DISASTER RECOVERY FRAMEWORK FOR IRRIGATION SECTOR SRI LANKA

DISASTER RECOVERY FRAMEWORK FOR THE IRRIGATION SECTOR OF SRI LANKA, DECEMBER 2023

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The United Nations Development Programme delivered output 3 of such Project with the aim to enhance technical capacities for recovery planning, and implementation, including adapting to Disaster Recovery Framework (DRF), SOPs and Post Disaster Needs Assessment (PDNA) guidelines for Irrigation sector in Sri Lanka.

This publication has been developed with the overall supervision and guidance from Major. Gen Sudan- tha Ranasinghe - Director General of DMC and Ms. Anoja Seneviratne, Director – Mitigation, Research and Development in Disaster Management Center with collaboration and input from Technical Working Committee members appointed by stakeholder agencies namely Department of National Planning, De- partment of National Budget, Department of Irrigation, Mahaweli Authority of Sri Lanka, Department of Agrarian Development, Provincial Department of Irrigation in 9 Provinces of Sri Lanka.

Technical support provided by the Disaster Recovery Consultant - Dr. Vishaka Hidellage and Irrigation Specialist Dr. Palitha Bandara, under the overall supervision and technical guidance of Ms. Rita Missal - UNDP Recovery Advisor, Ms. Joana Sampainho - UNDP's Recovery Analyst, and in close collaboration with Mr. Vajira Hettige, Technical Coordinator, Mr. Manjula Bandara – DRR Coordinator, Thamarashi Hei- yantuduwa- Consultant Project Assistant of UNDP Sri Lanka.

PREFACE

Recognizing the need for greater investment in the planning process for disaster-resilient infrastructure across Asia and the Pacific, the United Nations Development Programme (UNDP), via its Regional Hub in Bangkok, and with the financial support of the Asian Development Bank (ADB), has launched the 'Resilient Infrastructure through Enhanced Knowledge' Project initiative. The initiative received grant funding from the Japan Fund for Prosperous and Resilient Asia and the Pacific (JFPR), which was funded by the Japanese government through ADB. The objective of the project was to strengthen the capacity of the selected countries to define and implement disaster-resilient measures in pre-disaster recovery planning and post-disaster recovery efforts. Sri Lanka has chosen the irrigation industry to implement project activities. Recent disaster damages and losses highlight the imperative need to plan and design infrastructure in Sri Lanka with disaster risk in mind. Current climate projections indicate a significant increase in climate-induced disasters (hydro-meteorological disasters), which could lead to an increase in future damages and losses. As a result, this initiative is intended to address some of the most significant challenges and gaps in disaster recovery in the irrigation sector, which is crucial to agricultural production and rural development in Sri Lanka.

UNDP Sri Lanka implemented this project by providing technical and financial assistance to the Disaster Management Centre (DMC) and critical irrigation sector, National Planning Department, and Budget Department stakeholders. To coordinate and facilitate project activities, a Technical Working committee (TWC) has been established by the chairman of the stakeholder institutions.
The objective of the project was to enhance the capacity of the Irrigation Sector in Sri Lanka to define and implement disaster-resilient measures in pre-disaster recovery planning and post-disaster recovery efforts. Through the development of a Disaster Recovery Framework (DRF) and Standard Operation Procedures (SoP), Guidelines on DRF that include a Post-Disaster Needs Assessment (PDNA), and a Disaster Recovery Framework (DRF) Training Manual, the project also improves the environment for recovery in the country's irrigation sector.

The Publication is primarily intended for irrigation sector practitioners, particularly irrigation sector project planners and administrators who are responsible for implementing DRR and recovery initiatives at subnational and local levels. This manual is a practical guide that emphasises the process of planning and implementing risk reduction initiatives, as well as recovery preparedness and key decision points. The descriptions and discussions are supported by case studies that seek to illustrate the variety and range of practical approaches that can be employed.

This publication was created under the general supervision and direction of Ms. Anoja Seneviratne, Director – Mitigation, Research and Development in Disaster Management Centre, with collaboration and input from TWC members appointed by stakeholder agencies including Department of National Planning, Department of National Budget, Department of Irrigation, Mahaweli Authority of Sri Lanka, Department of Agrarian Development, Provincial Departments of Irrigation in 9 Provinces.
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CHAPTER 01

DISASTER RECOVERY FRAMEWORK FOR IRRIGATION SECTOR In SRI LANKA

ABBREVIATION

ADB	Asian Development Bank
CSO	Civil Society Organizations
DaLA	Damage and loss assessment
DAD	Department of Agrarian Development
DG	Director General
DM	Disaster Management
DMC	Disaster Management Center
DRF	Disaster Recovery Framework
DRP	Disaster Recovery Planning
DRR	Disaster Risk Reduction
DRT	Disaster Recovery Team
EU	European Union
EIA	Environmental Impact Assessment
FAO	Food and Agriculture Organization of the UN
IATF	Inter-Agency Task Force
ID	Irrigation Department
IWMI	International Water Management Institute
JICA	Japanese International Cooperation Agency
KSTA	Knowledge Sharing and Technical Assistance
ICRC	International Red Cross and Red Crescent
NBD	National Budget Department
NBRO	National Building Research Organization
NCT	National Coordination Team
NCDM	National Council on Disaster Management
NGO	Non-Governmental Organization
NPD	National Planning Department
MASL	Mahaweli Authority of Sri Lanka
O&M	Operation and maintenance
PDNA	Post Disaster Needs Assessment
PID	Provincial Irrigation Department
PrDRP	Pre-Disaster Recovery Planning
PoDRP	Post Disaster recovery Planning
SDG	Sustainable Development Goals
SOP	Standard Operating Procedures
TOT	Training of Trainers
TWC	Technical Working Group
UN	United Nations
UNDG	United National Development Group
UNDP	United nations Development Programme
WB	World Bank

CLARIFICATION OF TERMINOLOGY

Affected: People who are affected, either directly or indirectly, by a hazardous event. Directly affected are those who have suffered injury, illness, or other health effects; who were evacuated, displaced, relocated, or have suffered direct damage to their livelihoods, economic, physical, social, cultural, and environmental assets. Indirectly affected are people who have suffered consequences, other than or in addition to direct effects, over time due to disruption or changes in the economy, critical infrastructure, basic services, commerce, or work, or social, health, and psychological consequences.

Build Back Better: The use of the recovery, rehabilitation, and reconstruction phases after a disaster to increase the resilience of nations and communities through integrating disaster risk reduction measures into the restoration of physical infrastructure and societal systems and into the revitalization of livelihoods, economies, and the environment (The term "societal" will not be interpreted as the political system of the country.

Capacity: The combination of all the strengths, attributes, and resources available within an organization, community, or society to manage and reduce disaster risks and strengthen resilience. Capacity may include infrastructure, institutions, human knowledge and skills, and collective attributes such as social relationships, leadership, and management.

Capacity development is the process by which people, organizations, and society systematically stimulate and develop their capacities over time to achieve social and economic goals. It is a concept that extends the term capacity building to encompass all aspects of creating and sustaining capacity growth over time. It involves learning and various types of training, but also continuous efforts to develop institutions, political awareness, financial resources, technology systems, and the wider enabling environment.

Critical Infrastructure: The physical structures, facilities, networks, and other assets that provide services that are essential to the social and economic functioning of a community or society

Contingency planning is a management process that analyzes disaster risks and establishes arrangements in advance to enable timely, effective, and appropriate responses.

Annotation: Contingency planning results in organized and coordinated courses of action with clearly identified institutional roles and resources, information processes, and operational arrangements for specific actors at times of need. Based on scenarios of possible emergency conditions or hazardous events, it allows key actors to envision, anticipate, and solve problems that can arise during disasters. Contingency planning is an important part of overall preparedness. Contingency plans need to be regularly updated and exercised.

Disaster: A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability, and capacity, leading to one or more of the following: human, material, economic, and environmental losses and impacts.

The effect of the disaster can be immediate and localized, but it is often widespread and could last for a long period of time. The effect may test or exceed the capacity of a community or society to cope using its own resources and therefore may require assistance from external sources, which could include neighboring jurisdictions or those at the national or international levels.

Emergency is sometimes used interchangeably with the term disaster, as, for example, in the context of biological and technological hazards or health emergencies, which, however, can also relate to hazardous events that do not result in the serious disruption of the functioning of a community or society.

Disaster damage occurs during and immediately after the disaster. This is usually measured in physical units (e.g., square meters of housing, kilometers of roads, etc.) and describes the total or partial destruction of physical assets, the disruption of basic services, and damages to sources of livelihood in the affected area.

Disaster impact is the total effect, including negative effects (e.g., economic losses) and positive effects (e.g., economic gains), of a hazardous event or disaster. The term includes economic, human, and environmental impacts and may include death, injuries, disease, and other negative effects on human physical, mental, and social well-being.

Disaster Risk: The potential loss of life, injury, or destroyed or damaged assets that could occur to a system, society, or community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability, and capacity.

The definition of disaster risk reflects the concept of hazardous events and disasters as the outcome of continuously present conditions of risk. Disaster risk comprises different types of potential losses, which are often difficult to quantify. Nevertheless, with knowledge of the prevailing hazards and the patterns of population and socioeconomic development, disaster risks can be assessed and mapped, at least in broad terms. It is important to consider the social and economic contexts in which disaster risks occur and the fact that people do not necessarily share the same perceptions of risk and their underlying risk factors.

Residual risk is the disaster risk that remains even when effective disaster risk reduction measures are in place and for which emergency response and recovery capacities must be maintained. The presence of residual risk implies a continuing need to develop and support effective capacities for emergency services, preparedness, response, and recovery, together with socioeconomic policies such as safety nets and risk transfer mechanisms, as part of a holistic approach.

Disaster Risk Assessment: A qualitative or quantitative approach to determining the nature and extent of disaster risk by analyzing potential hazards and evaluating existing conditions of exposure and vulnerability that together could harm people, property, services, livelihoods, and the environment on which they depend.

Disaster risk assessments include: the identification of hazards; a review of the technical characteristics of hazards such as their location, intensity, frequency, and probability; the analysis of exposure and vulnerability, including the physical, social, health, environmental, and economic dimensions; and the evaluation of the effectiveness of prevailing and alternative coping capacities with respect to likely risk scenarios.

Disaster Risk Management: Disaster risk management is the application of disaster risk reduction policies and strategies to prevent new disaster risk, reduce existing disaster risk, and manage residual risk, contributing to the strengthening of resilience and the reduction of disaster losses.

Disaster risk management actions can be distinguished between prospective disaster risk management, corrective disaster risk management, and compensatory disaster risk management, also called residual risk management.

Disaster risk management plans set out the goals and specific objectives for reducing disaster risks, together with related actions to accomplish these objectives. They should be guided by the Sendai Framework for Disaster Risk Reduction 2015–2030 and considered and coordinated within relevant development plans, resource allocations, and program activities. National-level plans need to be specific to each level of administrative responsibility and adapted to the different social and geographical circumstances that are present. The time frame, responsibilities for implementation, and sources of funding should be specified in the plan. Linkages to sustainable development and climate change adaptation plans should be made where possible.

Disaster Risk Reduction: Disaster risk reduction is aimed at preventing new and reducing existing disaster risk and managing residual risk, all of which contribute to strengthening resilience and therefore to the achievement of sustainable development.

Disaster risk reduction is the policy objective of disaster risk management, and its goals and objectives are defined in disaster risk reduction strategies and plans.

Disaster risk reduction strategies and policies define goals and objectives across different timescales and with concrete targets, indicators, and time frames. In line with the Sendai Framework for Disaster Risk Reduction 2015–2030, these should be aimed at preventing the creation of disaster risk, reducing existing risk, and strengthening economic, social, health, and environmental resilience.

A global, agreed-upon policy of disaster risk reduction is set out in the United Nations-endorsed Sendai Framework for Disaster Risk Reduction 2015–2030, adopted in March 2015, whose expected outcome over the next 15 years is “The substantial reduction of disaster risk and losses in lives, livelihoods, and health and in the economic, physical, social, cultural, and environmental assets of persons, businesses, communities, and countries”.

Economic Loss: Total economic impact that consists of direct economic loss and indirect economic loss

Direct economic loss: the monetary value of the total or partial destruction of physical assets existing in the affected area. Direct economic loss is nearly equivalent to physical damage.
Indirect economic loss: a decline in economic value added as a consequence of direct economic loss and/or human and environmental impacts
Examples of physical assets that are the basis for calculating direct economic loss include irrigation infrastructure, other public, private, and business assets, industrial plants, and production assets such as crops, livestock, and production infrastructure. They may also encompass environmental assets and cultural heritage.

Direct economic losses usually happen during the event or within the first few hours after the event and are often assessed soon after the event to estimate recovery costs and claim insurance payments. These are tangible and relatively easy to measure.

Indirect economic loss includes microeconomic impacts (e.g., revenue declines owing to business interruption), microeconomic impacts (e.g., revenue declines owing to impacts on natural assets, interruptions to supply chains, or temporary unemployment), and macroeconomic impacts (e.g., price increases, increases in government debt, negative impact on stock market prices, and decline in GDP). Indirect losses can occur inside or outside of the hazard area and often have a time lag. As a result, they may be intangible or difficult to measure.

Exposure: The situation of people, infrastructure, housing, production capacities, and other tangible human assets located in hazard-prone areas
Measures of exposure can include the number of people or types of assets in an area. These can be combined with the specific vulnerability and capacity of the exposed elements to any particular hazard to estimate the quantitative risks associated with that hazard in the area of interest.

Hazard: A process, phenomenon, or human activity that may cause loss of life, injury, or other health impacts, property damage, social and economic disruption, or environmental degradation.
Annotations: Hazards may be natural, anthropogenic, or socio-natural in origin. Natural hazards are predominantly associated with natural processes and phenomena. Anthropogenic hazards, or human-induced hazards, are induced entirely or predominantly by human activities and choices. This term does not include the occurrence or risk of armed conflicts or other situations of social instability or tension that are subject to international humanitarian law and national legislation. Several hazards are socio-natural in that they are associated with a combination of natural and anthropogenic factors, including environmental degradation and climate change.

Hazards may be single, sequential, or combined in their origin and effects. Each hazard is characterized by its location, intensity or magnitude, frequency, and probability. Biological hazards are also defined by their infectiousness, toxicity, or other characteristics of the pathogen, such as dose-response, incubation period, case fatality rate, and estimation of the pathogen's transmission.

Mitigation: The lessening or minimizing of the adverse impacts of a hazardous event The adverse impacts of hazards, in particular natural hazards, often cannot be fully prevented, but their scale or severity can be substantially lessened by various strategies and actions. Mitigation measures include engineering techniques and hazard-resistant construction, as well as improved environmental and social policies and public awareness. It should be noted that, in climate change policy, "mitigation" is defined differently and is the term used for the reduction of greenhouse gas emissions that are the source of climate change.

Preparedness: The knowledge and capacities developed by governments, response and recovery organizations, communities, and individuals to effectively anticipate, respond to, and recover from the impacts of likely, imminent, or current disasters.
Preparedness action is carried out within the context of disaster risk management and aims to build the capacities needed to efficiently manage all types of emergencies and achieve orderly transitions from response to sustained recovery.
Preparedness is based on a sound analysis of disaster risks and good linkages with early warning systems and includes such activities as contingency planning, the stockpiling of equipment and supplies, the development of arrangements for coordination, evacuation, and public information, and associated training and field exercises. These must be supported by formal institutional, legal, and budgetary capacities. The related term "readiness" describes the ability to quickly and appropriately respond when required.

Recovery restoring or improving livelihoods and health, as well as economic, physical, social, cultural, and environmental assets, systems, and activities, of a disaster-affected community or society, aligning with the principles of sustainable development and "building back better", to avoid or reduce future disaster risk.

Response: Actions taken directly before, during, or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety, and meet the basic subsistence needs of the people affected.

Disaster response is predominantly focused on immediate and short-term needs and is sometimes called disaster relief. Effective, efficient, and timely response relies on disaster risk-informed preparedness measures, including the development of the response capacities of individuals, communities, organizations, countries, and the international community.

The institutional elements of response often include the provision of emergency services and public assistance by the public and private sectors and community sectors, as well as community and volunteer participation. "Emergency services" are a critical set of specialized agencies that have specific responsibilities for serving and protecting people and property in emergency and disaster situations. They include civil protection authorities, police, and fire services, among many others. The division between the response stage and the subsequent recovery stage is not clear-cut. Some response actions, such as the supply of temporary housing and water supplies, may extend well into the recovery stage.

Resilience: The ability of a system, community, or society exposed to hazards to resist, absorb, accommodate, adapt to, transform, and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management.

Residual Risk: The disaster risk that remains in unmanaged form, even when effective disaster risk reduction measures are in place, and for which emergency response and recovery capacities must be maintained.

The presence of residual risk implies a continuing need to develop and support effective capacities for emergency services, preparedness, response, and recovery, together with socioeconomic policies such as safety nets and risk transfer mechanisms, as part of a holistic approach.

Rehabilitation: The restoration of basic services and facilities for the functioning of a community or society affected by a disaster

Reconstruction: 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 and "building back better", to avoid or reduce future disaster risk.

Vulnerability: The conditions determined by physical, social, economic, and environmental factors or processes that increase the susceptibility of an individual, a community, assets, or systems to the impacts of hazards.

For positive factors that increase the ability of people to cope with hazards, see also the definitions of "Capacity" and "Coping capacity".

1.1 INTRODUCTION

1.1.1 Irrigation Sector of Sri Lanka

Sri Lanka's history of thriving irrigation goes back over two millennia. The significant link between irrigation systems and the wellbeing of people in Sri Lanka continues to the present. A substantial public investment (9–40%) has been channeled towards irrigation development from 1950–1990 (Shand, 2002). There is a close link between the irrigation and agriculture sectors, as over two-thirds of agricultural land in Sri Lanka is under irrigation (International Water Management Institute, 2006). Agriculture is a critical sector for the country as it contributes to food security, the livelihood security of many, foreign exchange generation, etc. A strong historical stand on irrigated agriculture has paved the way for the evolution of a powerful irrigation institutional base, prioritizing the use of over 80% of developed water resources for irrigation. Provision of free irrigation infrastructure and services has been seen as a priority need, reinforced by those in power keen on extracting benefits from irrigation investment to strengthen their own political visibility. This, in turn, has made irrigation agencies feel quite secure despite increasing management and operational inefficiencies and failures (IWMI, 2016).

1.1.2 Disasters in the Context of Sri Lanka

The geographical location of Sri Lanka makes the country prone to several natural hazards, mostly weather - and water-related, such as flooding, landslides, lightning, drought, tsunamis, etc. Sri Lanka's vulnerability to disasters stems from its high population density and economic activities, which are mainly concentrated in flood-prone and coastal areas. The Tsunami in 2004 brought serious impacts, and it was a turning point for the country. Consequently, disaster management started to be taken seriously, including with the introduction of the Disaster Management Act and Policy.

Sri Lanka, like many other nations throughout the world, is facing an increasing risk of disasters caused by climate change. The country is frequently placed among the top ten countries in the world in terms of vulnerability to climate catastrophes (German Watch, 2019 and 2020). Evidence of changing climate conditions across the island includes rising annual average mean temperatures, rainfall, and drought patterns, among other things, with the dry and intermediate (D&I) zones, considered the island's agricultural heartland, being more vulnerable to climate change than the rest of the country.

The frequency of floods and droughts is increasing, according to historical evidence. The southwest monsoons (May to September) cause severe flooding in the western and southwestern provinces. The northeast monsoons (December to February) cause flooding in the eastern, northern, and north-central regions. Due to a combination of heavy rainfall, geological changes in the hill country, and deforestation, the severity of landslides in the country's mountainous regions has increased over the past two decades. In the districts of Badulla, Nuwara Eliya, Ratnapura, Kegalle, Kalutara, Kandy, and Matale, landslides are prevalent. According to estimates from multiple models, Sri Lanka's annual mean temperatures will increase. There will be sea level rise, storm surges, and coastal erosion, with the greatest impact on the west, southwest, and southern coastal regions, where nearly half of Sri Lanka's population resides. The northern region of the country is frequently struck by cyclones, especially in November and December. In the past, cyclones and other climate-related disasters have been relatively mild, but their frequency and magnitude are likely to increase in the future.

1.1.3 Implications of Changing Disaster Trends for the Irrigation Sector

Conventional challenges faced by the irrigation sector in the country get compounded and more complex due to increased risks posed by natural hazards intensified by climate change and other changes. It has been demonstrated that repeated exposure of irrigation infrastructure (often still recovering from a previous disaster) to increasing occurrences of more intense disasters has devastating effects on it.

1.1.4 Disaster Recovery Planning

Having sound methodologies and tools for recovery planning will strengthen the preventative measures that the irrigation sector institutions in Sri Lanka currently practice.

Pre-prepared recovery strategies will enhance knowledge of reducing potential risks, minimizing exposure and vulnerability so that resulting damages are also reduced, and implementing efficient post-disaster recovery strategies and operations, among other things. In addition, it facilitates the formation of a more precise image of the resource requirements for implementing recovery plans and preparing to access available resources.

1.1.5 Scope

This document presents key concepts that underpin recovery planning leading to the development of the disaster recovery framework (DRF) in general and refers to the specificities of the irrigation sector in Sri Lanka wherever possible. A disaster recovery framework (DRF) drafted for the irrigation sector in Sri Lanka is presented, taking global best practices for recovery planning and the status of the irrigation sector in Sri Lanka into consideration. Attention is drawn to important aspects to tailor the sectoral DRF outline to produce individual institutional DRFs by the irrigation institutions: the Irrigation Department (ID), Mahaweli Authority of Sri Lanka (MASL), Department of Agrarian Development (DAD), and the nine Provincial Irrigation Departments (PID of Sri Lanka). Together with the Guidelines, this document is expected to be an important part of the comprehensive resource required to grasp concepts and practice disaster recovery planning by irrigation sector institutions in Sri Lanka.

1.1.6 Purpose

The objectives of the DRF Guide for the Irrigation Sector include:

- Create and strengthen capacity within irrigation sector institutions and effective coordination among relevant parties during recovery.
- Recovery planning will become an important part of organizational planning in the irrigation sector.
- Draw the attention of decision-makers to the rationale behind concepts, methodologies, etc., of disaster recovery planning and obtain their endorsement for improved irrigation sector planning and attention to the need for:
    - o Informed institutional and policy setting for recovery.
    - o Prioritization and recovery planning should be based on an inclusive, transparent process with stakeholder participation and national or global best practices.
    - o Having a comprehensive approach for financing recovery
    - o Having efficient and effective implementation, monitoring, and evaluation systems for recovery programs

1.1.7 Time frame

The recovery of the irrigation sector has implications for infrastructure recovery, including the achievement of certain long-term goals. It is essential to establish a timeframe for the Drought Recovery Framework (DRF), which is assumed to be at least five years depending on the specific post-disaster requirements.

1.1.8 Audience

This document is intended primarily for audiences involved with preparedness, planning, and management of recovery and reconstruction activities within government irrigation institutions. They would be staff members of ID, MASL, DAD, and nine (9) PIDs, planners of the National Planning (NPD) and Budget Departments (BD), and other stakeholders such as relevant staff of the Agriculture Department, Disaster Management Center (DMC), etc.

1.1.9 Structure of the Document

The document has three chapters, starting with an introductory chapter outlining scope, purpose, timeframe, and intended audience. Chapter 2 discusses the context and practices of disaster recovery in Sri Lanka's irrigation sector while drawing attention to the need for recovery planning to evolve with changing disaster trends and outlines global best practices of recovery planning that the irrigation sector can benefit from. Chapter 3 presents an outline disaster recovery framework (DRF) for the irrigation sector, proposing a recovery vision, objectives, and guiding principles that build on the irrigation sector DRF developed in 2017, while discussing policies, institutional arrangements that underpin disaster recovery planning in the irrigation sector of Sri Lanka, financing mechanisms, and implementing procedures, as well as monitoring and evaluating arrangements for the recovery plan. The proposed outlines of DRF for each institution to improve and use are annexed to the document.

1.2 RECOVERY PRACTICES: SRI LANKA AND GLOBAL

Post-disaster recovery planning in Sri Lanka took place after the nationally significant floods and landslide disaster events of 2016 and 2017. Sri Lanka carried out comprehensive post-disaster needs assessments (PDNA) and produced a recovery framework in 2017 to guide the recovery process. Irrigation was a key sector considered in the PDNA and post-disaster recovery planning (PoDRP). Key steps of a typical post-disaster recovery planning process that Sri Lanka would engage in after a nationally significant disaster event are given in Annex I, based on experience gained from post-disaster experiences in 2016 and 2017. According to Sri Lanka's Disaster Management Act No. 13 of 2005, the country will declare disaster status 'if at any time the extent or severity of a disaster is or is likely to be so great that any countermeasures that may become necessary to counter such a disaster or impending disaster are beyond the resources or means normally available to the administration.

1.2.1 Recovery Practices in the Irrigation Sector

Aging infrastructure and insufficient and reducing revenues for repair and maintenance are global irrigation challenges (Ward, 2010). Current global development discourses on irrigation emphasize the efficient maintenance and expansion of irrigation systems in the context of population growth, food insecurity, climate change, the deterioration of ecological assets, etc. As a consequence, emerging trends recommend a better comprehension and determination of the economic value of irrigation infrastructure in order to justify and recover the necessary investments to maintain the infrastructure. National and institutional policies (e.g., water user associations and agreements) should consider market approaches (e.g., infrastructure subsidies, clarifying titles to water rights, marginal cost pricing, and non-volumetric pricing) to assist in valuing irrigation infrastructure and encouraging investments.

In addition to the global challenges faced by the irrigation sector, inadequate productivity, insufficient water availability, inefficient use of water, low profitability of crops, Inadequate operation, maintenance, and management of multiple uses of irrigation water, limited stakeholder participation in the administration of irrigation systems, and inequitable distribution are presently the most significant issues facing the irrigation sector in Sri Lanka. Provision of free irrigation infrastructure and services has been seen as a need reinforced by political power keen on extracting benefits from irrigation investment to strengthen their own visibility. IWMI (2016) argues that this in turn has made irrigation agencies in Sri Lanka feel secure, despite the management and operational inefficiencies and failures that exist at these institutions.

[2]Recovery Plan 2017 https://www.gfdrr.org/sites/default/files/publication/Sri%20Lanka%20Recovery%20Plan.pdf

[3]When a disaster creates a significant impact on people's lives, their assets, and the economy across many sectors, the number of people and damage costs are very high, i.e., the Tsunami of 2004, which left over 30,000 people dead, over 1 million people displaced, and over 150,000 losing their main livelihood, and floods and landslides in 2016, which displaced close to 125,000 people with over 58,000 houses destroyed and damaged in 24 out of 25 districts in the country. In addition to the scale and severity of the disaster, the level of response required, geographic extent, threat to critical infrastructure, public perception and attention, political significance, etc. are other considerations that make a disaster nationally significant.

Global development discourses aim to ensure efficient maintenance and expansion of irrigation systems in the context of population growth, food insecurity, climate change, erosion of ecological assets, etc. Emerging trends recommend better understanding and determining the economic value of irrigation infrastructure, which is promoted as a result to justify and recover investments needed to sustain infrastructure. National or institutional policies (i.e., water user associations and agreements) and/or market approaches (i.e., infrastructure subsidies, clearing titles to water rights, marginal cost pricing, and non-volumetric pricing) are some proposals to help value irrigation infrastructure and promote investments. Debates, however, are continuing globally on how to use policy instruments for sustaining irrigation infrastructure, considering both market and institutional approaches, as well as whether and how water should be priced for agricultural use.

Despite the country's abundant water resources (103 rivers), water is a scarce resource, especially in the Dry Zone, where the majority of agricultural production occurs. Sri Lanka, however, has resisted the use of market-based tools to enhance water governance (S. K. Chandrasekara, 2020). Attempts to promote integrated water resource management, strengthen water governance, and facilitate improved water allocation to multiple water requirements have not ended as intended. Past policy proposals seemed to have fallen short of paying attention to public engagement and the country's water-related cultural and social aspects, i.e., public perception opposed charging farmers for irrigation water without understanding that the rationale for proposed pricing was waste security and to develop sectors that give high returns and reduce water inefficiencies and waste. Water and irrigation are areas that have significant political implications, and Sri Lanka has so far been unable to approve the drafted water policy. Considering alternatives to public investment and management of irrigation infrastructure, including its efficient expansion, has yet to happen in Sri Lanka. In addition to integrated water resource management, future policy formulation processes need to analyze areas previously overlooked. i.e., mitigation of floods, pollution and contamination of surface and groundwater, overexploitation of catchment forest cover, overexploitation of groundwater, minimizing non-revenue water, urbanization-influenced downstream water rights violations, etc.

1.2.2 Implications of Current Disaster Trends on Irrigation Infrastructure

Floods, the key irrigation sector disaster planning consideration, are a natural phenomenon that generally occur during or after the two annual monsoon rains, affecting different parts of the country depending on the time of the year. Seasonal flooding impacted generally on earthen canal water distribution systems of minor schemes is tackled by annual maintenance with community input. Yet instances of extreme flooding have been recorded from time to time. Minor irrigation schemes are the most affected. Tanks and anicuts cascading downstream of minor rivers and tributaries without gated-control spillways fail during extreme flooding, causing damage to their headworks and canal systems. The major and medium tanks are more resilient as they are equipped with gated-control spillway structures or improved versions that enable water regulation. Yet, the increasing flood hazard trend poses growing threats to them too, as indicated by the incidences of damage to spillways and the canal systems of major and medium schemes reported during flood events over the last few years.

Reservoir-induced floods are another threat that is mostly related to major and medium irrigation tanks. However, the only recorded serious disaster was the breach of the Kantale, a major irrigation dam (> 50 ft high and about 14,000 ft long). It started with a leak in the left spillway and ended up killing 126 people and destroying over 1600 houses. Sri Lanka has approximately 320 medium and large dams and about 12,000 small dams, and most of them were built more than 1,000 years ago (Rodriogo, 2011). Built in the 1980s, significant reservoirs such as Kotmale, Victoria, Randenigala, Samanalawewa, and Maduruoya are also prone to fractures and leaks. Sri Lanka's aging dams, particularly earthen dams, are in jeopardy of collapsing due to structural or geological deficiencies, operational and monitoring imperfections, and altered patterns of precipitation caused by climate change. The World Commission on Dams in 1998 recommended Sri Lanka urgently address dam safety issues (Fernando, 2008). In addition, it suggested strengthening technical and institutional capacity for effective regulation, operation, and maintenance of dams.

The increased drought trend can affect the irrigation sector; Reservoirs tend to dry out, and infrastructure gets exposed to risks of structural damage and deterioration, which may lead to increased maintenance costs (Njogu, 2021). However, there have been no reports of significant infrastructure damage in Sri Lanka. Landslides that did not pose a significant hazard are becoming a common occurrence during monsoon rain, resulting in severe damage and high recovery costs. In addition, with the emergence of convincing evidence on the long-suspected geological phenomenon of the splitting of the Indo-Australian plate not very far south of Sri Lanka, geologists suspect the country, including the irrigation sector, may become vulnerable to earthquakes and tsunamis (Dissanayake, 2010).

Increased arid periods and droughts can result in the intrusion of salt water. In general, the depletion of the groundwater table prompts people to overexploit subterranean well water. This is especially significant in areas such as the Jaffna peninsula, which are susceptible to growing droughts. In addition, reverse flow caused by sea-level rise and increased storm surges is contaminating canals in coastal areas such as Kalutara and Mannar with saline. Infiltration of salinity can contaminate irrigation system water, rendering it unfit for plant growth and necessitating costly corrosion prevention maintenance.

Disaster-induced damage and destruction of irrigation infrastructure have direct negative impacts on agriculture and related production sectors supported by irrigation and drinking water, energy generation, etc. Conventional annual budget allocations for routine repairs and maintenance have always taken annual monsoonal flood effects on infrastructure into account. Routine annual floods in Sri Lanka a few decades ago were at a significantly low level of severity, and the public funding allocations were sufficient for repairs and preventive maintenance. Generally rare phenomena in the past Sri Lankan context have become frequent events. Significantly more resources are required to rehabilitate, restore, and maintain infrastructure in satisfactory operating condition. The Irrigation sector is left with unattended repairs and rehabilitation, a problem that institutions attempt to address by requesting funds from future annual budget allocations. Prioritizing recovery weakens the overall irrigation infrastructure because systems operate with unattended and partially attended recovery requirements.

1.2.3 Annual Preventive Repairs and Maintenance

The sector's planning considers only annual monsoon flooding as the most significant natural hazard that can cause damage to irrigation infrastructure. Minor irrigation schemes: small reservoirs and anicuts cascading downstream of small rivers and tributaries without gated-control spillways are most impacted and fail during excessive floods, causing damage to headworks and canal systems. Major and medium reservoirs are designed to be resilient to even substantial flood hazards as they have the capability to release excess water. However, the release of excess water may cause devastation to smaller irrigation infrastructure located further downstream. Floods could destroy or impair small village reservoirs and their conveyance systems. Likewise, portions of the major and medium irrigation systems' earthen-based distributary canals could also be destroyed. Recognizing this, annual public funding allocations provide for pre-monsoon maintenance (risk reduction and exposure reduction) and restoration of damage caused by the previous monsoon (recovery). This conventional planning system , which has historically been effective, has sustainably managed irrigation infrastructure. However, at present, annual provisions are insufficient to recover from the damages and destruction to irrigation infrastructure caused by increasing (frequency and intensity) annual floods together with increasing annual dry spells with higher average temperatures.

1.2.4 Post-Disaster (Annual Floods) Needs Assessment

After every flood incidence, based on the extent of its impact, the irrigation sector institutions carry out an initial assessment of damage (to infrastructure) and loss (due to disruption of irrigation service) to plan the recovery. Initial assessments are based mostly on visual observations made by visiting affected locations and estimating damages and losses in consultation with field officers. Immediate response and medium- to long-term recovery needs and resource requirements are identified using this information. Since recovery funding is not promptly allocated, requirements and costs for recovery may fluctuate within the next year or several years when funding becomes available. Once the allocation of the recovery fund is available, precise engineering estimates are formulated and supported by current data and a feasibility analysis based on the requirements.

1.2.5 Immediate Response

Short-term needs identified by irrigation sector institutions are critical to preventing further impacts. Institutions in the irrigation sector handle imminent obligations (early recovery) in a number of ways, including community participation and the transfer of funds from annual maintenance budgets, etc., i.e., minimizing leakage, drawing water from excavated wells, providing temporary irrigation to save crops, etc., if the growing season is to commence but flood damage restorations and rehabilitation are to be postponed. As the frequency and severity of annual floods resulting from natural disasters increase, it becomes increasingly difficult for institutions to meet early recovery requirements in a timely and enduring manner.

5Please refer to Annex I for details of the systems practiced by irrigation institutions.

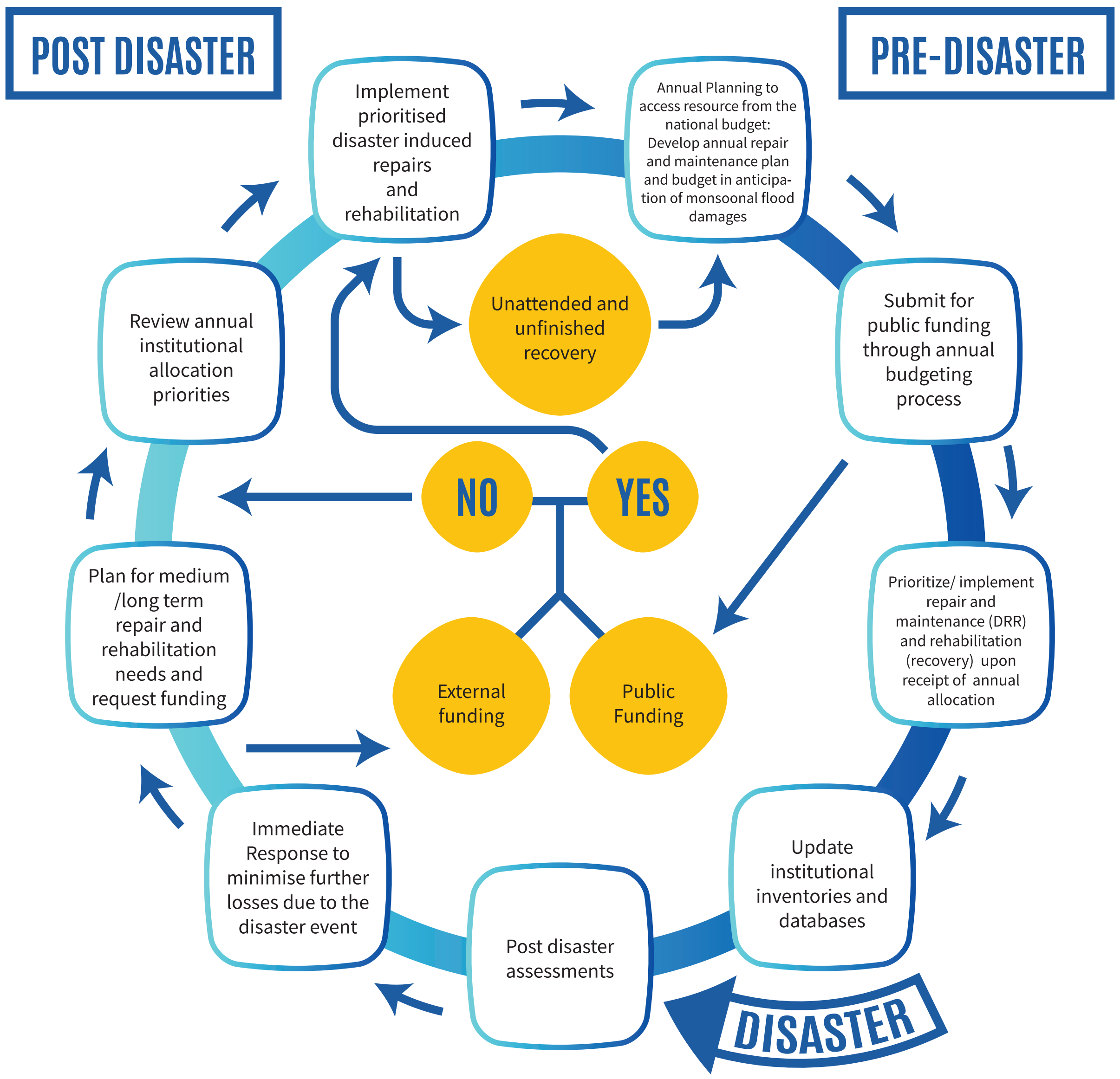

Figure 1 : Recovery Practices of the Irrigation Sector institutions

1.2.6 Planning for medium- to Long-term Recovery

Medium- and long-term recovery plans of irrigation sector institutions are generally individual institutional plans, focusing on restoring irrigation services in identified and prioritized locations by attending to each damage or destruction. Recovery actions may require time and resources that exceed the expectations of annual planning cycles. Institutions develop proposals for repair and rehabilitation and submit them through the National Planning Department (NPD) to the Treasury, seeking additional resources or donor funding.

Irrigation is considered a priority area for the country's public funding. Together with the agriculture sector, it ensures economically significant food production and supports national food security. Yet, this does not guarantee the timely allocation of adequate resources. Post-flood repair and rehabilitation get attended to only gradually, while outstanding work is considered and prioritized during every annul planning cycle.

1.2.7 Resourcing Recovery

As discussed, irrigation sector institutions have post-monsoonal repair and maintenance budgets, which in the past accounted for relatively simple repair and rehabilitation requirements caused by annual floods. Institutions do not have a specific calamity fund or a contingency budget that can provide for post-flood damage repair and rehabilitation of infrastructure. As mentioned, they must request additional allocations for medium- and long-term recovery. Given the context of disaster events getting more frequent and serious, the government must also decide among competing priorities. Irrigation institutions have already realized their requests for disaster-related additional allocations from the government treasury are not easily forthcoming. They resort to finding early recovery funds first and foremost from their annual repair and maintenance allocations, and if this is inadequate, which is often the case, the institution allocates more by reviewing overall organizational budgets.

Depending on the requirement, revisions to find funds may happen at different levels, i.e., tapping into possible contingency or other budgets (i.e., Range level or Head Office level budgets of ID, use of income budgets of MASL, under the Chief Secretary of Provincial Council by the PIDs) or deprioritizing some development actions planned at the range level or national level (i.e., purchasing equipment). The Provincial Irrigation Departments and the Department of Agrarian Development face the most challenges. They serve a large number of vulnerable communities based on relatively more vulnerable infrastructure, generally suffer more damage, and get relatively low annual allocations from the government (about 7-8% of the total annual irrigation budget . Their resource mobilization flexibilities are low, and internal budget reviews may not provide much for recovery. External sources such as Civil Society Organizations (CSOs) and charities, i.e., Rotary Clubs, have supplemented the repair and rehabilitation of minor systems, often in ad hoc manners.

1.2.8 Gaps In Irrigation Sector Recovery Processes

Irrigation institutions' rebuilding planning procedures (Recovery planning protocols) are based on conventional processes; resource allocation for repair and maintenance is based on well-predicted, expected yearly flood scenarios and the consequent damage and destruction. It served the industry well in the past when Monsoon rains were predictable in terms of time, amount of rain, severity, and so on. Recovery planning using traditional approaches has proven inadequate in the setting of escalating disaster patterns, and each year, post-flood recovery has begun to necessitate extra resources. Slow and inadequate funding allocations for recovery priorities are a major factor discouraging irrigation agency planners and implementors from considering additional improvements to recovery planning. As a result, Sri Lanka currently has a gradually accumulating incomplete and unattended recovery of irrigation infrastructure. The Sri Lanka component of the ADB-UNDP project on Building Disaster-Resilient Infrastructure through Enhanced Knowledge worked on identifying these gaps and ways to use them as entry points for introducing improvements based on global recovery best practices.

1.2.9 Data and Information Availability

All forms of planning, including recovery planning in the irrigation sector, require reliable and updated data and information. Individual irrigation agencies collect and use data relevant to the respective infrastructure managed by them, such as (I) the type of irrigation schemes (Tank or Anicut); (II) scale by command area (major, medium, minor); (III) identification name and the name of the operating unit of the state agency; (IV) location by administrative district or/ and province or coordinates; and (V) irrigation command area facilitated by the scheme, etc. Discussion with relevant staff of all the irrigation institutions revealed the existence of gaps in data management, including data and information sharing. Most data and information are scattered across various databases, reports, individual staff, or divisions; they are outdated and available in different, incomparable formats, etc. Often, it is not easy to access reliable and updated data and information. As a result, clear systems that help to understand the status quo, which can then be used as a pre-disaster situation, which is critical to recovery planning and is tailored to individual institutions, were introduced by the KSTA project.

1.2.10 Forecasting Flood damage

At present, irrigation institutions compile their next year's repair and maintenance plans based on forecasted scenarios of damage and destruction due to floods, but this is based only on historical information. Future trends and increasing vulnerabilities are systematically not incorporated into the planning processes.

1.2.11 Global Practices in Recovery Planning

Over the past decades, the emphasis of disaster management has been placed mostly on prevention, preparedness, emergency response, mitigation, etc., which has generated substantial knowledge on key aspects of the disaster management cycle. However, the recovery has received comparatively less attention and is not as well understood in general (UNDP, 2016). Recovery is equally important for disaster management, and given the opportunities it creates for change towards resilient and sustainable development, it must be taken seriously. Recovery consists of several phases, which can continue for months or years depending on the disaster situation, as shown in Figure 2.

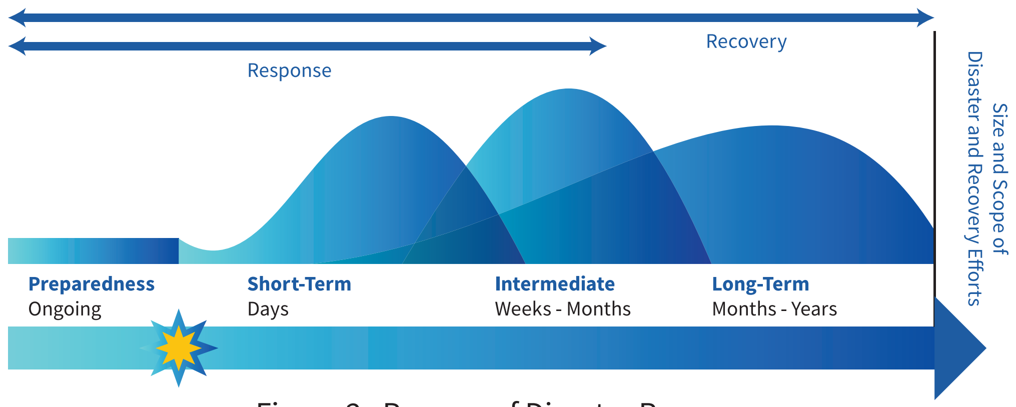

Figure 2 : Process of Disaster Recovery

[6]Source: Irrigation Sector Focal Point at the NPD

Disaster recovery begins after or during the final phases of emergency relief. Post-disaster periods of emergency rescue and aid are not conducive to planning. As such, it is recommended to plan for recovery prior to the occurrence of a disaster. Pre-disaster recovery planning (PrDRP) and post-disaster recovery planning (PoDRP) are two distinct but interconnected phases of disaster recovery planning, as depicted in Figure 3.

Instead of actual conditions, pre-disaster recovery planning (PrDRP) is guided by predicted disaster scenarios. It is an attempt to strengthen disaster recovery initiatives, planning, and outcomes by preparing for them prior to a disaster, based on the premise that many beneficial things can fall into place prior to a disaster to facilitate post-disaster recovery planning (PoDRP) and improve recovery outcomes (UNISDR, European Commission, 2011). These include creating and facilitating an institutional and policy environment, training and capacity building, reviewing and updating data and information systems, establishing coordination systems, and preparing financially. Figure 4 illustrates key PrDRP components. The visualization of post-disaster conditions and the establishment of recovery objectives, strategies, actions, institutional mechanisms, and resource requirements aid in post-disaster recovery planning.

Figure 3 : Disaster Recovery Planning; pre disaster and post disaster planning process

Conducting PrDRP does not mean that PoDRP is not required. On the contrary, PrDRP should be considered the start of the PoDRP process. PrDRP ensures adequate attention and time spent on deciding on key recovery strategies and actions needed in more challenging and tougher post-disaster circumstances, as well as how to resource, implement, monitor, and evaluate the recovery.

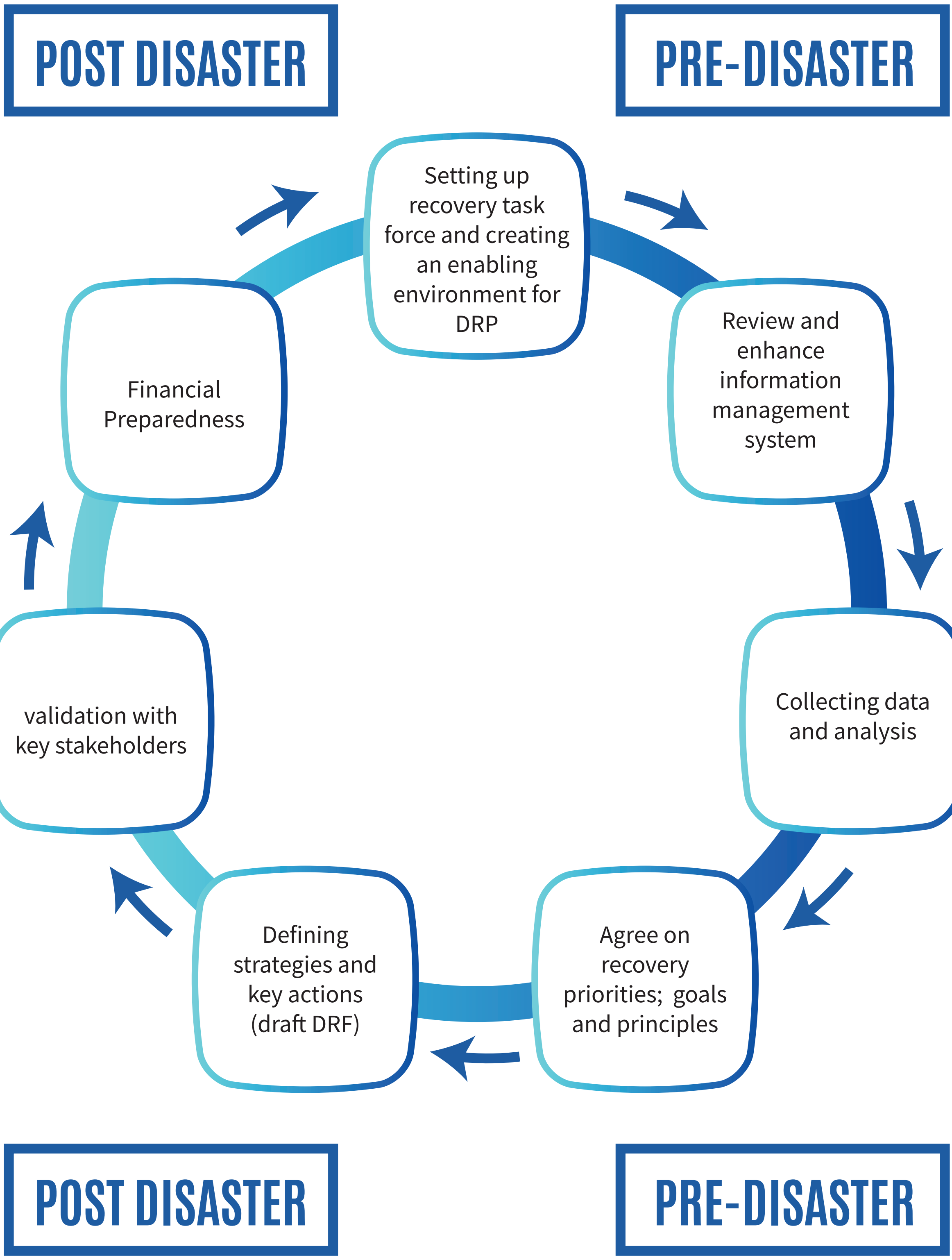

Figure 4 Key Elements of Pre-Disaster Recovery Planning (PrDRP)

1.3 PRE-DISASTER RECOVERY PLANNING

1.3.1 Creating an Enabling Environment

Irrigation institutions that have decided to engage in recovery planning must ensure that the institutional environment is conducive to recovery planning. This means embedding disaster recovery planning within institutional policies, systems, procedures, cultures, etc. As capturing and anticipating monsoonal flood risk and planning for recovery are important aspects of conventional planning in the irrigation sector, an extended analysis that considers disasters within the planning cycle is suggested. To do that, it is important that certain conditions fall into place within the institutions.

Institutional Heads to Drive the DRP: Heads of the irrigation institutions (Directors General of ID and MASL, Commissioner General of DAD, and Chief Secretaries of Provincial Councils) have been introduced to the rationale of incorporating disaster recovery planning (DRP) within their institutional mandate by the Sri Lanka component of the KSTA project [1] and have pledged their support to facilitate it. He or She should appoint a Focal point and team responsible for DRP within the institution and support the DRP team to create conducive conditions for DRP, including incorporating it within organizational planning manuals and protocols.

Appointing the Institutional Focal Point: Assigning disaster risk and recovery management to a specific individual in each institution within the irrigation sector (a Focal Point) could be the first step in incorporating DRR and DRP considerations into annual and longer-term institutional development plans. Those who served in the Technical Working Group of the KSTA project, representing each irrigation institution on disaster recovery, are initially recommended for this responsibility, as they have acquired extensive knowledge on the subject throughout the duration of the project. The institutional Focal Point would likely be a member of an interagency taskforce for the irrigation sector if the formation of such a taskforce is deemed necessary by all irrigation agencies in Sri Lanka or mandated by the government of Sri Lanka in exceptional circumstances, such as a nationally declared disaster situation. The institution's DRP team, managed by the Focal Point, is first and foremost responsible for introducing DRP to their institution. This includes raising awareness to gain the support of all institutional and external decision makers (e.g., farmer organizations and federations) and planners, organizing and conducting the required training programs for relevant staff, reviewing institutional policies, systems, procedures, culture, etc., and making the necessary recommendations to mainstream recovery planning within the institution.

1.3.2 Creating Awareness

To introduce recovery planning within irrigation institutions, it is necessary to raise awareness among relevant personnel and obtain their support for incorporating risk considerations and recovery into institutional planning. The Head of the institution is responsible for obtaining approval from the institution's top management (i.e., keeping the Secretary of the relevant Ministry and political authority informed) and facilitating and monitoring the DRP team's proposed institutional awareness program. If special programs are challenging from a practical standpoint, it is recommended to use existing platforms, such as planning meetings, review meetings, etc., to target all relevant staff and gain their buy-in. The KSTA project's resource materials can serve as valuable input for the creation of information and communication materials for such programs.

1.3.3 Training and Capacity Building

In each institution, planning should be carried out by specific teams while others provide cortical input. The introduction of DRP to the planning process implies some changes, such as the use of specific risk-based planning tools and methods. The planning teams need to be trained so that they are convinced of the value of the changes introduced and feel comfortable including and using them within irrigation sector planning. Training should happen either as special programs prior to planning or as on-the-job training, or even both.

The Focal Point should discuss with the Head of the Training division ways to continue the training, i.e., incorporation of DRP training as special training or regular training within the institutional training plans. The training manuals, guidance notes, and information packs for trainers and participants produced by the KSTA project will help in this endeavor.

Training programs must also consider what capacity building is required of farmers and field officers who collect information. Information collection and input from them will be more useful if they understand DRP concepts. Required training should be organized with the support of the respective field offices.

Institutions may request support from DMC or NPD to assist in DRP training and on-the-job training to produce DRF for the first time. In addition, Development Partner assistance may also be sought, using accepted protocols to carry out specific training and getting input from specialists who can work together with them to develop DRP.

The Sri Lanka component of the KSTA project conducted comprehensive training for selected professionals from all the irrigation institutions. This included data management, post-disaster needs assessment, and recovery planning. Training sessions were informed by internationally recommended recovery planning tools and methodologies and adapted to the irrigation sector in Sri Lanka.

1.3.4 Engaging with Irrigation Sector Stakeholders

Different players have a stake in irrigation services. Apart from the four key irrigation agencies, the stakeholders in irrigation could be from the agriculture sector, the Ceylon Electricity Board, the National Water Supply and Drainage Board (NWS&DB), the Rural Water Supply Division of the NWS&DB, the Officials of Inland Fisheries, etc., from government agencies. Private sector stakeholders may be construction agencies engaged in irrigation infrastructure development and their contractors, etc. As each irrigation institution already has mechanisms for interacting with key stakeholders, Focal Points can use these meetings and platforms to solicit input from these parties for disaster recovery planning. Donors and Development Partners (i.e., ADB, UNDP, FAO, etc.) interested in supporting irrigation infrastructure development may also be informed and involved to the extent they may want to be subjected to government planning in DRP in irrigation. Local-level actors who have a stake in irrigation must be engaged, and they may be farmer organizations, Local Authorities, women and their institutions, and youth and youth organizations. Those who show interest in irrigation development at the local level include CSOs (i.e., Palm Foundation, Sarvodaya, Sewa Lanka, etc.), the private sector (HSBC), and international organizations (World Vision, ICRC). Their engagement can be facilitated through appropriate forums. In addition, there are technical entities such as DMC, NBRO, Geological Survey and Mines Bureau, Met Department, IWMI, etc.; universities engaged in research on hazards, vulnerability, and risks; irrigation, water, etc. are also stakeholders who may provide important inputs to PoDRP.

While all the above-mentioned actors and more would have a stake in and/or need cortical input in planning and implementing irrigation work, each irrigation institution needs to decide who they must consult in the planning process. Irrigation agencies may already have mechanisms in place for participatory planning and decision-making (i.e., the water management planning process of ID and MASL in Mahaweli areas, the District Development Committee), and It is strongly suggested to utilize these forums for DRP. It may be advantageous to have coordinated discussions on occasion, as they may present novel challenges. These designated platforms on which DRP discussions have taken place will play a crucial role in PoDRP coordination after a disaster.

1.3.5 Data and Information Management

Last year, institutions in the irrigation sector collaborated with the Disaster Management Center to strengthen and establish institutional inventories and data management systems. As a key project action, each irrigation agency launched a comprehensive institutional inventory system or database based on disparate institutional data management tools and systems. In 2022, it was essential to administer the respective databases in accordance with institutional data management protocols and to update (i.e., asset costs and values). Currently (March 2023), all institutions are working to strengthen these systems, which were created by consolidating and integrating existing data, information, and systems. Individual institutional data management systems were established on compatible data platforms with the goal of facilitating simple integration when an analysis of the entire irrigation sector is required.

These systems support existing institutional data collection mechanisms and seek to strengthen them. Capturing, preserving, and disseminating data in a more organized and systematic manner will be beneficial for institutional and sector-level decision-making.

The agency head is responsible for ensuring that the newly implemented data and information management system integrates well with their respective institutional systems. Idealistically, it should become a component of the institution's inventory, with mandatory updates during annual planning and after a calamity. All personnel involved in data collection, input, and analysis should be well-trained through special training and/or opportunities such as annual planning and budgeting, the introduction of new policies, strategies, and master plans, etc. When respective agency officials begin utilizing the data and information in these systems for routine operations and planning initiatives, these systems will function properly. Having operational systems will provide vital baseline data for PoDRP and enhance current post-monsoon recovery planning practices.

It is also essential to consider that the irrigation industry as a whole now has a system with up-to-date and precise data for monsoon recovery planning. As the individual systems introduced to all institutions were designed based on a common data platform, it is not difficult to compile data across institutions when a need arises. In the event of a nationally declared disaster, when the government requests a multi-sectoral, multi-agency PDRP based on a nationally led PDNA, the sector's possession of a dependable baseline dataset will be of great value.

Please refer to the document, Guideline to Stakeholder Agencies for the Preparation of Pre-Disaster Baseline Dataset, for a detailed description of the system and its preparation.

1.3.6 Establishing Coordination Systems

Despite 13 different institutions being responsible for irrigation in Sri Lanka, there is no overall coordination system for the irrigation sector. However, there is some local coordination, such as at the district level through the district development committee meeting convened by the District Secretary, Meetings on water allocation convened by the Water Management Secretariat in Mahaweli areas, and informal coordination between PID and DAD in some provinces. The pre-disaster recovery planning phase is the optimal time for agencies to address the need and identify or propose a system of sectoral coordination for efficient recovery planning.

1.3.7 Developing a Draft DRF

The current practice of irrigation sector agencies is to forecast disaster scenarios and plan accordingly, although with some gaps. Planned disaster scenarios are founded on past impacts, physical observations, population feedback, etc. This process would benefit from more systematic projections supported by technical information and data. It is suggested that institutions begin by developing a shared vision of future disaster scenarios through discussions and utilizing crucial technical data, such as trends in flood hazards. Once planning teams feel confident and have sufficient knowledge, skills, and resources, they can begin scenario planning. Planned rehabilitation from a catastrophe requires the creation of disaster scenarios or a possible status snapshot in the event of a disaster. Disasters occur as a result of exposure to a hazard, and their effects are proportional to existing levels of vulnerability and insufficient capacity to mitigate and confront adverse consequences. As a result, information regarding potential hazards, populations and assets exposed to the hazards, vulnerabilities, and capacities, among other factors, is required to construct useful disaster scenarios. The accuracy of the projected scenarios will depend on the quantity, specificity, and precision of the information collected and analyzed within the constraints of available resources and time. Regardless of the adequacy and precision of the information used, a certain degree of uncertainty or uncaptured risk always exists. A detailed description of scenario planning is given in Annex II. The anticipated loss, damage, and effects can be determined by further scrutinizing either the envisioned or the created scenarios, based on which the recovery requirements can be determined. The draft (pre-disaster) disaster recovery framework was developed based on the identified and prioritized requirements, considering build-back-better considerations. A detailed explanation of pre-disaster data analysis is given in Annex I.

1.3.8 Review of DRF

The PrDRP procedure is cyclical. It must evolve through regular assessments. The DRF is assessed and revised as part of the PoDRP following a disaster. Even when no disasters occur, it is essential to conduct periodic evaluations and assessments of the DRF to ensure that it remains pertinent. PrDRP should not merely be an event or process that generates unused DRFs. A mechanism for reviewing and updating the DRF must be established. The irrigation sector agencies may wish to evaluate the DRF and update it as necessary during the annual budget proposal development process, as a DRF that has been updated will aid in the formulation of more realistic plans.

1.3.9 Challenges to PrDRP

Having recognized the benefits of recovery planning, irrigation institutions in Sri Lanka need to overcome a number of challenges (some of which are enumerated below) to actively participate in PrDRP:

- Institutional policies, systems, procedures, cultures, etc. currently recognize disaster management as a field requiring special and external inputs. Although the National Disaster Management Act No. 13 of 2005 mandates the integration of disaster management into sectoral institutions, the irrigation sector institutions have yet to do so.
- The PrDRP process is dependent on leadership within the irrigation institutions and on individual initiatives, as there are no national mechanisms to mandate and supervise the process.
- Institutions in the irrigation sector rely significantly on the Disaster Management Center (DMC) for guidance, technical advice, funding, etc., despite the DMC's inability to work alongside individual institutions.
- The availability of financial resources is a significant obstacle for all public

The National Planning Department (NPD) and the Disaster Management Center (DMC) are able to continue assisting the irrigation sector with recovery planning. The NPD, with the assistance of the DMC, may consider establishing and implementing an appropriate system to monitor the development of sectoral recovery plans, i.e., incorporating the PrDRP into the monitoring of the National Disaster Management Plan, while the DMC can assist irrigation institutions in planning a suitable capacity-building program by facilitating links to appropriate expertise.

1.4 POST DISASTER RECOVERY PLANNING (PODRP)

1.4.1 Post-Disaster Needs Assessment (PDNA)

The PDNA is regarded as the initial phase of the PoDRP. Comprehensive assessment of post-disaster damages and losses across all sectors of the economy, as well as the recovery, relief, reconstruction, and risk management requirements, led by the government. PDNA determines short-, medium-, and long-term recovery priorities for government and donor community consideration. The PDNA is conducted based on internationally accepted methodology to establish the physical damages, economic losses, and costs required for recovery needs (Relief Web, 2018). The methodology outlined by the European Union (EU), the United Nations Development Programme (UNDP), and the World Bank (WB) has been utilized by a large number of countries around the world since approximately 2015.

Participation of development partners (UN, World Bank, EU, and others) in a PDNA is triggered by a written request by the government, although government ownership of the PDNA and engagement are emphasized throughout the process (Jones, 2010) . A Terms of Reference (ToR) is developed to serve as the roadmap of the PDNA, listing the purpose, partners, and anticipated activities during the PDNA, as well as a timeline with deadlines for the deliverables. It is important to agree (or develop a TOR) and assign responsibilities for writing sections and chapters based on an outline of the structure of the report.

The PDNA process helps the national government take a multi-sectorial and multidisciplinary structured approach for assessing impacts. Interlinkages between sectors are taken as an important consideration. The methodology emphasizes the participation of all stakeholders and good coordination within and across key sectoral players. It identifies sectors recognized by the national accounting system (i.e., agriculture, industry, trade, services, etc.) and the corresponding sub-sectors under them. The PDNA process consists of a number of important aspects, listed below.

1.4.2 Institutional Arrangement for PDNA/DRP

Clarity in the duties and responsibilities of all PDNA stakeholders will prevent duplication of efforts and minimize information and communication gaps. Individual agencies would evaluate only those structures, assets, or geographic locations for which they have responsibility and field staff available, resulting in assessment gaps in the irrigation sector. Additionally, it is possible for multiple agencies to conduct their own assessments and data collection in the same areas. Existing coordination mechanisms, the activation of pre-agreed coordination arrangements, or the establishment of a coordination mechanism must be actively utilized by irrigation institutions. Good sectoral and cross-sectoral coordination at the national and subnational levels is an essential condition for the success of a PDNA. Therefore, a pre-agreed coordination plan for the irrigation sector during PrDRP will aid in the efficient and seamless conduct of PDNA.

[7] Output 3: "Resilient Recovery Capacity Enhanced" of the project on Knowledge and Support Technical Assistance (KSTA) on Building Disaster-Resilient Infrastructure through Enhanced Knowledge, implemented by the United Nations Development Programme (UNDP) and ADB

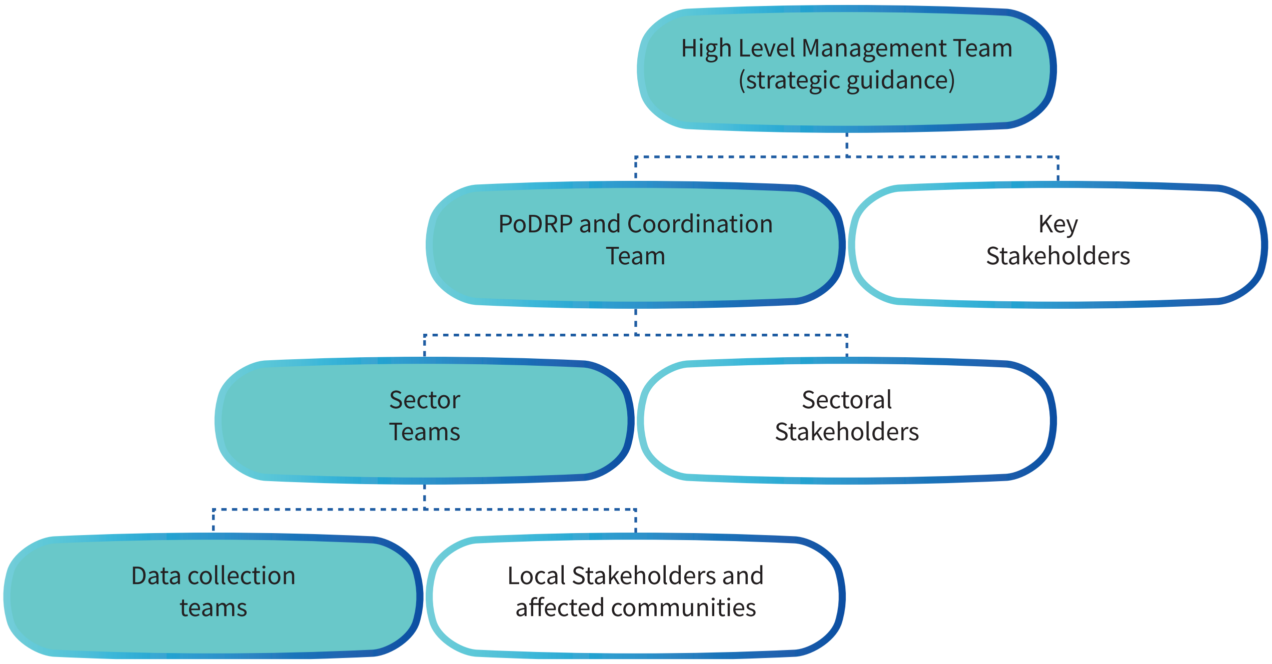

Figure 5 : Coordination Structure - Recovery Management

1.4.3 Post-Disaster Data Collection and Analysis

To determine post-disaster requirements, it is essential to acquire data and information on the ground. The PoDRP and the beginning of the PDNA will be guided by the data collection systems and protocols agreed upon during the PrDRP or at the beginning of the PDNA process. Before being deployed to collect data and information, personnel tasked with data collection must possess the necessary skills and abilities, preferably acquired through prior experience and training. Through the PrDRP, capacity development and training on the conduct of PDNA will become crucial. If adequate preparatory measures have not been taken, it is recommended to initiate PDNA by engaging in stakeholder discussions, evaluating capacities, conducting training and capacity building, and establishing coordination systems, as outlined in the PrDRP.

Data collection is focused on collecting data and information to identify (1) disaster effects and (2) damage to infrastructure and physical assets. (2) Losses: generally, no direct losses can be recorded as service is free, but indirect losses could be cultivation-related, additional costs to continue irrigation service in the post-disaster phase, etc. (3) Disaster impacts or longer-term effects of disaster: derived based on damage and loss information, taking macro-economic impacts into account to understand overall effects on development (economic, social, and environmental impacts). Please refer to the guidelines for conducting a PDNA.

The analysis is based on the damage and loss incurred and the human impact of the disaster.

1.4.4 DaLA (Damage and Loss Assessment)[8]

The Disaster Management Centre of Sri Lanka has been working on setting up a system to facilitate sectoral analysis in post-disaster recovery planning aligned with global best practices and will soon introduce the DaLA system. The irrigation sector will also benefit from this, and discussions are underway to ensure compatibility of recently introduced irrigation sector institutional data management systems with the DaLA system in Sri Lanka.

1.4.5 Human Impact Assessment

The focus is on the social impact of disasters, analyzing how disasters affect local patterns of life, social structures, and institutions. The assessment includes the analysis of primary data from households or other units of analysis and provides insight into recovery and reconstruction from the viewpoint of the affected community.
An elaborated description of PDNA and DRF development (DaLA and human recovery needs assessment and prioritization) is provided in Annex III.

1.4.6 Disaster Recovery Framework (DRF)

The DRF summarizes the recovery recommendations from the sectoral assessments within the PDNA. It is a systematic presentation of the policy, institutional, financial, and operational aspects of a disaster recovery program and addresses strategic and operational aspects of disaster recovery management as well as the results expected from the recovery work. It also outlines the short-, medium-, and long-term needs and priorities.

The drafting of a disaster recovery framework during PrDRP would give recovery planners time and space to carry out essential technical research, studies, and analysis based on identified risks and future ambitions and include other non-technical considerations within resilient recovery strategies. Depending on the actual circumstances of the post-disaster situation, the draft DRF developed as a result of PrDRP, which may have been drafted based on worst-case scenarios, may be fine-tuned to meet the requirements of actual post-disaster circumstances.
Annex II provides more details about PDNA and DRF formulations.

[8]In 1972, the UN Economic Commission for Latin America and the Caribbean (UN-ECLAC) produced the Damage and Loss Assessment (DaLA) methodology, which is currently widely used. The original methodology has undergone changes and improvements due to the cooperation of WHO, PAHO, the World Bank, the Inter-American Development Bank, UNESCO, the ILO, etc. It aims to capture disaster damage and losses to the closest approximation, and given its flexibility, it can be adapted to many disaster types and to the contexts under which different countries operate. The DaLA Methodology focuses on the overall economy of the country. It is a quantitative assessment. It uses data from government repositories, available in the national accounts and statistics, as the baseline. DaLA considers damage as the replacement value of totally or partially destroyed physical assets; losses in the flows of the economy that arise from the temporary absence of the damaged assets; and the consequential impact on post-disaster macroeconomic performance, with special reference to economic growth or GDP, the balance of payments, and the fiscal situation of the government.

1.5 OTHER KEY CONSIDERATIONS IN DRP

1.5.1 Guiding principles

Guiding principles are a set of moral values that establish a framework for the expected performance and decision-making of the PDNA and DRP. Some key aspects that must be considered in the guiding principles are given below.

1.5.2 Inclusivity

Evaluation of disaster recovery processes has shown that, despite good intentions, disaster recovery operations often fall short of empowering communities affected by the disaster (T. Van Krieken, 2017). As the first responders in the aftermath of a disaster, communities have a remarkable understanding of the local context. The urgency demanded by post-disaster recovery processes generally has resulted in a neglect to empower affected people adequately in PoDRP, particularly the marginalized. i.e., damages and destructions to irrigation infrastructure affect agriculture livelihoods; in Sri Lanka, farmers play a key role in rehabilitation and managing minor irrigation schemes and distribution channels. Their participation is essential for the restoration of minor irrigation systems as well as the distributary systems of large and medium schemes. Even though their power and influence may be small, going beyond just participation and engaging them in planning and decision-making will better empower them, bringing benefits such as increased ownership. PrDRP provides more space to engage citizens and local stakeholders in shaping recovery priorities based on needs on the ground, as well as creating a better environment to engage them and get their participation once a disaster occurs.

1.5.3 Gender

Different roles played by men and women are equally important in all stages of disaster management, including successful recovery. However, women in comparison are often not provided adequate opportunity to be actively engaged to represent their specific concerns, needs, suggestions, alternatives, etc., in post-disaster recovery circumstances (GFDRR, n.d.). i.e., farmers get affected by disaster disruptions to irrigation services, yet women in agriculture are rarely considered farmers. Engaging both men and women and addressing their different irrigation recovery concerns and needs are important aspects of the recovery process. Further, such recovery may bring about a better balance to current imbalances in irrigation service provision, better meeting real needs on the ground.

1.5.4 Building Back Better (BBB)

Capturing the window of opportunity' that disaster recovery presents through building back better' is considered strategic to effective recovery (W. J. Clinton, 2006). i.e., Having a good understanding of the context, vulnerabilities, and capacities of affected farmer communities will help promote equitable resilience building using BBB strategies. Irrigation infrastructure rehabilitated based on BBB strategies would be less vulnerable to future shocks as it offers the opportunity to rebuild stronger, safer, and more disaster-resilient irrigation infrastructure and systems. BBB strategies in the reconstruction of physical assets could:

- Introduce DRR measures infrastructure reconstructed to increase the resilience of physical assets, i.e., having designs that better resist floods in frequently flooding areas.
- Review of standards and regulations and/or inclusion or introduction of new ones, i.e., enforce or introduce suitable land-use planning regulations to stop reconstruction in high-risk areas
- Include additional specific measures to reduce vulnerabilities, i.e., nature-based solutions such as planting suitable local tree species on river banks, including reservoirs and canals as appropriate, fencing and layering, facilitating natural runoff as much as possible by removing barriers, etc., to protect reconstructed assets.
- Rebuild infrastructure to be context-sensitive and updated with modern technologies. i.e., automated flap gates instead of mechanical lift gates.
- Redesign infrastructure to a size that better meets community needs. i.e., reconstructing certain distributary canals to have better flow and control.

Engage affected farmers to promote disaster-resilient irrigation services by developing contingency or business continuity plans. It may be good to note here that while this is effective in some cases, it is also important to recognize that hard infrastructure solutions are not always the best or most sustainable approach to reducing disaster risk; e.g., also consider nature-based solutions.

1.5.5 Environment

Many disasters clearly show the significance of environmental risks. Similarly, the benefits of an improved environment are also well known. Despite this, environmental recovery often gets low priority (UNEP, UNISDR, 2009) [1]. It is true that environmental restoration usually requires long-term planning and management, and recovery plans must deal with it in that manner. Yet, short- and medium-term recovery must also take underlying environmental essentials and benefits into account. Environmental factors to consider in the disaster recovery of irrigation infrastructure may include: Recovery of physical (irrigation infrastructure) and environmental infrastructure (catchment restoration, replanting trees on riverbanks to replace those that were fallen or got washed away by the disaster, restoration of mangroves) together to strengthen DRR and sustainability of rehabilitated or reconstructed irrigation infrastructure Include or encourage good environmental practices such as natural resource management within recovery activities and longer-term livelihood activities that in turn help to protect irrigation infrastructure, i.e., encourage mangrove protection that helps fisheries, promote forestry, agro-forestry, or commercial tree farming as alternative sources of income. Improved habitats for wildlife boost rural tourism, for example.

1.5.6 Stakeholder Participation and Validation

The objective of the recovery process is to use recovery to accomplish national sustainable development goals by integrating these principles into sector-level reconstruction and rehabilitation. Active stakeholder participation is required. Various stakeholders with varying roles and responsibilities at various levels must collaborate to identify the post-disaster context comprehensively and develop a recovery plan based on inclusive and BBB sustainable development principles. The assessment committee should consist of various experts, such as engineers, economists, finance specialists, statisticians, etc., as well as academicians and researchers from the public and private sectors with knowledge of the valuation and estimation of damages, losses, and needs in the sector. Similarly, stakeholders at the national, subnational, and local levels, inclusive of affected communities through their institutions (Farmer Organizations, Women's Organizations, Youth Organizations, etc.), CSOs, temples, churches, and mosques, among others, should be involved.

1.5.7 Planning Resource Mobilization

Having a resource mobilization strategy or plan would facilitate accessing funds for recovery. Ideally, it should contain a thorough analysis and case for funding and financing, possibly targeting available sources and analyzing their priorities and conditions. Organizing International Donor Conferences is considered a key mechanism to get coordinated international recovery assistance and pledges for the PDNA and DRF rather than individual donors' pledges. The development partners working with the government on the PDNA and DRP will assist in this upon government request. It may also be good to note here that it is also important to recognize that relying solely on international donor funding may not be sustainable or effective in the long term. Local resource mobilization and the leveraging of domestic resources should also be emphasized. On this basis, opportunities and challenges can be generally discussed. However, long-term reliance on international donor funding is neither prudent, sustainable, nor effective. Local resource mobilization and domestic resource optimization should be fundamental components of planning. The authority granted by Section 17 of the Disaster Management Act No. 13 of 2005 can be utilized for this purpose. The government recognizes the need and allocates funds for recovery, although allocations are frequently insufficient to meet irrigation sector recovery requirements. The majority of irrigation institutions are prohibited from accumulating their own funds, and all deposits and earnings are returned to the Treasury. The Mahaweli Authority of Sri Lanka, despite being bound by policies related to public institutions and unable to accumulate funds, could negotiate with the government to set aside a portion of its income to build a fund for recovery and/or utilize funds for innovative funding options. Provincial Councils, unlike other public institutions, are permitted to have their own contingency budgets, and a number of provinces have already completed this process. The proportion of funds received by Provincial Councils is very small. Despite their size, these funds have also contributed to the recovery of minor irrigation systems in their respective provinces. While strengthening existing local mechanisms to ensure that irrigation institutions have adequate funding to meet recovery needs, the economic crisis that peaked in early 2022 and has persisted for over a year has compelled the government to suspend almost all public investments, making this the greatest obstacle to initiating such work at this time.

1.6 IRRIGATION SECTOR DISASTER RECOVERY FRAMEWORK

The Disaster Recovery Framework (DRF) initiated for the irrigation sector is expected to be adapted by all irrigation sector institutions in Sri Lanka to guide and promote effective recovery of the service, mainly after serious or catastrophic events. An outline of a DRF was formulated based on the discussion with the key irrigation agencies and stakeholders.

1.6.1 Irrigation Sector Recovery Vision

The recovery vision is framed to ensure that irrigation recovery reinforces disaster resilience. It will help to rehabilitate and reconstruct resilient infrastructure and prepare communities to better manage risks and face future disasters. The vision aims to be implicit about the reduction of risks and aligned with the Sendai Framework for Disaster Risk Reduction. The recovery vision of the Disaster Recovery Plan Sri Lanka 2017 was reviewed and updated as follows:

1.6.2 Recovery Goals

The recovery goals are specific to the post-disaster recovery challenges and aligned with the strategic development goals of the irrigation sector (or the institution). Irrigation institutions need to build consensus about goals, considering sectoral-level ambitions based on the strategic focus of their own institutions. Key objectives of the Irrigation Department are listed below as examples. Post-disaster recovery goals must be set to contribute to the agreed-upon common future vision of sustainable irrigation development through recovery actions[10].

- Development of land and water resources for irrigated agriculture, hydropower, flood control, domestic usage, industrial usage, and aquaculture development, giving priority to environmental factors and catchment protection
- Provision of lift irrigation, irrigation drainage, and salinity exclusion facilities for cultivable lands in irrigation and drainage projects Provision of salinity exclusion schemes
- Provision of drinking water sources, flood protection, and drainage facilities to lands and people affected by floods
- Alleviation of poverty in the rural farming community by increasing their farm income and raising their standard of living
- Management of water economically for sustainable agriculture and other uses
- Productivity enhancement of land and water in major, medium, and inter-provincial minor irrigation schemes
- Integrated water resources management and participatory management in major and medium Interprovincial minor irrigation systems
- Integrated water resources management and participatory management in river basins
- Provide technical assistance to other organizations, train trainers, and conduct in-house full-time NVQ Level 6 Engineering Technology Diploma programs.
- Soil and geological investigations and hydrological studies

1.6.3 Objectives of Recovery

Recuperation objectives specify what is necessary to meet recovery objectives. If increasing the resilience of irrigation infrastructure to future disasters is desired, then the following may be an objective: All new irrigation infrastructure shall be built to established hazard resistance requirements. Drafting goals and objectives during pre-disaster recovery planning (PrDRP) may allow for a thorough examination of barriers that may hamper recovery goals and objectives, as well as the creation of solutions to overcome and reduce them. The irrigation sector's overall recovery aim was amended and incorporated in the 2017 Disaster Recovery Plan. Improved irrigation management systems are being built to ensure that communities are safer and more robust to floods, as well as provide protection for communities affected by flood disasters.

1.6.4 Guiding Principles for Recovery

The recovery principles dictate how the rehabilitation objectives should be attained. They reveal the values that guide recovery. These are just as essential as the stated goals and objectives. Depending on their governing principles, two distinct organizations may use different methods to attain the same objectives. Consequently, each irrigation agency may establish its own recovery principles that are tailored to its own post-disaster scenario. When establishing and discussing PrDRP guiding principles, it is beneficial to review them in order to address new concerns and deprioritize those that have already been addressed. A set of guiding principles would reveal whether there is room for development, particularly in terms of strengthening the resilience-building aspects of recovery while taking into consideration social and environmental concerns. Irrigation agencies may decide to define recovery principles collectively to guide the recovery of irrigation infrastructure in Sri Lanka.

Proposed Irrigation Sector Recovery Principles

- Adopt a comprehensive strategy that aligns with the SDG principles.
- Individual irrigation agency recovery actions are coordinated with sectoral plans (if such plans exist).
- Maximize resource utilization, including the utilization of local recovery resources.
- Strengthen local irrigation management and disaster recovery capabilities, as well as local leadership.
- Partnerships with regional organizations
- Enhance the capacity of the community to participate in irrigation management.
- Optimize donor assistance.
- Transparent flow of monetary and other assets.
- Prioritizing the concerns and requirements of the most marginalized and most vulnerable affected community members

Safeguard and further secure environmental assets, etc.

