# Standardization of Loss and Damage datasets on BIPAD

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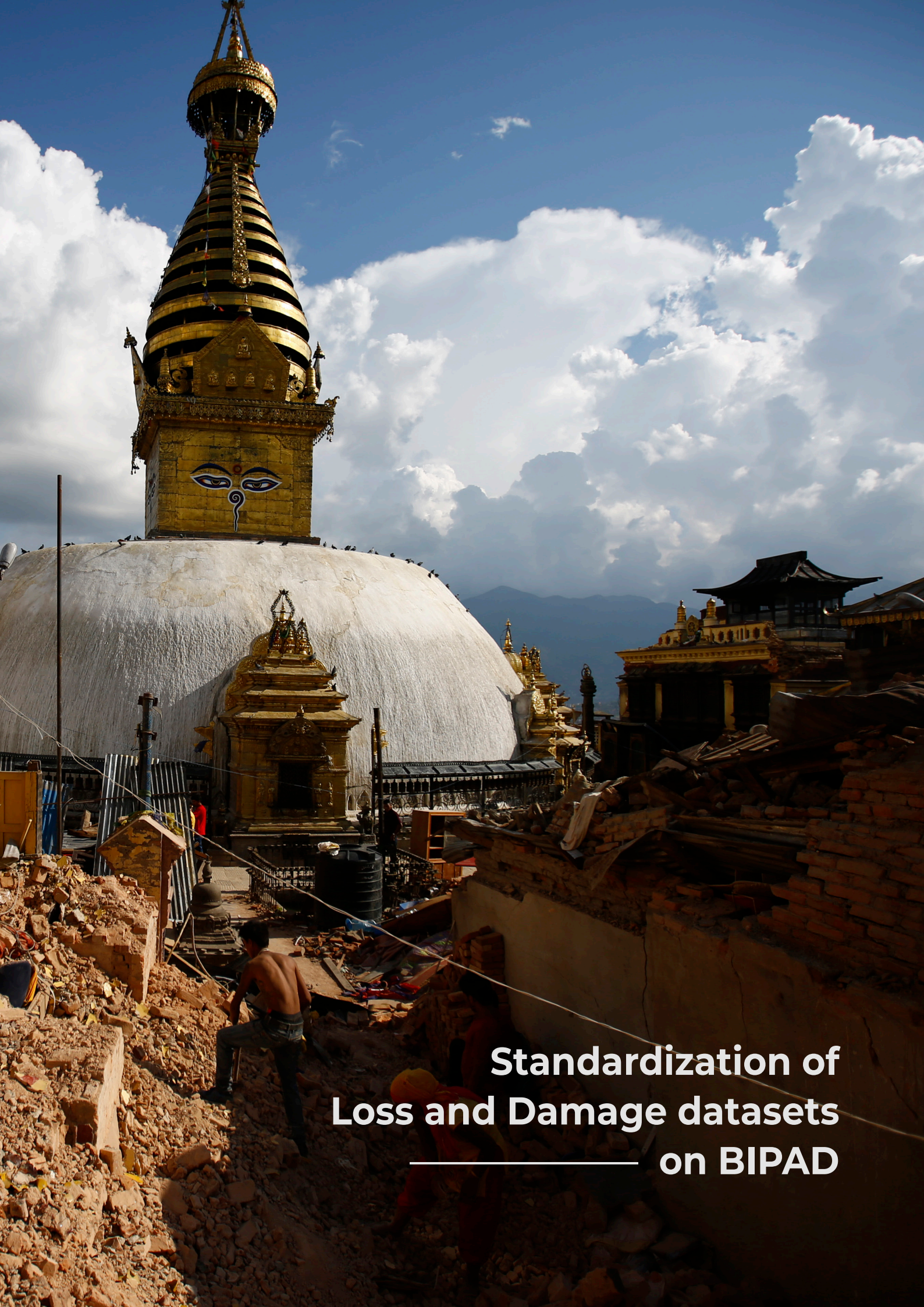8 PUBLICATIONS   5 CITATIONS

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# Standardization of
# Loss and Damage datasets
# on BIPAD

# Contents

# List of Tables

# List of Figures

# List of Abbreviations

| | |
|---|---|
| BIPAD | Building Information Platform Against Disaster |
| DaLA | Damage, Loss, and Needs Assessment |
| EU | European Union |
| GDP | Gross Domestic Product |
| IRA | Initial Rapid Assessment |
| IRDR | Integrated Research on Disaster Risk |
| NEOC | National Emergency Operation Center |
| OIEWG | Open-ended Intergovernmental Expert Working Group |
| PDNA | Post Disaster Needs Assessment |
| SFDRR | Sendai Framework for Disaster Risk Reduction |
| UNFCCC | United Nations Framework Convention on Climate Change |

# Executive Summary

Hazards like flood, earthquake, landslide, thunderbolt, snake bite, and fire cause numerous deaths and losses every year. According to the National Disaster Report 2019, disasters have resulted in hundreds of death and economic losses in billions of rupees in Nepal in the year 2017 and 2018 alone. Recurrent disasters like fire, landslides, thunderbolt, flood, heavy rainfall, and windstorms were recorded during the same period.

Building Information Platform Against Disaster (BIPAD) is a disaster information management system, built upon the concept of creating a national portal embedded with independent platforms for national, provincial, and municipal governments with a bottom-up approach of disaster data partnership. BIPAD has a 'Damage and Loss' module that has the records of the economic losses and damage to physical assets.

The research focuses on understanding methods to strengthen loss and damage data of the 'Damage and Loss' module in BIPAD. The standardization of loss and damage datasets will help improve the comparability of existing loss databases and reduce uncertainty in the estimates.

This research explores the importance of the loss and damage data in understanding the consequences of a disaster and in decision-making. It highlights the importance of the loss and damage data in helping the federal government understand the trend and patterns and assist to accordingly devise nation wise safety protocols, update existing standards, codes, guidelines, and acts. Similarly, it will help the province and local government prepare disaster risk reduction and management action plans.

The learnings from the international framework that is relevant to Nepal have been highlighted and eight major gaps in the loss and damage datasets in BIPAD have been outlined: i. Lack of well-defined terminologies for indicators, ii. Missing critical indicators, iii. Lack of systematic tools for data collection, iv. Missing metadata, v. Data inconsistency, vi. Misinterpretation of data vii. Missing historical data, and viii. Issues in data visualization.

The following recommendations are suggested to be followed and adopted in BIPAD to standardize the loss and damage datasets.

1.   Well defined terminologies for the loss and damage indicators used and the availability of information on such terminologies in BIPAD for the users.
2.   Addition of some missing key indicators in BIPAD.
3.   Defining systematic data collection and recording methodology.
4.   Incorporating the missing historical data.
5.   Better data visualizations in BIPAD.
6.   Ensure data consistency and reliability.
7.   Development of mobile app and capacity building of Nepal police staff for better data collection and recording.
8.   Use of BIPAD as a reporting tool for Sendai Framework Targets.

# 01

## INTRODUCTION

# Introduction

According to the World Disaster Report 2018[1], the largest proportion (40.6%) of the 3,751 disasters in the years 2008-2017(recorded by EM-DAT[2]) have taken place in Asia – the world's most densely populated region and one that has experienced 69.5% of the last decade's earthquakes, 69% of landslides, 43.7% of storms and 41.1% of floods. The World Disaster Report 2018 mentions that in the last few decades, floods and storms have been the primary type of disasters caused by natural hazards around the world – though even more people were affected by droughts and extreme temperatures. Asia also has by far the largest share of affected people and the largest share of estimated damages. From the year 2005-2015, a total of 481 events–were reported[3] in South Asia claiming around 135,000 lives, causing heavy economic losses for developing South Asian economies. The South Asian Disaster Report 2015[4] states that in the year 2015, the region accounted for 64 percent of total global fatalities that included 52 disasters and the loss of 14,647 lives — over 60% of those lives being lost in a single event – the 7.6 magnitude earthquake that devastated Nepal in April.

