

BIPAD *for* **Decision making in Federal Nepal**



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Acronyms

BIPAD	Building Information Platform Against Disaster
CBS	Central Bureau of Statistics
CSV	Comma-separated values
DHM	Department of Hydrology and Meteorology
DIMS	Disaster Information Management System
DMB	Disaster Management Bureau
DMG	Department for Mines and Geology
DoHS	Department of Health Services
DRR	Disaster Risk Reduction
DRRM	Disaster Risk Reduction and Management
GIDC	Government Integrated Data Centre
GoN	Government of Nepal
HDI	Human Development Index
HPI	Human Poverty Index
ICIMOD	International Centre for Integrated Mountain Development
LGOA	Local Government Operationalization Act 2074
METEOR	Modelling Exposure Through Earth Observation Routines
MoHA	Ministry of Home Affairs
MoU	Memorandum of Understanding
NAP	National Adaptation Plan
NDRRMA	National Disaster Risk Reduction and Management Authority
NEOC	National Emergency Operation Centre
NGO	Non-Governmental Organization
NPC	National Planning Commission
OSM	OpenStreetMap
SFDRR	Sendai Framework for Disaster Risk Reduction
SOP	Standing Operation Procedure
TAF	The Asia Foundation
TOR	Terms of Reference
UCD	User Centric Design
UN	United Nations
UI	User Interface
UX	User Experience
UNDRR	United Nations Disaster Risk Reduction
YI-lab	Youth Innovation lab

Executive Summary

Building Information Platform Against Disaster (BIPAD) (<https://bipad.gov.np/>) has the potential to create systemic shift on disaster governance in Nepal conforming to the global principles of Sendai Framework of Disaster Risk Reduction (SFDRR). National Disaster Risk Reduction and Management Authority (NDRRMA) is leading this momentum for the adoption of BIPAD at local and provincial level, however, there are several challenges in fully institutionalizing BIPAD. One eminent challenge for such digital technology interventions is - failing to acquire the commitments of its potential users, as they become data centric, technologically cumbersome and unable to meet the requirements of the users. Also, institutionalization of BIPAD demands that the system adapt fully to the decentralized DRRM governance. On this backdrop, it looks prudent for BIPAD to retain its focus on users, user personas and perspectives at all three layers of government while preparing to roll out at provincial and local levels.

The focus is on the key question- How BIPAD can be used for informed decision making at federal, provincial and local level? This key question raises follow up questions such as-Who makes the decisions and what decisions are supported by BIPAD?

This report takes stock of how decision making is contingent upon the persona of the users. Personas are concrete representations of different types of people that the system or service is being designed for. As any new system is likely to be used by different types of people, it is important to understand decision making through several personas that have very different goals and aspirations and differ in all the ways they make decisions through the portal. To understand the use of BIPAD for decision making for several aspects of DRRM, it is also important to breakdown BIPAD into use cases. Nine use cases representing different personas, different goals and different spheres of governance has been used as examples to comprehend the varying context of decision making through the existing data sets in BIPAD portal.

Findings: Who uses BIPAD for decision making?

BIPAD caters to wide range of stakeholders at all three spheres from politicians, academicians, researchers, civil society, and civil servants to professionals at NGO/INGO. Primary users are DRRM related stakeholders, however BIPAD supports decision making in other sectors - development and private sectors.

In essence, BIPAD has to cater to broad sets of users - "Disaster Managers" and "Planners". "Disaster Managers" are the ones who have to make choices/decisions fast during the onset of hazards, early warning, response and early recovery. Their requirements are fast information but can compromise on precision/details. On the other hand, "Planners" are those who are involved in long-term recovery, preparedness, risk reduction and risk-informed development. Their requirement is detail and reliable information but doesn't have to be quick.

Prospective stakeholders of BIPAD tend to have broad set of knowledge of technology ranging from novice, advanced beginner, competent, proficient and expert. Similarly, there are users with novice to expert level DRRM knowledge. Novice and advanced beginners might fall victim to non-rational decision making as they rely on heuristic techniques and their requirement is shortcut information. Competent to expert users seek

for reliability of data and analyze data for rational decision-making. Their need is detail and reliable data. As both categories of users are important for BIPAD, especially when embedding the system at local level; it looks important to focus on data quality but also, on shortcut decision making information.