[2]Vulnerable communities and crops are safer and more resilient to disasters, contributing to food security, livelihoods, and lifestyles derived from the inclusive and participatory restoration of flood protection systems, irrigation systems, infrastructure, and protected river basins.

[10]Source: Irrigation Department, http://www.irrigationmin.gov.lk/irrigation-department/

KEY POLICY GUIDANCE FOR RECOVERY

1.7.1 National Policy

Under the Disaster Management Act, the National Disaster Management Policy and National Disaster Management Plan shall provide guidance for 'the protection of life of the community, property, and environment from disasters and the development and maintenance of disaster-resilient infrastructure', 'the effective use of resources for preparedness, prevention, response, relief, reconstruction, and rehabilitation," and 'pre-disaster planning, preparedness, and mitigation while sustaining and further improving post-disaster relief, recovery, and rehabilitation capacities'.

1.7.2 Sectoral Policies

The Irrigation Ordinance of 1946 recognizes the government's role in irrigation development and service as well as the roles of other stakeholders. The government is responsible for financing all investments, including new development and the rehabilitation of major irrigation schemes. It also recognizes participatory decision-making. The District Agricultural Committee (DAC), an important actor introduced under the 1946 Ordinance to make decisions on irrigation, agriculture, and water resource development, has functioned well, particularly in the Dry Zone districts.

The Ordinance classified schemes into major, minor, and major, built and maintained with or without government assistance, respectively. In the minor schemes, farmers participate in construction and rehabilitation by providing labor, and as such, farmers too may need to get engaged in DRP. The Commissioner of Agrarian Development is also empowered by the 1968 amendment, and farmer organizations are empowered by the 1994 amendment to take decisions in seasonal planning and management of irrigation schemes.

The Irrigation Department is in charge of major scheme planning, operation, and maintenance. The Agrarian Services Act No. 58 of 1979 further defined minor irrigation systems that are managed by farmers. Part VI of the Act makes officials of Agrarian Services responsible for attending to all matters relating to the construction and maintenance of minor irrigation works.

Enactments by the 13th amendments to the constitution of Sri Lanka, Provincial Councils Act No. 42 of 1987, assigned irrigation as a provincial subject other than inter-provincial irrigation and land development, which the Agrarian Development Act No. 46 of 2000 and its subsequent amendments further elaborated. Responsibilities for managing minor irrigation systems are currently distributed across the PIDs and the DAD.

The Mahaweli Authority of Sri Lanka Act No. 23 of 1979 makes the MASL responsible for the construction and operation of reservoirs and irrigation distribution systems for the integrated development of declared special areas. Accordingly, the recovery responsibilities of the respective irrigation systems also fall under the above agencies.

In this context, the major share of irrigation recovery investment is provided by the government, either through public funds or funds negotiated with donors, and financing agencies are channeled through the ID and MASL. The DAD and PIDs get a smaller percentage (10%) of the irrigation public funding share and, in some instances, CSO funding for recovery work.

No policy measures are in place yet to provide incentives and attract private sector participation in irrigation investments, although there have been instances of Corporate Social Responsibility (CSR) projects in the private sector (i.e., HSBC Bank) targeting funds to rehabilitate small reservoirs. Overall, investment in strengthening the resilience of irrigation infrastructure to minimize exposure is a concept yet to be seriously considered in financing irrigation infrastructure development and rehabilitation.

There is no defined water allocation policy to allocate water for various purposes from water sources. This gap in the water allocation mechanism affects irrigation too. In the Mahaweli areas, however, water allocation decision-making (i.e., between irrigation and electricity generation) is facilitated by the Water Management Secretariat in a participatory manner. The draft National Policy, Strategies, and Institutional Framework for Water Resources Development, Conservation, and Management of Sri Lanka 2019 encourages integrated water resources development and management, emphasizing user rights, including new users, river basin approaches for water management, ecological aspects, surface and ground water interdependency, harmonizing national, provincial, and local stakeholder participation, climate change implications, etc., in the development and management of water resources.

PPP projects in irrigation can help expand irrigated areas faster, improve irrigation services, and reduce operation and maintenance costs and government subsidies for irrigation. Lack of and under-investments in irrigation development and expansion as Sri Lanka strives to bring additional cultivation areas in the Dry Zone under irrigated farming could be addressed through PPP. Experience from irrigation sector PPPs in Africa and Europe shows that shared investments in water infrastructure can contribute to increased yields and farm incomes and provide a range of secondary benefits to communities (German Institute of Development and Sustainability, 2016). Yet, PPPs need the well-functioning regulatory capacity of the government as well as farmers and policymakers considering practicalities and designing such arrangements beyond politics. If not, the commercial interests of the investor would control the farmers and their interests. As such, the discourse on irrigation sector PPP cautions against investing only in irrigation infrastructure in countries like Sri Lanka, where essential preconditions are weak or absent.

Maybe add a note here, or to another section more appropriate, on the potential for public-private partnerships as an option for attracting private sector participation in irrigation development and rehabilitation. PPP could be explored as part of efforts to strengthen the resilience of irrigation infrastructure. Opportunities and challenges on this can be discussed to add country context.

1.7.3 International Policy Guidance and Commitments

Sendai Framework for DRR: The Sendai Framework 2015–2030 targets the substantial reduction of the number of affected people and disaster damage to critical infrastructures due to natural disasters. It recognizes that the government has the primary role of reducing disaster risk, but that responsibility should be shared with other stakeholders, including local government, the private sector, and other stakeholders." (UNDRR, n.d.). The Government of Sri Lanka is a signatory to the SFDRR, and the National Disaster Management Plan 2018–23 was developed to align with and aim to realize national SFDRR commitments. The alignment of SFDRR with irrigation recovery planning is elaborated in Annex IV.

Links to Global Policy Frameworks: Build Back Better is among the Guiding Principles for Irrigation Infrastructure Reconstruction and aims to ensure that communities affected by disasters have access to improved and resilient irrigation service, better flood protection, and water intrusion infrastructure as a result of the recovery process. It helps to view disasters as an opportunity to reduce vulnerability and improve the resilience of affected communities.

1.7.4 Other Policies and Programs

The National Agricultural Policy: The national agricultural policy addresses irrigation and water management under policy number 6, proposing to safeguard irrigation reservoirs, canals, drainage systems, and other structures from damage by natural calamities.

Wari Saubhagya Program 2020–22: The program encouraged all irrigation institutions to work together to strengthen irrigation development through the rehabilitation of 5,000 tanks to achieve the country's food production and food security targets. The program was designed based on key BBB concepts in irrigation, such as increasing the water retention capacities of existing tanks, clearing invasive water weeds and debris from water bodies and maintaining them sustainably, renovating feasible abandoned and new tanks to increase water availability, renovation of irrigation systems and structures to improve water use efficiency, conservation of reservations, catchment areas, and riverine areas to ensure water quality, capacity building of beneficiary organizations for sustainable maintenance and management, introduction of good water management practices based on cascade and basin level management, etc. Yet the economic crisis and subsequent socio-political crisis in Sri Lanka in early to mid-2022 affected this program, which is currently suspended due to a lack of funding.

The Public Investment Plan (PIP) 2021–2024: "A Safe and Secure Country for All" is one of the nine policy cornerstones of the PIP. Environment and Disaster Management is one of the nine public investment thrust areas, and gaps in capacities and resources for disaster management planning, business continuity planning, and recovery planning are highlighted (page 175).
Development of a proper risk assessment mechanism by using the disaster information system, disaster mitigation, mainstreaming DRR into development planning preparedness and response to disasters, and targeted and effective capacity building at all levels through training and awareness are key strategies of the PIP (page 176). Further, working towards achieving the targets of the Sendai Framework by 2030 (1. understanding disaster risk; 2. strengthening disaster risk governance to manage disaster risk; 3. investing in disaster reduction for resilience; and 4. enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation, and reconstruction) is a medium-term target of the PIP 2021–24.

1.7.5 Irrigation Sector Institutional Context in Sri Lanka

Several government agencies that operate at the national and provincial levels are engaged in the construction, operation, maintenance, and other management aspects of irrigation systems, as shown in Table 2.1 below. They are the Irrigation Department (ID), Mahaweli Authority of Sri Lanka (MASL), Department of Agrarian Development (DAD), and nine (9) Provincial Irrigation Departments (PIDs), with the cooperation extended by respective farmer organizations as irrigation water users. While individual agencies handle the responsibilities of different schemes, overlapping responsibilities and practices in some instances cause a lack of clarity of institutional roles, possible duplication, and inefficient use of human and other institutional resources. (Sarath Abayawardana, 2006). The private sector is not permitted to manage the irrigation infrastructure and services in Sri Lanka.

Agency	Key Responsibilities
Ministry of Irrigation	Responsible for the provision of strategic guidance for irrigation sector (and sustainable water resources) development and management in Sri Lanka.
Ministry of Irrigation	Responsible for the development of inter-provincial land and water resources for irrigated agriculture, hydropower, flood control, domestic and industrial use, and aquaculture, with an emphasis on environmental considerations. In irrigation and drainage projects, the provision of Lift irrigation, irrigation drainage, and salinity exclusion facilities for cultivable lands Providing potable water sources and enhancing groundwater recharge facilities, flood protection, and drainage facilities in flood-affected areas The alleviation of the rural agricultural community's destitution through the enhancement of their farm income and standard of living Water resource management for sustainable agriculture and other uses Productivity enhancement of land and water in major, medium, and inter-provincial minor irrigation schemes; integrated water resource management; and participatory management in major and medium irrigation schemes Minor interprovincial irrigation systems Integrated water resource management and participatory river basin management are assigned to ID.
Mahaweli Authority of Sri Lanka (MASL)	Responsible for all aspects of land and water resource development in the Mahaweli River Basin, the Dry Zone areas of the North Central Provinces, and other designated Walawe River Basin areas, including water supply, sanitation, human settlement, land use planning, and irrigation construction and management, as well as providing overall water management with a view to the effective use of water for irrigation and power generation.
Department of Agrarian Development	Responsible for the provision of strategic guidance for irrigation sector (and sustainable water resources) development and management in Sri Lanka.
Provincial Councils Provincial Ministry of Irrigation; PID	Providing sustainable irrigation, flood control, drainage, and salt water exclusion facilities by managing the schemes within the respective Provincial River basins
Water resource Boards	Investigations and commercial exploitation of groundwater resources and extensive advisory responsibilities, which are largely not utilized.
National Water Supply and Drainage Board	Supply water to households and establishments through the grid. Use some of the same water sources for drinking water.
Ceylon Electricity Board	Generate hydropower for electricity supply using some of the same water sources.

Table 1 : Government Agencies Responsible for Irrigation in Sri Lanka

1.7.6 Institutional Arrangement for Recovery

The thirteen institutions currently responsible for irrigation in Sri Lanka are ID, MASL, DAD, and the nine PIDs. As stated in Section 2.4.2.7, a coordination mechanism that brings together all agencies for decision-making in irrigation does not exist at this time, but it is the responsibility of the Ministries managing irrigation sector institutions to facilitate such an arrangement. Currently, the institutions in the irrigation sector report to various ministries. ID and MASL are administered by the Ministry of Irrigation; DAD is administered by the Ministry of Agriculture; and PID, which is administered by Provincial Councils, is administered by the Ministry of Provincial Councils and Local Government.

As such, it is proposed that, in the event of a national calamity, the three Ministries unite under the direction of their respective Secretaries. The Heads of the Irrigation Institutions of ID, MASL, and DAD, with the assistance of their Focal Points, provide the necessary facilitation. In the case of PIDs, Chief Secretaries of Provincial Councils may brief the Secretary of their respective Ministry. The national platform will communicate with high-level teams and provide sectoral and institutional teams with essential guidance.

The process of institutional disaster recovery planning (DRP) will commence at the institution level under the direction of the agency heads. This holds true even if the calamity is local and limited to a few institutions. When the emergency ends, the institution's DRP teams will be activated and prepared to initiate the PDNA procedure. This includes scheduling the institutional process, reviewing the team's duties and responsibilities, determining the need for training and renewal programs, and determining resource needs, among other things.

Staff at field level and middle level (i.e., divisional, district, and range offices) have already been designated the responsibilities of data collection and input into the system; therefore, they can be deployed with specific instructions to collect information and data related to post-disaster loss and damage. Disasters prompt the District Secretary at the district level to convene local coordination platforms with cross-sectoral representation. This can be used to access and share additional information. Information will flow in accordance with the normal information flow for planning, unless an extreme situation necessitates the assignment of special data collection personnel or teams. Information will travel from the field to Divisional, District, or Range officials who may be responsible for the administration and consolidation of data management at their respective levels. There will be a transfer of consolidated data and information to the central institutional planning units.

The unit trained in loss and damage data analysis will determine recovery necessities and priorities, as well as recovery estimates. After the analysis of recovery planning has been completed, recovery proposals are submitted for resource mobilization. As a result, the institution may use the same data collection and compilation channels to communicate recovery priorities to all stakeholders. Please refer to Standard Operating Procedure for Disaster Recovery Planning and Implementation in Sri Lanka, Focusing on the Irrigation Sector, for detailed guidance.

1.7.7 Financial Preparedness

The objective of financial (disaster) preparedness is to have the necessary financial resources for disaster risk reduction (ex-ante) and emergency and recovery to rebuild more effectively (ex-post). It is a crucial aspect of the PrDRP, requiring early work on one of the most significant obstacles faced by post-disaster recovery programs. It seeks to accelerate the mobilization of recovery resources through pre-identified sources and arrangements, thereby laying the groundwork for a more resilient, expeditious, and effective recovery process. Essential to the development of a DRF is the identification and costing of specific recovery-required resources. Once the budgets and costs of recovery have been meticulously calculated, the DRF must also identify potential access points to the necessary financial resources for recovery. Financial Preparedness strategies developed by irrigation sector institutions prior to a disaster can be implemented in the post-disaster phase. Request National Planning and Budget Departments to activate commitments based on agreed financial preparedness strategies presented to them via Pre-disaster DRF, highlighting major deviations between Pre-disaster DRF and Post-disaster DRF; Request NPD/ERD to facilitate negotiations with potential donors who are most likely to support irrigation sector recovery in the given post-disaster situation and will work better if negotiations have been initiated with these.

It is essential to strengthen national and sectoral planning and budgeting processes so that the funds required for expeditious emergency relief and a speedier recovery can be estimated and options for gaining access to these funds can be identified. Sri Lanka is required by law to establish a National Disaster Fund, which has not yet been established. In the absence of dedicated reserve funds, post-disaster recovery expenditures are typically covered by adjusting existing institutional and project budgets and submitting an extraordinary request to the Treasury via the National Budget Department based on the magnitude of recovery requirements. This approach is inefficient and unlikely to facilitate adequate recovery resources in a timely manner in order to minimize ongoing losses. Diverting public funds for recurrent recovery has severe negative effects on the crisis-stricken economy and the social and economic development of the nation. During the Financial Preparedness phase of the PrDRP, irrigation institutes and governments will be able to consider potential budget shocks that could be caused by irrigation sector-relevant disasters and identify sources of recovery funds or contingency funding in advance to mitigate such shocks. Introducing financial preparedness practices into the planning process encourages the nation to plan ahead and have multiple options for accessing necessary resources. For decision-making purposes, i.e., allocating resources for recovery planning and implementation, institutions under the Ministry of Finance will be guided by an appropriate disaster risk reduction model.

Disaster risk financing solutions align with international financial standards and are designed based on the local context to consider broader issues, such as disaster resilience, financial stability, financial inclusion with DRR incentives, etc. Options for accessing recovery funds may be:

- Public funding, i.e., annual rehabilitation allocations,
- Contingency budgets; Special allocations or credits negotiated, including systems that are only applicable in an emergency or recovery context
- Donor funding
- Financing or insurance

The selection and availability of different types of financial instruments suitable for financing disaster management will depend on factors such as level of funding requirement, required speed of disbursement, cost effectiveness (compared to other options at the given level of risk), etc. at each level of risk, as well as factors such as the specific circumstances or macroeconomics of the country. As such, each source will have its own conditions to consider when supporting disaster recovery in the irrigation sector. Study of the funding landscape, available options, and their advantages and disadvantages, including considering Sri Lanka's experience in mobilizing resources for disaster recovery in the past too, i.e., use of the CAD DDO facility

The DRP Team should present the objectives and expected outcomes of the DRF's resource mobilization strategy to the government so that a decision can be made. Considering past experience, the government may decide to negotiate with key donors and development partners or consider risk financing options in advance for recovery support and to work out mutually viable arrangements. Donors, development partners, or service providers may evaluate recovery proposals and propose solutions from which the government can select the most suitable option. These negotiations may also involve drafting agreements and establishing systems and procedures to receive and manage funding.

Baseline data and information pertaining to infrastructure: This includes data and information related to structures, systems, processes, and procedures (i.e., repair and maintenance), as well as DRR measures identified and implemented, not implemented, planned, etc. Prior to a catastrophe, the funding source would require evidence that every effort had been made to minimize risks and exposure. Financial preparedness will compel irrigation institutions to maintain their newly implemented data management system and to have high-quality data and proof about pre-disaster conditions.

Legal documents: Preparation of required legal and financial documents essential to access recovery assistance (i.e., documents required to claim insurance for affected assets, to obtain donor assistance, and to access special catastrophic funds). Having the necessary documentation and information readily available makes it much simpler and quicker to obtain disaster recovery funding. It would facilitate access to resources, reduce recovery time, minimize post-disaster obstacles and disadvantages, etc.

The Ministry of Finance, the Departments of Budget and National Planning, and other relevant institutions must provide effective leadership for the development of a strategy to finance disaster recovery. It will aid in determining policy objectives and post-disaster expenditure priorities, among other things. Prioritization and consideration of potential alternative solutions based on available options, as well as the combination of financial tools and local context, will help the nation allocate essential resources for disaster recovery in the least distressing manner possible. Depending on the circumstances, public funding may be prioritized for essential recovery efforts. DRF may propose donor assistance, including the organization of donor conferences, to mobilize balanced resources when national resources appear insufficient to support the DRF-prioritized recovery.

Sri Lanka's irrigation sector was the focus of a financial preparedness study conducted by the project highlights (2022–23). It provides some recommendations for enhancing Sri Lanka's disaster-risk financing strategies. using international best practices as a model

1.7.8 Implementation Procedures

Developing implementation procedures is a crucial task that must specify who is responsible for what, the use of procurement and financial systems, coordination mechanisms for implementation and communications channels, logistical and capacity constraints identified and how they will be mitigated, the roles of key partner agencies, the institutional recovery framework, and the recovery budget. It should also emphasize institutional strategies.

The implementation strategy is not a recovery plan but rather an overview of the implementation methodology. The implementation procedures or strategies contribute to the achievement of the DRF's commitments. Inadequate implementation strategies can cause the recovery to deviate from its intended course and waste resources. Institutions in the irrigation sector must agree to a formal recovery procedure (i.e., one that is supported by an institutional circular). In the event of a national disaster, where sectors will come together for planning, it is crucial to ensure that, in addition to sector-specific implementation strategies, there are also institutional-level implementation strategies. This is because each institution is responsible for the recovery of its own infrastructure based on its own financial and procurement systems, standards, human and logistical capacities, and partners. The implementation schedule must outline these as well as strategies for filling the identified gaps.

The development of the implementation schedule will require input from the various departments (technical finance, administration and procurement, IT, etc.) and local teams. In the event of a national catastrophe, the institutional implementation strategy may be incorporated into the overall sectoral strategy to assure coherence with institutional processes and support local implementation strategies.

The implementation procedures will consider and influence DRF elements such as costs and timelines. As a result, a few iterations of the implementation schedule may be necessary prior to settling on the definitive implementation strategy.

The overall institutional implementation procedure must be communicated to the implementing and M&E Teams in order for them to develop their own specific or local plans with the support of the institutional recovery team. The implementation schedule will indicate how the funds allocated to initiatives within recovery programs will be made public. As implementation occurs, the implementation procedure will be subject to review. Having drafted and approved standard operating procedures, work scopes, and memoranda of understanding during PrDRP or during PDNA and recovery planning would expedite implementation.

[11]Catastrophe Deferred Draw Down Option (Cat DDO), which was a Development Policy Loan financed by the International Bank for Reconstruction and Development The deferred drawdown option made funds available within a three-year period, and after the Government provided the trigger condition, an official declaration of a catastrophe from a natural hazard or disaster, The CAD DDO drawdown option was used after the floods and landslide disaster in 2016, and the full loan amount of US$ 101.49 million (after deduction of the front-end fee of US$510,000) was transferred to the Government after complying with the trigger mechanism. https://documents1.worldbank.org/curated/en/648591537796001024/pdf/Sri-Lanka-CATASTROPHE-DEFERRED-DRAWDOWN-OPTION.pdf

1.7.9 Monitoring and Evaluation

Monitoring and Evaluation Frameworks are needed to ensure that disaster recovery programs can be evaluated for their efficacy and monitored for expected progress. Monitoring and evaluating disaster recovery aims to measure progress, report on it, and demonstrate to the government and other stakeholders how to enhance future disaster recovery programs. Evaluation findings are incorporated into the design and delivery of future programs. Prior to implementation, the recovery plan should include M&E as an essential component and allocate the necessary budgetary provisions to assure effective M&E during recovery implementation.

The ministry responsible for disbursing the Irrigation Fund will be in charge of monitoring the implementation of the recovery plan, while the Additional Secretary for Irrigation will be in charge of supervising and monitoring all activities at the national level. Individual irrigation institutions will implement infrastructure recovery in accordance with their respective perspectives. Individual agencies will be responsible for adhering to technical and management standards for activities involving modernization, rehabilitation, and reconstruction. After using their respective institutional data management systems for PDNA, each institution will be able to use the post-disaster baseline data base to measure and report on progress. A technical team consisting of the Chief Irrigation Engineer ID, the Engineer, the Director of Engineering MASL, the Director of Water Management DAD, and the Provincial Director of Engineers PID will provide overall technical guidance and enhancements that will serve as the technical foundation for all individual institutional implementation plans.

The Inter-Agency Task Force (IATF) will conduct biweekly progress monitoring and monthly progress review meetings (i.e., Weekly Water Panels at the national level may be used as a platform for monitoring). It is proposed that farmer organizations monitor activities at the community level. Farmer Organizations and Farmer Federations could be in charge of oversight. It is proposed that project management committees be established at the local initiative level. The IATF and the technical team will aid in the rehabilitation of Irrigation schemes administered by Provincial Irrigation Departments, as required, by providing all inputs necessary, including technical.

The District and Divisional Secretaries are the monitoring focal points at the district and divisional levels, respectively. Monthly District Development Forums can be used to report, monitor, and resolve implementation-related issues at the district or division level. They supervise the appraisal of damages, the disbursement of funds, and the monitoring of rehabilitation, improvement, and construction. Officers at the provincial and district levels (range level in the ID) under the direction of the Provincial Irrigation Departments are able to provide technical guidance and oversee rehabilitation, reconstruction, and enhancement activities.

Key indicators of the Irrigation sector’s recovery plans include:

- Number and description of components of headworks rehabilitated or upgraded
- The number of pump houses, gravity outlets, and irrigation infrastructures improved.
- The lengths of irrigation canals, drainage canals, and river banks improved.
- The length of flood protection bunds improved.

- Number of village irrigation systems (VIS) rehabilitated with farmer participation.
- The number of VIS improved, positively impacting the overall cascade system.
- The length of agricultural roads, access roads, and bund roads improved.

Recovery Frameworks drafted for ID, MASL, DAD, and PIDs are given in Annex IV.

1.7.11 Why Engage in the globally recommended DRP? Benefits of DRF and Challenges

The globally recommended DRP process encourages organizations to work towards recovery throughout the disaster management cycle. Recurrent disasters cause substantial stress on government resources and fiscal management and burden the private sector, households, and individuals. Lack of adequate access to resources, especially financial ones, for recovery prolongs the recovery, worsening related losses and inefficiencies in production and services, and in turn exacerbating national development setbacks. The irrigation sector can easily relate to this. Despite considering annual monsoonal flood-related maintenance and repair in their annual planning cycles, irrigation institutions struggle to attend to essential recovery, even after prioritizing recovery at the cost of irrigation development in Sri Lanka. Disaster recovery planning, specifically PrDRP, is highly relevant for the irrigation sector of Sri Lanka.

1.7.12 Benefits of DRP/DRF

Flood recovery planning and implementation have been a part of the annual work cycles of irrigation institutions. Aggravated and more frequent flooding over the past few years has, however, posed significant challenges to managing recovery. i.e., the damage cost of the floods and landslides disaster in May 2016 that affected almost the whole country was LKR 1723.2 M, which included infrastructure such as headworks, gates and structures, canals and roads of large tanks, a number of medium tanks, anicuts, flood bunts, canals, and a large number of small tanks and their canals (Government of Sri Lanka, 2016). Before recovering from the May 2016 disaster (certainly before recovery of irrigation infrastructure even began properly), the country was once again affected by floods and landslides of almost the same proportion in May 2017, causing further damages to irrigation infrastructure of an estimated LKR 1039 million (Government of Sri Lanka, 2017). Having a pre-prepared DRF will obviously be a big relief during and after the disaster. It will reduce stress for planners who face demands for quick recommendations or decisions with little or no information to base them on. PrDRP would avoid or reduce rushed decisions arising out of post-disaster requirements and allow for a better and more comprehensive DRP. Aligned with annual planning cycles, the PrDRP can constantly be improved with new information and experience.

Pre-disaster planning is the start of post-disaster recovery planning. By starting during pre-disaster times, PrDRP provides space for stress-free planning based on thorough analysis to recommend how the irrigation sector should use recovery as an opportunity to enhance the sustainable development focus of the irrigation sector and set some realistic development targets. PrDRP gives an opportunity, as the process is comparatively less time-pressed, to consider and incorporate lessons learned from past recovery and development work to steer recovery toward a more sustainable path.

Knowing about resource requirements for recovery is a first step towards resource mobilization for recovery. Financial preparedness helps the irrigation planners think about realistic recovery requirements to avoid the current situation of accumulating backlogs in the future. It will also generate information about funding sources, their standards, and conditions for accessing resources, which may help improve sectoral standards in general.

The disaster recovery framework and the preventative measures they include when implemented, although they may not always avoid a disaster, will minimize devastation due to a disaster. Implementing DRF will reduce disaster damage and losses and be able to restore operations and services after a disaster occurs. As the DRF is formulated and backed by solid evidence, the National Planning and Treasury Departments will be more likely to pay more attention to it. They will appreciate the logic of estimated potential damages and proposed options to reduce impacts, etc., especially when they get to review the proposals. Non-disaster time is free of post-disaster stress.

Globally accepted methodologies for engaging in DRP and producing DRF are available, and they have been formulated by analyzing disaster-related experience in many countries and recommending international good practice. These methodologies are developed to support governments in disaster recovery assessments and planning. Adapting global standards for recovery planning will help Sri Lanka's irrigation sector benefit from extensive research and lessons learned from pilot projects that have been carried out in many countries. A DRF developed based on global standards is more likely to attract development partners' interest.

Recovery considerations have strong alignment with the sustainable development ambitions of the individual institutions, the sector, and the country. They would also speak to relevant international development commitments of Sri Lanka (i.e., Rio Conventions and NDCs). Such a plan will receive efficient professional responses from the international community and improve financing opportunities for recovery and reconstruction, i.e., green sources of funding. Therefore, a well-formulated DRF will not only help recovery planning but also provide essential inputs and even guidance for development and project planning.

By using internationally recommended methodologies, the irrigation sector will adhere to minimum acceptable quality standards to produce an objective and comprehensive estimate of recovery needs. It will trigger quicker decision-making and support by stakeholders during implementation, given the higher credibility of assessments as they were developed with the engagement of stakeholders.

DRP emphasizes considering coordination. Despite being a small island, irrigation in Sri Lanka, which has high national significance, is looked after by 13 independent institutions, with overlapping mandates in some instances. Coordination considerations that PrDRP would push institutions to think of may become beneficial, reducing overlaps and helping to derive a more cost-effective approach to recovery.

The irrigation institutions must review their own policies, procedures, and institutional mechanisms to identify how to fit the PoDRP processes within existing organizational systems, cultures, and practices. It would show their fitness to cater to rising disaster concerns. These institutional reviews will provide an opportunity for planning teams to review systems, processes, and policies and update them to better support routine development work while focusing on what systems and capacities should be put in place to facilitate expedited recovery.

The DRP also drives institutions to review their data management and work out systems to have a reliable set of pre-disaster baseline data. The PrDRP, started by the irrigation institutions with the support of the KSTA project, made improvements to their data management systems. These systems will not only support recovery planning but also the routine and specific work of respective institutions, i.e., project development and work. Accessing important information with the click of a key on the computer keyboard is a big step toward producing credible and reliable recommendations and making decisions.

In the face of a serious disaster event (i.e., the 2004 tsunami), the irrigation sector (all 13 institutions) can adhere to a methodology of similar standard. In the likely continuing resource-constrained situation of the country, if the sector wants to seek donor funding for recovery, it becomes easier. The common platform on which the data management of all institutions is based will greatly help sectoral compilation.

The PrDRP/DRF tested by the irrigation sector in Sri Lanka will add to global experience, benefiting the irrigation sector globally.

1.7.13 Challenges

The resource-constrained situation of the country in general is the key challenge. This has created a reactive culture toward recovery among irrigation institutions. The recovery proposals prepared by the institutions are based on approximate data and information rather than solid data. This is because the receipt of recovery funding takes a very long time, during which the recovery requirements and the recovery cost would increase, implying new assessments and budgets. This makes decision-makers and proposal approvers suggest arbitrary reductions to budgets, making recovery even more challenging. It may be difficult to convince the irrigation planners to engage in pre-disaster recovery planning to produce a DRF in a worsened economic situation, as they would feel they would have to do the planning exercise all over again when funding is received after a longer lapse.

Developing disaster scenarios and considering risks may be lengthy and challenging until related skills are mastered. Planners who lead planning at their respective institutions may not prioritize DRP.

The resource-constrained situation in the country has suspended all training programs at the moment. Therefore, it is unlikely that the comprehensive training required for DRP will be introduced even over the next few years.

The formulation of PrDRP implies some amount of institutional resource allocation over some time. This may not be allowed in these stressful times. The resource-constrained situation of the country may also likely result in a situation of disregarding DRF and continuing with current practices (arbitrary prioritization of recovery or prioritization based on social, political, etc. pressure) even when a DRF is developed if investment for comprehensive recovery is considered out of question.

1.7.14 Resources Required to Operationalize Recovery Planning

Engaging in recovery planning has resource implications at the institutional level, some of which are:

1.7.14.1 Human resources

- An Institutional Focal Point or a similar resource is required to coordinate recovery management at the organizational level. This is especially important when the DRP is being introduced.
- Data and Information management: A person or a team should be assigned to this task to ensure proper management and updating of the system.
- Recovery Team: The person who leads intuition's recovery management needs a team that consists of technical, planning, administration, accounting, legal, etc., expertise to ensure that recovery planning adheres to policy and legal context as well as practical.
- Even with all the above-mentioned skilled human resources, every institution would need local-level personnel or teams who are trained to identify relevant data or information and help with data collection, documentation, and storage.

1.7.14.2 Technical

- Training and capacity building: resources required to train new staff and update the knowledge and skills of existing staff
- Some data with a certain level of technical accuracy may need equipment and tools, as well as safe and secure storage.
- Access to external and international technical experts when advice is needed. Availability of information on who and how to contact and get their input

1.7.14.3 Information

- Computers, web access, and other related basic facilities
- Accurate and updated data on irrigation assets
- Detailed and updated strategic or master plans related to the irrigation sector and to the organization
- Current National Development Strategies and plans
- Resource availability: information on sources of funding and donors interests in the irrigation sector

1.7.14.4 Financial Resources

- Donor priorities and their strategic plans, especially those of agencies such as ADB, WB, JAICA, etc.
- Study and investigate sustainable and green financing opportunities and entry points.
- Global best practices on financing irrigation

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Annex I : Planning Practice of Irrigation Institutes of Sri Lanka

Pre-monsoon discussions take place at subnational levels in every irrigation institution to review the status of service and its readiness to support cultivation in the upcoming season. The remaining time before the start of the season is utilized to implement measures to reduce identified risks as much as possible. This could be specific maintenance works, minor repairs, rehabilitation of damaged structures, etc., subject to budgetary and time constraints. If the identified risks are extreme and the time gap to address them is inadequate and/or a temporary measure will not work, an agreement is reached with the farmers to forgo part or full cultivation, depending on the risk. Often, temporary works are applied to provide services for several seasons (especially when adequate funding is not available) to avoid substantial cultivation losses.

The irrigation institutes capture outstanding recovery needs and new monsoonal damages and include the cost of recovery in the annual institutional budget proposal call by the NPD/NBD during the middle of every calendar year. However, even if total recovery requirements are allocated by public funding, which is rarely the case, the start of recovery almost always has a minimum gap of a year. For example, flood damage caused by Maha rains in October and November will be included in the irrigation institute's budget proposal in June next year, and allocations will be available only by January of the following year. Yet, if the damages are severe, special requests are accommodated outside the budget cycle by the NPD and NBD, and recovery funds would be allocated.

All irrigation institutions follow a similar procedure for flood preparedness, recovery planning, and implementation, as explained below.

Institution	Damage assessment and recovery planning
Irrigation Department	The damage assessment report of the irrigation department is prepared at the level of the Divisional Irrigation Engineer (or engineers) who handles the operation, maintenance, water management, and construction management within the respective division. Several divisional engineers' operations are governed by a Range Director of Irrigation (RDI), and the RDIs are accountable to the Director General of Irrigation (DGI). The secretary to the ministry that holds the irrigation portfolio submits the damage assessment prepared by the ID to the National Planning Department and Budget Department.
Mahaweli Authority of Sri Lanka	The damage assessment report of the MASL is prepared by the block managers, who get assistance from the engineering assistants and field assistants at the unit manager's level under each block. The damage assessments prepared at each block are overseen at the Resident Project Manager's (RPM) level by the Deputy RPM (Engineering).

	The engineer attached to each block manager's office handles the operation, maintenance, water management, and construction program with the support extended by unit managers' staff. The Director General of MASL ensures the compilation of damage assessments submitted by the respective RPMs. The secretary to the ministry that holds the Mahaweli portfolio submits the damage assessment prepared by the MASL to the National Planning Department and Budget Department.
Department of Agrarian Development	The DAD damage assessment report is prepared at the Assistant Commissioner of Agrarian Development (ACAD) level, which is established at each district level. The Engineers' Cadre is insufficient to assign an engineer to each ACAD division, and one engineer is responsible for several districts. However, each ACAD office has a senior technical officer in charge of irrigation operations, maintenance, and construction. The engineer oversees the assessments conducted at the district level. The Director (Engineering) at the Head Office compiles the all-island evaluations with help from the Water Management Division. The secretary of the ministry in charge of agricultural development delivers the DAD's damage estimate to the National Planning and Budget Departments.
PID (NP)	The Director (Irrigation) leads the largest provincial irrigation department, which is assisted by three Deputy Director Ranges, each of which has two or three Irrigation Engineer Divisions. This arrangement is identical to that of the Central Irrigation Department. The PID (NP) damage assessment report is generated at the Divisional Irrigation Engineer level, who is in charge of the associated division's operation, maintenance, water management, and development plans. The assessments of the divisional engineers are monitored by the Deputy Director (Irrigation) and presented to the Director (Irrigation). The Director (Irrigation) completes a damage assessment, which is transmitted to the Chief Secretary's office via the respective province government. After examining and assessing regional needs, the Finance Commission determines priorities.
PID (EP)	The PID (EP), similarly to the PID (NP), is led by the Director (Irrigation), and three Deputy Directors (DD) are allocated to three districts. Two or three Divisional Irrigation Engineers have been appointed under each DD. The PID (EP) damage assessment report is created at the level of the Divisional Irrigation Engineer, who is in charge of the district's operation, maintenance, water management, and construction plans. The divisional engineers' assessments are overseen by the Deputy Director (Irrigation) and submitted to the Director (Irrigation). The damage assessment completed by the Director (Irrigation) is forwarded to the Chief Secretary's office via the corresponding province ministry. Priorities are set by the Finance Commission after studying and evaluating regional priorities.

PID (Sab. P)	The Head of Irrigation Activities is the Director (Irrigation/Road/Local Government) of the Engineering Service Department. The Director (Irrigation/Local Government) is assisted by the Deputy Director (I/R/LG). The Executive Engineers (I/LG) are in charge of the PID's irrigation systems' operations, maintenance, and construction. The PID (Sab. Province) damage assessment report is created at the level of the Executive Engineer (I/LG), who is in charge of the operation, maintenance, water management, and construction projects within the appropriate command area. The assessments of the Executive Engineers are overseen and submitted to the Director (I/R/LG) by the Deputy Director (I/LG). The Chief Secretary's office gets the damage assessment completed by the Director (I/R/LG) of the provincial ministry of agriculture and irrigation via the Director (Irrigation). Priorities are set by the Finance Commission after studying and evaluating regional priorities.
Other PIDs	The other six (06) Provincial Irrigation Departments (PIDs) have a similar arrangement, with an irrigation engineer overseeing each District's irrigation systems. The technical personnel assist the District Irrigation Engineer with operations, maintenance, and construction. The District Engineers are overseen by the Director of Irrigation. The PID damage assessment report is created at the level of the District Irrigation Engineer, who is in charge of the district's operation, maintenance, water management, and construction programs. The District Engineers' assessments are overseen by the Director of irrigation. The damage assessment completed by the Director (Irrigation) is forwarded to the Chief Secretary's office via the corresponding province ministry. The Finance Commission establishes priorities by studying and assessing regional priorities.

Annex II : Data Analysis in Pre-disaster Phase to identify Recovery Needs and Priorities

Forecasting disaster scenarios and planning for them, despite gaps, is the current practice of irrigation sector agencies. Current disaster scenario planning based on past impacts, physical observations, and feedback from affected populations, among other things, will benefit from more systematic forecasts backed by technical data and information.

1. Selecting Hazards

Irrigation processionals, in collaboration with key stakeholders, should identify the most severe dangers that show symptoms of worsening due to climate change and have the potential to have disastrous effects on the irrigation infrastructure they are responsible for. The analysis of previous disaster data will aid in the selection and prioritization of dangers. A study of all key risks and their possible impacts on irrigation infrastructure would be beneficial, but it may not be feasible due to resource constraints. As a result, dangers that are most likely to devastate irrigation infrastructure should be prioritized. If resources allow, it is advised to build a series of scenarios connected to specified hazards at various intensities or magnitudes of the provided hazard.

Floods were formerly regarded as the single most serious danger, and this appears to be the case again. Irrigation facilities may begin by assessing flood risk. However, the consequences of other recurring calamities, such as droughts, have not been properly investigated and may be a topic worth exploring. Furthermore, based on information modeling exercises to estimate hazard trends, increased dangers of landslides and earthquake-induced tremors cannot be ruled out as prospective hazards, at least in some sections of the nation.

2. Past and future trends of the selected hazard

Frequency of occurrence and intensity, as well as the spatial spread of the selected hazard (i.e., floods), are aspects used for studying past and future disaster effects. Historical damages and losses caused by the given hazard with the given intensity in the given geographical area will help to create a basic picture of the post-disaster scenario caused by similar events in the future. This picture must be augmented with updated information (socio-economic and environmental data). Using weather forecasts and climate models, changes in the frequencies and intensities of the given hazard may also be assumed.

3. Existing and potential vulnerabilities

The extent of exposure of irrigation infrastructure to the hazard when it occurs at the assumed frequencies and intensities in the future will determine the disaster implications of the event, such as the design and strength of infrastructure, preventive repairs and maintenance to restore damaged infrastructure to its original strength, etc. This analysis will help in identifying potential physical hazards to infrastructure.

In addition, data and information on existing and potential vulnerability should be considered when determining future risks, including impacts on people and their assets (e.g., crops, houses), and nonfunctioning or reduced functioning of irrigation infrastructure in the event of physical destruction. Vulnerability can take various forms. It is not only characterized by exposure to a hazard but also by other factors: physical (mentioned above), social (i.e., women with lower access to irrigation services become even more vulnerable when the service is disrupted due to infrastructure damage), economic (i.e., poorer farmers find it more difficult to recover from losses incurred by irrigation disruption than better-off farmers), and natural (i.e., damages to catchment areas weaken irrigation services and increase vulnerability).

Vulnerability issues should be thoroughly considered to ensure that people who become most vulnerable as a result of the disaster are also included, i.e., poor and marginalized communities may not be able to reestablish their subsistence livelihoods if damage that is technically low threat is given a lower priority. The study of emerging hazards and their potential consequences may also be crucial. Some hazards (such as earthquakes) that did not pose a threat in the past may cause problems in the future for the nation's irrigation infrastructure.

Information and data on hazards and vulnerability would be accessible to national institutions (e.g., DMC, Met Department, NBRO, etc.) and within their plans (e.g., Current National Disaster Management Plan), as well as research institutions and organizations engaged in disaster management, weather information, climate change management, etc. on a national and international scale. Existing statistics, strategic development and disaster management plans, and reports from related institutions, such as the NBRO, may need to be reviewed in order to obtain hazard and vulnerability information.

4. Overlaying vulnerability maps or the spatial spread of vulnerability on the hazard maps:

Modeling risks is possible by superimposing vulnerability data on hazard data. The maps will depict the distribution of risk and indicate which regions are most at risk. Using this data, the irrigation infrastructure in high-risk regions could be prioritized by taking into consideration their physical vulnerabilities. Once the risk picture is better understood, post-disaster scenarios for a given intensity of hazard events can be formulated. Indicating the need for recovery, the scenarios will depict potential damages and losses in high-risk areas should a hazard event of a given intensity occur.

If time and resources permit, it is recommended to construct a series of scenarios for each of the prioritized hazards, with varying intensities of hazard events. If working with limited resources, it is recommended to create a worst-case scenario because scaling down the DRF during the PoDRP phase will be simpler than scaling up.

Given the specifics and diversity of irrigation infrastructure managed by each institution (i.e., large, medium, or small with varying levels of exposure, locations, dry, intermediate, or Wet Zones, resources for prior DRR, etc.), they must develop disaster scenarios that would have a significant impact on their assets.

It is recommended that all agencies train their key planners in risk identification. They can request that the DMC or NPD organize such training with input from the Met Department and also request assistance from Development Partners to transmit international knowledge and best practices.

5. Pre-Disaster Recovery Priorities

Prioritize the recovery requirements identified through the development of the disaster scenario. Criteria for periodization must be determined through consensus among stakeholders. The prioritization criteria and recovery priorities designated for the irrigation sector were formulated in 2017 for reference.

Annex III : Post Disaster Needs Assessment (PDNA)

PDNA is an important first step of the PoDRP that focuses on collecting the data and information required to identify recovery needs and priorities, which is crucial to developing the DRF or updating the draft DRF produced during the PrDRP.
Baseline data and information required for the analysis broadly fall into two categories:

(I) data and information related to the context within which irrigation infrastructure existed and functioned; and

(II) the status and function of irrigation systems and related infrastructure and assets The institutional data management systems were designed to capture and store baseline data, and information becomes useful here.

Data collection during PDNA focuses on collecting data to derive:

1. Disaster Effects

The disaster's consequences are the destruction it causes. Damage to infrastructure and other physical assets is considered an effect by PDNA in the irrigation sector. In a severe flood situation, typical damages to irrigation infrastructure include scouring of embankments of major reservoirs, scouring and breaching of embankments of village tanks, damages to diversion weirs and anicuts, erosion washing away of canals and canal structures, damages to access roads within irrigation schemes, and so on.

During or shortly after the disaster, the quantified value of public (and, if available, private sector) infrastructure and assets damaged or destroyed due to the disaster Damaged or destroyed assets include fundamental infrastructure (drains, culverts, footbridges) and productive assets (tanks, anicuts, distribution canals) in addition to business-related assets (offices, machinery, tools).
Damages must be expressed in physical terms (quantity, area, surface, length, or volume, as applicable). Then, they are converted to a monetary value:

(I) Replacement cost of completely destroyed assets: This is the asset's value prior to its entire devastation (pre-disaster value). The estimated cost of replacement is based on pre-disaster market prices. If the market value of a particular asset is difficult to ascertain, the construction cost, selling price, or insurance value may be used to determine the lost asset's value.

(II) Cost of repairing partially damaged assets. Repair costs are the amount necessary to restore an asset to its pre-disaster or pre-partial destruction condition.

Damages to the irrigation infrastructure should be computed using data and information collected and compiled by the field staff of the Irrigation Department (ID), the Mahaweli Authority of Sri Lanka (MASL), the Department of Agrarian Development (DAD), and the Provincial Irrigation Departments (PIDs). Table 5 describes the division of responsibilities among these sector agencies for various forms of irrigation systems, drainage, and flood control infrastructure. Engineers designated by the assessment team should determine whether an irrigation structure or piece of equipment has sustained total or partial damage. Post-disaster prices are used to estimate the cost of recovery and reconstruction (in DRF), with post-disaster price changes considered.

Assessing interruptions in irrigation service helps to comprehend the effects of a disaster on the delivery of irrigation services. This is accomplished by comparing the availability and quality of irrigation services in disaster-affected areas to their pre-disaster status using baseline data and information. The disaster's impact on the provision of irrigation services should be evaluated by all relevant social sectors and community organizations. New service demands resulting from the disaster may also need to be considered.

2. Disaster Losses to structures

As Sri Lanka does not charge for irrigation water, there are no direct losses in the irrigation sector. In order to mitigate production (economic) losses in the agriculture sector, the irrigation sector's recovery strategy will focus on repairing the damages and restoring the functionality of the damaged irrigation and flood control infrastructure as quickly as possible. However, it will also depend on the specific post-disaster situation; e.g., if disaster damages to irrigation infrastructure occur in the middle of an agriculture season, irrigation experts may decide on a temporary fix until the season is over to ensure the continued supply of irrigation water and proceed to concentrate on repairing damaged infrastructure after the season.

3. Disaster Impacts

Analyzed on a short, medium, and long-term basis, disaster impacts are the longer-term repercussions caused by the disaster's effects, damages, and losses. It combines a quantitative assessment of the macroeconomic impact of the catastrophe with damage and loss information to derive a quantitative and qualitative assessment of overall development, including social and environmental impacts.

Also evaluated are the effects on the governance and decision-making processes. People and their capacity to participate in governance and decision-making systems are affected by social and decision-making processes. That is, the impact of disasters on the (national and local) irrigation sector's functional and technical capacities required to administer the service and direct the recovery process It would include the disaster's impact on the operation of local irrigation offices and their capacity to carry out functions and administrative processes, the disruption of farmer organizational functions, etc.

The disaster may have resulted in increased risks and vulnerabilities. The focus here is on what additional threats or deteriorating conditions of irrigation infrastructure would increase the vulnerability of people and communities. The assessment should identify pre-existing risks that were realized or worsened during the disaster and the new risks and vulnerabilities created. Risks generated by the disaster should be well assessed to identify ways to minimize deteriorating conditions and risks during recovery. Increased unaddressed vulnerabilities, i.e., seepages of village irrigation tanks or canals, may increase vulnerability during the dry period (which in turn reduces production) and could increase damage and destruction during the next rainy or flood season. Other risks include potential disease outbreaks, malnutrition, risks of conflict, etc., given that the water in many village irrigation systems is multipurpose, including drinking, domestic, and social.

Macro-economic impacts Depending on the nature of damages and losses caused by a disaster and given the importance of irrigation in the national economy, the damages and losses caused to the irrigation infrastructure could have a big or small impact on the country's economic growth. The PDNA generally assesses the overall multisectoral macroeconomic impacts, of which the irrigation sector is part. It includes assessments of:

- An assessment of relative impacts on multiple sectors to assess the impact on GDP or GDRP
- Impact of the disaster on the fiscal budget, i.e., reduction of government revenues due to lower economic activity and increased expenditures due to emergency and recovery implications
- Impact on Balance of Trade and Payments: exports may decrease due to production losses of certain crops due to irrigation service disruptions, while imports may increase to replace lost assets and production.

Losses in production and revenue may be partially compensated by government intervention for economic recovery and investment in reconstruction. Some losses may be avoided or minimized if post-disaster recovery is quicker. Recovery, of course, depends on the severity of losses, the speed of reconstruction, and how the recovery program is implemented. Even relatively small disasters may have a significant impact on Sri Lanka's economy, which is vulnerable and relatively small in size with inadequate economic diversification. Larger disasters, which require significant reconstruction, would certainly affect the budget deficit and balance of payments, among others.

Human and social development impacts are the medium- and long-term effects of the disaster on human development and quality of life. By studying as accurately as possible the difference between pre- and post-disaster quality of life by comparing social indicators in order to identify recovery strategies to return to at least pre-disaster levels, recovery efforts should continue as long as necessary until human development is restored and/or enhanced.

4. Analysis

Identification of Recovery Needs, Recovery Priorities, and Developing Recovery Strategies

The recovery needs are the foundation for developing a recovery plan or fine-tuning the strategy developed during the PRDRP. Recovery requirements are a complete set of concerns discovered as a consequence of a detailed examination of post-disaster effects and implications. Identifying all essential topics in dialogue with stakeholders will produce a greater knowledge of difficulties and possibilities and opportunities, which will boost recovery results. When irrigation institutions participate in individual PDNAs in post-monsoon recovery, recovery demands are confined to the irrigation infrastructure of the relevant agency.

Recovery priorities are recovery needs that have been prioritized in conjunction with stakeholders in order to fulfill at least the most significant recovery requirements identified in a resource-restricted environment. Following the capturing, costing, and understanding of catastrophe consequences, the standardized evaluation techniques that govern PDNA involve the determination of post-disaster recovery priorities. Priorities for recovery must be determined throughout all impacted sectors of the economy, within sectors, or across geographical areas and social groupings. The goal of prioritizing identified difficulties is to make recovery planning objectives and outputs more realistic and feasible. Issues can be classified as (1) critical, i.e., preventing water leakages from critical infrastructure, removing debris from canals, and resuming water flow to provide water for the following season; (2) recommended, i.e., replacing a manual system with an automated system, restoring destruction to and strengthening of the catchment area, EIA prior to reconstruction of damaged infrastructure; and (3) desired, i.e., transformation of canal systems to reduce water waste, designing infrastructure that requires

Recovery strategies describe how to attain recovery goals while keeping the recovery vision and guiding principles in mind. BBB has the chance to develop a recovery strategy. Recovery ideas may be consistent with long-term plans and upgrades developed and approved by irrigation industry experts. It is also an opportunity to remedy some prior development mistakes, enhance quality, introduce new technology or techniques to increase overall efficiency, and align development commitments, among other things. The DRP suggests acceptable recovery plans and assesses the financial and technical resources needed to implement them. It specifies the structure, techniques, and resource needs of programs and initiatives in order to achieve total post-disaster recovery, rebuilding, and risk management while concentrating on other cross-cutting concerns. Implementing pre-disaster activities will (a) minimize risks, i.e., both structural and nonstructural measures; (b) accelerate and enhance post-disaster planning and implementation, i.e., policy and institutional measures; and (c) improve post-disaster planning and implementation, i.e., To swiftly design and implement the PoDRP, the disaster recovery strategy must include precise information.

Annex IV : Institutional DRFs

1. Draft Recovery Framework, Irrigation Department (ID)

Recovery Vision

Vulnerable communities and crops are safer and more resilient to disasters, contributing to food security, livelihoods, drinking water security, sustainable power generation, and lifestyles derived from the inclusive and participatory restoration of flood protection systems, irrigation systems, infrastructure, and protected river basins.

Recovery Objective

To improve harnessing, conserving, regulating, and allocating water resources in a manner to provide improved flood protection systems to ensure safe and resilient communities and protection for communities affected by hydro-meteorological (and other relevant) disasters.

Guiding Principles

- Adopt a comprehensive and holistic approach to recovery, aligning with SDG principles.
- Integrated water resources management and participatory management in major medium and interprovincial minor irrigation systems assigned to ID
- The optimum utilization of land and water resources considering environmental factors based on river basins
- Management of water economically for sustainable agriculture and other uses
- Knowledge-backed and consensus-based recovery decision-making
- Use accurate and updated data and methodologies for correct decision-making.
- Align recovery actions with sector-coordinated plans.
- Optimize donor assistance; Maximize resource utilization, including the use of local resources in recovery.
- Transparent flow of funding and other resources.
- Prioritizing the concerns and needs of marginalized or most vulnerable communities among affected communities
- Protect and further strengthen environmental assets, etc.

Policy Context

Operation, maintenance, improvements, rehabilitation, and water management of medium and major irrigation schemes, drainage and flood protection schemes, and saltwater extrusion schemes for optimum productivity in a participatory manner, and catering of water for inter-sectorial use, domestic use, industrial use, and environmental requirements are among the key responsibilities of the ID.

Irrigation works were divided into major and minor works by Irrigation Ordinance No. 32 of 1946. The major works were further defined by Ordinance No. 1 of 1951 as "an irrigation work constructed and maintained by or under the authority of the Director of Irrigation with monies provided by Parliament." The Agrarian Services Act No. 58 of 1979 defined an irrigation work commanding more than 200 acres as a major and medium scheme" and less than that as a "minor scheme."

Cultivation Meetings (Kanna Rasweema) are mandated by the Ordinance to decide on the cultivation calendar and agree on details of the seasonal operations before each season begins. This participatory decision-making structure and system continue to be a good communication and negotiation platform between farmers and the government and would be valuable in recovery planning too.

Institutional Arrangement

The ID appointed the Director of Hydrology as a member of the TWC and as the institutional recovery focal point. The Additional Director General for Investigation, Planning, and Design of the ID will have the key responsibilities to institutionalize DRP by mainstreaming it within institutional planning protocols with the blessings of the Director General (DG) of ID and the support of the focal point. The DG of the ID will facilitate getting the required endorsements from the Secretary of the respective Ministry (Ministry of Irrigation).

The ID plans to create awareness about recovery planning internally among the relevant staff by having dedicated discussions and using forums such as staff and review meetings, annual planning preoperative meetings, etc. Awareness sessions will target all divisions of the ID at the Head Office: planning, asset management, hydrology and disaster management, hydraulics, water management, IT and GIS, training, and finance administration. It is also important that the 14 Regional Directors at range levels and their teams, comprising the Chief Engineer and the Irrigation Engineers too, get well acquainted with the recovery concepts and methodologies.
Externally, Farmer Federation members within project management units who represent farmer organizations must also understand the importance of recovery, as they play a key role in risk minimization actions.

The Weekly Water Panels at the MASL and the Seasonal Water Allocation Discussions convened by the Water Management Secretariat are good forums for awareness creation among key external actors together with the MASL, which is reemphasized below under Section 3.4.2. In addition, seasonal cultivation meetings (Kanna Rasweema) are held twice annually with the participation of key stakeholders to decide on the cultivation calendar, types of crops to cultivate based on water availability, priority maintenance needs, and how they will be carried out with input from farmers, etc.

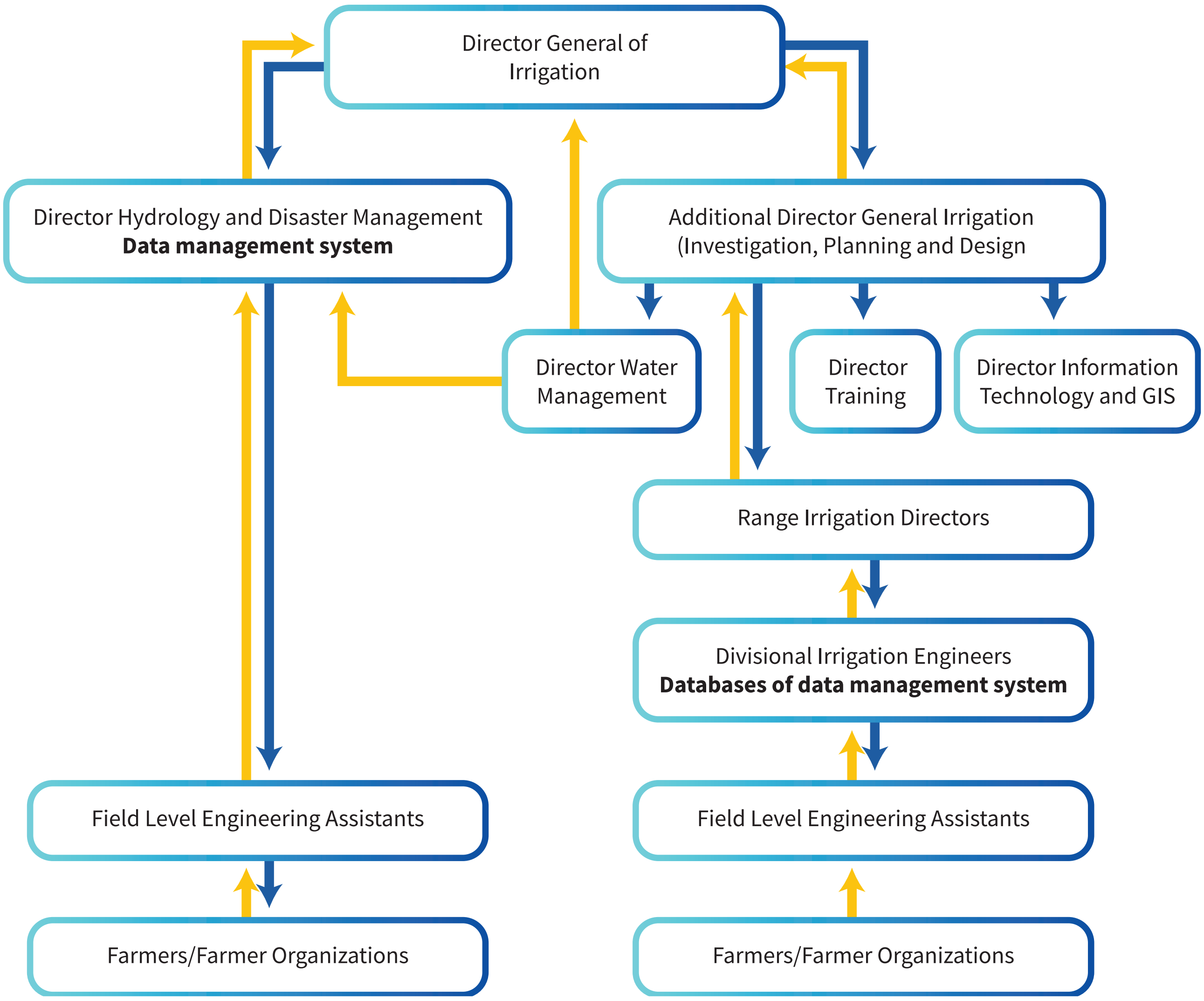


Figure 6 : Institutional Arrangement ID

Training

The ID will assign recovery training responsibilities to the Director of the Training Division, guided by the Additional Director General for Investigation, Planning, and Design. With the assistance of the Director of Hydrology and Director of Water Management, who are Recovery Focal Points of ID and trained by the KSTA project, the Director of Training will decide how to introduce recovery planning training to ID. It can be done by holding special training programs such as data management for recovery planning, including operation and use of the institutional data management system, which will primarily target the 40 divisional engineers who will collect and update data. The Director of Information Technology and GIS, under the guidance of the Additional Director General for Investigation, Planning, and Design, will develop a system of consolidation of individual data inputs by Divisional Engineers, which then get consolidated at the 14 Range Offices and finally at the Planning Division of the Head Office, and related training targeting all key persons in data management.

Data Management

PrDRP started in the ID with the design and introduction of an inventory and data management system that will be replenished to begin with using data collected currently by the Divisional Engineers, guided by the Planning Division of the ID and Directors of Hydrology and Water Management. The ID has a system of data collection by hydrological survey helpers on a 24-hour-a-day basis, which is ensured by hydrological field assistants. Data collection will build on this existing system.

Having comprehensive and updated data and inventory is critical to disaster recovery planning. Many of the above-mentioned discussions for water management, allocation, and planning will also generate important data and information that would be useful for updating the system. Information generated by seasonal cultivation meetings is an important source for updating data in the system. The data and information system that is currently being developed under the preview of the Director of Hydrology and Disaster Management (who is overall responsible for the inventory) needs to be considered an important institutional inventory required not only for DRP but also for overall planning.

Data sharing tools used by the ID, such as the public web portal, email, and social media, will also be considered for sharing information with different types of stakeholders.

Disaster Recovery Planning

Annual planning carried out by the ID provides important entry points for the DRP to consider potential disaster scenarios for the next year's cultivation seasons, as depicted in Figure 2. It will help them assess potential risks, make better decisions on preventive maintenance and repairs, and have more realistic plans for post-flood recovery. Scenario planning will also help to understand the potential risks over the next few years and help planning teams think of issues that may need addressing now to minimize significant damages and losses that may occur beyond the annual planning cycles.

Having realistic annual plans and budgets is a start to resource mobilization. While it would help the ID to more confidently negotiate with the NPD for required annual allocations, it is also advisable to consider beyond the annual budgets: identifying key sources of resources that would support irrigation sector recovery and negotiating through NPD/ERD processes of donor negotiations; identification and negotiation with sources of funding that support sustainable and green development aspects included in irrigation recovery and development, etc.

Financial Preparedness

The irrigation sector has always been considered a priority for the allocation of public funding. A substantial amount of public funds allocated for irrigation development and rehabilitation flow through the ID. LKR 42,242 million has been allocated for the Ministry of Irrigation in 2022, which amounts to over 8% of the total budget . Increasing disasters and government resource constraints have resulted in the ID having a backlog of unattended and incomplete recovery that has lasted for years.

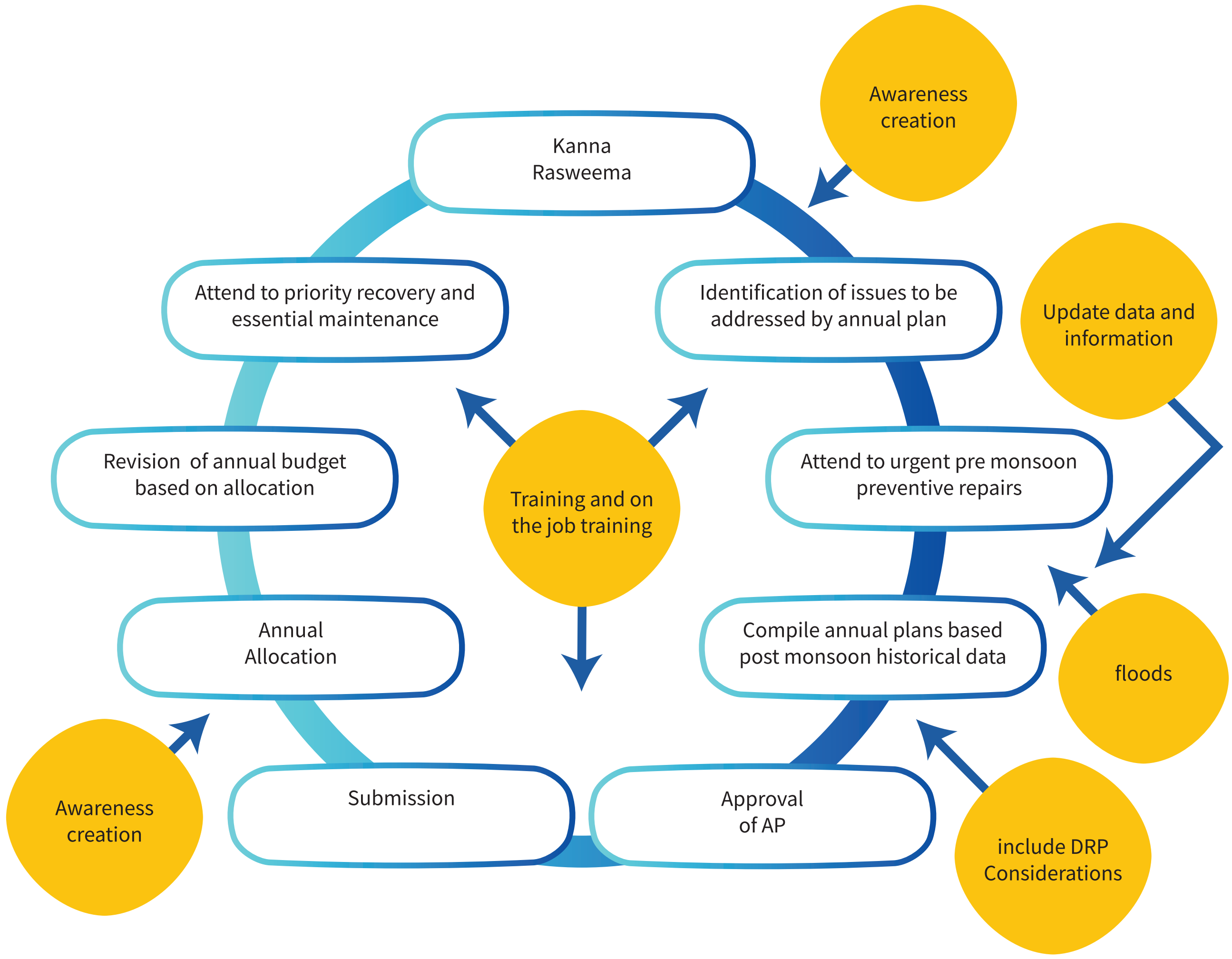


Figure 7 : Integration of PrDRP into Annual Planning of ID

The ID stands to gain much from DRP planning. Better focus on pre-disaster DRR as well as resource mobilization in anticipation of disaster. ID will be better able to negotiate with and persuade the government to invest more wisely in sustainable irrigation development and rehabilitation. With the risk-based analysis that underpins DRP included in planning, ID will be able to mobilize donor interest in advance together with NPD, ERD, etc.

[11]https://www.treasury.gov.lk/api/file/77a35a55-3f66-4ba5-8548-294df07a4e32

Recovery Implementation

The Additional Director General for Investigation, Planning, and Design, Directors of Hydrology, and Water Management, through the relevant Regional Directors and their teams, are responsible for recovery implementation and the development of implementation schedules based on available resources and in consultation with farmer organizations as required.

2. Draft DRF - Mahaweli Authority of Sri Lanka (MASL)

Recovery Vision

Vulnerable communities in Mahaweli and Walawa basins and their crops are safer and more resilient to disasters, contributing to sustainable power generation, land settlement, food security, livelihoods, and lifestyles derived from the inclusive and participatory restoration of Mahaweli systems, infrastructures, and protected river basins.

Recovery Objective

To have strengthened systems for regulation and harnessing the waters of the Mahaweli and Walawa river basins for power generation, land settlement, food production, and employment generation, to ensure safe and resilient communities and protection for communities affected by hydro-meteorological and other potential disasters.

Guiding Principles

- Adopt a holistic recovery strategy that is consistent with SDG principles and emphasizes long-term restoration within basin or hydrological borders (rather than particular jurisdictions).
- Recovery decisions must be founded on knowledge and consensus.
- Enhanced and upgraded national multi-purpose Mahaweli assets and structures to achieve high levels of safety.
- For right decision-making, use accurate and up-to-date data and procedures, and align recovery operations with sectoral coordinated plans.
- Maximize resource use, especially the use of local resources in recovery, by optimizing donor support.
- The free flow of funds and other resources
- Prioritizing the interests and needs of marginalized or vulnerable populations, protecting and strengthening environmental assets, etc.

Policy Context

As per the Mahaweli Authority of Sri Lanka Act No. 23 of 1979, the Mahaweli Authority of Sri Lanka (MASL) is responsible for the implementation of the Mahaweli Ganga development scheme. The Act gives the MASL authority the mandate for the construction and operation of reservoirs and irrigation distribution systems for the integrated development of declared special areas. The irrigation schemes integrated by the Mahaweli River Development Program (1964–1990) have been managed by the MASL. Recovery planning and implementation of the irrigation infrastructure constructed under the Mahaweli Development Program are the responsibility of the MASL.

Institutional Arrangement

The MASL appointed the Director of Engineering Design and Planning of MASL as a member of the TWC, who will also serve as the Recovery Focal Point of MASL. The Deputy Director General (DDG) Technical Services will have key responsibilities to institutionalize DRP by mainstreaming it within institutional planning protocols, with the blessings of the Director General (DG) MASL and the support of the focal point. The DG of the MASL will facilitate getting the required endorsements from the Secretary of the respective Ministry.

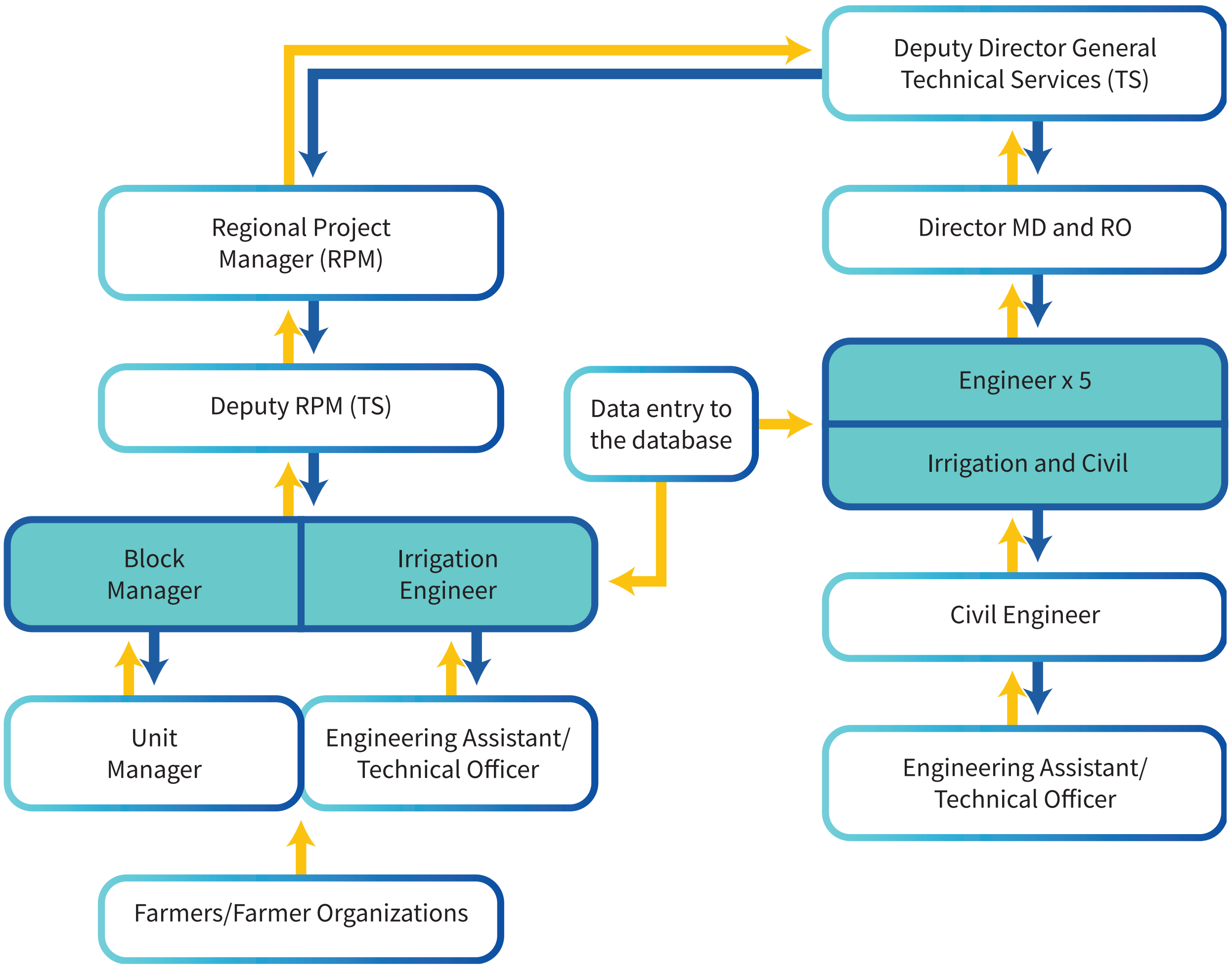


Figure 8 : Institutional Arrangement for Recovery - MASL

Awareness Creation and Training

The MASL will raise knowledge of recovery planning among relevant employees (RPMs, Deputy RPMs, Systems Irrigation Engineers, Technical Officers, and so on) through dedicated talks and platforms such as staff and review meetings, yearly planning pre-operational meetings, and so on. Weekly Water Panels at MASL, with involvement from ID and CEB, will be a suitable platform for linking disaster-related topics addressed during talks and discussing DRP when opportunities emerge. The Seasonal Water Allocation Discussions convened by the Water Management Secretariat are also viewed as an important chance to influence by introducing DRP as an agenda topic. Seasonal Water Allocation Discussions are critical opportunities to raise awareness among all stakeholders, especially the most important external stakeholders.

This decision-making platform involves all key players who have a say in water management; it begins with farmers indicating their own water requirements for the upcoming seasons, which are then consolidated at the field, distributary canal, and block levels by Farmer Organizations (FO) and used to produce system plans by RPM and his or her team. The Water Management Secretariat (WMS) organizes a seasonal water allocation meeting with all stakeholders, including DG MASL, appropriate Government Agents (GA), Divisional Secretaries (DS), the Ceylon Electricity Board (CEB), ID, DoA officials, and 50–60 farmers representing FOs. WMS considers all stakeholder concerns and makes water allocation decisions based on water availability and crop types suggested for cultivation, while lingering recovery challenges and potential solutions are also examined. The RPMs guarantee that decisions are conveyed to all farmers via block and distributary/feeder canal FF. This procedure is particularly beneficial since it includes various entrance points for stakeholders to raise awareness about DRP and get support for participating in it.

The Director Training Division, who is responsible for MASL staff training and capacity building, will be responsible for introducing and mainstreaming training on recovery planning, including PDNA, information system management, and so on, into the MASL training plan. Aside from the initial DRP training provided under the KSTA project, the MASL recommends conducting follow-up training in two batches to begin with, covering all necessary personnel involved in planning and execution both in their Colombo office and in the field. Given the importance of farmers ability to participate in DRP, the MASL advises that once properly trained, TOs should generate essential capacity among farmers by customizing and translating training material and using FOs as platforms.

Data Management

PrDRP was started in MASL with the introduction of inventory and data management systems, which are being updated with current data under the guidance of the Director of Engineering Design and Planning, followed up by a series of training and discussion forums to identify how to integrate the data management systems into organizational processes in a way that is practical for the organization. The technical officers in the field and irrigation engineers based at the block level will be capturing and updating data. Information generated by pre-cultivation repair and maintenance work will also be input into updating data in the system. Datta entry and update will be supervised by Deputy Regional Project Managers and, in turn, by Regional Project Managers. The above-mentioned seasonal water allocation discussions conducted by the WMS will also generate important data and information that would be useful for updating data and information in the system.

Data and information that are currently being developed under the preview of the Director of Engineering Design and Planning will be an important institutional inventory for planning as they get updated with relevant resources.

Disaster Recovery Planning

The annual planning carried out at system level is the key opportunity to consider potential disaster scenarios for the next year's cultivation seasons. It will help them assess potential risks, make better decisions on preventive maintenance and repairs, and have more realistic plans for post-flood recovery. Scenario planning will also help to understand the potential risks over the next few years and help planning teams think of issues that may need addressing now to minimize significant damages and losses that may occur beyond the annual planning cycles.

Financial Preparedness

MASL is a key player in Sri Lanka's water, food, and energy security, among other aspects, and as such, it, like the ID, receives priority in public financial distribution. However, increasing disasters and government budget limits have had an impact on MASL, including recovery difficulties. Having realistic annual plans and budgets is a good place to start when it comes to resource mobilization. While this would allow MASL to more confidently negotiate with the NPD for required annual allocations, it is also prudent to think beyond annual budgets, such as identifying key sources of resources that would support irrigation sector recovery and negotiating through NPD/ERD processes of donor negotiations; identifying and negotiating with sources of funding that support sustainable and green development aspects included in irrigation recovery and development; and so on.

The MASL earns funds while providing free irrigation and agricultural services to farmer communities; however, this income does not cover all operating costs. Given its varied portfolio of work and high-value assets, including those that generate money, MASL is in a position to think about DRP and financial readiness in ways that go beyond traditional thinking, driven by DRP inclusion in planning. MASL may be able to contemplate more effective resource management and creative financing solutions, such as risk sharing and transfer choices. With the Director General's help, the Deputy Director General for Technical Services is responsible for working with the National Planning and Budget Departments to evaluate possibilities and constraints and develop strategies.

Recovery Implementation

The Deputy Director General of Technical Services is in charge of implementing recovery plans through regional project managers and their staff, as well as organizing farmer organizations. S/he will be in charge of developing implementation schedules, revised budgets based on recovery allocations, and implementation schedules in collaboration with regional teams and farmer groups as required.

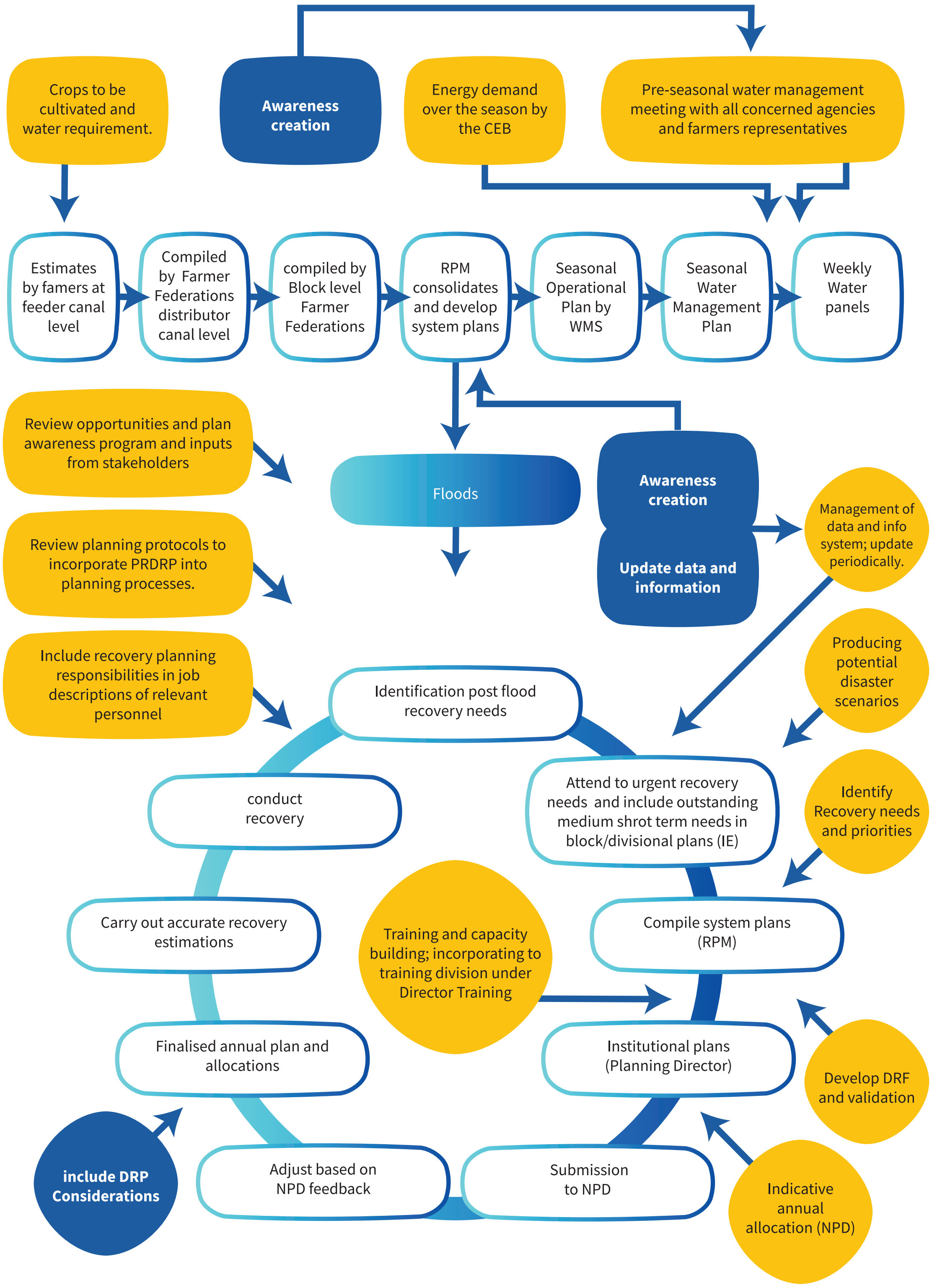


Figure 9 : Integration of PrDRP into Annual Planning MASL

3. Draft Recovery Framework - DAD

Recovery Vision

Vulnerable communities and crops are safer and more resilient to disasters, contributing to the sustainable building of a self-reliant and dignified agrarian society and the risk-sensitive development of all agricultural lands in Sri Lanka.

Recovery Objective

To provide improved flood protection systems to ensure safe and resilient communities and protection for communities affected by hydro-meteorological disasters.

Guiding Principles

- Adopt a comprehensive strategy that is consistent with SDG principles, guaranteeing the protection and conservation of small (rural) irrigation systems as well as enhancing their production and good management.
- Rebuild cascade systems and strengthen the systematic approach to rural village irrigation recovery.
- For comprehensive improvement, build on traditional knowledge and technology while using current techniques when appropriate.
- Strengthen local irrigation management, disaster risk reduction, and resilience building capacities in collaboration with local institutions.
- Prioritizing the concerns and needs of the most marginalized and vulnerable members of affected communities
- Motivate leadership and enable community institutions to participate in rehabilitation.
- Defend and strengthen local environmental assets.
- Maximize resource utilization in recovery by making judicious use of local resources.
- Optimize donor assistance.
- Transparent transfer of funds and other resources
- Align with sectoral-coordinated plans as needed (if such plans exist).

Policy Context

With the vision of "Sustainable Development of All Agricultural Lands and the Farming Community of Sri Lanka", the Department of Agrarian Development is implementing government policy on (1) agriculture and agrarian laws; (2) management of all agricultural land; (3) preparation of the organizational structure of the farmers and strengthening farmer organizations; and (4) irrigation and water management.