In Nepal, hazards such as flood, earthquake, landslide, thunderbolt, snake bite, and fire cause numerous deaths and losses every year. According to the Nepal Disaster Report 2019[5], a total of 6381 incidents have caused 968 deaths and Rs. 6.84 billion in economic loss in 2017 and 2018 in Nepal. Recurrent disasters like fire, landslide, thunderbolt, flood, heavy rainfall, and windstorms were recorded. Fire is the leading disaster incident in terms of the number of occurrences, but thunderbolts, landslides, and floods claimed more lives, comparatively.

The loss and damage data are important in understanding the consequences of a disaster. The loss and damage datasets, along with spatial, demographic, and socio-economic datasets, will help the federal government to formulate and implement the time-bound action plans at the provincial and local level. It will also help the federal government establish a special fund and monitoring mechanism for disaster risk reduction and management activities. The loss and damage datasets will help set the budget for improving the current condition of the critical infrastructure as per the loss and damage incurred. Similarly, it will help the province and local government prepare disaster risk reduction and management action plans. In this way, the disaster loss and damage data help to effectively understand the trends or patterns of the disasters and its impacts over time and supports in evidence-based decision-making and policy formulation for disaster risk reduction. However, disaster loss and damage data are not harmonized, and there is a lack of guidelines and implementation of standards for loss data collection and recording in Nepal. This in turn has hampered the data quality, reliability, and consistency of loss databases.

The Government of Nepal (GoN), with the technical support from Youth Innovation Lab (YI-Lab), has built a disaster information management system named as Building Information Platform Against Disaster (BIPAD)[6]. It is built upon the concept of creating a national portal embedded with independent platforms for national, provincial, and municipal governments with a bottom-up approach of disaster data partnership. BIPAD has a 'Damage and Loss' module that has the record of the

[1]IFRC (2018). World Disaster Report: Leaving No One Behind 2018.
[2]EM-DAT: The OFDA/CRED International Disaster Database. https://www.emdat.be/
[3]South Asian Disaster Report (2016). Are we building back better? Lessons from South Asia.
[4]South Asian Disaster Report (2016). Are we building back better? Lessons from South Asia.
[5]Ministry of Home Affairs (2019). Nepal Disaster Report 2019.
[6]www.bipad.gov.np

economic losses and damage to physical assets. At present, the terminologies for defining the indicators for the loss and damage data are missing in both the frontend and backend of BIPAD. Also, some critical indicators on loss and damage datasets are missing. It is also important to have a standard methodology of data collection and record for data accuracy and reliability.

Hence, this research focuses on establishing the methodologies for standardizing loss and damage data in BIPAD. This will improve the comparability of existing loss databases and reduce uncertainty in the estimates and impacts. The research has been conducted whilst working around the following questions:

1.  What are Loss and Damage as per UNFCCC[7]/ SFDRR[8] and other international frameworks?
2.  Why the standardization of loss and damage datasets are important?
3.  What constitutes in 'Loss and Damage' in the global context, regional context, and in the context of Nepal?
4.  Analyzing the global, regional and national context, what are the appropriate indicators of 'Loss and Damage' on BIPAD?
5.  What are the current issues/ challenges on the 'Damage and Loss' module of BIPAD?

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[7]*United Nations (2015). Paris Agreement.*
[8]*United Nations (2015). Sendai Framework Disaster Risk Reduction 2015 – 2030.*

# 02

## IMPORTANCE OF LOSS AND DAMAGE DATASETS IN DISASTER MANAGEMENT

# Importance of loss and damage datasets in disaster management

**2.1. What is loss and damage?** According to the World Bank report9, the terms loss and damage are not interchangeable. Damage refers to the total or partial destruction of physical assets existing in an affected area. Damages are measured first in physical units (such as numbers or square meters of housing destroyed, or kilometers of roads), and then in monetary terms, expressed as replacement costs according to prices prevailing just before the event. Loss refers to the changes in economic flows arising from a disaster. These changes in economic flow will continue until the achievement of full economic recovery is attained. For instance, after a disaster, there could be a decline in agriculture output, lower revenues and higher operational costs in health services provision, or losses in trade from damaged commercial facilities and it will take a certain amount of time to go back to the normal situation. All of these changes, expressed in current monetary values, constitute the losses from the disaster.

Another way of differentiating the loss and damage can be in terms of quantification10. Generally, loss is quantifiable. For example, in terms of economic loss or the number of deaths. However, damage is defined as a qualitative aspect of the negative impacts of a disaster.

Similarly, based on the recommendations of the open-ended intergovernmental expert working group, the term "loss" is expressed as a result of a disaster, which may be in the form of human, material, economic and environmental losses. It states that the potential losses are often difficult to quantify. And, damage is defined as the total or partial destruction of physical assets, the disruption of basic services, and sources of livelihood in the affected area. 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.).

Similarly, from a climate change perspective, Action Aid[11] report states that loss and damage refer to effects that would not have happened in a world without climate change, which have not been mitigated, and which cannot be (or have not been) adapted to.

There is no official UNFCCC[12,13] definition for "Loss and Damage". There are, however, some aspects of Loss and Damage that has been relatively widely accepted. Loss and Damage refer to the actual and/or potential manifestation of climate impacts that negatively affect human and natural systems. The losses include both the economic losses and non-economic losses. The economic losses are the loss of physical assets such as infrastructures and income such as tourism and agriculture production. Non-economic losses refer to the losses to items not commonly traded in the market such as human mobility, cultural heritage, and biodiversity.

Even though the description of loss and damage slightly varies with one another, it can be summarized that the loss and damage are the results of disasters or climate change that has an impact on physical assets, infrastructures, livelihoods, economy, individuals, society, and the environment.

A clear definition of the terms "loss" and "damage" cannot be found for Nepal. The National Policy for Disaster Risk Reduction[14] has mentioned losses as losses in lives, livelihoods and health, economy, social and physical infrastructure, cultural and environmental assets of persons, communities, and the nation, while the term "damage" is described in the context of the destruction of means of livelihood and physical infrastructures.

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[9]International Bank for Reconstruction and Development / The World Bank (2013). Building Resilience, Integrating Climate and Disaster Risk into Development.
[10]GFDRR (2014). Understanding risk in an evolving world. Emerging Best Practices in Natural Disaster Risk Assessment.
[11]Action Aid (2010). Loss and damage from climate change: The cost for poor people in developing countries.
[12]UN (2015). Paris Agreement.
[13]UNFCCC (2013). Non-economic losses in the context of the work programme on loss and damage.
[14]MoHA (2018). National Policy for Disaster Risk Reduction 2018.

## 2.2. What are the commonly used indicators for loss and damage?

Disaster events result in human, economic, and environmental losses every year all around the world. Understanding and estimating the losses and damages caused by a disaster is a complex but essential process. The effective collection and recording of loss and damage data will aid in mitigating the effects of future disasters.

Indicators are the tools to monitor changes in the status of the factors relevant to disaster risk reduction. These indicators help monitor progress towards a reduced disaster risk. Indicators are primarily a management tool – they provide a means for measuring what is happening against what has been planned for or hoped for. They offer insight into the effectiveness of a policy or program, in terms of quality, quantity and timeliness, and any unintended consequences.