BIPAD national portal with independent platforms for provincial and local level resonates with the Constitution of Nepal's sole authority for DRRM to local level and concurrent authority to all spheres. BIPAD supports 753 local governments and their staffs for decision making for almost all 12 clauses under DRRM as per Local Government Operationalization Act, 2017. BIPAD supports decision making towards fulfillment of responsibilities by all three spheres for all cycle of DRRM as per Disaster Risk Reduction and Management Act, 2017

Findings: What decisions are supported through the portal?

BIPAD supports decision making in all aspects of disaster cycle. Incident module is mostly relevant for emergency response, recovery, rehabilitation, hazard impact analysis, and damage and loss estimation. Damage and loss data is useful for recovery, rehabilitation and relevant for comprehending history. Damage and loss module supports decision making for some aspects of Post Disaster Need Analysis (PDNA) but also for future planning. Real Time module is mostly relevant for early warning and early response. Risk Info module is relevant for risk reduction and risk informed development. Profile module and Project Management Information System (PMIS) are relevant for Risk informed development and DRRM governance.

BIPAD supports multi sectorial decision making in development sector and also, for private sector. BIPAD is rightly placed as governance tool for intergovernmental data sharing, budget allocation and for monitoring progress against DRRM commitments at all three spheres, such as Nepal Disaster Risk Reduction National Strategic Plan of Action (2018-2030), and international commitments such as Sendai framework

Though it is envisioned as one stop solution for disaster related quantitative data but it is not to be understood as panacea for all DRRM data problems.

Recommendations: How to enhance the system to support decision making?

The modules on Incident, Dashboard, Real Time and citizen reporting need focus on quick relay of information to drive "Response Decisions" whereas damage and loss, Risk Info and Profile modules need focus on data standards, accuracy, details, metadata, and references to drive "Planning Decisions".

User Testing including key DRRM actors at local and provincial level would be important before rolling out the system. Similarly, it will be helpful to conduct training and capacity building focusing not just on using BIPAD but also, for decision making through BIPAD, for risk communication or for data contributing. Data standardization across all modules is necessary.

Mechanism of standard protocol on data relay (especially, for incidents, citizen reporting, situation report) will enhance decision making. Also, robust regulatory mechanism will be needed to ensure data is contributed to PMIS and Capacity and Resources by all relevant stakeholders.

Recommendations for modules:

-  **Incident Module:** Standardizing the attributes and list of response resources (based on response needs) is one way to further enhance response decisions.
-  **Real Time:** Real time stations/ warnings to be linked with capacity and resources for response. This allows decision making for response not just for post-incident but also for early action based on early warnings from Real Time page. This can be embedded by treating early warnings as incidents for response.
-  **Profile:** Summarized information on hazard and risks, risk ranking to support decision making for novice to advance beginners in technology and DRRM.
-  **Risk Info:** Integrating building footprints in exposure section will aid decision making in identifying the exposed population.

Given its scope and complexity, this report raises important opportunities for further work, particularly for wide range of user testing at provincial and local level.

01

INTRODUCTION

Introduction

This report presents the findings and recommendations emanating from the analytical review on: BIPAD for decision making in Federal Nepal.

The report starts with a brief background of Building Information Platform Against Disaster (BIPAD) and research aims. The focus is on the key question - *"How BIPAD can be used for informed decision making at federal, provincial and local level?"* which is further divided into follow up enquiries pertaining to the research.

This analytical review involves understanding elements and features of BIPAD for decision making with focus on understanding decision makers and decision support elements. Decision making is scrutinized case by case. For instance how would a mayor, NDRRMA CEO or a DRRM professional make decisions using datasets through the portal? What challenges would they face while using the portal?

Findings and Recommendations emerging from each individual case are discussed and bundled up towards the end across three main themes.

- ◆ **Who makes the decision through BIPAD?**
- ◆ **What decisions are supported by BIPAD?**
- ◆ **How the system can be enhanced for decision making?**

1.1 Background of BIPAD

Building Information Platform Against Disaster (BIPAD) is an integrated and comprehensive Disaster Information Management System (DIMS) initiated by the Government of Nepal, Ministry of Home Affairs, and is owned by National Disaster Risk Reduction and Management Authority (NDRRMA). BIPAD has the potential to galvanize/create systemic shift on disaster governance in Nepal that can conform to the global principles of Sendai Framework of Disaster Risk Reduction (SFDRR)¹.

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 focusing on the principle of user centric design². BIPAD is now hosted as an independent domain under the Government of Nepal (GoN): <https://bipad.gov.np/>. Currently, it is in the process of rolling out to local and provincial governments.

The focus of this research is to encompass broader views and perspectives at the federal, provincial and local levels on the challenge and opportunities to roll out BIPAD.