The DAD implements the provisions made under Sections 81 to 89 under the title “Irrigation Work and Management of Irrigation Water” in Part VII of the Agrarian Development Act No. 46 of 2000. The Agrarian Services Act No. 58 of 1979 also empowers DAD to attend to all matters relating to minor irrigation works and the maintenance of minor irrigation works.

The DAD, which is responsible for over 40,000 minor irrigation schemes, is mandated to ensure their sustainable operation with the participation of farmers. Agrarian Development

The Act empowers farmers to make decisions on the operation and maintenance of these schemes with the facilitation of DAD. The Water Management Division of DAD, along with engineering and other divisions, is responsible for irrigation and water management.

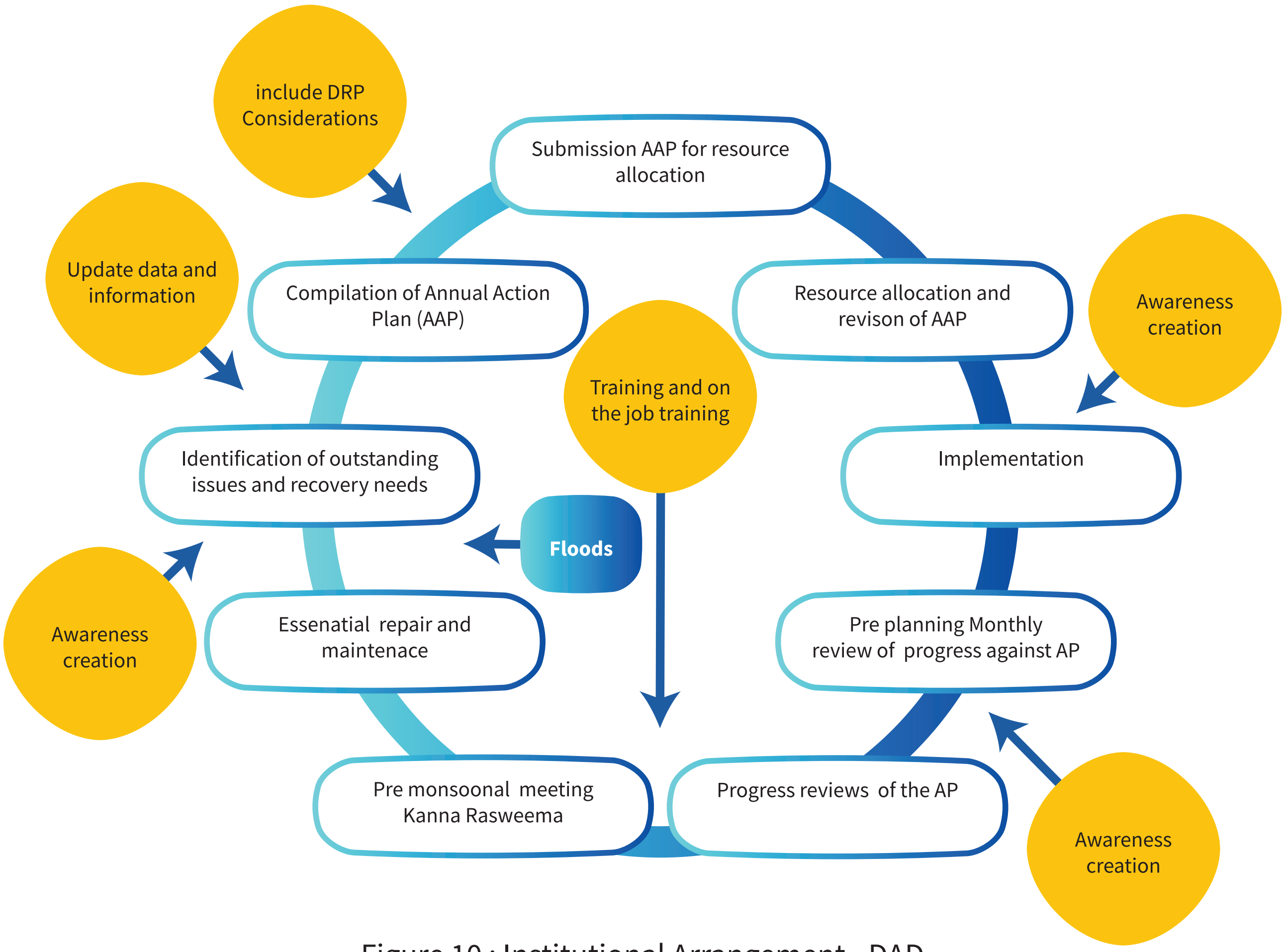


Figure 10 : Institutional Arrangement - DAD

Disaster Recovery Planning (DRP)

It was suggested that the Commissioner of Agrarian Development (Development Division) and the Deputy Director Planning be assigned responsibility for mainstreaming DRP within these talks and forums (see Figure 2 below). They would identify and implement entry points to examine probable catastrophe scenarios for the following year's agricultural seasons, analyze potential hazards, make more accurate preventative maintenance and repair decisions, and have more realistic post-flood recovery plans. Scenario planning may assist in understanding possible hazards in the next few years and can assist planning teams in considering issues that may need to be addressed now to prevent substantial damages and losses that may arise beyond the annual planning cycles.

Financial Preparedness

The DAD contributes very little public money to the maintenance and repair of minor schemes. Because community contributions are only in the form of labor, allocations are rarely enough. DAD and farmer groups rely heavily on NGO and other external assistance for disaster-induced scheme repair and rehabilitation.

DRP planning will help enhance annual schedules and budgets. Once the risk has been determined, the DAD will be better able to persuade the public and external financial sources of the necessity for DRR resource mobilization during the pre-disaster period, as well as attract community engagement. Furthermore, it will enable us to more confidently negotiate budget allocation choices and encourage the government to invest in and resource sustainable rural irrigation systems. With risk-based analysis underpinning DRP integrated into planning, DAD may be able to think of new local solutions, such as risk financing such as insurance through their banking systems, with expert assistance.

The Chief Accountant, Commissioner General (Development Division), and Commissioner General (Planning and Monitoring) will all play critical roles in formulating financial preparation measures.

Recovery Implementation

The Director of Engineering, with the assistance of the Commissioner General (Development Division) and the Engineer Water Management, will be in charge of developing implementation schedules based on available resources and in collaboration with district and divisional-level staff as needed, as well as farmers.

4. Draft DRF- Provincial Departments of Irrigation (PIDs)

Recovery Vision

Vulnerable agricultural communities in the province and their crops are safer and more resilient to disasters, strengthening their food security, livelihoods, and lifestyles derived from the inclusive and participatory restoration of village irrigation cascade systems, flood protection and drought management systems, and related infrastructure.

Recovery Objective

To provide improved flood and drought risk reduction in village irrigation and cascade system management to ensure communities in the province are safer and more resilient and have protection for those affected by hydro-meteorological and other key disasters.

Guiding Principles

- Adopt a holistic and comprehensive approach to rebuilding village irrigation systems, considering cascade principles.
- Prioritizing the concerns and needs of marginalized or most vulnerable communities among affected communities
- Protect and further strengthen environmental assets, etc.
- Maximize resource utilization, including the use of local resources in recovery and collaboration with other irrigation institutes.
- Strengthen local irrigation management, disaster recovery capacity, and local leadership.
- Partnerships with local institutions
- Strengthen community capacity to participate in irrigation management.
- Adopt a comprehensive approach aligned with SDG principles.
- Individual irrigation agencies' recovery actions align with sectoral coordinated plans (if such plans exist).
- Optimize donor assistance.
- Transparent flow of funding and other resources

There are 9 PIDs in Sri Lanka, and each would have a slightly different version of the DRF Provincial Irrigation Departments given the variation in extent and type of irrigation systems, institutional arrangements, resources, etc.

Policy Context

Enactments under the 13th Amendment to the Constitution of Sri Lanka paved the way for the setting up of the Provincial Councils in Sri Lanka. The Provincial Councils Act No. 42 of 1987 specified the subjects (provincial list) on which provinces are able to exercise legislative powers. A provincial council may initiate irrigation and land development within its province by utilizing water from rivers and through diversions from water systems that come from outside the province.

The administration and management of all existing irrigation schemes where the command area falls within the provinces is also part of the irrigation subject, which is on the provincial list. The DAD managed minor irrigation schemes in Sri Lanka until the Provincial Councils were established in 1988. Since then, responsibilities for managing minor irrigation systems have been distributed across the PIDs and DADs, governed also by the Agrarian Development Act No. 42 of 2000 and subsequent amendments. Recovery of provincial irrigation systems affected by disasters is a responsibility of the PIDs.

Institutional Arrangement

The Directors of PIDs have been appointed by the respective Chief Secretaries as the members representing the PIDs in the TWC of the KSTA project. As a TWC member, the Provincial Directors of Irrigation got extensive exposure and training in disaster recovery planning (DRP). Each provincial director of irrigation and PID is expected to serve as the institutional disaster recovery focal point of the respective PID.

The Deputy Chief Secretaries (Planning) of the Province will have the key responsibilities to institutionalize DRP by mainstreaming it within institutional planning protocols with the blessings of the Provincial Chief Secretary. The Provincial Chief Secretary needs to facilitate and ensure getting the required endorsements from the Governor and relevant political authorities

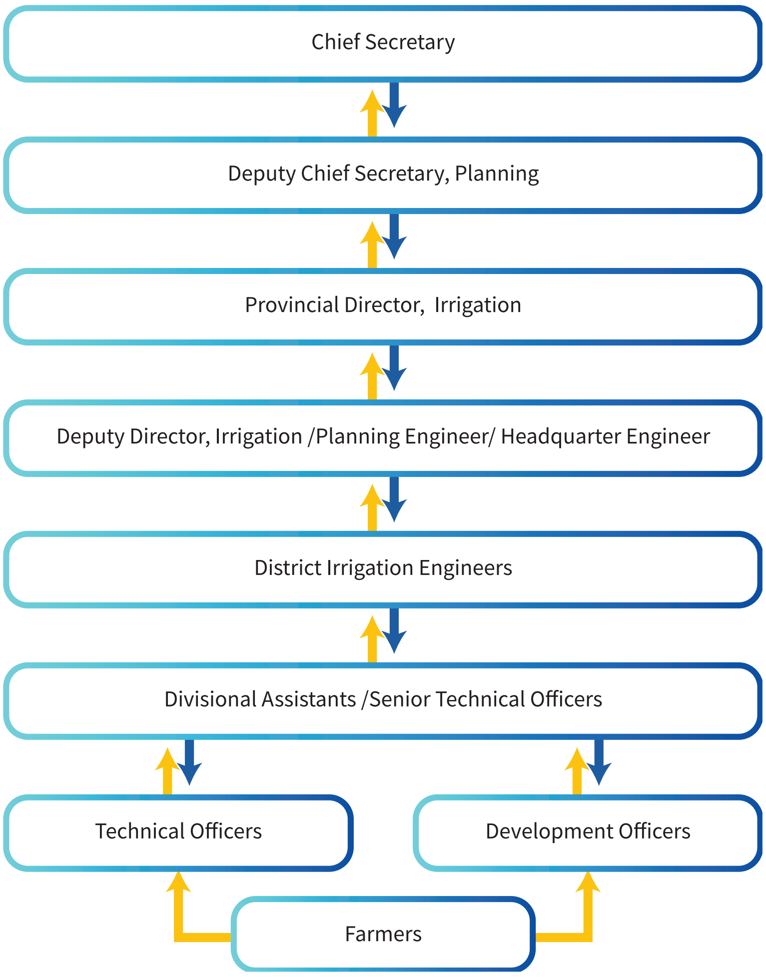


Figure 11 : Institutional Arrangement of PIDs

Creating Awareness and Training

Creating awareness among staff of the PID is the responsibility of the Deputy Chief Secretary Planning with the assistance of the Focal Point/Provincial Director Irrigation. Together, they will plan targeted awareness programs after carefully selecting the target staff and external actors. The PIDs that have irrigation systems in overlapping areas with the Mahaweli regions may join and align with the existing institutional systems of MASL to create awareness about recovery planning and include training PID cadre where possible. The relevant routinely organized or special events or discussions will be used for creating awareness as much as possible, i.e., provincial weekly water panel discussions (CEB) and district development forums.

Targeted discussion will be organized for key departments within the Provincial Chief Secretary's Secretariat, i.e., Provincial Treasury, Provincial Planning, Provincial Engineering, Personnel and Training, etc., of the relevant staff (RPMs, Dty. RPMs, Systems Irrigation Engineers, Technical Officers, etc.). Dedicated discussions and, where possible, forums such as staff and review meetings, annual planning meetings, etc. will also be targeted as awareness-creation forums for engaging in disaster recovery planning.

The Provincial Councils have management training units administered under the Secretariat of the Chief Secretary. These units will be responsible for ensuring DRP training is scheduled, planned, and implemented, prioritizing essential cadre. The Deputy Chief Secretary Planning and the Provincial Irrigation Director will convince the head of the Training Unit, getting the Chief Secretary's support as required, to introduce DRP as part of training programs and schedules and mainstream DRP training within the existing training programs.

The training of relevant officials kicked off with the institutional focal points having been trained as trainers to conduct the DRP training for selected officials. Technical training on data management and conducting PDNA and recovery planning will also be targeted at all technical officers (TO), development officers (DO), and engineers at the field level. It is important that the TOs and DOs have sound awareness and capacity about DRP so that they can in turn carry out training and awareness among farmers. A shorter, more concise version could be carried out, targeting high-level officials.

Data Management

Data and information that are currently being developed under the preview of the Provincial Director of Irrigation will be an important institutional inventory for planning as they get updated with relevant resources. The Provincial Director will take responsibility for the data management system and train and assign an appropriate officer (i.e., Technical Officer, Development Officer) for data update during the appropriate time (i.e., PIR (Provincial Irrigation Report) preparation January–March in the North Western Province, supervised by the Headquarter Engineer). Ensuring data updates are monitored by assigned officers is also a responsibility of the Provincial Director (i.e., the Planning Engineer in the North Central Province, while technical staff in the division will collect and update data). The PIDs will introduce an appropriate system to share data across the institutions (i.e., a web-based intranet in the Southern Province and Google Share in the North Central Province).

The annual planning-related discussions conducted by the PIDs mentioned below will also generate important data and information that will be updated in the system. Information generated through pre-monsoonal repair and maintenance is also a necessary input for updating data in the system.

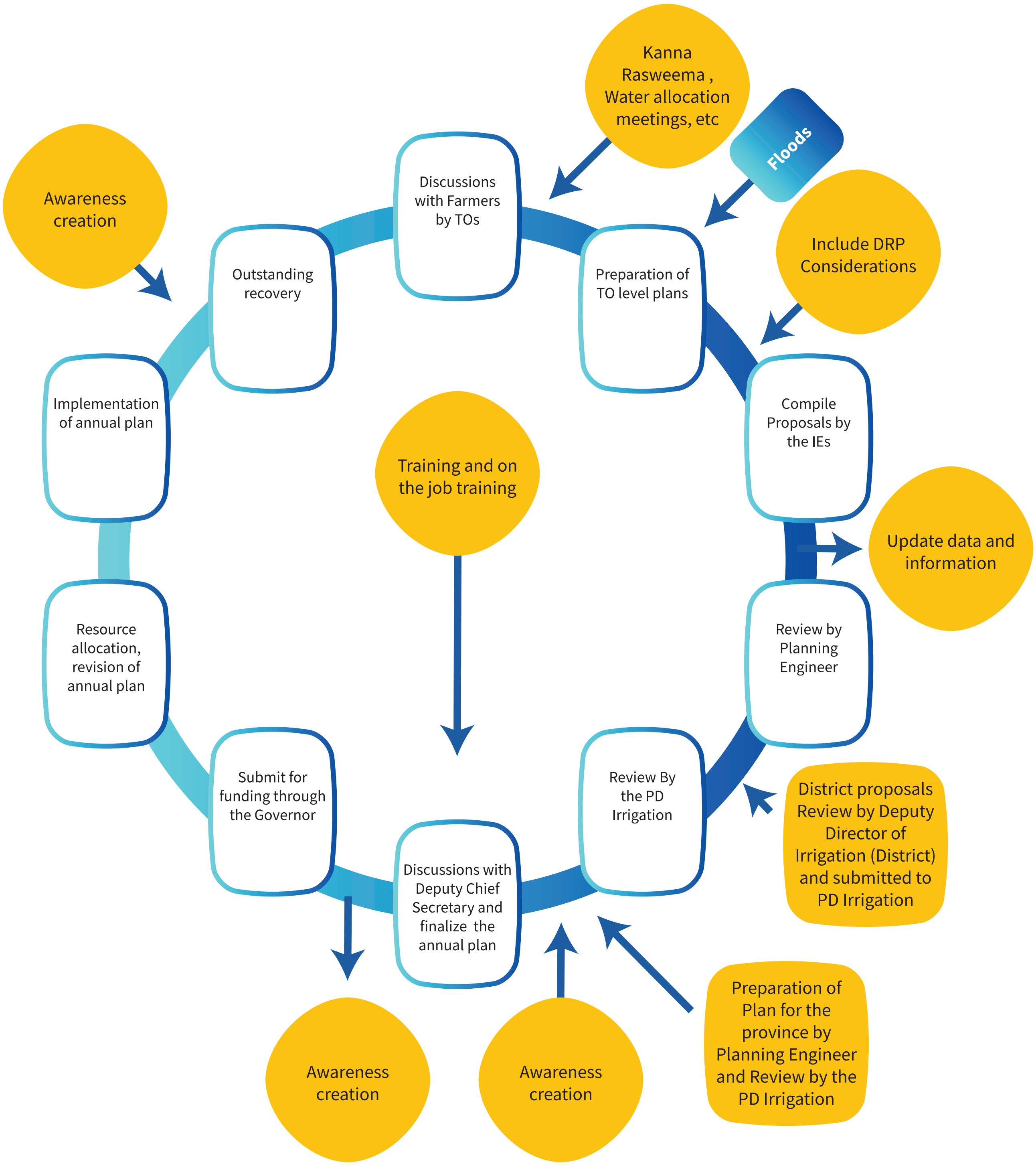


Figure 12 : Integration of PrDRP into Annual Planning Process of the PIDs

Recovery Planning

The PIDs will incorporate DRP into their annual provincial irrigation plans. Preparing for provincial annual planning cycles begins in July or August; this is generally the dry period in the country when pre-monsoonal repairs and maintenance take place. Yet the rains for most parts of the country, especially the Dry Zone, come by the end of the year (and around May for the Wet Zone). As such, unpredicted post-disaster recovery invariably gets pushed back to the next budget cycle or further, depending on resource availability in the country. The provincial allocations come with inflexible votes (proportions for districts that cannot be renegotiated within the year) and cannot be adjusted based on changed needs due to the post-monsoonal impacts. This makes it even more relevant and important that the PIDs engage in DRP; DRP will help to think about future disaster scenarios more systematically and with technical inputs. Planning using probable scenarios will bring plans closer to risk-ridden actual future scenarios. PIDs will be able to better plan, expect post-monsoon situations, and negotiate with the national treasury through the Chief Secretary and the Governor.

The formulation of the annual plan begins with engaging and having discussions with framers to get their input and make sure that the plan caters to their priority needs. The Technical Officers facilitate these discussions, while Irrigation Engineers are responsible for developing technically sound proposals, which then get passed through the Deputy Director of Irrigation with a recommendation to the Provincial Director for review and clearance. The plans are then presented and discussed with the secretary of the respective ministry (i.e., Ministry of Agriculture, Irrigation Eastern Province), Deputy Chief Secretary Planning, and Chief Secretary before finalizing. Finalized plans are submitted to the Treasury through the Chief Secretary with the consent of the Governor.

The PIDs started the introduction of inventory and data management systems and are being updated with current data under the guidance of the Provincial Irrigation Director. The introduction of the system underpinned a series of training and discussion forums to identify entry points practical for the organization to absorb the data system smoothly within institutions.

Financial Preparedness

PIDs have many challenges, as they are among the hardest hit by resource-constrained consequences in the country. As less than 10% of public funding for irrigation gets allocated to a large number of minor irrigation schemes spread across the country, mostly in dry and intermediate zones, their task is extremely difficult. Expected resource contributions from farmers are increasingly difficult, as many farmers are part-time farmers due to the subsistence nature of small-scale cultivation in Sri Lanka. It is difficult to get their contribution, even an in-kind contribution, as they are otherwise occupied.

Yet, having more realistic annual plans and budgets will help PID start more planned and systematic resource mobilization. Planners of PID should be able to present sound arguments backed by reliable evidence to make a strong case for pre-disaster risk reduction and recovery

CHAPTER 02

POST DISASTER NEEDS ASSESSMENT (PDNA) AND RECOVERY PLANNING GUIDELINES ADAPTED TO THE IRRIGATION SECTOR IN SRI LANKA

ABBREVIATION

ADB	Asian Development Bank
ARPA	Agriculture Research and Production Assistant
BBB	Build-back-better
BOP	Balance of Payments
BOQ	Bill Of Quantities
BTL	Bund Top Level
CBG	Criteria Based Grant
CBSL	Central Bank of Sri Lanka
DA	Department of Agriculture
DAD	Department of Agrarian Development
DaLA	Damage and Loss Assessment
DCB	Decentralized Capital Budget
DG	Director General
DMC	Disaster Management Center
DRF	Disaster Recovery Framework
DRM	Disaster Risk Management
DRPM	Deputy Resident Project Manager
DRR	Disaster Risk Reduction
DS	Divisional Secretary
ERD	External Resource Department
EU	European Union
FC	Finance Commission
FPS	Flood Protection Scheme
FSL	Full Supply Level
GDP	Gross Domestic Product
GFDRR	Global Facility for Disaster Reduction and Recovery
GN	Grama Niladhari (Village Headman)
GRM	Grievance Redress Mechanism

HFL	High Flood Level
ICB	International Competitive Bidding
ICT	Information and Communication Technologies
ID	Irrigation Department
IMF	International Monetary Fund
LG	Local Government
NBD	National Budget Department
NCB	National Competitive Bidding
NPA	National Procurement Agency
NPD	National Planning Department
MASL	Mahaweli Authority of Sri Lanka
MDTF	Multi Donor Trust Fund
M & E	Monitoring and Evaluation
PDNA	Post-Disaster Needs Assessment
PIDs	Provincial Irrigation Departments
PIP	Public Investment Plan
PSDG	Province Specific Development Grant
RPM	Resident Project Manager
SWES	Salt Water Exclusive Scheme
TA	Technical Assistant
TO	Technical Officer
TOR	Terms of Reference
TWC	Technical Working Committee
UN	United Nations
UNDP	United Nations Development Program
UNDRR	United Nations Office for Disaster Risk Reduction
WB	World Bank Group

TERMINOLOGY

Adaptation: The adjustment in natural or human systems in response to actual or expected climatic or other stimuli or their effects, which moderates harm or exploits beneficial opportunities.

Audit: An official examination and verification of accounts and records to analyze the legality and regularity of project expenditures and income, in accordance with laws, regulations, and contracts, such as loan contracts and accounting rules. It also may analyze the efficient and effective use of funds.

Baseline data: Initial information collected during a post-disaster needs assessment, including facts, numbers, and descriptions of the pre-disaster situation. This information will permit a comparison between the pre and post-disaster situations.

Build Back Better (BBB): The use of the recovery, rehabilitation, and reconstruction phases after a disaster to increase the resilience of nations and communities through integrating disaster risk reduction measures into the restoration of physical infrastructure and societal systems, and into the revitalization of livelihoods, economies, and the environment.

Design guidelines and specifications: A set of associated standards intended to control aspects of the design, construction, materials, alteration, and occupancy of structures that are necessary to ensure human safety and welfare, including resistance to collapse and damage.

Capacity: The combination of all physical, institutional, social, and/or economic strengths, attributes, and resources available within a community, society, or organization that can be used to achieve agreed goals. Also includes collective attributes such as leadership and management.

Capacity building: the process by which individuals, groups, and organizations build their knowledge, abilities, relationships, and values to solve problems and achieve development objectives.

Climate change resilience: The ability to resist, absorb, adapt to, and recover from meteorological changes attributed directly or indirectly to human activities that alter the composition of the global atmosphere or the natural climate variability. See also "Resilience."

Community: A social group of any size whose members reside in a specific locality, share government, and often have a common cultural and historical heritage

Disaster: A situation or event that overwhelms local capacity, necessitating a request to a national or an international level for external assistance; an unforeseen and often sudden event that causes great damage, destruction, and human suffering.

Disaster risk management (DRM): Systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies, and improved coping capacities to lessen the adverse impacts of hazards and the possibility of disaster.

Disaster risk reduction (DRR): Concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters. Results of DRR include reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness.

Early warning system: The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities, and organizations threatened by a hazard to prepare and act appropriately; and in sufficient time to reduce the possibility of harm to or loss of life or livelihoods, injury, damage to property, and damage to the environment. A people-centered early warning system comprises four key elements. They are (a) knowing the risks; (b) monitoring, analyzing, and forecasting the hazards; (c) communicating or disseminating alerts and warnings; and (d) developing the local capacities to respond to the warnings. The term "end-to-end warning systems" is used to emphasize that warning systems need to span all steps from detecting hazards to the community's response.

Efficient recovery: Stabilizing lives and livelihoods to return to normal; and rapidly restoring critical social, physical, and productive infrastructure and service delivery.

Effective recovery: Achieving the intended outcomes of medium- to long-term recoveries such as the rehabilitation and reconstruction of damaged infrastructure and the re-creation of sustainable livelihoods and income-generating opportunities.

Empowerment: Authority given to an institution, organization, or individual to determine policy and make decisions.

Ex-post measures: Actions taken after a disaster has occurred to seek to mitigate or repair all damages caused by the disaster.

Exposure: People, property, systems, or other elements present in hazard zones that thereby are subject to potential losses.

Annotation: By its nature, the irrigation infrastructure is exposed to flood hazards created by monsoon rains and climatic depressions. The number of irrigation schemes managed by each institution of the irrigation sector and the magnitude of such schemes and the spread area of infrastructure determines the scale of exposure to a flood event.

Flood: General and temporary condition of partial or complete inundation of normally dry land areas from (a) the overflow of inland or tidal waters, (b) the unusual and rapid accumulation or runoff of surface waters from any source, or (c) mudflows or the sudden collapse inland of shoreline.

Hazard: Natural process or phenomenon or human activity that has the potential to cause property damage, loss of livelihoods and services, social and economic disruption, and/or environmental degradation

Annotation: Probabilistic flood hazard is the likelihood of occurring a flood event that could damage irrigation infrastructure and its operations.

Infrastructure: Systems and networks by which public services are delivered. These services include water supply and sanitation, energy, and other utility networks, and transportation networks for all forms of travel.

Livelihoods: The ways in which people earn access to the resources that they need, individually and communally, including food, water, clothing, and shelter.

Losses: Include the decline in output in productive sectors and the lower revenues and higher operational costs in the provision of services. Also considered losses are the unexpected expenditures to meet emergency needs. Losses are expressed in current values.

Loss assessment: An assessment that analyzes the changes in economic flows that occur after a disaster and over time, valued at current prices.

Mitigate/mitigation: The use of reasonable care and diligence to minimize damage; to take protective action to avoid additional injury or loss; to lessen or limit the adverse impact of hazards and disasters.

Monitoring: Ongoing task of collecting and reviewing program-related information that pertains to the program's goals, objectives, and activities.

Needs assessment: Process for estimating (usually based on a damage assessment) the financial, technical, and human resources needed to implement the agreed program of recovery, reconstruction, and risk management.

Node: The central location for staff and materials during a disaster event.

Nonstructural measure: Any measure not involving physical construction that uses knowledge, practice, or agreement to reduce risks and impacts, particularly through policies and laws, public awareness-raising, training, and education. See also "Structural measures."
Off-budget financing: Could not be managed directly by the national government or is not comprised in its budget.

On-budget financing: Within the national government's control, including own source revenue as well as external funding and loans.

Partners: Donor community or any group or individual taking part and sharing the responsibility of the reconstruction and recovery process. In contrast, see "Stakeholders.

Policy: Principle or protocol to guide decisions and achieve rational outcomes.

Post-disaster needs assessment (PDNA): A multisectoral assessment that measures the impact of disasters on the society, economy, and environment of the disaster-affected area.

Preparedness: The knowledge and capacities developed by governments, professional response and recovery organizations, communities, and individuals to effectively anticipate, respond to, and recover from the impacts of likely, imminent, or current hazard events or conditions.

Prior measures (ex-ante): Actions taken in advance of a disaster in the expectation that they will either prevent or significantly reduce the impacts of a possible disaster.

Project outputs: Results of a project that are measurable at the immediate point of project completion.

Preliminary assessment: Assessment that provides immediate information on needs, possible interventions, and resource requirements. May be conducted as a multisectoral assessment or in a single sector or location.

Reconstruction: Restoration and improvement, where possible, of facilities, livelihoods, and living conditions of disaster-affected communities, including efforts to reduce disaster risk factors. Focuses primarily on the construction or replacement of damaged physical structures, and the restoration of local services and infrastructure

Recovery: Decisions and actions taken after a disaster to restore or improve the pre-disaster living conditions of the affected communities while encouraging and facilitating necessary adjustments to reduce disaster risk. Focuses not only on physical reconstruction but also on the revitalization of the economy and the restoration of social and cultural life.

Recovery framework: Pragmatic, sequenced, prioritized, programmatic, yet living (and flexible) action plan that ensures resilient recovery after a disaster.

Rehabilitation: The restoration of basic services and facilities for the functioning of a community or a society affected by a disaster.

Relief: Provision of assistance or intervention immediately after a disaster to meet the life preservation and basic subsistence needs of the persons affected. While concerning irrigation infrastructure, taking immediate precautions to reduce the risk of failure or further damages is carried out during the relief phase.

Residual risk: The risk that remains in unmanaged form, even when effective disaster risk reduction measures are in place, and for which emergency response and recovery capacities must be maintained. The presence of residual risk implies a continuing need to develop and support effective capacities for emergency services, preparedness, response, and recovery together with socioeconomic policies such as safety nets and risk transfer mechanisms.

Resilience: The ability of a system, community, or society exposed to hazards to resist, absorb, accommodate, and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential structures and functions. Resilience is determined by the degree to which the community has the necessary resources and is capable of organizing itself both prior to and during times of need.

Resilient recovery: Builds resilience during recovery and promotes resilience in regular development. Resilient recovery is a means to sustainable development. See also “Resilience,” “Recovery,” “Disaster risk management,” and “Disaster risk reduction.”

Response: The provision of emergency services and public assistance during or immediately after a disaster to save lives, reduce health impacts, ensure public safety, and meet the basic subsistence needs of the people affected. See also “Humanitarian relief.”

Risk: The combination of the probability of an event and its negative consequences.

Stakeholders: Groups who have any direct or indirect interest in the recovery interventions, or who can affect or be affected by the implementation and outcomes. The term includes groups undertaking, managing, reporting on, affected by, promoting, and funding the interventions. Stakeholders include vulnerable segments of the population and local governments that are in direct dialogue with communities.

Structural measure: Any physical construction to reduce or avoid possible impacts of hazards, or application of engineering techniques to achieve hazard-resistance and resilience in structures or systems. See also “Nonstructural measures.”

Sustainable development: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. This 1987 Brundtland Commission definition does not address questions regarding the meaning of the word “development” and the social, economic, and environmental processes involved. Disaster risk is associated with unsustainable elements of development such as environmental degradation. Conversely, disaster risk reduction can contribute to sustainable development by reducing losses and improving development practices.

Underlying Risk: Processes or conditions, often development-related, that influence the level of disaster risk by increasing levels of exposure and vulnerability or reducing capacity.

Annotation: Underlying disaster risk drivers (also referred to as underlying disaster risk factors) include poverty and inequality, climate change and variability, unplanned and rapid urbanization, and the lack of disaster risk considerations in land management and environmental and natural resource management, as well as compounding factors such as the limited availability of technology, unsustainable uses of natural resources, declining ecosystems

Vulnerability: Characteristics and circumstances of a community, system, or asset that make it susceptible to the damaging effects of a hazard.

Vulnerable groups: Groups or members of groups who are particularly exposed to the impacts of hazards. Examples are displaced persons, women, the elderly, the disabled, orphans, and any group subject to discrimination.

2.1 INTRODUCTION

2.1.1 Background

Analyzing the consequences and impact of a disaster on a number of sectors in order to identify recovery needs and create an extensive, multisectoral recovery strategy is known as a post-disaster needs assessment (PDNA). In addition to macroeconomic, human, and social development, finance, and several cross-cutting themes (government, environment, disaster risk reduction, gender, employment, and livelihood) that are addressed across all sectors, the PDNA process focuses on three main sectors: social, productive, and infrastructure (of which irrigation is a sub-sector).

Infrastructure for irrigation supports the sustainability of the agriculture sector (productive), the environment sector, and the social sector while also enhancing the irrigation sector. To avoid double counting and to guarantee that the data gathered at the sector level enhances the irrigation sector's priority needs and is well-integrated into the PDNA process's results, it is crucial to note that from the outset of the irrigation sector's PDNA, it will be necessary to hold consultations with assessment teams from other sectors, such as agriculture and social livelihoods.

2.1.2 Irrigation sector overview

One of the most frequent natural hazards to the agriculture industry is drought. In Sri Lanka, irrigation system development began in the first century B.C. as a way to control water in the water-rich wet zone and to lessen the impact of drought on agricultural operations in the water-scarce dry zone.
Minor, medium, and Major irrigation schemes, respectively, are those that enable less than 80 hectares, between 80 and 400 hectares, and more than 400 hectares of irrigation. Irrigation reservoirs, also known as irrigation tanks, and diversion weirs, sometimes known as Anicuts, are the two fundamental forms of irrigation schemes. Trans-basin canals are a group of river diversion plans that move extra irrigation water from one basin to nearby basins with less water. By storing diverted water in irrigation tanks, utilizing water controllers (such as an Anicut), and producing hydropower when available, river diversion programs give farmers irrigation facilities.

To safeguard people and property from significant flooding disasters, the British monarchy began building Flood Protection Schemes (FPS) for key rivers about 100 years ago. Since then, various local governments have maintained this work. In order to prevent irrigated agriculture from being contaminated by seawater during the high tide period, salt water exclusion schemes (SWES) were built throughout the coastal strip.

Flooding is a seasonal occurrence that has negative effects, mostly on irrigation systems and the agricultural industry. Sometimes a single upstream injury can shut down the entire downstream process, which has a big impact on food security. The PDNA technique's essential steps speed up the recovery process after any substantial flood danger. In order to tackle a crisis situation, the irrigation sector community of practice's (CoP) knowledge garnered from seasonal flood dangers can be further developed. The PDNA approach evaluates the entire scope of a hazard's effect and impact on infrastructure in the irrigation sector and generates an effective and sustainable recovery strategy for deploying financial and technical resources.

2.1.3 Management of irrigation schemes

Twelve (12) State sector organizations, including the Irrigation Department (ID), Mahaweli Authority of Sri Lanka (MASL), the Department of Agrarian Development (DAD), and nine (9) Provincial Irrigation Departments (PIDs) that represent nine provinces of the nation, have been in charge of managing the irrigation sector's routine operations, maintenance, and developments, including disaster management. The management of Sri Lanka's irrigation sector is not permitted in the private sector.

Those irrigation institutes are responsible for managing irrigation systems, flood protection Schemes, and salt water exclusion Schemes as follows:

1. The Irrigation Department manages about 100 large irrigation schemes, nearly 250 minor irrigation schemes, and more than 235,000 acres of irrigation facilities. Additionally, ID oversees flood protection schemes and saltwater exclusion schemes.

2. To provide irrigation facilities for more than 101,000 ha, the MASL manages the Mahaweli River Diversion Scheme and Uda-Walawe Irrigation Scheme, which comprise irrigation tanks and regulators such as Anicuts.

3. The PID (Northern Province) manages 10 major irrigation schemes, 43 medium irrigation schemes, and almost 28,000 hectares of irrigation facilities. Furthermore, salt water exclusion schemes are also managed by PID (Northern Province).

4. The PID (Eastern Province) manages 32 medium irrigation schemes, 8 large irrigation schemes, and roughly 12,000 hectares of irrigation facilities. Additionally, salt water exclusion schemes are also managed by PID (Eastern Province).

The DAD and the PIDs oversee more than 25,000 minor irrigation systems (tanks and anicuts) that provide irrigation facilities for more than 260,000 acres.

2.1.4 Purpose of the PDNA Guide to the Irrigation Sector

The overarching purpose of the PDNA Guide is to provide enhanced support to the government in post-disaster need assessment and planning for recovery following a more coordinated approach among the institutions of the irrigation sector. The guide's more immediate objective is to offer a framework for the irrigation sector that has been agreed upon and is in line with global best practices[1].

This guide strengthens present need assessment practice as a practical and action-oriented process focusing on quality, reliability, and inclusiveness by:

1. Facilitating quick decision-making and implementation
2. Providing a predictable and coherent approach to assessment and planning
3. producing a consistent estimation of recovery needs;
4. Adapting to international best practices
5. Following a cost-effective approach by assessing priority needs;

[1] The ADB Knowledge and Support Technical Assistance (KSTA) March 2020 for Building Disaster-Resilient Infrastructure through Enhanced Knowledge provides financial assistance for this assignment.

6. Improving the credibility of assessments and recovery strategies
7. Looking for financing opportunities for recovery and reconstruction.

The methodologies used to assess the effects and impact of disasters on irrigation infrastructure are expanded upon in this guide. It makes it easier to carry out thorough assessments of the effects of disasters on the farming community, others involved in agro-based industries, communities protected by current flood protection schemes, and state agencies engaged. The Guide uses these evaluation results to highlight the recovery needs of irrigation infrastructure as well as the supporting needs of irrigated agriculture production, national food security, social well-being, and environmental factors. Perspective, a recovery strategy to fully and sustainably fulfill recovery requirements.

2.1.5 Audience

The PDNA Guide is primarily designed to support irrigation professionals who are involved in the planning and execution of PDNA in irrigation infrastructure, as well as the heads of Sri Lanka's irrigation institutions who are in charge of directing and coordinating the PDNA process. Specifically, it is intended for:

1. Senior government officials are in charge of requesting national and international assistance for an assessment of the disaster in the irrigation sector and the subsequent recovery and reconstruction efforts.
2. Senior managers from multilateral organizations in the country who would be required to set up and coordinate a post-disaster need assessment and recovery process
3. Government representatives from several sector ministries who are in charge of risk reduction, disaster recovery, and response

2.1.6 Limitations

The PDNA Guide emphasizes a more comprehensive assessment of post-disaster needs and recovery planning. The methods and procedures recommended in the next chapter of the guide, in particular, are intended to provide an example of one possible way to maintain coordination among the irrigation institutions and other national-level state agencies involved in the decision-making process for grant release.

The more complex assessment procedures created and utilized by UN agencies or the WB are not intended to be replaced by the PDNA Guide. International standards, however, offer a comprehensive strategy and orientation for evaluation and the start of the recovery planning process that would be helpful to a large audience. To design irrigation sector-specific recovery strategies and programs regarding overall impact, governmental agencies, donors, and International Finance Institutions (IFIs) may need to do such an assessment.

2.1.7 The Objectives of the PDNA

The main goal of conducting a PDNA is to assist irrigation institutions in assessing the full extent of a disaster's impact on the irrigation infrastructure and, based on these findings, producing an actionable and sustainable Recovery Strategy for mobilizing financial and technical resources and receiving international assistance. The main objective of a PDNA is to assist irrigation institutions in assessing the full impact of a disaster on the irrigation infrastructure and services and to produce actionable and sustainable recovery strategies based on the results, enlisting the aid of financial and technical resources as well as receiving international support. More specifically, a PDNA sets out the following subobjectives:

1. Support government-led assessments and initiate recovery planning processes using a coordinated platform for irrigation sector entities that integrates the UN system's and other participating international donors' and financial institutions' combined efforts.
2. Evaluate the effect of the disaster on:
   - Irrigation infrastructure and assets
   - Disrupted service delivery and access to goods and services;
   - Disrupted decision-making process and governance;

1. Assessing needs to address underlying risks and vulnerabilities to reduce risk and Build Back Better (BBB)
2. Estimating the damage and loss caused by the disaster to the irrigation Sector, including an assessment of its macro-economic consequences;
3. Identify all recovery and reconstruction needs.
4. Create the recovery strategy, recovery interventions, expected outputs, and cost of recovery and reconstruction that will serve as the foundation for a comprehensive recovery framework.

The PDNA Guide includes the essential aspects of the Damage and Loss Assessment (DaLA) method and process for conducting a comprehensive assessment of damages, losses, and needs, which will lead to the formulation of a Recovery Strategy.

2.1.8 Deliverables of the PDNA

The PDNA produces the following four core deliverables:

1. Presenting the overall effect and impact of the disaster on the irrigation sector, the recovery needs, as well as the explicit impact on cross-cutting themes, with a gender perspective, environmental considerations, risk reduction, and governance.
2. A Recovery strategy provides a strategy for recovery actions within the irrigation sector and is armed with clear objectives and interventions; directs it toward expected results; and defines the timeframe as well as the cost for the recovery process.
3. Provides the basis for effective resource mobilization in support of the country's recovery process.
4. Provides an outline for a country-led implementation mechanism for recovery.

2.1.9 Guideline Principles

The PDNA is guided by the following core principles[2] :

1. Acknowledge the national ownership of PDNA and ensure that it is a demand-driven and government-led process, with the fullest possible leadership and engagement of irrigation institutions in assessment, recovery planning, and implementation, and at the level of technical expertise.
2. Support local ownership and the fullest possible engagement of local authorities and community-based organizations in the planning and execution of recovery, and build specific capacities where needed.
3. Provide coordination at all stages of the process and at all levels, ensuring collaboration and partnership between the UN agencies, donor partners, and other stakeholders engaged in the PDNA.

4. Support and strengthen national and local capacities to lead and manage recovery and reconstruction.
5. Ensure transparency and accountability in the PDNA process as well as in post-disaster recovery and reconstruction.
6. Integrate DRR measures into the recovery process to enhance the resilience of affected populations and countries in the event of future disasters.
7. Ensure the participation of the affected farmer community and the community living in the flood-prone areas protected by existing Flood Protection Schemes in the assessment of needs and priorities and the recovery process.
8. Ground recovery in the principles of sustainable development.
9. Build on national development strategies as required.
10. Monitor, evaluate, and learn from practice.

2.1.10 Structure of the PDNA Guide

Chapter 1 is an introduction to the guide and outlines the objectives, deliverables, and principles for participation and coordination of the assessment.

Chapter 2 provides the framework for a common approach to assessment and planning as well as guidance on the development of a Recovery Strategy based on the assessment results.

Chapter 3 guides the PDNA process. This includes suggestions regarding measures for the planning, preparation, and implementation of a PDNA. The chapter includes a section with a brief guide for the Government and a more detailed section for the tripartite partners.

[2] Post-Disaster Needs Assessment Guidelines, Volume A (GFDRR 2013).

2.2 CONDUCTING A PDNA FOR THE IRRIGATION SECTOR

2.2.1 Disaster Management as a Cyclic Process

The prevalent method of “reactive response to a sudden hazardous event” reduces the damage caused by hazards and accelerates an organization’s recovery from them, but it considers that disasters may occur before management responds, and, as a result, management may respond only after the disaster has occurred. A proactive risk management method recognizes prospective hazards before a potentially risky event occurs and devises strategies to avoid or reduce the risk. This guideline utilizes an international approach to disaster risk management (DRM) as a cyclic process that emphasizes the relationship between the pre- and post-disaster phases of the cycle (Figure 2.1), as well as the interactions among the reaction, recovery, mitigation, and preparation phases.

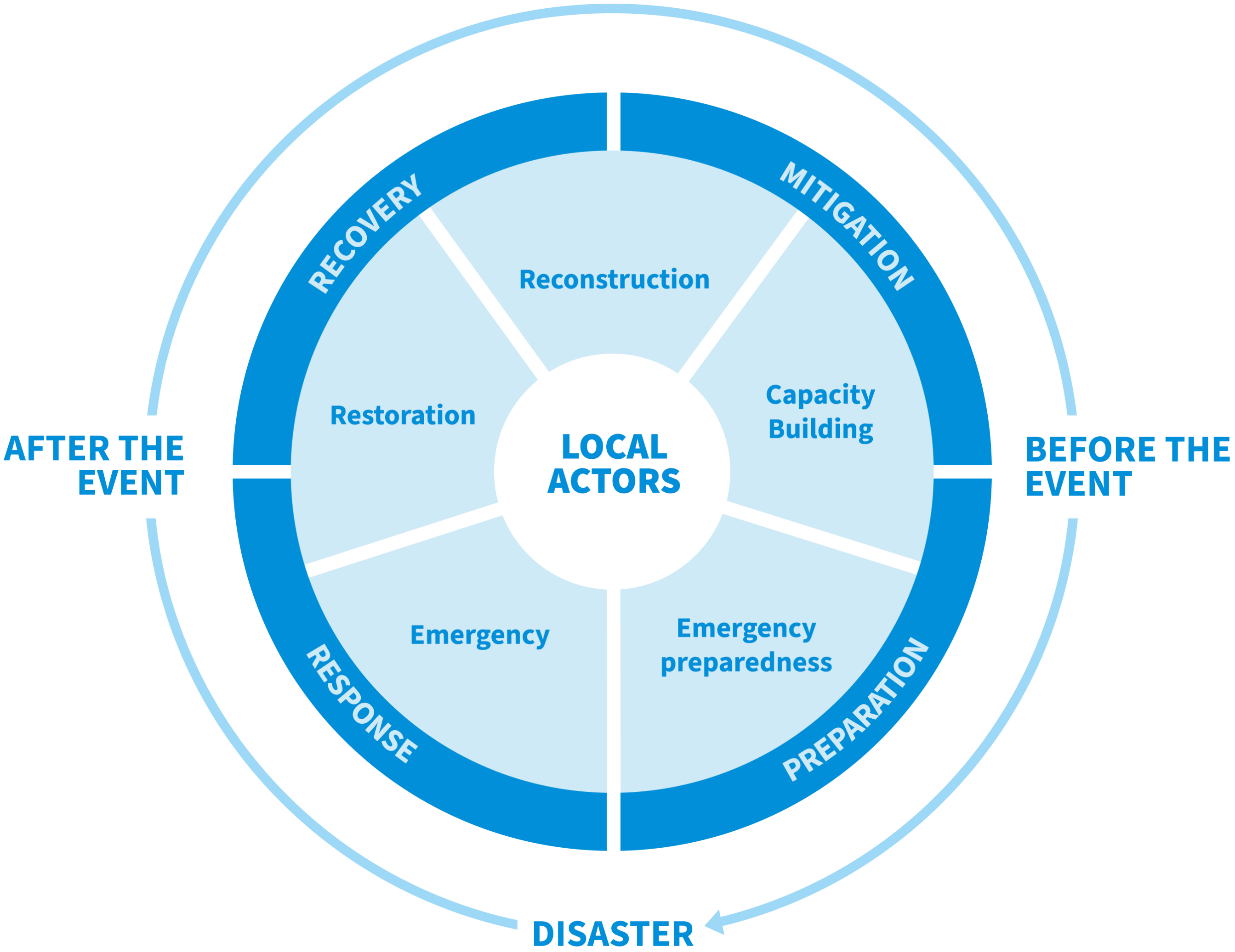


Figure 2.1 Disaster Risk Management (DRM) Cycle Source: The guide to engaging local actors in Disaster Recovery Frameworks (2019) [3]

[3] https://www.gfdrr.org/sites/default/files/publication/Engaging%20Local%20Actors%20in%20Disaster%20Recovery%20Frameworks%20-%20Final.pdf

2.2.2 The Approach of the PDNA for the irrigation sector

The irrigation sector PDNA is designed to be a guiding tool to assist government institutions, international development organizations, and donor partners in planning for resilient post-disaster recovery. A PDNA for the irrigation sector consists of the following main elements:

1. Comparison of pre-disaster baseline data and post-disaster impact data and information;
2. Assessment of the disaster's effects in terms of damage and loss;
3. Assessment of the disaster's impacts; and
4. Preparation of a recovery strategy that determines the recovery needs for the irrigation sector.

A comprehensive assessment of the irrigation sector will integrate quantitative and qualitative primary data as well as Planning Preparedness. that includes:

1. Quantifying the extent of physical damage to infrastructure and assets caused by the disaster
2. Additional expenses incurred for rehabilitation and operations during the disaster were a loss.
3. Re-establishment cost of a governance system disrupted by the consequences of a disaster as a loss
4. The cost of taking immediate precautions and early actions to minimize the risk, in addition to the cost of taking long-term measures to minimize the risk, is a loss.
5. To assess the implications of irrigation infrastructure damage and loss of livelihoods for the farmer community and others engaged in agricultural and related industries as cross-sectoral losses and the impact on national food security
6. To assess the implications of such damage and loss on the livelihoods of the community living in the flood-prone areas protected by existing Flood Protection Schemes.

The assessment of the cross-cutting sectors' implications will enhance the priority of the irrigation sector's needs and avoid duplication among sector needs complemented by each other.

2.2.3 Pre-disaster Baseline Information

As government entities, all movable assets (instruments, vehicles, machines, and tools) and immovable assets (residential units) are to be inventoried in detail, including key information such as purchasing or sanctioning dates, value, etc. As a common practice, most immovable assets in the irrigation sector are not included in the inventories. The non-availability of an inventory register of irrigation infrastructure delays post-disaster damage assessment.

Example
When the dam of Kantalai Irrigation Reservoir burst on April 20, 1986, devastating downstream infrastructure, the process for determining rehabilitation needs was greatly hindered because there was a lack of inventory.

Furthermore, using the inventory register and engineering drawings, it was simple to assess the damage to the residential units of the irrigation sector following the Tsunami on December 26, 2004.

A pre-disaster baseline dataset can be generated from an "inventory register" of irrigation infrastructure, which could be upgraded by including the status of irrigation structures and the cost of construction before disaster strikes. It is useful to make a comparison between pre-disaster and post-disaster conditions in order to evaluate the magnitude and scale of the disaster.

Hence Developing pre-disaster baseline datasets and updating the status of the infrastructure are essential for rapid and effective post-disaster needs assessments and the planning of recovery frameworks seeking financial assistance.

2.2.3.1 Pre-monsoon meeting

Pre-monsoon meetings are conducted by each irrigation institution to plan the seasonal cultivation pattern. At this meeting, considering the conditions of the irrigation infrastructure, storage capacity of irrigation tanks, estimated inflow from monsoon rains, and irrigation system management, possible cultivation patterns are recommended for the seasonal cultivation, enabling farmers to make a collective agreement for a feasible and sustainable cultivation pattern.

The cultivation meeting does not, however, include any preparedness programs before a severe flood event, prior to a severe flood event, or during a severe flood event. The Disaster Recovery Framework (DRF) is a practice-based, results-oriented instrument that constructs disaster recovery policy principles for the irrigation sector's organizational strategies in order to institutionalize these policy principles and establish an appropriate financial mechanism. Before convening the seasonal cultivation meeting with farmer institutions, only operational-level organizations will be able to prepare for implementation during pre-monsoon meetings. The institutionalized DRF policy principles can be implemented with the assistance of farmer institutions and by taking corrective action, followed by performance monitoring and evaluation. In addition, a DRF for the irrigation sector unites sector organizations, farmer institutions, donors, development partners, and other community initiatives in the short, medium, and long-term recovery timeframes.

Although cultivation meetings are held by operational-level units of the twelve (12) irrigation agencies along with farmer institutions and other state sector organizations providing supportive services, inter-coordination among all such agencies from the operational level to the national level is required for the preparatory works and implementing arrangements since DRF addresses the recovery of irrigation schemes or the irrigation sector of the entire nation.

2.3.2 Establishing pre-disaster baseline information

In the current country context, damage assessment of irrigation infrastructure following a flood event is performed as a routine practice by technically qualified people at the operational level of sector agencies using their experience. The primary requirement of the irrigation institution, as determined by such an assessment, is the rehabilitation of damaged structures. The losses are reimbursed by the funds that are accessible or resources allocated for other purposes, as applicable. Though irrigation infrastructure directly improves the productivity of agriculture and agro-industry and indirectly improves the sustainability of other sectors such as the environment, health, education, and nutrition, among others, such information is not provided by irrigation sector agencies to prioritize the importance of irrigation infrastructure recovery at the national level.

As described in the global approach, maintaining an updated pre-disaster baseline dataset becomes a decision-supportive tool for assessing the damage, loss, sustainable recovery needs, and recovery priorities of the post-disaster need assessment (PDNA) in a consistent manner. A common platform for managing institutional data on irrigation infrastructure is essential to streamlining irrigation sector data.

The quality of the damage and loss assessment (DaLA) performed by operational-level employees and the auxiliary data of cross-sectional sectors is critical to the national-level or institution-level planning process of identifying and distributing financial resources. The worth of financial resources provided for the recovery process based on the DaLA method determines the production of precise engineering estimates prior to commencing implementation.

However, the impacts of flood events ranging from typical monsoon flood events to severe flood risks cause damage to irrigation infrastructure on a variety of dimensions in the irrigation sector. As a result, during the disaster recovery process, the inventory data of pre-event baseline information serves as a guiding tool to support irrigation staff decisions. Furthermore, it creates a reference database for possible future disasters.

2.2.3.3 General Information Guide for Pre-Disaster Baseline Information

What type of general information is to be included in the pre-disaster baseline information?

To determine the status of the irrigation system affected by a hazardous event, the respective irrigation institutions must be equipped with technical information such as the type, scale, capacity, functionality, and command area of the system.

The PDNA process will be legally initiated in the case of an extreme disaster event for which the government declares a disaster emergency. A disaster will almost certainly cause infrastructure damage to all sorts of irrigation schemes overseen by the majority of the irrigation institutions. Furthermore, it causes numerous damages and losses in other sectors as well. Administrative information regarding the irrigation institution that controls impacted irrigation schemes is required when carrying out post-disaster actions for a common PDNA.

The financial resources are released by the Budget Department through the line ministries. Thus, administrative details such as the implementing agency and the ministry, administrative districts or divisions, etc. shall be included as general information in the baseline database. Pre-disaster baseline information furnishes preliminary data to initiate a recovery proposal or any other development proposal.

Topographical information, technical features, and attributes of damaged irrigation schemes are needed for mapping and clustering physical damages at the district, province, and national scales to make assessments meaningful and to ensure simple recovery. The same kind of pre-disaster baseline information is relevant for a hazard, even on a smaller scale.

The agricultural service area that is directly facilitated by the irrigation tank and anicut and indirectly protected by the salt water exclusion schemes and flood protection schemes is required to determine the magnitude of the irrigation scheme's service and the needs of the agriculture sector and other social sectors. As a result, knowledge of the command area is required.

Flood events are experienced seasonally. Irrigation tank bunds, flood protection dams, or river gauges are calibrated to identify extreme flood events based on their probability of occurrence. The severity of extreme flood events is a measure of when the actual flood level reaches the safe margins (FSL, HFL, and BTL) of the designed flood level of the irrigation structure. Thus, information on flood levels concerning safe parameter levels of the irrigation structure is necessary. Flooding occurs on a seasonal basis. The calibration of irrigation tank bunds, flood protection dams, and river gauges is used to identify extreme flood occurrences based on their probability of occurrence. The severity of extreme flood events is gauged by when the actual flood level arrives at the threshold margins (FSL, HFL, and BTL) specified for the specific irrigation structures. As a result, information on flood levels pertaining to the irrigation structure's threshold values is required. The required information is shown in Figure 2.2.

Technical Information	• Type of Irrigation System (Tank, Anicut, Trans basin/Feeder canal, Flood Protection Schemes, Salt Water Exclusion Schemes) • Scale (Major Medium. Minor) • Functionality (Fully, Partially. Not) • Capacity
Service Information	• Command Area of the irrigation scheme • Protected area of the Salt Water Exclusion Scheme • Flood prone area of the Flood Protection Scheme
Administrative Information	System Management Information (Irrigation Institution. National level, Regional Administrative Unit, Operational Unit, Public Administration Division, Province, District. District Engineer of Agrarian Development
Topographical Information	Location, Public Administration Division, Province, District, Agrarian Development Center
Hazard Information	• Peak Flood Level • Vulnerability of peak flood level (Below HFL Between HFL and BTL Above BTL)

Figure 2.2 Required information in a pre-disaster baseline information

Why does the pre-disaster baseline dataset need a common format for all irrigation institutions?

1. At present, twelve (12) irrigation sector institutions are operating under three different government ministries, and the subjects of these ministries have changed several times in the past.
2. Regardless of irrigation institution management hierarchy, all twelve institutions:
   a) manage similar-type irrigation schemes;
   b) use the same design codes, engineering principles, and base data;
   c) achieve one common goal of delivering irrigation water to the farmer community; and
   d) use the same water management principles. As a result, the pre-disaster baseline data has common features and characteristics.

General information about the pre-disaster baseline dataset in a common format is illustrated in Table 2.1.

Table 2.1 General information of pre-disaster baseline dataset.

1	**Technical and Service Information**		
	Name of the Scheme		
	Type		
	Category	**(Major/Medium/Minor)**	
	Command area (ha)		
	Capacity (for Tank in MCM)		
	Beneficiaries	**Farmer families/families protected by FPS**	
	Functionality at present	**Fully/Partially/Not - Functioning**	
	Any other details (if required)		
2	**Administrative Information**		
	Managing Agency		
	National-level coordination by		
	Regional Administration by		
	The operation, maintenance, and construction Division		
3	**Topographical Information**		
	Coordinates (GPS/Metric/Tank)		
	Operational division of Engineer or DTO of DAD		
	Province		
	District		
	DS Division		
4	**Hazard Information**		
	Occurrence of extreme flood events	**Year**	**Month**
	Observed Peak-Flood	**Below HFL/ Between HFL and BTL/Above BTL**	

2.2.3.4 Technical information guide of pre-disaster baseline data

Table 2.2 depicts the key technical information about irrigation schemes that is fundamentally necessary for the baseline database. The pre-disaster baseline dataset can be used as an inventory registration of the irrigation scheme at this level. The most recent reconstruction costs prior to the disaster are also included in the database, which will not be included in the inventory.

Table 2.2 Structural information of pre-disaster baseline dataset

Structural Components		Pre-Disaster status and rebuilding cost		
1	Major Tank	Unit	Functionality (G/A/P*)	Cost (LKR)
a	**Head Works**			
	Bund	1 km		
	Riprap	1 km		
	Bund Road	1 km		
	Spill	01 No		
	Sluice -RB	01 No		
	Sluice -LB	01 No		
	Other structures			
b	**Conveyance System**			
	Main Canal			
	Lined Canal RB/LB	1km		
	Earthen Canal RB/LB	1km		
	Regulator	1No		
	Turn out structure	1No		
	Drops/Other structure	1No		
c	**Branch canal**			
	Lined Canal RB/LB	1km		
	Earthen Canal RB/LB	1km		
	Regulator	1No		
	Turn out structure	1No		

	Drops/Other structure	1No		
d	**Distribution Canal**			
	Lined Canal RB/LB	1 km		
	Earthen Canal RB/LB	1 km		
	Regulator	1No		
	Turn out structure	1No		
	Drops/Other structure	1No		
d	**Field Canal**			
	Earthen Canal	1 km		
	Farm Turnout	1No		
	Sub Total 1			
2	**Administration/Operation asset**			
	Unit Office building			
	Field staff quarters			
	Any other			
	Sub Total 2			
	Sub Total 1+2 (Total Damage)			

2.2.3.5 Ancillary data and information

Previous disaster recovery data and information will be beneficial in the post-event stage. The identification of financial sources will be guided by previous financial information. Disaster recovery policies, procedures, and circulars serve as a guide for determining the scope of the recovery plan. Past recovery information will aid in understanding the scope of past recovery actions. Table 2.3 depicts the critical information necessary during the recovery period. This information should be updated during the pre-monsoon meeting.

Table 2.3 Ancillary data and information

Ancillary data and information as pre-disaster baseline information
1. Potential financial strategies for recovery The financial resources utilized to recover from earlier hazardous occurrences may be extended to meet current needs. Furthermore, including recovery needs in continuing development financing may help address short-term needs. For example, the Green Climate Fund's (GCF) project for "strengthening the resilience of smallholder farmers in the Dry Zone to climate variability and extreme events through an integrated approach to water management" could provide opportunities for the recovery of irrigation infrastructure damages in dry-zone schemes. The critical information needed to meet the GCF objectives can be incorporated into the recovery plan's financial mechanism. Such records relating to similar prior incidents that were included in the pre-disaster baseline information may aid in the allocation of funds for the current catastrophe.
2. Information on development policies and strategies for recovery From the recovery planning stage to the implementation stage, information on recovery policies, procedures, standing orders, emergency operation plans, national disaster management plans, and international recommendations is useful. Before commencing recovery planning, the recovery planning team must be fully aware of and competent about the content of such papers, guidelines, application processes, formats, constraints, and so on. The incorporation of such materials into a single guidance tool will make recovery planning easier.
3. Past recovery information In general, the preparation of detailed engineering estimates will begin after the requested financial resources are approved. Further additional damages may be added to the recovery needs even during the fund processing period of the recovery plan that has already been submitted, as monsoon rains produce flood threats periodically. Occasionally, urgent damages would have been repaired with adequate funds. The inclusion of records linked to past construction activities in the pre-disaster baseline information will provide the recovery planning team with a detailed picture of the irrigation infrastructure's construction history and the exact requirements.

2.2.4 Disaster Effect and Impact on the Irrigation Sector

Disaster Effect:

Disaster Effects are the "immediate results brought about" by the disaster, which are normally reported just after it has occurred. The disaster effects of the irrigation infrastructure sector involve:

1. Damage to the infrastructure of the irrigation schemes and other assets;
2. Disruption to governance and decision-making processes;
3. Disruption to service delivery and access to goods and services;
4. Increased risks and vulnerabilities of irrigation systems

The effects of the irrigation infrastructure sector are assessed in monetary terms based on:

1. The engineering judgment about the extent of physical damages to the irrigation infrastructure and other assets;
2. The losses experienced during and after the disaster for excess expenditures incurred in addition to normal operations: re-establishing governance and decision-making procedures identified as having a high operational cost
3. The resumption of (a) production complemented by irrigation infrastructure and service delivery; and (b) access to goods and services;
4. The additional expenditure incurred for taking safety precautions to control the potential risk that would be increased by the disaster against the stability of the irrigation infrastructure

Disaster impact:

Disaster impacts are the long-term consequences of the immediate effects of disasters, with a focus on macroeconomic impact and human and social development impact. The disaster impact study examines the macro, medium, and long-term effects in quantitative terms, as well as an estimate of economic performance. It assesses the possibility of temporary macroeconomic imbalances as well as the potential for temporary declines in employment, income, and well-being for impacted individuals and households.

To measure the impact on macroeconomic variables[4], analyses are usually made of the post-disaster performance on the gross domestic product (GDP[5]) and the balance of payments (BOP[6]). The impact on GDP refers to the temporary negative consequences of disaster losses on economic performance as well as the beneficial effects of the reconstruction program on construction and other industries.

Agriculture contributes significantly to the Sri Lankan economy in terms of GDP, foreign exchange earnings, and government revenue. There is potential to improve the agriculture sector's GDP by enhancing coordination of farm services and input supply for food crops, introducing better land use practices, promoting research, science, and technology, and extending services. For example, at present, the agriculture sector only contributes around 7.5% of GDP; the majority of the agriculture sector's contribution to GDP (5.3%) comes from crops, especially paddy; the fisheries sector accounts for 1.4% of GDP; and the livestock sector accounts for 0.8%. The Central Bank of Sri Lanka (CBSL) compiles GDP and BOP (balance of payments) data for Sri Lanka on a quarterly and annual basis, as shown in Box 1.

[4] The macro-economic effect reflects the manner in which the disaster modifies the main economic variables of the affected country (and includes fiscal impacts, implications for Gross Domestic Product growth, the Balance of Payments, etc.). (modified from UN ECLAC/R. Jovel, 2007)

[5] GDP is one of the measures of national income and output for a given country's economy. GDP is defined as the total market value of all final goods and services produced within the country in a given period of time (usually a calendar year).

[6] Balance of Payment: The difference between the monetary value of exports and imports in an economy over a certain period of time A positive balance of trade is known as a trade surplus and consists of exporting more than is imported; a negative balance of trade is known as a trade deficit or, informally, a trade gap.

Box 1

GDP includes all private and public consumption, government outlays, investments, and exports minus imports that occur within a defined territory. GDP determined using Expenditure Approach measures the value of goods and services produced in terms of the expenditure or consumption by the various institutional sectors namely; Households (HH), General Government (GG), Financial Corporations (FC), Non – Financial Corporations (NFC), and Non–profit Institutions Serving Households (NPISH).

For compiling National Account Estimates, in each quarter administrative data are collected from about 250 organizations. Apart from that, data are also collected through, censuses, surveys, administrative reports, annual reports, research reports, etc. However, there are instances where the required data are not available at the time of releasing National Account estimates. For certain economic activities, it takes a year or more to obtain finalized data required for the calculation of National Account Estimates.

For example, there are two paddy cultivation seasons in Sri Lanka: Maha (Wet) and Yala (Dry). Harvesting of the Maha and the Yala seasons are taken place from February to April and August to September respectively. The value added of rice growing is estimated and is used in respective quarters in GDP Estimates as final production statistics are not available for respective quarters. Final real output/production data will only be available when the harvesting is over in the entire country. Then only the final quarterly and annual value added of rice growing sub-economic activity can be calculated in respective quarters (Department of Census and Statistics:

http://www.statistics.gov.lk/FAQ/CompilationOfGDPCompliesWithInternationalStandards-DCS)

The balance of payments for Sri Lanka is a statement of all economic transactions of Sri Lanka residents with residents of the rest of the world during a specific period. All entities operating in the geographic territory of Sri Lanka, including Foreign Currency Banking Units of commercial banks and Duty-Free Zones, are included. Sri Lanka's balance of payments follows the recommendations of the sixth edition of the IMF "Balance of Payments Manual" ("BPM6") except that imports are included on a CIF (cost, insurance, and freight) basis rather than FOB (free on board). The balance of payments of Sri Lanka is compiled using several sources including customs declarations, an International Transactions Reporting System (ITRS) for data from the banking system, administrative records of the government, CBSL, and commercial banks, and surveys carried out by the CBSL and other agencies. Thus, estimation of the agriculture food production sector's contribution to the BOP is rather difficult.

The difference between pre- and post-disaster levels could be used to determine the disaster's impact on human development, which is assessed both qualitatively and quantitatively as appropriate. It seeks to quantify not only income but also life by considering many indicators such as the Multidimensional Poverty Index and the Gender Inequality Index, among others. The influence on human development refers to the long-term impact of the disasters on human life quality. As illustrated in Box 2, the United Nations Human Development Index for Sri Lanka is a composite statistic that includes life expectancy, educational attainment, and income level, but it could also include the impact of disasters on people's lives.

Box 2

The HDI is a summary measure for assessing long-term progress in three basic dimensions of human development: a long and healthy life, access to knowledge, and a decent standard of living. A long and healthy life is measured by life expectancy. The knowledge level is measured by mean years of education among the adult population, which is the average number of years of education received in a lifetime by people aged 25 years and older; and access to learning and knowledge is measured by expected years of schooling for children of school-entry age, which is the total number of years of schooling a child of school-entry age can expect to receive if prevailing patterns of age-specific enrolment rates stay the same throughout the child's life. Standard of living is measured by Gross National Income (GNI) per capita expressed in constant 2011 international dollars converted using purchasing power parity (PPP) rates.

(Human Development Report 2015: Sri Lanka. https://www.undp.org/sites/g/files/zskgke326/files/migration/lk/Sri-Lanka-Explanatory-Note.pdf)

For instance, the disaster's impact on human development can be predicted from indicators including:

1. the number of children attending school (damaged canal crossings and agriculture roads interrupt the mobility of schoolchildren);
2. the number of women and men who lost their livelihoods (lost harvest in the agriculture sector will decrease grain supply to agro-based industries in the industry sector, affecting employment opportunities);
3. the number of families that do not have access to safe water (polluted water in the home garden wells);
4. the number of families whose health care is being affected (mosquito breeding in newly created water logs); and
5. the level of access to basic services such as education and health care before and after the disaster.

2.2.5 Damage and Loss Assessment of the Irrigation Sector

Damage and loss assessments must be completed within two weeks of the disaster in order for damage, loss, and recovery data to be acceptable. The PDNA Guidelines indicate that the exercise should take 6–12 weeks; the majority of cases reviewed were done in 3–4 weeks[7]. Delays in completing PDNA may result in missed opportunities to receive financial and other resources from donors. Empirical judgment is preferable at this stage to a detailed analysis of damaged buildings. However, most assessments are based on existing institutional capacities. After institutionalizing disaster recovery policy principles into the organizational strategies of irrigation sector entities, the capacity-building process is able to start. The operational staff in Sri Lanka's irrigation institutions are generally engineers or engineering assistants with adequate technical capacity for damage assessment. Following the same concepts, the twelve irrigation agencies will employ different formats and techniques during the damage and loss assessment stage. Capacity building for technical staff on international best practices will provide consistent methodologies and forms for damage and loss assessment, eliminating unnecessary delays. Thus, capacity training of operational staff is crucial since it can speed up the assessment process by ensuring consistency of data and comparability.

Prior to the disaster, the irrigation structure inventory, which includes the most recent rebuilding costs, could be extended to assess the damage to the irrigation system. The management and technical data are sufficient to identify the scheme and analyze the irrigation infrastructure damage. Irrigation sector losses are defined as high operating expenses incurred in addition to routine operations for disaster operations. The agricultural production sector suffered a loss as a result of the cultivation loss. Water is provided by the irrigation sector as a supplementary service to agriculture. However, recovering from agricultural losses prioritizes irrigation infrastructure recovery needs over social and environmental recovery needs.

2.5.1 Damage Assessment Guided by Pre-Disaster Baseline Information

The pre-disaster baseline information for irrigation infrastructure is an inventory data collection of irrigation structures, including their functional state and the most recent rebuilding cost. This should be expanded to incorporate provisions for damage assessment. This would make the recovery planning process simple, consistent, and rapid.

Damage is assessed in physical units (for example, the length of a dam or canal, kilometers of road, square meters of dwellings, a particular number of typical structures, etc.). The damages reflect the demolition or partial destruction of irrigation structures.

Case 1: Fully damaged structure (destruction): The structure is destroyed and must be replaced. The cost of preparing the site by removing debris from the damaged structure will be included.

Case 2: Partial damage: The engineer will decide whether the partially damaged structure needs to be replaced or can be repaired without replacement. It is based on the engineer's judgment about the stability of the damaged structure.

Example: Figure 2.3 depicts a scenario in which half of the structure is considered to be damaged (roughly) in a hazardous event; this might be the upper or right-side half of the spillway structure with control gates. Because the damage emerged as a geometrical fraction (say 50%) that is not comparable to the 50% of the rebuilding cost, the rebuilding cost cannot be approximated to the 50% of the rebuilding cost that prevailed immediately before the hazardous event. This is the situation when financial and physical improvement are tracked separately. As a result, the engineer will decide regarding the type of reconstruction (small repair, rehabilitation, or replacement), and the cost will be calculated appropriately.

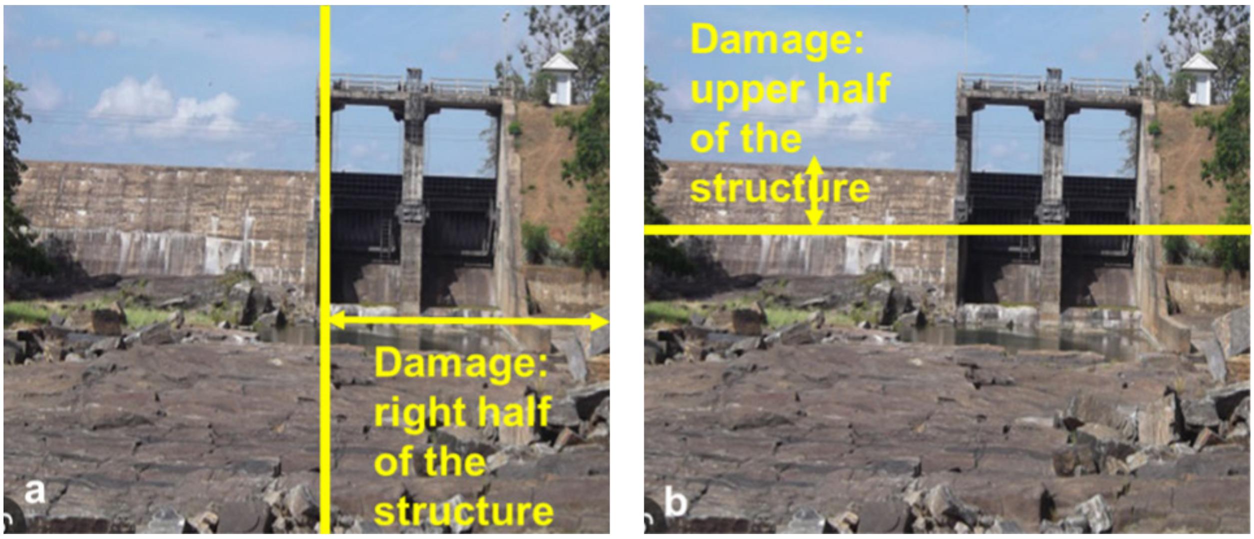


Figure 2.3 Damage assessment of partially destroyed irrigation structure

[7] [1] PDNA: Lessons from a Decade of Experience (2018) https://reliefweb.int/report/world/post-disaster-needs-assessment-pdna-lessons-decade-experience-2018

The cost of rebuilding irrigation infrastructure is independent of observable damage, and the engineer estimates the cost of damage at the PDNA. As indicated in Table 2.4, the rebuilding cost that prevailed prior to the hazardous event is provided in the pre-disaster baseline dataset as guiding information for the costing engineer to make a consistent judgment about the rebuilding cost (a guesstimated cost on an empirical basis). Annex 1 illustrates the detailed damage assessment formats that involve irrigation tanks, anicuts, river diversions schemes, FPSs, SWESs, and buildings.

Table 2.4 Sample damage assessment guided by pre-disaster baseline dataset

1		Structural Components							
	Major Tank	Rebuilding cost			Rehab. or Re-construction cost				
		Pre-Disaster			Post-disaster damage				
		Unit	Fun	Cost LKR	Unit	Dam.	Fun.	Guess.	Re.
a	**Head Works**								
	Bund	1 km							
	Riprap	1 km							
	Bund Road	1 km							
	Spill	01 No							
	Sluice -RB	01 No							
	Sluice -LB	01 No							
	Other structures								
b	**Conveyance System**								
i	Main Canal	1 km							
	Main Canal RB (Lined)	1 km							
	Main Canal RB (Earthen)	01 No							
	Regulator	01 No							
	Turn out structure	01 No							
ii	Branch canal								

c	**Distribution Canal**								
d	**Field Canal**								
	Sub Total 1								
2	**Asset (Administration/ Operation)**								
	Unit Office building								
	Field staff quarters								
	Any other								
	Sub Total 2								
	Sub Total 1+2 (Total Damage)								

Abbreviation:
Fun. – Functionality (Good/Average/Poor)
Dam. – Damage (Fully/Partially)
Guess. Cost – Guesstimated Cost
Re. – Remarks

2.2.5.2 Disaster Loss Assessment of the Irrigation Sector

Similar to damage assessment, loss assessment can also be physically carried out after disaster strikes. However, provisions included in the pre-disaster baseline information at the planning stage would make the process easy, consistent, and fast. Loss assessment could also be done in the post-disaster phase. Provisions incorporated into the pre-disaster baseline information at the planning stage would make the procedure simple, consistent, and quick.

The losses incurred by irrigation institutions during and after the disaster are the costs of operations in addition to routine operations, such as:

1. Re-establishing governance and decision-making processes;
2. Re-establishing service delivery and access to goods and services, which are identified as high operational costs,
3. The additional expenditure incurred for reducing risk includes establishing early warning measures at the preparedness phase, taking immediate precautions at the response stage, and taking early recovery measures during the recovery phase to control the potential risk that may increase.
4. In certain cases, the immediate precautions and early recovery measures will be continued for a longer period until permanent measures are taken.

Because the irrigation industry contributes to the national economy through agriculture, a lost harvest (or potential harvest) caused by a hazardous event is accounted for by the agriculture sector. Similarly, the social sector accounts for relief assistance supplied to the impacted farming community. (Sector classification is shown in Figure 2.4.) The probable losses incurred by the irrigation sector are listed in Table 2.5.

In some cases, temporary measures are required to be implemented until permanent remedies can be implemented. For example, Temporary access roads, culverts, and bridges need to be rehabilitated to ensure the accessibility of the public as well as responders. However, PDNA must be completed within 15 to 45 days of the disaster, and a preliminary figure must be added as a long-term maintenance expense.

c. the additional expenditure incurred for reducing risk: taking early warning measures at the preparedness phase; taking immediate precautions at the response stage; and early recovery measures taken during the recovery phase to control the potential risk that may increase.

d. In certain cases, the immediate precautions and early recovery measures will be continued for a longer period until permeant measures are taken place
Since the irrigation sector contributes national economy through the agriculture sector, lost harvest (or potential harvest) caused by a hazardous event is accounted for by the agriculture sector. Similarly, relief services provided to the affected farmer community are accounted for by the social sector (Sector classification is shown in Figure 2.4). The probable losses incurred by the irrigation sector are listed in Table 2.5.

There are situations that temporary measures taken are needed to be maintained until permanent measures are taken place. For example, temporary access roads, culverts, or bridges are provided to streamline the mobility of public needs. However, PDNA shall be completed soon after the disaster (within 15 to 45 days from the disaster) and a provisional sum shall be included as a long-term maintenance cost.

Table 2.5 Probable losses incurred in the irrigation sector

Type of Loss	Possible temporary measures (Irrigation sector)	Anticipated expenses for taking temporary measures (LKR)		
		Imminent a hazardous event	During a hazardous event	Followed by a disaster
a. The cost of reestablishing governance and decision-making procedures.	Rectifying interruption to a communication network and other internal utility services		√	
	The formalizing decision-making process to arrange operational works	√	√	
	Hiring transport, machinery, and equipment for emergency operations	√	√	√
	Expert consultation including hiring additional staff			

b.	Providing temporary access by rehabilitating damaged sections of by-pass		√	√
	Providing temporary transport as necessary		√	
	Making temporary arrangements to provide irrigation water deliveries (e.g. providing coffer dams)		√	√
	Making temporary arrangements to close a breached part of a spillway, anicut, or any other structure to re-start service delivery		√	√
c. Cost for reducing the potential risk that may increase during and post disaster phase	Public awareness by starting early warning (preparedness stage)	√	√	
	Placing sandbags where unusual seepage appears to control damages (response phase)	√	√	√
	Placing sandbags at either side of breached sections (dams, canal bunds) to control further damages as an early recovery (recovery phase)		√	√
	Cleaning sand barriers formed at sea-outfall of rivers to drain out stagnant upstream flood water (response phase)		√	√
	Cleaning debris stuck between piers of canal/river structures to reduce upstream floods (response phase)		√	√
Subtotal				
Total High Operational Cost (imminent+ during+ post)				

2.2.5.3 Damage and loss in Cross-sectional Sectors

The cross-cutting themes are common in all sectors. Apart from the irrigation sector's damage and loss assessment, an indication of damage and loss experienced in other complementary sectors as cross-sectional data will reduce duplication.

Figure 2.4 depicts a typical sector classification in the PDNA process.

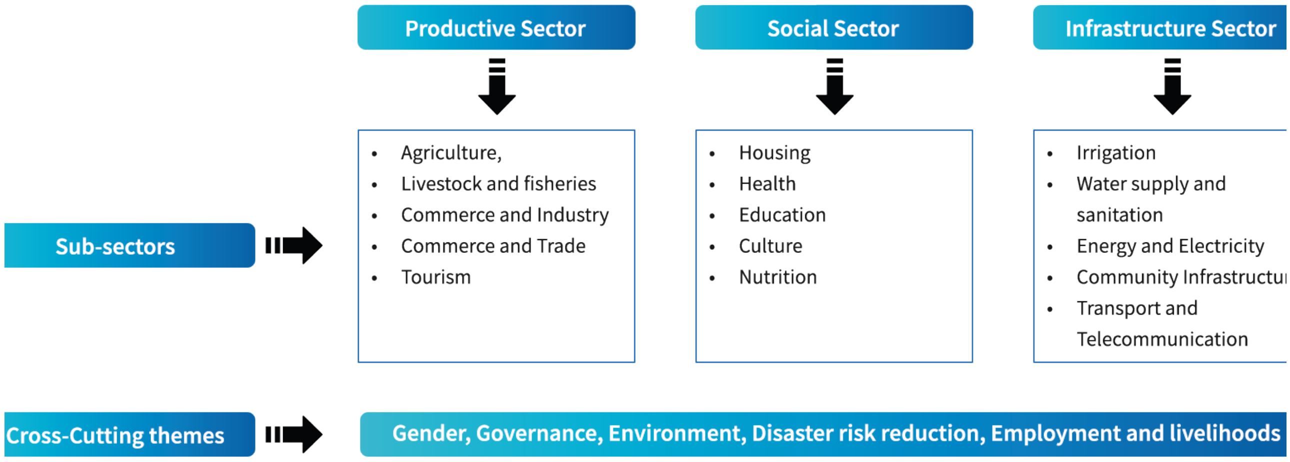


diagram illustrates a typical sectors that are commonly assessed in the PDNA process, but subject to the variations as necessary.

Figure 2.4 Typical sector classification in the PDNA process

Furthermore, such knowledge will raise the priority of restoring irrigation infrastructure. For example, a burst tank will have a direct impact on the agriculture sector, the inland fishing community, aquaculture (environment), groundwater users (depletion of water levels in home garden wells and agro-wells), a water supply system that pumps water from the breached tank, and so on. This additional information will help prioritize irrigation infrastructure for recovery. A few examples of damages and losses related to other sectors are listed in Table 2.6.