When choosing sets of indicators, it is very important to select a limited number of indicators that focus on the most essential aspects of the matter at hand and that can be readily implemented and sustained over many years.

An important foundational capacity for every country is its database on losses and impacts of disasters. This requires the systematic assembling of data on past and ongoing disaster events, with each event having records of dates, location, deaths, economic losses, number of people affected, etc., and a suitable archiving system to maintain the records and allow easy access.

**SFDRR:** Indicators for loss and damage data help keep records for future monitoring and making decisions on disaster-related issues. The Sendai Framework for Disaster Risk Reduction 2015-2030 has seven global targets. There are indicators that help monitor and report the achievement of the targets of the Sendai Framework for Disaster Risk Reduction. Out of the seven targets, the targets A-D, are directly related to the losses and damages caused by a disaster. Target A focuses on reducing mortality, target B on reducing the number of affected people, target C focuses on reducing the economic loss and target D on the reduction of the disaster damage to critical infrastructures and basic services interrupted.

The technical Guidance for Monitoring and Reporting on Progress in Achieving the Global Targets of the Sendai Framework for Disaster Risk Reduction[15] has outlined the minimum requirements for data, indicators and methodologies to monitor the targets. The indicators for monitoring the Sendai Framework Targets are:

| Indicator Number | Description |
|---|---|
| A-1 | Number of deaths and missing persons |
| A-2 | Number of deaths |
| A-3 | Number of missing persons |
| B-1 | Number of directly affected people |
| B-2 | Number of injured or ill people |
| B-3 | Number of people whose damaged dwellings were attributed to disasters |
| B-4 | Number of people whose destroyed dwellings were attributed to disasters |
| B-5 | Number of people whose livelihoods were disrupted or destroyed |
| C-1 | Direct economic loss attributed to disasters in relation to global gross domestic product |
| C-2 | Direct agricultural loss attributed to disasters |
| C-3 | Direct economic loss to all other damaged or destroyed productive assets attributed to disasters |
| C-4 | Direct economic loss in the housing sector attributed to disasters |
| C-5 | Direct economic loss resulting from damaged or destroyed critical infrastructure attributed to disasters |
| C-6 | Direct economic loss to cultural heritage damaged or destroyed attributed to disasters |
| D-1 | Damage to critical infrastructure attributed to disasters |
| D-2 | The number of destroyed or damaged health facilities attributed to disasters |
| D-3 | The number of destroyed or damaged educational facilities attributed to disasters |
| D-4 | Number of other destroyed or damaged critical infrastructure units and facilities attributed to disasters |
| D-5 | Number of disruptions to basic services attributed to disasters |
| D-6 | Number of disruptions to educational services attributed to disasters |
| D-7 | Number of disruptions to health services attributed to disasters |
| D-8 | Number of disruptions to other basic services attributed to disasters |

*Table 1 List of Indicators used to monitor the Targets A-D of the Sendai Framework*

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[15]UNDRR (2017). Technical Guidance for Monitoring and Reporting on Progress in Achieving the Global Targets of the Sendai Framework for Disaster Risk Reduction.

The SFDRR also recommend disaggregation of loss and damage data based on hazard, geography, sex, age, disability, and income.

Both SFDRR and EU guidelines[16] have emphasized that the dataset should include metadata for monitoring the targets of disaster risk reduction. Metadata such as demographics, socio-economic parameters and source of the data, entry date, author, validation status, uncertainty in data, and other data, not directly related to the loss data should be recorded.

While the disaggregation of data and metadata complement the loss and damage data, it is also equally important to record the causes of the losses and damages resulting from a hazard. For example, a person could die from drowning during a flood hazard or sometimes by the collapse of a building during the same flood hazard.

**UNFCCC:** The UNFCCC[17] has classified losses relating to climate change into economic and non-economic losses. Economic losses can be understood as the loss of resources, goods, and services that are commonly traded in markets. As such, economic losses should be recorded by and manifest in the system of national accounts (although they may not be in countries with large informal economies). Market prices can be used to value economic losses. Non-economic losses can be understood as the remainder of items that are not economic items; that is to say that non-economic items are those that are not commonly traded in markets. The absence of a market price is one of the main reasons why assessing non-economic losses is challenging. However, their effect on human welfare is no less important. The types of economic and non-economic losses are described through Table 2. The UNFCCC has not defined indicators to measure loss and damage yet. Global Stocktake (GST) mentioned in Article 14 of the Paris Agreement, serves as a crucial review exercise to periodically assess collective progress toward the Agreement's long-term goals, enhance implementation of the Agreement and scale ambition. The comprehensive and exhaustive list of indicators defined in the GST[18] offers useful parameters against which information should be

collected and measured in view of the long-term goals. The GST mentions that the successful implementation of adaptation actions would result in lower losses and damages. The GST has proposed the following indicators for assessing and measuring the efforts to reduce the climate-related loss and damage:

- Estimated loss of economic assets and human lives in different temperature scenarios
- Vulnerability index
- Kinds and extend of safety nets available for farmers
- The level of coverage of agricultural insurance to farmers
- Type and extent of risk reduction measures
- Extent of disaster risk management institutions

Parties first need to agree on the list of broad indicators proposed by the GST so that their work is streamlined and channelized in collecting and submitting information for the GST process.

| Economic loss | Loss of physical assets | Business |
| | | Agricultural production |
| | | Tourism |
| | Loss of physical assets | Property |
| | | Infrastructure |
| Non-economic loss | Individuals | Life |
| | | Health |
| | | Human mobility |
| | Society | Territory |
| | | Cultural heritage |
| | | Indigenous knowledge |
| | | Societal/cultural identity |
| | Environment | Biodiversity |
| | | Ecosystem services |

*Table 2 Summary of types of economic and non-economic losses defined in UNFCCC*

[16]*European Union (2015). Guidance for recording and sharing disaster loss data.*
[17]*UNFCCC (2015). Non-economic losses in the context of the work programme on loss and damage.*
[18]*Centre for Science and Environment. Global Stocktake under the Paris Agreement (An equity-based approach)*

| Sendai Indicators | UNFCCC parameters of losses |
|---|---|
| A1 - Number of deaths and missing | Life lost |
| B1 - Number of people affected | Health |
| C1 - Economic loss | Loss of income and economic loss due to loss of physical asset |
| D1 - Damage to critical infrastructure | Loss of physical asset (infrastructure and property) |

*Table 3 Common indicators in the Sendai Framework and UNFCCC parameters of losses*

**Common indicators in SFDRR and UNFCCC:** Although the UNFCCC has not defined indicators for loss and damage datasets, the various types of losses that are to be recorded and monitored are compared with the indicators of the SFDRR. The indicators for loss and damage defined by the Sendai Framework (listed in Table 1) and the types of losses mentioned in the UNFCCC (as listed in Table 2) are compared and the tentative common indicators are listed in Table 3. The loss and damage parameters such as life lost, health, loss of income and economic loss due to loss of physical asset and loss of physical assets such as infrastructure and property mentioned in the UNFCCC can be related to the Sendai Framework Target Indicators such as number of deaths and missing, number of people affected, economic losses, and damage to infrastructures respectively. However, the UNFCCC non-economic loss types such as loss of human mobility, territory, indigenous knowledge, biodiversity, and ecosystem services are difficult to measure and are also not addressed in the Sendai Framework Targets for measuring loss and damages.