1.2 Objectives of the Study

This analytical review aims to identify opportunities for decision making through BIPAD and constraints that hinder decision making. This resonates with the primary objective of BIPAD 2020 and beyond which is to ensure that BIPAD is used to make informed decisions by national, provincial and local governments to enhance disaster resilience.

Operational recommendations on system changes are expected as an output of this research that can help to address systemic challenges that hinder effective decision making.

¹United Nations, 2015, Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR) https://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf

²BIPAD, Final Report, second phase project document, 'Strengthening Building Information Platform Against Disaster', Youth Innovation Lab, YI-lab, 2020

02

APPROACH AND METHODS

Approach and Methods

This section presents the rationale, study methodology — including research sub questions, approach, analytic framework, and methods of data collection and analysis.

2.1 Rationale

Youth Innovation lab (YI-Lab) signed Memorandum of Understanding (MoU) with Ministry of Home Affairs (MoHA), National Emergency Operation Centers (NEOC) on 11 February 2019. With this, the federal level government, NEOC at the forefront, internalized BIPAD system, engaging extensively from design to system development. The official launch of beta version within three months, in April 2019, marked an important milestone and convinced MoHA that BIPAD had the potential to fulfill their Disaster Risk Reduction and Management (DRRM) ambitions. Another important milestone towards localization of BIPAD was the announcement in May 2019 by the Prime Minister that BIPAD be used at the federal, provincial and local level. Post beta version, the second phase of the project focused mostly on system coherence, User Interface (UI) and User Experience (UX), system usability, data integration and visualization but did retain focus on localization by engaging provincial level stakeholders for training on BIPAD in five provinces.

Currently, BIPAD is now hosted in the Government Integrated Data Centre (GIDC)'s server. Subdomains are created for each 753 municipal governments, 77 districts and seven provincial governments, which allow independent hosting of BIPAD system at provincial, local and district level³.

While the above efforts point to an initial momentum for the adoption of BIPAD at local and provincial level, there is a long way to go on how BIPAD would be fully mainstreamed and institutionalized across the country. This presents a recurrent challenge that many such interventions, such as SAHANA DIMS⁴ has encountered: how such novel digital technology fails to acquire the commitments of its potential users as they become data

2019

FEBRUARY

Y-Lab signed MoU with GoN, MoHA, NEOC.

APRIL

BIPAD beta version was officially launched.

MAY

Prime Minister, chair of NDRRMC mandated "all related stakeholders" at the federal, provincial and municipal shperers to use DIMS.

JULY

BIPAD second phase:
Second phase of system development, system coherence, enhanced, UI/UX.

Training on BIPAD conducted in five Provinces.

2020

FEBRUARY

BIPAD full-fledge system was launched.

Institutionalization of BIPAD at federal, provincial and local level.

Figure 1 Timeline of Major BIPAD milestones with relevant aspects to localization

³BIPAD, Final Report, second phase project document, 'Strengthening Building Information Platform Against Disaster', Youth Innovation Lab, YI-lab, 2020

⁴SAHANA DIMS is hosted by NEOC: <http://sahana.neoc.gov.np/sahana>

centric, technologically cumbersome and unable to meet the requirements of the users. For the successful rollout of BIPAD, it is essential that the system is understood and operated as a strong chain in a coordinated, aligned and harmonized manner. Challenge lies in institutionalizing an efficient UI/UX along with robust, stable and functional Disaster Information Management system (DIMS) across the depth and width of government with strong linkages across government.

Institutionalization of BIPAD demands that the system adapt fully to the decentralized DRRM governance. While the Constitution of Nepal, 2015 has divided the jurisdictions between these three levels of administrative government, there are still persistent and emerging challenges on how different layers of government will work together to implement policy and practices on DRRM.

After the promulgation of new constitution in 2015 and Disaster Risk Reduction and Management (DRRM) Act in 2017, the institutional context is such that DRRM is an exclusive jurisdiction of municipal government (Annex 8 of the Constitution of Nepal), and at the same time, it is concurrent at the local, provincial and federal government (Annex 9 of the Constitution). This means, the decision making roles of these three spheres are obscured and yet to be clarified. Alongside, the newly formed 753 local governments have contested priorities⁵ across sectors of health, education, infrastructure among others that raises a question whether they are capable to take up BIPAD, which demands competent human resource and expertise to become fully operational. NDRRMA has a mandate to coordinate DRRM at the federal, provincial and local levels with both technical and financial assistance. However, since the authority has been established recently it is yet to develop its own capacity to undertake these functions. The principal challenge is in achieving inter-governmental and inter-departmental harmony in implementation, and inter-agency accountability on DRRM, that would provide a sustainable platform for BIPAD. This calls for the need to analyze BIPAD through wider perspectives of local, provincial and federal level.