Table 2.6 Examples of damage and loss incurred in cross-sectoral areas

	Damage/Loss	GN Division	Extent/ No	Sector	Sub-sector
1	Damaged paddy area (Ha)			Productive	Agriculture
2	Damaged non-paddy area (Ha)			Productive	Agriculture
3	Loss of harvest (or potential loss)			Productive	Agriculture
4	Affected paddy mills			Productive	Industry
5	Affected agro-industries			Productive	Industry
6	Interruption to safe water (provided water source is irrigation scheme)			Infrastructure	Water supply

7	Interruption to electricity (provided water source is irrigation scheme)			Infrastructure	Electricity
8	Obstruction to Public transport (provided public road aligned over-irrigation bund)			Infrastructure	Transport
9	Environmental damage (depletion of water table, pollution of environment)			Social	Environment
10	Damaged houses of the farmer community			Social	Social Service
11	Affected farmer families			Social	Social Service
12	Affected males, females, and disabled persons in farmer families			Social	Social Service
13	Affected school children of farmer families			Social	Service Education

2.2.6 Disaster Risk Assessment of the Irrigation Sector

The disaster risk is a probabilistic function of the hazardous event, the vulnerability of the irrigation infrastructure, and its exposure to the hazardous event that determines the degree of potential loss or damage to the irrigation infrastructure and its operations over a particular period of time. The capacity of irrigation institutions and their staff participating in disaster recovery influences their preparedness to handle the event while reducing risk. Furthermore, the farming community's and other stakeholders who may be impacted by the irrigation infrastructure's ability to deal with the situation helps to risk reduction. The risk level of irrigation infrastructure is determined as a function of the likelihood of hazards, exposure, vulnerability, and capacity[8] .

Even after successful disaster risk reduction measures have been implemented, it is vital to take actions to maintain the residual risk that remains unmanaged. Because irrigation infrastructure is vulnerable to floods caused by monsoon rains and climatic depressions, security measures are built into irrigation infrastructure design criteria to reduce residual risk to a minimum. Irrigation institutions can update the requirements for design by upgrading design specifications based on climate change dynamics over the last few decades. The Irrigation Department design guidelines are used by all irrigation institutions in Sri Lanka. The residual risk can be minimized by improving irrigation staff capacity for irrigation system planning and design. Poor communities may encroach on irrigation canals or river reserves and settle without regard for their vulnerability to recurrent flood dangers. Before relocating them from dangerous areas, it is required to instruct them on how to stay safe throughout the rainy season. However, the chance of damage to the spillway structure, spill tail canal, canal system, and irrigable area in the flood-prone area along the main river course occurring after each flood occurrence has been significantly increased.

A sample risk assessment of minor irrigation schemes located in the flood-prone wet zone, those located at the tail end of the tank cascades in the dry zone, and the major and medium irrigation schemes located upstream is illustrated in Table 2.7.

[8] Terminology illustrates the terms in italic letters

Table 2.7 Sample of a risk matrix

	Tank bund	Anicut	Spillway	Field canal
Risk Factors	**Irrigation Department**			
Exposure	High	High	High	Low
Vulnerability of infrastructure	Low	low	Moderate	Moderate
Likelihood of Hazardous flood event	Low	High	Likely	Rare
Coping capacity	High	High	Moderate	Moderate
Risk level	**Low**	**High**	**High**	**Low**
	Tank bund	**Anicut**	**Spillway**	**Field canal**
	Mahaweli Authority of Sri Lanka			
Exposure	High	High	High	Low
Vulnerability of infrastructure	Low	low	Moderate	Moderate
Likelihood of Hazardous flood event	Low	High	Likely	Rare
Coping capacity	High	High	Moderate	Moderate
Risk level	**Low**	**High**	**High**	**Low**
	Department of Agrarian Development			
Exposure	High	High	High	Low
Vulnerability of infrastructure	Low	low	Moderate	Moderate
Likelihood of Hazardous flood event	Low	High	Likely	Rare
Coping capacity	High	High	Moderate	Moderate
Risk level	**Low**	**High**	**High**	**Low**
	Provincial Irrigation Departments			
Exposure	High	High	High	High
Vulnerability of infrastructure	Moderate	Moderate	Moderate	Moderate
Likelihood of Hazardous flood event	High	High	High	Moderate
Coping capacity	Moderate	Moderate	Moderate	Moderate
Risk level	**High**	**High**	**High**	**Moderate**

2.2.7 Data and Collection Methods

The PDNA of the irrigation sector limits the assessment of damaged irrigation infrastructure in order to request financial assistance. Because losses are characterized as unanticipated expenditures to fulfill emergency demands, irrigation sector agencies recoup such costs from operating and maintenance funds or transfer funds from other unspent financial votes without seeking funds. The losses incurred are indicated in the year-end expense reports. The irrigation sector agencies only investigate post-disaster needs for damaged infrastructure, which are subsequently followed by seasonal floods. Agriculture, agro-industry, social, environmental, inland fisheries, nutrition, and other cross-sectors rely on irrigation water delivery, and such sectors cannot function until damaged irrigation infrastructure is restored. As a result, the irrigation sector's priority is determined by the knowledge of the other cross-sectors, which is supplemented by irrigation infrastructure. However, the irrigation sector does not collect damage and loss information from cross-sectoral areas in the need assessment, which is a major disadvantage for prioritizing irrigation infrastructure recovery needs. Therefore, there is a need for improved communication and collaboration between the irrigation sector and other cross-sectoral areas to ensure a comprehensive understanding of the overall needs. Additionally, incorporating a system for collecting damage and loss information from these areas can greatly enhance the prioritization process for irrigation infrastructure recovery.

Presently, data is collected for assessing irrigation infrastructure damage through:

1. Field inspection by technical staff
2. Carrying out walk-through surveys with the farmer community (beneficiaries)
3. Referring to engineering drawings
4. Referring to blocking out plans (BOPs),

In addition to the above data collection methods, the following data collection methods can also be used for collecting data and information required for prioritizing irrigation infrastructure recovery related to the sectors complemented by the irrigation sector:

1. Institutional publications
2. Annual Reports
3. Corporate Plans
4. Consultation with other stakeholders and cross-sectoral agencies
5. Establishing lateral communication among cross-sectors
6. Establishing a digital platform for sharing data

Data and information compiled under different sectors, as shown in Figure 2.4, will avoid duplication.

2.2.8 Building Back Better Concept

The Building Back Better (BBB) concept applies to the rehabilitation and reconstruction phases following a disaster by integrating disaster risk reduction measures into the restoration of physical infrastructure and societal systems, as well as the revitalization of livelihoods, economies, and the environment. This approach aims to create more resilient communities that are better equipped to withstand future disasters. BBB also emphasizes the importance of involving local communities in the planning and implementation of recovery efforts.

BBB is associated with an increase in initial reconstruction expenses. In the long run, the benefits of BBB far outweigh the costs of avoiding sporadic and ad hoc repairs. For example, in irrigation infrastructure, a lined canal will extend the life of a breached earthen canal that has fallen numerous times owing to scouring. Furthermore, BBB can also improve the overall efficiency and effectiveness of the infrastructure, leading to higher productivity and reduced maintenance costs over time. Therefore, investing in the BBB is a wise decision for any organization looking to achieve long-term sustainability and success.

Nonstructural components of BBB include improving regulations and adapting institutional arrangements, such as established digital monitoring systems, communication systems, and data collection systems, so that they may better respond to future disasters. Except for a few exceptions, all irrigation systems in Sri Lanka provide water using gravitational force, which is an irreversible process. Irrigation infrastructure operations that integrate digital measuring and communication will reduce the overuse of water, a scarce resource.

2.2.9 Recovery Strategy of the Irrigation Sector

The Sri Lanka Disaster Management Act No. 13 of 2005 established the Sri Lankan legal framework for disaster management and disaster resilience in the country. Further, the Government of Sri Lanka is a signatory for the implementation of the Sendai Framework for Disaster Risk Reduction. All DRR activities are formulated under the four priority areas below and follow the 13 guiding principles.

Following a hazardous event, the irrigation sector conducts a damage and loss assessment to identify and prioritize recovery needs. It is important to involve the irrigation sector and cross-cutting sector stakeholders in the prioritization process to ensure that their perspectives and needs are taken into account. Additionally, regular review and updating of the priorities can help ensure that they remain relevant and effective over time.

The irrigation sector recovery strategy, as depicted in Figure 2.5, outlines the framework of:

1. Irrigation sector priority recovery needs
2. inputs or interventions required, expected outputs, and the intended outcome;
3. recovery costs

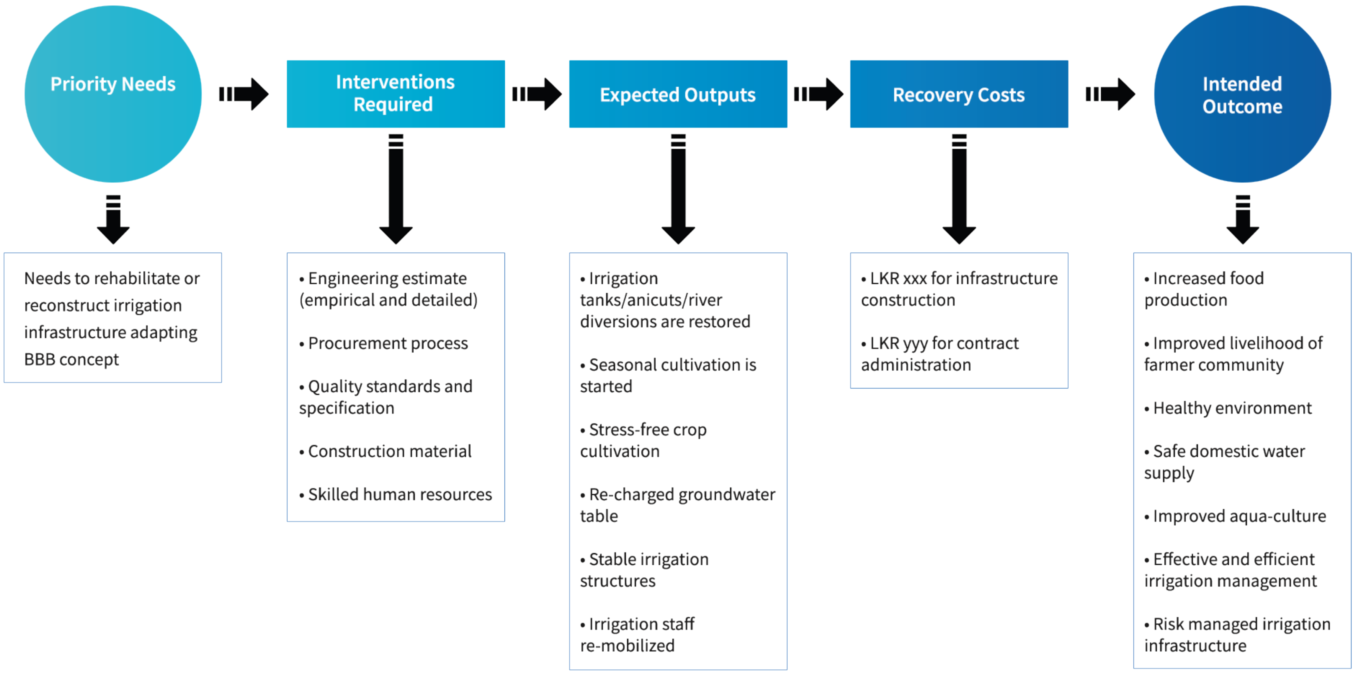


Figure 2.5 Elements of the irrigation sector recovery strategy

The recovery strategy is a crucial component of disaster management as it helps to ensure that the irrigation sector can rebuild and recover from the impacts of disasters. By providing a comprehensive framework for recovery, the strategy helps to ensure that resources are used effectively and efficiently to support long-term recovery efforts. The Recovery Strategy leads to the formulation of a detailed recovery framework that includes information on policy and institutional arrangements, financing mechanisms, and recovery monitoring and evaluation systems. The primary objective of irrigation sector recovery is to restore irrigation infrastructure and, hence, operationalize the irrigation water management system. This major objective enables the impacted farmer community and others to engage in agro-based enterprises, thereby improving their overall well-being and ensuring national food security. The recovery strategy establishes the vision for recovery and determines prioritized interventions as well as the outcomes and costs of recovery within a defined time period. The assessment leads to a comprehensive recovery framework.

The Recovery Strategy aims to accomplish the following key objectives:

1. Mobilize stakeholders towards a common purpose of irrigation sector recovery.
2. Facilitate coordination among irrigation institutions and other state agencies.
3. Establish common parameters, focusing on irrigation infrastructure.
4. Identify irrigation sector priorities based on the assessment results.
5. Establish a calendar of recovery actions.
6. Establish the guiding principles of good practice related to the irrigation sector.
7. Promote government ownership of the recovery process.
8. Promote an equity-based, participatory, and inclusive recovery process.
9. Contain the fundamentals for reducing risks and building back better.
10. Provide an estimate of the cost of recovery.
11. Provide the basis for a recovery framework that will lead to a detailed implementation plan, including specific objectives for the irrigation sector, sectoral projects contributing to the irrigation sector, and partners, among others.
12. Serve as a tool for resource mobilization with donors, including donor relations. It is critical to determine the methods and capacities required to restore irrigation infrastructure to its full potential in order to lead productive irrigated agriculture and creative lives for the impacted community, as well as their demands and interests, including risk protection.

The irrigation sector recovery strategies need to answer the following questions:

1. What are the main recovery needs of irrigation infrastructure that supports farmers and others involved in agro-based businesses through irrigated agriculture, as well as the community living in flood-prone areas protected by existing flood protection schemes?
2. What recovery interventions will address the aforementioned needs, and what are the overall resource requirements?
3. What recovery outputs will meet these needs, and what are the overall resource requirements?
4. Given the foregoing, what are the broad anticipated outcomes and the staging and timing required to achieve them?

2.2.9.1 The Elements of Recovery Needs

The examples in Box 3 illustrate that infrastructure damages cannot be judged based on the magnitude of the damage to the infrastructure, and as a result, even minor damage to the infrastructure sector can disrupt complete service delivery to the cross-sectors it supports. Furthermore, when it comes to service delivery to other cross-sectors, each infrastructure service scheme is viewed as a unified network that cannot be divided into its components.

Box 3

The recovery needs of a sub-sector, like agriculture, can be classified based on the scale or magnitude of potential harvest damage as well as losses incurred for the re-preparation of farm beds by removing silt deposited after a severe flood hazard. Recovery needs of a sub-sector, like housing, are within the social sector and can be characterized based on the type of damage, such as partially damaged provided the undamaged section is fit for use, damaged roof, unfit for use, and so on.

The recovery needs of an infrastructure sub-sector, such as the road sub-sector, cannot be classified based on the scale or magnitude of the damage. For example, if a section of a culvert across a major road is broken after a flood, it prevents access to the township, marketplace, schools, hospitals, offices, and so on. Similarly, the same flood incident may cause damage to a lengthy length of the wearing surface, inflicting more damage but decreasing mobility.

When a small portion of the transmission line and a large portion of the distribution system of the pipe-borne water supply scheme are damaged, priority can be given to repairing the water distribution line as the damage is higher compared to the transmission line. However, until the small part of the transmission line is repaired, no water can be transmitted to the distribution system. Therefore, it is important to ensure that both the transmission line and distribution system are repaired in a timely manner to avoid any disruptions in the water supply.

Likewise In the irrigation infrastructure sector, though the entire canal system is rehabilitated, irrigation water cannot be delivered until a small repair is made to the water-controlling unit of the sluice gate of the headworks.

The PDNA classifies early recovery needs, reconstruction needs, and medium/long-term recovery needs as shown in Figure 2.6.

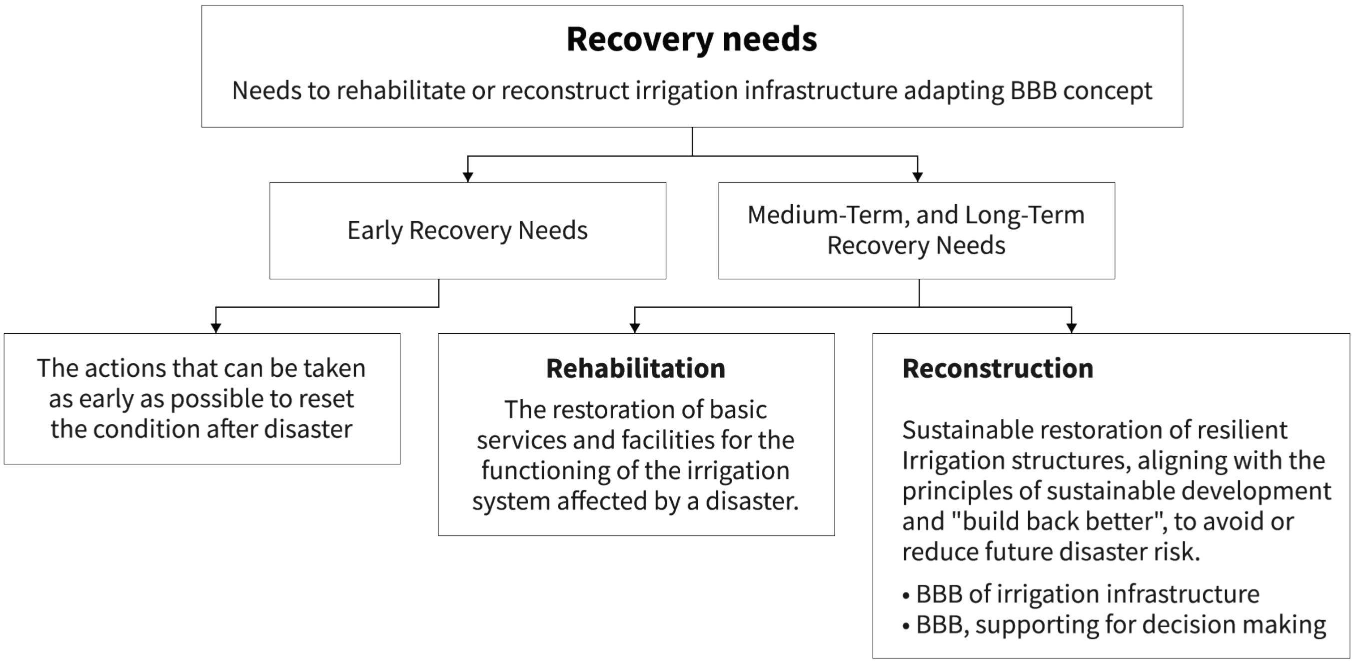


Figure 2.6 Classification of recovery needs

Based on the data provided by the DaLA as negative effects and impacts of the disasters, the PDNA procedure is used to determine recovery needs. In order for the farmer community and other stakeholders to resume farming and agro-based activities, the recovery implementation determines: (a) the delivery of irrigation water to the farm gate; and (b) the safety of the community living in a flood-prone area, as well as their properties, which are protected by a flood protection scheme, with the least amount of risk. In order to prevent or lower the risk of future disasters, the global recovery strategy also adheres to the principles of sustainable development and "Build Back Better."

Recovery activities under various phases (preparation, response, recovery, and mitigation) of the disaster management cycle, as shown in Figure 2.1, may overlap in terms of implementation.

For example, during a high flood, it appears there is an unusual water leak at the downstream embankment of a Flood Protection Dam (previous warning). Sandbags are used in the response phase to reinforce the weak embankment and take immediate protective measures. Similar sandbag placement can be used as an early recovery measure to control further damage when an irrigation canal embankment is breached without prior notice. This can be done until a permanent or semi-permanent solution is implemented. Immediate and early recovery measures include clearing sand formation at river outfalls to drain out stagnant flood water at the upstream river section and providing temporary bridges, culverts, or by-pass access to restore human mobility and transportation across an irrigation service road.

Long- and medium-term recovery encompass the processes of rehabilitation and reconstruction. The irrigation infrastructure is being repaired, restoring it at least to the level of performance it had prior to the disaster. The replacement of damaged structures is the main focus of reconstruction. To avoid or lower the risk of future disasters, the disaster recovery and reconstruction process is in line with "Build Back Better" and sustainable development principles. The disaster recovery needs are formulated into four components while adapting to the BBB concept as indicated in the international guidelines[9] .

[9] Post-Disaster Needs Assessment Guidelines, Volume A (2013), GFDRR

1. The reconstruction of damaged infrastructure and physical assets
2. The resumption of (a) production complemented by irrigation infrastructure and service delivery; and (b) access to goods and services;
3. The restoration of governance and decision-making processes in the irrigation institutions
4. The reduction of disaster risk

The disaster recovery plan needs to be formulated under four components that are aligned with the irrigation infrastructure, as illustrated in Table 2.8.

Table 2.8 Recovery needs that are aligned with the irrigation infrastructure

Component	**Description**
Restoration of physical assets and irrigation infrastructure that have been damaged	The financial needs (or requirements) for reconstruction following disasters are determined using quantitative estimates of the destruction of irrigation structures and other physical assets that must be rebuilt and restored to the level before the disaster. The estimated values of damage, as determined empirically during the PDNA, are used to define the reconstruction needs. Private or public-sector organizations may be the owners of the destroyed assets. Then, the additional requirements associated with the "building back better" concept are added to the damage figures. Therefore, reconstruction needs are calculated as the sum of: Value of Damage + Cost of Quality Improvement +Technological Modernization + Relocation, when needed +Disaster Risk Reduction Features + Multi-Annual Inflation The quality improvement includes stability improvements (rehabilitation or replacement of the entire structure). Sometimes the location of the structure may shift (relocation). Modernized structures are introduced, adapting to advanced technology
Reinstatement of (a) production supported by irrigation infrastructure and service provision; and (b) access to goods and services	Resuming the production of goods through irrigation infrastructure means increasing costs to improve service delivery while still delivering irrigation water to the farm gate at the same level as before the disaster. The goal of restoring service delivery is to raise the standard of fundamental services to that of before the disaster or higher (delivery efficiency). This goes along with the "reconstruction" of physical assets mentioned above. Instrumentation supports making priceless and deadline-bound decisions, as well as implementation and service from experts, in the context of the irrigation sector. Both structural and non-structural supports are included. Resumption of access aims to restore access to services and goods that meet needs, considering both the increased costs for accessing goods and services for populations affected by disasters as well as the increased costs of service providers as a result of the disaster. In addition to the irrigation

	structures, access to goods and services is made possible by bunds, service roads for public transportation, tractor crossings, cattle crossings, footbridges, small bridges across large canals, and others.
Restoration of the governing and decision-making processes	Restoration of governance and social processes aims to revitalize and improve: 1. irrigation institutions, other related institutions, 2. Policies, public administration, and governance procedures are crucial for the restoration of irrigation infrastructure in order to provide the community of farmers with the essential services they need to survive. It refers to the requirement for institutions in the irrigation sector to have their leadership and management capabilities restored or strengthened, including decentralized local capacities, human resources, information systems, capacity-building training, etc. The costs for the restoration of governance and social processes are calculated as follows: 1. Costs for additional human resources with improved technical skills and capacities of service providers to undertake the recovery; 2. Costs for replacing lost records and upgrading documents for the various public services; Costs for addressing governance and social cohesion issues if disrupted
Reducing Risks	In addition to estimating the need to rebuild irrigation infrastructure more effectively (which is described in the point above under the heading "reconstruction"), the cost of incorporating risk reduction measures is also estimated for the following: 1. To address immediate risks, 2. Initiatives to reduce residual risks and vulnerabilities to future disasters, such as safer infrastructure with consideration of updated hydrological parameters, hazard and risk maps, technical expertise, technologies, and practices that build resilience; 3. Preparedness capacities of the irrigation institutions and farmer institutions to manage the impact of future disasters; The additional costs to BBB of reducing risks and increasing preparedness are calculated as follows: 1. Costs for addressing immediate risks; 2. Costs for upgrading preparedness measures in the irrigation sector; 3. Costs for further studies or assessments, technologies, practices, technical expertise, etc. required to facilitate implementation of building back better approaches; 4. Cost of specific measures to strengthen disaster risk reduction

2.2.9.2 Vision and Guiding Principles

Stakeholder consultation results in the development of a post-disaster recovery vision, which is then incorporated into the recovery strategy. Prioritizing recovery needs requires an understanding of how the impacted area and sectors will look following the recovery process. During the consultative process, the post-disaster recovery vision is jointly developed, ensuring the Recovery Strategy has the endorsement of important stakeholders.

The vision for post-disaster recovery acts as a road map for the recovery procedure. It gives the stakeholders the broad direction and "end state" they desire to accomplish through the recovery process. The vision statement needs to be concise and comprehensively express the hopes and expectations of the nation and the affected population, as well as the changes they hope to see as a result of the recovery interventions.

The following key points are used to establish a vision for the irrigation sector's recovery.

Advantages of a Recovery Vision:

- A recovery vision enables the government to convey its recovery priorities and build national or subnational consensus around them.
- The vision becomes the starting point around which the entire recovery process will be formulated.
- The post-disaster recovery vision ensures the support of key stakeholders for the recovery strategy.

Characteristics of a vision:

- The vision usually reads as short as a single sentence.
- It results from a cohesive work of consultation and analysis to ensure that all relevant stakeholders are committed to it.
- The Recovery Vision is framed with the aim of "ensuring recovery and reconstruction programs that reinforce irrigation infrastructure resilience to disasters".
- The vision is also implicit in the goal to "reduce damage from floods and economic losses (food security) in the future".

Further, the vision shall be aligned with the outcome of the Sendai Framework for Disaster Risk Reduction for 2015–2030[01] ; in a broader sense, it calls for "substantial reduction of disaster risk and losses in lives, livelihoods, and health and in the economic, physical, social, cultural, and environmental assets of persons, businesses, communities, and countries."

According to the DRF Guide (2020)[02] the core elements to consider when formulating a recovery vision are:

1. **Ensuring that the vision is developed at the highest level of government:** Without agreement at the highest level on the vision, it will be hard to leverage the needed resources, build up the capacities, and support the implementation of recovery.
2. **Carrying out stakeholders' consultations for a common recovery vision:** The government can invite groups of internal and external stakeholders (including reconstruction partners).
3. **Ensuring alignment with development programs:** The government's broader, longer-term development goals for the irrigation sector must be consistent with the recovery vision. By bridging both pre-existing development gaps and new development gaps brought on by the disaster, the vision can provide a strategic continuum between pre- and post-disaster development planning.

4. **Incorporating resilience and BBB into the recovery vision**
5. **Optimizing recovery across sectors:** The recovery vision should, whenever possible, include other sectors (such as the social and agricultural sectors), as they may have been impacted by the disaster and have a part to play in recovery and reconstruction.
6. **People-focused.**

"To build improved irrigation management systems to ensure cross-sectoral needs by delivering irrigation water" can be a vision statement for the recovery of the irrigation sector. As the Irrigation Department oversees flood protection plans, the vision may be further expanded by the addition of "to protect communities affected by flood disasters."

2.2.9.3 Guiding Principles for Recovery

To improve the efficacy of recovery, promote coordination among stakeholders, and increase the transparency and accountability of the various actors, guiding principles for recovery are established. The principles are used in the planning and execution of the recovery interventions as well as in the overall Recovery Strategy. Prior to the PDNA, these guidelines should be established to ensure their application in the Recovery Strategy and programmatic response.

Successful disaster recovery experiences from around the world have in common the adoption of at least three crucial principles for recovery planning (DRF Guide, GFDRR, Revised Version, March 2020)[03]:

1. Converting adversity into opportunity
2. Building Back Better, and
3. Prioritizing the inclusive recovery of vulnerable groups
4. **Converting Adversity into Opportunity**

As governments and populations realize they need to be better prepared to respond to future disasters, crises can be a catalyst for change and an opportunity for the development of sustainable solutions. The affected farmer community, other interested parties, and government institutions coordinate their efforts to find the answers required for better planning by conducting walk-through surveys along the irrigation infrastructure in post-disaster contexts. The affected farmer community will benefit from the recovery plan's employment opportunities during implementation.

How does adversity become an opportunity for disaster recovery in the irrigation infrastructure?

1. It makes for a better understanding of flood risk due to the vulnerability of irrigation infrastructure faced by irrigation institutions and the farmer community;
2. It reduces the vulnerabilities of irrigation schemes in future disasters and builds the resilience of irrigation infrastructure.
3. It makes for better preparedness for the next disaster.
4. It mainstreams disaster risk management into policies, planning decisions, and legislation.
5. It prioritizes investments that could support resilient communities.
6. It realizes resilient recovery before a disaster occurs, and
7. It identifies the need for campaigns for irrigation sector agencies to highlight integrated disaster risk management practices.
8. It increases government intervention in food security through enhanced irrigation efficiency and sustainability of existing irrigation schemes.

[01] Sendai Framework for Disaster Risk Reduction 2015–2030, United Nations
[02] Disaster Recovery Framework Guide, Revised Version, March 2020. Source: GFDRR
[03] https://reliefweb.int/report/world/disaster-recovery-framework-guide-revised-version-march-2020

9. It improves irrigation infrastructure and assures reliable irrigation water management practices for the farmer community and other stakeholders engaged in the agro-based industry.
10. **Building Back Better**

In Section 2.6, the BBB concept is defined. Costs for reconstruction initially rise when BBB is present. The long-term advantages of BBB far outweigh the short-term expenses by preventing sporadic and unplanned repairs. BBB also includes nonstructural aspects like policy enhancement and institutional configuration adaptation to digital monitoring, communication, and data collection methods so that these can better prepare for future disasters. BBB, through the use of the recovery of the irrigation sector, integrates disaster risk reduction measures into:

1. Restoration of irrigated agriculture;
2. Revitalization of the livelihood of the farmer community, economies, and the environment; and
3. Increased resilience of irrigation infrastructure
4. Prioritizing Inclusive Recovery for Vulnerable Groups

The agriculture industry employs almost one-third of Sri Lanka's workforce. It is estimated that communities involved in agriculture, including paddy cultivation, make up about 70% of the rural population. In 2019, the agriculture sector's share of the overall GDP was 7.4%. The contribution of women was 28.4% of this total. The irrigation system is still battling with:

1. Creation of a sustainable irrigated agriculture infrastructure sector to ensure food security that is capable of generating healthy income levels for the farmer community;
2. Providing indirect benefits to improve the livelihood of other stakeholder communities
3. Enhancing the sustainability of the surrounding eco-system by re-charging sub-surface water table; and
4. Providing direct or indirect benefits to other sectors (e.g., the drinking water sector pumping water from irrigation reservoirs, hydropower generation using irrigation water discharge, the social sector, and industry sector protection by flood protection bunds)

Due to the lack of resilience of irrigation infrastructure against seasonal flood risks, the livelihood of those who depend on irrigated agriculture, the environment, and other sectors is constantly at risk. So, irrigation infrastructure, including flood protection bunds, can be a concern in the aforementioned priority areas.

2.9.4 Prioritization of Irrigation Infrastructure Recovery Needs

Once the list of problems has been created, it should be prioritized to help the process run more smoothly. While dealing with the most important issues, the less important ones can be put on the list to be dealt with later. Prioritizing and organizing the requirements at the irrigation sector level (i.e., the national level) is crucial. Post-disaster settings are characterized at the sector level by a concentration on the needs of the irrigation sector as well as related cross-sectoral needs and scarce resources. Therefore, it is necessary to address recovery needs and the interventions that go along with them in stages, starting with the ones that are most urgent. It is acknowledged that factors like priorities at the national and local levels, technical feasibility of interventions, resource availability, and environmental factors, among others, influence how needs are prioritized. Regular stakeholder consultations at the local, state, and federal levels are advised as part of the process to be used for prioritizing and sequencing needs, as well as donor consultations if practical.

As such, some key considerations to help facilitate prioritization are:

1. To ensure that it addresses the effects and impacts of the disaster.
2. To consider the gap between the pre-disaster and post-disaster conditions
3. The key guiding principle related to irrigation infrastructure is that recovery and reconstruction protect communities engaged in farming and agro-based activities from future disaster risks.
4. It requires restoring national food security.
5. It requires reducing the risk.
6. Any other social and environmental concerns

Assessment of irrigation scheme levels is done at the operational level. Since irrigation water is delivered using gravity force in all irrigation systems (with the exception of a few lift irrigation projects), Even in lift irrigation schemes, irrigation water is lifted from the source and then transported by gravity to the farm gate. After canals pool, water is released for drainage and irrigation systems near coastal locations.

The irrigation sector is a subsector of the infrastructure sector (Figure 2.4), and it complements other sectors, particularly the agriculture sector (productive) and the community protected (including assets) from FPSs (social sector). It enhances the peasant community's standard of living through the agriculture sector and the environment sector, which represent cross-sectors. The irrigation sector assures national food security and mitigates drought at the macro level. Without restoring irrigation infrastructure, it is impossible to extend its benefits to other sectors. Therefore, it is obligatory to meet irrigation infrastructure requirements.

Table 2.9 Key considerations for prioritizing needs

Level of prioritizing	**Key considerations**
National level	The service provided by the irrigation sector, as measured by the area of farmland benefited and the number of farm families benefited (both factors are interrelated),At the national level, the total affected farm area of the complete irrigation sector is considered before allocating funds among irrigation institutions. Taking into account social life, flood protection schemes are given top priority. When irrigation water is delivered to farmland, nearly forty percent is used by the crop through evaporation and transpiration, while the remaining sixty percent is used by downstream water consumers and the groundwater table, which sustains the environment. Thus, environmental concerns must be appropriately acknowledged.

Irrigation scheme level	Irrigation water is stored in irrigation reservoir headworks to mitigate the impact of drought. In order to use irrigation water more efficiently, the headworks of an Anicut or a river diversion regulate irrigation water. The Headworks of Salt Water Exclusion (SWES) safeguard irrigation systems from Salt water Exclusion. As it is an irreversible process, when irrigation water is discharged from the headwork, it must be utilized by downstream users. If any canal structure close to the canal's head is damaged, irrigation water can be delivered downstream by blocking a portion of the command area and adopting temporary measures. If any canal structure close to the tail-end is damaged, irrigation water can be delivered to other areas by blocking the part of the command area and taking temporary measures. Communities residing in flood-prone areas that are vulnerable (including their assets) are protected by FPSs' headwork structures. For the safety of the headwork structure of the tanks, excess water is discharged through the spillway during extreme flood events, threatening downstream canal structures close to the valley and human settlements at downstream locations.

The above facts reveal:

1. Disaster risk recovery reduction (DRR) of headwork increases the social safety of downstream settlers, the safety of irrigation structures closes to the flood-prone area, and the communities living within the flood-prone areas protected by FPSs;

2. Disaster risk recovery of the canal system reduces the harvest losses of the command area and contributes to the food security and social livelihood of the farmer community and others whose livelihoods are supported by irrigated agriculture.

2.2.9.5 Interventions, Outputs, and Outcomes of the recovery strategy

The required interventions refer to the inputs and activities necessary to address the identified recovery requirements at the implementation stage (recovery strategy) and transform them into outputs. Interventions may consist of programs, initiatives, or policies that address the priority need and sustainably promote recovery. They are significant in terms of what they ultimately lead to (outcomes) and reflect what is implemented. Rebuilding a damaged structure would be an example of a high-priority recovery need, while procurement and construction are examples of critical interventions or inputs.

Recovery interventions are devised for the irrigation sector and incorporated into the Recovery Strategy, along with their implementation timelines, as well as the responsible irrigation institution and implementation partners, if any. According to international guidelines, interventions are designed for short-term (disaster events up to six months), medium-term (six to eighteen months), and long-term (eighteen months to five years) recovery timeframes. However, according to the current government strategy, it will take at least a year to disburse the funds. In selecting interventions, it is essential to evaluate their impact on the affected farmer community and other stakeholders, as well as their implementation feasibility, including government and donor support and political implications, among others. Outputs are the specific goods and services that result from the processing of inputs via recovery activities. Therefore, outputs pertain to the conclusion (rather than the execution) of activities and are the sort of outcome over which managers have a great deal of control. The intended outcomes are the actual or intended changes in calamity conditions that the recovery interventions are designed to facilitate. Table 2.10 illustrates an example of an infrastructure recovery strategy for irrigation systems.

Table 2.10 Priority needs, interventions, outputs, costs, and outcomes

Priority Needs	Interventions / Inputs Required	Expected Outputs	Recovery Costs	Intended Outcomes
Rehabilitation of spillway of irrigation tank Water storage at the full supply level Assured water deliveries to the farmer community Successful seasonal cultivation without water stress Recharged ground water table Re-commissioned domestic water supply scheme Optimized unmanaged risk Irrigation system operationalized	Engineering estimate incorporating BBB concept Quality standards and specification Procurement process following NPA guidelines Construction material, machinery, Construction Administration Removing obstacles for flood water storage Exposure to flood hazards	Restoration of irrigation tank Seasonal cultivation started by 100 farmer families Stress-free Irrigated water received by 100 ha of farmland Safe drinking water received by 100 families Safe environment. Re-charged Garden wells and agro-wells Stable spillway Re-mobilized Irrigation staff	LKR xxx for spillway construction LKR yyy for contract administration	Increased food production and ensure food security The improved livelihood of the affected farmer community and poverty reduction Healthy community in terms of safe water Improved quality of domestic activities benefitted from recharged dug wells Improved domestic agriculture benefitted from recharged agro-wells Risk-managed irrigation scheme Sustainable environment

2.2.10 Recovery Costs

After identifying recovery priorities and their corresponding interventions, outputs, and final intended outcomes, costs are calculated. As shown in Table 2.8, costs are typically calculated for each of the expected outputs and intended outcomes included in the recovery strategy.

The PDNA team initially estimates the cost of outputs for the irrigation infrastructure on an empirical basis. Several interventions can meet the requirements of other sectors. By supplying irrigation water, a crucial input for agricultural production, the irrigation infrastructure sector has been a facilitator for the agriculture sector. The proposed interventions, outputs, and expenditures are primarily geared towards the irrigation infrastructure sector and the agricultural productive sector. In addition, the social sector requirements are met by the irrigation infrastructure. Since the recovery costs are limited to components of the irrigation infrastructure development, there will be no double tally. During the assessment and planning phases, the various sector teams must communicate to facilitate sector coordination. The unit cost of replacement and contract administration costs can be utilized to estimate recovery and reconstruction costs. The unit cost is the agreed-upon cost of a cost schedule used by irrigation institutions for development planning. In addition, there would be a standard unit cost increase to account for improved construction or risk reduction measures. In practice, additional items are included in the estimate of recovery to enable the reconstruction of improved or risk-reduction measures.

The international guidelines stipulate the following considerations that should be made in estimating costs for building a better

1. The costs for BBB should be proportionate to the costs of recovery and reconstruction needs based on the impact of the disaster.
2. The costs for BBB should be realistically compared to the financial envelope pledged by the government and international development partners since most funds will be needed for physical reconstruction and compensation for losses.
3. The costs for BBB should be realistic based on the absorption capacity of the country and what is feasible to achieve over 3 years.

2.2.11 Recovery Strategy

The Recovery Strategy contains a description of the implementation provisions, including the following essential elements:

1. Partnerships, coordination among irrigation institutions and cross-sectors, and management
2. Cross-cutting themes;
3. Links to development
4. Resource mobilization;
5. Key assumptions and constraints

2.2.11.1 Partnerships, Coordination, and Management

The irrigation sector's recovery strategy describes critical partnerships between the National Planning Department, the Budget Department, the Disaster Management Center, and UN agencies. There must be coordination between twelve (12) irrigation agencies. In addition to soil investigations and hydraulic modeling, the Irrigation Department is responsible for updating structural design guidelines, hydrological design guidelines, and soil investigation guidelines. The Irrigation Department and the Meteorology Department are working together to share climate data. The Mahaweli Authority of Sri Lanka holds monthly sector coordination meetings (Water Panel) with all other stakeholder agencies benefiting from the river Mahaweli and other irrigated agricultural areas declared under MASL (such as the Uda-Walawe irrigation scheme across the river Walawe).

Under each irrigation scheme, farmer organizations are established and participate in seasonal cultivation meetings or project management committee meetings (for irrigation projects). All irrigation systems' field canals are maintained and operated by peasant organizations. Farmer organizations have been given permission to carry out small-scale construction projects for their respective irrigation systems using a single source selection method. Participation of farmer organizations in walk-through surveys with irrigation sector personnel to prioritize regular and post-disaster rehabilitation and reconstruction efforts Farmer organizations manage the system operations of all minor irrigation schemes administered by DAD and PIDs. This participatory approach enhances farmer dedication and coordination.

Each irrigation institution is responsible for the management arrangements for the recovery process. Each of the twelve (12) irrigation institutions is recognized for the engineering construction of the institution-managed irrigation infrastructure. ID and MASL are responsible for all of the main irrigation engineering designs.

The Recovery Policy outlines the essential planning and policy considerations that must be integrated into the DRF. This will include the recovery's guiding vision, principles, prioritization of recovery activities, best practices, and associated critical results.

In addition to the coordination among the institutions of the irrigation sector, there are connections between other sectors that necessitate intersectoral cooperation. For instance, the irrigation sector may necessitate the repair or reconstruction of irrigation infrastructure, which may impact the livelihoods of the social sector if the reconstruction process generates paid employment. Consequently, each sector must exchange its findings with the others and jointly determine inter-sector connections. This requires collaborating with teams from other sectors to develop coherent recovery interventions. This process would be facilitated by the coordination team, which has access to all sector assessment reports and can identify areas for collaboration.

2.2.11.2 Cross-cutting Themes

Since the irrigation infrastructure sector complements other sectors, disaster risk reduction is the central theme of disaster management and recovery. In addition, re-establishment of the irrigation sector's governance is a requirement for recovery. The environmental aspects of the irrigation industry are discussed in terms of groundwater recharge and aquaculture. Enhanced agricultural productivity impacts gender, employment, and subsistence. Moreover, the reconstruction phase creates employment opportunities for the surrounding community.

2.2.11.3 Links to Development

The Recovery Strategy would be useful for outlining how the recovery process could link up with and support the country's development goals and priorities. The irrigation sector recovery strategy, in collaboration with the agriculture productive sector, is directly linked with the national food security program, which is a broader strategic development objective of the national government.

2.2.11.4 Resource Mobilization

The preponderance of resources that support a country's recovery are mobilized in accordance with the recovery strategy. Under this strategy, a resource mobilization endeavor would be able to secure funds for the irrigation sector's recovery program. Since national resources are insufficient to meet the identified requirements, identifying a donor partner is a crucial component of the strategy. Following the fulfillment of the PDNA and the recovery strategy in accordance with international best practices, such an event could be organized. The donor's goals and objectives, as well as the strategy for resource mobilization, should be debated and determined by the government with the assistance of the PDNA Team. Under the direction of the government and the National Coordination Team, the donor conference could be organized. The strategy for resource mobilization should include advocacy and communication to raise awareness among policymakers, potential donors, key population groups, the media, and other stakeholders deemed essential audiences.

2.2.11.5 Key Assumptions and Constraints

1. The PDNA identifies the key assumptions that were made in order to complete the recovery process, as well as the main obstacles that are likely to be encountered during the recovery process and how they can be overcome. Among the principal assumptions are the following: Irrigation institutions would be a part of the recovery process and participate in it.
2. There would be no new disaster affecting the irrigation sector.
3. Irrigation institutions' administrative capacities would be able to incorporate the recovery into their functional and technical capacities;
4. As part of the recovery support, resources would be allocated to improve the functional and technical capacities of local agriculturists.

2.3 PREPARATION OF IRRIGATION SECTOR PDNA

2.3.1 Introduction

The PDNA is an internationally recognized process that was devised with the assistance of UN agencies and international donor partners, among others, by compiling a vast amount of disaster management experience. As and when the President of the country declares a disaster on his or her own or with the advice of the National Council for Disaster Management (NCDM), or for an intensive type of disaster, PDNA is carried out as a government-led process for all affected sectors. As a severely affected infrastructure sector, the irrigation sector shall initiate the PDNA and recovery planning process. The preparation section of the PDNA includes the main outputs listed in Table 3.1:

i. Brief situation analysis
ii. Preparation of the PDNA plan

Table 3.1 Core outputs of the PDNA

Core Outputs	Description
Brief Situation Analysis	Write a brief situation analysis report providing an update on the disaster situation, including: Key data collected from a rapid assessment carried out by the field staff, available meteorological data, and past data about rehabilitation, among others; Consultations with all key stakeholders; Irrigation institutions' ability and capacity to provide leadership and technical and logistical support for the conduct of the PDNA and the requirement of hired staff
The PDNA plan (Based on standard PDNA content, adapted to local situation and agreed with government)	Scope of the PDNA: • Objectives of the PDNA: • Sectors and cross-cutting themes to be assessed by the PDNA, and the criteria for identification of the themes; • Geographic areas to be assessed • PDNA timeframe; • PDNA work plan. PDNA management arrangements: • Management structure and composition, especially of the Divisional Recovery Team, Institutional Coordination Team, and National Coordination Team, report writing, among others

2.3.2 Output 1: Brief Situation Analysis Report

The concise summary of the situation analysis includes the outcomes of the interviews, desk review, consultations, and capacity evaluation. Depending on the extent of the damage, the report may include the following sections:

1. The impact of the disaster on the irrigation infrastructure
2. Affected geographic areas, particularly those most affected;
3. Major post-disaster consequences;
4. Urgent needs requiring attention in the PDNA;
5. The inter-relationship within each irrigation institution, among irrigation institutions, and how overlaps may be addressed, as well as priority cross-cutting themes such as environment, risk reduction, and governance;
6. Information gaps that need to be filled;
7. Current and planned needs assessments and planning exercises;
8. Potential mechanisms for consultation;
9. Overview of current and planned response actions;
10. Current and potential funding available for the PDNA and/or recovery

2.3.3 Output 2: The PDNA Plan: Terms of Reference

The situation analysis constitutes the basis for developing the PDNA Plan. This plan outlines all the arrangements necessary to undertake a successful PDNA:

The PDNA defines:

1. The scope of the PDNA
2. The timeframe,
3. Management structure
4. Technical support and report writing
   Each of these elements of the plan is outlined below.

2.3.3.1 Defining the Scope of a PDNA

The situation analysis will allow each irrigation institution to define the PDNA's scope and objectives. The situation analysis describes:

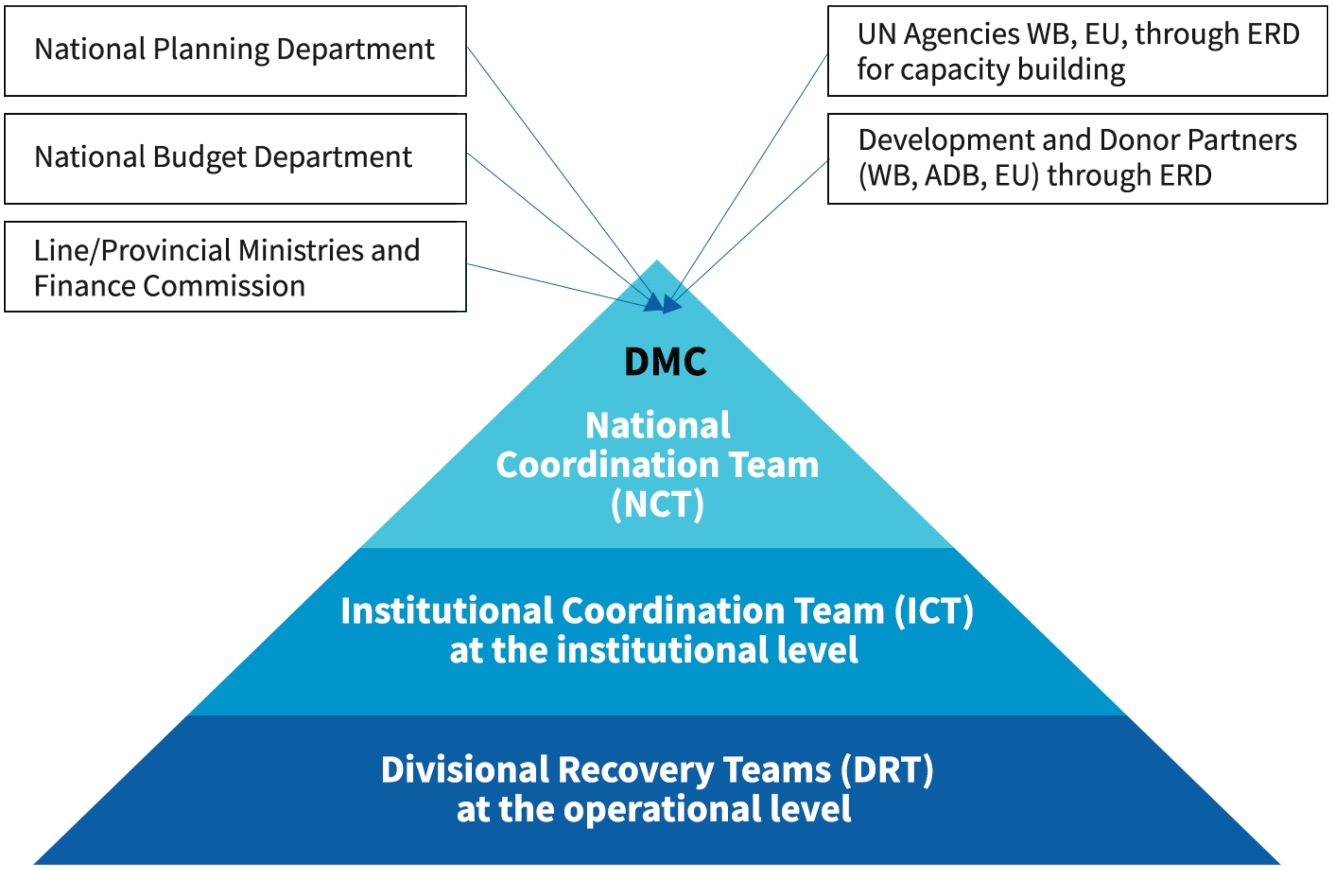
1. the cross-sectors to be included in the assessment;
2. the irrigation schemes and their geographical locations to be evaluated in accordance with official decisions;
3. the stakeholder organizations and individuals who would be involved in the assessment; and
4. the timeline for initiating and completing the PDNA.

The Time Period: The duration of a PDNA varies based on the scope and magnitude of the disaster, as well as other variables such as the availability of personnel and other resources. The conduct of the PDNA should be guided by the principle of timely delivery of the assessment.

2.3.3.2 The PDNA Management Structure

In designing the management structure, the teams representing the various levels of the management hierarchy should consider the pre-disaster and post-disaster coordination and management mechanisms that each irrigation institution already employs. Insofar as feasible, the management structure should be based on existing national capabilities, maximizing the utilization of available and experienced national and sector experts and government personnel. Figure 3.1 illustrates the proposed organizational structure.

Figure 3.1 Proposed management structure for disaster recovery



The Divisional Recovery Team (DRT): This team is comprised of operational-level engineers, engineering assistants, technical officers, and other field auxiliaries, such as drawing office assistants for the irrigation institutions. Each institution establishes DRTs at the division, district, or block level (the lowest operational level). Each DRT is assigned a focal point. Since disaster management is a cyclical process, the phase of disaster preparation occurs prior to the onset of monsoon rainfall. Therefore, it is recommended to form divisional recovery teams at the pre-monsoon meeting and to continue them as a routinely operating team, revolving members as needed.

The Institutional Coordination Team (ICT): This team is comprised of senior officers with the authority to coordinate all operational-level divisions. Each irrigation institution has the ability to establish an ICT. A focal point is designated as the institution's representative. As described, it is recommended to form the Institutional Coordination Team at the pre-monsoon meeting and to continue it as a regularly functioning team while changing its members as needed.

The National Coordination Team (NCT): A prominent representative of the government agency responsible for recovery and reconstruction leads the National Coordination Team. The DMC shall notify the main ministries of irrigation institutions as well as the ministries of provincial councils and local governments and invite irrigation institutions to participate in PDNA activities. The National Coordination Team of the DMC will direct cooperation and coordination within the PDNA. The DMC is the national agency charged with recovery and reconstruction, and the DG (DMC) shall be authorized to command the National Coordination Team.The twelve (12) irrigation institutions responsible for irrigation in Sri Lanka (ID, MASL, DAD, and the nine (9) PIDs) currently operate as separate entities, despite achieving the same objective in irrigation system operations and management, including system rebuilding and new development. A coordination mechanism that draws together all agencies for irrigation decision-making is not currently available. It is the responsibility of ministries that directly oversee irrigation institutions to facilitate this arrangement.

The DMC is Sri Lanka's primary agency for disaster management and is charged with implementing and coordinating national and sub-national-level programs to reduce disaster risk with the participation of all relevant stakeholders. Mitigation Research and Development, Planning Preparedness, Early Warning Dissemination for the Vulnerable Population, Emergency Response, and Coordination of Relief and Post-Disaster Activities in Collaboration with Other Key Agencies are the main activities of the DMC. In addition, disaster management committees were established in all district secretariats, divisional secretariats, and Grama Niladhari divisions (village headman divisions) throughout the nation. Nevertheless, this administrative network currently facilitates the public by coordinating other state agencies at the district level and below. The recovery plan containing national-level development proposals shall be coordinated and evaluated by a state agency tasked with coordinating the national development program rather than at the district level. Recommendation: The DMC should be strengthened as the national coordinating agency to coordinate twelve (12) irrigation institutions at the planning and implementation level with the NPD, NBD, and ERD as the national development plan's decision-making agencies.

The Disaster Management Center (DMC): The Sri Lanka Disaster Management Act No. 13 of 2005 was passed on May 13, 2005, and the DMC was established on August 1, 2005, in accordance with the Act. The Act mandated the establishment of two significant institutions, namely the National Council for Disaster Management (NCDM) and the Disaster Management Centre (DMC), under the National Council for Disaster Management (NCDM) as the lead agency on disaster risk management in the country in implementing NCDM's directives. This Act also establishes a framework for disaster risk management in Sri Lanka and takes a holistic approach to disaster management, resulting in a transition from response-based mechanisms to a proactive approach to disaster risk management.

The DMC is primarily responsible for the implementation of the National Disaster Management Plan and the National Emergency Operation Plan in accordance with the Act.

i. Ensuring that the various disaster management plans prepared by ministries, government departments, or public corporations conform to the National Disaster Management Plan;

1. Preparing and implementing programs and plans for disaster preparedness, mitigation, prevention, relief, rehabilitation, and reconstruction activities, and coordinating organizations that implement such programs and plans and obtain financial assistance from the Treasury for such activities; and a.

2. issuing instructions and guidelines to appropriate organizations, non-governmental organizations, district secretaries, and divisional secretaries regarding activities related to disaster management and initiating and implementing work programs in coordination with these organizations and secretaries.

Technical Support Functions: The PDNA requires assistance with a number of essential functions. Among them is technical support for essential functions like logistics procurement, information and communication technology (ICT), data compilation and management, geographic information system (GIS) and mapping, logistics arrangements, administration, financing, interpretation and translation, etc. Each irrigation institution is required to provide this assistance through its general and technical administration.

Report-Writing Function:

A key outcome of the PDNA is the report, which contains a recovery strategy and sector analysis. However, each irrigation institution and its members of the Institutional Coordination Team (ICT) are responsible for drafting the report. The final report will be written under the direction of senior National Coordination Team (NCT) members.

1. Compile and edit all institutional chapters;
2. Draft the overall PDNA report.
3. Incorporate irrigation institution feedback and complete the PDNA Report and Recovery Strategy.

Intervention of stakeholder agencies: The ERD will convene an internal meeting of UN agencies and development partners (typically the UN Office, EU, ADB, and World Bank) and government agencies. Representatives of the PDNA National Coordination Team will participate in the consultation meeting and define the objectives and roles of development partners within the coordination team and the respective sector teams. The NCT seeks assistance in resource sharing, including human (technical support), logistical, and financial resources. As this is a government-led process, the NBD will pay for the assessment, with assistance from development partners as required. In preparation for the assessment, the government may consult with UN agencies and development partners on the scope of the irrigation sector assessment, cross-sectoral requirements complemented by irrigation infrastructure, and other logistics.

Monitoring and evaluation (M&E): The progression of the PDNA and recovery process is monitored and compared to the expected outcomes. The ICTs conduct M&E at the institutional level, whereas the NCT is responsible for M&E at the national level. The duration is determined as necessary.

2.3.3.3 Roles and responsibilities of the PDNA Teams in the irrigation sector

A summary of the roles and responsibilities of each team is illustrated in Table 3.2.

Table 3.2 Roles and responsibilities of PDNA Teams

Coordination and Recovery Teams	**Primary role and Responsibilities**
National Coordination Team	Primary role: To coordinate with twelve (12) irrigation institutions and national-level decision-making agencies (NPD, NBD, and ERD) to more effectively manage irrigation infrastructure disasters through a clear comprehension of the roles and responsibilities of each stakeholder. It provides strategic direction for the PDNA at the national level in order to facilitate the provision of necessary resources and the realization of PDNA objectives by holding the following responsibilities: • To provide overall strategic direction for the PDNA. • To coordinate with institutional coordination teams • maintains communication and coordination with counterparts at the national level and with donor groups in the country. • Ensure the generation of a technically accurate and strategically sound PDNA report with comprehensive participation from key stakeholders. • Approve the draft and final report of the PDNA and Recovery Strategy for government submission and validation. • To lead and support the facilitation of resource mobilization for the Recovery Strategy's implementation, including inclusion in revised appeals and the organization of donor support.
Institutional Coordination Team	Primary role: To manage the PDNA planning, implementation, and coordination, as well as the development of the Recovery Strategy at the institutional level, by assuming the following responsibilities: • Arranging all preparations to support the PDNA (logistics, human resources, etc.); • supporting and facilitating the PDNA orientation and training workshop when the Divisional Recovery Team arrives; • Conduct training workshops for the Divisional Recovery Team by defining the objectives and expected results of the PDNA, the guiding principles, geographic areas, and cross-sectors to be coordinated, the methodology applied, and information collection instruments, as well as all other necessary arrangements; • To ensure a coordinated and consistent approach throughout the entire PDNA process, including field visits; • To ensure that all PDNA principles are accepted and adhered to; • To manage the budget, resources, work plan, and timeline of the PDNA;

	• To organize a consultation process for developing the recovery strategy; to ensure the necessary cross-sectoral, theme-based, and area-based consultation and analysis to provide a solid basis for the prioritization of recovery strategies across sectors; • Manage and supervise the drafting, validation, and final revision of the PDNA Report; • Coordinate with the National Coordination Team; • draft the recovery strategy for their respective irrigation institutions.
Divisional Recovery Team	Primary role: Responsible for implementing the PDNA and developing the divisional recovery plan. • To compile and integrate data on the effect and impact of disasters in accordance with the PDNA and Recovery Guide; • to choose the method of data collection; • To collect baseline field data and ancillary data as outlined in the PDNA and Recovery Guide; • To collect any other necessary primary data; • To process and analyze data and assessment results; • To write the unit assessment reports, including the proposed priority recovery requirements;

2.3.4 Arrangements for the PDNA execution

As soon as the need for a PDNA is confirmed, preparations should be made, particularly in the following areas:

1. Human resource arrangements
2. logistics arrangements
3. The budget and resource mobilization
4. The PDNA's training provisions

The necessary arrangements for each of these preparatory procedures are described.

Human Resource Arrangements: Personnel needs must be determined for the Divisional Recovery Teams, the Institutional Coordination Team, for technical support and report writing, as well as for government ministries or the National Coordination Team (as proposed), which may require additional support.

The irrigation sector PDNA would necessitate irrigation specialists identified by each irrigation institution. In addition to the methodology and scope of the assessment, personnel requirements are also determined by these factors. For instance, the number of field surveyors required to conduct on-site investigations of damaged structures In addition to sector-specific needs, personnel may also be required to assist with coordination, management, etc. Utilizing retired irrigation industry professionals is more convenient. Staff who may be required to support the PDNA process should receive adequate training in capacity-building.

Logistical Arrangements: Logistical considerations include office infrastructure or a functional location for PDNA personnel and management, the required transport and travel arrangements for conducting the PDNA, including tools and instruments required for field surveys, procurement, ICT, and similar arrangements. The extent of logistical support required depends on the magnitude of the disaster and the size of the afflicted area, as well as their accessibility and distance from the PDNA teams' central location.

For local transportation, logistical arrangements must be made. The government sector employs local drivers because they are familiar with local access roads. Other logistical considerations include communications, office apparatus and supplies, and provisions for data acquisition, translation, interpretation, printing, and distribution, as well as editing and formatting. These arrangements fall under the purview of individual irrigation institutions. Digitalized, updatable, pre-disaster baseline information shall be made available.

The PDNA Budget and Mobilizing Resources Estimating the PDNA's resource requirements and mobilizing the necessary resources to conduct the task is a significant undertaking. At this point, organizations are responsible for covering their participation costs. However, the next phase, the PDNA, necessitates an influx of resources. The department of the national budget should evaluate the following major budget lines and costs:

1. Human resources, management, and coordination needs;
2. Logistical arrangements;
3. Training/workshop expenses;
4. Consultative and planning activities;
5. Workshops, meetings, and conferences
6. Administration.

The PDNA Training: Training in the Development of Pre-Disaster Baseline Information, PDNA and Recovery Strategies, and the Disaster Recovery Framework are the three primary training sessions that enhance the capacity of the staff of irrigation institutions and other stakeholder agencies involved in the disaster management process. Each training session for a new group of senior officials from all twelve irrigation institutions, including NPD and NBD, will last approximately one and a half days. Such training sessions shall be incorporated into the institution's annual training program. The effectiveness of training sessions organized by one irrigation institution for the participants of other institutions will be enhanced by the participants' ability to share their sector-wide expertise. In addition, a one-day training program comprising the four modules listed below has been developed and made available.

- Module 1: Disaster Recovery Methodology
- Module 2: Preparedness for Recovery
- Module 3: Assessment of Post-Disaster Needs
- Module 4: Recovery Strategy Development Based on Post-Disaster Need Assessment

Given the diversity of participants in the PDNA, it is essential to organize a team-wide session to debate and agree upon a common strategy and work plan. The institutional coordination team may organize and lead a half-day workshop as a refresher session. The workshop would provide participants with an introduction to the PDNA methodology. It is possible to utilize pre-prepared training materials on the PDNA process, such as pre-disaster baseline data, damage and loss evaluation, recovery strategy, etc. prioritizing

2.3.5 Data collection and analysis

Desk review: In order to initiate the data collection process, the Divisional Recovery Team must collect and analyze quantitative baseline data regarding past enhancements to the irrigation infrastructure in question. Additionally, the team accumulates supplementary information regarding the command area, farmer families who benefit from the irrigation scheme, and the community protected by FPSs. This data helps to define the country's pre-disaster conditions and also provides the quantitative foundation for comparing pre- and post-disaster conditions. Preparedness and regular updates of pre-disaster baseline data reduce response time. The Divisional Secretariat can provide access to social data.

Primary data collection through field assessment The operational staff of the irrigation institutions, including engineers, engineering assistants, technical assistants, field assistants, water delivery and operation staff, and representatives of agricultural organizations, collects data on damage and loss. The irrigation field staff's familiarity with irrigation water management and construction activities qualifies them to carry out this task. In addition to the collection of secondary data, field visits are planned to acquire and validate the data. In addition, the farmer organizations have been in close and consistent contact with the irrigation personnel, and the validation procedure is straightforward. However, such a system has not been implemented for FPSs.

Prioritizing needs: The service provided by the irrigation sector is determined by the interrelated extent of farmland benefited and the number of agricultural families benefited. Locally damaged irrigation infrastructure decreases the farmers' income and consequently affects their ability to sustain themselves. Additionally, agricultural communities are indirectly impacted. These demands are evaluated by the social sector in order to organize relief services. The irrigation infrastructure's water storage or water regulation stabilizes the subsurface water table, thereby stabilizing the downstream environment. These effects are accounted for as cross-sectoral requirements in the social sector. As a subsector of the infrastructure sector, the irrigation sector prioritizes infrastructure restoration for its requirements. This is consistent with the "rehabilitation of irrigation infrastructure" section of the national development plan. However, if the recovery of damaged infrastructure is supported by the requirements of its complementary sectors, such as the agricultural economy, the restoration of rural livelihoods, and environmental sustainability, economic returns on rehabilitation investments are enhanced. Since all irrigation institutions operate as distinct entities, the National Coordination Team can conduct an assessment at the sector level.

Data analysis and compilation: After the field visits and desk evaluation have been completed, the PDNA team will need to consolidate, analyze, and interpret the collected data. Damages to the irrigation infrastructure are quantified by analyzing the cost of recovery. Restoring Back The PDNA's primary focus is on improving concepts. The loss information is analyzed in monetary terms and factored into the budget. Since the irrigation sector complements other sectors by providing irrigation water storage, regulation, and delivery, cross-sectoral data increases the importance of infrastructure requirements for irrigation. In addition, FPSs provide protection for humans, industries, transportation, and the environment, among others. to identify intersectoral connections and issues. The macroeconomic and human development data will then be aggregated, if available. This analysis is crucial to the success of the PDNA because it transforms data into credible and compelling evidence that informs national decision-makers and international donor partners about the recovery of the irrigation sector.

2.3.6 Formulating an irrigation sector recovery strategy

The Recovery Strategy is a component of the PDNA and its primary objective. This section provides a concise summary of the procedure followed to develop the Recovery Strategy. The Institutional Coordination Team facilitates the development of the Recovery Strategy under the supervision of the National Coordination Team.

The steps to developing the Recovery Strategy are as follows:

1. Define the vision for irrigation sector recovery and the strategy for recovery actions within the irrigation sector;
2. Define clear objectives and interventions that point the way to expected results and help in defining the timeframe;
3. Define the priority of needs.
4. Define the cost of the recovery process;
5. Conduct stakeholder consultations with the national level (NPD, NBD, ERD, DMC), international agencies (UN agencies, donor partners), and irrigation institutions to present the Recovery Strategy and validate the priorities and needs of the recovery and reconstruction roadmap.

The core elements included in a Recovery Strategy are summarized in Table 3.3.

Table 3.3 Core elements included in the recovery strategy

Recovery Needs	Vision & Guiding Principles	Recovery Plan	Implementation Arrangements
The outline of recovery needs to be based on the results of the PDNA: • For reconstruction of damaged irrigation infrastructure and physical assets • For resumption of: (a) production complemented by the irrigation infrastructure, and service delivery; and (b) access to goods and services • For restoration of governance and decision-making processes • To reduce risk and build back better	The agreed vision aligned with National development goals and guiding principles for the overall recovery process.	Outline of the results-based recovery plan: • Priority needs; • Interventions required; • Expected outputs; • Recovery Costs; • Intended outcomes	Outline of the arrangements for successful implementation of the Recovery Roadmap: • Partnerships, coordination among irrigation institutions and cross-sectors, and management; • Cross-cutting themes; • Links to development; • Resource mobilization; • Key assumptions and constraints

2.3.6.1 Drafting PDNA Report and Recovery Strategy

Once the PDNA is finalized and the Recovery Strategy is approved, it is the National Coordination Team's responsibility to consolidate the recovery plans produced by each irrigation institution. It is proposed that the team designated by the National Coordination Team compile recovery strategy reports prepared by each irrigation institution and finalize them as chapters of a single report that includes a sector summary.

For feedback and substantiation, the first draft should be shared with irrigation sector institutions and national-level state agencies (NPD, NBD, ERD, and DMC). This is essential not only for cross-checking and validation but also for reiterating the government's stewardship of the PDNA, the recovery strategy process, and the outcomes. All feedback should be incorporated into the final validated report, which should then be printed. The team designated by the National Coordination Team and endorsed by the National Government should complete the report on-site. The report should provide an integrated and coherent presentation of all assessment results and the recovery strategy. It should guarantee quality and reflect the agreements reached between the government and donors. This report is essential for resource mobilization and any donor conference that may be planned as part of the strategy to mobilize resources.

2.3.6.2 Towards a Recovery Framework

The framework for recovery discusses institutional arrangements, financial mechanisms, and implementation procedures. Through the development of a recovery framework, the recovery strategy developed during the PDNA exercise provides the basis for more comprehensive recovery planning. The Recovery Framework extends stakeholder engagement and the recovery planning process well beyond the PDNA by building on the PDNA's broad strategy.

It is suggested that the PDNA be conducted as efficiently as feasible in order to maximize its utility in guiding recovery. The relatively brief duration of the assessment does not permit a detailed recovery planning exercise, and the majority of constraints (such as the available financing envelope) cannot be determined until after the assessment results are known.

Annex 1: Sample Template: Pre-Baseline Information including provisions for damage assessment

1. General Information

1	**Technical and Service Information**		
	Name of the Scheme		
	Type		
	Category	**(Major/Medium/Minor)**	
	Command area (ha)		
	Capacity (for Tank in MCM)		
	Beneficiaries	**Farmer families/families protected by FPS**	
	Functionality at present	**Fully/Partially/Not - Functioning**	
	Any other details (if required)		
2	**Administrative Information**		
	Managing Agency		
	Name of the Scheme National-level coordination by		
	Regional Administration by		
	The operation, maintenance, and construction Division		
3	**Topographical Information**		
	Coordinates (GPS/Metric/Tank)		
	Operational division of Engineer or DTO of DAD		
	Province		
	District		
	DS Division		
4	**Hazard Information**		
	Occurrence of extreme flood events	**Year**	**Month**
	Observed Peak-Flood	**Below HFL/ Between HFL and BTL/Above BTL**	

2. Major Tank

Pre-Disaster Baseline Data: Guiding Tool for Damage Assessment							Post-Disaster Damage Assessment					
Structural Components				Rebuilding Cost (Pre-Disaster)			Post Disaster Damage					
				Unit	Functionality (Good/Average/ Poor)	Cost (LKR)	Unit	Damage	Functionality (G/A/P)	Guesstimated Cost (LKR)	Remarks
1	**Major Tank**											
	1.1	**Headworks**										
		1	Bund	1 km								
		2	Riprap	1 km								
		3	Bund Road	1 km								
		4	Spill	01 No								
		5	Sluice-RB	01 No								
		6	Sluice-LB	01 No								
		7	Other structures	01 No								
	1.1	**Conveyance System**										
	1.2.2	**Main Canal**										
		1	Main Canal RB (Lined)	1 km								
		2	Main Canal LB (Lined)	1 km								
		3	Main Canal RB (Earthen)	1 km								
		4	Main Canal LB (Earthen)	1 km								
		5	Main Canal service road RB (Gravel)	1 km								

		6	Main Canal service road RB (Asphalt)	1 km							
		7	Main Canal service road LB (Gravel)	1 km							
		8	Main Canal service road LB (Asphalt)	1 km							
		9	Retaining walls (Concrete)	25 m							
		10	Retaining walls (RR Masonry)	25 m							
		11	Retaining walls (Gabion)	25 m							
		12	Regulators	01 No							
		13	Turn out structure	01 No							
		14	Bridges	01 No							
		15	Siphons	01 No							
		16	Bathing steps	01 No							
		17	Over crossings	01 No							
		18	Under crossings	01 No							
		19	Drainage outlets	01 No							
		20	Side spill ways	01 No							
		21	Other structures	01 No							
	1.2.2	**Branch Canal**									
		1	Branch Canal RB (Lined)	1 km							

		2	Branch Canal LB (Lined)	1 km							
		3	Branch Canal RB (Earthen)	1 km							
		4	Branch Canal LB (Earthen)	1 km							
		5	Branch Canal service road RB (Gravel)	1 km							
		6	Branch Canal service road RB (Asphalt)	1 km							
		7	Branch Canal service road LB (Gravel)	1 km							
		8	Branch Canal service road LB (Asphalt)	1 km							
		9	Retaining walls (Concrete)	25 m							
		10	Retaining walls (RR Masonry)	25 m							
		11	Retaining walls (Gabion)	25 m							
		12	Regulators	01 No							
		13	Turn out structure	01 No							
		14	Bridges	01 No							
		15	Siphons	01 No							
		16	Bathing steps	01 No							
		17	Over crossings	01 No							

		18	Under crossings	01 No							
		19	Drainage outlets	01 No							
		20	Side spill ways	01 No							
		21	Other structures	01 No							
	1.2.3	**Distribution Canals**									
		1	D Canal (Lined)	500 m							
		2	D Canal (Earthen)	500 m							
		3	Service Road	500 m							
		4	Turn out structures	01 No							
		5	Drop Structures	01 No							
		6	Other Structures	01 No							
	1.2.4	**Field Canals**									
		1	F Canal (Lined)	500 m							
		2	F Canal (Earthen)	500 m							
		3	Service Road	500 m							
		4	Turn out structures	01 No							
		5	Drop Structures	01 No							
		6	Other structures	01 No							

3. Medium Tank

Pre-Disaster Baseline Data: Guiding Tool for Damage Assessment							Post-Disaster Damage Assessment				
Structural Components				Rebuilding Cost (Pre-Disaster)			Post Disaster Damage				
				Unit	Functionality (Good/Average/ Poor)	Cost (LKR)	Unit	Damage	Functionality (G/A/P)	Guesstimated Cost (LKR)	Remarks
2	**Medium Tank**										
	2.1	**Headworks**									
		1	Bund	1 km							
		2	Riprap	1 km							
		3	Bund Road	1 km							
		4	Spill	01 No							
		5	Sluice-RB	01 No							
		6	Sluice-LB	01 No							
		7	Other structures	01 No							
	2.1	**Conveyance System**									
	2.2.2	**Main Canal**									
		1	Main Canal (Lined)	1 km							
		2	Main Canal (Earthen)	1 km							
		3	Main Canal service road (Gravel)	1 km							
		4	Main Canal service road (Asphalt)	1 km							
		5	Retaining walls (Concrete)	25 m							

		6	Retaining walls (RR Masonry)	25 m							
		7	Retaining walls (Gabion)	25 m							
		8	Regulators	1 No							
		9	Turn out structure	1 No							
		10	Bridges	1 No							
		11	Siphons	1 No							
		12	Bathing steps	1 No							
		13	Over crossings	1 No							
		14	Under crossings	1 No							
		15	Drainage outlets	1 No							
		16	Side spillways	1 No							
		17	Other structures	1 No							
	2.2.3	**Distribution Canals**									
		1	D Canal (Lined)	500 m							
		2	D Canal (Earthen)	500 m							
		3	Service Road	1 km							
		4	Turn out structures	1 No							
		5	Drop Structures	1 No							
		6	Other Structures	1 No							
	2.2.4	**Field Canals**									
		1	F Canal (Lined)	500 m							
		2	F Canal (Earthen)	500 m							
		3	Service Road	500 m							

		4	Turn out structures	1 No							
		5	Drop Structures	1 No							
		5	Other Structures	1 No							

4. Minor Tank

Pre-Disaster Baseline Data: Guiding Tool for Damage Assessment							**Post-Disaster Damage Assessment**				
Structural Components				**Rebuilding Cost (Pre-Disaster)**			**Post Disaster Damage**				
				Unit	**Functionality (Good/Average/ Poor)**	**Cost (LKR)**	**Unit**	**Damage**	**Functionality (G/A/P)**	**Guesstimated Cost (LKR)**	**Remarks**
3	**Minor Tank**										
	3.1	**Headworks**									
		1	Bund	1 km							
		2	Riprap	1 km							
		3	Bund Road	1 km							
		4	Spill	01 No							
		5	Sluice-RB	01 No							
		6	Sluice-LB	01 No							
		7	Other structures	01 No							
	3.2	**Distribution Canals**									
		1	D Canal (Lined)	100 m							
		2	D Canal (Earthen)	100 m							
		3	Service Road	500 m							
		4	Turn out structures	1 No							
		5	Drop Structures	1 No							
		6	Other Structures	1 No							

	3.3	**Field Canals**									
		1	F Canal (Lined)	100 m							
		2	F Canal (Earthen)	100 m							
		3	Service Road	500 m							
		4	Turn out structures	1 No							
		5	Drop Structures	1 No							
		6	Other Structures	1 No							

5. River Diversion Scheme (Trans-basin Canal)

Pre-Disaster Baseline Data: Guiding Tool for Damage Assessment							Post-Disaster Damage Assessment				
Structural Components				Rebuilding Cost (Pre-Disaster)			Post Disaster Damage				
				Unit	Functionality (Good/Average/ Poor)	Cost (LKR)	Unit	Damage	Functionality (G/A/P)	Guesstimated Cost (LKR)	Remarks
4	**River Diversion**										
	4.1	**Headworks**									
		1	Diversion weir	1 No							
		2	Regulator RB	1 No							
		3	Regulator LB	1 No							
		4	Flank Bunds	500 m							
		5	Other structures	1 No							
	4.2	**Conveyance System**									
	4.2.2	**Main Canal**									
		1	Main Canal (Lined)	1 km							
		2	Main Canal (Earthen)	1 km							

		3	Main Canal service road (Gravel)	1 km						
		4	Main Canal service road (Asphalt)	1 km						
		5	Retaining walls (Concrete)	25 m						
		6	Retaining walls (RR Masonry)	25 m						
		7	Retaining walls (Gabion)	25 m						
		8	Regulators	1 No						
		9	Turn out structure	1 No						
		10	Bridges	1 No						
		11	Siphons	1 No						
		12	Bathing steps	1 No						
		13	Over crossings	1 No						
		14	Under crossings	1 No						
		15	Drainage outlets	1 No						
		16	Side spillways	1 No						
		17	Other structures	1 No						
	4.2.3	**Branch Canal**								
		1	Branch Canal (Lined)	1 km						
		2	Branch Canal (Earthen)	1 km						

		3	Branch Canal service road (Gravel)	1 km							
		4	Branch Canal service road (Asphalt)	1 km							
		5	Retaining walls (Concrete)	25 m							
		6	Retaining walls (RR Masonry)	25 m							
		7	Retaining walls (Gabion)	25 m							
		8	Regulators	1 No							
		9	Turn out structure	1 No							
		10	Bridges	1 No							
		11	Siphons	1 No							
		12	Bathing steps	1 No							
		13	Over crossings	1 No							
		14	Under crossings	1 No							
		15	Drainage outlets	1 No							
		16	Side spillways	1 No							
		17	Other structures	1 No							
	4.2.4	**Distribution Canals**									
		1	D Canal (Lined)	500 m							
		2	D Canal (Earthen)	500 m							
		3	Service Road	500 m							
		4	Turn out structures	1 No							

		5	Drop Structures	1 No							
		6	Other Structures	1 No							
	4.2.5	**Field Canals**									
		1	F Canal (Lined)	500 m							
		2	F Canal (Earthen)	500 m							
		3	Service Road	500 m							
		4	Turn out structures	1 No							
		5	Drop Structures	1 No							
		6	Other Structures	1 No							

6. Anicut (Diversion Weir)

Pre-Disaster Baseline Data: Guiding Tool for Damage Assessment							**Post-Disaster Damage Assessment**				
Structural Components				**Rebuilding Cost (Pre-Disaster)**			**Post Disaster Damage**				
				Unit	**Functionality (Good/Average/ Poor)**	**Cost (LKR)**	**Unit**	**Damage**	**Functionality (G/A/P)**	**Guesstimated Cost (LKR)**	**Remarks**
5	**Anicut**										
	5.1	**Headworks**									
			Regulator Structure	1 No							
			Gates	1 No							
			Flank Bunds	100 m							
			Turn-out structure RB	1 No							
			Turn-out structure LB	1 No							
			Other structures								

	5.2	**Conveyance System**									
	5.2.2	**Main Canal**									
		1	Main Canal RB (Lined)	100 m							
		2	Main Canal RB (Earthen)	100 m							
		3	Main Canal LB (Lined)	100 m							
		4	Main Canal LB (Earthen)	100 m							
		5	Main Canal service road RB (Gravel)	100 m							
		6	Main Canal service road RB (Asphalt)	100 m							
		7	Main Canal service road LB (Gravel)	100 m							
		8	Main Canal service road LB (Asphalt)	100 m							
		9	Retaining walls (Concrete)	25 m							
		10	Retaining walls (RR Masonry)	25 m							
		11	Retaining walls (Gabion)	25 m							
		12	Regulators RB	1 No							
		13	Regulators LB	1 No							

		14	Turn out structure	1 No							
		15	Bridges RB	1 No							
		16	Bridges LB	1 No							
		17	Siphons RB	1 No							
		18	Siphons LB	1 No							
		19	Bathing steps	1 No							
		20	Over crossings RB	1 No							
		21	Over crossings LB	1 No							
		22	Under crossings RB	1 No							
		23	Under crossings LB	1 No							
		24	Drainage outlets RB	1 No							
		25	Drainage outlets RB	1 No							
		26	Side spillways RB	1 No							
		27	Side spillways LB	1 No							
		28	Other structures	1 No							
	5.2.3	**Distribution Canals**									
		1	D Canal (Lined)	100 m							
		2	D Canal (Earthen)	100 m							
		3	Service Road	100 m							
		4	Turn out structures	1 No							
		5	Drop Structures	1 No							

		6	Other Structures	1 No							
	5.2.4	**Field Canals**									
		1	t F Canal (Lined)	100 m							
		2	F Canal (Earthen)	100 m							
		3	Service Road	100 m							
		4	Turn out structures	1 No							
		5	Drop Structures	1 No							
		c	Other Structures	1 No							

7. Flood Protection Schemes (FPS), Salt Water Exclusion Schemes, River Bank Protection, and Buildings

Pre-Disaster Baseline Data: Guiding Tool for Damage Assessment							Post-Disaster Damage Assessment				
Structural Components				Rebuilding Cost (Pre-Disaster)			Post Disaster Damage				
				Unit	Functionality (Good/Average/ Poor)	Cost (LKR)	Unit	Damage	Functionality (G/A/P)	Guesstimated Cost (LKR)	Remarks
6	**Flood Protection Schemes**										
		1	Pump house	1 No							
		2	Pumps	1 No							
		3	Flood Bund	1 km							
		4	Drainage Canals	1 km							
		5	Flood Control Regulators Regulators	1 No							
		6	Drainage Structures	1 No							
		7	Retaining Walls (Concrete)	25 m							

		8	Retaining Walls (Masonry)	25 m							
		9	Retaining Walls (Gabion)	25 m							
		10	Other structures	1 No							
7	**Salt Water Exclusion Schemes**										
		1	Sea water Control Regulators	1 No							
		2	Flood Bunds	100 m							
		3	Drainage Canals	100 m							
		4	Drainage Structures	1 No							
		5	Retaining Walls (Concrete)	25 m							
		6	Retaining Walls (Masonry)	25 m							
		7	Retaining Walls (Gabion)	25 m							
		8	Other structures	1 No							
8	**River Bank Protection**										
		1	Retaining Walls (Concrete)	50 m							
		2	Retaining Walls (Masonry)	50 m							
		3	Retaining Walls (Gabion)	50 m							
		4	Sheet Piling	50 m							
		5	Other structures	1 No							

9	**Buildings**										
		1	Residential Units	1 No							
		2	Office Units	1 No							
		3	Field Units	1 No							
		4	Any other	1 No							

Annex 2: Sample Templates for Loss Assessment

The following data shall be included in the pre-disaster baseline information for future use

Type of Loss	Possible temporary measures (Irrigation sector)	Anticipated expenses for taking temporary measures (LKR)		
		Imminent a hazardous event	During a hazardous event	Followed by a disaster
a. Cost incurred for re-establishing governance and decision-making processes	Rectifying interruption to a communication network and other internal utility services		√	
	The formalizing decision-making process to arrange operational works	√	√	
	Hiring transport, machinery, and equipment for emergency operations	√	√	√
	Expert consultation including hiring additional staff			

b. Re-opening of disrupted access to goods and services	Providing temporary access by rehabilitating damaged sections of by-pass Providing temporary transport as necessary Making temporary arrangements to provide irrigation water deliveries (e.g. providing coffer dams) Making temporary arrangements to close a breached part of a spillway, anicut, or any other structure to re-start service delivery		√ √ √ √	√ √ √
c. Reducing the potential risk that may increase	Public awareness by starting early warning (preparedness stage) Placing sandbags where unusual seepage appears to control damages (response phase) Placing sandbags at either side of breached sections (dams, canal bunds) to control further damages as an early recovery (recovery phase) Cleaning sand barriers formed at sea-outfall of rivers to drain out stagnant upstream flood water (response phase) Cleaning debris stuck between piers of canal/river structures to reduce upstream floods (response phase)	√ √	√ √ √ √ √	 √ √ √ √
Subtotal				
Total High Operational Cost (imminent+ during+ followed by)				

Annex 3 Sample Template: Cross-Sectoral data support for prioritizing needs

The following data shall be included in the pre-disaster baseline information for future use

	Damage/Loss	GN Division	Extent/No	Sector	Sub-sector
1	Damaged paddy area (Ha)			Productive	Agriculture
2	Damaged non-paddy area (Ha)			Productive	Agriculture
3	Loss of harvest (or potential loss)			Productive	Agriculture
4	Affected paddy mills			Productive	Industry
5	Affected agro-industries			Productive	Industry
6	Interruption to safe water (provided water source is irrigation scheme)			Infrastructure	Water supply
7	Interruption to electricity (provided water source is irrigation scheme)			Infrastructure	Electricity
8	Obstruction to Public transport (provided public road aligned over-irrigation bund)			Infrastructure	Transport
9	Environmental damage (depletion of water table, pollution of environment)			Social	Environment
10	Damaged houses of the farmer community			Social	Social Services
11	Affected farmer families			Social	Social Services
12	Affected males, females, and disabled persons in farmer families			Social	Social Services
13	Affected school children of farmer families			Social	Education

Annex 4 Ancillary data

The following data shall be included in the pre-disaster baseline information for future use

	Type of Ancillary data	Description
1	Potential financial strategies for recovery	The financial resources used to recover from previous natural disasters may be repurposed to meet current requirements. Possibility of incorporating recovery requirements with ongoing development funds may aid in meeting immediate recovery needs
2	Information on development policies and strategies for recovery	From the recovery planning phase to the recovery implementation phase, information on recovery policies, procedures, standing orders, emergency operation plans, national disaster management plans, and international guidelines is useful.
3	Expenditure incurred in the past	The documentation of previous construction activities will provide the recovery planning team with a clear picture of the construction history of the irrigation infrastructure.