## 2.3 Importance of loss and damage datasets in disaster management

- Loss and damage datasets help better understand the impacts of disasters, loss trends, and spatial patterns.
- Loss inventories establish a historical baseline for monitoring the level of impact on a community or country. They make it possible to quantify the impact of individual hazards so that communities can focus on disaster risk reduction efforts on frequently occurring hazards rather than the last disaster.
- Loss and damage datasets assist decision-makers in identifying critical hazard events and help take necessary actions for response and increase preparedness in similar hazards.
- They also help the government as well as humanitarian aid agencies to prioritize the area of work.
- They also help monitor and achieve the targets of the SFDRR.

# 03

## THE USEFULNESS OF LOSS AND DAMAGE DATASETS FOR DECISION-MAKERS

# The usefulness of loss and damage datasets for decision-makers

One of the guiding principles of the Disaster Risk Reduction, National Strategic Plan of Action (2018 – 2030)[19] of Nepal is that the disaster risk reduction and management work will be pursued in participation and cooperation of the Federal, Provincial and Local-level authorities, stakeholder organizations and communities, private sectors and international organizations. Also, Schedule 7 of the Constitution of Nepal 2015 has enlisted natural and non-natural disaster preparedness, rescue, relief, and rehabilitation activities in the concurrent powers of federal and provincial governments. Similarly, Schedule 8 has enlisted disaster management as the sole responsibility of the local government and Schedule 9 has included it in concurrent powers of Federal, Provincial, and Local governments.

The loss and damage dataset, along with other relevant datasets such as spatial, demographic, and socio-economic datasets, will help the federal government to formulate and implement the time-bound action plans at provincial and local level. It will help the federal government establish a special fund and monitoring mechanism for disaster risk reduction and management. It will also help set the budget for improving the current condition of the critical infrastructure as per the loss and damage incurred. Similarly, it will help the federal government to understand the trend and patterns and assist accordingly to devise nation wise safety protocols, update existing standards, codes, guidelines, and acts. At the province and local level, the loss and damage dataset will be useful in preparing disaster risk reduction and management action plans.

In addition to the above, the loss and damage dataset can help to identify the sectors for the capacity building programs after recognizing the governance capacity in disaster risk reduction at the federal, provincial, and local levels. It will help to identify the frequent as well as the most destructive hazard at the local level and prepare a response plan as well as improve preparedness in the future. It will help reduce losses and damages in the future by developing a community based early warning system for each hazard at the local level.

Hence, as loss and damage datasets are important to each sphere of the government, the standardization of loss and damage datasets should be a burning priority. The standardization of the datasets will eventually help better the disaster risk reduction and management approaches on a long run.

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[19]MoHA (2018), Disaster Risk Reduction National Strategic Plan of Action 2018 – 2030.

# 04

## CURRENT SCENARIO AND GAPS IN LOSS AND DAMAGE DATASETS OF BIPAD

# Current scenario and Gaps in loss and damage datasets of BIPAD

**4.1. Current scenario of BIPAD:** The BIPAD system has six modules: Dashboard, Incident, Real-time, Profile, and Risk Info, including the 'Damage and Loss' module.

At present, the information on the 'Damage and Loss' module is extracted from the DRR portal[20]. First, the Nepal police report the details of the incident to NEOC, NEOC then updates the information into the DRR portal and the information on the DRR portal is linked to the BIPAD platform. The information on loss and damage is displayed in the form of maps, charts, and in tabular form. In the compare mode, a user can make comparisons between any two Province, District or Municipality based on overall disaster data.

At present, Nepal police can also record the loss data directly in the BIPAD system in the following categories: people loss, family loss, infrastructure loss, livestock loss, and agricultural loss. Only the officials with the authority to edit the incident reporting form can edit the loss data and the verifier (at present, officials from NEOC) can only access the form and can comment if the data is incorrect or incomplete and verify the data if there are no discrepancies. Forms to add losses are available only after all incident details are saved. In the people loss, the information is further disaggregated into age, gender, poverty line, disability, and nationality. The family loss form helps to insert information of families when individual detail is not available. The infrastructure loss has disaggregated the information based on the type of infrastructure such as a house, educational facilities, road,

electricity, sewerage, business, telecommunication, water supply, irrigation, health facilities, transportation facilities, cultural heritage, tools and equipment. The economic loss on infrastructure is calculated summing the economic loss due to equipment in the infrastructure damaged and the economic loss due to damaged/destroyed infrastructure itself. The agriculture and livestock loss forms help record the loss incurred in the respective fields. The information is disaggregated into their respective types. Also, the total estimated loss can be inserted in the loss form. However, at present, the information entered in this platform is not available to other end-users in the 'Damage and Loss' module in BIPAD. This section in the backend has not been used to the full extent as of now and the data displayed in the front end of BIPAD is the data fetched from the DRR portal.

The Nepal police also has a separate data collection template[21] to collect the information on losses and damages caused by a disaster. This form is designed to record the casualty statistics, displaced family, affected livelihood (agriculture, business, salary), direct economic loss (house, land, infrastructure property such as health center, school, industry, road, bridge, electricity, telecommunication, water supply, transportation, drainage, irrigation), damage to tools and equipment (agricultural tools, heavy equipment, and others), and damage to cultural heritage (movable and immovable). This template has been adopted in the loss data entry system of BIPAD.

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[20]http://drrportal.gov.np/
[21]https://bit.ly/32cBlQu

## 4.2. Gaps in loss and damage datasets of BIPAD:

Through the research work carried out, key issues and gaps in BIPAD have been identified and are listed below:

**Lack of well-defined terminologies for indicators:** In the current version of BIPAD, the information on the terminologies associated with each category of loss data is not included in the loss data entry form (Figure 1 and Figure 2), and also cannot be found in the frontend by any user. This might lead to misinformation, which could eventually result in unsuitable actions for disaster management by the decision-makers. For example, a user adding data on infrastructure loss, is entering a data of a house damaged by a fire incident. The house is a masonry house (brick-walled) with timber framing on the ground floor. The user wants to know whether the damaged house should be included in either the wooden house or brick-walled house category. The information on what constitutes a brick-walled house or a wooden house is currently not available on the platform. Similarly, basic terminologies such as what constitutes house damaged, house destroyed, or services disrupted are missing. This could result in the entry of data into the wrong categories.

**Some critical indicators missing:** Indicators for loss and damage data help keep records for future monitoring and making decisions on disaster-related issues. At present, both the information extracted from the DRR portal and the data entry system for loss and damage in BIPAD (which is based on the Nepal police data collection template), have not included some critical datasets in the databases. Information on the number of people whose livelihood had been damaged/ destroyed is not available in the BIPAD system but is listed in the Nepal police data collection template. Similarly, one cannot find information on the number and type of services disrupted by a disaster event in both of the platforms.

The table 4 summarizes a list of indicators described in the SFDRR and the availability of data for those indicators in BIPAD. The table also lists the possible source to data collection for these missing indicators, if any.