2.2 Research Question and Framework

The key research question mandated for this analytical review is elaborated to five relevant sub-questions and issues that are explored in this research.

How BIPAD can be used in federal, provincial, and local level for decision-making?

KEY QUESTION

- What elements of different BIPAD modules can be used for decision making at local, provincial and federal level government?
- Who are the users at local, provincial and federal level government, their motivation and their role in BIPAD data ecosystem?
- How can BIPAD system help the users at local, provincial and federal level to fulfill their legal mandates?
- How can the modules be customized and better visualized to adapt to the needs of the users at all three spheres of government?
- What additional support features and decision-making tools can be developed and embedded within BIPAD system to enhance disaster risk reduction and management in Nepal?

SUB QUESTIONS

⁵The Asia Foundation, 2019, *The Roles of Local Governments in Disaster Management and Earthquake Reconstruction*, Democracy Resource Centre, The Asia Foundation, Kathmandu.: https://asiafoundation.org/wp-content/uploads/2019/08/Nepal_Role-of-Local-Government-in-Disaster-Management.pdf

The overarching framework for this review draws on insights from research and literature to respond to the sub-questions.

It is important to understand that disasters are unstructured in scope⁶; their management requires a complicated iterative process that includes risk reduction, disaster monitoring, early detection, forecasting, response and recovery. Each task typically involves multiple geospatial information resources, including sensors, data sources, models, geo-tools, software packages, and computing resources. This poses a risk that a comprehensive Disaster Information Management System (DIMS) turn into highly complex, centralized, data-centric system, ultimately compromising its usability.

However, from the inception of BIPAD system, it was well thought by the technical team not to manifest a system that is data centric but to retain focus on users. Accordingly, BIPAD has been meticulously designed to conform to the principle of a user centric, decentralized, hierarchy independent approach, where the end users at all end of DRRM is empowered for quick and effective results⁷. At the same time, it complies with the spirit of devolution of power for DRRM as envisioned by federalism.

Nevertheless, implementation and operationalization of BIPAD at local and provincial level demands reviewing its User Centric Design (UCD). UCD is typically iterative with each iteration comprising of four phases-understanding context of use, specifying user requirements, designing user solutions and finally evaluating against requirements⁸.

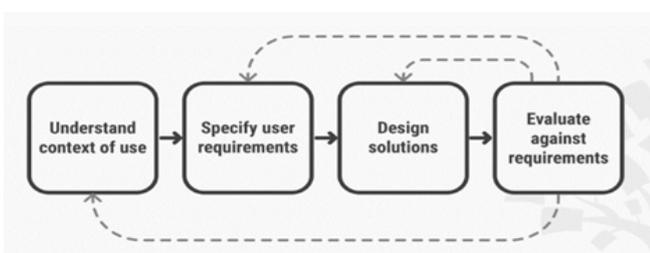


Figure 2 User Centric Design (UCD) with its core essence of iteration

⁶Boin A and Hart P (2003) *Public Leadership in Times of Crisis: Mission Impossible*, *Public Administration Review* 63 pp 555–564.

⁷Scalem M., Bandyopadhyay S., Sircar A.K. (2004) *An Approach Towards a Decentralized Disaster Management Information Network*. In: Manandhar S., Austin J., Desai U., Oyanagi Y., Talukder A.K. (eds) *Applied Computing, AACC 2004. Lecture Notes in Computer Science*, vol 3285. Springer, Berlin, Heidelberg

⁸This toolkit was developed by the Sunlight Foundation. It was supported by the Data for Development in Nepal Program which is implemented by The Asia Foundation in partnership with Development Initiatives with funding from UK Aid. This toolkit was compiled using resources from the Sunlight Foundation's Open Data Policy Hub and Roadmap to Informed Communities, and adapted based on the needs of open data providers in Nepal.

⁹Benyon, D. (2013). *Designing interactive Systems: A Comprehensive Guide to HCI, UX and interaction design*.

¹⁰Cooper, A., Reiman, R. and Cronin, D. (2007) *About Face 3: The Essentials of Interaction Design*. Wiley, Hoboken, NJ.

¹¹Benyon, D. (2013). *Designing interactive Systems: A Comprehensive Guide to HCI, UX and interaction design*.