Tool Kit for executing the PDNA process for the irrigation infrastructure sector

1. Sample TOR: For PDNA

1 Background

The Disaster Event and Characterization of Impact

A brief description of the disaster effects and the available preliminary impact figures.

This should include the irrigation infrastructure sector and complementing sectors and geographic areas, urgent needs and priorities, vulnerable irrigation structure, current and planned responses of the irrigation institutions, Government, and International partners

The role of line ministries, DMC for the assessment

If available, include a description of the disaster risk typology of the affected area and any information about previous/recent disaster events

2 Objectives of the Assessment

The primary objective of the PDNA is to assist irrigation institutions, national-level government institutions (NPD, NBD, ERD, and DMC), in-country representatives of UN agencies, and potential donors in assessing the impact of hazardous events and defining a strategy for recovery, including its financial costs: (a) to complete rehabilitation and reconstruction of irrigation infrastructure; (b) to restore irrigation water deliveries that will reestablish farmer livelihoods; and (c) to restore irrigation water deliveries that will reestablish agricultural production.

The specific objectives of the PDNA could be as follows are:

i Assess the damage and loss of irrigation infrastructure (including FPSs) caused by extreme climate events in order to develop a recovery strategy and early, medium, and long-term recovery and reconstruction requirements with costs and a timeline according to a predetermined sector format.

ii Ensure that recovery strategies incorporate concepts of disaster risk reduction, "building back better", environmental concerns, governance, gender, employment, and livelihood issues.

iii Estimate the overall impact of the hazardous event on the irrigation infrastructure that supports social protection, national economic development, and affected cross-sectors.

iv Recommend and define a strategy for Disaster Risk Management in the country by prioritizing needs

3 Deliverables of the PDNA

i A damage and loss report of the irrigation infrastructure caused by effects and impacts of hazardous events following a pre-agreed format by sector institutions and national-level decision-making institutions including DMC

ii A recovery strategy with early medium- and long-term needs by costs and timeline for the irrigation sector

iii A disaster risk management strategy adapting the Building Back Better concept

4 Coordination of the PDNA

The PDNA exercise will be led by the Government of Sri Lanka under the oversight of the NPD, NBD, ERD, DMC, Irrigation Institutions, and relevant line ministries. The PDNA is coordinated by National Coordination Team:

- The National Coordination Team will be formed with a team of technical experts representing NPD, NBD, ERD, DMC, Irrigation Institutions, relevant line ministries, and the Finance Commission. The DMC is recommended as the focal point of the National Coordination Team.
- The National Coordination Team supported by in-country representatives from the United Nations (UN) System, and donor partners will provide overall direction to the PDNA.

The Institutional Coordination Team of each irrigation institution performs institutional-level coordination.

5 Methodology for the Assessment

- The methodology adheres to international best practices for the assessment of the irrigation infrastructure damages and losses followed by seasonal extreme flood events.
- The methodology will include a comprehensive assessment of the effects and impact of the disaster from the irrigation scheme (including FPSs) to the state level, combining complementary impacts of agriculture sector productivity, the livelihood of farmer community, and others engage with agro-base industries representing the social sector and financial aspects of the effects of the disasters.
- The assessment will take into consideration early recovery requirements as well as longer-term rehabilitation and reconstruction needs.
- The assessment includes the identification of increased residual disaster risk of irrigation infrastructure and taking engineering measures to control the unmanaged risk.
- The assessment includes the identification of the capacity of irrigation staff and farmer organizations and taking management measures to strengthen the capacity of stakeholders
- The assessment will update the pre-disaster baseline information established on a common and digital format as agreed by all irrigation institutions incorporating newly observed data caused by the disaster.

The assessment will have the following phases:

i. Training phase:

A day workshop was organized and facilitated by the Institutional Coordination Team to enhance the capacity of the Divisional Recovery Team.

ii. Preparatory and Desk Review Phase:

The desk reviews will be carried out to analyze and compile all available baseline information for the irrigation sector, identify gaps in baseline data, and to also identify various data sources for the collection of both baseline and damage and losses data.

iii. Field Visits:

To update gaps in past data, collect present damage and loss data. The operational staff of the irrigation institutions including engineers, engineering assistants/technical assistants, field assistants, water delivery and operation staff, and representatives of farmer organizations will participate.

The team also collects ancillary data about the command area, farmer families benefiting from the irrigation scheme, and the community protected by the FPSs.

Social data can be collected from the Divisional Secretariat.

iv. Data Analysis and Development of sector reports:

The Field visit will be followed by a review and analysis of the data by Institutional Coordination Teams to prepare the draft institutional reports including impact, damage, losses, and needs.

- Costing of recovery analyzing damaged data of the irrigation infrastructure adapting the Building Back Better concept is the prime concern of the PDNA. The loss data is analyzed in monetary terms and incorporated for budgeting.
- Cross-sectoral data enhance the priority of irrigation infrastructure needs since the irrigation sector complements other sectors by providing irrigation water storage, regulation, and delivery.
- FPSs provide human protection, industry protection, transport protection, and environmental protection, among others. to identify linkages and issues that cut across sectors.
- The macroeconomic and Human development data will then aggregate subject to availability.

v. Final consultations and Report writing:

The Coordination Teams consolidate the reports and elements of the irrigation infrastructure of the Recovery Strategy produced by the respective irrigation institution, aided by the writer(s) and editor.

It is proposed to compile recovery strategy reports prepared by each irrigation institution and finalize them as chapters of one single report including sector summary by the team appointed by the National Coordination Team (Recommended national coordinating agency).

2. Sample TOR: National Coordination Team

1 Composition

Senior managers of NPD, NBD, ERD, and DMC (director-level Officers), line Ministries of the irrigation institutes and the Ministry of Provincial Councils and Local Government (Additional Secretary to director-level officers), Heads of Irrigation Institutions with Institutional Coordination Team leaders, and a representative of the Finance Commission are the key members. DG (DMC) is the team leader.

Decision-making support functions should include high-level representations that include NPD, NBD, ERD, DMC, line ministries of irrigation institutions, the Finance Commission, and Irrigation Institutions, specialists. The areas of expertise and the number of staff needed will depend on the context of the disaster.

2 Primary role

To coordinate with twelve (12) irrigation institutions and national-level decision-making agencies (NPD, NBD, and ERD) to manage irrigation infrastructure disasters more effectively through a clear understanding of the roles and responsibilities of individual stakeholders. Compiling institutional reports to make a consolidated single

3 Key Activities

i. To arrange capacity-building programs for the institutional staff who handled the disaster management activities (the trained staff may be transferred within or outside the organization from time to time) to maintain the ability to handle the disaster recovery process, including risk management and crisis management.

ii. To provide overarching central guidance and support services to keep the recovery program on its planned course.

iii. To ensure relatively quick delivery of reconstruction deliverables and meeting targets.

iv. To evaluate the recovery needs with the national development plan

v. To review the priorities, they need to be evaluated by the institutions focused on contribution to the national economy, social impact, environmental impact, and risk reduction.

vi. To coordinate with national agencies (NPD, NBD, and ERD), line ministries, the finance commission, heads of ID, MASL, and DAD, and representatives of each provincial institution for finalizing the implementing phase of the recovery program, specifying short-term, medium-term, and long-term activities.

vii. Compiling institutional reports to make a consolidated single report, including separate chapters for each institution

4 Reporting

The National Coordination Team will report to the government.

3. Sample TOR: Institutional Coordination Team

1 Composition

The Institutional Coordination Team consists of senior engineers who have the authority to coordinate all operational-level units, an accountant, and an information management officer as key officers.

Institutional Coordination Team functions at the regional or district level should include specialists in Engineering Planning and Design, Procurement, information management, and report writing. The areas of expertise and the number of staff needed will depend on the context of the disaster.

2 Primary role

To manage the PDNA planning, implementation, and coordination and the development of the Recovery Strategy at the institutional level.

3 Key Activities

i Engineering planning & Design (Engineers):
To supervise Divisional Recovery Team while assessing the stability of critical structures affected by disaster and proposing risk-minimized rehabilitation/reconstruction adapting the BBB concept

ii Procurement (Engineers): Purchasing office supplies and equipment that may be needed to support the PDNA Team

iii Finance (Accountants): providing financial services to support the payment of local staff, locally-contracted consultants, and governmental per diems, as necessary

iv Information management support (Information Management Officer):
To make available GIS services, manage the PDNA virtual workspace, facilitate the collection and processing of PDNA digital data, and support the drafting of the PDNA Report (A separate TOR is given below)

v PDNA Report writing (Engineer)
To write PDNA report at the irrigation institutional level and coordinate with the head of the institution and National Coordination Team

4 Reporting

The Institutional Coordination Team reports to the head of the irrigation institution and participates in National Coordination meetings with the head of the institution.

4. Sample TOR: Information Management Specialist

1 Composition

Information Management Units including GIS operations, organizational web portals, and other ICT activities are functioning and operating at each government organization. The required service for disaster operations can be obtained from IM units after conducting an awareness program.

The IM specialist would participate as a member of the Institutional Coordination Team.

2 Primary role

For compiling, maintaining, and updating the PDNA information included in the pre-disaster baseline information, Damage and Loss assessment data, cross-sectoral data, and other ancillary data and information. Handling GIS data as necessary

3 Coordination

i Establish partnerships and coordinate with key information stakeholders, identify information systems, and collect information of relevance to the PDNA from local, district level, regional level, and national officials.

ii Coordinate with other institutional teams as required to ensure common procedures that facilitate data collection and processing.

iii Participate in Institutional Coordination Team meetings

4 Day-to-day Tasks

i In collaboration with stakeholders, compile information on recent surveys and assessment

ii Provide GIS mapping support to the PDNA as needed

iii Coordinate the preparation of meeting materials (background documents, maps, data, etc.)

iv Manage contact lists and facilitate the sharing of data and information among the National Coordination Team, Institutional Coordination Team, Divisional Recovery Team, and cross-sectoral focal points

v Participate in PDNA training workshops and lead in training components of information management such as the use of the pre-disaster baseline data and damage and loss assessment

5 Reporting

The IM specialist would report to the head of the Institutional Coordination Team

5. Sample TOR: Divisional Recovery Team

1 Composition

The Divisional Recovery Team consists of operational-level engineers, engineering assistants and technical officers, and other field assistants, including drawing office assistants and Agriculture Research and Production Assistants of the DAD, as key members.

Divisional Coordination functions at the operational level should include specialists in engineering operations, field investigating, damage and loss assessment, contract and construction administration, drawing office work, data and information collection and compilation, and report writing. The areas of expertise and the number of staff needed will depend on the context of the disaster.

2 Primary role

To carry out the PDNA and prepare the divisional-level recovery plan.

3 Key Activities

i Engineering operations (Engineers):

To lead the Divisional Recovery Team by assigning duties and allocating resources while assisting the Coordination Team. Assessing the stability of damaged structures affected by disaster and proposing risk-minimized rehabilitation or reconstruction, adapting the BBB concept

To take immediate precautions during the relief phase and early recovery measures (short-term) during the response phase.

To carry out damage and loss assessments with team staff

To make engineering judgments about the damaged irrigation structures during the damage assessment phase

To guide team staff in preparing detailed engineering estimates after receiving financial resources and carrying out the procurement process

To implement a medium- or long-term recovery program by supervising the Divisional Recovery Team.

ii Field investigation, damage, and loss assessment (Engineering Assistants/Technical Officers):

To carry out a preliminary investigation of damaged structures during the PDNA period.
To collect data and information from farmer organizations (In DAD, this is the responsibility held by the Agriculture Research and Production Assistants),

To prepare an initial empirical estimation during the PDNA period.

To prepare detailed engineering estimates

To supervise construction, including rehabilitation and reconstruction.

iii Drawing Office Operations (Drawing Office Assistants):

To prepare engineering drawings and quantification

4 Reporting

The Divisional Recovery Team reports to the head of the irrigation institution and the Institutional Coordination Team

6. Schedule for the PDNA

	PDNA Activities	Dates
1	Mobilize sector teams	
2	Orientation Training on PDNA methodology	
3	Data collection and field visits	
4	Data analysis and initial findings	
5	Needs assessments and prioritization	
6	Draft irrigation institution reports submission to National Coordination Team	
7	Consultative meeting with national-level decision makers, and Institutional Coordination Team, to finalize the damage and need assessment, recommendations on recovery strategy, etc.	
8	Presentation of the irrigation sector findings to the Government (NPD)	

7. Sample Template 1: PDNA Report (Guide for completing this section is provided at the end)

Part 1: PDNA Assessment Report

1 Name of the Irrigation Institution

2 Participants in PDNA

3 Period of PDNA

4 Executive Summary

5 Introduction

i Overview of the irrigation infrastructure
ii Purpose of the PDNA
iii Main Objective of the PDNA
iv Specific Objectives of the PDNA
vi Implementation Arrangements for starting the recovery process

6 Assessment of Disaster Effect

i General description of the disaster event, its geographical scope, and affected sectors.
ii Effects on irrigation infrastructure and physical assets
iii Disruption to:
- production complemented by the irrigation infrastructure, service delivery; and
- access to goods and services

iv Effects on governance and decision-making processes
v Effects on Risks and vulnerabilities

7 The total value of the effects of the disaster

i Value of total/partial destruction of infrastructure and assets
ii Value of changes in production complemented from the irrigation infrastructure, service delivery
Value of changes to providing access to goods and services
iii Value of changes to re-establishment governance and decision-making processes
iv Value of changes to reduce Risks and vulnerabilities

8 Assessment of disaster impact

This section summarizes in qualitative terms the impact of the disaster based on the assessment of the disaster effects, the sector development plans, lessons from past experiences, and the emerging concerns that derive from the events.

i Macro-economic impact
ii Human development impact

9 Cross-Sectoral linkages

The irrigation sector, being classified as a sub-sector of the infrastructure sector, complements other sectors, mainly the agriculture sector (productive) and the community protected (including assets) from FPSs (Social sector).

i Agriculture sector
ii Social Sector
iii Other Infrastructure sectors

8. Sample Template 2: Recovery Strategy (Guide for completing this section is provided at the end)

Part 2: Recovery Strategy

---

1 Executive Summary

---

2 Introduction

Recovery vision and guiding principles

i Vision
ii Guiding Principles

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3 Reconstruction and recovery needs including Build Back Better

Regional Basis: Irrigation Department, PID (Northern), PID (Eastern)

System Basis: Mahaweli Authority of Sri Lanka

District Basis: Other PIDs and DAD

NB. Cross-cutting issues, such as gender, age, etc., are to be considered under each heading where appropriate.

a) To repair or rebuild damaged infrastructure and physical assets: b) to restore to pre-disaster levels; and c) BBB for the reconstruction of infrastructure and physical assets where appropriate.

i Short-term needs
ii Medium-term needs
iii Long-term needs

The resumption of:

- production complemented by the irrigation infrastructure, service delivery; and
- access to goods and services
  Incorporating BBB where appropriate

i Short-term needs
ii Medium-term needs
iii Long-term needs

Re-establishment of governance and decision-making processes, incorporating BBB where appropriate

i Short-term needs
ii Medium-term needs
iii Long-term needs

To mitigate risks and vulnerabilities to future disasters incorporating BBB where appropriate

i Short-term needs
ii Medium-term needs
iii Long-term needs

4 Irrigation sector recovery strategy

Priority Recovery Needs	Interventions	Recovery Costs			Expected Outputs	Intended Outcomes
		Short Term	Medium Term	Long Term		
i						
ii						
iii						
iv						

5 Implementation Arrangements

i	Partnerships, coordination, and management arrangements to implement recovery
ii	Monitoring and evaluation
iii	Resource mobilization mechanisms
iv	

6 Assessment Methods

9. A brief guide for completing the template for the PDNA and recovery strategy report

Part 1: PDNA Assessment Report		
1	**Introduction**	
	i	Overview of the irrigation infrastructure: Pre-disaster baseline information provides such information as it includes information on sources and key documents used to determine pre-disaster conditions. Description of the Infrastructure and physical assets Description of benefits extended to the agriculture sector and agricultural community Risks and vulnerabilities of irrigation infrastructure, including existing preparedness plans Description of existing Governance and decision-making processes
	ii	Purpose of the PDNA. The purpose should include: Statement on the desired long-term recovery outcome in the sector (vision)
	iii	Main Objective of the PDNA. Refer section 1.7
	iv	Specific Objectives of the PDNA. Refer section 1.7
	v	Implementation Arrangements for Starting the Recovery Process (Detailing Resources, Forming Teams, etc.)

2	**Assessment of Disaster Effect**	
		General description of the disaster event, its geographical scope, and affected sectors
		Effects on irrigation infrastructure and physical assets: The damage assessment part of the DaLA will explain how a comparison can be made with pre-disaster baseline information. Damage: Value of total or partial destruction of infrastructure and assets
		Loss: Refer to Table 2.5 The value of changes in production is complemented by the irrigation infrastructure, service delivery, and access to services and goods. Value of changes to governance and decision-making processes (the operation cost incurred in addition to the cost incurred in the no-disaster situation) Value of changes to risks (cost incurred for taking immediate precautions to reduce the risk of vulnerable structures, if any, and cost incurred for taking early but temporary recovery actions that will be replaced in the future)
3	**Assessment of disaster impact**	
		This section provides a report on the aggregated economic (GDP and Balance of Payment) and human development impacts (Human Development Index). However, such national indicators are not evaluated focusing on a single event by the Central Bank or the Department of Census and Statistics. Impact assessment provides an analysis of the expected trend for the sector after the disaster and what could be the worst-case scenario, provided policy and programming measures are not considered. It identifies major challenges for the sector. This impact analysis is based on the assessment of the disaster effects, the sector development plans, lessons from past experiences, and the emerging concerns that derive from the events. The analysis of the impact of the disaster provides a medium- and long-term projection of the effects on the sector. The impact analysis forms the basis of the recovery strategy.
4	**Cross-Sectoral linkages**	
		The irrigation sector, a sub-sector of the infrastructure sector, complements the agriculture sector in terms of crop productivity by supplying irrigation water. The crop productivity will contribute to the livelihood of the agricultural community (the social sector), such as farmers and others engaging in agro-based industries. The FPSs protect the lives of the community (including their properties and other industries) from extreme flood events by reducing risk. Some irrigation infrastructure is used as access roads for public transport.

Part 1: PDNA Assessment Report		
1	Recovery vision and guiding principles Refer to section 2.9.2	
2	Reconstruction and Recovery Needs, including Build Back Better	
		I. This section defines the need for reconstruction and recovery: the need to restore and resume irrigation infrastructure to pre-disaster levels; the need to improve production, service delivery, and access to services and goods; and II. the need to strengthen DRM in the irrigation sector by improving the III. governance system and decision-making process. IV. mitigate future disaster risks and vulnerabilities All BBB interventions associated with the four headings listed above contribute to the resilience of irrigation infrastructure.
3	**The irrigation sector Recovery Strategy**	
		Prioritization and sequencing: This section describes the reconstruction and recovery requirements in terms of short-, medium-, and long-term priorities. It identifies the main interventions, outputs, and outcomes, as well as those interventions related to adapting BBB interventions. Consult Section 2.9.
4	**Implementation Arrangements**	
	i	This section describes and elaborates on recovery implementation partnerships, coordination, and administration arrangements.
	ii	This section proposes monitoring and evaluation mechanisms. It also includes a discussion of existing irrigation infrastructure development coordination mechanisms. It also describes potential mechanisms for resource mobilization.
	ii	This section provides a brief description of the recovery challenges (e.g., lack of financial resources) that may be encountered during the sector's implementation process and should be supported by key assumptions and constraints.
5	**Assessment methods**	
		This section provides a summary of the methods and sources used (primary and secondary data collection) and the analysis methodology. It also explains the methodology and assumptions used to estimate (empirically) the reconstruction and recovery requirements. Sections 2.3, 2.4, and 2.5 are relevant.

CHAPTER 03

STANDARD OPERATING PROCEDURES (SOPS) FOR DISASTER RECOVERY IN THE IRRIGATION SECTOR OF SRI LANKA

3.1 INTRODUCTION

The irrigation sector in Sri Lanka is keen to pursue disaster recovery planning to strengthen its capacity for planning for sustainable development. The Disaster Management Centre (DMC) Sri Lanka, with the facilitation of the ADB-UNDP project on Building Disaster-Resilient Infrastructure through Enhanced Knowledge, worked with the key irrigation sector institutions such as the Irrigation Department (ID), Mahaweli Authority of Sri Lanka (MASL), Department of Agrarian Development (DA), and the nine Provincial Irrigation Departments (PIDs) and recommended including disaster considerations into strengthening irrigation sector planning[1] . Post-Crisis Assessments and Recovery Planning methodologies such as Post Disaster Needs Assessment (PDNA) and Disaster Recovery Framework (DRF) were introduced, and the tripartite agreement of September 25, 2008, by the European Commission, the United Nations Development Group, and the World Bank guided this work.

3.2 PURPOSE

This document recommends procedures for the disaster recovery of irrigation infrastructure, taking policy and institutional context and practices in Sri Lanka into account. It describes processes and activities necessary to complete recovery tasks in accordance with national requirements while aligning with international disaster recovery guidelines.

Irrigation sector institutions are required to plan for recovery after (a) a nationally declared disaster event or (b) annual floods. This document proposes procedures for engaging in disaster recovery planning for each of these scenarios, taking into consideration their differences.

3.3 SCOPE

This document concentrates on the duties and responsibilities of various institutions and actors based on their legal mandates in the disaster recovery process, including the institutions of Sri Lanka's irrigation sector.

The SOPs shall focus on the assessment of damages incurred to the irrigation infrastructure due to natural disasters (i.e., floods), the analysis of consequent impacts on local people and economies, and corresponding recovery (rehabilitation and rebuilding) needs. This document considers two key scenarios:

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[1] Annex 1 details out roles of irrigation institutions in Sri Lanka

- Planning and implementing the recovery of irrigation infrastructure after a national-level disaster event
- Planning and implementing the recovery of irrigation infrastructure after a localized disaster event or regularly expected hazard events (i.e., annual monsoonal floods)

The SOPs are developed as a standalone document that describes steps and key actions required for post-disaster recovery planning and implementation, indicating responsible parties for each key action, while taking current legal, functional, and practical aspects of institutional management of the irrigation sector in Sri Lanka into account.

Separate documents titled Disaster Recovery Framework for Irrigation Sector Sri Lanka and Guidelines for Developing Disaster Recovery Framework for Irrigation Sector Sri Lanka are available to supplement this document and detail conceptual and practical guidance to engage in internationally accepted disaster recovery planning.

3.4 TARGET GROUP

The Standard Operating Procedures (SOPs) outlined in this document are intended to serve as a guide for officials of the institutions responsible for managing irrigation infrastructure and services in Sri Lanka, namely the Irrigation Department, the Mahaweli Authority of Sri Lanka, the Department of Agrarian Development, and the nine Provincial Departments of Irrigation in Sri Lanka. Officials of the relevant ministries (i.e., the Ministry of Irrigation and the Ministry of Agriculture) and other government institutions such as the National Planning and Budget Departments and the Disaster Management Center, as well as development partners and civil society organizations that partner with and assist in disaster recovery processes, are also expected to refer to this document.

Depending on the magnitude and scope of the disaster's effects, the Post-Disaster Needs Assessment (PDNA) should be finished within four weeks, including report production. The PDNA is followed by the development of a detailed recovery plan based on the disaster recovery framework (DRF), with the timing varying depending on the post-disaster situation

3.5 RECOVERY PLANNING IN RESPONSE TO NATIONALLY DECLARED DISASTER EVENT

When the consequences of a disaster (or an impending catastrophe) are likely to be severe and affect multiple districts, provinces, or the entire nation, a national-level process is initiated to mobilize the necessary support for emergency and recovery. To coordinate and implement recuperation, the government may employ international best practices (PDNA and DRF methodologies) and internal institutional capacities. Multi-stakeholders are involved in a multi-sectoral and multidisciplinary structured assessment of disaster damages, losses, and impacts. Depending on the circumstances, the irrigation sector and its institutions, such as ID, MASL, DAD, and PIDs, would also be required to participate in this process.

If the post-disaster situation is severe and response needs are likely to exceed national capacity, the government may contemplate requesting assistance from overseas development partners. The typical multisector planning and implementation process for post-disaster recovery driven by the national government is outlined in Table 1.

Table 1: Post Disaster Recovery Planning and Implementation Process

No	Activities	Outputs	Persons and agency responsible	Reference
01	Declare status of disaster up to 2 months applicable to a specific area or for the whole country. The declared status of disaster could be extended for a further period of not exceeding two (2) months at a time depending on the necessity. Timing: After receiving reliable early warning messages about an impending disaster or soon after a catastrophic event.	The declaration needs to be presented for the approval of Parliament.	The President, either independently or based on the advice of the National Council for Disaster Management (NCDM),	National Disaster Management Act No 13 of 2005, section 11 (1)
02	Approval of the status of disaster. Timing: During the first sitting after the declaration of emergency by the parliament	Parliament resolution Gazette notification	Minister of Disaster Management with NCDM support	National Disaster Management Act 2005 section 11 (3)

03	Issue directives for immediate actions using available and additional resources	Activation of National Emergency Operational Plans (NEOP) National Disaster Management Plan (NDMP) and Sectoral Disaster Management Plans as appropriate.	The President	National Disaster Management Act 2005 section 12
04	Convene to assess national capacity to conduct recovery planning (PDNA and DRF formulation) Timing: In response to receiving early warning communications about an imminent disaster or During the phase of emergency rescue on the advice of NCDM	Depending on the severity of the calamity, a decision is made to conduct PDNA and produce DRF within a specified time frame. Assess national capacity and determine how to manage the recovery process, whether to rely solely on national institutions or on the support of development partners. A decision is made to conduct PDNA and produce DRF within a specified timeframe based on the severity of the disaster. Assess national capacity and decide how to manage the recovery process, deciding whether to rely solely on national institutions or development partners.	Minister of DM assisted by DMC	The extra ordinary gazette no 1933/13 of 21st Sept 2015
05	Obtain assistance from non-governmental organizations if deemed necessary.	Enhanced mobilization of resources to meet rising demand during emergency and rehabilitation phases	NCDM/DG Disaster Management Centre (DMC)	National Disaster Management Act 2005 section 13
Optional Actions (6-9) If the government decision is to invite Development Partners:				
06		A letter of request from GoSL to UN, WB or EU requesting recovery assistance	Minister of DM	The extra ordinary gazette no 1933/13 of 21st Sept 2015
07	In country communication between EU, WB, UN on the request for a DRF. Timing: during the post-disaster phase, primarily after rescue operations are complete, and based on NCDM recommendations.	A letter of request from the government to the country Head of UN, WB or EU to requesting assistance with disaster recovery planning.	Government of Sri Lanka	Joint Declaration (UN, EU and WB) on Post-Crisis Assessments and Recovery Planning of 25th September 2008.

08	Mobilize support immediately using the respective institutional systems of EU, UNDP and WB to reach out to coordinated mechanisms	Confirm support for the government and specify the type and conditions of that support.	UNDP, WB and EU	The coordinated inter-institutional platform comprising of UN agencies, EU, WB, other key international donors, financial institutions such as ADB, JAICA etc., private sector, NGOs, etc., in support of governments' international collaboration..
09	Convene meeting among development partners to notify request by the government. Timing; Upon receipt of letter of request by the government	Agree on coordination structure, input from and role of each stakeholder including development partners, private sector, and NGOs in the recovery planning.	EU, WB, EU, ADB, JAICA, ICRC, bilateral NGOs, Private Sector etc.	National Disaster Management Act 2005 section 13
10	Appoint required teams to coordinate Post Disaster Recovery Planning; to conduct PDNA and formulate of DRF. Timing: When the emergency phase ends (roughly within about 45 days or 6 weeks)	High Level Coordination Team (HLCT), National Coordination Team (NCT), Sectoral Teams	NCDM NPD/DMC	Revised National Disaster Management Policy in 2018 (to be approved by the cabinet)
11	Develop ToR for Disaster Recovery Planning (Please Refer to Annex 2 for a sample format)[2]	The ToR	Prepared by NCT Approved by HLCT	PDNA and Recovery planning methodology
12	Mobilize resources	Resources allocated to conduct PDNA and develop DRF	NCDM	National DM Act No 13 of 2005 section 12, and 13

[2] Copied from the Source: (GFDRR, 2013))
https://www.gfdrr.org/sites/default/files/publication/pdna-guidelines-vol-a.pdf

13	Inform sectoral agencies to initiate PDRP (PDNA/ DRF) processes	Activation of sectoral teams	Secretaries of the relevant sectoral ministries	PDNA & DRF methodology
14	Convene planning meetings /workshops	Establish sectoral scopes, inter-sectoral coordination mechanisms for data collection, information and data sharing, and communication etc.	National Coordination Team (NCT) assisted by national sectoral leaders	PDNA/DRF methodologies
15	Sectoral damage and loss data collection	Appointment of sectoral data collection teams	Sectoral data collection team assisted by local stakeholders and Sectoral Leaders	PDNA methodology
16	Analysis of data in comparison with the pre-disaster situation using pre-disaster baseline database	Identify sectoral damage and loss and impact on society, economy and environment.	Sectoral Leaders assisted by NCT	Use of the DaLA tools as appropriate
17	Validation with relevant sectoral stakeholders	Establish sectoral damage and loss and impact on society, economy and environment	Sectoral Leaders assisted by NCT, Stakeholders including community representation	PDNA methodology
18	Analysis of disaster impacts on cross cutting sectors	Social impact of disaster: effects on people, particularly deteriorating status of economically disadvantaged, marginalized and vulnerable groups, who have greater difficulty to recover; livelihood and employment issues and challenges posed by the disaster to all productive sectors, impact on environment etc. Impact on the nation's disaster management capacity Impact on the nation's disaster management capability	Sectoral Leaders assisted by NCT, Stakeholders including community representation	PDNA methodology

19	Study of human impact and macroeconomic impacts	Damages to physical assets and losses in production flows; impact on inflation, impact on (likely decreased) exports and (increased) expenditures on fiscal management, in turn (increased?) public liabilities.	NCT assisted by NPD/ led by focal point for NPD?	PDNA guide
20	Identification of social, economic, and environmental recovery needs and priority areas for recovery	Vision and objectives for recovery	NCT, sectoral teams/Leaders, specialists, stakeholders	DRF formulation methodology
21	Outline the policy and financial mechanisms and the capacities institutional arrangements for recovery, needed to implement	Recovery strategy	NCT/sector Leaders, National Planning (NPD) and Budget (NBD) Departments	Financial preparedness commendations/ plans
22	Develop implementation arrangement and M&E plan	Recovery Plan	NCT, sector Leaders, NPD, NBD	Recovery planning methodology
23	Work out resource mobilization	Financial plan for disaster recovery	NPD/NBD	Financial preparedness plans
24	Produce the Report (Please refer to Annex 3)[3]	PDNA and DRF	NCT	PDNA and DRF planning methodologies
25	Validation	Validated PDNA and DRF	NCT with key stakeholders	PDNA and DRF planning methodologies

[3] Source: (GFDRR, 2013)
https://www.gfdrr.org/sites/default/files/publication/pdna-guidelines-vol-a.pdf

3.6 ROLE OF THE GOVERNMENT

Recovery planning, including the formulation of the PDNA and the DRF, is an inclusive process led and owned by the government. The government of Sri Lanka must initiate and lead the process, utilizing the capacity and expertise of national institutions, appoint a High-Level Coordination Team and sectoral Leaders, and review, endorse, and publish the final report, among other responsibilities. The government may contemplate inviting Development Partners to participate, assist, and augment national capabilities. The Secretary of MDM should lead the High-Level Coordination Team, which consists of prominent officials from NPD, NBD, CBSL, and ERD. If Development Partners are invited and agree to participate, the heads of the Development Partner agencies will join the HLCT. Principal responsibilities of the HLCT include providing strategic direction, making key management decisions, and ensuring the necessary resources for conducting the PDNA and achieving its objectives.

The National Coordination Teams (NCT) will be comprised of senior officials appointed by the Secretaries of Ministries or Heads of Agencies of all key sectors affected by the disaster. The NCT is responsible for managing and administering the PDNA process so that it will be conducted as intended. The daily planning, implementation, coordination, and review of the progress of assessments are the responsibility of the NCT, while they also have to ensure the development of the Recovery Strategy. The NCT provides guidance and ensures consistency across different institutional and sectoral approaches while emphasizing inter-sectoral and cross-cutting themes. Development partner agencies and CSOs may assist sectoral agencies with their relevant functional interests. i.e., WB, UNDP, EU, ADB, FAO, WFP, ILO, ICRC, World Vision, etc. Therefore, NCT, with the guidance of HLCT, must ensure the participation and coordination of external actors, which are essential to the assessment process and the development of a Recovery Strategy.

The National Coordination Teams (NCT) will consist of senior officials appointed by the Secretaries of Ministries or the Heads of Agencies of all major sectors impacted by the disaster. The NCT is accountable for managing and administering the PDNA process so that it proceeds as intended. The NCT is responsible for the daily planning, implementation, coordination, and review of the progress of assessments, as well as the development of the Recovery Strategy. The NCT provides guidance and assures consistency across various institutional and sectoral approaches, with a focus on intersectoral and cross-cutting topics. Development partner agencies and CSOs may assist sectoral agencies with functional interests pertinent to their missions, i.e., the World Bank, UNDP, EU, ADB, FAO, WFP, ILO, ICRC, etc. Therefore, the NCT, under the direction of the HLCT, must guarantee the participation and coordination of external factors that are essential to the assessment process and the development of a Recovery Strategy.

Sectoral Teams comprise representatives of institutions of sectors affected by the disaster, i.e., the irrigation sector team would comprise representatives of ID, MASL, DAD, and 09 PIDs, while the electricity sector would comprise representatives of the Ceylon Electricity Board, Lanka Electricity Company, Sri Lanka Sustainable Energy Authority, and a few state-owned entities in the energy sector. Sectors are tasked with conducting sectoral-level assessments using the given methodology and to the required standards to contribute to the overall PDNA, under the guidance of the NCT.

i.e., The irrigation sector team consists of representatives from ID, MASL, DAD, and nine PIDs, while the electricity sector team would include representatives from the Ceylon Electricity Board, Lanka Electricity Company, Sri Lanka Sustainable Energy Authority, and a few state-owned entities in the energy sector. Sectoral teams are tasked with conducting sectoral-level assessments using the provided methodology and to the required standards in order to contribute to the overall PDNA under the supervision of the NCT.

3.8 ROLE OF DEVELOPMENT PARTNERS

The Government of Sri Lanka determines the role of development partners in supporting national PDNA efforts, drawing on the Tripartite Agreement or seeking the support of partners, such as ADB, bilaterally. The EU engages in a high-level Coordination Team at the invitation of the government, together with the UN and World Bank, and supplements government technical capacity with international technical expertise in assessments of social and governance impacts.

The World Bank offers technical expertise to the government on assessing infrastructure sectors and the impacts of the disaster event on the macroeconomics of the country.

The United Nations Development Programme (UNDP) acts as the technical lead on behalf of the UN. UNDP facilitates the engagement of all UN agencies to work together with the respective government technical lead agencies and personnel, i.e., UNICEF (education), WHO (health), and FAO (agriculture). In addition, UNDP runs the technical secretariat, conducts orientation for team members involved in recovery planning, undertakes quality assurance, and is responsible for overall report drafting while also leading certain sector assessments.

Possible Role of ADB and JICA: ADB and JICA can become part of the technical secretariat, support orientation, contribute to overall report writing and quality assurance, and conduct selected sector assessments, especially in previously supported and/or potentially interested sectors. ADB, too, has led PDNAs at the request of respective governments.

3.9 RECOVERY PLANNING IN IRRIGATION SECTOR IN RESPONSE TO ANNUAL FLOODS

The most significant natural occurrence that can affect the repair and maintenance of irrigation infrastructure, as determined by irrigation sector institutions, is routine flooding caused by predictable annual rainfall seasons. Once effective, this conventional planning system is now ineffective for restoring the devastation caused by increasing annual flooding and irrigation infrastructure-related challenges.

The recommended process of incorporating PDNA and DRF methodologies into irrigation sector institutions to strengthen their planning and improve their ability to recover from disasters (i.e., annual floods) is given in Table 2. It helps individual institutions in the irrigation sector in Sri Lanka shift from conventional to risk-based planning and implementation processes.

Table 2: Strengthening Annual Recovery Planning and Implementation of Irrigation Sector

No	Activity	Output	Responsiblity	Reference
01	Convene an institutional level meeting soon after a disaster event, that is expected to have an impact on irrigation recovery	Decision to initiate post disaster recovery planning.	DG of ID, DAD, MASL, and Chief Secretaries of PIDs	Relevant sections of institutional Emergency Operational Plans, Contingency Plans and Institutional Disaster Management Plans produced to fulfil requirement of Section 12 of the Disaster Management Act of 2005
02	Meet relevant staff and stakeholders to plan for post disaster recovery	Agreement on the recovery process.	Focal point (FP) and institutional disaster recovery teams (IDRT) of each institution	Appointment letter/ circular or internal memo
03	Hold a refresher or a training program on PDNA and DRF formulation (Depending on the need)	Conduct training program on DRP (disaster recovery planning) IDRT with required skills	Institutional FP and IDRT	Recovery Plan, Training manual, Trained Trainers
04	Hold IDRT meeting to agree on plan for recovery planning	Clear roles responsibilities, coordination, schedules	FP and IDRT	PDNA guidelines
05	Deploy staff assigned by the respective institution for data collection	Agreements based on actual circumstances: Specific training for field staff prior to deployment, locations, formats, coordination, roles and responsibilities of each member of data collection team, engagement of farmers and CBOs, resource allocation for data collection and logistical arrangements etc.	FP/ data collection lead	Data collection formats, Institutional policies and systems

06	Data and information collection	Data on: damage and loss, increased risks, affects local irrigation management (governance) on people's lives, local economy etc.	Members of the data collection team	Updated data collection formats
07	Analysis of collected data comparing with the pre-disaster baseline status	Disaster effects and impacts	FP, relevant members of IDRT and data collection team	PDNA methodology, Institutional data and information management systems with updated pre-disaster data
08	Identify and prioritize recovery needs	Prioritization criteria, Recovery priorities	FP, relevant members of IDRT	PDNA methodology
09	Implement short term (early) recovery actions	Continued losses are minimized	DG assisted by FP, IDRT	Institutional irrigation works implementation protocols, special protocols for emergency if available
10	Develop recovery framework (or review draft pre-disaster recovery framework produced during pre-disaster phase; please refer to Table 3)	DRF: recovery vision, objectives, guiding principles, strategies with short-, medium- and long-term strategies policy guidance and institutional arrangement resource requirement and monitoring and evaluation	DG assisted by FP, IDRT	DRF planning methodology, Sectoral institutional vision and planned programs, institutional policy and capacity
11	Mobilize resources	Enactment of pre-agreed resource mobilization plans Proposal submitted to NPD for additional requirements	DG/NPD	Financial preparedness plans
12	Formulate the implementation arrangement of recovery	Develop and revise implementation schedules, priorities, roles and responsibilities, M&E plans etc., based on available resources	DG	DRF/DRP methodology Institutional implementation protocols
13	Recovery implementation and M&E	Activating recovery implementation arrangements	FP and IDRT	Institutional implementation protocols

3.10 PRE-DISASTER RECOVERY PLANNING OF IRRIGATION INSTITUTIONS

TPre-disaster recovery planning is recommended for the irrigation sector. By incorporating DRP (PDNA and DRF formulation methodologies), irrigation institutions may expand on and enhance their existing planning procedures. It is recommended that irrigation institutions participate as much as possible in the process indicated in Table 3 so that they may begin to move toward risk-based planning.

Engaging in DRR and disaster preparedness activities identified through pre-disaster recovery planning will reduce disaster impacts while increasing the effectiveness of post-disaster planning and implementation, respectively. It will also assist in creating intra-sector coordination within institutions (ID, MASL, DAD, and PIDs), which currently lacks and has been recognized as a critical gap by the agencies themselves

Table 3: Key pre disaster recovery actions recommended for irrigation institutions:

No	Activity	Output	Responsiblity	Reference
01	Appoint Focal /Lead Officer and a team for DRP	DRP is key planning criteria and an assigned responsibility in irrigation institutes	DG (ID and MASL) CG (DAD) Provincial Chief Secretary (CS) PID	Institutional policies and Acts
02	Conduct training on DRP. PDNA, data management for good baseline, DRF formulation and recovery implementation	Irrigation institutes have the required capacity to engage in DRP (PDNA, DRF formulation)	DG/ CG/CS with assistance of the FP	Institutional training policy and plans
03	Consider including training on PDNA, data management for good baseline, DRF formulation and recovery implementation within institutional training protocols and schedules	Irrigation institutes have sustainable capacity to engage in DRP (PDNA, DRF formulation)	Training Director /Head of Training of relevant irrigation institute	Institutional training policy (revised if necessary)
04	Review and strengthen or redesign institutional inventories and data management systems	Identified and addressed data and information gaps to capture data and information required for post disaster recovery analysis	DG/CG/CS assisted by the FP	Institutional policy (revisions included as required)

05	Data collection and update information in data management system	Accurate and current information on institutional irrigation assets, locations, costs etc., and development goals and programs	DG/CG/CS assisted by FP	PDNA methodology
06	Utilization of data to create a collective image of future disaster or for disaster scenario planning	Future loss, damage and impacts are depicted and estimated based on the following:	Planning division assisted by FP and DRT	PDNA methodology
07	Agree on key components and possible content should be considered in DRF	Recovery vision, goals objectives, guiding principles, recovery strategies, pre-disaster DRR measures, institutional arrangement, and financial requirements for recovery	FP, DRT	DRF formulation methodologies
08	Attend to DRR activities identified during recovery planning	Reduced disaster risk on irrigation infrastructure	DG/CG/CS, Division Heads and Relevant implementation teams	Institutional policies
09	Investigate and identify financial sources	Options and priorities for financing identified risk reduction and potential recovery actions	DG/CG/CS assisted by FP	PDNA/DRF methodology, institutional policy,
10	Actions and negotiations to mobilize financing	Availability of funds for emergency risk reduction and financial preparedness for recovery implementation	Guidance by NPD	institutional policy
11	Review draft DRF during annual planning cycles	Updated draft DRF	FP	institutional policy

3.11 COORDINATED DISASTER RECOVERY PLANNING (DRP) IN IRRIGATION SECTOR

In Sri Lanka, the twelve distinct Irrigation institutions carry out their irrigation management tasks independently, despite instances of ambiguity and overlap. While the processes outlined in Tables 2 and 3 will be performed by individual institutions, it is clearly evident that disaster recovery planning will be more effective when all institutions and actors in the irrigation sector collaborate.

Also strongly recommended is pre-disaster recovery planning for the irrigation sector as a whole. Currently, this does not occur unless there is a new development, but coordination ends there because institutions implement development and manage services independently. For the consideration of decision-makers and individual institutions, this section explains key aspects of sectoral coordination for recovery planning.

3.12 SECTORAL COORDINATION

The Ministry of Irrigation (MoI) is in the best position to oversee the development of the Irrigation Sector Disaster Preparedness Plan (PrDRP) as a strategic disaster preparedness measure. The Ministry of Irrigation needs to summon relevant Secretaries from other ministries with irrigation responsibilities and monitor irrigation institutions. It is recommended that the MoI appoint a Focal Point at the level of Additional Secretary to ensure that effective ministry-level sectoral appoint their respective Focal Points. The Institutional Focal Points will form the Inter Agency Task Force (IATF), which will ensure inter-agency coordination and select and appoint a main agency to lead the IATF with the assistance of the Focal Point of the Ministry of the Interior. Individual institutions will be assisted by the IATF in pre-disaster recovery preparations such as:

- At each institution, the institution's heads must lead or facilitate a review of organizational policies and procedures with the assistance of the respective Focal Point and the input of planning and operational units. Through the respective Focal Point, the IATF can assist with the assessment by helping to understand how to align the PrDRP process with institutional systems and making any necessary adjustments.
- Each institution must identify the specific personnel required at various levels for PrDRP, assign them to tasks, clarify their responsibilities and roles, and assess their capacity to engage in DRP. The respective Focal Point may assist in this regard by facilitating the sharing of information and experience between institutions.
- Each institution's training and capacity building units have the responsibility of planning and implementing capacity building on DRP (PDNA and developing DRF) and determining who should be trained on what, when, etc. The IATF is able to communicate with external specialists, such as DMCs and development partners, in order to coordinate common

training in coordination with respective training departments and tailor it as required by getting access to required internal (within sector) and external assistance.

- Each irrigation institute should consider establishing appropriate communication channels (i.e., PrDRP as an agenda item in operational and review meetings), which will help intra-agency communication and coordination as well as the motivation to work across various teams (i.e., planning, finance, technical) and at national and sub-national levels. The IATF can assist by disseminating common messages and coordinating cross-agency personnel working on comparable tasks so that they can learn from one another, etc.

- IATF can help obtain stakeholder inputs without duplicating effort from stakeholders such as the agriculture sector, Ceylon Electricity Board, National Water Supply and Drainage Board (NWS&DB), Rural Water Supply Division of NWS&DB, Officials of Inland Fisheries, private construction agencies engaged in irrigation infrastructure development, etc. In addition, technical entities such as DMC, NBRO, the National Geological and Survey Department, IWMI, Universities engaged in research on hazards, vulnerability, and risks, irrigation, water, etc. are also stakeholders who can provide valuable inputs. At the local level, farmer organizations, Local Authorities, women and women's rural development institutions, youth and youth organizations, etc., NGOs (Plan Foundation, Sarvodaya, Sewa Lanka, World Vision, etc.), CSOs (IUCN, ICRC), the private sector (HHSBC) and donors and development partners (i.e., UNDP, FAO) who have previously supported or are newly interested in supporting irrigation infrastructure development may also be involved at the local level. These various parties with a stake or interest in irrigation services should be invited to participate in discussions regarding the recovery of irrigation infrastructure in the event of a serious disaster. In lieu of individual-level discussions, they can review sectoral recovery strategies agreed upon by irrigation institutions, ideally aligning with the irrigation sector's sustainable development objectives and targets. Recovery will also be viewed as an opportunity to build back better (BBB); to construct or modify irrigation infrastructure to make it structurally, technically (using modern and appropriate technologies), safer, and more resilient than before.

IATF may also promote nominating cross-institutional and individual institutional-level teams during the pre-disaster phase for improved coordination. In addition, it will be advantageous for members of these teams to acquire the relevant recovery-related skills required by their respective teams and to be able to immediately engage in recovery actions in the event of a disaster. Such teams might include:

3.13 DATA MANAGEMENT

Baseline data and information required for DRP broadly fall into two categories:

1. data and information related to the context in which irrigation infrastructure exists and functions;
2. the status and function of irrigation systems and associated infrastructure with accurate and up-to-date information about the pre-disaster status, disaster effects and impacts can be estimated with greater speed and accuracy.

The KSTA project helped each irrigation institution design a data management system that is specific to the institution and captures and updates the status of all assets. As a result of the project's facilitation of the design of all institutional data systems on a common platform, sectoral data compilation will be facilitated. Each irrigation institute must designate specific officials' responsibilities for functions such as collecting, verifying, updating, consolidating, and sharing at specific times or events and monitor their effective implementation.

The majority of the contextual data required for analysis in the DRP will be common to the irrigation sector. It is more beneficial to disseminate such data at the sectoral level and share it with the respective agencies. The IATF will also help with this. Such information would include:

- Role and contribution of irrigation services and infrastructure to the country's development, as well as service delivery areas. Main focus (agriculture sector), additional uses (i.e., fisheries, drinking water), and special functions (constriction of bridges for local mobility, construction of saltwater bunds for DRR, etc.).
- Legal and institutional systems and processes are used in the irrigation sector to develop and maintain irrigation infrastructure and services. Roles and responsibilities of each key organization in relation to their specific systems and operations, Role of other key government, private sector, and local-level stakeholders
- Financial information such as past, present, and future public spending information on irrigation, information on calamity budget allocations, priority post-disaster recovery allocations for the irrigation sector after a disaster, other potential sources of post-disaster recovery funding, untapped or unexplored financing opportunities, etc.
- Data and information on the context of disasters, including hazard trends and forecasts, vulnerability and risk maps, and historical disaster data
- In addition, baseline data should also include specific institutional information, such as the pre-disaster status of specific irrigation schemes and related infrastructure.

Table 4: Type of data available in different institutions

Data and information repositories	Coordination	Type of data and information collected
ID	IATF	Historical disaster (flood) events and related data, historical rainfall data, Land use and Soil data, Policies, laws, standards for irrigation infrastructure, and strategic futuristic vision for irrigation sector and potential water resources developments, Contribution to national development, economic, disaggregated socio-economic and demographic special data.
MASL		Farmer priorities based on processes of engagement with Farmer Organizations. Policies, laws, standards, and strategic futuristic vision for irrigation and agriculture development in Mahaweli areas, water management and allocation policies, systems and strategies, institutional level development strategies and plans including recommended upgrade in technology standards etc. Socio-economic information of communities in Mahaweli areas
DAD		Historical disaster events and related data, information about cascade systems and small irrigation systems etc. Hazards and trends, vulnerabilities, risks, spread in local areas Farmer organization farmer profiles vulnerabilities capacities etc.
PID		Provincial development priorities Irrigation infrastructure and, related resources and assets in provinces Local vulnerabilities and gaps Financial data and information Provincial post disaster outstanding recovery information.
NPD/NBD		Expenditure on irrigation development, rehabilitation and rebuilding Plans for future irrigation development (public investment plan)
DMC		Hazard profiles for some hazards, access to vulnerability profile for some areas.

3.14 PRE-DISASTER FINANCIAL PREPAREDNESS FOR POST DISASTER RECOVERY

To reduce the budgetary impact of disasters caused by natural hazards, the government must identify sources of recovery funds or contingency funding, including external sources of donor funding. The Ministry of Finance should lead the development of a financial preparedness strategy with the policy objective of identifying post-disaster expenditure priorities, prioritizing them in advance, and considering potential solutions based on the optimal local combination of financial tools.

The Disaster Management Act allows the government to negotiate with key donors to support and develop the capacity of the 12 key agencies in the irrigation sector in order to receive contributions from donors. This may involve negotiations and the drafting of agreements with potential donors or bilateral funding sources, as well as the establishment of systems and procedures to receive and manage funding (disburse and account for funds to and with local implementers).

3.15 FLEXIBILITY OF SOPS

The institutional DRT team at head office or central level, including the field-level team led by the institutional Focal points, should determine the appropriate timing and duration for initiating and completing the DRP, recognizing that multiple disasters may cause different effects in different locations depending on the type (major, medium, or minor) and type of headworks or distributor system of irrigation infrastructure they manage.

Individual irrigation agencies are responsible for implementing the DRP for irrigation infrastructure under their preview. Depending on the situation, representatives from other irrigation institutes, other government offices (i.e., DMC, NBRO), development partners (ADB, JAICA), community organizations, and concerned private groups as deemed appropriate by the DG (in consultation with NPD/DMC as required) could be included in the event of a major disaster.

In the event of a national disaster, the NPD/DMC-led national DRP process will notify the respective irrigation institute's DG, CG, or CS to initiate DRP for the irrigation sector. The DG must ensure that an appropriate system of coordination exists between its own and other irrigation institutions, as well as other relevant institutions.

Annex I. Roles and Responsibilities of Irrigation Institutions in Sri Lanka

The routine operations, maintenance, construction, and developments, as well as disaster management, of the irrigation sector are managed by twelve (12) state sector agencies: the Irrigation Department (ID), the Mahaweli Authority of Sri Lanka (MASL), the Department of Agrarian Development (DAD), and nine (9) Provincial Irrigation Departments (PIDs) representing nine provinces of the country. Sri Lanka's irrigation projects or schemes cannot be managed by the private sector. Below are depicted the primary functions of twelve (12) irrigation institutions.

Irrigation Institution	Major Role
Irrigation Department (ID)	Manages nearly 100 major irrigation schemes and nearly 250 medium irrigation schemes, providing irrigation facilities to more than 235,000 ha. Further, ID manages saltwater exclusion schemes and Flood Protection schemes.
	Manages the Mahaweli River Diversion Scheme and Uda-Walawe Irrigation Scheme, which include irrigation tanks and regulators (like Anicuts) to provide irrigation facilities to more than 101,000 ha
Provincial Irrigation Department - PID (Northern Province)	Manages 10 major irrigation schemes and 43 medium irrigation schemes, providing irrigation facilities to nearly 28,000 ha. Further, PID (Northern Province) manages saltwater exclusion schemes
Provincial Irrigation Department - PID (Eastern Province)	Manages seven major irrigation schemes and 36 medium irrigation schemes, providing irrigation facilities for nearly 14,000 ha. Further, PID (Eastern Province) manages saltwater exclusion schemes.
Other Provincial Irrigation Departments - PIDs Department of Agrarian Development (DAD_	Manages more than 25,000 minor irrigation schemes (tanks and anicuts), including drainage schemes that are separately managed by the DAD and the PIDs, to provide irrigation facilities to more than 260,000 ha.

Annex 24 : A Sample Format for ToR for conducting PDNA and Developing a Recovery Plan

1. Background

- The disaster effects using available preliminary impact figures
- A description of the affected area and the disaster risk
- May include information about recent disaster events.

2. Objectives of the Assessment

Objective is to assess the impact of the disaster event and define a strategy for recovery and its financial costs.

May include specific objectives such as:

- Estimate the impact of the disaster on the socio-economic development of Sri Lanka (at the national level and in affected areas and communities).
- Assess the effects and impacts of the disaster to develop a Recovery strategy. Identify the early, medium-, and long-term recovery and reconstruction needs with associated costs and a timeline in one consolidated report.
- Develop recovery strategies that reflect the requirements and priorities of the affected communities, integrating concepts of disaster risk reduction, building back better, gender equality, and environmental sustainability.
- Recommend any improvements to the National Disaster Management Plan.
- Recommend institutional mechanisms and policy options for recovery and reconstruction.
- To promote long-term disaster resilience.

3. Deliverables of the PDNA

A Report consisting of:

- Sectoral disaster effects and impacts
- recovery strategy with early medium- and long-term needs
- Recovery costs and timelines for each sector
- disaster risk management strategy

4. Coordination of the PDNA

Explain the government coordination mechanism: which ministry or ministries lead (disaster management), supporting ministries (i.e., environment, planning, and finance), assistance extended by the Development partners, etc. Explain the structure of the high-level management team and the supporting duties of technical experts in addition to providing daily guidance and technical oversight for the PDNA process.

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[4] Source: (GFDRR, 2013))
https://www.gfdrr.org/sites/default/files/publication/pdna-guidelines-vol-a.pdf

5. Methodology for the Assessment

Explain the methodologies for data collection and analysis and the development of a recovery strategy, as well as the integration with WB/EU and UN methodologies for assessment, analysis, and strategy formulation. Define participation and methods for obtaining input from stakeholders and the affected community, such as surveys, focused group discussions, and other data collection and validation techniques.

Explain the phases of the assessment: training, preparatory or desk review, field-level data collection, data analysis, producing sectoral reports, validation, and report production.

6. Sectors and geographic areas to be assessed

Determined by the government of Sri Lanka, enumerate the sectors and geographic regions that are to be assessed. The sector teams should be led by government officials from Line ministries and supported by relevant UN agencies, the World Bank, and other development partners such as ADB, JICA, etc.

7. Schedule of Activities

Timeline for completing each phase.

8. Estimated Cost of Activities

The following expenses are considered:

- Local Staff (sector specialists, technical staff, and support staff)
- Report-writing and editing staff
- Coordination team (PDNA manager, specialist)
- International Technical expertise
- Coordination
- Transport arrangements (field visits)
- Office infrastructure to accommodate PDNA staff and management
- Office supplies and computer equipment, IT, and telecommunications (internet, mobile phones, etc.) Special logistical arrangements (e.g., to facilitate humanitarian access) Staff travel (in-country and international)

Accommodation arrangements

- Training of the PDNA Team (venue, facilitators, materials) Coordination workshops and meetings Donor conference (venue, facilitators, materials, printing) Utilities (electricity, etc.) Admin support Miscellaneous and contingency provisions
- Information management requirements (software, data, maps, equipment)
- Support services for the Humanitarian Coordinator,
- high-level management team
- Coordination and Capacity Building
- Office management and administration

Annex 3: Instructions for Producing a Report on PDNA And Recovery Strategy

1. Introduction

Include the purpose of the sector in the PDNA and Recovery Strategy.

The purpose should include:

1.1 Statement on the desired long-term recovery outcome in the sector (vision);

1.2 Recovery strategies that may be derived from the recovery outcome statement, including measures to reduce future risks;

2. Pre-disaster baseline information/sector overview

This section describes the sector's Overview and pre-disaster Baseline information. In addition, it contains details on the sources and essential documents used to ascertain pre-disaster conditions. It should contain information on the following:

2.1 The state of the human, natural, cultural, financial, social, and physical capital within the sector

2.2 Description of the Infrastructure and physical assets

2.3 Description of the Production and delivery of goods and services and access to goods and services;

2.4 Description of Governance and Decision-Making Processes (Incl. people's ability to exercise their citizenship and priority development policy objectives, etc.)

2.5 Risks and vulnerabilities, including existing preparedness plans

3. Assessment of Disaster Effect

This section defines and describes the effects as well as the direct responses to mitigate these effects. Disaster effects are defined as the destruction of infrastructure and assets, disruption of service delivery and production, disruption of governance, and influences on previous and emerging risks and vulnerabilities.

NB: Effects can be described as both tangible and intangible.

These effects must be presented in accordance with the country's geographical divisions as outlined in the Census as well as other pertinent sociological characteristics where relevant (gender, age, ethnicity, religion, ability, and disability of the given population, as applicable). The effects can be expressed in quantitative or qualitative terms.

- Introduction: general description of the disaster event, its geographical scope, affected population, evolution up to this point, etc.;
- Effects on Infrastructure and Physical Assets;
- Effects on Production and delivery of goods and services; access to services and goods;
- Effects on Governance and decision-making processes;
- Effects on Risks and Vulnerabilities;

It also addresses cross-cutting issues such as gender, environment, and risk reduction across the description of the effects or in a separate paragraph.

4. Calculating the Value of the Effects of Disaster

This section should give an estimate of the value of Damage and Loss, extracted from the section on effects, for those elements that have financial implications, either in terms of damage to infrastructure and assets or loss due to changes in financial flows as linked to service, / production, governance, and risks. This section presents the economic value of the event.

Damage:

Value of total or partial destruction of infrastructure and assets

Loss:

- Value of changes in production of goods and services, delivery of services, and access to services and goods
- Value of changes to governance
- Value of changes to risks

5. Assessment of Disaster Impact

This section provides a report on the aggregated economic and human development impact.

It also provides an analysis of the expected trend for the sector after the disaster and what could be the worst-case scenario if policy and programming measures are not considered. It identifies major challenges for the sector. This impact analysis is based on the assessment of the disaster effects, the sector development plans, lessons from past experiences, and the emerging concerns that derive from the events. The analysis of the impact of the disaster provides a medium- and long-term projection of the effects on the sector. The impact analysis forms the basis of the recovery strategy."

6. Cross-Sector Linkages, Including Cross-Cutting Issues

This section reports on the inter-sectoral linkages inherent in the functioning of society and links across sectors.

7. Sector Recovery Strategy

7.1 Sector Recovery Vision and Rationale for the sector.
This section presents the recovery vision and expected outcome for the sector. This should be based on the country's existing sector development plan, aligning, where possible, recovery objectives with existing national development plans and strategies.

7.2 Stakeholders' consultation
This section reports on the stakeholders consulted in the development of the recovery strategy and the recovery needs and priorities.

7.3 Reconstruction and Recovery Needs, including Building Back Better

7.4 The Sector Recovery Strategy

7.4.1 Prioritization and sequencing:

This section presents the reconstruction and recovery needs prioritized in short-, medium-, and long-term terms. It identifies the key interventions, outputs, and outcomes and distinguishes those interventions that are related to restoration or resume from BBB interventions.

7.5 Implementation Arrangements

7.5.1 This section describes and elaborates on partnerships, coordination, and management arrangements to implement recovery.

7.5.2 This Section proposes mechanisms for Monitoring and Evaluation. It also reports on existing coordination mechanisms for Development and Humanitarian Assistance. It also outlines possible resource mobilization mechanisms.

7.5.3 This section provides a short description of the recovery challenges that might be expected in the implementation process for the sector and should be supported with key assumptions and constraints.

8. Assessment Methods
This section gives a brief description of the methods and sources used (primary and secondary data collection) and the methodology for analysis. It also explains the basis and assumptions for estimating reconstruction and recovery needs.

CHAPTER 04

TRAINING COURSE OF THE DISASTER RECOVERY IN SRI LANKA: FACILITATOR GUIDE BOOK

4.1 INTRODUCTION

The “Training Course on Disaster Recovery Planning for the Irrigation Sector” is conducted by the Disaster Management Center in collaboration with Irrigation Sector institutions such as the Irrigation Department, Mahaweli Development Authority Sri Lanka, Department of Agrarian Development, and Provincial Irrigation Departments of nine provinces in Sri Lanka, with funding from the United Nations Development Programme and Asian Development Bank.

The course was designed at the end of 2022 as part of the project. The Training Course on Disaster Recovery Planning for the Irrigation Sector is based on the Development of Disaster Recovery Programme for the Irrigation Sector Step-by-Step methodology, and its main objective is to teach staff of irrigation sector institutions to use the document, which serves as a key document for the development of the Disaster Recovery Framework for the irrigation sector in Sri Lanka.

This ‘Facilitator Guidebook’ is intended to assist the Course Coordinator in delivering and documenting consistently high-quality Disaster Recovery Framework for Irrigation Sector training courses. The bundle includes supporting documents designed to offer practical advice and forms. Documents such as the Facilitators’ Guidebook, Participants’ Workbook, Case Study, and PowerPoint presentations accompany the training course materials.

4.2 COURSE CURRICULUM

The course consists of four main modules, which are briefly described as follows:

4.2.1 Module 1: Disaster Recovery Framework Introduction

Module 1 introduces participants to the principles of the Disaster Recovery Framework using internationally accepted definitions, terminology, and procedures. Module 1 introduces the Disaster Recovery Framework for Irrigation Sector Manual briefly to familiarize participants with the document. Furthermore, basic features of the Disaster Recovery Framework for the Irrigation Sector in Sri Lanka are discussed to ensure that all participants are on the same level of knowledge.

4.2.2 Module 2: Disaster Recovery Preparedness

The second module introduces participants to international procedures for disaster preparedness and recovery as they pertain to the implementation of irrigation sector recovery programs. Participants will be instructed on how to use the manual as a resource for future program implementation, and the essential points of each step will be discussed.

4.2.3 Module 3: Post-Disaster Damage and Loss Assessment (DaLA) and Post-Disaster Need Assessment (PDNA)

Damage and loss assessment and post-disaster need assessment are introduced to participants in Module 3 of the Recovery Program Implementation course. One session will concentrate on the damage and loss assessment of an exit strategy, while another will provide an in-depth introduction to the Post Disaster Needs Assessment.

4.2.4 Module 4: Recovery Strategy Development Based on Post-Disaster Need Assessment

The fourth module discusses the post-disaster recovery strategy in light of the results of the Post Disaster Needs Assessment and the available governance, financial, and technical strategies in the country.

4.2.5 Training Schedule Disaster Recovery Framework for Irrigation Sector

Day 1	Day 2
Inauguration of	Module 3
Training	Session 1
Introduction to the	Session 2
Training	Module 4
Module 1	Session 1
Session 1	Session 2
Module 2	Closing

4.2.6 Pre-Course Activities

Timing	Activity	Methodology	Material
45 Minutes	Opening Ceremony		
30 Minutes	Formation of Group	Group Discussion	Flip Chart and Marker
30 Minutes	Expectation Review	Discussion	Flip Chart and Marker
30 Minutes	Establishment of Ground Rule	Discussion	Flip Chart and Marker
15 Minutes	Course Over view	Presentation	Course Schedule Print Out

For this training, the followings are the pre-course activities:

- Opening Ceremony
- Formation of Groups
- Expectation Review
- Establishment of Ground Rules
- Course Overview

4.2.7 Setting up the Room

- During the Opening Ceremony, the room could be arranged in auditorium style with chairs in rows facing speaker's stand which is the standard set-up for the opening ceremonies of government events.

- After the Opening Ceremony, the room has to be rearranged for the actual workshop. The seating of the participants should be organized in such a way that official from different section/divisions of respective institution of Irrigation sector agency are sitting next to each other as group.

- The LCD projector and screen, linked to a laptop, should be placed at the front of the room. Flip charts should always be in place, preferably in all four corners of the room, to capture any points raised by the participants for later discussions and reference. The facilitators should always be moving around the room.

4.2.8 Opening Ceremony

Activity duration: **45 minutes**
Materials required: **Speaker's desk**

The opening ceremony format should follow the standard government opening ceremony with relevant speakers. If there is no pre-appointed master of ceremony, one of the facilitators should take on the role of the master of ceremony to invite speakers and announce the sequence of activities involved. Before starting with the formation of the groups, a group picture should be taken as well.

4.2.9 Formation of Groups

Activity duration: **30 minutes**
Materials required: **Time cards ,flip charts and markers (blue, green, black, red)**

This activity is important because group exercises will occupy a large portion of this training. Each group should consist of people with a spread of experiences and backgrounds in different aspects. It is advised to divide the training participants in groups before the actual training. Based on their experience as well as the number of trainings they have already attend beforehand, the training organizers should make sure that the level of expertise in each of the groups is more or less even.

The group formation can be performed as follows:

- All participants are asked to stand along the side of the room and then announce the names of the members of each group. Each group will be seated at different table.

- Each group is asked to come up with a name for their group which can be used to refer to the group later during the training and also encourage initial dialogue among the group members.

- Furthermore, each group should choose a group leader which is presented together with the group name. During the presentation of the group, each individual group member should get the chance to shortly introduce him or herself to the rest of the participants as well.

4.2.10 Expectation Review

Activity duration: 30 minutes (15 minutes - group discussion, 15 minutes - open discussion)
Materials required: Flip charts and markers

For this activity, flip charts are put up at random interval around the class room. Then five key questions as follows are written, one on each flip chart:

- What do you expect to learn from this training?
- What factors can facilitate your learning?
- What could hinder your learning?
- What can you contribute to making this training successful?
- How do you think the learning from this course could help you in disaster recovery in irrigation sector?

After having explained the reason for this exercise, the participants are asked to walk around the room and write down their thoughts on each of the flip charts.

Afterwards, the facilitator should summarize the points raised by the participants and address specific answers that are of interest to the whole group.

4.2.11 Establishment of Ground Rules

Activity duration: 15 minutes
Materials required: Flip charts and markers

By encouraging the participants to develop the ground rules by themselves, the participants own them and can exert peer pressure for compliance to the rules. The facilitators can motivate the discussions with leading questions like:

- 'what do you think of the use of mobile phones in the class room?'
- 'do you think it is ok to interrupt the instructors? 'etc.

Some examples of ground rules are:
switch off mobile phones during the course lectures, no eating allowed in the class room, etc. The facilitators' main task under this activity would be to note down the suggested ground rules. Set the number of ground rules to be developed from the beginning; for instance, maximum 15. Explain to the participants that more can be added during the course as long as there is a consensus. Once the maximum number of ground rules is reached, review them with the participants and some deleting and adding might be carried out based on the time.

2.12 Course Overview

Activity duration: 15 minutes
Materials required: Questionnaire hand-outs

Distribute latest course schedules to the participants and give a quick run through of the content of odules and sessions using power-point presentation.

Key points that should be included:

Module 1: **Introduction to the Disaster Recovery Framework**

Module 2: **Preparedness for Disaster Recovery**

Module 3: **Post Disaster Damage and Loss Assessment (DaLA) and Post Disaster Need Assessment (PDNA)**

Module 4: **Development of Recovery Strategy based on Post Disaster Need Assessment**

4.3 MODULE 1- DISASTER RECOVERY FRAMEWORK

4.3.1 Introduction

Module 1
Introduces participants to the fundamentals of implementing a disaster recovery framework in the irrigation sector. Module 1 provides a brief introduction to the Manual in order to familiarize participants with the document. In addition, fundamental aspects of the framework for disaster recovery in the irrigation sector are discussed to ensure that all participants have the same level of knowledge.

4.3.2 Learning Objectives

At the end of this module, the participants will be able to;

- Explain basic terms and concepts related to disaster recovery framework for irrigation sector
- Explain the essential elements and benefits of disaster recovery framework for irrigation sector as well as its fundamental process;
- Understand why disaster recovery framework is relevant for irrigation sector;
- Examine challenges and opportunities in for irrigation sector with regards to advocating for wide-spread adoption of disaster recovery.

Session time - 2 hrs. 30 min | Presentation: 1hour | Group work 1 hour 30 min

The following topics will be covered in Module 1:

Session 1 –

Introduction to the Disaster Recovery Framework Manual and Standard Operation Procedures

Module 1 is designed to assist irrigation sector institutions in preparing for recovery and implementing timely, efficient, and effective recovery programs to ensure the resilience of the sector. It contributes to the reduction of disaster-related economic losses, which are on the rise due to the increased vulnerability of infrastructure and assets. It manages the recuperation process in a more scientific and organized fashion.

The purpose of recovery initiatives is not to exacerbate vulnerabilities. Effective disaster recovery occurs when institutions, policies, and financial mechanisms for recovery are in place prior to a disaster. Participants will learn terms and concepts of disaster recovery, disaster recovery principles, recovery preparedness, how to Identify recovery needs, policies, and recovery planning in order to comprehend the significance of disaster recovery for the irrigation sector.

Session will explain following areas:

- Terms and concepts;
- The significance of the disaster recovery framework for the irrigation sector;
- How the framework was developed;
- The available legal and policy framework for disaster recovery in Sri Lanka;

- Components of early recovery in the irrigation sector;
- Disaster recovery principles
  Describe the above concept using PowerPoint Slide presentations followed by group discussions to achieve the objectives.
- Participatory training and coaching approach;
- Small group exercises and discussions are included;
- Active inputs are expected from the participants

4.3.3 Outline of Session

Following key areas discussed under module 1

- Introduction of the module with its objectives
- Explain terms and concept use in disaster recovery
- Describe the importance of disaster recovery following the disaster management cycle
- Describe when to start the damage and loss assessment, Post Disaster Need Assessment and Recovery
- Explain the Evolution of Disaster Recovery Framework based on Hyogo Framework for Action 2005-2015 and Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR)
- Explain case study and discuss following questions related to the Recovery Framework as a group work

Questions:

- Explain whole process of PDNA as a flow chart.
- Describe the link between Disaster Management Cycle and PDNA concept
- Who are the international agencies closely working with PDNA process and why their assistance required to commence the PDNA process
- How PDNA help in post disaster recovery
- List out 5 guiding principles of PDNA and briefly explain.
- Explain How to collect the Damage data and how you are going to compare the post disaster situation with pre disaster situation
- Identified the required data for damage and loss assessment including demographic and social data as well
- Explain mechanism to fill the data gaps
- Identified possible damages and losses separately to irrigation sector
- How to calculate the damages and losses (To calculate the damages and losses following given data set you can used as sample data set for damage and loss calculation)
- List out impact of floods on irrigation system, elements that could be damaged, losses incurred by the Irrigation sector and increase vulnerability due to floods.
- What is social ad microeconomic impacts of floods in affected areas
- Draft PDNA report considering the need for recovery.

Activity

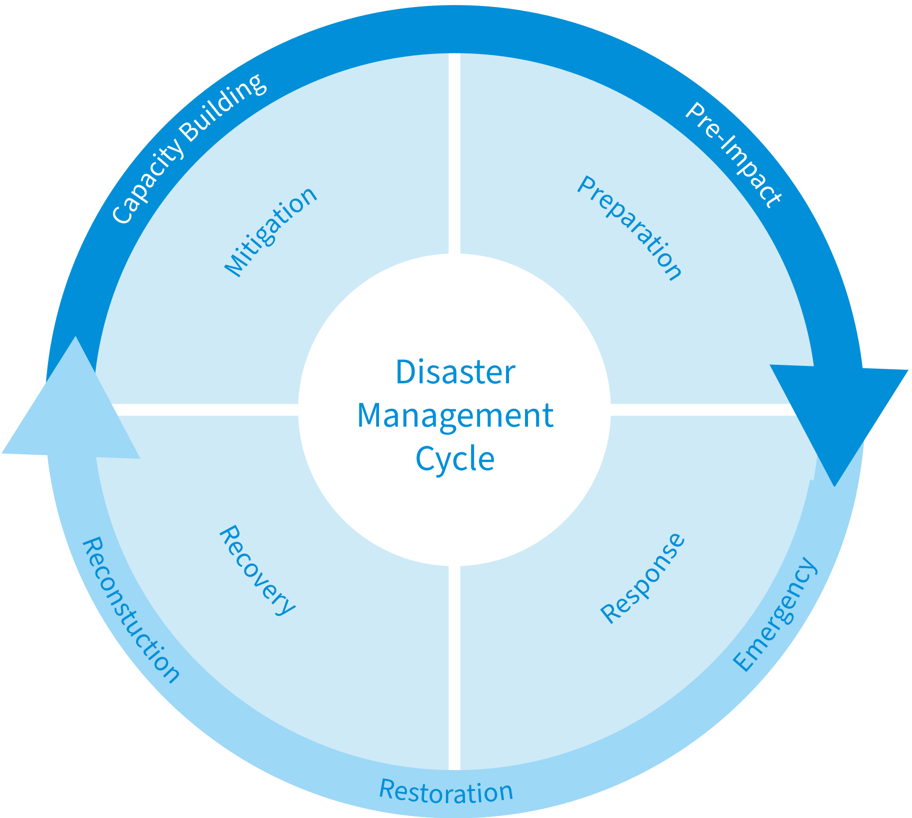
Explains Module 1 objectives and learning outcomes of the session and question for any clarifications.

Objectives:
- To help the irrigation sector institutions
- to prepare for recovery
- to deliver timely, efficient and effective recovery programmes to ensure disaster resilience and contributes to sustainable development.

Learning outcome:
By the end of the session, Participants will be able to understand:
- The importance of disaster recovery for irrigation sector
- Terms and concepts of disaster recovery
- Principles of disaster recovery
- Recovery preparedness
- How to identify recovery needs policies
- Planning for recovery

Explain terms and concept use in disaster recovery
Disaster Recover (Early, Medium term, Long Term) Resilience, component of Early Recovery in irrigation sector

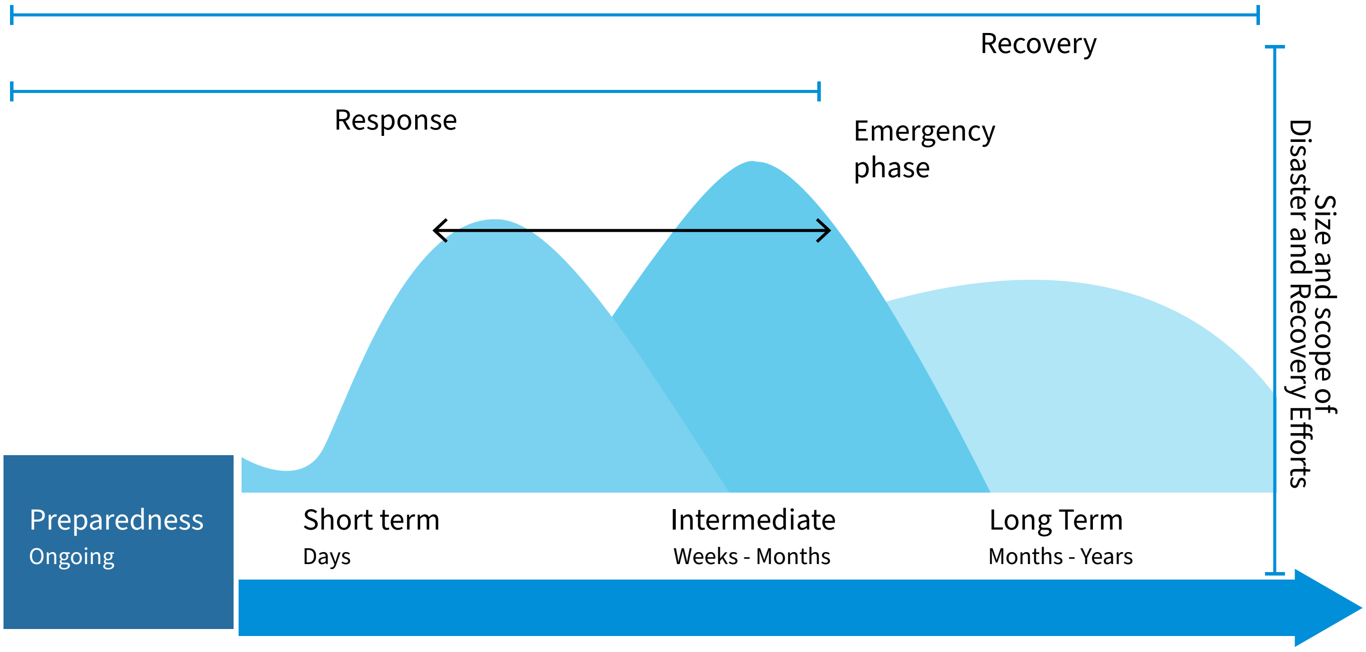
Emergency
Meeting basic needs simply to keep people alive.



Recovery

Continue beyond the emergency period to restore critical community functions and begin to manage stabilization efforts

Case study
When?



Discuss the case study with participants and ask them to clarify unclear areas. Inform that the case study will be used throughout the training programme.