*Figure 1 A screenshot of the people loss form in the BIPAD platform*



*Figure 2 A screenshot of the infrastructure type in the loss data entry form in BIPAD*

| Sendai Indicator Number | Sendai Indicator description | Availability in BIPAD | Possible source of data (if already collected by others) |
|---|---|---|---|
| A-1 | Number of deaths and missing persons | YES | - |
| A-2 | Number of deaths | YES | - |
| A-3 | Number of missing persons | YES | - |
| B-1 | Number of directly affected people | | |
| B-2 | Number of injured or ill people | YES | - |
| B-3 | Number of people whose damaged dwellings were attributed to disasters | NO | - |
| B-4 | Number of people whose destroyed dwellings were attributed to disasters | NO | - |
| B-5 | Number of people whose livelihoods were disrupted or destroyed | NO | - |
| C-1 | Direct economic loss attributed to disasters in relation to global gross domestic product | (Compound indicator) | - |
| C-2 | Direct agricultural loss attributed to disasters | NO | - |
| C-3 | Direct economic loss to all other damaged or destroyed productive assets attributed to disasters | NO | - |
| C-4 | Direct economic loss in the housing sector attributed to disasters | YES | - |
| C-5 | Direct economic loss resulting from damaged or destroyed critical infrastructure attributed to disasters | NO | - |
| C-6 | Direct economic loss to cultural heritage damaged or destroyed attributed to disasters | NO | - |
| D-1 | Damage to critical infrastructure attributed to disasters | Compound indicator | - |
| D-2 | The number of destroyed or damaged health facilities attributed to disasters | NO | IRA[22] |
| D-3 | The number of destroyed or damaged educational facilities attributed to disasters | NO | IRA |
| D-4 | Number of other destroyed or damaged critical infrastructure units and facilities attributed to disasters | NO | IRA |
| D-5 | Number of disruptions to basic services attributed to disasters | NO | IRA |
| D-6 | Number of disruptions to educational services attributed to disasters | NO | IRA |
| D-7 | Number of disruptions to health services attributed to disasters | NO | IRA |
| D-8 | Number of disruptions to other basic services attributed to disasters | NO | IRA |

*Table 4 Sendai Framework Targets indicators and the availability of data in Nepal*

The data collected/available in Nepal is compared only with Sendai Framework Targets as the UNFCCC has not defined indicators for monitoring adaptation of the Paris Agreement yet.

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[22]*Nepal Red Cross Society. Initial Rapid Assessment*

**Lack of systematic tools for data collection:** Although the BIPAD system and Nepal police data collection template have tried to standardize the data collection and recording tool, but both the platforms have not yet implemented the standardized tool to collect data in the field. Especially, sector-based economic losses are not collected, probably because of the lack of sector understanding and requirements. Sector governmental agencies such as the Department of Health, Department of Roads, and Department of Agriculture are currently not involved in data collection and reporting.

Thus, at present, the process of data collection is not systematized. This might lead to data inaccuracy, delay in data relay, and loss of reliability of the collected data.

**Metadata:** Metadata is a set of data that describes, provides context, and gives information about data. Metadata provides additional information about the number, list, type, and description of the elements. Although some metadata have already been included, some additional metadata are missing. They are listed in section 5.3.

**Data inconsistency:** While comparing the data available in Nepal Disaster Report 2019, DRR portal, and BIPAD, it was found that the data for loss and damage datasets were the same in Disaster Report 2019 and DRR portal for the year 2017 and 2018 but the data in BIPAD varied. The inconsistencies across these three platforms are summarized in Table 5. Some other inconsistencies encountered within BIPAD are presented in Table 6.

Such issues may result in loss of reliability of data and reduced trust in the information provided in the newer database, BIPAD. This may also cause a hindrance to the institutionalization of BIPAD in all three tiers of the government.

| SN | Comparison parameter | BIPAD | DRR portal | Nepal Disaster Report 2019 | Remarks |
|---|---|---|---|---|---|
| 1 | Total economic loss | Rs. 6,834,278,020 | Rs. 6,838,823,320 | Rs. 6,838,823,320 | Data in BIPAD not consistent with the other sources |
| 2 | Economic loss due to fire | Rs. 6,417,302,713 | Rs. 6,422,638,013 | - | Data in BIPAD not consistent with the other sources |
| 3 | Number of fire incidents | 3962 | 3973 | 3973 | Data in BIPAD not consistent with the other sources |

*Table 5 Comparison of data in BIPAD, DRR portal and Nepal Disaster Report 2019*

| S.No | List of inconsistencies |
|---|---|
| 1 | Repetition of the same incident two or more times in BIPAD, while it is listed only once in the DRR portal. This results in varying loss and damage data. |
| 2 | Inconsistency in the number of incidents in the 'Damage and Loss' module and 'incident' module for the same date range. |
| 3 | In some cases, the economic loss data available in DRR portal is missing in BIPAD |
| 4 | Incidents of drowning are available in BIPAD but not available in the DRR portal. This results in a higher number of incidents in BIPAD than in the DRR portal. |
| 5 | In some data, the total people count does not match with the sum of male, female, and unknown counts. |
| 6 | Some natural hazards like flash flood, hailstone are listed in the 'other non-natural hazard' category. |

*Table 6 List of data inconsistency issues in BIPAD*

**Misinterpretation of data:** At present, the economic loss data in BIPAD is taken from the DRR portal. The data in the DRR portal represents the total economic loss and is not subcategorized into losses from various sectors like agricultural loss, and infrastructure loss. However, in BIPAD, if we look into the tabular data, it shows that the total economic loss is, for instance, Rs. 100,000 and but economic losses due to agricultural loss and infrastructure loss is zero. This might confuse the end-user while interpreting the data. It is unclear what caused the total loss during the disaster event.

**Missing historical data:** The loss and damage data in BIPAD are extracted from the DRR portal. The DRR portal has datasets from the year 2011 onwards. The DesInventar database has Nepal's historical data of loss and damage from 1971 to 2013. At present, these data have not been imported to the BIPAD system. Such historical datasets will help understand the mostly low-frequency hazards of higher magnitude that have higher return periods.

**Issues in data visualization:** At present, the 'Damage and Loss' module in the BIPAD system has the interface shown in Figure 3. When data is presented in graphical format, if a user wants to visualize data, for instance from 1st June 2020 to 20th June 2020 (within a month's range), the visualization, which should have been a time series line graph for the number of incidents, economic loss, infrastructure destroyed, and livestock destroyed, is merely a point in the graph. This is because the visualization is available only for the accumulated monthly data.

Furthermore, the various information on each loss and damage indicators are available only in the tabular format but is not visualized in the charts and map. The inclusion of such information is needed for easier data visualization and understanding of the loss and damage datasets.