Evaluating against requirements provides the opportunity to see how design and development matches with targeted user needs on decision making.

BIPAD launched in February 2020 was designed in close consultation with NEOC, Ministry of Home Affairs and NDRRMA, who are also the principal users of BIPAD. One aspect of institutionalization depends on how BIPAD fulfills their need for decision making for DRRM. In this context, BIPAD can be said to have undergone the first iteration of UCD design by synchronizing with the views of its main users. The rationale for this research is to reevaluate the system as a part of its iterative process to re-understand its context of use. For this research, the context of use considers the perspectives from all three spheres of governance through use case and user persona.

The methodology of forming use cases and user persona for this research have particularly adopted the toolkit - Design for Open data Impact developed by the Sunlight Foundation⁹ which emphasizes paying attention to users while developing such open web portal.

Personas are concrete representations of the different types of people that the system or service is being designed for^{10 11}. As any new system is likely to be used by different types of people, it is important to develop several different personas that have very different goals and aspirations and differ in all the ways they make decisions through the portal.

Also, to understand the use of BIPAD for decision making for several aspects of DRRM, it becomes important to breakdown tasks into use cases. A use case describes the interaction between people (or other 'actors') and devices. It is a case of how the system is used and hence needs to describe what people do and what the system does¹².

Accordingly, the review proposes a framework drawing a relationship between the above components:

- Core of the research involves review of BIPAD modules based on conceptual understanding of DRRM-forming use cases
- DRRM actors at all three spheres of government, their role in data ecosystem, their mandates for DRRM, their characteristics- forming user persona
- Brief analysis of what decisions can be inferred through BIPAD
- Gaps, constraints for decision making through BIPAD
- Actionable recommendations

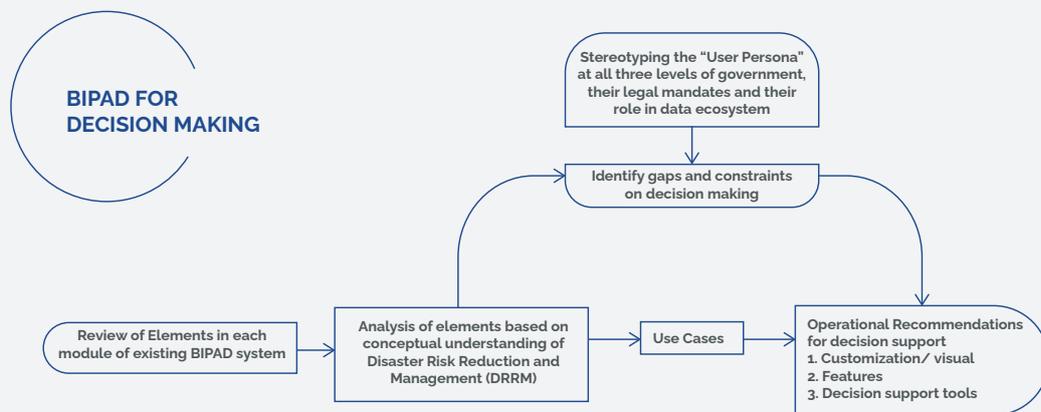


Figure 3 Framework for this study

2.3 Methods

This analytical review is based upon desk review of literature. Assumptions are made while creating use cases and user persona based on available data and understanding of DRRM practices. The use cases and user personas can be further sharpened when stakeholders at three spheres of government are engaged for operationalizing BIPAD.

Box 1 shows the steps that followed and Box 2 shows the use case template for the analysis.

Box 1. Research Steps

- I. Review of elements in each module of BIPAD
- II. Analysis of decision-making elements to create "Use cases" based on the conceptual understanding of DRRM through literature.
- III. Stereotyping the "User persona" at all three levels of government through available desk data.
- IV. Identifying the legal mandates, motivation and the role of user persona in data ecosystem through policy review
- V. Recommendations, drawing insights from global practices wherever applicable

Box 2. Proposed Use Case Template

Persona: [Title of occupation]	Use Case: What decision can be made through BIPAD by the User Persona?
Characteristics [Brief synopsis of person's level of comfort with technology and data and DRRM concepts, governance level (federal, provincial or local)]	[Detail actions in BIPAD to make above decision] [What decision support information is available in BIPAD]
Goal/Motivation: [Succinct relay of representative activities that the persona is working to accomplish] Legal Mandates: [What legal mandates is the persona entitled to?]	Challenges: [Challenges for the Persona to meet their goal through BIPAD, challenges for decision making through BIPAD]
Recommendations: [What actionable changes in BIPAD system support's the persona's decision making]	