Facilitator may add more information from time to time

Describe the importance of disaster recovery following the disaster management cycle

Four phases of disaster management cycle and link among each phase of disaster management cycle and importance of recovery for resilience

Why Disaster recovery is important for irrigation sector resilience

- It helps to reduce economic losses in disaster which shows rising trends due to high exposure of infrastructure and assets.
- It focuses beyond response and manages recovery process in more planned and scientific ways.
- Planned recovery efforts contribute not to exacerbating vulnerabilities
- Disaster recovery is efficient if institutions, policies and financial mechanism for recovery are set up prior to the disaster.
- Pre-disaster recovery planning can help a community to accelerate the recovery process once disaster strikes by predefining roles and responsibilities and, through the plannings process itself, building the institutional and community awareness and capacity to engage in recovery effort.

Evolution of Disaster Recovery

The Hyogo Framework for Action 2005 - 2015

Indicator 4.5 of the framework:
Disaster risk reduction measures are integrated into post - “disaster recovery and rehabilitation processes” and in Indicator 5.3: Financial reserves and recovery when required.

The Sedeai Framework for Disaster Rick Reduction 2015 - 2030 (SFDRR)

Priority 4 of SFDRR aims at Enhancing disaster preparedness for effective response and to build back better in recovery, rehabilitation and reconstruction. With this, the SFDRR puts more emphasis on the imperative to reduce risk in recovery and encourages governments to operationalize the concept of “Build Back Better”

Describe when to start the damage and loss assessment, Post Disaster Need Assessment and Recovery in post disaster phase of disaster management cycle 4

Describe the actions taken for pre-disaster planning and preparedness for recovery in Short Term (Days), Intermediate (Weeks, Months) Long terms (Months Years)

Evolution of Disaster Recovery

Terms and concept in disaster recovery

Early recovery
Early recovery is a Multi dimensional process guided by development principles that begin in a humanitarian setting and cheeks to build on humanitarian programs and catalyse sustainable development opportunities. It aims to generate and/ or reinforce nationally owned processors for post crisis recovery that are resilient and sustainable. It encompasses livelihoods, transitional shelter, governance, security and rule of law, environment and other socio economic dimensions, including the Re integration of displaced populations. Its strengthens human security and aims to begin addressing the underlying causes of the crisis.

Medium term recovery
Medium term recovery activities can be undertaken from 12 months to 2 years and long term recovery can even take from 2 to 5 years or a decade in very large scale disasters.

Long term recovery
Long term recovery involves actions that lead to the Restoration of normal life and of the social and economic functioning of the effected community. UNDP, 2008, Guidance Note in Early Recovery

Resilience
The UN International strategy for disaster reduction defines resilience as the ability of a system community or society exposed to hazards in a timely and effective manner including through the preservation and restoration of its essential basic structures and functions.
Explain case study and discuss following questions related to the Recovery Framework as a group work

Explain case study and discuss the case study as group activity following the above given guiding questions under outline of the session.

Explains that the principles of recovery are

- Readiness of government and citizens for recovery
- Planned strategically and managed efficiently
- Participation of all key stakeholders and affected population
- Use recovery as an opportunity to reduce risk.
- Countries should strive for continuous improvement of recovery practices.

Initiate a dialogue with participants to elaborate how effective these principles for recovery. Discussion could be based on past experience on disaster recovery in 2016/2017 flood in the Southwestern part of the country.

Terms and concept in disaster recovery

Components of Early Recovery in Irrigation Sector

- Restoring essential services including critical infrastructure in irrigation sector
- Providing additional support to critical governance functions of coordination (irrigation distribution) and information management (Reservoir and river water level, forecasting)
- Sharing information regularly with the other irrigation sector institutions and other institutions such as agriculture sector, energy sector working on recovery
- Mobilizing resources for recovery
- Providing temporary or transitional office spaces when and where required restoration bunds using sand bags etc...
- Debris clearing activities
- Conducting damage and needs assessment
- Providing emergency employment through cash for work programmes

Group Work

Group work 1:
Refer the case study, identify vulnerable communities and how a recovery plan will help to reduce their disaster risk. Write on the flipcharts and one of the groups to present. Ask for others' views

Refer to case study -
Several minor, medium large tanks were damages during floods Irrigation Department and Mahaweli Authority have to repair some of them urgently to provide water for paddy cultivation.

Question 1:
Who is responsible for carrying out recovery activities after a major flood?

Question2:
What are the finance sources available for irrigation sector recovery?

Question 3:
How will "off-budget" financing, such as that contributed by Non-Governmental Organizations or

the private sector for recovery programme, be directed, tracked, and reported?

Question 4:
What are the roles and responsibilities of stakeholders (national government, local government, line ministries, national and international NGOs, the private sector, communities and others) involve in the recovery process?

Question 5:
If irrigation sector institutions receive financial assistance for recovery programme from donors, Non-Governmental Organizations, United Nation agencies etc. What would be the appropriate mechanism need to be followed for planning and coordination of recovery ensuring the participation of all relevant stakeholder agencies?

4.4 MODULE 2 - PREPAREDNESS FOR DISASTER

RECOVERY

4.4.1 Introduction

Preparedness for disaster recovery is now a widely acknowledged concept that aids in pre-disaster planning so that recovery and reconstruction aid can be implemented without delay when required. Similar to preparedness for response, preparedness for recovery seeks to implement well-planned and coordinated recovery management systems. Pre-disaster preparedness refers to the actions performed prior to a disaster to ensure predictable and swift action to initiate recovery.

4.4.2 Learning Objectives

To enhance the capacity of Irrigation sector agencies to prepare for recovery before a disaster event thus expediting recovery activities during and after a disaster.

4.3 Out Line of the session

The following topics will be covered in Module 2:

Session 1 – Preparedness for Disaster Recovery

Session time: 2hrs
Presentation: 1hour
Group work: 1hour

Session will explain following areas;

- Preparedness for recovery is measures taken prior to disasters to ensure swift action to initiate recovery
- Explain key elements in preparedness for recovery
- Existing policies for planning for recovery
- How to identify irrigation sector recovery outcomes, priorities and funding requirement in pre disaster phase.

Slide presentations are used to guide the participants and to focus on the objectives

Small group discussions are involved. Use the whiteboard to highlight the participants' feedback.

Activity
Explain objectives and learning outcome of the module 2

Recovery Preparedness

Explain how preparedness for recovery will help to have a well-planned system for recovery, discuss how it would be effective if the recovery could be planned before disaster strikes. Ensure participatory approach to discuss advantages and challenges of preparedness for recovery.

To strengthen capacity of irrigation sector agencies to prepare to initiate recovery actions before disaster strike.

Learning outcomes:

By the end of session, participants will understand:

- Prior to disaster to swift action need to be taken to initiate recovery
- Key elements in recovery preparedness
- Policies for planning recovery
- How to identify irrigation sector recovery outcomes
- How to identify priorities and funding requirements including sources before disaster strikes

Describe the principles of disaster recovery.
Explain that it is a participatory process involving the key stakeholders and affected population, and how to utilize recovery as an opportunity for risk reduction and resilience building.

Introduction

- Similar to preparedness for response, preparedness for recovery aims to have well planned and coordinated systems for management of recovery.

- It is measured taken prior to a disaster to have capacities, institutions and finance to ensure predictable and swift action to initiate recovery.

What are key elements of recovery preparedness? Discuss why these criteria are so important. Refer to the experience in 2016/2017 recovery planning after floods to elaborate on these key elements.

Principles of disaster recovery

- Governments and citizens should be ready for recovery
- Recovery programmes should be planned strategically and managed efficiently
- Key stakeholders including the affected population must participate in the recovery process
- Recovery should use the opportunity for risk reduction and resilience building
- Countries should strive for continuous improvement of recovery practices

Key elements of recovery preparedness

- Will explain key policies and planning for recovery
- Establishing the institutional framework for recovery
- Post disaster assessments
- Resource mobilization and financial management for recovery
- Implementation, coordination, communications and monitoring for recovery

Describe internationally recognized policy guidelines.

Discuss how effective and feasible it is to implement these guidelines in the context of the country.

Policies and planning for recovery

- Sustainable livelihood, environment, DRR and climate change adaptation
- Facilitation of private partnership
- Gender sensitivity, social inclusion, community partnership
- Targeting the most vulnerable
- Subsidiary and local implementation
- Eligibility criteria for compensation
- Implementing oversight transparency mechanism

How to coordinates recovery activities in irrigation sector and how the recovery link to the development priorities of the irrigation sector in the country.

Identify irrigation sector recovery outcomes

- A recovery framework prepared before a disaster provides the reference for developing a post disaster recovery framework and the recovery programme.
- Irrigation sector institutions at national and provincial levels have the responsibility to lead, manage and coordinate disaster response and recovery with respect to the sector
- Outcomes of the recovery programme should contribute to the development priorities of the irrigation sector in the country
- The involvement and leadership of the national planning department under ministry of finance and disaster management center in post disaster assessments and developing a recovery frame work helps to bring about this linkage and also to prioritize recovery for long-term development gains.

Explain why it is necessary to assess the effects and repercussions in order to determine the recovery requirements after a major disaster.

How to identify recovery priorities and find priority needs

- After a major disaster, it i required to undertake an assessment of damage, loss and recovery needs.
- Such assessments help to identify the short, medium and long term recovery priorities and needs
- Success of the assessment depends on to what extent pre-disaster baseline data set is completed

Describe the roles and responsibilities of irrigation sector agencies, as well as the arrangements required for recovery and the agency in charge of recovery efforts. These could be completed as part of recovery preparedness.

Establishing the institutional framework for recovery

- The institutional framework for irrigation sector recovery
  Defines the roles and responsibilities of the irrigation sector institutions (Public) and recovery (Public and Private) and provides for their collaboration. It also establishes the legal basis for the actions of all actors and the rules under which they operate.

- Organize the institutional arrangements for recovery
  The recovery framework should define the institutional arrangements for recovery which defines the roles and responsibilities

- Designate a lead recovery institution
  Designating a lead recovery agency is an important task that could be done before a disaster

Designated lead agency usually depends on the following characteristics

- Characteristics of the disaster
- Current governance structure
- Agency's prior disaster recovery experience
- Agency's ability to reach out and include communities in defining and implementing their recovery process, and capacity to work with local authorities and nongovernmental organizations
- Overarching coordination, monitoring, oversight, and control framework in operation among a country's agencies, line ministries, local governments and civil society
- In Sri Lanka, irrigation sector institutions under the government collaborate to execute recovery using normal procedures.

Technical capacity at national and local levels

- There is a need for professional and technical expertise at the national and local levels to steer all irrigation sector institutional capacities and resources for recovery planning and implementation.Such expertise should be institutionalized in all sector institutions for implementing recovery.

Establish a legal framework for recovery in Irrigation Sector
A legal framework for recovery combines:

- legal instruments and procedures in use in normal times,
- instruments and procedures established specifically for disaster recovery

Explain the prevailing legal frameworks for disaster recovery such as Sri Lanka Disaster Management Act no 13, 2005, Sri Lanka Disaster Management policy, rules and regulations under Coast Conservation and Coastal Resources Management act, Local Governance etc.
Explain the Preparedness and Response Policy Statement and the Integrated Systems to Reduce Disaster Risk.

The legal framework for recovery

Legal Framework includes

- Disaster Management Act and regulations
- Laws and regulations that govern public expenditure, land use, social protection, and irrigation, agriculture and water management sectors
- New or strengthened enforcement mechanisms (for instance, to enforce no-build zones)
- Modifications to or suspensions of normal rules and procedures (Approval and management of expenditures during disasters Transparency and competition in procurement Planning and environmental review of projects, Incorporating disaster risk reduction)

Often, legal or regulatory requirements can cause procedural delays for implementing recovery activities which need to be delivered promptly.

If modifying or suspending normal procedures creates risks, mitigation measures for these risks should be identified before rule changes are promulgated. Instead of suspending or weakening rules related to disaster risk reduction to facilitate reconstruction, efforts should be made to address bottlenecks in the disaster risk management system.

Policy Framework for Disaster Recovery in Sri Lanka

- The National Policy on Disaster Management states the government's intent and commitment for emergency response and recovery. Assistance to affected persons is elaborated under two main areas : 'Preparedness and Response' and 'Integrated Systems to Reduce Disaster Risk'. The clauses in the National Policy on Disaster Management recommend further improving post disaster relief, recovery and rehabilitation capabilities.

- Explain the role of stakeholders in recovery preparedness and the benefits and drawbacks of decentralized recovery.

- Request group opinions on decentralizing the recovery of the irrigation sector after a disaster to local level agencies.

Identify recovery stakeholders

Stakeholders	Examples
Key stakeholders in Recovery	Central Provincial and local government agencies Affected population stakeholders Civil society organizations and community-based organizations Non-government organizations (local, national) International non-government organization United Nations agencies Bilateral donors Multilateral financial institutions Private sector
Examples of other stakeholders	Non-affected population in affected area Property owners Political actors (political parties, candidates, opponents of elected officials, etc.) Civil society outside affected area

Decentralize Recovery Advantages

Advantages	Disadvantages
• Easier to identify beneficiaries • Easier to mobilize the affected community for common goals • Greater opportunities for joint decisions and planning with beneficiary involvement • More likely that services reflect local preferences and meet needs • Greater receptivity on the part of beneficiaries to pay for servicesor participate • Greater engagement of beneficiaries in oversight and accountability • Easier coordination with local partners and stakeholders	• Possible lack of technical capacity and human resources • Possible lack of adequate funds • Greater burden of procedural approvals • Possible delays due to requirement of coordination, monitoring and reporting to the central government

4.5 MODULE 3 - POST DISASTER DAMAGE AND LOSS ASSESSMENT (DALA) AND POST DISASTER NEED ASSESSMENT (PDNA)

4.5.1 Introduction

The third module will help participants comprehend the terminology and concepts of post-disaster damage and loss assessment and need assessment, as well as the applicability of pre-disaster damage and loss assessment baseline databases. In addition, it describes the significance of post-disaster need assessment, which is essential for the development of recovery strategies. Module also addresses the methodology for conducting a DaLA and PDNA, as well as identifying the sectors and stakeholders involved in assessment.

Sharing past experience with implementing DaLA and PDNA in Sri Lanka, the facilitation provided by international partners and United Nations agencies, and the potential and challenges of stakeholder coordination in implementing DaLA can be elaborated upon.

4.5.2 Learning Objectives

To assist the institutions of the irrigation sector

- To comprehend terms and concepts associated with the post-Disaster Damage and Loss Assessment and Need Assessment
- Key principles, local experience in conducting a DaLA and PDNA
- Key principles, methodology, tools, guidelines, processes, and procedures of DaLA and PDNA;
- Coordination with sector agencies and monitoring process.

4.5. 3 Learning Sessions

In Module 3, the following topics will be covered:

Session 1 - Introduction to DaLA and PDNA

Session 2 - How to conduct a DaLA and PDNA

Session 3 - Process and procedure of Assessment

Learning outcomes of the Session 1: Introduction to DaLA and PDNA

By the end of the session Participant will be able to understand

- Important terms and concepts of DaLA and PDNA
- Key principle and local experience in conducting a DaLA and PDNA,
- Process and procedures of conducting a assessments
- Methodology, tools and guidelines available
- Coordination with sector agencies and monitoring procedures

Session time: 3 hrs and 30 minutes | Presentation: 1hour and 30 minutes | Goup work: 2 hour

4.5.4 Session 1 Outline

Session will explain following areas

Session will explain the terminology and concepts of the post-disaster damage and loss assessment and need assessment, as well as key principles, local experience in conducting a DaLA and PDNA, application of baseline database and key principles, methodology, tools, guidelines, process and procedures of DaLA and PDNA, coordination with sector agencies and stakeholders for monitoring process.

Slide presentations and small group discussions are used to guide the participants and to achieve the session objectives.

Use either the whiteboard or flip chart to highlight the participants' feedback.

Activities
Explain the objectives of module 3 and learning outcomes, as well as the participatory training and mentoring approach, small group exercises, and participant expectations.

Module 3

Post Disaster Damage and Loss Assessment (DaLa) and Need Assessment

Session 1 - introduction to DaLa and PDNA

Session 2 - how to conducts DaLa and PDNA

Session 3 - process and procedures of conducting DaLa and PDNA

Session 1
Introduction to Damage and Loss Assessment and Post Disaster Need Assessment

Briefly introduce DaLA PDNA, its adoption by the government, and the organizations supporting the process.

- After a major disaster identifying recovery needs of effected infrastructure and communities, consider an important requirement to mobilize resources to implement a recovery programme

- In this respect, Post Disaster Damage and Loss Assessment and Need Assessment Tool developed by the UNDP in coloration with World Bank and European Union is a Scientific approach to assess post disaster needs.

Explain
- Terms and concepts of the DaLA and PDNA
- Key principles, local experience in conducting a DaLA and PDNA
- Key principles, methodology, tools, guidelines, process and procedures of DaLA and PDNA, coordination with sector agencies and monitoring process

Objectives:

To help the irrigation sector institutions:

- To understand terms and concepts of the post Disaster damage and Loss Assessment and Need Assessment

- Key principles, local experience in conducting a DaLA and PDNA

- Key principles, methodology, tools, guidelines, process and procedures of DaLA and PDNA, coordination with sector agencies and monitoring process.

Learning outcome:

By the end of the session, participants will be able to understand

- Important terms and concepts of DaLA and PDNA
- Key principle and local experience in conducting a DaLA and PDNA
- Methodology, tools and guidelines available
- Coordination with sector agencies and monitoring

Describe what is DaLA and PDNA and their objectives, why it is necessary the government to conduct a DaLA and PDNA and who are stakeholders involved in both assessments.

Explain that DaLA and PDNA is a government led and owed process supported by other agencies, avoid duplication and use as a tool for recovery planning

01 What is a PDNA?

02 Why conduct a PDNA?

03 Who conducts a PDNA?

04 Key Principles

05 Evolution of the PDNA Methodology

What is DaLA and PDNA?

The objective:

- Post-disaster damage and loss assessment (DaLA) needs assessments (PDNAs) are an internationally accepted methodologies for determining the physical damages, economic losses, costs of meeting recovery needs after a natural hazard through a government-led process.
- The DaLA and PDNA is a mechanism for joint assessment and recovery planning after a disaster
- The assessment also highlights the macro-economic and human impacts of the disaster.
- The recovery needs identified helps to mobilize resources and develop a comprehensive recovery strategy.

Why conduct a DaLA and PDNA - The rationale

- The DaLA and PDNA is envisaged as a country owned and led process, supported by international agencies and other stakeholders such as CSO, academia, private sector, etc. to assess effect and impacts of disaster.

- By bringing together key stakeholders engaged in recovery, the DaLA and PDNA aims to avoid duplication and harmonize assessment efforts.

- The multi-stakeholder approach leads to the development of a single PDNA report including results of DaLA, that can be used as a tool for planning and programming recovery, as well for resource mobilization.

Explain evolution of DaLA and PDNA and declaration at global platform in Sendai.

Post-crisis Cooperation Agreement and Guidelines

On 25 September 2008, the UN, EU and WB signed a Joint Declaration on Post-Crisis Assessments and Recovery Planning:

- PDNA Volumes A and B
- Disaster Recovery Framework

Presented in September 2014 at the Second World Reconstruction Conference; officially launched at the Sendai World Conference on Disaster Risk Reduction on 14 March 2015.

International accepted guidelines for conducting PDNA incorporating DaLA methodology. Highlighting following key points:

- Prior to 2014 World Bank led the process of reconstruction and rehabilitation of damaged/destroyed infrastructure.
- United Nation Agencies led the process of humanitarian assistance and programme for recovery of livelihood.
- The two approached integrated and launched as PDNA.
- Main actors were United Nation Development Programme, European Union and World Bank.

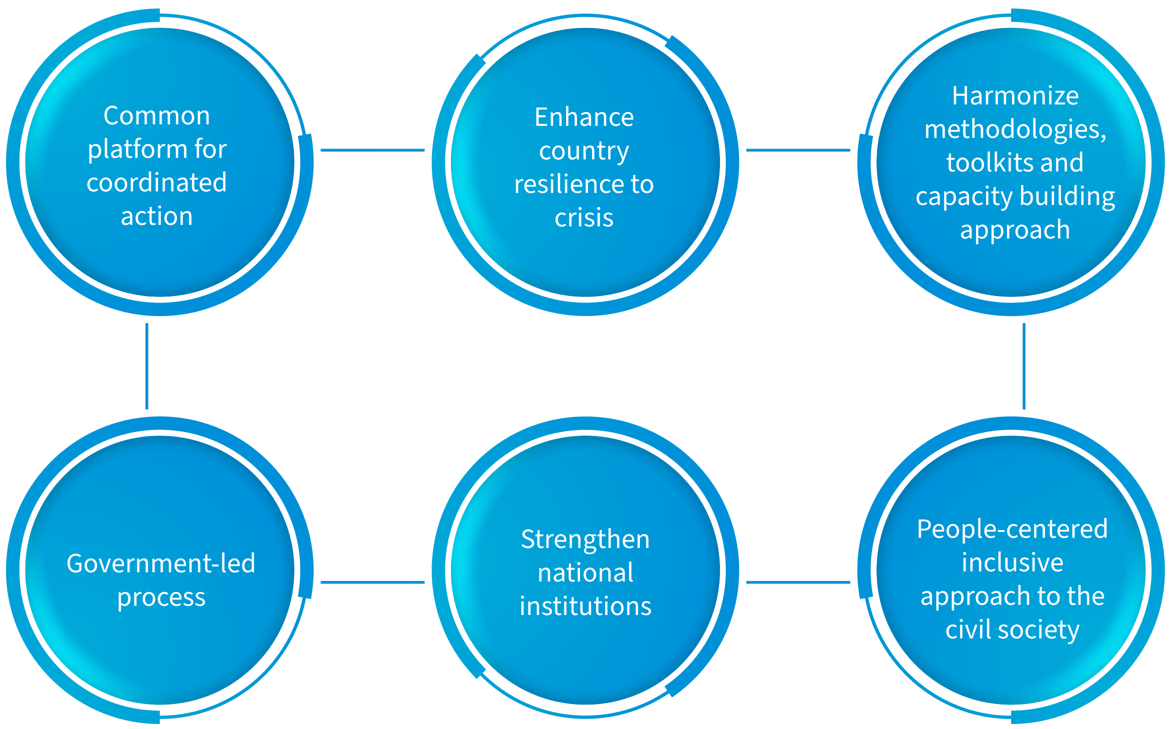
Questions:

- What are the factors led to integrate two approaches for DaLA and PDNA?
- What are the advantages and disadvantages?
- Facilitator can request one group to write their views on the white board and other groups to discuss and add if any missing points.

Explain 6 Key principles of DaLA and PDNA.

Facilitator could initiate a discussion with participants using following questions;

Key Principles



Question:
Why government need to provide leadership for DaLA and PDNA process?

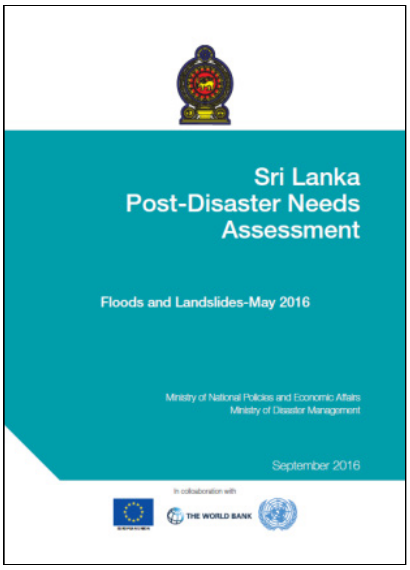
Encourage each group to provide at least one point.

Explain PDNA experience in Sri Lanka.

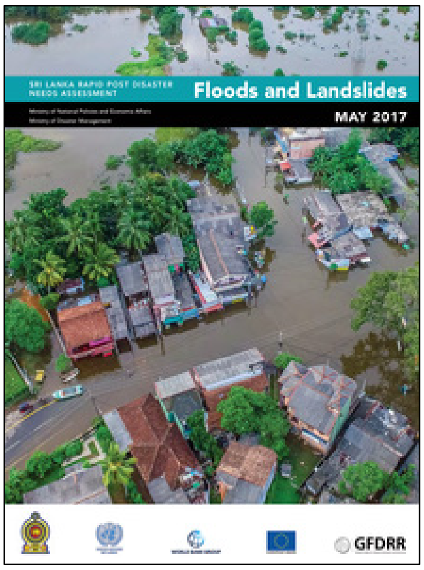
Sri Lanka has conducted DaLA in 2010 and PDNA in 2016 with international experts and 2017 PDNA with local professional with a minimum input for expatiate consultant on specific fields with recovery identifications.

DaLA and PDNA Experience in Sri Lanka

PDNA - 2016
(for floods)



PDNA - 2017



Post-Disaster
Recovery Framework

Explain sector-based approach for DaLA and PDNA emphasizing following key points:

Major categories of sectors such as Productive, Social, and Infrastructure and subsectors as well as the cross-cutting sectors

Explain Irrigation sector as a subsector of Agriculture.
Gender, Disaster Risk Reduction (DRR), environment, livelihood and governance as cross cutting sector since these subjects are common to all.

Typical sector and sub-sectors

Productive	Social	Infrastructure
Agriculture	Housing	Water & Sanitation
Commerce	Education	Community infrastructure
Industry	Health	Energy
Tourism	Culture	Transport
		Telecommunication

Cross-Cutting

Gender · Governance · Environment · Disaster Risk Reduction · Employment and livelihoods

Note: The diagram above illustrates the typical sectors that are assessed in the PDNA, this can vary from country to country.

Following group work could be used enhance understanding of participants:

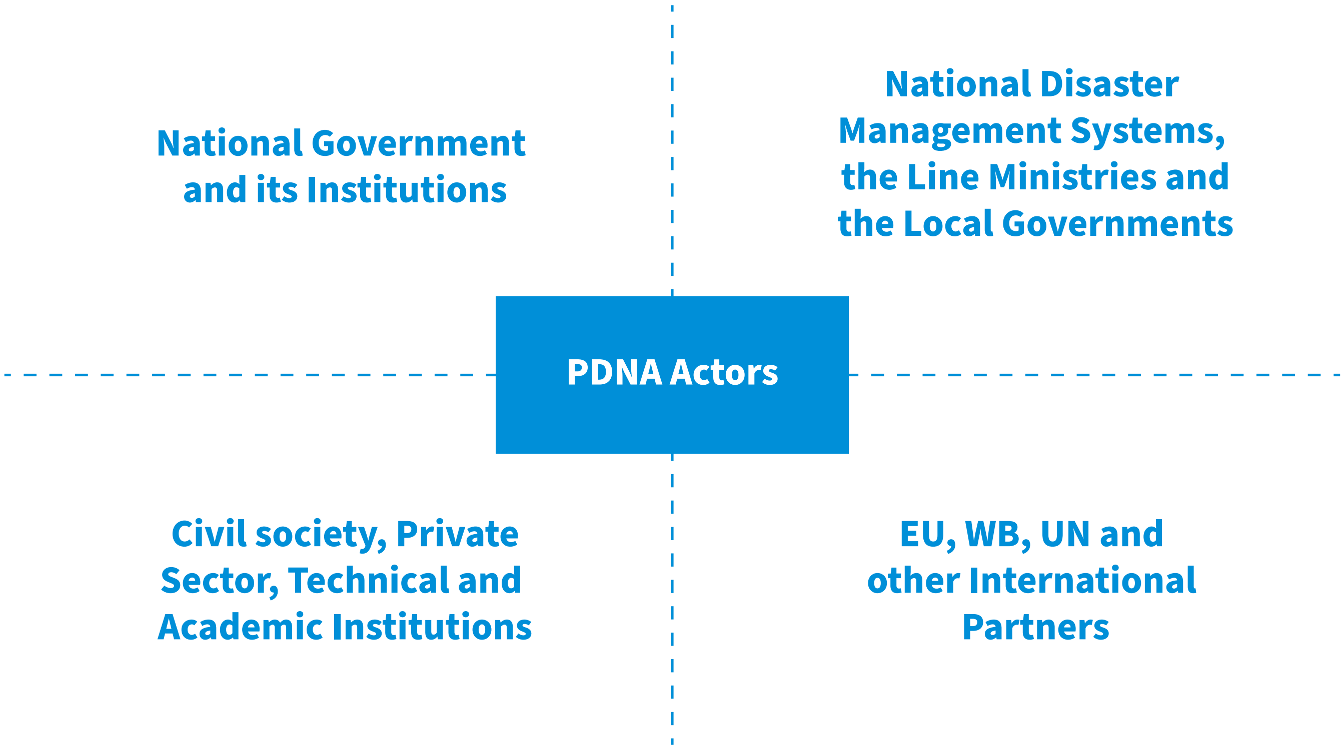
Discuss the case study within the group and answer following questions:

- What sectors should be assessed post flood disaster in Polonnaruwa/ Lankapura district?
- Why DRR, gender, environment, livelihood and governance are not considered as a sector and consider as cross cutting sector?

Explain major institutions involve in DaLA and PDNA process and requirements for strong coordinating and guidance from top management.

Who conducts a PDNA? -The Key Actors.

PDNA Coordination Structure



If there are any participants who participated in 2016 or 2017 PDNA representing Irrigation sector, facilitator can ask them to share their experience on the process.

Explain roles and responsibilities of government and supporting agencies such as UN agencies, European Union and World Bank in the assessment.

Role of the National Government in the Assessments
The Role of the EU, UN and WB
Role of the UN Agencies in the Assessments

Leadership and Coordination	• **Designation of a Ministry to lead and anchor the PDNA process.** • **Brings together all national ministries and departments and international actors under a joint process**
Data Collection & access to information	• **Pre Disaster data National data bases, line ministries data bases** • **Post disaster data: Facilitates data Collection from the affected areas**
Provides / logistics support	• **Space for PDNA secretariat** • **Facilities for workshops and consultations**
Reviews and endorses the PDNA report	• **Reviews all sector reports for accuracy** • **Approves the report at the highest office** • **Allocates resources, presents report for international assistance**

Facilitator can assign groups to express their views on roles and responsibilities of different UN agencies such as UNDP, WFP, WHO, UNICEF, UNFPA, etc. on PDNA process.

Multi sectorial experts deployment for coordination and sector assessment

Technical support to implement post-disaster recovery

Tripartite Partners

Funding PDNAs and reconstruction and recovery activities

Training and Capacity Building

Sector Group	Sectors
Social sectors	• **Housing, land and settlements (UN-Habitat)** • **Education (UNICEF)** • **Health (WHO)** • **Culture (UNESCO)**
Productive sectors	• **Agriculture, fisheries and livestock (FAO)** • **Employment and livelihoods (ILO)**
Infrastructure sectors	• **Water and sanitation (UNICEF)** • **Community infrastructure (UNDP)**
Cross-cutting	• **DRR (UNDP)** • **Governance (UNDP)** • **Gender (UN Women)** • **Environment (UNEP)**

Display slides no 17 and Explain implementation process of the DaLA and PDNA. Following group can be discussed among the groups

DaLA and PDNA Implementation Process

Group work:

According to the case study, you are a member of the Irrigation sector's PDNA team.

01 Establish the PDNA assessment team

02 Conduct training/orientation on PDNA

03 Data collection and validation, draft sectorial reports

04 Consolidation and analysis of Sector effects, impact and needs

05 Formulating the Recovery Strategy

06 Resource mobilization and implementation mechanism

- How do you propose to assess the flood damages and losses in the Lankapura/ Polonnaruwa / Lankapura district?
- Describe the Implementation process of PDNA
- Who should comprise the team and what should their duties and responsibilities be?

Discuss 20 minutes and 10 minutes to present.

Describe the methodologies for DaLA and PDNA process under following sub topics:

- Context analysis,
- Disaster effect and impacts,
- Recovery needs and strategy.
- Baseline for social, economic, cultural, financial and political status

The DaLA and PDNA Methodolog
This method of analysis is undertaken for each sectors of interest.

Tools & Guidelines for PDNA

Context Analysis:
- Pre-Disaster context-baseline of social, economic, cultural, financial, political status

Disaster Effect:
- Infrastructure and assets
- Production of goods and services
- Governance processes
- Increased risks

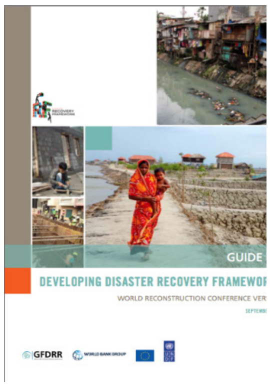
Disaster Impact:
- Economic
- Human/social

Recovery Needs:
- Includes BBB
- Includes DRR

- Agreed protocols and methodology for the assessment: PDNA Vol. A
- 18 Sector-specific guidelines: PDNA Vol. B
- A Disaster Recovery Framework: DRF
- Training package.
- Roster of experts for PDNA.

http://www.undp.org/content/undp/en/home/librarypage/crisis-prevention-and-recovery/pdna.html

Methodology, Sector Guides, Recovery Framework, Training Package, Case Studies.



Display slides no 21 and explain following areas in details with examples

- The contend of baseline database and mechanism to establish a baseline database,
- Methodology for analysis effect and impacts
- How to identify recovery needs following Build Back Better concept
- Develop plan for sustainable recovery

Once the pre-disaster context has been completed, a base line for analysis is established, the following steps are undertaken by Sector:

Facilitator can use following Group work to enhance knowledge on DaLA and PDNA process:

The Assessment of the Disaster Effect by Sector			
Effects on the infrastructure and Physical Assets	Production and Access to Goods & Services	Disruption to Governance & Decision Making Processes	Increased Risks and Vulnerabilities
↓			
The Assessment of the Disaster Impact			
Macro-economic	Human Impact (Personal/Household)	Cross-Cutting Concerns (Governance, Gender, DRR, Environment)	
↓			
Estimate the Needs to Counter the Effects and Impacts			
Reconstruction of infrastructure and physical assets	Resumption of Production, Service Delivery and Access to Goods and Services	Restoration of Governance and Decision Making Processes	Reducing Risks or Building Back Better
↓			
The Recovery Strategy			
Recovery Needs	Vision and Guiding Principles	Intended Sectorial Results	Implementation Arrangements

Assign groups to identify and list out the items/ fields for baseline database under following infrastructures:

- Irrigation scheme
- Head works (Bund, Spillway and Riprap)
- Canal system
- Canal Structure
- Service Roads
- Road culverts and structures

Inform groups to discuss and present how to use the baseline data and information for damage and loss assessment comparing pre-disaster and post disaster conditions.

Explain deliverable of a DaLA and how to use the DaLA deliverables to formulate PDNA. Further following areas need to be explain with example:

- Preparation of consolidate assessment report
- Formulation of recovery strategy (vision, prioritize intervention, cost and time line)
- Strategies for resource mobilization and to obtain local, national and international support

PDNA deliverables

Consolidated Assessment Report based on sector reports that present disaster effect and impact, recovery needs, and impact on cross-cutting concerns.

Recovery Strategy including the vision for national recovery, prioritized sector-specific recovery interventions, costs, timelines and potential actors.

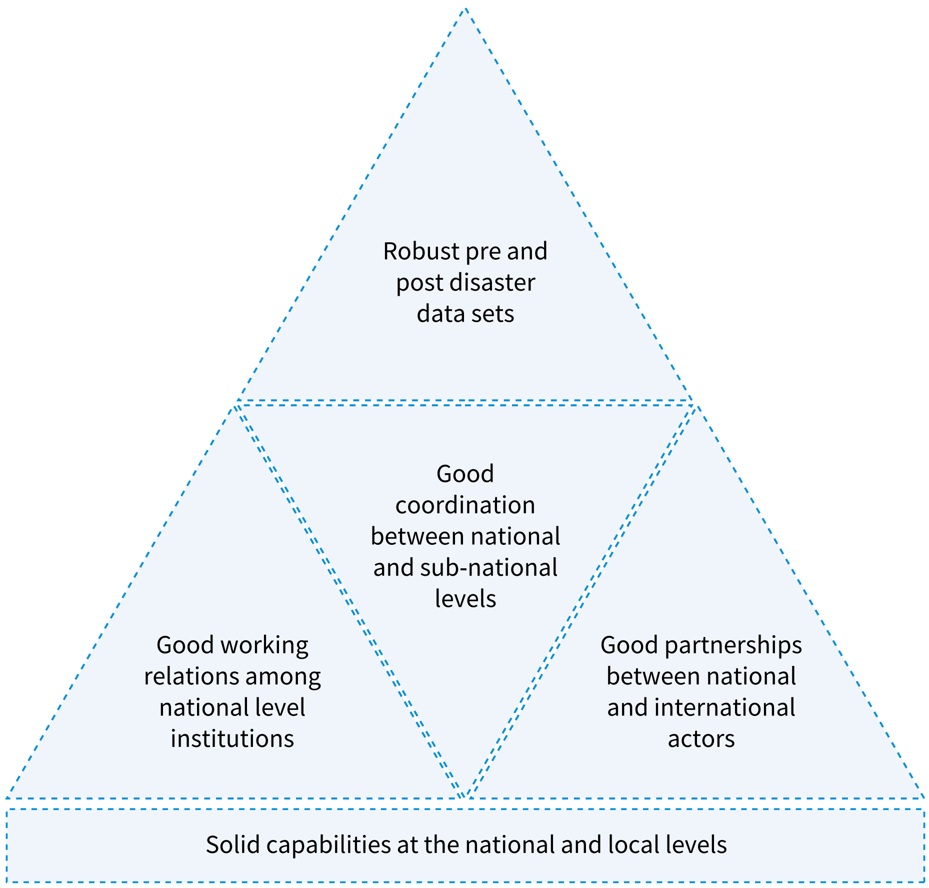
Basis for Mobilizing (Financial) Resources through allocation of local, national and international sources.

Outline for Implementation Mechanism led by the affected country for implementing the recovery strategy.

Explain essential states to complete comprehensive PDNA assessment, implementation, limitation of methodology and factors that contribute to success of both DaLA and PDNA using following group work.

Enabling conditions for a successful DaLA and PDNA

Limitations to Methodology



Factors that Contribute to the Success of a PDNA

Does not replace in-depth sectorial analysis.

Does not provide detailed recovery projects.

Recovery strategy requires elaboration into a framework and programming.

PDNA has a fixed timeframe which places limitations on the collection of data.

Government Leadership:
National ownership and leadership is an essential pre requisite for the use and application of the PDNA.

National expertise:
Works better when people with skills and knowledge of the country and region undertake the PDNA. It should be Institutionalized as a part of the national DRR strategy.

Linked with Recovery:
The PDNA must lead to recovery planning and programming. It should be done with a on focus on reducing risks and "building back better

Right balance:
PDNA must have the right balance between social and economic and infrastructure needs.

Time bound:
The PDNA should be planned and completed within a stipulated timeframe.

Collaborative Effort:
The PDNA is a collaboration between ministries and national and international partners. A strong collaboration leads to better results.

Group work:
Assign groups to discuss essential steps required to be taken to make a successful PDNA and recovery framework, considering factors that could contributed to the successes of PDNA in Sri Lanka. Facilitator could use following case as to elaborate the group work; "Sri Lanka has conducted two PDNAs in 2016 and 2017. Post disaster recovery framework has been formulated following the results of the PDNA of 2017 floods. Government has funded immediate recovery requirement. However long-term recovery has not been incorporated into development planning process"

4.6 MODULE 3 SESSION 2 - HOW TO CONDUCT A DAMAGE AND LOSS ASSESSMENT (DALA) AND POST DISASTER NEED ASSESSMENT (PDNA)

Session 2 of module 3 is on how to conduct a Damage and Loss Assessment (DaLA) and Post Disaster Need Assessment (PDNA)

4.6.1 Introduction

Session 2 of Module 3 will educate participants on disaster-related terminology and concepts. Damage and losses, post-disaster need assessment, baseline data is one of the central components of the PDNA process and emphasizes the significance of collecting baseline data prior to a disaster. Introduce formats for the collection of irrigation scheme baseline data, which could be used to compare post-disaster effects to pre-disaster conditions. It also emphasizes the significance of post-disaster need assessment results for the development of recovery strategies. The module also addresses the methodology for conducting a PDNA, as well as the identification of sectors and stakeholders involved in the assessment.
Session describes the past experience in conducting DaLA and PDNA in Sri Lanka, as well as the international partners who supported the implementation of DaLA and PDNA.

4.6.2 Objective

The objective of the session 2 is to enhance the capacity of participants from the Irrigation sector to collect and validate baseline data, including social and environmental data, prior to a disaster in order to conduct a damage and loss assessment. Assessing damages and losses based on a case study and identifying recovery requirements.

4.6.3 Learning outcomes

At the end of Module, the participants will understand;

- The necessity of having baseline data prior to the occurrence of a disaster so that damage loss assessments can be completed expeditiously and a recovery plan can be formulated;
- Types of baseline data in the irrigation sector, where to collect them, and how to collect them, including information on irrigation schemes and organizational structures.
- The effects and consequences of a major calamity on the irrigation sector
- How to assess the damages and losses and identify the sector's recovery requirements

Session will explain

- The need for baseline data prior to the occurrence of a disaster so that damage loss assessments can be completed without delay and recovery plans can be formulated;
- Types of baseline data in the irrigation sector, their sources, and collection methods, including information on irrigation schemes and organizational structures
- The effects and consequences of a large-scale disaster on the irrigation industry
- How to assess damages and losses and identify recovery needs in the irrigation sector;

- Effects and repercussions, including microeconomic and human development repercussions, following a large-scale disaster Participants will receive hands-on training in the assessment of damages and losses in the irrigation industry.
  Introduce forms for collecting baseline information and assessing losses.
- How to identify rehabilitation requirements

Participants are guided and kept focused on the objectives through the use of PowerPoint presentations, and small-group discussions are also incorporated.

Utilize the whiteboard to emphasize participant feedback.

4.6.4 Outline of Module 3 – Session 2 How to conduct a Damage and Loss assessment and Post Disaster Need Assessment (PDNA)

Describe the participatory training and coaching approach with small group exercises and discussions adapt in the session to obtain the active participation throughout the session.

Module 2: How to conduct Post Disaster Need Assessment

Objective:
To improve capacity of Irrigation to assess damages and losses after a large scale disaster.

Learning outcome:

By the end of the session Participant will be able to understand:

- The pre disaster baseline dataset for irrigation schemes and other infrastructures
- The irrigation infrastructure inventory will present the predisaster situation when a disaster strikes and is essential o accurately capture post disaster damager and losses for recovery planning.
- Irrigation infrastructure inventory in a common format representing all irrigation institutions is required for recovery planning
- Requirement of incorporating ancillary information of disaster recovery to irrigation infrastructure for future reference
- The effects and impacts of large scale disaster on irrigation sector
- How to assess the damages and losses in the irrigation sector

Explain what baseline information is and why it is necessary for assessing the magnitude of a disaster, as well as how to assess disaster damages, losses, and impacts and how to identify sector recovery needs

Core Elements of DaLA and PDNA

Explain what data is contained in the Baseline data set?

Deliverables of a PDNA Baseline Information

Includes:- National, socio economic, demographic and geographical data relevant to the affected area of irrigation sector , including development indicators such as literacy rates, malnutrition and food insecurity, poverty levels.

Pre-Disaster context and BASELINE information	The collection of pre-disaster baseline data to compare with post-disaster conditions in order to evaluate the magnitude and scale of the disaster
Assessment of disaster EFFECTS & IMPACTS	The evaluation of the disaster effects and disaster impacts in each sector to determine the overall recovery needs.
RECOVERY STRATEGY, determining sector recovery needs	The prioritization of these recovery needs by way of a Recovery Strategy

Explains that collecting baseline data during or after a disaster will delay the process of assessing disaster damages and losses, thereby delaying recovery planning. How useful it is to estimate damages and losses in the irrigation sector.

What are the data fields of the baseline data set, and how do participants feel about data collection and storage?

Baseline Data

Determining the overall impact of the disaster
Including impact on humans

contributes to the vulnerability analysis that effects in planning an effective and resilient framework

Request that they share their expertise in data collection for the 2016–2017 flood damage assessment. The trainer will initiate a discussion with the participants by posing the question, "Why is baseline data or information a core element of a PDNA?"

Use for estimating damages and losses in each sector by geographical area of assessment

Assets
- Types of Assets
- Construction costs
- Repair costs

Economic flows
- Production levels/Outputs
- Incomes
- Production costs

Use for impact assessments

Social impacts
- Demography – number of family members (male/female), sources and amount of incomes, etc.
- Social status of the people – standard of living, health, education, housing, etc.
  Cultural – family relations, spirituality, etc.

Economic and financial impacts
- GDP, employment, budget deficit, inflation, balance of payments, etc.

Governance
- political stability, provision of government services, etc.

Environment
- Impacts on habitats, protected areas, etc.

Baseline data information and data in an irrigation scheme.

Irrigation Schemes

- Categorize date on the basis of major, medium, minor tanks and anicuts.
- Functionality of each tank (Whether it is currently functioning or abandoned).
- X, Y Coordinates of each tank
- Capacity
- Average Cropping Intensity in Yala season.
- Average Cropping Intensity in Maha season

Salt Water Exclusion Schemes

- Name of the scheme
- X, Y Coordinates
- Ownership
- Administrative Division
- Functionality (Whether it is currently functioning or abandoned)
- Number of Beneficiaries
- Any other relevant data

Flood Protection/Drainage Schemes

- Name of the scheme
- Associated river (Name of the river to which the flood protection scheme is related)
- X, Y Coordinates
- Ownership
- Administrative Division
- Functionality (Whether it is currently functioning or abandoned)
- Number of Beneficiaries
- Any other relevant data

a) If relevant, Include fishing communities under each irrigation scheme as beneficiaries.
b) Consider annual cropping intensity for each scheme.
c) Include lift irrigation systems in the database.
d) Consider ground water development projects

Baseline information must be compiled and validated at the national, provincial or district levels before the field assessment or, if possible, prior to the occurrence of disaster.

The facilitator will instigate a discussion with the participants by asking, “Why are baseline data or information essential components of a PDNA?”

What data fields comprise the baseline data set, and how do participants perceive data collection and storage?
Allow each group to enumerate the irrigation scheme’s data followed by the discussion among the group to identify the missing data fields if any and to share experience on the data collection during the 2016–2017 PDNA in irrigation sector and the impact of the non-availability of baseline data.
Followig group works can further enhance participant knowledge on development of baseline database on irrigation sector.

Group work1:
Ask participants to refer to the case study and identify and list exposed elements to floods and their vulnerabilities.

Baseline database of irrigation schemes (refer to slide 7) will provide data to assess vulnerability of structural elements. Vulnerability of exposed communities and environment could be assessed using social and environment data (refer to slide 6) in the baseline dataset.

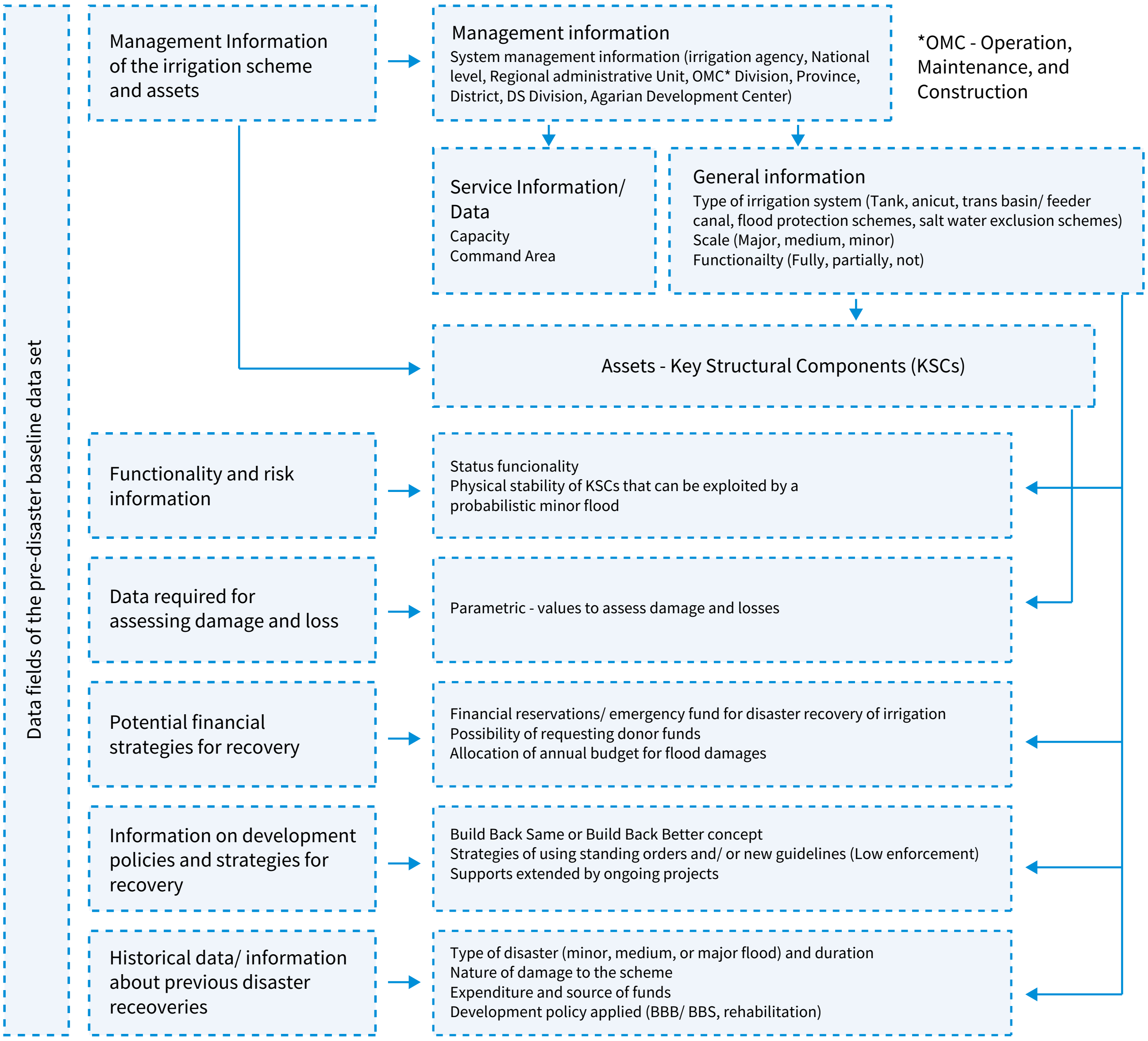
Group work 2:
Ask participants to identify data available with the irrigation sector institutions and from where other data/information could be collected. Identify supportive institutions to complete database.

Request one of the participants to write the missing data on the board and agency providing such data while others could propose required data fields.

Explains data fields of pre disaster baseline data set

Explain emphasizing the following points:

- Basic information on irrigation schemes, flood protection schemes, and saltwater exclusion schemes
- Information on the inland fishing community as a beneficiary of irrigation schemes
- Validation of baseline data and information is required.
- How an inventory of irrigation infrastructure can serve as a benchmark Information in a routine situation and baseline information gathered prior to a disaster



Explains what information and data are considered as baseline data in an irrigation scheme

Form A - for recording pre disaster baseline data of irrigation scheme (ID Asset Register) - general information

Form B. Structural Data/ information

The facilitator will engage the participants in discussion by asking following question:

- Why are baseline data or information essential components of a PDNA?
- What data fields should be included in the baseline data set, and data collection and storage methods and requirements in a user-friendly way?

Permit each group to catalog the irrigation scheme's information. Refer participant manual "Form A" under Module 3 and explain the computed items. Ask participants if there are additional elements to be included.

1	Identification of the scheme		
	Name of scheme		
	Type		
	Category	(Major/ Medium/ Minor)	
	Command area (ha)		
	Capacity (for tank in MCM)		
	Beneficiaries	Farmer families/ families protected by FPS	
	Functionality at present	Fully/ Partially/ Not - funtioning	
	Any other details (if required)		
2	Administrative information		
	Managing Agency		
	National-level coordination by		
	Regional Administration by		
	Operation, maintenance, and construction Division		
3	Geographical location		
	Coordinates (GPS/ Metric/ Tank)		
	Agarian Service Center		
	Province		
	District		
	DS Division		
4	Vulnerability for potentialdisaster risk		
	Observed flood event	Year	Month
	Observed Peak-Flood	Below HFL/ Between HFL and BTL/ Above BTL	

Introduce the standard format for baseline data collection.
Refer to the available forms for documenting pre-disaster baseline data and information and describe what information should be included on each form.

5	Key Structural Components		
		6 Rebuilding cost	
		Unit	Cost (LKR)
a	Head Works		
	Bund	1 km	
	Riprap	1 km	
	Bund Road	1 km	
	Spill	01 No	
	Sluice - RB	01 No	
	Sluice - LB	01 No	
	Other structures		
b	Conveyance System		
i	Main Canal		
	Main Canal	1 km	
	Bund Road	1 km	
	Spill	01 No	
	Sluice - RB	01 No	
ii	Batch Canal		
c	Distribution Canal		

Form A for recording Pre-disaster Baseline Data of the irrigation scheme (ID Asset Register): General information

Section 2 of Form B:
Structural Information Form C: Baseline information prior to the disaster: loss assessment. Module 3 of the Participants' Handbook contains forms.
Describe the data associated with assets, economic flow, and Social, economic, and environmental impacts.

Form A - for recording pre disaster baseline data of irrigation scheme (ID Asset Register) - general information
Form B. Structural Data/ information
Form C - Pre-disaster baseline information for Loss assessment

Group work:

Case study provide information on damage infrastructure during 2011 floods. Select the format (Form B) an enter data and unit costs for calculating value of damages. Explain units of measurements. This information will be used to calculate the disaster damages.

Explain the effect of the disaster in four specific areas:

- Damage to infrastructures such as roads, buildings, irrigation, power, water, electricity etc.

1	Identification of the scheme		
	Name of scheme		
	Type		
	Category	(Major/ Medium/ Minor)	
	Command area (ha)		
	Capacity (for tank in MCM)		
	Beneficiaries	Farmer families/ families protected by FPS	
	Functionality at present	Fully/ Partially/ Not - funtioning	
	Any other details (if required)		
2	Administrative information		
	Managing Agency		
	National-level coordination by		
	Regional Administration by		
	Operation, maintenance, and construction Division		
3	Geographical location		
	Coordinates (GPS/ Metric/ Tank)		
	Agarian Service Center		
	Province		
	District		
	DS Division		
4	Vulnerability for potentialdisaster risk		
	Observed flood event	Year	Month
	Observed Peak-Flood	Below HFL/ Between HFL and BTL/ Above BTL	

- Disruption of access to goods and services, such as education, health water/electricity, banking service, etc.

1	Structural Components			
		Pre-disaster		
		Unit of measurement	Unit cost (LKR)	Funcionality (G/ A/ P)
		Unit		
a	Head Works			
	Bund	1 km		
	Riprap	1 km		
	Bund Road	1 km		
	Spill	01 No		
	Sluice - RB	01 No		
	Sluice - LB	01 No		
	Other structures			
b	Conveyance System			
i	Main Canal			
	Main Canal RB (Lined)	1 km		
	Main Canal RB (Ear then)	1 km		
	Regulator	01 No		
	Turn out structure	01 No		
ii	Batch Canal			
c	Distribution Canal			
d	Field Canal			
e	Service Roads	1 km		

- Disruption to governance process, eg; local government has to spend additional human and financial resources not included or projected in annual work plan.

Type of Loss	Possible temporary measures (Irrigation sector)	Pre disaster Immediately before LKR	During a disaster LKR	Immediately after disaster (S & R and relief phase) LKR
Cost incurred for restoration of governance and decision making process	Rectifying interruption to communicate network and other internal utility services		✓	
	Formalizing decision making process to arrange oprational work	✓	✓	
	Hiring transport, machinery and equipment for emrgency oprations	✓	✓	✓
	Expert consultation including hiring additional staff			
Reopening of disrupted access to goods and services	Providing temporary access to by-pass damage section		✓	✓
	Providing temporary transport as necessary		✓	✓
	Making temporary arrangements to provide irrigation water deliveries (eg. coffer dams)		✓	✓
	Making temporary arrangements to close a breached part of a spillway, anicut or any other structure to re-start service delivery	✓	✓	✓
Reducing potential risk that may increase	Public awareness by strarting early warning (preparedness stage)	✓	✓	✓
	Placing sand bags at either side of breached sections (dams, canal bunds) to control further damages as an early recovery phase)		✓	✓
	Cleaning sand barriers formed at sea outfall or rivers to draining out stagnant upstream flood water (response phase)		✓	✓

- Increase risk and vulnerability, e.g., spread of water borne diseases after floods.

Disaster Effects

Group work:

The objective of the group task is to identify damages and losses separately. Distribute a copy of the questioner labeled Q1: Questioner to identify expenditure on damages and losses; Annex 1 of the facilitator guide; and instruct each group to identify the condition as either a damage or a loss.

Give 10 minutes and begin the discussion, ensuring that all encouraging arguments are actively engaged.

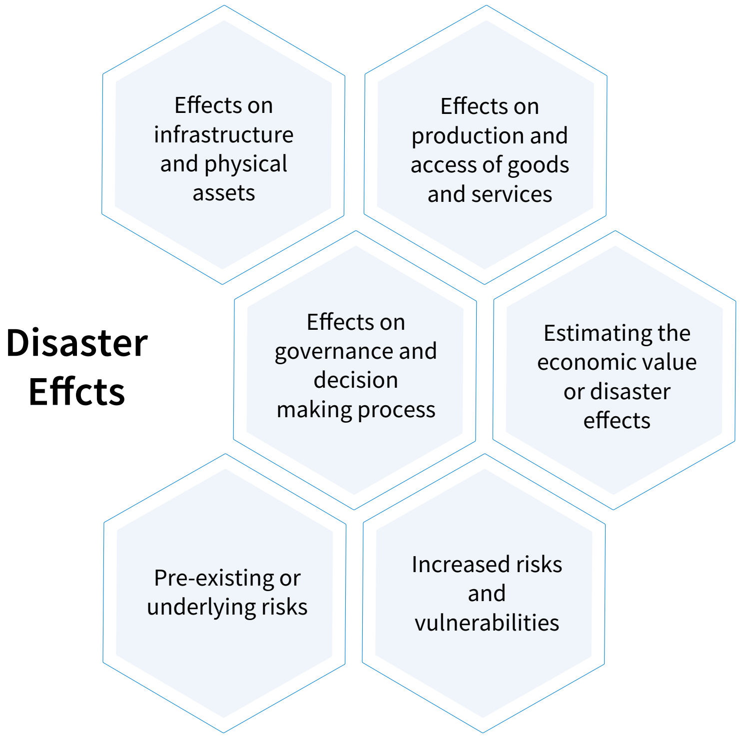
Explain the effect of disaster on physical assets such as homes, schools, hospitals, community infrastructure, and places of worship. Also, fundamental infrastructure, such as irrigation systems, water, electricity, and communication systems, as well as productive sectors, such as agricultural infrastructure, industrial and commercial installations, tourism, etc., are essential.

Damage to infrastructure and physical assets	Quantification of PUBLIC AND PRIVATE SECTOR INFRASTRUCTURE AND ASSETS DESTROYED in the disaster
Disruption of access to goods and services	Assessment of the disaster EFFECTS ON SERVICE DELIVERY; availability, quality and public access to goods and services supporting lives and livelihoods; education, health care, water, public administration; provided by public or private
Governance and decision making processes	Assessment of the disaster EFFECTS ON SOCIAL AND DECISION MAKING PROCESSES; people's ability to exercise their citizenship; government & community functions, added burdens on local governments
Increased risks and vulnerabilities	Assessment of INCREASED RISKS as a result of the disaster and additional threats or deteriorating conditions increase the vulnerabilities of people; cascaded hazards such as rains & landslides

Effects on Infrastructure and Physical Assets

- Social infrastructure such as the number of homes, education and health facilities, government buildings, community infrastructure, cultural and religious centers;
- Basic infrastructure such as transport and communications (roads, bridges, ports, airports, and train lines, among others), water and sanitation systems, irrigation systems, energy generation, distribution and supply lines;
- Productive sectors such as agricultural infrastructure, industrial and commercial installations, and businesses including tourism and service-based industries;
- In addition it quantifies the physical assets damaged or destroyed in those buildings and infrastructures, such as furnishings and equipment, farm machinery and tools, among others;
- These damages are valued first in physical terms (number, extension in terms of area or surface,
  as applicable) and then in terms of their monetary value, expressed as the replacement costs according to the market price prevailing just before and after the disaster.
- This is to be seen as the baseline cost, for the calculation of reconstruction costs would take into account post-disaster price alterations and improvements associated with risk reduction and the concept of build back better in the preparation of the Recovery Framework.

Explain that physical and monetary terms are used to quantify damages.



Explain the effect of the disaster on products and services, assessing the losses as required temporary infrastructure.

- Sector-wise assessment of equipment, supplies, information systems and technology destroyed;
- The availability or lack of basic supplies and commodities in markets. In this case care should
  be taken not to duplicate the effect that may have been quantified in terms of Irrigation , agricultural, industrial or commercial damages and losses;
- Focus on population groups that are particularly affected by the lack of available Irrigation services
- Assessment of the temporary infrastructure required and additional services required as a result
  of the disaster such as emergency response
- Thinking of how service delivery programs such as cash for work programs, to name a few, need
  to be re-adapted;
- The availability of human resources to ensure adequate service delivery, including wage compensation to service delivery staff additional technical expertise.

Describe the effects on governance and decision-making processes, including the impact of disasters on the management and organization of sectoral services that support life and livelihoods.

Effects on Production of Goods and Services and Access to Goods & Services

- Sector-wise assessment of equipment, supplies, information systems and technology destroyed;
- The availability or lack of basic supplies and commodities in markets. In this case care should be taken not to duplicate the effect that may have been quantified in terms of Irrigation , agricultural, industrial or commercial damages and losses;
- Focus on population groups that are particularly affected by the lack of available Irrigation services;
- Assessment of the temporary infrastructure required and additional services required as a result of the disaster such as emergency response
- Thinking of how service delivery programs such as cash for work programs, to name a few, need to be re-adapted;
- The availability of human resources to ensure adequate service delivery, including wage compensation to service delivery staff additional technical expertise.

Describe the effects on governance and decision-making processes, including the impact of disasters on the management and organization of sectoral services that support life and livelihoods.

Effects on Governance and Decision Making Processes

The effect of the disaster on Irrigation sector functions and on officials which disrupt sector-based administrative processes;

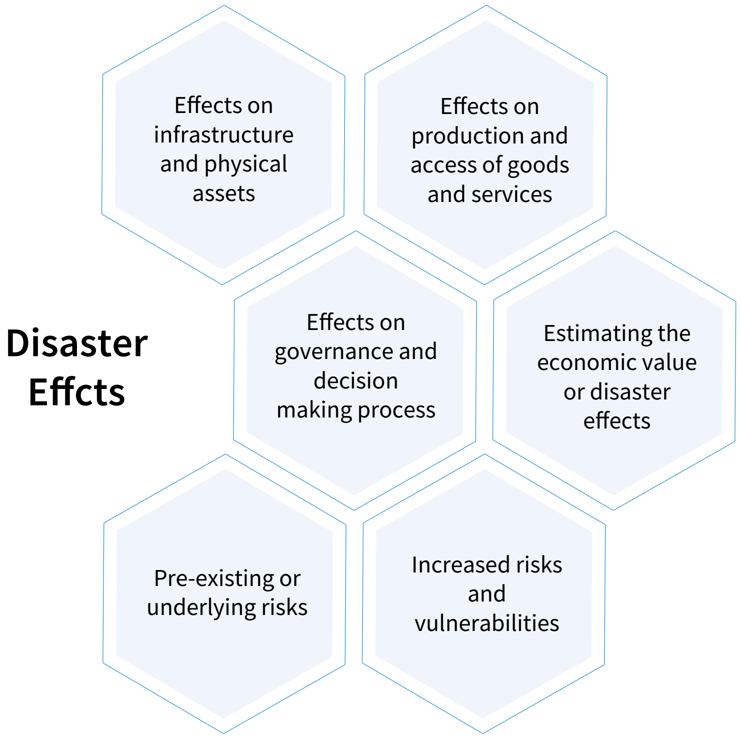
The disruption of basic community functions, social services provided by community-based organizations/ Farmer Organizations, and disruption of cultural and community life;

The effect of disasters on the management and organization of sectoral services that support life and livelihoods;

The assessment of sectoral, national, and local capacities to lead and manage the recovery process itself

Explain how to estimate the economic cost of disasters.

Increased Risks and Vulnerabilities
The PDNA examines the risks and vulnerabilities underlying the impact of the disaster – pre-existing risks that become apparent during the disaster, and new risks and vulnerabilities enhanced by the disaster. Both are to be taken into account to determine the key elements needed to ensure a resilient recovery Disaster generated risks and vulnerabilities



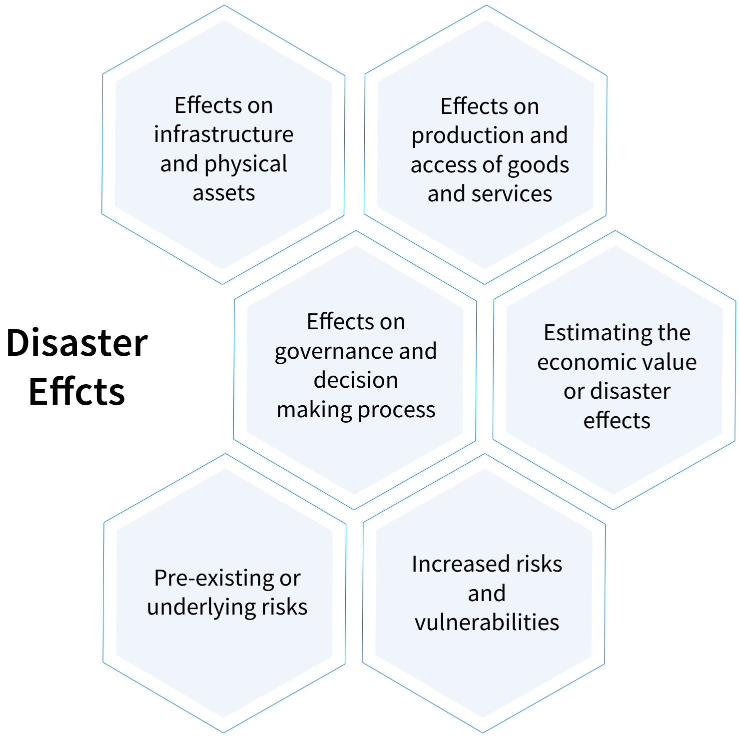
The assessment relating to risks has two key objectives:
Assess immediate disaster risks to avoid emerging threats and/or deteriorating conditions;

Assess pre-existing vulnerabilities and factors that contributed to damage and loss of the sector in the current disaster.

Below are some elements of risk and vulnerability indicators to assess:

- Identifying additional hazards and risks that may threaten the recovery process;

- Further landslides, upcoming rainy season, hurricane season, further tremors, among others;



- Environmental risks;
- Socio-political risks, including conflict risk;
- New vulnerabilities created by the disaster that may present additional threats;
- Population groups served by the sector (economic, social, cultural, geographic) that are especially vulnerable or at risk;
- Priority mitigation measures needed to avoid another disaster or the further deterioration of current conditions.

Explain the economic value of disaster effects. To determine the economic value of a disaster, damages and losses are assessed in physical terms and then converted to monetary values.

Estimating the economic value of Disaster effects
Economic Losses refer to changes in economic flows arising from the disaster which continue until the achievement of full economic recovery and reconstruction -- in some cases lasting for several years.

Typical losses include
- Decline in output in productive sectors (Agriculture, livestock, fisheries; Industry, Commerce, and services including Tourism) associated with damage to infrastructure and asset damages;
- Lower revenues associated with demand reduction due to the disaster, higher production and operational costs, including higher costs in the provision of services (education, health, water and sanitation, electricity, transport and communications), combined with an increased demand for social services by the affected population in the recovery period;
- Increased expenditure for management of new risks arising from the disaster;
- Increased fiscal expenditures as opposed to reduced tax revenues in a scenario where the demand for government expenditures related to the disaster increases even as revenues drop on 'account of damages sustained by the productive sectors.

Explain the various infrastructure damage levels.

The assessment team must decide on criteria for developing damage levels prior to a disaster and reach agreement on damage levels (e.g., four levels of damage: minor, partial, severe, and total) for the assessment. Some infrastructure is evaluated by number, while others are evaluated by linear unit.

Damage levels

Minor damage cost of repair; 5% of the replacement cost

- Electrical and plumbing installations need repair
- Repainting
- Minor cracks in walls
- Minor damage to door and window slashes
- Non-structural cracks in walls and floors
- Few roof tiles to be replaced
- Debris cleaning
- Minor damages to toilets and soakage pits

Partial damage cost of repair; 20% of the replacement cost

- Replace electrical and plumbing installations
- Repair for structural cracks in part of the house
- Painting of the total damage area
- Replacement needed for doors and windows
- Parts of roof tiles are to be replaced
- Replacement of toilet fittings and soakage pits

Damage Levels

Severe Damage
aside from the partial damage, the roof is totally blown off and the walls collapsed leaving only the foundations, columns and beams of the housing unit. cost of repair; 60% of the replacement cost

Fully damaged
houses that suffered severe structural damage and is rendered inhabitable (not livable) anymore. The value of damage for a fully or totally destroyed house is its estimated replacement cost.

The average replacement cost refers to the reconstruction value at current market prices of the structure that was fully or totally destroyed.

Enter number damaged and level of damages in the relevant column. Engineers will have to decide the level of damages when they inspect the structure after the disaster. It is advisable to develop criteria to assess the damage level as given for buildings

Complete the calculation as provided in the format. For all infrastructure and schemes. Compile total damages to irrigation schemes in Polonnaruwa district

DL9 and DL 10 to be used to calculate the Higher Operational cost and Social and Environmental losses.
Pre-disaster Baseline data collected in Form C could be used to asses' losses.

Compile total Damages + Losses into a single document.

Total value of Damages	=	2106.72
Total Value of Losses	=	+259.30
Total value of Damages and Losses	=	2366.02 LKR

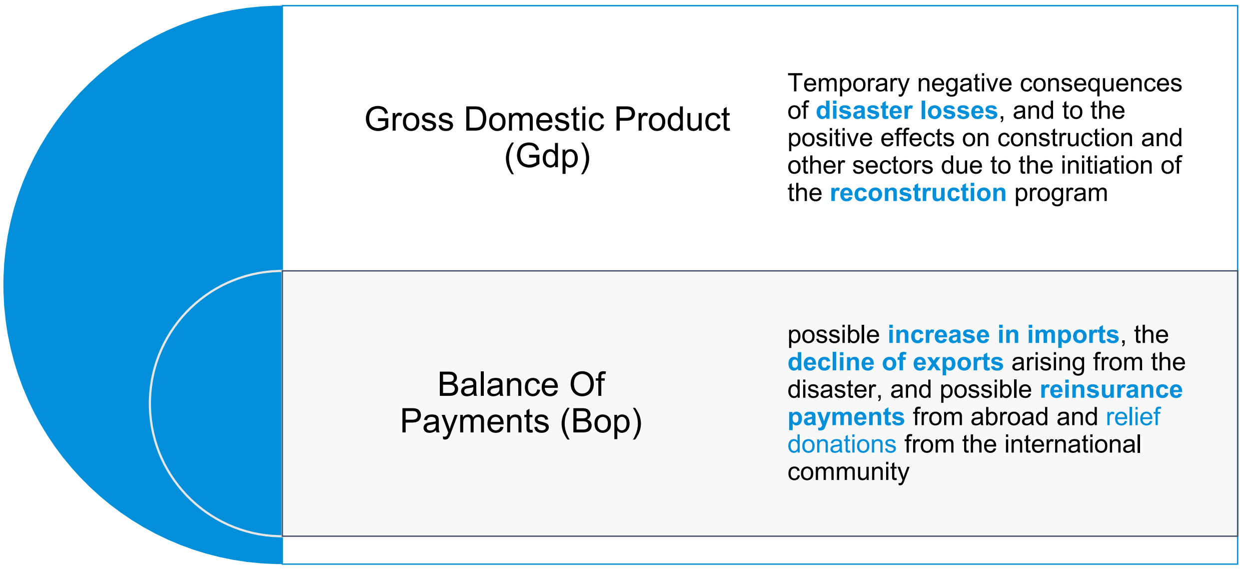
Display slide Explain how the disaster could impact the GDP and the Balance of payment of the government as the disaster impact tax revenue and export market production of good to fulfill local demand forcing additional imports.

Economic performance macro-economic imbalances

Explain how the disaster could impact micro economy and human development

Macro-economic impact analysis

- The disaster impact analysis looks at the macro, medium and long-term impacts of the disaster. It combines a quantitative assessment of the macro-economic impact of the disaster with a quantitative and qualitative impact assessment on human development. The macro-economic impact analysis includes an estimation of the disaster's likely effects on economic performance.
- It measures the temporary macro-economic imbalances that may arise, as well as the potential temporary decline in employment, income and well-being of affected individuals and households



- The analysis of disaster impact on the public sector budget is estimated in terms of increased operational costs and lower revenues; wherever the public sector directly owns sectoral enterprises, its budget would sustain losses. The analysis of impact on personal or household well-being normally includes an estimation of employment and income decline due to the losses sustained in the productive and services sectors, as well as higher than normal family or personal expenditures.

The Human Development Impact

- A disaster's impact on human development is known to persist long after physical reconstruction is complete. It is therefore essential that the impact on human development be accurately assessed so that recovery strategies can be put in place to mitigate development reversals.
- This exercise is also crucial in forging the link between initial humanitarian efforts, recovery measures and longer-term development. The objective is to overcome the adverse impact on human development and that recovery strategies ensure that development, at the very minimum, returns to pre-disaster levels.
- Therefore, recovery efforts would continue for as long as necessary until human development is restored and/or enhanced.
- The impact on human development due to the disaster can be captured as the difference between pre-disaster and post disaster levels of human development, including the cumulative deficits accruing until human development has recovered and returns to the pre-disaster human development trajectory. The impact on human development is the disaster's impact on the quality of human life in the medium and long term.

Explain haw Irrigations sector keep the institutions ready to respond disasters and conduct Post disaster damage and loss assessment, make the officer aware of what types of damages could be expected and what are the immediate remedial measures.

What is the main task of irrigation staff during and immediate after a disaster?

To make damage assessment of requesting funds for implementing recovery program (full recovery)

While taking temporary measures (for urgent recovery)

- to strengthen weak sections of irrigation structures to avoid further damage and
- to deliver irrigation water, by minimizing losses

Note: Urgent measures, taken temporary would be a loss to the institution since permanent measures are planned to be taken to replace the temporary measures

Losses:

- Irrigation sector (temporary measures and service rendered in addition to routine practices)
- Temporary measures taken during a disaster (for urgent recovery) to avoid damage or to provide irrigation facilities
- Some temporary measures would be continued for a kong period (temporary accesses provided, transport services) Needs additional funds
- The operational cost incurred during a disaster beyond routine activities (field visits, purchasing and transport of material, re-establishing disrupted office administration, getting expert consultation, deploying additional or hired staff) is accounted as a loss - High operational cost

Note: Though lost harvest of a farmer community would be a loss, it is accounted by the agriculture sector (not by the irrigation sector)

Group work

Explain the case study:

Irrigation Engineers have reported infrastructure damage to four small tanks, two medium tanks, and one large tank in the Polonnaruwa/Lankapura district. They also classified levels of damage as either partial or total.

Use the DL-1 through DL-8 forms (Annex-2) to calculate irrigation infrastructure damages.

Use following DL-1 to DL-8 forms (Annex-2), to calculate the damages of irrigation infrastructures.
DL1- Head works Bunds, spillway, Riprap
DL-2 Canal System
DL3- Canal structures
DL4- Flood Protection schemes
DL5- Salt Water Exclusion
DL6- Service Roads
DL7- Road Culverts
DL8- Quarters of irrigation workers

Following, DL-9 and DL-10 forms could be used to calculate losses
DL9- Losses as a result of Higher Operation costs
DL-10 Social and Environmental losses

Unit cost of structures or schemes has to be taken from the baseline dataset.
For the calculation of damages and losses in the case study each group can assume unit costs or facilitator could provide unit costs used in the example.

Annex 1

Q1 - Questioner to identify expenditure on damages and losses

Mark this situation as damage (D) or loss (L)

Annex 2

Sample Assessment of Damaged Infrastructure based on the Case study. (Hypothetical figures are assumed for infrastructure and level of damages for calculation)

DL-1: Head works Bund, Spillways and Rip rap

Sample Assessment of Damaged Infrastructure due to floods developed based on the Case study.

(Hypothetical figures are assumed for infrastructure and level of damages for calculation)

DL-1: Head works Bund, spillways and Rip rap

All values to be shown in two decimal places

Item no		Description	Group A	Group B	Group C	Group D	Group E
1		Part of the main canal washed away preventing water supply to farmers					
2		Engineers have to build coffer dam to temporarily repair damage sect ion to resume supply of water.					
3		When road at Mana m pitiya inundated traffic was suspended on road for two days.					
4		Farmer organization has to hire machinery to remove derbies deposited in paddy field due to floods.					
5		Irrigation department engaged labors on ' cash for work ' basis to repair service road damaged by floods					
6		Flood inundated shed where fowls were kept and covered with debris. Further nearly 3000 chicks died.					
7		Irrigation Institute arranged transport service to em ployees to return to work.					
8		Engineers observed few cracks on the bund after the flood and decided to undertake mitigation work pending full investigation.					
9		In one of the scheme sluice gate was not functioning					

DL 2- Canal system

DL -3 Canal Structures

DL4 - Flood Protection Schemes

DL 5- Saltwater Exclusion Schemes

DL 6-. Service Roads

DL 7 -Road Culverts

District	Polonnaruwa/ Lankapura								
	Head Works								
Scheme	Tank Bund			Spillway			Rip Rap		
	Pre disaster value	% Damage	Damage	Pre disaster value	% Damage	Damage	Pre disaster value	% Damage	Damage
	Rs Mn		Rs Mn	Rs Mn		Rs Mn	Rs Mn		
Minor Tank 1	125	30%	37.5	30	5%	1.50	10	20%	2.00
Minor Tank 2	225	35%	78.75	40	10%	4.00	15	35%	5.25
Minor Tank 3	300	70%	210.00	80	25%	20.00	20	30%	6.00
Minor Tank 4	225	100%	225.00	110	100%	110.00	60	100%	60.00
Medium Tank 1	400	20%	80.00	75	10%	7.50	40	5%	2.00
Medium Tank 2	600	5%	30.00	150	5%	7.50	110	3%	3.30
Major Tank 1	900	10%	90.00	200	5%	10.00	130	6%	7.80
Sub Total				685		160.50			86.35
Grand Total		685 + 160.50 + 86.35 = 931.85							

DL 8 - Quarters of Irrigation Workers

DL 9- Higher Operation Cost - Losses

DL 10 Social and Environmental losses

District: Polonnaruwa/ Lankapura									
Canal system									
Scheme	1	2	3	4	5	6	7	8	9
	Pre disaster value	Damage Km		Value of section damage LKR Mn		Damage level %		Value of damages LKR Mn	
		Partial	Fully	Partial	Fully	Partial	Fully	Partial	Fully
				1 x 2	1 x 3			4 x 6	5 x 7
Minor Tank 1	11.5	30	6	345	69			138	69
Minor Tank 2	11.5	12	2	138	23	40	100	41.4	30
Minor Tank 3	11.5	8	1	92	11.5	30	100	18.4	20
Minor Tank 4	11.5	6	1	69	11.5	20	100	19.8	20
Medium Tank 1	40	4	-			20	100		
Medium Tank 2	40	3	-						
Major Tank 1	60	-	-						
Sub Total		63	10						
DL1: Head works Bund, spillways and Rip Rap									

District: Polonnaruwa/ Lankapura										
Canal system										
Scheme	1	2	3	4	5	6	7	8	9	
	Pre disaster value LKR Mn	Damaged		Total value of damage no LKR Mn		Damage level %		Value of no. of structures damaged LKR Mn		Total value of damage LKR Mn
		Partial	Fully	Partial	Fully	Partial	Fully	Partial	Fully	
				1 x 2	1 x 3			4 x 6	5 x 7	8 + 9
Minor Tank 1	50	2	1	100	50	40	100	40	50	90.00
Minor Tank 2	60	2		120	-	10		12	-	12.00
Minor Tank 3	75	-	1		75		100		75	75.00
Minor Tank 4	40	1		40		10		4		4.00
Medium Tank 1	200	1		200		5		10		10.00
Medium Tank 2	350	1		350		5		17		17.00
Major Tank 1	450	1		450		3		13.5		13.50
Sub Total										221.50

District: Polonnaruwa/ Lankapura										
Flood Protection Bund										
Scheme	1	2	3	4	5	6	7	8	9	
	Pre disaster value of Bund LKR Mn	Damaged No		Total Value of damage nos LKR Mn		Damage level %		Value of no. of structures damaged LKR Mn		Total value of damage LKR Mn
		Partial	Fully	Partial	Fully	Partial	Fully	Partial	Fully	
				1 x 2	1 x 3			4 x 6	5 x 7	8 + 9
Minor Tank 1	300	1		300		30		90	50	140
Minor Tank 2	400	1		400		10		10		10
Minor Tank 3							100		160	
Minor Tank 4	160		1		160					160
Medium Tank 1										
Medium Tank 2										
Major Tank 1										
Sub Total										310

District: Polonnaruwa/ Lankapura										
Saltwater Exclusion Schemes										
Scheme	1	2	3	4	5	6	7	8	9	
	Pre disaster value of scheme LKR Mn	Damaged No		Total value of damage No of LKR Mn		Damage level %		Value of no. of structures damaged LKR Mn		Total value of damage LKR Mn
		Partial	Fully	Partial	Fully	Partial	Fully	Partial	Fully	
				1 x 2	1 x 3			4 x 6	5 x 7	8 + 9
Minor Tank 1	1300	1	1	1300		30		39		39
Minor Tank 2										
Minor Tank 3		-	1							
Minor Tank 4	1600	1		1600		20		32		32
Medium Tank 1										
Medium Tank 2										
Major Tank 1										
Sub Total										71

District: Polonnaruwa										
Service Roads										
Scheme	1	2	3	4	5	6	7	8	9	
	Pre disaster value of Road Km LKR Mn	Damaged No		Total value of damage sections LKR Mn		Damage level %		Value of no. of damaged Road sections LKR Mn		Total value of damages Roads LKR Mn
		Partial	Fully	Partial	Fully	Partial	Fully	Partial	Fully	
				1 x 2	1 x 3			4 x 6	5 x 7	8 + 9
Minor Tank 1	4	8		32		30		9.6		39.0
Minor Tank 2	4	6	1	24	4	30	100	7.2	4	11.20
Minor Tank 3	4	7	1	29	4	40	100	11.6	4	15.60
Minor Tank 4	4	5	2	20	8	20	100	4	8	12.00
Medium Tank 1	4	2		8		10		0.8		0.80
Medium Tank 2	4	1		4		10		0.4		0.40
Major Tank 1	4	1		4		5		0.2		0.20
Sub Total		30	4							79.20

District: Polonnaruwa										
Road Culverts										
Scheme	1	2	3	4	5	6	7	8	9	
	Pre disaster value of constru-ction LKR. mn	Damaged No		Total value of damage culverts LKR Mn		Damage level %		Value of damaged culverts LKR Mn		Total value of damaged culverts LKR Mn
		Partial	Fully	Partial	Fully	Partial	Fully	Partial	Fully	
				1 x 2	1 x 3			4 x 6	5 x 7	8 + 9
Minor Tank 1	1	3		3		20	100	9.6		39.00
Minor Tank 2	1	2		2		30	100	6	4	11.20
Minor Tank 3	1.5	1		1.5		30	100	0.45	4	15.60
Minor Tank 4	1.5	2	2		3				3	12.00
Medium Tank 1	2	1		2		10		0.2		0.80
Medium Tank 2	2	1		2		10		0.2		0.40
Major Tank 1	5									
Sub Total		10	2							79.00

District: Polonnaruwa										
Quarters of Irrigation Workers										
Scheme	1	2	3	4	5	6	7	8	9	
	Pre disaster value of constr-uction LKR. Mn	Damaged No		Total value of damage buildings LKR Mn		Damage level %		Value of damaged buildings LKR Mn		Total value of damaged buildings LKR Mn
		Partial	Fully	Partial	Fully	Partial	Fully	Partial	Fully	
				1 x 2	1 x 3			4 x 6	5 x 7	8 + 9
Minor Tank 1	1.5	3		4.5		20		0.9		0.90
Minor Tank 2	1.5	2		3		60	100	1.8		1.80
Minor Tank 3	1.5	3	1	4.5	1.5	60	100	2.7	1.5	4.20
Minor Tank 4	1.5	3	2	4.5	3	20		0.9	3	3.90
Medium Tank 1	1.5	2		3		20		0.6		0.60
Medium Tank 2	1.5	1	1	1.5	1.5	20		0.3	1.5	1.80
Major Tank 1	1.5	1		1.5		5		0.075		0.07
Sub Total		15	4							13.27

Scheme	Higher Operating Costs LKR Mn	Unexpected Expenses LKR Mn
Minor Tank 1	3	1
Minor Tank 2	4	2
Minor Tank 3	7	1
Minor Tank 4	10	3
Medium Tank 1	2	1
Medium Tank 2	5	2
Major Tank 1	10	2
Flood Bund 1	3	1
Flood Bund 2	4	1
Flood Bund 3	7	2
SWE Scheme 1	3	1
SWE Scheme 2	4	1
Total	62	18

Scheme	Affected Farmer Families	Degredation of Forestry/ Wetland (Ha) (Environment)
Minor Tank 1	10	0.3
Minor Tank 2	20	-
Minor Tank 3	10	0.2
Minor Tank 4	30	1
Medium Tank 1	10	0.5
Medium Tank 2	20	0.6
Major Tank 1	30	1
Flood Bund 1	10	1
Flood Bund 2	10	2
Flood Bund 3	20	3
SWE Scheme 1		
Sub Total	170	9.3

4.7 MODULE 3 SESSION 3 - PROCESS AND PROCEDURES OF POST DISASTER DAMAGE AND LOSS ASSESSMENT AND NEED ASSESSMENT

4.7.1 Introduction

A PDNA and Recovery Framework (RF) constitute a method for harmonizing the assessment, analysis, and prioritization of damages, losses, and needs by a variety of stakeholders (United Nations agencies and programs, the World Bank, donors, and non-governmental organizations) in support of the national government.