Also, sector-wise information is not available for users in the frontend. For instance, if a user wants to study the number of schools destroyed by a particular hazard, such information is currently not available.
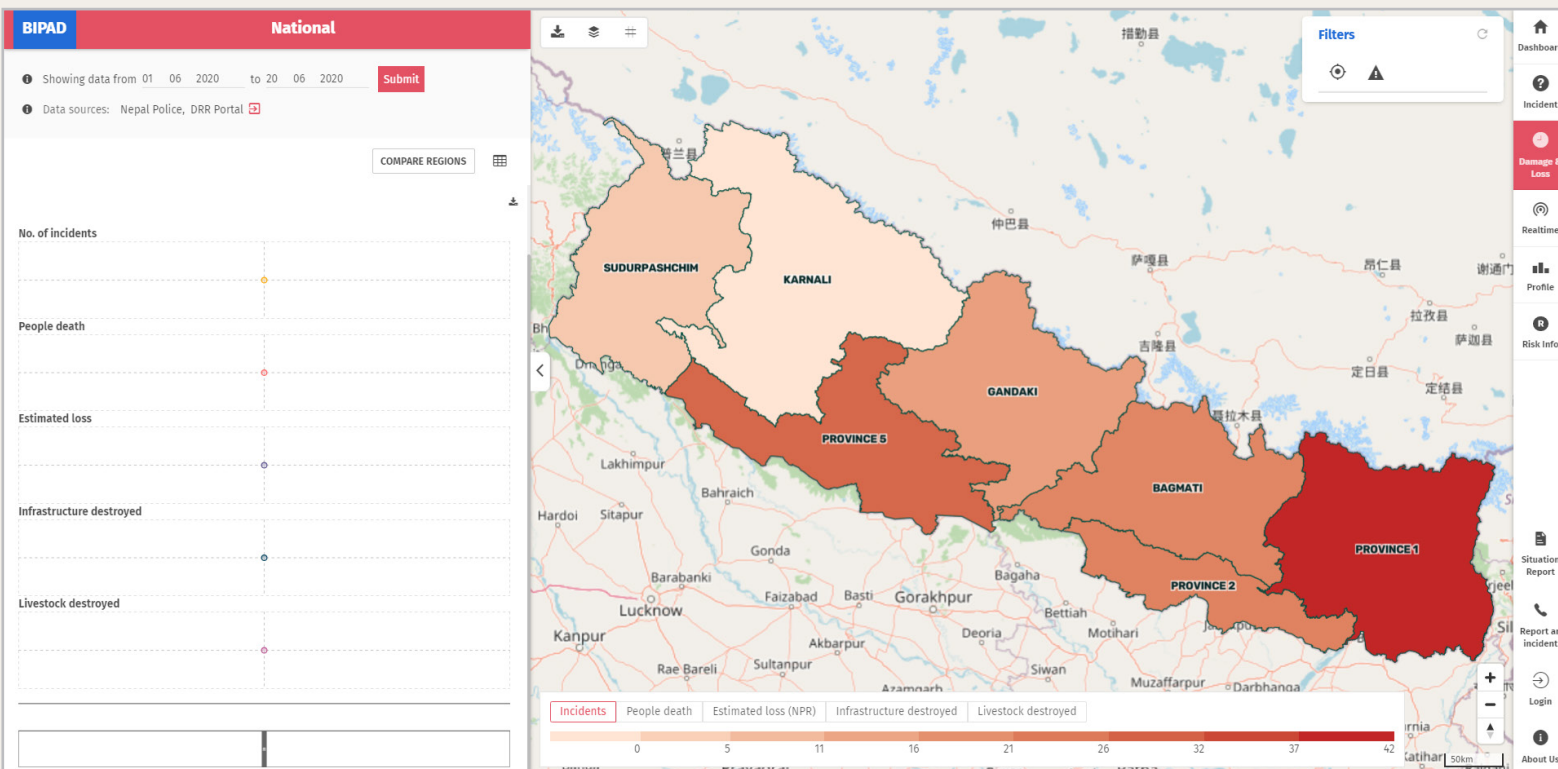


*Figure 3 Loss and damage data visualization in BIPAD from 1st June 2020 to 20th June 2020*

05

# PROPOSED STANDARDIZATIONS IN BIPAD

# Proposed standardizations in BIPAD

Based on the study of the international practices on loss and damage, and advantages over standardizing the loss and damage datasets, the following aspects are explored and are suggested to be updated on the BIPAD system so that the current gaps and issues on BIPAD can be resolved.

**5.1. Proposed Indicators:** Indicators for loss and damage data help keep records for future monitoring and making decisions on disaster-related issues. The inclusion of the missing indicators in BIPAD will contribute to reducing mortality from disasters, decreasing the numbers of those affected by disasters, reducing economic losses, and lessening damage to critical infrastructures. They will help better understand the impacts of a disaster event. Also, it will aid in developing DRR strategies, make risk-informed policy decisions and allocate resources to prevent new disaster risks.

The indicators and their terminologies defined below are largely based on existing definitions taken from various frameworks such as SFDRR, EU guidelines[23] as well as the Nepal police data collection template[24] and which are relevant in the context of Nepal. It is suggested that the indicators be subcategorized into sectors and their respective subgroups as shown in Table 7. The list includes the indicators that are already included in BIPAD as well as those that are missing.

| Sector | Subgroups | Indicators | |
|---|---|---|---|
| Social | People | Number of deaths | |
| | | Number of missing people | |
| | | Number of injured/ill people | |
| | | Number of people with dwelling damaged | |
| | | Number of people with dwelling destroyed | |
| | | Number of people with livelihood disrupted or destroyed | |
| | Housing | Number of houses damaged | |
| | | Number of houses destroyed | |
| | | Economic loss due to damaged/ destroyed housing | |
| Productive | Agricultural | Crops | Area of crop fields destroyed |
| | | | Economic loss |
| | | Livestock | Number of livestock destroyed |
| | | | Economic loss due to destroyed livestock |
| | | Forestry | Economic loss |
| | | | Area lost |
| | | Aquaculture | Economic loss |
| | | Productive asset | Economic loss due to damaged/destroyed productive asset in the agricultural sector |
| | Industry | Number of industries affected | |
| | | Economic loss to infrastructure damaged/ destroyed | |
| | | Economic loss due to productive asset damaged/ destroyed | |

| Sector | Subgroups | Indicators |
|---|---|---|
| **Infrastructure and services** | Commerce | Number of commerce affected |
| | | Economic loss to infrastructure damaged/ destroyed |
| | | Economic loss due to productive asset damaged/ destroyed |
| | Tourism | Number of tourism industry affected |
| | | Economic loss to infrastructure damaged/ destroyed |
| | | Economic loss due to productive asset damaged/ destroyed |
| | Water and sanitation | Number of infrastructures damaged/ destroyed |
| | | Number of services disrupted |
| | | Economic loss due to damaged infrastructure |
| | | Number of beneficiaries (or households) affected because of service disrupted |
| | | Economic loss due to productive asset damaged/ destroyed |
| | Health | Number of infrastructures damaged/destroyed |
| | | Number of services disrupted |
| | | Number of beneficiaries (or households) affected because of service disrupted |
| | | Economic loss |
| | | Economic loss due to productive asset damaged/ destroyed |
| | Education | Number of infrastructures damaged/ destroyed |
| | | Number of services disrupted |
| | | Number of beneficiaries (or households) affected because of service disrupted |
| | | Economic loss |
| | | Economic loss due to productive asset damaged/ destroyed |
| | Electricity Transportation | Number of infrastructures damaged/ destroyed |
| | | Number of services disrupted |
| | | Number of beneficiaries (or households) affected because of service disruption |
| | | Economic loss |
| | | Economic loss due to productive asset damaged/ destroyed |
| | | Road/bridge/airport/port/ railway: |
| | | Number/length of element damaged/ destroyed |
| | | Number of services disrupted |
| | | Economic loss due to damage/destroyed infrastructure |
| | | Economic loss due to productive asset damaged/ destroyed |
| | Irrigation | Number of infrastructures damaged/ destroyed |
| | | Number of services damaged/ destroyed |
| | | Number of beneficiaries (or households) affected because of service disruption |
| | | Economic loss due to damage/destroyed infrastructure |
| | | Economic loss due to productive asset damaged/ destroyed |

| Sector | Subgroups | Indicators |
|--------|-----------|------------|
| Infrastruc-ture and services | Telecommunication | Number of infrastructures damaged/ destroyed |
| | | Number of services damaged/ destroyed |
| | | Number of beneficiaries (or households) affected because of service disruption |
| | | Economic loss due to damage/ destroyed infrastructure |
| Others | Cultural heritage | Cultural heritage asset damaged/ destroyed |
| | | Cultural heritage structures damaged/ destroyed |
| | Environment | Loss to biodiversity, deforestation, desertification, etc. |

*Table 7: Proposed indicators in BIPAD*

**5.2. Proposed terminologies on loss and damage:** The proposed terminologies used for defining the above-mentioned indicators are as follows:

**Death:** The number of people who died during the disaster, or directly after, as a direct result of the hazardous event.