03

OBSERVATON AND ANALYSIS

Observation and analysis

3.1 Data/Features that are available in BIPAD for DRRM

This section focuses on available data in BIPAD¹³ to understand BIPAD's potential use through use cases in the subsequent sections-

BIPAD Module	Available data/features	Potential use
Dash-board	<ul style="list-style-type: none"> Dashboard shows alerts of recent incidents/events 	Mostly relevant for response and hazard impact analysis
Incident Reporting	<ul style="list-style-type: none"> Incident data (death, injury, economic loss) coming directly from Nepal Police through the incident form in BIPAD. Downloadable tabular form in CSV format 'LEAVE FEEDBACK' feature that allow users to leave comments or feedbacks for any details provided about the incident. 'GO TO RESPONSE' page links the incident with the capacity and resources within 10 km radius of the incident. 	Mostly relevant for emergency response, planning for response, recovery and rehabilitation, hazard impact analysis, loss and damage estimation
Damage and Loss	<ul style="list-style-type: none"> Historical data on damage and loss For incidents that are more than a month old, their damage and loss details automatically get recorded in the Damage and loss module Downloadable tabular form in CSV format Compare mode that allow users to make comparison between any two Province, District or Municipality on the basis of overall disaster data 	<p>Mostly relevant for analysis and comparison of historical disaster profile of jurisdictional areas of interest,</p> <p>For identifying some aspects of post disaster recovery needs based on spatial data, preparedness planning and risk reduction based on historical data- which type of incidents are likely to impact which sector (lives, livelihood, agriculture, and infrastructure)</p>
Real Time	<ul style="list-style-type: none"> Real-time data on rainfall and river watch, earthquake, air pollution, and forest fire Stream flow forecast dataset gives 10 days probabilistic forecast information of major rivers 	Mostly relevant for early warning, early action, and response.
Risk Info	<p>Hazard</p> <ul style="list-style-type: none"> Flood hazard map from Government of Nepal and METEOR¹⁴ project Seismic hazard map from METEOR project Landslide hazard map from Durham University <p>Exposure</p> <ul style="list-style-type: none"> Visualization of OpenStreetMap <p>Vulnerability</p> <ul style="list-style-type: none"> Human Development Index(HDI), Life expectancy, Human Poverty Index (HPI), Per Capita Income from National Planning Commission (NPC). Household data (communication, water, toilet, education) from Central Bureau of Statistics (CBS) <p>Risk</p> <ul style="list-style-type: none"> Earthquake risk map, Landslide risk map from Durham University. Capacity and Resources Data on road network, educational institutions, health, government bodies <p>Climate Change</p> <ul style="list-style-type: none"> Climate change scenarios (temperature and precipitation data) of Nepal taken from the National Adaptation Plan (NAP) report with reference period (1981 - 2010), mid-term (2010 - 2045), long term (2036 - 2065) 	Mostly relevant for risk reduction and risk informed-development

Table 1 Potential Use of BIPAD

¹³The list of data is based on BIPAD second Phase project document, February 2020, Youth Innovation lab (YI-lab).

¹⁴ Modelling Exposure Through Earth Observations Routines (METEOR) is UK Space Agency's project, <https://meteor-project.org/lab>.

Profile and Project Mapping	<ul style="list-style-type: none"> Summary gives overview of disaster profile loss information of past disasters, and demographic profile of Nepal. Projects allow the users to view project related to DRRM for the government and to track the projects progress. Contacts allow the users to view the contact information of officials from Disaster Management Committee of municipal as well as ward level including disaster focal person. Documents page is a repository for disaster related documents, such as acts, guidelines, laws, regulations, reports, publications, frameworks 	Mostly relevant for risk-informed development and DRRM governance; for instance, Sendai Reporting
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3.2 Data Ecosystem

The First and foremost aspect of BIPAD data ecosystem is its platform structure. The ecosystem of BIPAD is such that a unified national level system embeds separate independent platforms for provincial and local levels. This means, each 753 local governments and 7 provinces can fully enjoy a separate log in with area specific data. At the national level, NDRRMA is the authorized body for decision making for BIPAD national level system. This allows local level DRRM actors to embed certain local level data on risks, hazards, vulnerability and also, store local level documents within the system. Similarly, the provincial government can integrate data of their interest without having to share publicly in national system. This creates ownership but also, helps the local and provincial governments to track progress to their own DRRM commitments. Separate platform means it will be even more important to ensure harmony in data types and standardization in data collection.