Consistency and quality of the assessment process are of paramount importance to the success of DaLA and PDNA, given the significance of the assessment procedure.

4.7.2 Objective

The objective of session 03 is to enhance the understanding of Irrigation sector agencies regarding the role of government, sector agencies, and international agencies in supporting disaster damage and loss assessment, identifying priority needs, and writing PDNA reports that include the results of damage and loss assessments for the irrigation sector.

4.7.3 Learning outcomes

At the end of session 3, participants will understand:

- To identify recovery requirements, align them with the concept of Build Back Better (BBB), and prioritize them.
- To prepare RF according to recovery planning guidelines and principles, create recovery policies, Institutional arrangements, financial mechanisms, and implementation plans.
- Prepare a PDNA sector report incorporating damage and loss assessment results.

Session will explain;
The session 03 of module 3 includes the following activities along with the Case Study, as explained below:

- Activity 1 will describe the session 3 objectives and learning outcomes.
- Activity 2 will describe the procedure for conducting damage and loss assessments following a disaster, as well as the role of the government and other partners in conducting assessments.
- Activity 03 describes the procedure Irrigation sector agencies must follow to conduct a post disaster damage and loss assessment, as well as the government and other international and local partner assistance required.
- Activity 4 group work to devise a plan for conducting a disaster damage and loss assessment in the flood-affected Polonnaruwa/Lankapura district constitutes .

- Activity 5 explain how to conduct a Damage and Loss Assessment (DaLA) and a Post-Disaster Needs Assessment (PDNA), as well as the need to estimate recovery requirements to mitigate the impacts and how to draft a PDNA report that incorporates the results of the Damage and loss assessment.
- Activity 6: Compile a list of damaged infrastructure, affected commodities and services, and environmental issues and enter estimated damages and losses on Form DaLA 1.

4.7.4 Outline of Module 3 – Process and Procedures of Post Disaster Damage and Loss Assessment and Need Assessment

Describe the session's expectations and active participation of participants, and expected outcome.

Module 3: Process and Procedures of Post Disaster Need Assessment

Session 3 objectives and learning outcomes of Module 3

Objectives:

Assessing recovery needs aligning with the Build Back Better concept, prioritization of needs, and preparation of recovery framework for the irrigation infrastructure sector after any hazardous event.

Learning outcomes:

By the end of the session, Participant will be able to understand

- Steps, process and procedures for conducting Post disaster damage and loss assessment and need assessment
- Role of the Government, sector agencies and international organizations to conduct assessment
- Contents and writing a PDNA report incorporating DaLA results

Describe the procedure for conducting a damage and loss assessment and a need assessment, as well as the significance of a government's request for assistance from the UN, WB, and EU in conducting an assessment.

Explain the role of the government and other agencies, from the local to the national level, in identifying the required resources and appointing the leading agency and management committee.

Conducting PDNA for Irrigation Sector:

Steps and process of DaLA and PDNA

Establishing PDNA and DaLA Management Team	Agreement on rolls and responsibilities	Composition of Assessment teams	Resourcing Requirements	Assessment logistics

Key steps	Process
01. Activation of DaLA and PDNA	• In-country communication between EU, WB, UN on possible need for PDNA • Immediate communication from EU, WB, UN country offices with respective HQ and communication between EU,WB and UN for support to a possible PDNA exercise • Government request for PDNA, in-country and HQ decision by EU, WB, UN to activate PDNA; • Identification of objectives, scope and resources for PDNA; • Determination of the institutional set up from the national to local level, includinggovernment ministries and departments, local governments, community institutions, NGOs, and civil society • Support that the Government will provide to the assessment mission (this normally occurs during a pre-assessment Planning Mission by the staff of the tripartite agencies or can be arranged with local representatives of the tripartite agencies) • Deployment of Planning Mission • Establishment of High-Level Management Team in-country • Establishment of coordination arrangements at HQ to provide support form HQ and regional levels when required; • Development of a resource mobilization strategy for the DaLA and PDNA.

Explain the duties and responsibilities of Irrigation sector agencies in conducting a DaLA during the post-disaster phase.

Describe the assistance required from the government and other agencies to accomplish the following:

- Training requirements;
- Collection and validation of baseline data;
- Field visits to collect additional data including consultation with local communities
- Timeframe for completing the DaLA and PDNA assessments

Key steps	Process
02. Sector (Irrigation) Preparedness for DaLA and PDNA	• Set-up arrangements and PDNA plan; • In consultation with Government, the tripartite members will set up all necessaryarrangements to support the PDNA (team composition, logistics, human resources,information management, strategic planning and human development specialists, budget, management structures, etc.); • Workshop organized for training the irrigation sector PDNA Team to conduct the assessment; • Timeline for PDNA: establish the work schedule and timeline for the assessment, including the composition of sector groups.
03. Data Collection and Validation	• Desk review: in the context of the sector and thematic groups created, collection of secondary quantitative data on disaster damages and losses and pre-disaster baseline information; • Field visits: sample collection of data, and validation of data from affected areas, including surveys and other data collection methods through Interviews. Field visits to be coordinated with national and local authorities. Selection of locations will be based on preliminary data of most affected or relevant areas or sectors • Stakeholders' consultations, including focus groups
04. Consolidation and analysis	• Data analysis at the sector level: the consolidation, processing and analysis of data on damage and losses collected by each Sector Team • Once the damage and losses are compiled, identify sector recovery needs and priorities and synthesize into sector reports;Inter-sector data analysis: cross-check findings across sectors. Do a multi-sector analysis to achieve a common understanding of disaster; identify common priorities across sectors and geographic areas, vulnerable groups, cross-cutting issues, and establish a common basis for recovery programming; • Consultation: consultative process of engagement with local stakeholders in affected areas to agree on priority needs and recovery strategies • Cross-checking needs/recovery strategies across sectors and geographical areas; • Impact analysis at the macro level (projection of the impact on the economy and on human development.)

Key steps	Process
05. Formulating the Recovery Strategy	• Workshop with all PDNA Team members to share PDNA results and recovery needs in all sectors and the results from the consultation with local stakeholders • Develop the Recovery Strategy (vision, guiding principles recovery and reconstruction needs and priorities implementation arrangements) • Draft PDNA Report with Recovery Strategy • Feedback and validation process • Write final report • Preparation of summary and power point presentation
06. Resource mobilization and implementation mechanism	• Support resource mobilization, if needed, as a complement to the resources allocated from the national budget • Organize donor/pledging conference to present PDNA and Recovery Strategy • Recommend inter-institutional mechanism for implementing and coordinating recovery, respecting and strengthening national/local institutional organization

Group work

Refer to the case study (Annex 1) and create a strategy for conducting a disaster damage and loss assessment in the Polonnaruwa/Lankapura district. Indicate the aid that the government, the United Nations, the European Union, and the World Bank should provide. Priorities must include the validation of baseline data, who will be consulted, and how their input will be obtained.

Each group to present its plan and discuss with other groups.

Explain how to conduct a DaLA and need assessment.

Explain briefly the fields used to estimate disaster effects (damage and loss in the sector, effect on goods provided by service providers in society).Estimate the effect on the governance system (children's education, delay in decision-making, etc.), increase in risk and vulnerability caused by disasters, etc. Provide illustrations whenever feasible.

Explain the impact on the country's micro-economy and the social impacts at the household and personnel levels, as well as the impact on cross-cutting issues such as gender, DRR, etc.

Explain the necessity of estimating recovery needs to mitigate the effects and how to draft a PDNA report incorporating the results of the Damage and loss assessment.

Group work

Examine the case study and identify the damaged infrastructure, affected goods and services, and environmental issues.

Document the estimated damage and losses, as well as the disaster's impact on services such as transportation, education, etc.

Data are to be extracted from Forms DL1 through DL8 and engineers' observations on infrastructure reported in the baseline survey.

Utilize the DaLA1 form supplied in the participant's manual.

Form DALA 1

Description of infrastruce	Estimated damage Rs Mn	Estimate losses Rs Mn
Minor Tank 1		
Bund		
Spillway		
Rip Rap		
Minor Tank 2		
Canal		
Service Roads		
Worker quarters		

4.8 MODULE 4 - DEVELOPMENT OF RECOVERY STRATEGY BASED ON POST DISASTER NEED ASSESSMENT

4.8.1 Introduction

The objective of the module four is to help participants understand the procedure for devising a recovery strategy based on the results of the post-disaster needs assessment conducted by the agencies responsible for the irrigation sector. The report on needs assessment will include information on the effects and consequences of disasters on the irrigation sector. The recovery strategy will be closely tied to the country's development plan. The reconstruction of damaged infrastructure and physical assets, the resumption of production, service delivery, and access to products and services, the restoration of governance and decision-making processes, and the reduction of risks are all aspects of recovery that are considered.

Sector agencies must develop and agree upon criteria for prioritizing sector recovery. The session will cover implementation arrangements, coordination with implementing agencies, and monitoring the recovery program.

4.8.2 Objective

To understand the process of developing a disaster recovery strategy, the data and information required to develop the strategy, the sources of financing, and the implementation and monitoring arrangements.

4.8.3 Learning outcomes:

At the end of the module, participants will understand:

- Key concepts of the disaster recovery strategy and the process of developing a recovery strategy;
- How to assess recovery needs and prioritize recovery requirements of irrigation infrastructure; and
- How to develop a recovery strategy.
- How to construct a recovery implementation and monitoring plan

Session will Explain

Session will explain the Key concepts of the disaster recovery strategy, and process developing a recovery strategy, how to assess recovery needs and priorities of irrigation infrastructure and how to prepare implementation and monitoring plan for recover.

4.8.4 Outline of Module 4 – Process and Procedures of Post Disaster Damage and Loss Assessment and Need Assessment

Describe the session over view and expected active participation of participants, and expected outcome.

Module 4

Development of recovery strategy based on post disaster need assessment

Describes the session objectives and learning outcomes of Module 4

Objective of the session:

To help the irrigation sector institutions:

- To understand the process of development of disaster recovery strategy,
- data and information needed to develop the strategy, sources of financing
- implementation arrangements including monitoring.

Leaning outcome:

By the end of the session Participant will be able understand:

- Key concepts of the disaster recovery strategy, and process developing a recovery strategy,
- How to assess recovery needs and priorities of irrigation infrastructure
- How to prepare a implementation and monitoring plan for recovery

Display slide no. 4 and explain that recovery begins with a report detailing the impacts and consequences of disaster, recovery strategies and potential to obtain funding to implement recovery activities, and the implementation mechanism.

PDNA | Deliverables

- Consolidated ASSESSMENT REPORT, detailing the overall effects and impacts of the disaster on each sector and cross cutting themes, the recovery needs for each
- RECOVERY STRATEGY with objectives and recovery actions for each sector and affected regions, defined timeframe, and cost for recovery process
- Provides the basis for RESOURCE MOBILIZATION including a donor assistance where required
- Provides an outline for a country-led IMPLEMENTATION MECHANISM for recovery

Describe the effects and impacts to determine what is needed.

- PDNA, led by the government, coordinates all sector agencies, the private sector, CBOs, and other agencies for major disasters when a state of disaster is declared.
- However, irrigation sector institutions could institutionalize this methodology to conduct damage and loss assessments, identify recovery needs, and calculate recovery costs for local or regional-level disasters.
- It will be advantageous to include these in a report when requesting funding from the government to implement recovery programs.

The assessment of disaster effects and disaster impacts collectively defines recovery needs.

The needs identified determine early, medium and long-term recovery interventions through a Recovery Strategy.

PDNA process initiate by the government, when state of disaster is declared for major event where international support required.

However for local or regional level disasters, Irrigation department could follow the same methodology and identify recovery needs and develop a strategic plan with early, medium and long term recovery action and costs.

Report could be useful document to request funds from National Planning Department.

Describe a group work

Explain form No. 1 in the Participant's Handbook, and have each group complete the form using the assessed values of damage and loss from module 3.
Display slide number 7 and explain that institutions must develop policies and mechanisms to access funds prior to the occurrence of a disaster.

Description of infrastructure damaged	**Value of damages In LKR**						
	Minor 1	Minor2	Minor 3	Minor 4	Medium1	Medium 2	Major
Infrastructure - Bunds, spillways, Ripraps, canal system							
Flood protection schemes							
Salt water Exclusion schemes							
Service Roads and Culverts							
Irrigation worker quarters							
Total Damages							
Description of losses							
Environmental degradation							
Higher operation costs							
Expenditure of temporary protection measures, opening service route for transport, are consider losses.							

Due to limited resources, social requirements and reconstruction and rehabilitation must be balanced; a well-defined recovery plan and monitoring mechanism are required for successful implementation. Include DRR measures in the preparations for reconstruction. Important is the participation of the private sector and other collaborators.

Disaster Recovery

- Disaster recovery is efficient if institutions, policies and financial mechanism for recovery are set up prior to the disaster
- Recovery takes time and requires a special skills and expertise
- Disaster recovery must balance social needs with demands for reconstruction of infrastructure
- Recovery is undertaken on the basis of systematic assessment and a well-defined plan
- Recovery requires close monitoring and supervision
- Post Disaster Recovery is an opportunity to strengthen disaster risk reduction systems
- Recovery is multi sectoral in nature and is a partnership effort
- The private sector has an important role to play in recovery

Explain how disaster recovery affects human and community requirements. Construction entails the rehabilitation and reconstruction of damaged assets, while recovery addresses the restoration of human and community needs.

Discuss with the group the reconstruction and recovery requirements following the case study.

The facilitator uses the whiteboard, and participants will identify needs pertinent to their strategies.

Reconstruction and recovery

Reconstruction:

The restoration and improvement, where possible of facilities, livelihoods, and living conditions of disaster-affected communities, including efforts to reduce disaster risk factors. Generally it is focused primarily on the construction or replacement of damaged physical structures, and the restoration of local services and infrastructure.

Recovery:

The restoration, and improvement where appropriate, of facilities, livelihoods and living conditions of disaster-affected communities, including efforts to reduce disaster risk factors.

Reconstruction needs

The restoration, replacement and improvement of:

- Damaged buildings
- Roads and bridges
- Airports and ports
- Government buildings and
- other infrastructure that facilitate the resumption of services

Recovery needs

The restoration, improvement and construction of facilities that will:

- Revive businesses and livelihoods (support to farmers and businesses, etc.)
- Improve living conditions (safe housing, etc.)
- Reduce disaster risks factors (construction of dikes, relocation of vital infrastructure, update building codes, zoning, improvement of weather forecasting and earl warning systems, etc.)
- Sustain socio-economic growth (support to private businesses, etc.)

Describe four elements of recovery requirements for general reconstruction.

The cost could be calculated using the following formula:

Value of Damage + Cost of quality Improvement + Technological Modernization + Relocation, if necessary + Disaster Risk Reduction Features + multi-Year inflation.

Elements of Recovery Needs

Recovery needs are calculated on the basis of the PDNA results for disaster effects and disaster impacts. Recovery needs are determined for four components:

- Reconstruction of damaged infrastructure and physical assets
- Resumption of production, service delivery and access to goods and services
- Restoration of governance and decision making processes
- Reduction of risks

Reconstruction of Infrastructure in the Irrigation sector

Component	Description
Reconstruction of infrastructure and physical assets	The financial requirements (or needs) for reconstruction after disasters are calculated on the basis of the quantitative estimations of destruction of physical assets that need to be rebuilt and restored to predisaster level. In other words, reconstruction needs are defined on the basis of the estimated values of damage, as derived during the assessment. The destroyed assets may be owned by private or public sector entities. Damage figures are then supplemented by the additional needs involved in the “building-back-better” concept. Therefore, reconstruction needs are calculated as:Value of Damage + Cost of (Quality improvement +Technological modernization + Relocation, when needed +Disaster risk reduction features + Multi-annual inflation).(This may be dealt with on a case- by-case basis, though.)

Preparation of detailed estimates

- Detailed investigations are carried out to identify the reconstruction needs preciously.
- The completely destroyed structures needs to be replaced.
- The engineer will decide whether partially damaged structure needs to be replaced or can be repaired without replacing. It is based on the engineer’s judgement about the stability of the structure.
- Based on the funds allocated, taking the decision of recovery measures either:
    - Restricting to a rehabilitation - rebuilding of irrigation infrastructure for the restoration of basic irrigation functions to provide irrigation facilities to the farmer community affected by a disaster or
    - Going for a reconstruction - rebuilding and sustainable restoration of resilient irrigation structures and irrigation management system aligning with the principles of sustainable development and “build back better”, to avoid or reduce future disaster risk

Explain how the Irrigation sector will conduct an investigation and estimate the cost of reconstruction, including DRR measures.

Describe the restoration of infrastructure services required to restart production. This includes access to products and markets, education and health care, cultural centers, water and sanitation, electricity, and communication.

Debris removal and house cleansing are also included in the resettlement of a displaced community. After necessary repairs and cleaning, school structures that have been used as safe centers must be returned to school authorities. These expenditures are categorized as disaster losses.

Component	**Description**
Resumption of Production, Service Deliveryand Accessto Goods andServices	Resuming production of goods includes needs for achieving same level of outputs prior to the disaster and adding costs to improve production. Restoring service delivery aims to improve the availability and quality of basic services to their pre disaster level or better. This complements the rebuilding of physical assets described above under "reconstruction". It includes human resources and expertise required to ensure adequate service delivery, as also supplies, information systems or technology, as well as the need to re-adapt service delivery programs.The resumption of access aims to restore access to services and goods that fulfil the basic needs of individuals, families and communities such as access to markets, employment, water points, health care, food, schools, religious and cultural centers, etc. These needs consist of both the additional costs to disaster affected populations to access goods and services as well as the additional costs to service providers as a result of the disaster. These costs for resumption of services are calculated as: • the additional costs to service providers to restore basic services • Costs to provide Build Back Better (BBB) and equitable and afford able services to vulnerable groups and affected population to access services

In the provided case study, institutions in the Irrigation sector must repair damaged roads or restore temporary access to construction sites, as well as make temporary repairs to damaged canal systems and other structures, in order to supply farmers with water for the next growing season.
Explain how the price of resumed services is determined.

Explain the remaining two components of recovery requirements: the restoration of governance and decision-making processes and the incorporation of DRR into the reconstruction of damaged tangible assets. Under the governance system, the irrigation sector considers the cost of employing additional personnel, training officers, establishing a temporary office at the reconstruction site, and incurring additional transport and communication costs. The BBB concept considers the cost of additional surveys and fortifying preparedness measures prior to the next monsoon rain, as well as additional risk reduction measures incorporated during the design and construction phases, in order to reduce further risks.

Describe the need assessment to identify measures to restore normalcy to the disaster situation. This includes measures for immediate rehabilitation, medium- and long-term recovery, and reconstruction.

Component	Description
Restoration of Governance and Decision Making Processes	Restoration of governance and social processes aims to revitalize and improve formal and informal institutions and policies, public administration and governance functions that are essential for livelihood restoration, for basic service delivery, and community and cultural life. It refers to the need for restoring or strengthening the capacity of sector authorities to lead and manage the recovery process, including decentralized local capacities, human resources, information systems, capacity building training, etc. The costs for restoration of governance and social processes are calculated as: • Costs for additional human resources with improved technical skills and of capacities of service providers to undertake the recovery • Costs for replacing lost records and upgrading documents of the various public services • Costs for addressing governance and social cohesion issues if disrupted
Reducing Risks	In addition to the estimation of needs to build back better in the reconstruction of physical infrastructure (described in the point above under the title "reconstruction", the cost of integrating risk reduction measures are estimated also for the following: To address immediate risks; • Initiatives to reduce risks and vulnerabilities to future disasters such as safer infrastructure with considerations of spatial/territorial or land-use planning, hazard and risk maps, technical expertise, technologies and practices which build resilience • Preparedness capacities of the various sectors to manage the impact of future disasters • Provide equitable and affordable services to vulnerable groups • Initiatives to promote resilience of individuals and communities. The additional costs to Build Back Better (BBB) reducing risks and increasing preparedness is calculated as follows: • Costs for addressing immediate risks; • Costs for upgrading preparedness measures in each sector; • Costs for further studies or assessments, technologies and practices, technical expertise, etc. required to facilitate implementation of building back better approaches; • Cost for specific measures to strengthen disaster risk reduction.

Needs Assessment

NEEDS: the amount needed to bring back normalcy

May be classified as:

- Early Recovery needs
- Reconstruction needs
- Recovery needs

The classifications may overlap in terms of implementation.
Applies the "Build Back Better" principle.

Recovery needs of Irrigation Sector

Describe the Irrigation sector's flowchart for addressing recovery requirements, detailing both short- and long-term recovery needs.

Priority Needs	Interventions/ Inputs Required	Expected Outputs	Recovery Costs	Intended Outcomes
Repair and rebuild damaged community schools Teaching, learning and classroom materials for all transitional schools Access to education for boys and girls	Construction materials, labour Procurement and distribution of teaching and learning supplies Removing obstacles and providing incentives for school attendance of boys and girls (eg: school feeding schemes, provision of sanitation facilities seperated by sex, safe transportation, etc.)	421 community schools repaired and rebuilt Restored access to quality primary education	Costs for repaire of schools $8,000000 Costs for ungraded sanitation facilities in school $2,000,000 Costs of school supplies $2,000,000 Costs for school feeding programmes $2,000,000 Total costs for recovery in Education sector $14,000,000	Increased attendance rate of boys and girls in school

Explain that early recovery requires restoring irrigation infrastructure and fundamental services such as housing, water, electricity, communication, livelihood, law and order, and government services in order to restore normalcy.

Early Recovery

A multidimensional process of recovery that begins in a humanitarian setting. It is guided by development principles that seek to build on humanitarian programs and to catalyze sustainable development opportunities. It aims to generate self-sustaining, nationally owned, resilient processes for post crisis recovery.

It encompasses the restoration of basic services, livelihoods, shelter, governance, security and rule of law, environment and social dimensions, including the reintegration of displaced populations.

Early Recovery Needs

The restoration of

- Irrigation infrastructure and services
- Businesses and livelihoods: farming assistance, credit etc.
- Governance: restoration of peace and order, resumption of government services

Recovery needs of Irrigation Sector

Early recovery needs

- Construction of a coffer dam along the breached section of the dam and the spillway to save in flow water to protect the cultivation of undamaged areas. And this coffer dam will be useful for the reconstruction of breached section of the dam and the spill way.
- Construction of a coffer dam along the breached edge of the canal to release available irrigation water to the downstream farmers.
- Open by-pass road along the breached canal section

Rehabilitation

Construction completion of

- Tank Bund
- Spillway
- Sluice outlet
- Breached sections of Main canal, D- canal, and field canals including structures

Reconstruction:

a. To take efforts to reduce risk of irrigation infrastructure

- To provide a curtain wall along the outer bend of the breached canal section
- To provide a canal spillway to the main canal as a safety measure
- To provide D-Canal and Field Canal lining where necessary

b. To support the decision making process of the irrigation institution

- To install digital canal flow measuring system
- To train staff for implementing ESOP (Provided ESOP is available)
- To practice the digital communication between canal flow operators and the irrigation staff to strengthen the system

Refer to the case study and ask groups to identify early recovery requirements to restore water supply and construction site material delivery to farmers.

The facilitator writes the inventory of rehabilitation and reconstruction requirements identified by one group on the whiteboard and invites others to contribute.

Explain the recovery strategy, which identifies what the priorities and costs are, as well as who is responsible for implementation and how long it will take to complete all tasks.

The Recovery Strategy

- The assessment produces an integrated sector-by-sector report of the damages, losses and needs that is then summarized into a Recovery Strategy.

- The Strategy identifies recovery priorities, a cost structure, stakeholders, and suggests a timeframe for recovery. The Recovery Strategy would need to be followed through with a detailed recovery framework which comprises information on the policy and institutional arrangements, financial mechanisms, monitoring and evaluation systems for recovery.

What Recovery Strategy aims to accomplish?

- Mobilize stakeholders towards a common purpose
- Facilitate inter-institutional coordination.
- Establish parameters for joint action planning.
- Identify priorities based on assessment results.
- Establish a calendar of recovery actions.
- Establish the guiding principles of good practice.
- Promote national ownership of the recovery process.
- Promote an equity-based, participatory and inclusive recovery process.
- Contain the fundamentals for reducing risks and for building back better.
- Provide an estimate of the cost of recovery.
- Provide the basis for a recovery framework that will lead to the detailed implementation plan including specific objectives, sectoral projects as well as partners, among others.
- Serve as a tool for resource mobilization with donors, including donor conferences.

Coordination of stakeholders, identification of priorities, timeline for completing activities, and cost estimation for recovery are a few of the primary objectives.

Describe the four primary components of recovery strategies for:

- Priority needs identified under four categories (explained previously);
- What are the mission statement and guiding principles?
- Intentional outcomes, including prioritization of needs and interventions, cost, expected output and outcomes.

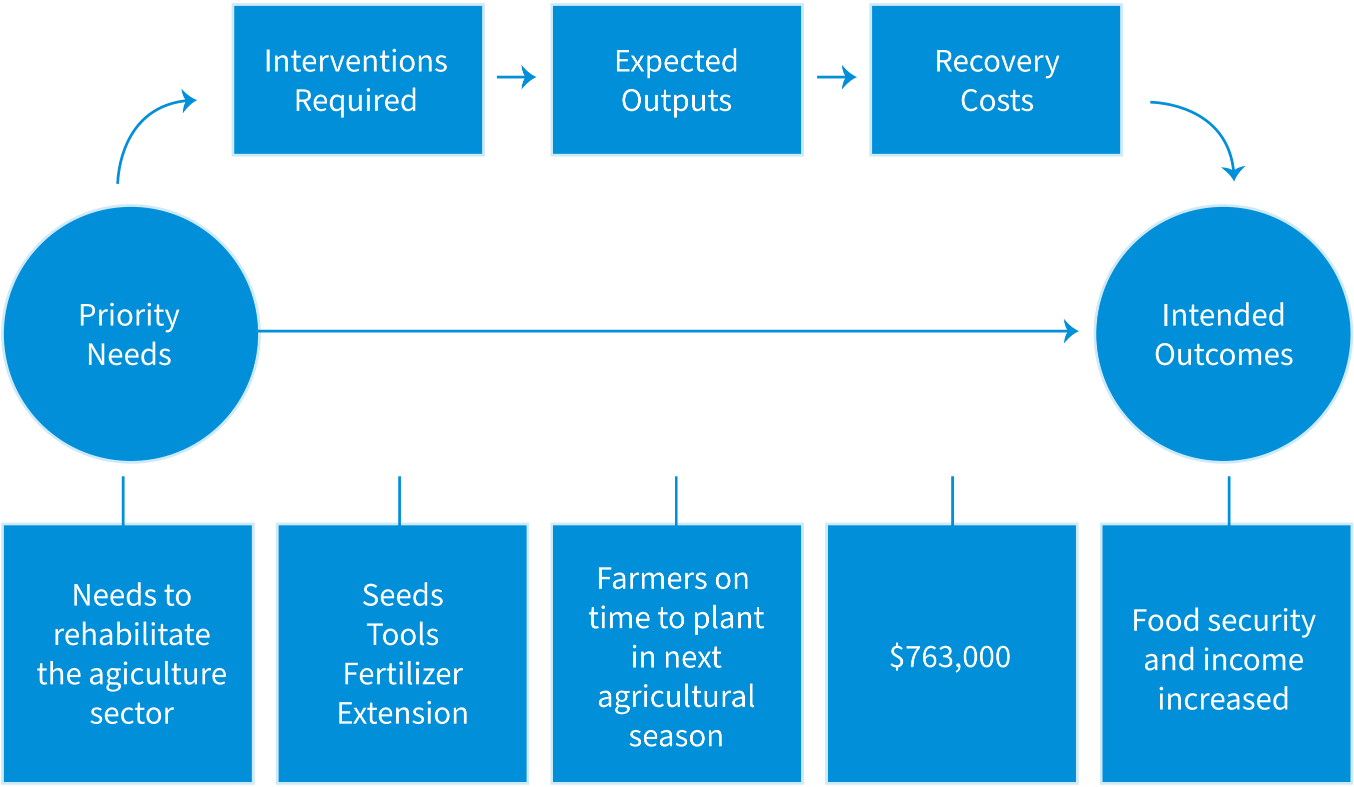
The Sector Recovery Strategy

The Sector Recovery Strategy outlines the framework of:

- Sector priority recovery needs
- Inputs/interventions required, expected outputs, and the intended outcome
- Recovery costs

Element of Recovery Strategy

The Elements of Recovery Needs



- The reconstruction of damaged infrastructure and physical assets;
- The resumption of production, service delivery and access to goods and services;
- The restoration of governance and decision making processes;
- The reduction of risks.

The Sector Recovery Strategy Cont.:- Interventions, Outputs, Outcomes

Recovery Costs

MAIN ELEMENTS	DESCRIPTION				
RECOVERY NEEDS	*Outline of recovery needs for each of the components of disaster effect and disaster impact*				
	1/ For reconstruction of physical assets Build Back Better (BBB)	2/ To restore service delivery and access to goods & services Build Back Better (BBB)	3/ To restore governance and decision making processes Build Back Better (BBB)	4/ To reduce risks and vulnerabilities Build Back Better (BBB)	
VISION & GUIDING PRINCIPLES	*Overall vision for recovery and agreed guiding principles*				
INTENDED SECTORAL RESULTS	*Outline of aggregated sector results specifically*				
	1/ Priority Needs and Intervention	2/ Recovery Costs	3/ Expected Outputs	4/ Intended Outcomes	
IMPLEMENTATION ARRANGEMENTS	*Broad sectoral implementation strategy in terms of*				
	1/ Partnerships coordination and management	2/ Cross-cutting themes	3/ Links to development	4/ Resource mobilization	5/ Key assumptions and constraints

Recovery interventions are developed for all sectors and are included in the Recovery Strategy along with their timeframe for implementation, as also the responsible government agency and implementation partners

- The interventions are designed for short-term (disaster event to 6 months), medium-term (6-18 months) or long-term (18 months to 5 years) recovery timeframes
- In selecting interventions, it is important to assess the impact it is likely to have on the affected population and its feasibility in terms of implementation, i.e., government and donor support as well as political implications, among others.

The expected outputs are the specific products and services that emerge from processing inputs through recovery activities.

- Outputs, therefore, relate to the completion (rather than the conduct) of activities and constitute the type of result over which managers have a high degree of influence.

The intended outcomes are actual or intended changes in disaster conditions that the recovery interventions seek to support.

Recovery Costs Cont.

- Costs are calculated once recovery priorities have been identified with their corresponding interventions, outputs and final intended outcomes. Typically costs are calculated for each of the expected outputs and intended outcomes included in the Recovery Strategy (as illustrated in the above table).

- The following considerations should be made in estimating costs for building back better The costs for BBB should be proportionate to the costs of recovery and reconstruction needs as well as the type of disaster (slow onset drought may have very low reconstruction needs, but high needs to invest in resilience/BBB)

- The costs for BBB should be realistic compared to the financial envelope pledged by the government and international development partners, taking into account that most funds will be needed for physical reconstruction and compensation of losses.

- The costs for BBB should be realistic toward the absorption capacity of the country and what is feasible to achieve over a period of 3 years.

Sector Implementation Arrangements

The Recovery Strategy includes a description of the implementation arrangements, particularly in terms of the following:

Key elements:

- Partnerships, coordination and management
- Cross-cutting themes
- Links to development
- Resource mobilization
- Key assumptions and constraints

Cross-cutting Sectors and Themes

The cross-cutting sectors considered in the PDNA are:

- Employment and Livelihoods
- Disaster Risk Reduction (DRR)
- Governance
- Environment

Links to Development
Resource Mobilization
Broad implementation arrangements encompassing coordination and partnerships, cross-cutting issues, how the recovery plan relates to development, anticipated source of funding, key constraints and underlying assumptions, and a discussion with groups regarding the obstacles to implementing the recovery program in the sector.

Write on the whiteboard potential solutions to avoid such situations.

Explain four factors considered to prioritize requirements. Explain how the delay in restoring infrastructure and services will have a profound effect on exports, the Gross Domestic Product (GDP), and tax revenue. Therefore, infrastructure and service rehabilitation and reconstruction must be top priorities.

Prioritizing Needs

In prioritizing the projects, the analysis can consider the following:

Contribution to the Economy
Disasters may cause losses to outputs that are very important to the economy. For instance, without assistance, a planting season may be missed by the farmers which will result in the scarcity of basic food supply like rice and corn that can cause inflation not only in the disaster-affected areas but also in other districts or even nationwide. Moreover, if damaged agricultural products along with electricity, minerals, livestock, tea, etc. are for export, the much-needed foreign exchange for the country may be severely reduced.

Sectoral linkages

The outputs of manufacturing companies and other related services that are major contributors to the annual gross domestic product (GDP) can be drastically reduced if recovery activities will be delayed.

Some of the questions that should be addressed are:

- What are the damaged structures or facilities (usually power and water supply) that are components of production in most sectors? How much is the overall potential loss per day if these facilities are not restored?
- What are the potential economic impacts from closure of government vital facilities like airports, ports, customs, etc.?
- How much export earnings will be lost if recovery is delayed by, say 6 months or 1 year?
- What are the priorities that will avert a sharp decline in GDP within the year?
- What are the programs and projects that will fast track the recovery of the country in the medium-term?
- How much is the potential tax revenue losses if the productive sectors are not rehabilitated?

Social impacts

The identified recovery priorities should consider the impacts of projects on the lives of the people especially the poor. The result of the social impacts assessment (SIA) will provide the necessary inputs here.

- Gender issues
- Livelihood
- Migration and human trafficking

Environment.

The results of the environmental impact assessment will be used here.

- Reduction or prevention of further environmental destruction.
- Elimination of air, water or land pollution.
- Restoration of environmental assets that are important to livelihoods.

Potential risk due to disaster

- Disaster could create additional risk
- Conduct a risk assessment to assess the risk levels
- Prioritize risk and mitigation activities

Prioritization of Sector Recovery Needs

Key considerations to help facilitate prioritization:

- The most urgent needs expressed by the affected population;
- Population sub-groups in vulnerable situations or those who are at particular risk;
- Sequencing of needs, from the short-term to the medium and long term;
- Restoring to pre-disaster levels, followed by improvements;
- Actions that can yield early results effectively (within 18 months);
- Comparative advantages;
- Opportunities for greater impact;
- Institutional and technical capacity;
- Geographic areas with urgent needs;
- Current or near future milestones (e.g. elections);
- Addressing key obstacles associated with sectors;
- Recovery initiatives that contribute to peace where relevant

Additionally, additional social and environmental impacts and prospective risk factors must be considered. Describe a few essential factors that require careful consideration:

- Urgent population requirements
- Extremely vulnerable communities
- Identify actions that produce immediate results.
- Geographic regions with pressing requirements
- Which activities will have the greatest effects?

Describe the four components of prioritizing recovery requirements in the Irrigation sector. Also, briefly describe the risk matrix and how to assess risk in light of the following considerations:

- Importance to the economy
- Social impact;
- Environmental impact;
- Potential Risk

Prioritization of recovery needs in Irrigation sector

Key concerns to prioritize an irrigation project

1. Contribution to the economy
2. Social impact
3. Environmental impact
4. Potential Risk

1. Contribution to the economy

Irrigation infrastructure directly contributes the national economy by facilitating agricultural production.

2. Social impact

Affected livelihood of farmer families who lost their cultivation
Disruption to school children's mobility caused by breached canal crossings, canal roads etc.
Affected Houses
Affected Fishing Community
Bathing facilities disrupted by tank and canal breaches

3. Environmental impact

Irrigation infrastructure indirectly contributes the environment by recharging shallow ground water table, especially in the dry zone areas

Note:
Recharging wells in home gardens and agro-wells, bathing facilities to rural community are classified as social needs.
Aqua-culture development in the irrigation tanks, drinking water to animals and forestry development (facilitated by recharged shallow water table) are classified as environmental needs

4. The additional risk accumulated to the risk level of irrigation scheme after the disaster

It is explained as a composite effect of two qualitative events
Probability of failure
Anticipated consequences

A simple approach of a Risk Matrix can be used. Risk level is indicates as High, Medium, and Low

Available and potential funding sources Irrigation Sector

Probability of failure	To occur further damage to the breached sections or any other sections of the irrigation tank
Anticipated consequences	Magnitude of anticipated damages that could be occurred to the downstream irrigation structures, social livelihood, other assets, environment

Risk matrix		Probability of failure		
		Certain	Likely	Unlikely
Anticipated	Major	High	High	Medium
	Moderate	High	Medium	Low
	Minor	Medium	Low	Low

Engineers will be required to evaluate the probability of a catastrophe occurring and its repercussions based on a detailed inspection of structures and pre-disaster infrastructure baseline data.
Discuss with the group the process of risk assessment as it pertains to the irrigation schemes described in the case study. Slide, 35, 36 and 37
Display slides no 38 and 39 and discuss the available funding sources.
Initiate discussion by requesting groups for further clarification on the contents.

Type of Funding source	Description
Local level funding	Reserved funds from the national budget at the institutional level for the use of an emergency
Ministry level funding	Reserved funds from the national budget at the ministry level for the use of an emergency
National level (NPD and BD) funding	• The government will allocate required funds through the treasury (NPD and BD) for a given emergency operation based on the severity of the disaster. • If additional resources are required, the Government has the option to draw loan funds from the "Catastrophe Deferred Drawdown Option" (Cat DDO) upon declaring a state of disaster.
Potential local funding sources	National Adaptation Fund (NAF) through the government budget as an annual allocation for a specified period Establishment of a Disaster Response Fund (DRF) in the annual budget of relevant stakeholder organizations
Potential Donor Funding sources	• Asian Development Bank (ADB), • World Bank (WB), • GEF (UNDP), and other United Nations organizations such as • UNHABITAT, UNESCAP • Green Climate Fund (GCF)

CHAPTER 05

TRAINING COURSE OF THE DISASTER RECOVERY IN SRI LANKA : PARTICIPANT HANDBOOK

5.1 INTRODUCTION

5. 1.1 Background

The significance of irrigation in the socioeconomic development of the country is crucial. Over 70% of the Sri Lankan population resides in rural regions. Agriculture is the primary source of income for the vast majority of the rural population, which focuses primarily on rice production under irrigated conditions and other agricultural products.

The irrigation infrastructure serves a total command area of approximately 568,000 hectares, which accounts for approximately 18 percent of the total agricultural land area and 8.7 percent of the country's total land area. Ninety percent of irrigated land is utilized for rice cultivation.
The country's irrigation infrastructure is categorized based on the designed command area served by the scheme: minor (small or village) scheme (command area less than or equal to 80 ha), medium scheme (more than 80 ha but less than 400 ha), and major (large) scheme (command area greater than or equal to 400 ha). The Mahaweli Authority of Sri Lanka (MASL) and the Irrigation Department (ID) maintain the major schemes; the ID and the nine Provincial Irrigation Departments (PIDs) maintain the medium schemes; and the Department of Agrarian Development (DAD) maintains the minor schemes.

The Sri Lankan irrigation infrastructure consists of a variety of facilities, including large and medium-sized reservoirs; small village tanks; diversion weirs (anicuts); feeder canals; trans-basin water conveyance canals; irrigation distribution canals and structures; flood protection embankments; facilities for salt water exclusion from coastal agricultural lands; and drainage canals.

This infrastructure is not only vital for sustaining the incomes and livelihoods of the rural population but also for domestic water use, flood and drought prevention and control, recreation, and other environmental services. Typically, reservoir, village tank, and irrigation canal embankments serve as link roads between rural villages and urban areas.

Consequently, the devastation to the irrigation infrastructure would impact each of these parties. It is crucial that we rapidly repair or rehabilitate damaged infrastructure and restore service in order to minimize the impact on rural communities. It is necessary to devise a sector-specific recovery plan to raise funds for repairing or rehabilitating damaged infrastructure. The recovery planning competence of irrigation sector officers at the national, provincial, and divisional levels must be enhanced.

5.1.2 Course Objectives

The course objective is to increase the capacity and understanding of disaster recovery planning among irrigation sector officials.

5.1.3 Course Content

The training course will consist of four modules.

- Module 1: Disaster Recovery Framework
- Module 2: Recovery Preparedness
- Module 3: Post-Disaster Need Assessment
- Module 4: Development of a Recovery Strategy Based on a Post-Disaster Need Assessment

5.1.4 Target Participants

Engineers, Technical Officers, and Field Staff of the Irrigation Department Mahaweli Authority, the Department of Agrarian Development, and nine provincial Irrigation Departments are the intended audience for this course.

5.1.5 Teaching and learning methodology

The participants will work in groups to incorporate their extensive experience into the assessment procedure. Case study (Refer to case study) will be utilized across all modules. Participants are encouraged to acquire the necessary data and information from the Department of Irrigation in order to calculate unit costs, which are required for the damage and loss assessment. For the collection and recording of baseline data and the value of damaged assets and losses, standard international formats will be adapted to fit the country's needs.

To facilitate the group discussion, a PowerPoint presentation will be made available. A projector, flip charts, and marker pencils are required for the training course.

5.2 MODULE 1- DISASTER RECOVERY FRAMEWORK

5.2.0 Structure of the Module

5.2.1. Introduction

The Irrigation Sector Disaster Recovery Framework (DRF) is intended to assist irrigation sector institutions in preparing for recovery and delivering timely, efficient, and effective recovery programs to assure sector resilience. It seeks, in particular, to ensure that recovery contributes to sustainable development and increases disaster resilience.

The training modules aid institutions in the irrigation sector in preparing for disaster recovery by delineating the provisions that must be in place beforehand, such as those pertaining to legislation, policies, financial arrangements, implementation, monitoring, etc.

Recognizing that the nature and impact of disasters vary, these arrangements can be tailored to the specific circumstances of post-disaster recovery. Preparedness for recovery indicates that stakeholders can work together to develop recovery strategies that can be implemented effectively in the event of a disaster. Additionally, planning permits the incorporation of repeatable best practices. Preparation, execution, and monitoring can produce more effective and resilient recovery operations and outcomes.

Recovery from disasters caused by natural hazards is crucial for the resilience of the irrigation sector because:

- It manages the recovery process in a more planned and scientific manner.
- It reduces economic losses from disasters, which are on the rise due to the high exposure of infrastructure and assets.

- Recovery efforts are not intended to exacerbate vulnerabilities.
- Institutions, policies, and financial mechanisms for recovery are effective if they are in place prior to a disaster.
- Pre-disaster recovery planning can help a community accelerate the recovery process.

Response and recuperation are not sequential, as one does not precede the other. Instead, recovery begins on the day of the catastrophe. Early recovery activities that address the immediate stabilization needs of the community are typically followed by medium- and long-term recovery activities. In each nation, the duration of early recovery is determined by local conditions. Early recovery can commence on the day of a disaster and last between one and two years, depending on its severity.

5.2.2 Terms & Concept in Disaster Recovery

5.2.2.1 Disaster Recovery

The UN International Strategy for Disaster Reduction (UNISDR) defines recovery as:
Decisions and actions taken after a disaster with a view to restoring or improving the pre-disaster living conditions of the stricken community, while encouraging and facilitating necessary adjustments to reduce disaster risk.

The United Nations Development Programme (UNDP) defines recovery as:
Recovery is about shifting focus from saving lives to restoring livelihoods, effectively preventing the recurrence of disasters and harnessing conditions for future development. The ensuing transition process [entails] restoring trust and confidence as much as regaining human and physical developing capital. Managing recovery [requires] building national capacities, restoring coping mechanisms, empowering communities, and determining root causes and vulnerabilities [that] make societies disaster-prone[1].

5.2.2.2 Early Recovery

Early recovery is a multidimensional process guided by development principles that begins in a humanitarian setting and seeks to build on humanitarian programs and catalyze sustainable development opportunities. It aims to generate and/or reinforce nationally owned processes for post crisis recovery that are resilient and sustainable. It encompasses livelihoods, transitional shelter, governance, security, the rule of law, the environment, and other socio-economic dimensions, including the reintegration of displaced populations. It strengthens human security and aims to begin addressing the underlying causes of the crisis[2].

5.2.2.3 Medium-term recovery

Medium-term recovery activities can be undertaken for twelve months to two years, and long-term recovery can even take from two to five years or a decade in very large-scale disasters.

5. 2.2.4 Long-term recovery

Long-term recovery involves actions that lead to the restoration of normal life and the social and economic functioning of the affected community. Planning and management of them are government responsibilities; they may be supported by others. Long-term recovery includes:

- Developing enabling policies and plans to guide recovery
- Establishing an institutional framework to organize and manage recovery;
- Ensuring that there are adequate resources available or mobilizing resources to carry out recovery activities;
- Redeveloping and revitalizing disaster-affected areas;
- Rebuilding and/or relocating damaged or destroyed infrastructure and buildings;
- Partnering with relevant organizations for multi-sectoral recovery, including restoring and reviving health, education, transport, agriculture, livelihoods, etc.;
- Restoring negative impacts on natural ecosystems and the environment;
- Establishing monitoring mechanisms to ensure that recovery is transparent, accountable, and inclusive; and
- Improving community capacity, including that of women, the elderly, persons with disabilities, and vulnerable and marginalized groups, to reduce disaster risks and manage future disaster events (case study provide information for recovery planning)

5.2.2.5 Resilience

The UN International Strategy for Disaster Reduction (UNISDR) defines resilience as:
The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.

5.2.3 Evolution of Disaster Recovery

The Hyogo Framework for Action 2005–2015 outlined five action priorities and provided guiding principles and practical means for nations and communities to achieve disaster resilience. The aim was to substantially reduce disaster losses and develop resilience by 2015. The framework mentions recovery only in Indicator 4.5: "Disaster risk reduction measures are integrated into post-disaster recovery and rehabilitation processes" and Indicator 5.3: "Financial reserves and contingency mechanisms are in place to support effective response and recovery when required."

Signed in March 2015, the Sendai Framework for Disaster Risk Reduction 2015–2030 (SFDRR) has four priorities, one of which is recovery. Priority 4 of the SFDRR seeks to "enhance disaster preparedness for effective response and to "build back better" in terms of recovery, rehabilitation, and reconstruction." With this, the SFDRR places a greater emphasis on the need to reduce risk during recovery and encourages governments to implement the concept of "Build Back Better."

[1]UNDP, 2011, Methodological Guide for Post disaster Recovery Planning Processes: Guidelines and Actions for National, Regional and Local Governments

[2]UNDP, 2011, Methodological Guide for Post disaster Recovery Planning Processes: Guidelines and Actions for National, Regional and Local Governments

5.2.4 Legal and Policy Framework for Disaster Recovery in Sri Lanka

The National Policy on Disaster Management outlines the government's intentions and commitments regarding emergency response and recovery. Assistance to afflicted individuals is developed in two main areas: "Preparation and Response" and "Integrated Systems to Reduce Disaster Risk." The provisions of the National Policy on Disaster Management's legal basis include enhancing post-disaster relief, recovery, and rehabilitation capabilities. The policy recognizes recovery as a necessary aspect following disasters. Include in the policy statement assistance for the expeditious recovery of disrupted livelihoods and market systems for affected communities. Government, nongovernment, private sector, academic, media, religious, and other organizations and individuals have a 'collective responsibility' to reduce disaster risk and foster a culture of safety. The Disaster Management Act specifies the roles of the National Council for Disaster Management and the Disaster Management Center in terms of recovery.

5.2.5 Components of Early Recovery in Irrigation Sector

- Restoring essential ("lifeline") services, including critical infrastructure in the irrigation sector
- Providing additional support to critical governance functions of coordination (Irrigation water distribution) and information management (Reservoir and River water levels, Flood forecasting);
- Sharing information regularly with other irrigation sector institutions and other sector institutions such as the agriculture sector and the energy sector working on recovery;
- Mobilizing resources for recovery;
- Providing temporary or transitional office spaces when and where required for restoration tanks, bunds using sand bags, etc.
- Debris clearing activities;
- Conducting damage and needs assessments;
- Providing emergency employment through cash-for-work programs

5.2.6 Resilience Recovery in Irrigation Sector

The government is primarily responsible for organizing recovery, but implementation is a shared responsibility. While the Disaster Management Center is responsible for reducing the risk of disasters, the Ministry of Finance is typically the primary agency for recovery. The recovery of the irrigation sector is the responsibility of the Irrigation Department, the Mahaweli Authority of Sri Lanka, the Department of Agrarian Services, the Provincial Irrigation Departments, and their respective Subject Ministries. Governments can mobilize the necessary capacities for recovery by inviting international and national NGOs, donors, the private sector, and others to participate. These external actors may participate in the recovery process through the provision of resources, technical advice, capacity development, or the implementation of recovery projects. In accordance with the government's foreign and financial policies, irrigation sector agencies could establish a relationship with donor agencies.

5.2.7 Principles of Disaster Recovery

Recovery from a disaster presents a unique opportunity for risk reduction: there is greater awareness of the underlying risks, resources are available or can be mobilized, and conditions are favorable for ensuring that recovery activities include risk reduction in order to minimize the impact of future disasters on lives, livelihoods, the environment, health, etc. However, this is only possible if the government and recovery partners have the foresight and cognizance to incorporate risk reduction into recovery efforts.

In light of the preceding, key stakeholders reached consensus on five goals or principles that all recovery programs should strive to achieve:

- Governments and citizens should be ready for recovery.
- Recovery programs should be planned strategically and managed efficiently.
- Key stakeholders, including the affected population, must participate in the recovery process.
- Recovery should use the opportunity for risk reduction and resilience building.
- Countries should strive for continuous improvement in recovery practices.
  Refer to cases study (provide information for risk reduction in recovery)

5.3 MODULE 2: PREPAREDNESS FOR RECOVERY

5.3.0 Structure of the Module

3.1 Introduction
3.2 Key elements of Recovery Preparedness
- 3.2.1 Policies and Planning for Recovery
- 3.2.2 Identify Irrigation sector Recovery Outcomes
- 3.2.3 How to Identify Recovery Priorities and Fund Priority Needs

3.3 Establishing the Institutional Framework for Recovery
- 3.3.1 Organize the Institutional Arrangements for Recovery
- 3.3.2 Designate a lead recovery Institution
- 3.3.3 Technical Capacity at National and Local Levels
- 3.3.4 Establish a Legal Framework for Recovery in Irrigation Sector
- 3.3.5 Identify Stakeholders for Recovery
- 3.3.6 Decentralize Recovery Process

5.3.1. Introduction

Preparedness for Recovery is now a widely accepted concept that helps to plan ahead of the disaster so that recovery and reconstruction assistance are predictable and can be implemented without delay when needed.

- Similar to preparedness for response, Preparedness for Recovery aims to have well-planned and coordinated systems for the management of recovery.
- It is a measure taken prior to a disaster to have the capacities, institutions, and finances to ensure predictable and swift action to initiate recovery.

5.3.2 Key elements of Recovery Preparedness

There are five key components:

- Policies and Planning for Recovery;
- Establishing the Institutional Framework for recovery
- post-disaster assessments;
- Resource Mobilization and Financial Management for Recovery; and
- Implementation, Coordination, communications, and Monitoring for recovery

In particular, it emphasizes that preparedness for recovery is an opportunity to build disaster resilience and contribute to sustainable development.

5.3.2.1 Policies and Planning for Recovery

Separate policies on Disaster recovery at the national or sectoral level are not available. Policy and planning for disaster recovery are covered under the Sri Lanka Disaster Management Act No. 13, 2005, and the Sri Lanka Disaster Management Policy (2010), which provide the Legal and Policy Framework for Disaster Recovery in Sri Lanka.

National strategies for disaster risk management provided under the National Disaster Management Plan and National Emergency Operations Plan are focused on ex-ante preparations for disaster risk reduction, preparedness, and response.

Irrigation sector recovery could be implemented following the provisions given under the existing disaster management act, the national disaster management policy, and the existing policies and frameworks under each institution in the irrigation sector.

Elements of Recovery Policies for Large Scale Disasters

5.3.2.2 Identify Irrigation sector Recovery Outcomes

A Recovery Framework prepared before a disaster provides the reference for developing a post-disaster Recovery Framework and the Recovery program. Irrigation sector institutions at the national and provincial levels have the responsibility to lead, manage, and coordinate disaster response and recovery with respect to the sector.

In the event of a major disaster, as several stakeholders engage in response and recovery activities, a coherent and coordinated recovery program needs to be implemented in collaboration with other sectors such as Agriculture, hydropower, energy, etc.

Based on the principles of good recovery, a vision for irrigation sector recovery can be broadly outlined even before an actual disaster. The post-disaster Recovery Framework for the irrigation sector must include the specific vision and strategic objectives of the recovery program. In a large-scale disaster, a recovery program will engage a significant number of stakeholders for a considerable period who directly and indirectly link with the irrigation sector.

Therefore, the outcomes of the recovery program should contribute to the development priorities of the irrigation sector in the country.

The involvement and leadership of the National Planning Department under the Ministry of Finance and Disaster Management Center in post-disaster assessments and developing a recovery framework helps to bring about this linkage and also prioritize recovery for long-term development gains.

5.3.2.3 How to Identify Recovery Priorities and Fund Priority Needs

After a major disaster, an assessment of the damage, loss, and recovery needs is required. Such assessments help identify short-, medium-, and long-term recovery priorities and needs. The assessments also help to prioritize the resources required for recovery in the irrigation sector within an identified time span. The post-disaster Recovery Framework and Recovery program should be based on a systematic assessment of recovery needs and priorities.

5.3.3 Establishing the Institutional Framework for Recovery

The institutional framework for irrigation sector recovery defines the roles and responsibilities of the irrigation sector institutions (Public) and recovery actors (Public and Private) and provides for their collaboration. It also establishes the legal basis for the actions of all actors and the rules under which they operate.

5.3.3.1Organize the Institutional Arrangements for Recovery

The Recovery Framework should define the Institutional arrangements for recovery, which define the roles and responsibilities.

5.3.3.2 Designate a lead recovery Institution

Designating a Lead Recovery Agency is an important task that could be done before a disaster. A designated lead agency usually depends on the following characteristics:

- Characteristics of the disaster;
- Current governance structure;
- Agency's prior disaster recovery experience;
- Agency's ability to reach out and include communities in defining and implementing their recovery process, and capacity to work with local authorities and nongovernmental organizations;
- Overarching coordination, monitoring, oversight, and control frameworks in operation among a country's agencies, line ministries, local governments, and civil society.

In Sri Lanka, government-affiliated Irrigation sector institutions collaborate to execute normal recovery procedures.

5.3.3.3 Technical Capacity at National and Local Levels

There is a need for professional and technical expertise at the national and local levels to steer all institutional capacities and resources in the irrigation sector for recovery planning and implementation. Such expertise should be institutionalized in all sector institutions for implementing recovery.

5.3.3.4 Establish a Legal Framework for Recovery in Irrigation Sector

A legal framework for recovery combines

- legal instruments and procedures in use in normal times,
- instruments and procedures established specifically for disaster recovery

The legal framework for recovery includes:

- Disaster Management Law and Regulations
- Laws and regulations that govern public expenditure, land use, social protection, irrigation, agriculture, and water management sectors
- New or strengthened enforcement mechanisms (for instance, to enforce no-build zones);
- Modifications to or suspensions of normal rules and procedures (Approval and management of expenditures during disasters) Transparency and competition in procurement; Planning and environmental review of projects; Incorporating disaster risk reduction;

Often, legal or regulatory requirements can cause procedural delays in implementing recovery activities that need to be delivered promptly.

If modifying or suspending normal procedures creates risks, mitigation measures for these risks should be identified before rule changes are promulgated. Instead of suspending or weakening rules related to disaster risk reduction to facilitate reconstruction, efforts should be made to address bottlenecks in the disaster risk management system.

5.3.3.5 Identify Stakeholders for Recovery

Recovery stakeholders include the government, national and international agencies, civil society, and the private sector involved in the irrigation sector at different scales. Some of these stakeholders are key to the planning and implementation of recovery, while others may not directly participate in the process but can influence it.

Examples of Stakeholders for Recovery in Irrigation Sector

Stakeholders	Examples
Key stakeholders in Recovery	• Central, Provincial and local government agencies • Affected population • Civil society organizations and community-based organizations • Non-government organizations (local, national) • International non-government organization • United Nations agencies • Bilateral donors • Multilateral financial institutions • Private sector
Examples of other stakeholders	• Non-affected population in affected area • Property owners • Political actors (political parties, candidates, opponents of elected officials, etc.) • Civil society outside affected area

5.3.3.6 Decentralize Recovery Process

Provincial, district, divisional, and local-level authorities are responsible for the development and well-being of their respective areas. Hence, there is lots of potential for them to play a leading role in recovery. Local governments can further enhance their own credibility and capacities by engaging and interacting with the community.

Decentralization of Recovery has advantages as well as disadvantages, as follows:

Advantages	Disadvantages
• Easier to identify beneficiaries • Easier to mobilize the affected community for common goals • Greater opportunities for joint decisions and planning with beneficiary involvement • More likely that services reflect local preferences and meet needs • Greater receptivity on the part of beneficiaries to pay for services or participate • Greater engagement of beneficiaries in oversight and accountability • Easier coordination with local partners and stakeholders	• Possible lack of technical capacity and human resources • Possible lack of adequate funds • Greater burden of procedural approvals • Possible delays due to requirement of coordination, monitoring and reporting to the central government

Certain recovery functions can be carried out only at the central level, such as negotiations with international donors.

Some can be shared, like planning and infrastructure reconstruction, and others can be fully executed locally, such as in communities.

MODULE 3: POST DISASTER DAMAGE AND LOSS ASSESSMENT AND POST DISASTER NEED ASSESSMENT

5.4.0 Structure of the Module

5.4.1 Introduction

The Disaster Recovery Framework (DRF) is intended as a practice-based, results-focused tool to assist governments and partners in planning for resilient post-disaster recovery following a large-scale disaster.

It provides key planning and decision-making processes for the development of recovery policies and programs that lead to quick recovery and minimize the long-term impact of disasters. A solid basis for identifying and quantifying recovery needs could be accomplished using tools such as Damage and Loss assessment and post-Disaster Needs Assessment (PDNA).

5.4.1.1 Terms & Concepts in Post Disaster Need Assessment

a. Pre-Disaster context and baseline information.

In general, pre-disaster conditions Physical, social, economic, cultural, financial, and political information and data from the irrigation sector serve as a baseline to compare with post-disaster conditions in the affected irrigation infrastructure and services. Pre-disaster baseline.

Information relevant to the irrigation sector includes national, socioeconomic, demographic, and geographical data relevant to the affected areas, including development indicators such as malnutrition and food insecurity, poverty levels, access to potable water and sanitation facilities, etc.

Where possible, all relevant data should be disaggregated by sex, age, ethnicity, or cultural or religious characteristics if relevant to the identification of specific vulnerabilities and opportunities. In situations where the baseline data is not available in the census, sector or local surveys, or sector and disaggregated reports, it may be necessary to:

A legal framework for recovery combines

- Estimate baseline data on the basis of discussion with key informants;
- Visual impressions of unaffected areas and their comparison with the affected areas; and
- In certain situations where satellite imagery of pre-disaster situations is available, these images could be interpreted to develop sector-wise baseline data.

Generally, the information collected includes the following:

- Pre-disaster demographic, socio-economic, geographic, ethnic, and cultural information;
- Nature and extent of pre-disaster hazards, vulnerabilities, and risks;
- National as well as regional (or local) development plans, socio-economic goals in the short term, and poverty reduction strategies

b. Damages

Damages are the costs of bringing back the affected structures, equipment, machinery, and other assets to their pre-disaster levels or condition.

- **Totally destroyed**
  Structures, equipment, materials, data, etc. that are completely destroyed or unusable and need replacement Included are also structures that have suffered irreparable structural damage and need total rebuilding or new construction.

- **Partially damaged**
  Affected structures, equipment, materials, etc. that can be repaired or reused and whose structural integrity has not been compromised.
  The engineers on the assessment team could decide whether a structure or piece of equipment is totally damaged or partially damaged.

c. Losses

Losses refer to the value of changes in economic flows (usually lower income or revenues, higher operating costs, and unexpected expenditures) due to the adverse effects of a disaster. Losses can manifest as production declines (thus reduced revenues) and increased expenditures over a time period, which include unexpected expenses until the pre-disaster levels are recovered. Losses, whether public or private, are the values or the amount in pre-disaster prices of:

1. Foregone income opportunities, like:
- Total loss of crops or reduction in farm output (production or yield);
- Income reduction from businesses, rent, etc.
- Income losses from public facilities and companies like airports, ports, state-owned enterprises, etc.

2. Higher operating costs, which are additional expenses to produce the same output of goods and/or services during the recovery phase, like:
- Higher prices of inputs, labor, etc.
- Investment costs in crops that were washed away by floods or the cost of replanting new crops;
- Cost of temporary power and/or water supply; rent of temporary offices by suppliers; higher transport costs, etc.

3. Foregone income opportunities, like:
- Cleaning up of debris;
- Unexpected expenses on temporary shelters, water supply, medicines, food supply, etc.

d. Increased risks and vulnerabilities during disasters

Increased risks and vulnerabilities are the added risks as a result of the disaster and focus on how and what additional threats or deteriorating conditions increase the vulnerabilities of people. Pre-existing risks that become apparent during the disaster and new risks and vulnerabilities enhanced by the disaster that should be integrated into the recovery planning process are considered increased risks and vulnerabilities in PDNA.

e. Effects:

Effects are the immediate results brought about by the disaster, which are normally reported just after it has occurred. These effects in the irrigation sector could be assessed using the following:

- Quantified value of irrigation sector infrastructure and assets damaged or destroyed in the disaster
- Monetary value, expressed as the repair or replacement costs according to the market price prevailing just before the disaster
- Monetary value of affected assets (stock) like physical assets or infrastructure, finalgoods, raw materials, equipment, and other properties They would occur at the time of the disaster or shortly after the disaster and be estimated in terms of physical units of assets that may be totally or partially destroyed.
- Replacement cost of totally destroyed assets the replacement cost is the value of the asset before it was totally destroyed (pre-disaster value).
- Repair costs of partially damaged assets the repair cost is the amount required to put the asset back into its condition just before its partial destruction.
- Disruption of access to goods and services, which are the assessed effects on service delivery,including the availability and quality of services and the population's access to goods and services that are required to support lives and livelihoods.
- Losses refer to the value of changes in economic flows (usually lower income or revenues, higher operating costs, and unexpected expenditures) due to the adverse effects of a disaster.
- Increased risks and vulnerabilities, which are known as added risks as a result of the disaster, and a focus on how and what additional threats or deteriorating conditions increase the vulnerabilities of people

Table. The effects of a Disaster Under Main Elements.

Effect of disasters under main elements	Effect of disasters related to the Irrigation Infrastructure sector
Damage - total or partial destruction of physical assets existing in the affected area	**Damage - total or partial destruction of irrigation infrastructure and assets existing in the affected area**
Damage to infrastructure and physical assets : The quantification of public and private sector infrastructure and assets destroyed in the disaster.	Example: Irrigation Tank or Anicut- Declined functionality of Head works (Dam, Spillway, Sluice, Anicut regulations etc.), and downstream canal System as a result of damaged KSCs (bunds, structures, service roads, drainage system, etc.) In addition to effect on the irrigation subsector components, effects of related

	other sectors can be highlighted. Example: Damages to farm lands, houses of farmer community and irrigation subsector beneficiaries, and protected areas in the proximity of the irrigation system. See Box 2.2.
Losses - temporary changes in the economic flows arising from the disaster	**Losses - temporary changes in operating cost of the irrigation subsector arising from the disaster**
Governance and decision-making processes: Assessment of the disastrous effects on social and decision-making processes including people's ability to exercise their citizenship and priority development policy objectives	Assessing rectifying interruption to communication network, taking measures to get down the sector staff for decision making and operating process where their accessibility is blocked by flooded routes or damaged roads. The same situation that may affect governance and decision-making processes of other sectors (productive and social sectors, and other subsectors of infrastructure sector) are highlighted.
Disruption of access to goods and services: Assessment of the disaster effects on service delivery, including the availability and quality of services, and on the population's access to goods and services that are required to support lives and livelihoods.	Assessing temporary measures to be taken for rectifying disruption to irrigation service delivery and access to irrigation systems. Any losses beyond above including disruptions to agriculture products (productive sector) and supplies and other goods, services across other related sectors (Social sector services, Productive sector industry and commerce) and community infrastructure are highlighted
Increased risks and vulnerabilities: Assessment of what risks increase as a result of the disaster and how, and what additional threats or deteriorating conditions increase the vulnerabilities of people	The underlying risk (explained below) of the irrigation structures will be increased or new risk will be added during the disaster. Sometimes, the residual risk (explained below) will be increased as a result of global climate change phenomena as explained in Box 3.1). In both situations, additional expenses incurred for taking temporary measures to control the risk that may create large damages.

f. Governance and decision-making processes for DaLA and PDNA

Governance and decision-making processes are the assessed effects on social and decision-making processes, including people's ability to exercise their citizenship and priority development policy objectives. These include:

- The effect of the disaster on government functions and administrative processes
- The disruption of basic community functions, social services provided by community-based organizations, and disruption of cultural and community life; and
- The effect of disasters on the sectorial, national, and local capacities to manage services that support life and livelihoods and lead the recovery process itselfTo know the existing capacity, governance should be assessed both in functional and technical terms.

g. Impacts

Impacts are the longer-term consequences brought about by the effects (damages and losses) of the disaster, which are analyzed on a short-, medium-, and long-term basis. It combines a quantitative assessment of the macro-economic impact of the disaster with a quantitative and qualitative impact assessment on human development (social impacts).

h. Macro-economic impacts

Depending on the nature of damages and losses caused by a disaster and the size and structure of the affected economy, economic growth may be affected to varying degrees. The following macroeconomic impacts will be assessed in the Damage and Loss Assessment and in PDNA:

- Impact on gross domestic product or gross regional domestic product (GDP or GRDP), including an assessment of relative impacts on various sectors.
- Impact on the fiscal budget due to disaster as government revenues may decline (lower economic activity resulting in lower tax collections) while expenditures will increase.
- Impact on the balance of Trade and Payments as exports may decrease due to production losses, while imports may increase to replace lost assets and production.

i. Human and social development impacts

The impact on human development is the disaster's impact on the overall quality of human life in the medium and long term. It is the difference between pre-disaster and post-disaster levels of the quality of life or human development based on social indicators, which can happen until the economy and community have recovered and return to pre-disaster levels.

It is important to assess the social and human development impacts accurately so that recovery strategies can be put in place to mitigate development reversals.

j. Recovery

Recovery is defined as the restoration and, where appropriate, improvement of facilities. livelihoods and living conditions of disaster-affected communities, including efforts to reduce disaster risk factors.

k. Reconstruction

Reconstruction focuses primarily on the construction or replacement of damaged physical structures and the restoration of local services and infrastructure.

l. Needs

Needs are the estimated values of activities required for post-disaster recovery and reconstruction. The DaLA and PDNA and the analysis of disaster impacts provide the basis for the identification and estimation of recovery and reconstruction needs. The needs identified in the PDNA should also include possible measures to mainstream Disaster Risk Reduction (DRR) in post-disaster recovery and reconstruction plans.

Recovery Needs may be short-term, medium-term, or long-term. Programs and projects that are required to restore personal and family income, essential services or lifelines, and production activities in affected sectors, among others, include restoration of basic services (Water Supply for Agriculture).

Reconstruction needs are longer-term activities, such as:

- New infrastructure like the relocation of buildings, a new road, new diversions, etc.
- Preparedness and mitigation like weather forecasting, ricer and reservoir gauges, the development of new building codes, land use plans, etc.

m. The Recovery Strategy

The Recovery Strategy defines the vision for recovery and identifies priority interventions as well as results and costs for recovery within a given time frame. The primary objective of recovery is to enable all people to improve their overall well-being by restoring their physical assets, livelihoods, and socio-cultural and economic status. It provides:

- The critical link between assessment results and a comprehensive Recovery framework
- Information on the policy and institutional arrangements, financial mechanisms, monitoring, and evaluation systems for recovery

All activities undertaken as part of the recovery strategy must consider the principle of Building Back Better (BBB).

5.4.1.2 What is DaLA and PDNA

DaLA and PDNA are internationally accepted methodologies for determining the physical damages, economic losses, and costs of meeting recovery needs after a natural disaster through a government-led process. The DaLA and PDNA methodologies were elaborated by the European Union (EU), the United Nations Development Programme (UNDP), and the World Bank (WB).

5.4.1.3 Link between Disaster Management Cycle and PDNA

Below, Figure 1 illustrates the PDNA concepts linked to the disaster risk management cycle.

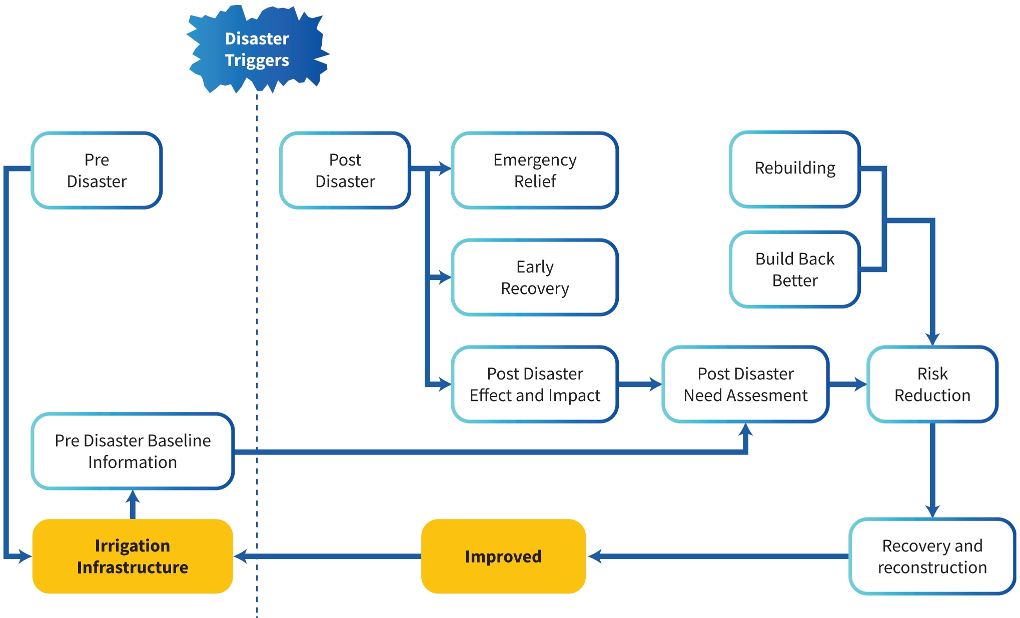


Figure 01 DaLA and PDNA concepts linked with disaster risk management cycle

5.4.1.4 Typical sectors, sub-sectors and cross-cutting issues commonly used in the DaLA and PDNA process

Below, Figure 2 depicts the Typical sectors, sub-sectors, and cross-cutting issues commonly used in the DaLA and PDNA processes.

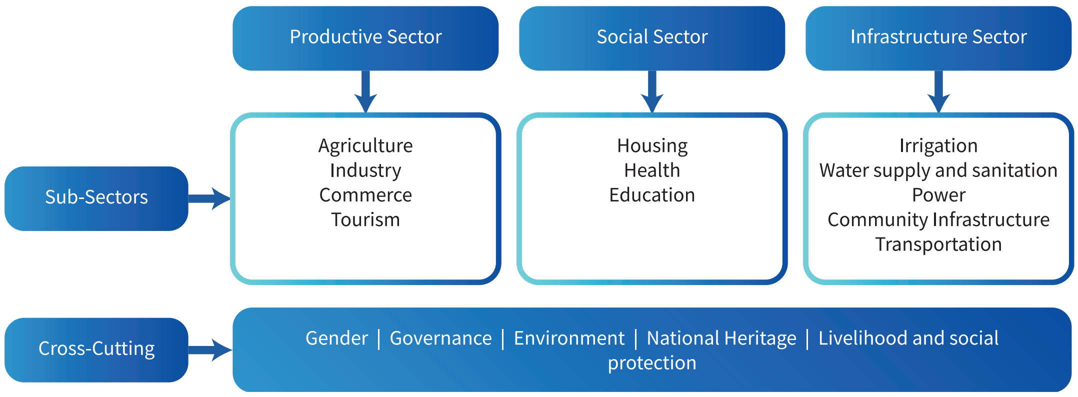


Figure 2: Typical sectors, sub-sectors, and cross-cutting issues commonly used in the DaLA and PDNA processes

5.4.1.5 Standard time frame for DaLA and PDNA

Disaster Strikes		
Disaster Response	**0-10 Days**	Recuing life and property
Disaster Relief	**0-25 Days**	Cash grants, food relief, restoring critical public services, temporary employment generation, emergency needs and assesments
Damage and Loss Assesment	**14-45 Days**	Baseline data, physical damage, economic losses, impact, needs, disaster risk management
Recovery and Reconstruction	**20 Days to Few Years**	Cash grants, asset replacement, temporary employment generation, infrastructure and micro finance projects, medium and long term planning
Risk Reduction	**Continuous**	Building codes, retro fiting, risk transfer mechanism, risk assesment, land use planning, awareness raising, institutional development
Development	**From 20 Days**	Local resource baseed infrastructure development, regular micro-finance projects, local baseline studies, counselling of local governments

5.4.1.6 Typical Sectors considered in DaLA and PDNA

The diagram below illustrates the typical sectors that are assessed in the DaLA and PDNA.

Social

Housing
Education
Health
Culture
Nutrition

Infrastructure

Water & Sanitation
Community Infrastructure
Energey & Electricity
Transport &
Telecomunication

Productive

Agriculture, livestock and
fisheries
Commere & Industry,
Commerce & Trade Tourism

Macro - Economy

GDP
Balance of trade
(Import-export,
revenue-expenditure)

PDNA:

An Integrated
Frameworkfor
Assessing Disaster
Effect & Impact Across
all Sectors

Human & Social Development

MGD's
HDI
Poverty

Finance

Banks
Finance Institutions

Cross Cutting Sectors/themes

Governance
Disaster Risk Reduction
Environment
Gender
Employment & Livelihoods

The irrigation sector is a subsector of the Agricultural sector and belongs to the main sector known as the productive sector.

5.4.1.7 National and international actors participating in the DaLA and PDNA

National	Irrigation Sector Agencies	International
• Presidential Office or equivalent • The Ministry of Finance • The Ministry of Planning or equivalent • Line ministries • Civil Defense • Governors, senators and mayors • National Red Cross • National NGOs • Civil society organizations Community-based organizations • Affected population • Private sector	• Subject Ministry of Irrigation Water Management • Subject Ministry of Finance • Subject Ministry of Agriculture • Subject Ministry of Agrarian Service Development • Irrigation Department • Mahaweli Authority of Sri Lanka • Agrarian service Department • Provincial Irrigation Departments in 09 Provinces	• EU • WB and other IFIs • UN agencies • Other bilateral donors • International NGOs • Regional International Organizations

5.4.2 Requirements to conduct DaLA and PDNA for Disaster Recovery

- During catastrophic events, as the damages and losses are huge, it is required to get support from international donors, investors, or partners. To obtain such facilities, globally accepted assessment-based needs must be identified. Hence, DaLA and PDNAs are highly valued and relevant, particularly for governments, tripartite institutions (EU, UNDP, WB), international organizations, and donors to ensure sustainable recovery.
- DaLA and PDNAs represent a valuable legacy for convening many contributors, working across all productive and social sectors toward a common national purpose.
- Government ownership and leadership in implementing DaLA and PDNAs are critical for achieving the harmonized management and productive outputs of the exercise.
- The sustainability and effectiveness of DaLA and PDNA evaluations are enhanced when the process is embedded in national governance structures and wider development objectives.
- Governments could consider multiple interests when requesting DaLAs and PDNAs, depending on the needs of the country.
- DaLA and PDNAs serve different interests among primary partners and participating organizations, and this multiplies potential benefits.

5.4.2.1 Objectives of DaLA and PDNA

The main goal of conducting a DaLA and PDNA is to assist governments in assessing the full extent of a disaster's impact on the country and, on the basis of these findings, producing an actionable and sustainable Recovery Strategy for mobilizing financial and technical resources. And, if necessary, request additional external cooperation and assistance to implement it, given the affected sectors capacities, financial, technical, and institutional. More specifically, a DaLA and PDNA set out the following objectives:

- Support country-led assessments and initiate recovery planning processes through a coordinated interinstitutional platform integrating the concerted efforts of the UN system, the EU, the WB, other participating international donors, financial institutions, and NGOs;
- Evaluate the effect of the disaster on:
    - o Infrastructure and assets in the irrigation sector
    - o Service delivery and access to goods and services across the different institutions in the sectors, particularly the availability of basic services and the quality-of-service delivery;
    - o Governance and social processes related to the irrigation sector
    - o Assessing needs to address underlying risks and vulnerabilities so as to reduce risk and build back better (BBB).
- Estimating the damage and loss caused by the disaster to physical infrastructure, productive sectors, and the economy, including an assessment of its macro-economic consequences;
- Identify all recovery and reconstruction needs;
- Develop a Recovery Strategy outlining priority needs, recovery interventions, expected outputs, and the cost of recovery and reconstruction, which would form the basis for a comprehensive Recovery Framework;
- Provide the basis for mobilizing resources for recovery and reconstruction through local, national, and international sources.

5.4.2.2 Responsibilities in DaLA and PDNA

Although the DaLA and PDNA are important for decision-making and prioritization in disaster recovery, they have not been applied to every incident. Generally, DaLA and PDNA conduct themselves according to international standards and guidelines when there is a catastrophic event that causes huge damages and losses.

But as and when required, sectoral agencies can assess damages and losses and thereby need assessment following the standard method.

Output from the DaLA and PDNA is important to irrigation sector agencies as well as decision-making entities such as the National Planning Department, Budget Department, and External Resources Department under the Ministry of Finance.