**Missing:** Corresponds to the number of people whose whereabouts since the disaster are unknown, and presumed dead based on official figures although there is no physical evidence.

**Injured or ill:** People suffering from physical injuries, trauma, or illness requiring immediate medical treatment as a direct consequence of the disaster event.

**Livelihood:** The capacities, productive assets (both living and material) and activities required for securing a means of living, on a sustainable basis, with dignity.

**Houses damaged:** Houses (housing units) with minor damage, not structural or architectural, and which may continue to be habitable, although they may require repair and/or cleaning.

**Houses destroyed:** Houses (housing units) leveled, buried, collapsed, washed away or damaged to the extent that they are no longer habitable, or must be rebuilt.

**Economic loss:** The monetary value of total or partial destruction of physical assets existing in the affected area. Direct economic loss is nearly equivalent to physical damage.

**Infrastructure Damaged:** Infrastructure which can be repaired and rehabilitated.

**Infrastructure Destroyed:** Infrastructure which needs replacement.

**Infrastructure Affected:** Infrastructure that is either damaged or destroyed.

**Services disrupted:** The complete interruptions, partial interruptions, reduced coverage, and reduced quality of service, with or without damaged or destroyed infrastructure.

**Productive asset:** Facilities, machinery, tools, and key infrastructure related to agricultural production.

**Industry:** Economic activity concerned with the processing and manufacture.

**Commerce:** Economic activity that involves trading.

**Tourism:** Economic activity involving organization and operations of holidays and visits to places of interest.

**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.

**Water and sanitation:** Drinking water supply system, sewerage system, and solid waste management system.

**Health:** Health facilities and services that include: National/ Provincial/ Local Hospital/ Health Post and Sub-health Post.

**Education:** Education facilities and services such as public or private Preprimary, Primary, High School, College, and University.

**Electricity:** Facility and services that deal with powerhouse, substation, dam, and transmission grid.

**Transportation:** The transportation sector includes different road types/ airport/ bridges/ ports/ railways.

**Telecommunication:** It includes telephone network and optical fiber.

**Cultural heritage assets:** Tangible moveable and non-moveable assets.

**5.3. Proposed metadata:** The metadata complement the loss and damage data and helps to understand the changes in the local and global context. Metadata is a set of data that describes, provides context, and gives information about data. Metadata provides additional information about the number, list, type, and description of the elements. Additionally, metadata will also be used to provide additional information about the described items themselves (like the typical size of infrastructure or asset, or the average number of employees) and the data such as population, GDP, the total number of households, etc. that provide the required context for the indicators (notably economic loss and livelihoods) to be successfully estimated. The useful metadata for people loss and infrastructure loss are as follows:

**Definition of metadata for data on people loss:** Data on demographic and socio-economic parameters are some metadata needed while studying the affected population[25]. The population of the country, the number of households in the country, or the average number of people per household for each year of the reporting exercise, could also be included.

**Definition of metadata describing assets and infrastructure elements:** For each type of productive asset that is reported, metadata should contain[26]:

- Code
- Description of type of asset
- Measurement Units (m², meter, hectare, km, tonne, etc.)
- Value per unit [Series per Year 2005… 2030]
- % of additional value for equipment, furniture,

materials, product (if applicable)
- % of additional value for associated physical infrastructure (if applicable)
- Average number of workers per facility or infrastructure unit
- Formula (or description of the method) to calculate the economic value

**5.4. Proposed methodology:** An important foundational capacity for every country is its database on losses and impacts of disasters. This requires the systematic assembling of data on past and ongoing disaster events, with each event having records of dates, location, deaths, economic losses, number of people affected, etc., and a suitable archiving system to maintain the records and allow easy access.

The data quality can be improved by defining how the data is measured. Data collection should be done at the level of each sector of the economy. Then, the aggregation of such losses and damages, ensuring that no double accounting or gaps are incurred, provides an estimation of the overall effects of the disaster on the affected society and economy.

The international guidelines (Post Disaster Needs Assessments (PDNA[27]), Guidance for Recording and Sharing Disaster Loss Data (EU[28]), Guidelines on Measuring Losses from Disasters, Human and Economic Impact Indicators[29], and Damage, Loss and Needs Assessment Guidance Notes (DaLA[30]) suggest the definition of a clear methodology on data collection and data recording. The following methodology for the collection and recording of data can be followed in Nepal.

[25]UNDRR (2017). Technical Guidance for Monitoring and Reporting on Progress in Achieving the Global Targets of the Sendai Framework for Disaster Risk Reduction.
[26]UNDRR (2017). Technical Guidance for Monitoring and Reporting on Progress in Achieving the Global Targets of the Sendai Framework for Disaster Risk Reduction.
[27]Post Disaster Needs Assessment 2013, Volume A Guidance.
[28]EU (2015). Guidance for Recording and Sharing Disaster Loss Data.
[29]IRDR (2015). Guidelines on Measuring Losses from Disasters, Human and Economic Impact Indicators.
[30]The International Bank for Reconstruction and Development/ The World Bank (2010). Damage, Loss and Needs Assessment Guidance Notes.

**Proposed methodology of collection:** The methodology of collection includes details on timing, means, and actors for loss data collection. It describes the responsible/ mandated organization such as local civil protection or national or regional loss data collection centers or hazard-specific national authorities or NGO or academic institutions. It also emphasizes on the technique for data assessment while collecting the data. It is suggested to rate/ assess the uncertainty of the data at source. The following framework is suggested to be used in Nepal for data collection.

1. **Mandated organization: who is responsible:** In Nepal, the Nepal police is the authorized body to report an incident and its associated losses. The mandated organization (Nepal Police) is responsible for establishing sufficient capacity of qualified staff, to collect and achieve consistent quality of data as well as their coordination during the emergency. Also, if needed, they need to collaborate with other humanitarian organizations, relevant ministries and their departments, and academic institutions for data collection. A list of specialists should be consulted for accurate data collection and estimation of losses. Based on the sector being assessed, deployment and consultation of experts such as agronomist, agriculture engineer, veterinarian, civil engineer, architect, industrial engineer, sociologist, medical doctor, epidemiologist, and an economist specializing in various sectors is needed. This is especially important in the case of large-scale events such as the 2015 Gorkha earthquake and large flood events.

2. **Techniques for data assessment**: The mandated organization and the responsible staffs determine the appropriate techniques of data collection such as desk research of media reporting or government reports, sectorial field assessment, sampled surveys, official reporting mechanisms such as insurance or compensation claims, police reports or emergency intervention reports, and remote sensing (satellite or airborne assessments). Whichever technique is chosen, it should be compatible with the data model to ensure consistency. It is usually achieved with assessment forms prepared in advance. Assessment forms should include date and location of data assessment, name of the assessor as well as the technique used beside the fields related to the loss indicators, which are described in section 5.1.

A mobile app can be developed for the collection of data so that the loss datasets could be collected and recorded in the easiest ways possible. The replacement of the use of pen and paper by the mobile app will reduce errors while digitizing the data as well as ease the data collection in the field.