The second aspect of data ecosystem is its data partnership and data contribution. While there is some top-down trickling of data from national level to local level system, the data partnership dwells upon bottom-up approach of data collection. Local level and provincial level stakeholders are to play crucial role in validating and adding spatial data on capacity and resources, uploading project information on BIPAD's Project Management Information System (PMIS), adding available data on local risks and hazards. Similarly, local level and provincial level Nepal police are responsible for reporting damage and loss for the incidents, which constitute the major part of BIPAD data.

Top-down approach becomes necessary for Real Time and Risk Info section. As such, the federal level

agencies, such as Department of Hydrology and Meteorology (DHM), Department of Mines and Geology (DMG), and International Centre for Integrated Mountain Development (ICIMOD) are the contributors for Real Time module. Similarly, the federal level agencies have the responsibility of validating international and national level research for Risk Info module.

The data ecosystem map on the next page indicates the BIPAD data sources from different levels of government and from international research institutions

The third aspect of the data ecosystem is its users, which are discussed broadly in subsequent sections.

3.3 User Persona and their role in data ecosystem

Here, we create user personas that are based on assumptions on stereotypes rather than on field research. The following list of persona aims to encompass the wider users in the sector of DRRM in Nepal from federal, provincial and local level. Here, we select personas with different level of understanding of disaster risk reduction and management with varying scope of work and varying interest in decision making through BIPAD.

1. DRR focal person at a municipality (Local level)
2. NDRRMA CEO (Federal level)
3. Researcher at a local NGO (Local level)
4. Disaster Response expert at Red Cross (Local level)
5. Member of Provincial Disaster Management Committee/ Council (Provincial level)
6. Mayor of municipality (Local level)
7. An ordinary citizen/By stander (Local level)
8. Urban Planner at Provincial government (Provincial level)
9. MoHA official (Federal level)