As per the Sri Lanka Disaster Management Act No. 13 of 2005, H.E. the President is responsible for declaring a disaster. Consequently, following the policies, rules, and regulations, the Disaster Management Center (DMC), through the Subject Ministry, can call for PDNA in collaboration with the Finance Ministry and the Foreign Ministry to obtain international cooperation for a national assessment of the disaster and the ensuing recovery and reconstruction efforts.

Senior managers from multilateral agencies at headquarters and in-country who would be required to respond to a government's request to organize and coordinate a post-disaster assessment, response, and recovery This would include the Humanitarian Coordinator (HC) and Resident Coordinator (RC), UN Country Teams, in-country. Representatives of UN agencies, the WB, and the EU, as well as HQ units, departments, or services directly linked to post-disaster response beyond the humanitarian phase

Government officials across sector ministries with responsibilities for disaster response, recovery, and risk reduction could be involved in the operationalization of DaLA and PDNA. Technical staff from multilateral agencies at headquarters and in-country with responsibilities in post-disaster assessment, response, and recovery planning are involved and support the government sector agencies in assessment.

The DaLA and PDNA are inclusive, government-led, and government-owned processes that build on the capacity and expertise of national and international actors. Therefore, participation and coordination are essential to the assessment process and the development of a Recovery Strategy. To ensure a government-led and owned process, it is recommended that government representatives from relevant line ministries and sectorial institutions be actively involved at all levels, in both the technical and management teams. This would include their High-level leadership and coordination down the line with the sectors.

5.4.2.3 Deliverables of DaLA and PDNA

The PDNA produces the following four core deliverables:

- One consolidated assessment report incorporating the results of DaLA, based on sector reports, presents the overall effect and impact of the disaster on each sector, the recovery needs for each, as well as the explicit impact on cross-cutting themes with a gender perspective, environmental considerations, risk reduction, and governance.
- A Recovery Strategy that defines the vision for national recovery, provides a strategy for recovery actions within each sector and affected region, armed with clear objectives and interventions, directs it towards expected results, and defines the timeframe as well as the cost of the recovery process
- Provides the basis for resource mobilization in support of the country's recovery, including a donor conference where required. Provides an outline for a country-led implementation mechanism for recovery.

5.4.2.4 Guiding principles of DaLA and PDNA

All DaLA and PDNAs would be guided by the following core principles:

- Adhere to the core principles of humanitarianism, impartiality, and neutrality.
- Acknowledge the national ownership of DaLA and PDNA and ensure that it is a demand-driven and country-led process with the fullest possible leadership and engagement of national authorities in assessment, recovery planning, and implementation, from the highest political levels to local levels and at the level of technical expertise.
- Support local ownership and the fullest possible engagement of local-level institutions and community-based organizations in the planning and execution of recovery, and build specific capacities where needed.
- Provide coordination at all stages of the process and at all levels, ensuring collaboration and partnership between the UN, the WB, and the EU, as well as with the National Government, donors, NGOs, civil society, and other stakeholders engaged in the PDNA.
- Ensure one team, one process, and one output.
- Adopt a conflict-sensitive approach and ensure that the assessment does not exacerbate existing tensions and that the recovery strategy considers potential disaster-related conflicts.
- Support and strengthen national and local capacities to lead and manage recovery and reconstruction.
- Ensure transparency and accountability in the DaLA and PDNA processes as well as in post-disaster recovery and reconstruction.
- Integrate DRR measures into the recovery process to enhance the resilience of affected populations and sectorial institutions with regard to future disasters.
- Develop a recovery plan that addresses the gap created by the disaster and effectively helps in building back better and reducing future risks without expanding recovery needs and priorities into a full-fledged development plan that goes beyond the disaster.
- Ground recovery in the principles of sustainable development.
- Build on national development strategies as required.
- Monitor, evaluate, and learn from practice.
- Complete the assessment in a timely manner to capitalize on the limited window of opportunity to start recovery, resource mobilization, and resilience-building initiatives.

5.4.2.5 Core Elements of DaLA and PDNA

Pre Disaster context and baseline information

The collection of pre-disaster baseline data to compare with post-disaster conditions in order to evaluate the magnitude and scale of the disaster

The assessment of disaster effects and Impacts Damage and Loss Assessment

The evaluation of the disaster effects and disaster impacts in each sector to determine the overall recovery needs,

Effects
Damage to infrastructure and physical assets, Disruption of access to goods and services, Governance and decision making processes, Increased risks and vulnerabilities

Impact
Economic impact at macro and micro levels Human development impact

The Recovery Strategy, determining Irrigation sector recovery needs.

The prioritization of these recovery needs by way of a Recovery Strategy

5.4.2.6 Baseline Information

Pre-disaster baseline information includes national, socioeconomic, demographic, and geographical data relevant to the affected area of the irrigation sector, including development indicators such as literacy rates, malnutrition and food insecurity, poverty levels, Where possible, all relevant data should be disaggregated by sex, age, ethnic, or religious characteristics if they are relevant to the identification of specific vulnerabilities and opportunities that women, girls, boys, and men, as well as different ethnic and religious groups, may face and that must be addressed post-disaster.

Baseline data is critical to determining the overall impact of the disaster across all sectors, including its impact on human development.

Baseline data also contributes to vulnerability analysis and an understanding of the underlying causes of the disaster. That, in turn, contributes to planning an effective and resilient recovery.

The pre-disaster baseline dataset expedites the post-disaster needs assessments and recovery framework while providing background information to establish a financial mechanism by:

1. comparing post-disaster damage to the irrigation subsector with pre-disaster conditions;
2. identifying possible avenues for post-disaster losses in advance;
3. highlighting a general overview of other sector information such as lost harvest, livelihoods of the affected community, disruptions to services, damages to community infrastructure and environment, etc.

In the case of the unavailability of Baseline data, using the following method, baseline data could be obtained:

- local surveys or sector and disaggregated reports,
- It may be necessary to estimate baseline data on the basis of discussion with key informants.
- It could also be feasible to arrive at baseline data on the basis of visual impressions of unaffected areas and their comparison with the affected areas, provided there is geo-referenced data corresponding to the images.
- In certain situations where satellite imagery of pre-disaster situations is available, these images could be interpreted to develop sector-wise baseline data.

Example of Baseline Data;

Type	Description
Assert	Type of Assert
	Construction cost
	Repair cost
Economic Flow	Production Level
	Income of Farmers
	Production cost
Social Impact	Demography – number of family members (male/female), sources and number of incomes, etc.
	Social status of the people – standard of living, health, education, housing, etc.
	Cultural – family relations, spirituality, etc.
Economic and financial impacts	GDP, employment, budget deficit, inflation, balance of payments, etc.
Governance	political stability, provision of government services, etc.
Environment	Impacts on habitats, protected areas, et

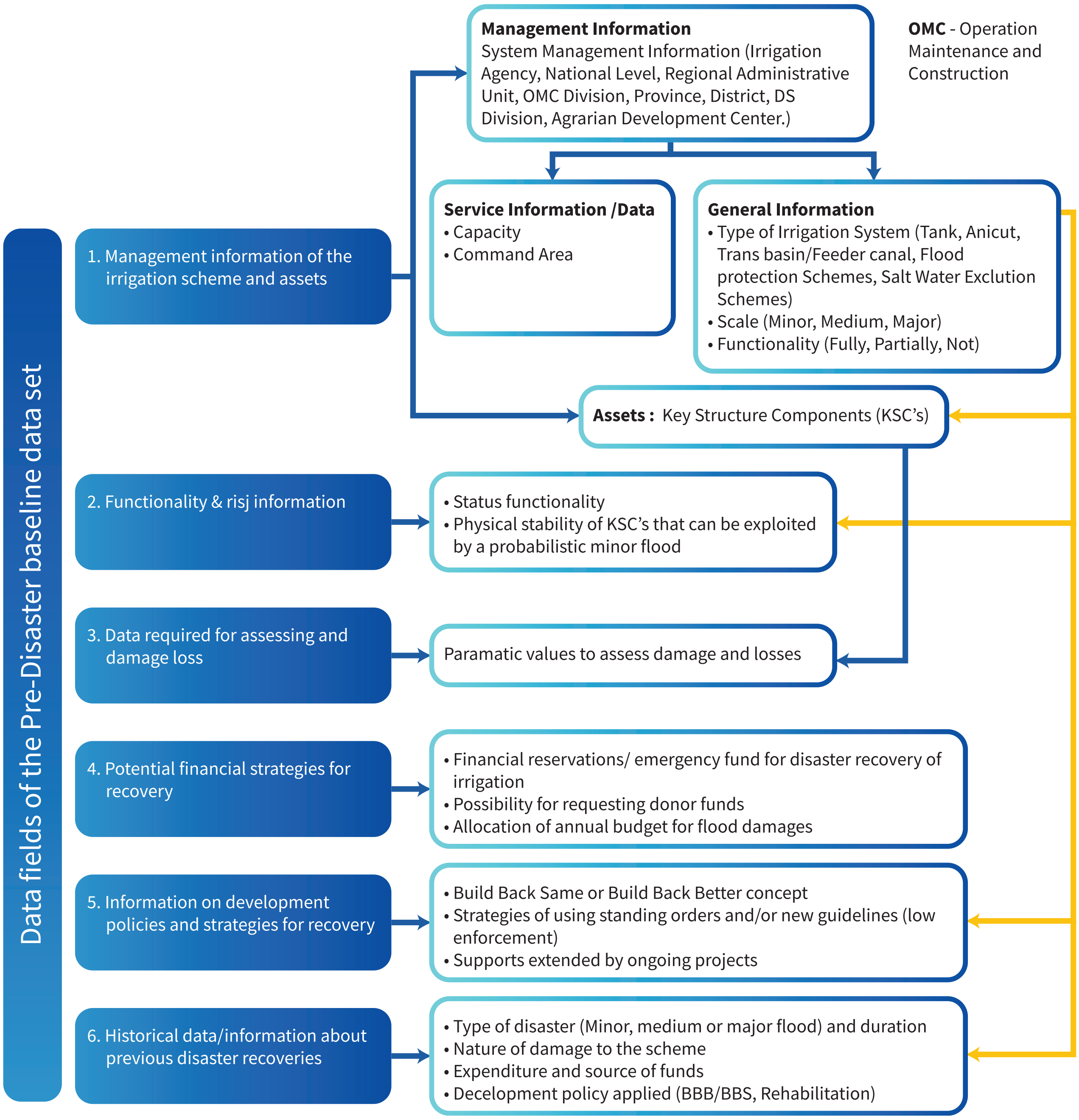
indicators such as literacy rates, malnutrition and food insecurity, poverty levels, Where possible, all relevant data should be disaggregated by sex, age, ethnic, or religious characteristics if they are relevant to the identification of specific vulnerabilities and opportunities that women, girls, boys, and men, as well as different ethnic and religious groups, may face and that must be addressed post-disaster.

Type of Structure	Examples
Irrigation Schemes	i. Categorize date on the basis of major, medium, minor tanks and anicuts. ii. Functionality of each tank (Whether it is currently functioning or abandoned). iii. X, Y Coordinates of each tank iv. Capacity v. Average Cropping Intensity in Yala season. vi. Average Cropping Intensity in Maha season
Flood Protection/ Drainage Schemes	i. Name of the scheme ii. Associated River (Name of the river to which the flood protection scheme is related) iii. X, Y Coordinates iv. Ownership v. Administrative Division vi. Functionality (Whether it is currently functioning or abandoned) vii. Number of Beneficiaries viii. Any other relevant data
Salt Water Exclusion Schemes	i. Name ii. X, Y Coordinates iii. Ownership iv. Administrative Division v. Functionality (Whether it is currently functioning or abandoned). vi. Number of Beneficiaries vii. Any other relevant data

- If relevant, Include fishing communities under each irrigation scheme as beneficiaries.
- Consider the annual cropping intensity for each scheme.
- Include lift irrigation systems in the database.
- Consider groundwater development projects.

Baseline information must be compiled and validated at the national, provincial, or district levels before the field assessment or, if possible, prior to the occurrence of a disaster.
The value of the structure could be extracted from the asset inventory maintained at the head office or provincial or district offices.

Refer to the case study - base line information and data given for Calculating Damages and losses. Each irrigation sector organization updates its “Schedule of Rates” at the beginning of the year as a routine practice, and Unit prices to estimate the damages to irrigation structures could be taken from the Schedule of Rates.


Data fields of the Pre-Disaster baseline data set
Management Information
System Management Information (Irrigation Agency, National Level, Regional Administrative Unit, OMC Division, Province, District, DS Division, Agrarian Development Center.)
OMC - Operation Maintenance and Construction
Service Information /Data
• Capacity
• Command Area
General Information
• Type of Irrigation System (Tank, Anicut, Trans basin/Feeder canal, Flood protection Schemes, Salt Water Exclution Schemes)
• Scale (Minor, Medium, Major)
• Functionality (Fully, Partially, Not)
1. Management information of the irrigation scheme and assets
Assets : Key Structure Components (KSC's)
2. Functionality & risj information
• Status functionality
• Physical stability of KSC's that can be exploited by a probabilistic minor flood
3. Data required for assessing and damage loss
Paramatic values to assess damage and losses
4. Potential financial strategies for recovery
• Financial reservations/ emergency fund for disaster recovery of irrigation
• Possibility for requesting donor funds
• Allocation of annual budget for flood damages
5. Information on development policies and strategies for recovery
• Build Back Same or Build Back Better concept
• Strategies of using standing orders and/or new guidelines (low enforcement)
• Supports extended by ongoing projects
6. Historical data/information about previous disaster recoveries
• Type of disaster (Minor, medium or major flood) and duration
• Nature of damage to the scheme
• Expenditure and source of funds
• Decelopment policy applied (BBB/BBS, Rehabilitation)

Data fields of pre-disaster baseline data set			
1	**Identification of the scheme**		
	Name of the Scheme		
	Type		
	Category	(Major/Medium/Minor)	
	Command area (ha)		
	Capacity (for Tank in MCM)		
	Beneficiaries	Farmer families/families protected by FPS	
	Functionality at present	Fully/Partially/Not - Functioning	
	Any other details (if required)		
2	**Administrative information**		
	Managing Agency		
	National-level coordination by		
	Regional Administration by		
	Operation, maintenance, and construction Division		
3	**Geographical location**		
	Coordinates (GPS/Metric/Tank)		
	Agrarian Service Center		
	Province		
	District		
	DS Division		
4	**Vulnerability for potential disaster risk**		
	Observed flood event	Year	Month
	Observed Peak-Flood	Below HFL/ Between HFL and BTL/Above BTL	
5	**Key Structural Components**		
		6. Rebuilding cost	

		Unit	Cost (LKR)
a	**Head Works**		
	Bund	1 km	
	Riprap	1 km	
	Bund Road	1 km	
	Spill	1 Nos	
	Sluice -RB	1 Nos	
	Sluice -LB	1 Nos	
	Other structures		
b	**Conveyance System**		
i	Main Canal		
	Main Canal RB (Lined)	1 km	
	Main Canal RB (Earthen)	1 km	
	Regulator	1 Nos	
	Turn out structure	1 Nos	
ii	Branch canal		
c	**Distribution Canal**	1 Nos	
f	**Field Canal**	1 Nos	
7	**Administration/Operation asset**	1 Nos	
	Unit Office building		
	Field staff quarters		
	Any other		

5.4.3 Process and Procedures of Post Disaster Damage and Loss Assessment and Need Assessment

This section focuses on the process of conducting DaLA and PDNA. It provides directives to take measures for the preparation and implementation of PDNA, incorporating results from the DaLA. More specifically, it provides guidance on:

- The consultation and decision-making process required to activate DaLA and PDNA;
- Preparation for a DaLA and PDNA through a Planning Mission
- The process for conducting a DaLA and PDNA

Recommended processes and procedures need to be followed along with sound inter-agency coordination during the assessment process, building on good practices from past disaster responses. All these proposed coordination procedures could be customized based on the sector and institutional context and characteristics.

Although here we focus only on the irrigation sector (DALA and PDNA), generally assessments are conducted across all sectors in a holistic way to address catastrophic events. The government's request for an international assistant for PDNA, very dynamic inter-agency relationships in various sectors, the nature, size, and specific objectives of interagency responses to specific disaster situations, and other ground realities are highly important. As an example, When the irrigation sector conducts an assessment as part of the Main PDNA of the particular disastrous event, the interagency relationship of all agencies and their individual demands and requirements involved in the irrigation sector (Irrigation Department, Provincial Irrigation Department, Agrarian Service Department, Mahaweli Development Authority) are to be considered. Meanwhile, all irrigation sector agencies need to maintain close collaboration between the National Government and the respective country representatives of the UN, the EU, the WB, and other partners, as well as close collaboration at headquarters (HQ) level among the UN, the EU, the WB, and other international partners, to ensure that the assessment process and the development of a Recovery Roadmap are well coordinated.

Conducting Irrigation Sector DaLA and PDNA involves the following:

- Establishing the DaLA and PDNA management teams;
- Agreement on roles and responsibilities;
- Composition of assessment teams;
- Resourcing requirements;
- Assessment logistics.

5.4.3.1 Steps & Process

The basic steps and processes required to follow the Irrigation Sector Assessment PDNA could be summarized as follows:

Key Steps	Main Process
Activation of DaLA and PDNA As explain the above this is general procedure for assessment and not specifically for the sector	• In-country communication between EU, WB, UN on possible need for DaLA and PDNA; • Immediate communication from EU, WB, UN country offices with respective HQ and • communication between EU, WB and UN for support to a possible assessment exercise; • Government request for PDNA, in-country and HQ decision by EU, WB, UN to activate PDNA; • Identification of objectives, scope and resources for DaLA and PDNA; • Determination of the institutional set up from the national to local level, including • government ministries and departments, local governments, community institutions, NGOs, and civil society; • Support that the Government will provide to the assessment mission (this normally occurs during a pre-assessment Planning Mission by the staff of the tripartite agencies or can be arranged with local representatives of the tripartite agencies); • Deployment of Planning Mission; • Establishment of High-Level Management Team in-country; • Establishment of coordination arrangements at HQ to provide support form HQ and regional levels when required; • Development of a resource mobilization strategy for the DaLA and PDNA.
Irrigation Sector Preparedness for assessment	• Set-up arrangements and DaLA and PDNA plan; • In consultation with Government, the tripartite members will set up all necessary arrangements to support the DaLA and PDNA (team composition, logistics, human resources, information management, strategic planning and human development specialists, budget, management structures, etc.); • Workshop organized for training the irrigation sector PDNA Team to conduct the assessment; • Timeline for Assessments: establish the work schedule and timeline for the assessment, including the composition of sector groups.
Data Collection and Validation	• Desk review: in the context of the sector and thematic groups created, collection of secondary quantitative data on disaster damages and losses and pre-disaster baseline information; • Field visits: sample collection of data, and validation of data from affected areas, including surveys and other data collection methods

Data Collection and Validation	• affected areas, including surveys and other data collection methods through Interviews. Field visits to be coordinated with national and local authorities. Selection of locations will be based on preliminary data of most affected or relevant areas or sectors; • Stakeholders' consultations, including focus groups.
Consolidation and analysis	• Data analysis at the sector level: the consolidation, processing and analysis of data on damage and losses collected by each Sector Team; • Once the damage and losses are compiled, identify sector recovery needs and priorities and synthesize into sector reports; Inter-sector data analysis: cross-check findings across sectors. Do a multi-sector analysis to achieve a common understanding of disaster; identify common priorities across sectors and geographic areas, vulnerable groups, cross-cutting issues, and establish a common basis for recovery programming; • Consultation: consultative process of engagement with local stakeholders in affected areas to agree on priority needs and recovery strategies; • Cross-checking needs/recovery strategies across sectors and geographical areas; • Impact analysis at the macro level (projection of the impact on the economy and on human development.)
Formulating the Recovery Strategy	• Workshop with all Team members to share results of DaLA and PDNA, recovery needs in all sectors and the results from the consultation with local stakeholders; • Develop the Recovery Strategy (vision, guiding principles, recovery and reconstruction needs and priorities, implementation arrangements); • Draft PDNA Report incorporating results of DaLA and with Recovery Strategy; • Feedback and validation process; • Write final report; • Preparation of summary and power point presentation.
Resource mobilization and implementation mechanism	• Support resource mobilization, if needed, as a complement to the resources allocated from the national budget; • Organize donor/pledging conference to present PDNA and Recovery Strategy; • Recommend inter-institutional mechanism for implementing and coordinating recovery, respecting and strengthening national/local institutional organization.

5.4.3.2 Consultation with the government (Respective Authority who trigger the assessments) for conducting the DaLA and PDNA

The Assessment is a government-led and government-owned process carried out with the participation of national and international agencies. The National Government's leadership of the exercise is critical to a successful assessment. The following section briefly outlines the support required from the Government to undertake the DaLA and PDNA.

Initiating the Assessment, The PDNA is initiated at the request of the National Government. International agencies do not have a mandate to conduct a PDNA without an explicit request from the Government. It is desirable that a letter be addressed requesting the tripartite partners (EU, WB and the UN) to support the Government is conducting the PDNA.

↓

Preparatory Steps for Conducting a PDNA At the outset it is important to appoint a ministry or department to lead the PDNA. The role of this ministry/ department would be to coordinate all the National Government line ministries and International agencies in following the various steps for conducting the

↓

Drafting the ToR for the PDNA and Schedule and Timeframe for the PDNA

↓

Government Participation The Government must nominate its officials and experts to participate in the PDNA. It should begin with making arrangements for the coordination of the PDNA. Within the Government, a senior level official must be nominated to coordinate the PDNA.

↓

Provision of Local Facilities including office space for team, interpretations, translations etc.

↓

Formation and Training of Sector Team The assessment should cover all affected sectors. For each sector, a team would be constituted, which would include experts from the Government, international agencies and on the private sector, based on their expertise.

↓

Collection of Baseline and Primary Data & Field Visit to Data collection It is for the government agencies to provide baseline data on all the sectors that would be assessed. Sector teams would have to meet the relevant department/ agency for collecting the baseline data. Wherever the baseline data is not readily available, the Government should locate sources of information for constructing the baseline data

↓

Writing the report/ Presentation of PDNA Results/ Review and Approval of the PDNA Report/ PDNA Follow-up Measures

↓

Formulation of a Recovery Framework

5.4.3.3 Data Collection and Analysis

To start the data collection process, the Assessment Team is required to collect and analyze quantitative secondary data to assess the extent of damage to irrigation sector infrastructure and assert the team also collects data on the general demographic, social, and economic characteristics of the country and geographic areas affected, apart from the data and information on the sector. This data helps to describe the conditions in the country prior to the disaster and also forms the quantitative basis for a comparative analysis of pre-disaster and post-disaster conditions.

Team members should be assigned this task from the beginning of the assessment process to ensure that the collection of information can take place in tandem with field visits by other team members, thereby making efficient use of time.

In addition to secondary data collection, field visits are organized to collect and validate data. Interviews with key stakeholders through field visits to affected areas are crucial for a first-hand vision of the effects and impact of the disaster.

In general, methods for information collection may include one of the following or a combination of these:

Focus group discussions;

- Interviews with livelihood groups;
- Interviews with key informants;
- Household visits and interviews;
- Participant observation in the field;
- Household surveys;
- Maps and satellite imagery

5.4.3.4 Consolidation and Analysis

Once the field visits and desk review are complete, the PDNA Team will need to consolidate, analyze, and interpret all the collected data. This analysis is critical to the success of the overall PDNA, as it converts data into credible and compelling evidence that informs the decisions taken by government authorities and the international community with regard to the irrigation sector's recovery.

5.4.3.5 Inter-Sector Data Analysis

Irrigation Sector teams would need to share and cross-check findings across other important sectors such as agriculture, water supply sectors, etc. too. Inter-sector analysis helps identify linkages and issues that cut across sectors. It can go a long way in helping achieve a common understanding of the overall effect of the disaster by identifying common priorities across sectors and geographic areas, vulnerable groups, and cross-cutting issues.

5.4.4 PDNA Report Format (The report incorporates the Results of DaLA)

Participants in PDNA:	
Participating agencies:	
Date:	

Executive Summery
Introduction

Need to include the sector purpose of the PDNA. The purpose should include:

- Statement on the desired long-term recovery outcome in the sector (vision)
- Recovery strategies that may be derived from the recovery outcome, including measures to reduce future risks
- Implementation arrangements for recovery processes

Pre-disaster baseline information/ sector overview

The section provides the Irrigation Sector Overview and pre-disaster Baseline information for the sector. It also includes information on sources and key documents used to determine pre-disaster conditions. It should include information on the following:

- The state of the human, natural, cultural, financial, social, and physical capital within the sector
- Description of the Infrastructure and physical assets
- Description of the Production and delivery of goods and services and access to goods and services;
- Description of Governance and decision-making processes (Incl. people's ability to exercise their citizenship and priority development policy objectives, etc.)
- Risks and vulnerabilities, including existing preparedness plans

Assessment of Disaster effect

The assessment of disaster effects defines and describes the effects of the disaster (disaster effects are defined as the:

- Destruction of infrastructure and assets,
- Disruption of service delivery, production,
- Disruption of governance,
- Influences on previous and emerging risks and vulnerabilities
- The direct responses that mitigate these effects

Effects can be described as tangible as well as intangible. These effects must be presented according to the geographical divisions and by other key sociological characteristics where relevant (sex, age, ethnicity, religion, ability, and disability of the given population). The effects can be expressed in quantitative or qualitative terms.

Introduction:

General description of the disaster event, its geographical scope, population affected, evolution till date, etc.;

- Effects on Infrastructure and Physical Assets;
- Effects on Production and delivery of goods and services; access to services and goods;
- Effects on Governance and decision-making processes;
- Effects on Risks and Vulnerabilities;

It also addresses cross-cutting issues such as gender, environment, and risk reduction across the description of the effects or in a separate paragraph.

Value of the effects of the disaster need to be calculated following standard method.

It is required to estimate the value of Damage and Loss, extracted from the section on effects, for those elements that have financial implications, either in terms of damage to infrastructure and assets or loss due to changes in financial flows as linked to service, / production, governance, and risks. Consequently, the economic value of the event can be presented as follows:

Total Value of the Effect of the Disaster

Damage

- Value of Fully /partial destruction in infrastructure and assets

Losses

- Value of changes on production of goods and services, delivery of services and access to services and goods
- Value of changes to governance
- Value of changes to risks

Assessment of Disaster Impact

This section provides a report on the aggregated economic and human development impact. It also provides an analysis of the expected trend for the sector after the disaster and what could be the worst-case scenario if policy and programming measures are not considered. It identifies major challenges for the sector. This impact analysis is based on the assessment of the disaster effects, the sector development plans, lessons from past experiences, and the emerging concerns that derive from the events. The analysis of the impact of the disaster provides a medium- and long-term projection of the effects on the sector. The impact analysis forms the basis of the recovery strategy.

- Macro-economic impact
- Human development impact

Cross sectoral Impact

This section reports on the inter-sectoral linkages inherent in the functioning of society and links across sectors.

Standard Forms for Pre-Disaster Baseline Dataset (inventory) of Irrigation Sector

Form A: Section 1- General information

1	**Technical and Service Information**		
	Name of the Scheme		
	Type		
	Category	**(Major/Medium/Minor)**	
	Command area (ha)		
	Capacity (for Tank in MCM)		
	Beneficiaries	**Farmer families/families protected by FPS**	
	Functionality at present	**Fully/Partially/Not - Functioning**	
	Any other details (if required)		
2	**Administrative Information**		
	Managing Agency		
	National-level coordination by		
	Regional Administration by		
	Operation, maintenance, and construction Division		
3	**Topographical Information**		
	Coordinates (GPS/Metric/Tank)		
	Agrarian Service Center		
	Province		
	District		
	DS Division		
4	**Hazard Information**		
	Occurrence of flood event	Year	Month
	Observed Peak-Flood	Below HFL/ Between HFL and BTL/Above BTL	

Form B: Section 2 – Structural information

1	Structural Components			
	Major Tank	**Rebuilding cost**		
		Pre-Disaster		
		Unit of measurement	**Unit Cost (LKR)**	**Functionality (G/A/P*)**
a	**Head Works**			
	Bund	**1 km**		
	Riprap	**1 km**		
	Bund Road	**1 km**		
	Spill	**01 No**		
	Sluice -RB	**01 No**		
	Sluice -LB	**01 No**		
	Other structures			
b	**Conveyance System**			
i	**Main Canal**			
	Main Canal RB (Lined)	**1 km**		
	Main Canal RB (Earthen)	**1 km**		
	Regulator	**01 No**		
	Turn out structure	**01 No**		
ii	**Branch canal**			
c	**Distribution Canal**			
d	**Field Canal**			

2	**Administration/Operation asset**			
	Unit Office building			
	Field staff quarters			
	Any other			
	Sub Total 2			
	Sub Total 1+2 (Total Damage)			
3	**Losses (High operational cost)**			
a	Cost of taking immediate precautions during response phase			
b	Cost of taking and continuing temporary early recovery measures			
c	Operational cost incurred in addition to the normal operations			
Abbreviation: G-Good; **A**-Average; **P**-Poor				

Form C: Pre-disaster baseline information – Loss assessment

Type of Loss	Possible temporary measures (Irrigation sector)	Anticipated expenses for taking temporary measures		
		Pre-disaster Immediately before LKR	During a disaster LKR	Immediately after disaster (S&Rand Relief phase) LKR
a. Cost incurred for restoration of governance and decision-making processes	Rectifying interruption to communication network and other internal utility services		✓	
	Formalizing decision-making process to arrange operational works	✓	✓	
	Hiring transport, machinery, and equipment for emergency operations	✓	✓	✓
	Expert consultation including hiring additional staff			
b. Re-opening of disrupted access to goods and services	Providing temporary access to by-pass damaged section		✓	✓
	Providing temporary transport as necessary		✓	
	Making temporary arrangements to provide irrigation water deliveries (e.g. coffer dams)		✓	✓
	Making temporary arrangements to close a breached part of a spillway, anicut, or any other structure to re-start service delivery		✓	✓
c. Reducing potential risk that may increase	Public awareness by starting early warning (preparedness stage)	✓	✓	
	Placing sand bags where unusual seepage appears to control damages (response phase)	✓	✓	✓
	Placing sand bags at either side of breached sections (dams, canal bunds) to control further damages as an early recovery (recovery phase)		✓	✓
	Cleaning sand barriers formed at sea-outfall of rivers to draining out stagnant upstream flood water (response phase)		✓	✓
	Cleaning debris stuck between piers of canal/river structures to reduce upstream floods (response phase)		✓	✓

Standard Forms for Post Disaster Damages and Losses Assessment for Irrigation sector Assessment on Damaged Infrastructure due to Floods

A. Head works Bund, spillways and Rip rap

Data and information provided in the case study will be used to calculate the disaster damages and Losses. Case study will also help to identify recovery needs

District	Polonnaruwa/Lankapura								
Head Works									
Scheme	Tank Bund			Spillway			Rip Rap		
	Pre-disaster value	% Damage	Damage	Pre-disaster value	% Damage	Damage	Pre-disaster value	% Damage	Damage
	Rs Mn		Rs Mn	Rs Mn		Rs Mn	Rs Mn		Rs Mn
Minor Tank 1	125	30%	37.5	30	5%	1.5	10	20%	2
Minor Tank 2	225	35%	78.75	40	10%	4	15	35%	5.25
Minor Tank 3	300	70%	210	80	25%	20	20	30%	6
Minor Tank 4	225	100%	225	110	100%	110	60	100%	60
Medium Tank 1	400	20%	80	75	10%	7.5	40	5%	2
Medium Tank 2	600	5%	30	150	5%	7.5	110	3%	3.3
Major Tank 1	900	10%	90	200	5%	10	130	6%	7.8
Sub Total				685		160.5			86.35
Grand total	685+160.5+86.35 = 931.85								

Sample Assessment of Damaged Infrastructure due to floods developed based on the Case study. (Hypothetical figures are assumed for infrastructure and level of damages for calculation)

DL-1: Head works Bund, spillways and Rip rap

B. Canal system

District	**Polonnaruwa/Lankapura**								
	Canal system								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Scheme	**Pre-disaster value LKR Mn/ KM**	**Damage Km**		**Value of section damage LKR Mn**		**Damage level %**		**Value of damages LKR Mn**	
		Partial	**Fully**	**Partial**	**Fully**	**Partial**	**Fully**	**Partial**	**Fully**
Minor Tank 1	11.5	30	6	345	69	40	100	138	69
Minor Tank 2	11.5	12	2	138	23	30	100	41.4	30
Minor Tank 3	11.5	8	1	92	11.5	20	100	18.4	20
Minor Tank 4	11.5	6	1	69	11.5	20	100	13.8	20
Medium Tank 1	40	4	-	-					
Medium Tank 2	40	3	-						
Major Tank 1	60	-	-						
Sub Total		63	10						
DL-1: Head works Bund, spillways and Rip rap									

C. Canal Structures

District	**Polonnaruwa/Lankapura**									
	Canal structures									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	
Scheme	**Pre-disaster value LKR Mn**	**Damaged**		**Total Value of damage no's LKR Mn**		**Damage level %**		**Value of no. of structures damaged LKR Mn**		**Total value of damage LKR Mn**
		Partial	**Fully**	**Partial**	**Fully**	**Partial**	**Fully**	**Partial**	**Fully**	
				1x2	1x3			4x6	5x7	8+9
Minor Tank 1	50	2	1	100	50	40	100	40	50	90
Minor Tank 2	60	2		120	-	10		12	-	12
Minor Tank 3	75	-	1		75		100		75	75
Minor Tank 4	40	1		40		10		4		4
Medium Tank 1	200	1		200		5		10		10
Medium Tank 2	350	1		350		5		17		17
Major Tank 1	450	1		450		3		13.5		13.5
Sub Total										221.5

D. Flood Protection Schemes

District	Polonnaruwa/Lankapura									
Flood protection Bund										
Scheme	1	2	3	4	5	6	7	8	9	
	Pre-disaster value of Bund LKRMn	Damaged no		Total Value of damage no's LKR Mn		Damage level %		Value of no. of structures damaged LKRs Mn		Total value of damage LKR Mn
		Partial	Fully	Partial	Fully	Partial	Fully	Partial	Fully	
				1x2	1x3			4x6	5x7	8+9
Minor Tank 1	300	1		300		30		90	50	140
Minor Tank 2	400	1		400		10		10		10
Minor Tank 3										
Minor Tank 4	160		1		160		100		160	160
Medium Tank 1										
Medium Tank 2										
Major Tank 1										
Sub Total										310

E. Salt water Exclusion Schemes

District	Polonnaruwa/Lankapura									
Salt water Exclusion Schemes										
Scheme	1	2	3	4	5	6	7	8	9	
	Pre-disaster value of Scheme LKR. Mn	Damaged No		Total Value of damage No of LKR. Mn		Damage level %		Value of no of structures damaged LKR. Mn		Total value of damage LKR. Mn
		Partial	Fully	Partial	Fully	Partial	Fully	Partial	Fully	
				1x2	1x3			4x6	5x7	8+9
Minor Tank 1	1300	1		1300		30		39		39
Minor Tank 2										
Minor Tank 3		-								
Minor Tank 4	1600	1		1600		20		32		32
Medium Tank 1										
Medium Tank 2										
Major Tank 1										
Sub Total										71

F. Service Roads

District	Polonnaruwa/Lankapura									
	Service Roads									
Scheme	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	
	Pre-disaster value of Road/ Km LKR. Mn	**Damaged Km**		**Total Value of damage sections LKR Mn**		**Damage level %**		**Value of damaged Road sections LKR. Mn**		**Total value of damaged Roads LKR Mn**
		Partial	**Fully**	**Partial**	**Fully**	**Partial**	**Fully**	**Partial**	**Fully**	
				1x2	1x3			4x6	5x7	8+9
Minor Tank 1	4	8		32		30		9.6		39
Minor Tank 2	4	6	1	24	4	30	100	7.2	4	11.2
Minor Tank 3	4	7	1	29	4	40	100	11.6	4	15.6
Minor Tank 4	4	5	2	20	8	20	100	4	8	12
Medium Tank 1	4	2		8		10		0.8		0.8
Medium Tank 2	4	1		4		10		0.4		0.4
Major Tank 1	4	1		4		5		0.2		0.2
Sub Total		30	4							79.2

G. Road Culverts

District	Polonnaruwa/Lankapura									
	Road Culverts									
Scheme	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	
	Pre-disaster value of construc-tion LKR. Mn	**Damaged No**		**Total Value of damage culvertsLKR Mn**		**Damage level %**		**Value of damaged culverts LKRMn**		**Total value of damaged Culvert LKRMn**
		Partial	**Fully**	**Partial**	**Fully**	**Partial**	**Fully**	**Partial**	**Fully**	
				1x2	1x3			4x6	5x7	8+9
Minor Tank 1	1	3		3		20		9.6		39
Minor Tank 2	1	2		2		30	100	6	4	11.2
Minor Tank 3	1.5	1		1.5		30	100	0.45	4	15.6
Minor Tank 4	1.5	2	2		3		100		3	12
Medium Tank 1	2	1		2		10		0.2		0.8
Medium Tank 2	2	1		2		10		0.2		0.4
Major Tank 1	5									
Sub Total		10	2							79

H. Quarters of Irrigation Workers

District	Polonnaruwa/Lankapura									
Quarters of Irrigation Workers										
Scheme	1	2	3	4	5	6	7	8	9	
	Pre-disaster value of construc-tion LKR Mn	Damaged No		Total Value of damage buildings LKR Mn		Damage level %		Value of damaged Buildings LKR Mn		Total value of damaged Buildings LKR Mn
		Partial	Fully	Partial	Fully	Partial	Fully	Partial	Fully	
				1x2	1x3			4x6	5x7	8+9
Minor Tank 1	1.5	3		4.5		20		0.9		0.9
Minor Tank 2	1.5	2		3		60		1.8		1.8
Minor Tank 3	1.5	3	1	4.5	1.5	60	100	2.7	1.5	4.2
Minor Tank 4	1.5	3	2	4.5	3	20	100	0.9	3	3.9
Medium Tank 1	1.5	2		3		20		0.6		0.6
Medium Tank 2	1.5	1	1	1.5	1.5	20	100	0.3	1.5	1.8
Major Tank 1	1.5	1		1.5		5		0.075		0.075
Sub Total		15	4							13.275

I. Higher Operational Cost

Scheme	Higher Operating Costs LKRMn	Unexpected Expenses LKRMn
Minor Tank 1	3	1
Minor Tank 2	4	2
Minor Tank 3	7	1
Minor Tank 4	10	3
Medium Tank 1	2	1
Medium Tank 2	5	2
Major Tank 1	10	2
Flood Bund 1	3	1
Flood Bund 2	4	1
Flood Bund 3	7	2
SWE Scheme 1	3	1
SWE Scheme 2	4	1
Total	62	18

J. Social and Environmental losses

Scheme	Affected Farmer Families	Degradation of Forestry/Wetland (Ha) (Environment)
Minor Tank 1	10	0.3
Minor Tank 2	20	-
Minor Tank 3	10	0.2
Minor Tank 4	30	1
Medium Tank 1	10	0.5
Medium Tank 2	20	0.6
Major Tank 1	30	1
Flood Bund 1	10	1
Flood Bund 2	10	2
Flood Bund 3	20	3
SWE Scheme 1		
Sub Total	170	9.3

MODULE 4: DEVELOPMENT OF RECOVERY STRATEGY BASED ON POST DISASTER NEED ASSESSMENT

5.5.0 Structure of the Module

5.5.1 Introduction

Following the damages, losses, and needs of the PDNA report, a recovery strategy for the particular disaster could be formulated. The Strategy identifies recovery priorities, such as a cost structure and stakeholders, and suggests a timeframe for recovery. The Recovery Strategy would need to be followed through with a detailed recovery framework that comprises information on the policy and institutional arrangements, financial mechanisms, monitoring, and evaluation systems for recovery in the irrigation sector.

The primary objective of recovery is to enable all institutions responsible for the irrigation sector to improve their overall damages and losses quickly, ensuring the well-being of people who depend on the irrigation sector, including social and cultural aspects as well.

5.5.2 Objectives of Recovery Strategy

- The Recovery Strategy aims to accomplish the following key objectives:
- Mobilize all stakeholders towards a common purpose in the irrigation sector.
- Facilitate inter-institutional coordination within the irrigation sector and between institutions outside but linked to the irrigation sector.
- Identify priorities based on the PDNA assessment results.
- Establish a timeframe for recovery actions.
- Establish the guiding principles of good practice.
- Promote an equity-based, participatory, and inclusive recovery process.
- Address the fundamentals for reducing risks and building back better.
- Provide an estimate of the cost of recovery.
- Provide the basis for a recovery framework that will lead to a detailed implementation plan, including specific objectives, sectoral projects, and partners, among others.
- Serve as a tool for resource mobilization with donors, including donor conferences.

5.5.3 Elements of the Recovery Strategy

The Recovery Strategy for the irrigation sector needs to be closely linked to national coordination and planning for human and economic development; hence, the goals of the recovery process are aligned with the overall development plan for the country.

Element	Description
Recovery needs	Outline of recovery needs for each of the components of disaster effect and disaster impact • For reconstruction of physical assets • To restore service delivery and access to goods & services • To restore governance and decision-making processes
Vision & guiding principles	Overall vision for recovery and agreed guiding principles
Intended sectoral results	Outline of aggregated sector results specifically • Priority Needs and Intervention • Recovery Costs • Expected Outputs • Intended Outcomes
Implementation arrangements	Broad sectoral implementation strategy in terms of • Partnerships coordination and management • Cross-cutting themes • Links to development • Resource mobilization • Key assumptions and constraints

5.5.3.1 Recovery Needs

The Consolidation and Analysis of Data

In order to design the Recovery Strategy, the quantitative data obtained from the PDNA assessment of disaster effects and disaster impact needs to be consolidated and presented in a manner that provides a comprehensive picture of all parts of the irrigation sector and areas affected, as examples of needs for major irrigation, provincial irrigation, minor irrigation, Mahaweli scheme, etc.

The assessment results need to be presented by separately representing irrigation sector institutions and geographic areas to facilitate a comparative analysis and prioritization with regard to the most critical needs identified in the disaster effects analysis.

Recovery needs are calculated on the basis of the PDNA results for disaster effects and impacts. Recovery needs are determined for four components relevant to the irrigation sector:

- The reconstruction of damaged infrastructure and physical assets
- The resumption of production, service delivery, and access to goods and services
- The restoration of governance and decision-making processes
- The reduction of risks

Components of Recovery need could be identified as follows:

Element	Description
Reconstruction of infrastructure and physical assets	The financial requirements (or needs) for reconstruction after disasters are calculated on the basis of quantitative estimations of the destruction of physical assets that need to be rebuilt and restored to pre-disaster levels. In other words, reconstruction needs are defined on the basis of the estimated values of damage derived during the assessment. The destroyed assets may be owned by private or public-sector entities. Damage figures are then supplemented by the additional needs involved in the "building back better" concept. Therefore, reconstruction needs are calculated as: **Value of Damage + Cost of Quality Improvement +Technological Modernization + Relocation, when needed +Disaster Risk Reduction Features + Multi-Annual Inflation** (This may be dealt with on a case-by-case basis, though.)

Resumption of Production, Service Delivery and Access to Goods and Services	Resuming production of goods includes achieving the same level of output as prior to the disaster and adding costs to improve production. Restoring service delivery aims to improve the availability and quality of basic services to their pre-disaster level or better. This complements the rebuilding of physical assets described above under “reconstruction”. It includes the human resources and expertise required to ensure adequate service delivery, as well as supplies, information systems, or technology, as well as the need to re-adapt service delivery programs. The resumption of access aims to restore access to services and goods that fulfill the basic needs of individuals, families, and communities, such as access to markets, employment, water points, health care, food, schools, religious and cultural centers, etc. These needs consist of both the additional costs for disaster-affected populations to access goods and services as well as the additional costs for service providers as a result of the disaster. **These costs for the resumption of services are calculated as follows:** • the additional costs to service providers to restore basic services; • Costs to provide Build Back Better (BBB) and equitable and affordable services to vulnerable groups and affected populations to access services;
Restoration of Governance and Decision Making Processes	Restoration of governance and social processes aims to revitalize and improve formal and informal institutions and policies, public administration, and governance functions that are essential for livelihood restoration, basic service delivery, and community and cultural life. It refers to the need for restoring or strengthening the capacity of sector authorities to lead and manage the recovery process, including decentralized local capacities, human resources, information systems, capacity-building training, etc. **The costs for the restoration of governance and social processes are calculated as follows:** • Costs for additional human resources with improved technical skills and the capacities of service providers to undertake the recovery; • Costs for replacing lost records and upgrading documents for the various public services; • Costs for addressing governance and social cohesion issues if disrupted

Reducing Risks	In addition to the estimation of the need to build back better in the reconstruction of physical infrastructure (described in the point above under the title reconstruction), the cost of integrating risk reduction measures is also estimated for the following: • To address immediate risks, • Initiatives to reduce risks and vulnerabilities to future disasters, such as safer infrastructure with considerations of spatial, territorial, or land-use planning, hazard and risk maps, technical expertise, technologies, and practices that build resilience; • Preparedness capacities of the various sectors to manage the impact of future disasters; • Provide equitable and affordable services to vulnerable groups; • Initiatives to promote the resilience of individuals and communities **The additional costs of Building Back Better (BBB), reducing risks, and increasing preparedness are calculated as follows:** • Costs for addressing immediate risks; • Costs for upgrading preparedness measures in each sector; • Costs for further studies or assessments, technologies and practices, technical expertise, etc. required to facilitate implementation of building back better approaches; • Cost for specific measures to strengthen disaster risk reduction

5.5.3.2 The Guiding Principles for post disaster recovery.

Guiding principles for recovery are established to enhance the effectiveness of recovery, increase transparency and accountability among the various actors, and promote coordination among stakeholders.

- Prioritize the concerns and needs of the marginalized, most vulnerable, and most affected.
- Restore capacities and capabilities.
- Rebuild people's livelihoods.
- Support spontaneous recovery processes.
- Support local networks and volunteerism.
- Ensure equity and accessibility and promote gender equality in decision-making, service delivery, and recovery.
- Be inclusive, conflict-sensitive, and participatory, and consult equally with women and men of all ages in order to understand and consider their distinct experiences of the disaster, as well as their specific needs and priorities for reconstruction and recovery.

- Secure development gains
- Reduce disaster risk.
- Engage the civil society and private sector.
- Encourage self-sufficiency.
- Maximize resource utilization, including the use of local resources in recovery.
- Be transparent in all actions, including the flow of funding and other resources, and be accountable.
- Implement subsidiarity and decentralization.
- Ensure strong coordination.
- Establish partnerships with local institutions aimed at gaining efficiency and effectiveness.
- Strengthen community capacity to participate in irrigation management.
- Adopt a comprehensive approach aligned with SDG principles.
- Protect and further strengthen environmental assets, etc.

5.5.3.3 Sector recovery need prioritization

- The most urgent needs expressed by the damage are:
- sequence of needs, from the short-term to the medium and long-term;
- restoring pre-disaster levels, followed by improvements;
- Actions that can yield early results effectively
- Comparative advantages;
- Opportunities for greater impact;
- Institutional and technical capacity;
- Geographic areas with urgent needs;
- Current or near-future milestones (e.g., elections);
- Addressing key obstacles associated with sectors
- Recovery initiatives that contribute to peace where relevant

For estimating recovery and reconstruction needs, costs can be calculated using either the unit cost of replacement or management costs. Unit cost is the established cost of an item or service based on the standard of approved rates in the country or an agreed schedule of costs used by the irrigation sector agencies. There would also be a standard increase in the unit cost to allow for build-back or risk reduction measures. The following considerations should be made in estimating costs for building back better:

- The costs for BBB should be proportionate to the costs of recovery and reconstruction needs as well as the type of disaster (a slow-onset drought may have very low reconstruction needs but a high need to invest in resilience or BBB).
- The costs for BBB should be realistic compared to the financial envelope pledged by the government and international development partners, considering that most funds will be needed for physical reconstruction and compensation for losses.
- The costs for BBB should be realistic based on the absorption capacity of the country and what is feasible to achieve over a period of 3 years.

Priority Needs, Interventions or inputs required, Expected Outputs, Recovery Costs, and intended outcomes could be presented as follows:

Priority Needs	Interventions /Inputs Required	Expected Outputs	Recovery Costs	intended outcome
Repair and rebuild damaged canals	Construction materials, labour	….km length of canal repaired	150 Mn LKR	Yield of paddy will be enhanced

Use the case study to complete the above table.

5.5.3.4 Sector Implementation Arrangements

The Recovery Strategy includes a description of the implementation arrangements, particularly in terms of the following key elements:

- Partnerships, coordination, and management
- Cross-cutting themes;
- Links to development
- Resource mobilization;
- Key assumptions and constraints

5.5.4 Formulation of Recover Strategy

The Recovery Strategy forms part of the PDNA and constitutes its main goal.
The steps to developing the Recovery Strategy are as follows:

- Define the vision for recovery and the strategy for recovery actions within each sector and affected region;
- Define clear objectives and interventions that point the way to expected results and help in defining the timeframe;
- Define the cost of the recovery process;
- Conduct Stakeholder consultations with national and regional governments, affected communities, civil society agencies, and private sector partners to present the Recovery Strategy and validate the priorities and needs of the recovery and reconstruction roadmap.

The Core elements of the recovery strategy could be summarized as follows:

Recovery Needs	Vision & Guiding Principles	Recovery Plan	Implementation Arrangements
Outline of recovery needs based on results of the PDNA: • For reconstruction of physical assets and compensation of economic loss; • To restore service delivery and access to goods & services; • To restore governance and social processes; • To reduce risks and build back better	The agreed vision aligned with ational development goals and guiding principles for the overall recovery process	Outline of results-based recovery plan: • Priority needs; • Interventions required; • Expected outputs; • Recovery Costs; • Intended outcomes.	Outline of the arrangements for successful implementation of the Recovery Roadmap: • Partnerships, coordination and management; • Cross-cutting themes; • Links to development; • Resource mobilization; • Key assumptions and constraints.

5.5.5 Resource Mobilization and Financial Management for Recovery

In the Recovery Framework, the recovery financing component addresses mechanisms for mobilizing, spending, and reporting on the use of recovery funds.

The responsibility for issues related to recovery finance rests with several agencies, especially the Ministry of Finance, Planning, Government Treasury, provincial governments, donors, and the private sector, including banks and insurance providers.

Each disaster's financial strategy is unique, but the options for financing disaster recovery are predictable. If a government can establish a recovery financing policy and put financial arrangements in place before a disaster as part of a Recovery Framework, it will accelerate post-disaster implementation.

Disasters not only put financing demands on governments to cover reconstruction costs, but they may also simultaneously reduce Gross domestic Product (GDP) as they have a high impact on agriculture and inland fisheries.

Public financial management (PFM) comprises all activities for managing a government's financial affairs, including:

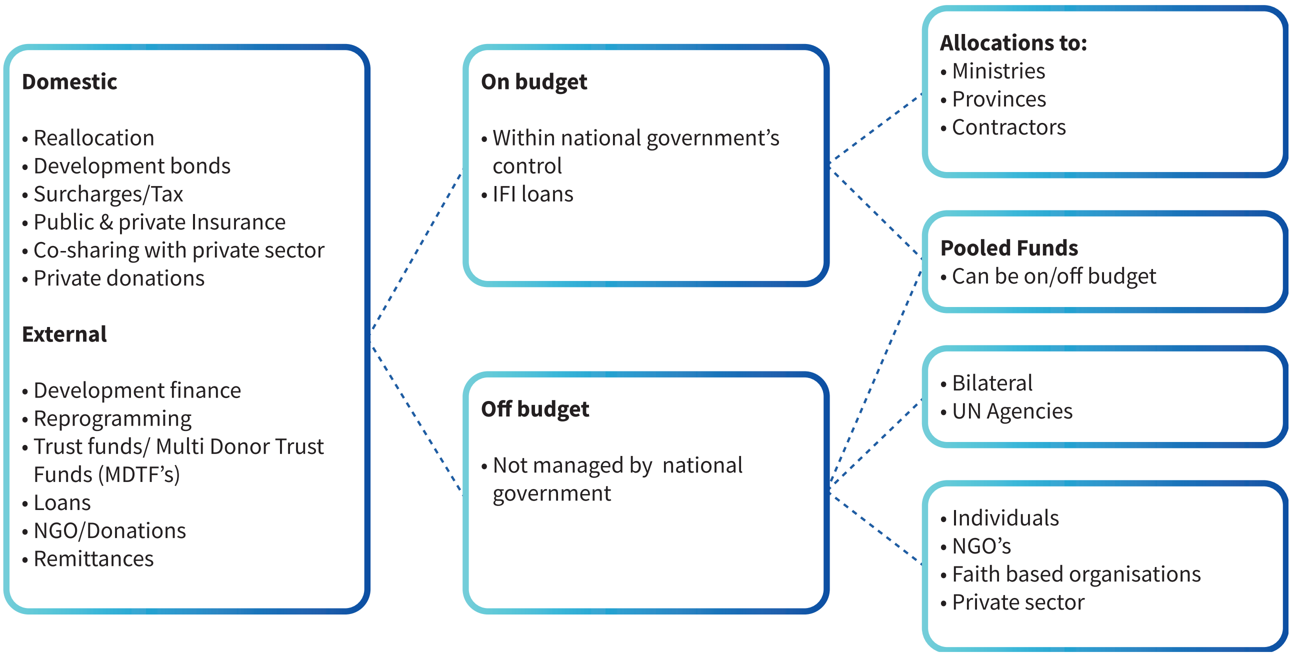
- Financial planning;
- Budget preparation and approval;
- Mobilizing and managing cash (treasury);
- Accounting and Financial reporting
- Procurement;

5.5.5.1 Domestic resources generated by disaster-affected governments;

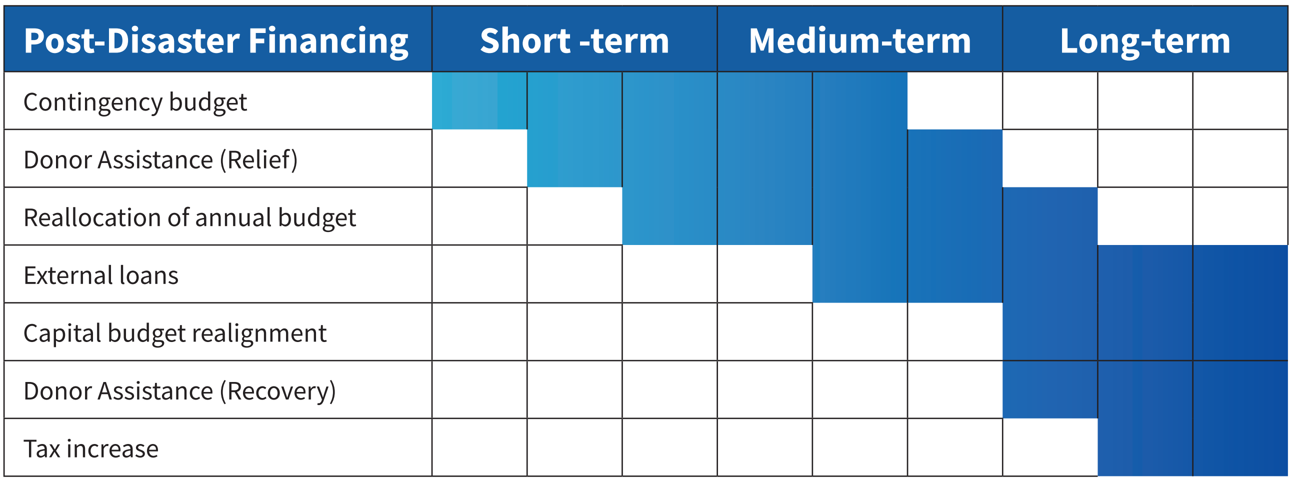
- Reallocation among the budget items from "less" to "more" disaster-hit sectors It is important that governments adopt a legal framework on reallocation possibilities before a disaster strikes to allow for flexible reallocation when a disaster strikes.
- Issuing sovereign reconstruction or development bonds.
- levying a tax or surcharge for recovery.
- Introducing policy incentives for the private sector to share recovery costs
- Voluntary civil society and private philanthropies' contributions.

Reconstruction and recovery add demands on financial management systems due to time pressure, an expanded flow of financial transactions, and the need for closer tracking and more rapid reporting.

Global View of Post Disaster Financing



Timeframe for Allocated Resources



Source : Adapted from ASEAN, "Advancing Disaster Risk Financing and Insuarance in ASEAN Member states : Freamework and Options for Implementation." Association od South Asian Nations, Jakartha, 2012.

5.5.6 Implementation, Coordination, Communications and Monitoring for Recovery

Recovery is evaluated based on a number of variables. These include timeliness, transparency, efficiency, and equity.

Institutional frameworks highlighted the need to define the roles, responsibilities, and functions of irrigation sector agencies and staff in recovery. For implementing recovery activities, it is important that staff have the knowledge, capacities, and expertise to implement the recovery program.

In addition, standard operating procedures (SOPs), manuals, and guides on recovery project operations can help with implementing recovery projects in the irrigation sector. Government focal points identified before a disaster should be aware of such guidance and how to implement it, which will enhance implementation.

The ultimate measure of a good recovery program is one where risk reduction has been integrated so that there is increased capacity to deal with future disasters and reduced vulnerability to irrigation infrastructure.

5.5.6.1 Monitoring Recovery

Monitoring is the process by which stakeholders obtain regular feedback on the progress being made towards achieving goals and objectives. This means that monitoring is concerned with tracking not only projects and the use of resources but also whether progress is being made towards accomplishing the desired results.

Monitoring recovery requires the following:

- Decide what to monitor and how to measure results.
- Develop indicators and targets.

5.5.7 Recovery Strategy Report

Executive Summery

Recovery Vision

This section presents the recovery vision and expected outcome for the sector. This should be based on the country's existing sector development plan, aligning, where possible, recovery objectives with existing national development plans and strategies.

Guiding Principles

Reconstruction and Recovery needs including Build Back Better

This section defines the needs for reconstruction and recovery, distinguishing the needs to restore and resume to pre-disaster levels from the needs that will improve access to services and goods, catalyze the economy, build livelihoods, strengthen the DRM of the government and communities, and reduce risks and vulnerabilities to future disasters. All BBB interventions linked to the four headings contribute to the resilience of governments, systems, and communities.

Duration	Short -term	Medium-term	Long-term
By Region	To repair / rebuild damaged infrastructure and physical assets Restore to pre-disaster level, BBB for reconstruction of infrastructure and physical assets		
	Service delivery and production, and access to services and goods Restore service delivery and production capacity, and ensure access to services and goods BBB needs for service delivery and production of goods, and access to services and goods		
	Governance BBB needs for governance and DRM		
	Risks To mitigate risks and vulnerabilities to future disasters		

1. Integrated Results Framework for Disaster Recovery Planning

Results	Outputs
Preparing Prior to a Disaster	
Develop Pre-Disaster Capacity to Implement Post-Disaster Needs Assessments	Identification of a standard assessment tool to be used in case of a disaster
	Pre-designation of the institution(s) responsible for maintaining PDNA preparedness and conducting the assessments
Prepare Recovery Frameworks Prior to a Disaster to Improve Resilience	Government establishes clear roles and responsibilities for all actors in a recovery setting. Stakeholders include national and local governments, private sector, academia, and civil society organizations (CSOs), and communities
	National and decentralized multi-sectoral action plans are set to improve the institutional and legislative recovery arrangements in advance of disasters
Establish Predictable Financing	Activate special procedures for fast-track project procurement and implementation
	Establishment of draft agreements with potential donor governments and setting up mechanisms to receive and manage future contributions
	Establishment of an aid-tracking mechanism that enables the lead agency to manage, disburse, and account for funds with local implementers.
Conducting Post-Disaster Damage and Needs Assessment	
Broad and Consistent Policy Framework for Recovery Planning through the PDNA	Preliminary assessment reports Compilation and transmittal of damage and loss data to a centralized management unit
	Credible Disaster damage and needs assessment Quantitative and qualitative baseline for damage, loss, and needs across sectors and administrative divisions Results monitoring and evaluation plan for recovery program
Planning and Policymaking for Recovery	
Develop a Central Vision for Recovery Acceptable to all Stakeholders	Articulation of a recovery vision Setting up community meetings to build consensus for the recovery vision
	Working out the sectorial, geographic, and functional details of recovery

Ensure Continuity from the Humanitarian Response to Recovery	Adoption of the cluster approach for managing work in the different sectors impacted by the disaster.
	Maintenance of institutional knowledge from humanitarian response to recovery
Develop a Centrally and Programmatic Overseen Approach to Recovery	Establishment of a central meeting point for large scale recovery
	Adopt the 3 crucial principles for recovery planning • Converting adversity into opportunity • Building Back Better • Prioritizing the inclusiveness of vulnerable groups
	Determination of criteria for inter-sectoral prioritization to help ensure equitable and demand-responsive recovery across affected jurisdictions and communities.
	Sequencing of recovery activities according to the agreed order of prioritization
Develop Sector-Specific Recovery Programs	Consultative process and review of information from assessments and surveys to plan individual sector projects.
	Development of detailed sector-specific programs reviewed by affected communities
Institutional Arrangements for Recovery	
Continuity between Relief and Recovery	Maintenance of institutional knowledge from humanitarian response to recovery
Assessment of Human Resource Capacity and Specialist Skills Required	Appropriate capacity assessments are conducted
Mandate and Operational Modalities for Lead Recovery Agency	The most relevant institutional framework is chosen and developed to be central body behind which donors and partners align financing and efforts
An Empowered Recovery Institution with Effective Leadership	Choosing the appropriate leader for an empowered recovery institution
Institutions with Clear Purpose and Jurisdiction	Appropriate attention is given to all lost/damaged assets; focus is kept on recovery
Ensuring Adequate Human Resources throughout Recovery Process	Employ necessary professional and technical human resources

Recovery Program That Integrates Civil Society and Private Sector Participation	Mechanisms to include civil society, private sector, and expert associations in recovery
Decentralized Implementation Guided by Centrally Established Policy and Coordination	Clear structures for setting recovery policy and implementation
Well-Managed Integration of International Agencies and Development Partners	Institutionalizing role of international agencies and development partners; establishment of donor coordination forums
Financing Mechanisms for Recovery	
Quickly Quantify the Economic Costs of the Disaster	Undertake a PDNA to quantify the economic costs and as a basis for resource mobilization
Identify and Mobilize sources of Financing	Depending on the scale of the disaster and the capacity of a national economy, the government may either rely largely on national resources, or appeal to external sources for funding
Adequate Financing for Recovery	Revised budgetary allocations focusing initially on post-disaster response and later on recovery
Functioning Financial Systems for Recovery	Financial system endorsed by the highest political level able to absorb inflows.
Strengthened Public Financial Management	Policy that strengthens and establishes effective modalities in PFM.
Adequate Monitoring & Evaluation	Model to manage resources coming from bilateral and multilateral donors.
	Establish procedures for sharing assessment data with implementing agencies. Identify means for monitoring and auditing transfers and use of funds.
	Financial oversight mechanisms that enhance the confidence that recovery funds are being spent for the intended purposes.
Financing Mechanisms for Recovery	
Set-up Monitoring and Evaluation Systems	• Conduct of a readiness assessment • Agreement on outcomes to monitor and evaluate • Selection of key indicators to monitor outcomes • Identification of baseline data on indicators • Planning for improvements: selection of results targets • Monitoring of results • Conduct of evaluations

	• Report on the findings • Use of the findings
Establishment of feedback and complaint handling mechanisms	Evaluation framework established early in recovery process, allowing for mid-course corrections and early partner buy-in
Reconstruction standards applied to relevant projects	Standards are defined by local stakeholders from both the government and civil society, including NGOs and the private sector
A local Implementation Process	Community-owned projects that meet real needs
Fast, Efficient, and Transparent Procurement	Faster procurement with more reliable contractors
Effective Internal Communication Between Recovery Partners	Information easily shared between sectors and ministries
	Ongoing consultations between central government and communities
Effective Public Communication	Public communication campaign enables all actors to be aware of changes in the recovery program.
	Communicate clear and realistic goals for recovery, minimizing unrealistic expectations
Transparency Resulting in Confidence Among all Recovery Stakeholders	More reliable results information available. Partners work together to produce information and analyze results.

Form No1. Summary of effects and Impact of disaster on irrigation schemes

Description of infrastructure	Value of damages LKR. MN						
	Minor 1	Minor 2	Minor 3	Minor 4	Medium 1	Medium 2	Major
Infrastructure - Bunds, spillways, Ripraps, canal system	201.7	171.4	432.4	432.8	99.5	13.8	107.8
Flood protection schemes	14.0	10.0	-	160.0			
Salt water Exclusion schemes	39.0			32.0			
Service Roads and Culverts	10.2	21.2	20.5	15.0	1.0	0.6	0.2
Irrigation worker quarters	0.9	1.8	4.2	3.9	0.6	1.8	0.08
Total Damages	265.8	203.4	456.1	642.7	101.1	16.2	108.08
Description of losses							
Environmental degradation	3	-	2	1.0	0.5	0.6	1.0
Higher operation costs	4	6	8	13	3	7	12
Expenditure of temporary protection measures, opening service route for transport, are consider as losses.							

Damages and losses calculated based on data and information given in the case study.

TRAINING COURSE ON DISASTER RECOVERY PLANNING FOR IRRIGATION SECTOR

Case Study for – Post Disaster Need Assessment (PDNA) Disaster Recovery Framework- Irrigation Sector

The "Lankapura" District is located in the Mahaweli River Basin. The agricultural activities of the Mahaweli Authority and Irrigation Department primarily support the residents of Lankapura. The Department of Census and Statistics reports that 65% of the population is Sinhala, 20% is Tamil, and 10% is Muslim. Agriculture (rice and vegetables) and livestock (cattle, goats, poultry, etc.) support 75% of the population. The "Samurdhi" social assistance network assists 70% of the population that lives below the poverty line. The majority of downstream canal reservations have been encroached upon and converted to agricultural and residential use, according to a recent catchment-wide hydrological study. In addition, the study reveals that fifty percent of the district is susceptible to inundation if the flood gates of the upstream reservoirs owned by the Mahaweli Authority and Irrigation Department are left open for longer than four hours.

In 2011, during the North East Monsoon, the Meteorological Department predicted significant rainfall exceeding 200 millimeters per day in a number of districts in the Eastern and North-Central provinces, as a result of a low depression in the Bay of Bengal. Consequently, the Disaster Management Center has organized a national and district-level monsoon preparedness meeting with the participation of all parties responsible for disaster response and has taken collaborative initiatives at all levels of preparedness for response and recovery, leaving no one behind. The Irrigation Department and Mahaweli Authority of Sri Lanka have decentralized authority to engineers in charge of irrigation schemes and reservoirs for decision-making on tank and reservoir water management and coordinating irrigation sector recovery efforts in the event of a disaster caused by natural hazard.

Under the Community awareness of catastrophe, all communities have been prepared for a response, and farmer organizations have been notified to be prepared to immediately implement any recovery measures. In response to information released by the Meteorological Department, the Irrigation Department, and the Disaster Management Center, the government has issued a Treasury Circular mandating the use of existing project funds to address essential recovery needs until additional funds become available if a predicted disaster occurs.

The Bay of Bengal depression and the North-East monsoon brought torrential rainfall to the Eastern and North-Central regions of the country, resulting in a continuous flooding of water in all tanks and reservoirs along the Mahaweli river in the Eastern and North-Central provinces. Ten days of precipitation have exceeded three times the average annual precipitation over the previous decade as shown in the following table 1

Table 1 Rainfall during Jan and Feb in 2011

Rainfall in mm		
District	**January 1^{st} to 20^{th}**	**February 1^{st} – 20^{th}**
Ampara	481.3	228.0
Anuradhapura	285.3	199.5
Badulla	347.1	199.5
Batticaloa	1195.5	443.0
Kurunegala	115.0	465.8
Maha Illuppallama	230.4	126.8
Mihintale	293.1	178.6
Polonnaruwa/ (Lankapura)	**-**	**440.2**
Pottuvil	256.9	217.6
Trincomalee	443.1	496.1
Vavuniya	286.9	588.8

The Director Generals of the Irrigation Department and the Mahaweli Authority of Sri Lanka have canceled the leave of all technical and field staff and made them aware of the impending situation in response to the adverse weather. The Mahaweli Authority and the Irrigation Departments were in charge of the water management of the tanks, but as all the tanks were overflowing and all gates were open, the water management was beyond their control. As a result, water sources downstream were also flooded.

Following the Standing Operation Procedures (SOP) of their respective tanks and reservoirs, Mahaweli Authority and Irrigation Department tank/reservoirs in charge officials opened all gates within the catchment in response to the high rainfall reports. Due to heavy rainfall and the large volumes of water released from reservoirs/tanks, over topping of embankments, heavy runoff, and prolonged inundation of canals and farmlands have caused severe damage to irrigation and flood control infrastructure, as well as deposition of silt and debris in paddy fields. The most typical kinds of damage include:

- scouring of embankments of several major reservoirs;
- scouring and breaching of the embankments of several village tanks;
- damages to diversion weirs/anicuts;
- erosion and washing away of canals and canal embankments, drainage canals and canal structures;
- and damage to farm access roads within the irrigation schemes.

Farmer organization of few schemes reported that the service roads connecting the village with the nearest town was washed away from two places and need to repair immediately.

Paddy and other field commodities (OFC) were in the harvesting phase at the time of the flood. Re-cultivation was therefore impossible. A partially damaged distributary canal system (including field canals and canal structures) decimated paddy and other field crops. Almost ten percent of the partially damaged homes (2,500 in total) belonged to farmer families from the irrigation schemes.

Immediately after the floods, respective officials assessed damages and identified immediate response and recovery needs. Sand bags were kept ready to attend to immediate recovery needs. The farmer organization reported that some paddy lands were covered with debris and needed to be cleaned before next cultivation began. Temporarily repairing damaged service canals, were identified as an early recovery needs. At the coordinating meeting chaired by the District Secretary (DS), it was informed that the treasury has issued a Treasury Circular authorizing the use of available project funds to attend to the early recovery needs of the Irrigation Department and Mahaweli Authority. DS highlighted the need to give priority to women-headed farmer families in the early recovery program. Farmer organizations express their willingness to engage in cash-for-work activities launched by the World Food Programme to expedite early recovery actions.

Damage caused by the extreme weather event was so severe that more than 1.2 million people were affected, covering the entire Eastern and north-central Province districts of the country. Damage in all areas (social, infrastructure, productive, finance, cross-cutting, etc.) is so severe that it goes beyond the national capacity level of the country.

DMC has discussed this with the National Planning Department, and at the ministry level, the Ministry of Disaster Management and the Ministry of Finance have decided to conduct a post-disaster need assessment and thereby plan for recovery in a sustainable way. DMC has organized all the preliminary activities and coordinated with the UNDP, WB, ADB and European Union to established committees to conduct the PDNA in collaboration with sectoral agencies. Director General Irrigation has appointed Regional Engineers to coordinate and lead the irrigation sector team and assist in preparing recovery plan for the Irrigation Department.

Lists of damaged Irrigation schemes, distribution canals were prepared by Irrigation Engineers in charge of the scheme are given below Table 2.

Table 2 List of Damages Irrigation schemes

No	District	No of schemes damages
1	Ampara	5
2	Anuradhapura	36
3	Badulla	10
4	Batticaloa	8
5	Kandy	5
6	Kegalle	1
7	Mannar	3
8	Matale	7
9	Nuwaraeliya	3
10	Kurunegala	5
11	Hambantota	9
12	Moneragala	10
13	Polonnaruwa/Lankapura	16
14	Putalam	6
15	Trincomalee	9
16	Vavuniya	3

It was reported that a portion of the headwork and canal system of a medium irrigation tank were breached and several structural elements of irrigation schemes have been damaged as a result of this. The following table 3 summarize the damage recorded by field staff soon following floods:

Table 2: List of Damages Irrigation schemes

Item	Type of infrastructure affected by floods	No of affected	Level of damage	
			Partially	Fully
1	Minor Irrigation Tanks No	4	3	1
2	Medium tanks No.	2	2	
3	Major tank No.	1	1	
4	Canal system including structures km	73	63	10
5	Service Roads, KM	34	30	04
6	Culverts Nos.	12	10	2
7	Canal spillways, including structures No	8	6	2
8	Flood protection bunds km	3	2	1
9	Salt water exclusion scheme Nos	2	2	
10	Family quarters of irrigation workers. No	12	8	2
11	Paddy land contaminated with silt and debris ha	19	15	4
12	Environment within the irrigation systems were damaged with silt deposits, vegetation damage, and polluting wetlands.	12	12	

Table 4: Assessment of Damaged Infrastructure due to floods Polonnaruwa/ Lankapura District

A- Head works Bund, Spillways and Rip Rap

Scheme	Tank Bund			Spillway			Rip Rap		
	Pre-disaster value	% Damage	Damage	Pre-disaster value	% Damage	Damage	Pre-disaster value	% Damage	Damage
	Rs Mn		Rs Mn	Rs Mn		Rs Mn	Rs Mn		Rs Mn
Minor Tank 1	125	30%	37.5	30	5%	1.5	10	20%	2
Minor Tank 2	225	35%	78.5	40	10%	4	15	35%	5.25
Minor Tank 3	300	70%	210	80	25%	20	20	30%	6
Minor Tank 4	225	100%	225	110	100%	110	60	100%	60
Medium Tank 1	400	20%	80	75	10%	7.5	40	5%	2
Medium Tank 2	600	5%	30	150	5%	7.5	110	3%	3.3
Major Tank 1	900	10%	90	200	5%	10	130	6%	7.8
Sub Total									

B. Canal system

District	Polonnaruwa/Lankapura									
	Canal system									
Scheme	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	
	Pre-disaster value Rs Mn/KM	**Damage KM**		**Value of section damage Rs mn**		**Damage level %**		**Value of damages**		**Total damage**
		Partial	**Fully**	**Partial**	**Fully**	**Partial**	**Fully**	**Partial**	**Fully**	**Rs mn**
				1x2	1x3			4x6	5x7	8+9
Minor Tank 1	11.5	30	6	345	69	40	100	138	69	207
Minor Tank 2	11.5	12	2	138	23	30	100	41.4	30	71.7
Minor Tank 3	11.5	8	1	92	11.5	20	100	18.4	20	38.4
Minor Tank 4	11.5	6	1	69	11.5	20	100	13.8	20	33.8
Medium Tank 1	40	4	-	-						
Medium Tank 2	40	3	-							
Major Tank 1	60	-	-							
Sub Total	Sub Total	63	10							

C. Canal Structures

District	Polonnaruwa/Lankapura									
Canal structures										
Scheme	1	2	3	4	5	6	7	8	9	
	Pre disaster value Rs. mn	Damaged no		Total Value of damage nos Rs mn		Damage level %		Value of no. of structures damaged Rs mn		Total value of damage
		Partial	Fully	Partial	Fully	Partial	Fully	Partial	Fully	Rs mn
				1 x2	1x3			4x6	5x7	8+9
Minor Tank 1	50	2	1	100	50	40	100	40	50	90
Minor Tank 2	60	2		120	-	10		12	-	12
Minor Tank 3	75	-	1		75		100		75	75
Minor Tank 4	40	1		40		10		4		4
Medium Tank 1	200	1		200		05		10		10
Medium Tank 2	350	1		350		05		17		17
Major Tank 1	450	1		450		03		13.5		13.5
Sub Total										

D. Flood Protection Schemes

District	Polonnaruwa/Lankapura									
Flood protection Bund										
Scheme	1	2	3	4	5	6	7	8	9	
	Pre disaster value of Bund Rs. mn	Damaged no		Total Value of damage nos Rs mn		Damage level %		Value of no. of structures damaged Rs mn		Total value of damage Rs mn
		Partial	Fully	Partial	Fully	Partial	Fully	Partial	Fully	
				1 x2	1x3			4x6	5x7	8+9
Minor Tank 1	300	1		300		30		90	50	140
Minor Tank 2	400	1		400		10		10	-	10
Minor Tank 3		-								
Minor Tank 4	160		1		160		100		160	160
Medium Tank 1										
Medium Tank 2										
Major Tank 1										
Sub Total										

E. Salt water Exclusion Schemes

District	Polonnaruwa/Lankapura									
Salt Water Exclusion Schemes										
Scheme	1	2	3	4	5	6	7	8	9	
	Pre disaster value of Scheme Rs. mn	Damaged no		Total Value of damage nos Rs mn		Damage level %		Value of no. of structures damaged Rs mn		Total value of damage
		Partial	Fully	Partial	Fully	Partial	Fully	Partial	Fully	Rs mn
				1x2	1x3			4x6	5x7	8+9
Minor Tank 1	1300	1		1300		30		39		39
Minor Tank 2										
Minor Tank 3		-								
Minor Tank 4	1600	1		1600		20		32		32
Medium Tank 1										
Medium Tank 2										
Major Tank 1										
Sub Total										

F. Service Roads

District	Polonnaruwa/Lankapura									
Service Roads										
Scheme	1	2	3	4	5	6	7	8	9	
	Pre disaster value of Road/ Km Rs. mn	Damaged Km		Total Value of damage sections Rs mn		Damage level %		Value of damaged Road sections Rs mn		Total value of damaged Roads Rs mn
		Partial	Fully	Partial	Fully	Partial	Fully	Partial	Fully	
				1x2	1x3			4x6	5x7	8+9
Minor Tank 1	4.0	8		32		30		9.6		9.6
Minor Tank 2	4.0	6	1	24	4	30	100	7.2	4	11.2
Minor Tank 3	4.0	7	1	29	4	40	100	11.6	4	15.6
Minor Tank 4	4.0	5	2	20	8	20	100	4.0	8	12
Medium Tank 1	4.0	2		8		10		0.8		0.8
Medium Tank 2	4.0	1		4		10		0.4		0.4
Major Tank 1	4.0	1		4		05		0.2		0.2
Sub Total		30	4							

G. Road Culverts

District	Polonnaruwa/Lankapura									
Road Culverts										
Scheme	1	2	3	4	5	6	7	8	9	
	Pre disaster value of construction Rs. mn	Damaged no		Total Value of damage culverts Rs mn		Damage level %		Value of damaged culverts Rs mn		Total value of damaged culverts
		Partial	Fully	Partial	Fully	Partial	Fully	Partial	Fully	Rs mn
				1x2	1x3			4x6	5x7	8+9
Minor Tank 1	1.0	3		3.0		20		0.6		0.6
Minor Tank 2	1.0	2		2.0		30		0.0		10.0
Minor Tank 3	1.5	1		1.5		30		0.45		4.45
Minor Tank 4	1.5	2	2		3.0		100		3.0	3.0
Medium Tank 1	2.0	1		2		10		0.2		0.2
Medium Tank 2	2.0	1		2		10		0.2		0.2
Major Tank 1	5.0									
Sub Total		10	2							

H. Quarters of Irrigation Workers

District	Polonnaruwa/Lankapura									
Quarters of Irrigation Worker's										
Scheme	1	2	3	4	5	6	7	8	9	
	Pre disaster value of construction Rs. mn	Damaged no		Total Value of damage buildings Rs mn		Damage level %		Value of damaged Buildings Rs mn		Total value of damaged buildings Rs mn
		Partial	Fully	Partial	Fully	Partial	Fully	Partial	Fully	
				1x2	1x3			4x6	5x7	8+9
Minor Tank 1	1.5	3		4.5		20		0.9		0.9
Minor Tank 2	1.5	2		3.0		60		1.8		1.8
Minor Tank 3	1.5	3	1	4.5	1.5	60	100	2.7	1.5	4.2
Minor Tank 4	1.5	3	2	4.5	3.0	20	100	0.9	3.0	3.9
Medium Tank 1	1.5	2		3.0		20		0.6		0.6
Medium Tank 2	1.5	1	1	1.5	1.5	20	100	0.3	1.5	1.8
Major Tank 1	1.5	1		1.5		5		0.075		0.075
Sub Total		15	4							

I. Social Environmental Losses

Scheme	Affected Farmer Families	Degradation of Forestry/Wetland (Ha) (Environment)
Minor Tank 1	10	0.3
Minor Tank 2	20	-
Minor Tank 3	30	0.2
Minor Tank 4	60	1
Medium Tank 1	40	0.5
Medium Tank 2	20	0.6
Major Tank 1	30	1
Flood Bund 1	10	1
Flood Bund 2	10	2
Flood Bund 3	20	3
SWE Scheme 1	-	-
Sub Total		

J. Higher Operational Cost

Scheme	Higher Operating Costs (Rs.mn)	Unexpected Expenses (Rs.mn)
Minor Tank 1	3	1
Minor Tank 2	4	2
Minor Tank 3	7	1
Minor Tank 4	10	3
Medium Tank 1	2	1
Medium Tank 2	5	2
Major Tank 1	10	2
Flood Bund 1	3	1
Flood Bund 2	4	1
Flood Bund 3	7	2
SWE Scheme 1	3	1
SWE Scheme 2	4	1

Note: Pre-disaster value of construction of the damage properties need to be collected from relevant technical agency.

Under above situation;

1. Explain whole process of PDNA as a flow chart.
2. Describe the link between Disaster Management Cycle and PDNA concept
3. Who are the international agencies closely working with PDNA process and why their assistance required to commence the PDNA process
4. How PDNA help in post disaster recovery
5. List out 5 guiding principles of PDNA and briefly explain.
6. Explain How to collect the Damage data and how you are going to compare the post disaster situation with pre disaster situation
7. Identified the required data for damage and loss assessment including demographic and social data as well
8. Explain mechanism to fill the data gaps
9. Identified possible damages and losses separately to irrigation sector
10. How to calculate the damages and losses? (Sample data given in table A-J could be used to calculate damages and losses)
11. List out impact of floods on irrigation system, elements that could be damaged, losses incurred by the Irrigation sector and increase vulnerability due to floods.
12. What is social ad microeconomic impacts of floods in affected areas?
13. Draft PDNA report considering the need for recovery.

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