3. **Ensuring reliability of information: assessing uncertainty at the source:** The mandated organization and the responsible staffs determine the appropriate techniques of data collection such as desk research of media reporting or government reports, sectorial field assessment, sampled surveys, official reporting mechanisms such as insurance or compensation claims, police reports or emergency intervention reports, and remote sensing (satellite or airborne assessments). Whichever technique is chosen, it should be compatible with the data model to ensure consistency. It is usually achieved with assessment forms prepared in advance. Assessment forms should include date and location of data assessment, name of the assessor as well as the technique used beside the fields related to the loss indicators, which are described in section 5.1. A mobile app can be developed for the collection of data so that the loss datasets could be collected and recorded in the easiest ways possible. The replacement of the use of pen and paper by the mobile app will reduce errors while digitizing the data as well as ease the data collection in the field.

**Proposed methodology of recording:** A methodology of recording explains how data should be stored once field data have been collected. While recording the data, the data needs to be organized into a manageable database of pre-defined (standardized) formats and fields ready to be analyzed efficiently. The Nepal Police data collection template is available but not effectively used in the field. It should be followed effectively. The data recording involves transcribing data into a systematic format, entering the information obtained from each field assessment group or organization, and organizing it into one overall structured database. While this may be straightforward for techniques that use predefined forms compatible with the database, it may be more challenging for other techniques such as media-based evidence, satellite-derived information, or information from non-governmental actors. The following procedure and recommendations will aid the data recording.

1. **Mandated organization:** The mandated recording organization develops and maintains the information management system for storing data of different formats based on the data model. It is responsible for the training of personnel involved to process the collected data before they are entered into the system and takes care of existing links (and compatibility) to external databases.

   At present, the data collected by Nepal police is shared with NEOC, NEOC then updates the information into the DRR portal. Later, the Nepal police will directly enter the loss and damage data into the BIPAD system.

2. **Processing of collected data:** The raw data collected from the field must be first processed to systematically record the data into the database. The processing of data could include the following tasks:
   - Calculation of codified values of database fields accompanied with method used,
   - Identification of unclear or missing values that should be investigated,
   - Assessment of data quality with the level of uncertainty,
   - Conversion into the unit defined by methodology
   - Utilization of external references for the validation and verification process.

3. **Disaggregation of collected data:** As the disaggregation of data will help better understand the impacts of disasters, loss trends, and spatial patterns, the collected data should be disaggregated. For the data related to people affected by a disaster, the data should be disaggregated into the hazard affecting the person, the geographic location of the occurrence of the incident as well as the address of the person, age, sex, income, and disability of the person affected. For other sectors: disaggregation into types is recommended: e.g. Building type, livestock type, infrastructure type. Sector-wise classification of the infrastructures, assets, and services disrupted by a disaster, and their economic losses should be done. The suggested sectors are social, productive, infrastructure, and others. The subgroups in each sector can be understood from Table 5.

4. **Storing and accessing information:** The recording methodology must be supported by a software application that provides the basis for interacting with the disaster loss database. While the data model should capture subtle information of the technical requirements, the user interface must be able to deal with the complexity of the data model and show the searched selection as well as respect all the restrictions (e.g., privacy-related data) regarding the sharing policy. At present, we have the DRR portal and the BIPAD system that aims to store the information systematically.

06

# RECOMMENDATIONS AND SUGGESTIONS

# Recommendations and Suggestions

The following recommendations are suggested to be followed for an effective standardization of the 'Damage and Loss' module and overcoming the challenges mentioned above and thereby solving the key issues.

**6.1. Well defined terminologies:** Standardized and well-defined terminologies on various loss and damage indicators increase data reliability, quality, and interoperability of global and national disaster databases. Along with the standardization of terminologies on loss and damage, it is equally important to include those terminologies in the frontend and backend platforms to reduce the error while recording and interpreting the data. It is recommended that the technical team include the definitions of the proposed terminologies in the frontend and backend of the system. However, the approval from the government is necessary before these definitions are incorporated into the system.

**6.2. Addition of some missing key indicators in BIPAD:** It is suggested to incorporate all the missing indicators such as the number of people who lost their livelihood, number of services disrupted (apart from the services disrupted by damage to infrastructure), loss and damage data for infrastructures such as airports, railways, and ports, as well as environmental losses in BIPAD. Where data are not collected in the first place, it is advised to initiate talks with NDRRMA to advocate the need for collecting data.

As some new indicators are suggested to be included in the system that were previously not available, it could result in data gaps between the past and future data. The users should be notified of the gaps.

**6.3. Defining systematic data collection and recording methodology:** It is recommended to have detailed guidelines that define the methodology of collection and methodology of data recording for Nepal. The methodology of collection includes details on timing, means, and actors for loss data collection. A methodology of recording explains how data should be stored once field data have been collected. These detailed methodologies will reduce data inaccuracy and improve the quality and the reliability of loss estimates that will support the higher-level strategic objectives of disaster loss analyses.

**6.4. Incorporating missing historical data:** At present, BIPAD has not incorporated the loss and damage data available in DesInventar, which has the records from the year 1971 to 2011. It is suggested to keep the data from the DRR portal and discard the data from the DesInventar in case of duplication.

**6.5. Better data visualization:** Some of the errors in visualization in BIPAD are mentioned in section 4 under 'Issues in data visualization'. Error in data visualization could lead to misinformation. It is important to fix the errors in the maps, graphs, and data presented in tabular forms. Some recommendations for better data visualizations are provided below:

1. In the 'Damage and Loss' module of BIPAD, the visualization of various loss and damage datasets, plotted in graphical format, shows a single point in the graph when the selected date range is within a month's duration. It is recommended that the technical team work on fixing this issue such that the graphs are plotted using the daily data. This will help users visualize data for any date range (even within a month) more effectively.

2. Furthermore, some information on loss and damage indicators are available only in the tabular format but not in the form of charts. It is recommended that we incorporate additional bar charts for visualization of that information.

3. The user should be allowed to sort, filter, and compare damage and loss data geographically, temporally, and sectorally in charts.

**6.6. Ensure data consistency and reliability:** The total economic loss is the summation of economic loss incurred across various sectors. The data entry form in BIPAD for the Nepal police that allows the total economic loss to be manually entered must be removed and should be calculated by summing the economic loss of the individual category. However, it is first necessary to seek permission from the government authority before making the changes.

Also, it is suggested to write "Not available" for the missing economic loss data in the DRR portal or BIPAD instead of giving them the value 0. This will reduce misinformation and omit confusion.

Also, research by the technical team is needed to find the cause of inconsistency of data available in the DRR portal and BIPAD and bring consistency to the data across various platforms.

**6.7. Capacity building:** The intensive capacity building of the Nepal police staff from various backgrounds is needed to fully enforce all the recommendations made in this research.

A mobile app can be developed for the collection of data so that the loss data could be collected and recorded in the easiest ways possible. By replacing the use of pen and paper with the mobile app will reduce error while digitizing the data as well as ease the data collection in the field.

Also, training should be provided to the Nepal police staff to familiarize them with the app. The training provided to the staff will improve the assessment of loss and damage in the field and hence will result in reduced error in data.

**6.8. Use of BIPAD as a tool to report Sendai Framework Targets:** It is suggested to follow the detailed computational methodologies described in the Guidance for Monitoring and Reporting on Progress in Achieving the Global Targets of the Sendai Framework for Disaster Risk Reduction to measure loss and damage datasets, which will also assist in reporting and achieving the Sendai Framework Targets.

Also, a separate module or a section within the 'Damage and Loss' module of BIPAD could be added where users can get the calculated values for the indicators to monitor the Sendai Framework Targets. The module or section should provide users with values of indicators such that they are readily available for reporting or at least without major computational efforts. This will promote the use of BIPAD as a tool to report the targets.

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