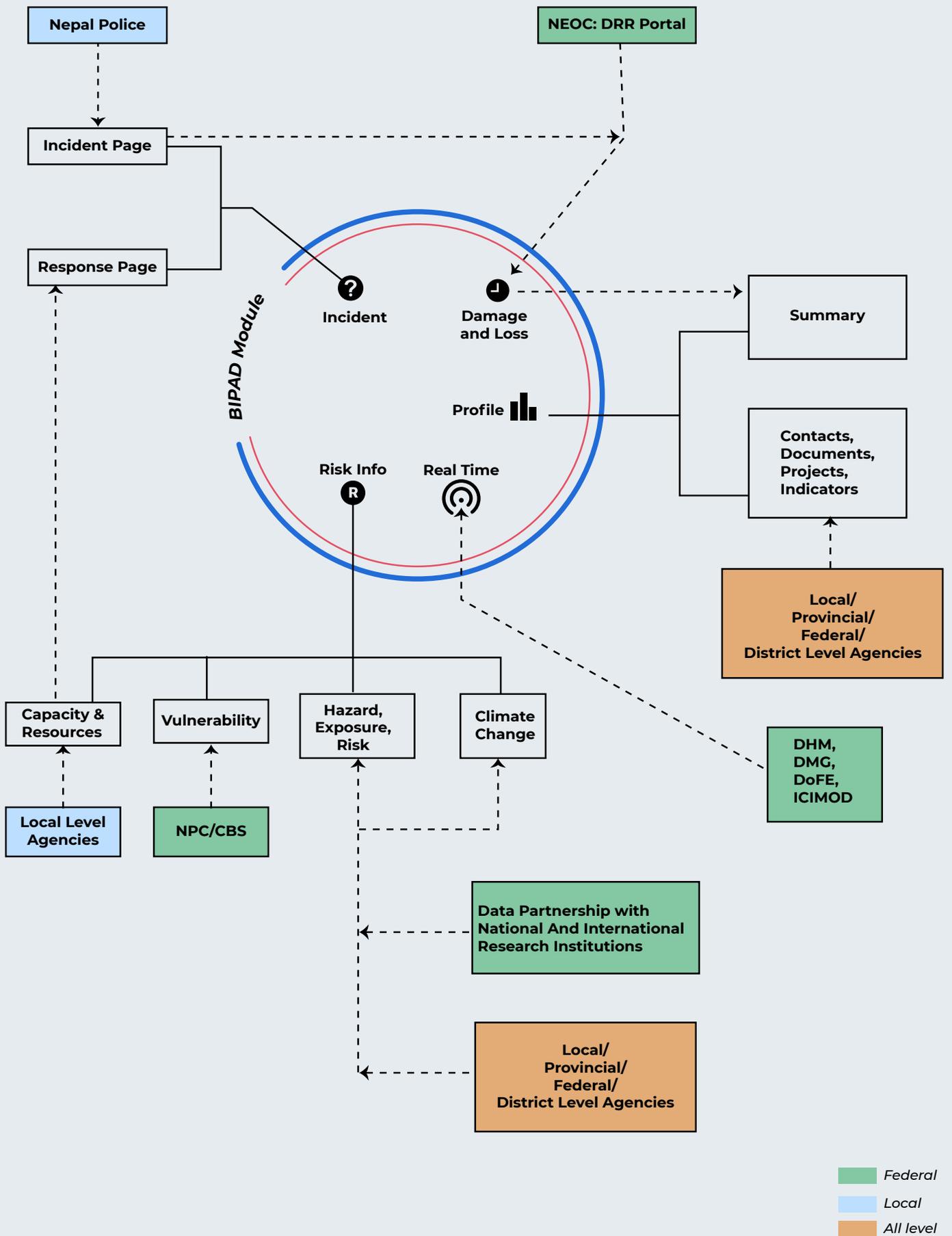


Figure 7 Data ecosystem showing the source of BIPAD data across three levels of government

The characteristics of these personas are expressed through following fields-

1. Occupation: It reflects the user's scope for using BIPAD for decision making.
2. Tech-know how: It portrays the user's convenience in using digital portal for decision making.
3. DRRM competence: It reflects the understanding of BIPAD modules for decision making.
4. Motivation/goal: It is the succinct relay of activities that the user wants to accomplish.
5. Legal mandates: It reflects the decision making tools that the user is seeking to accomplish their legal mandates. The legal mandates are derived from Disaster Risk Reduction and Management (DRRM) act, 2017, the Constitution of Nepal, 2015, Local Government Operation Act (LGOA), 2017 and National Strategic Action Plans, 2015-2030 and international commitments wherever relevant.

The fields on Tech-know how, DRRM competence, motivation and goal are fabricated as realistic as possible to add insight to the use cases- how such characteristics hinder or facilitate decision making through BIPAD.

Fields	Novice	Advanced beginner	Proficient	Competent	Expert
Tech-know how	Very little knowledge on technology; hence cannot use BIPAD successfully	Some knowledge on technology, can use BIPAD portal with the help of user manual	Skilled in using BIPAD with user manual	Can use BIPAD efficiently for analysis	Can use BIPAD efficiently for analysis in DRRM
DRRM competence	Very little/no knowledge on DRRM	Beginner level knowledge on DRRM	Skilled at DRRM	Can successfully use the concepts of DRRM	Can innovate and find solutions to DRRM problems

3.4 Use Cases

Innumerable use cases can be formed based on different personas, different goals and different spheres of governance. However, selecting the major themes and major personas of interest allows forming use cases that are most relevant for the review. Here we create a matrix that represents different aspects of DRRM for decision making through BIPAD against the three spheres of governance. This allows creating use cases that encompasses three major dimensions with their inherent sub-categories.

Table 2 Dimensions for Use Cases

	Risk Reduction	Early Warning	Response	Post Disaster Analysis	Risk-informed development/ DRRM governance
Local (Government actor, non-government actor, Civil society, Researcher)	Risk Info, Damage and loss	Real Time, Dashboard	Dashboard, Incident	Damage and Loss	Risk Info, Profile
Provincial (Government actor, non-government actor, Civil society, Researcher)	Risk Info, Damage and loss	Real Time, Dashboard	Dashboard, Incident	Damage and loss	Risk Info, Profile
Federal (Government actor, non-government actor, Civil society, Researcher)	Risk Info, Damage and loss	Real Time, Dashboard	Dashboard, Incident	Damage and loss	Risk Info, Profile

Persona: Mayor of a municipality

Use Case 1: BIPAD for risk informed settlement planning

<p>Characteristics</p> <p>Governance level: Local</p> <p>Tech-know how: Advanced beginner</p> <p>DRRM competence: Advanced beginner</p>	<p>Problem statement: <i>(The municipality is frequently affected by flood, landslide, fire and others and the mayor of municipality wants to focus on risk informed development and city planning)</i></p> <p>Steps:</p> <ol style="list-style-type: none"> 1. Log in to Municipal BIPAD system The dashboard shows the latest incidents/hazard types that the municipality faces 2. Go to- Damage and loss module to acquire information on- Which hazard is most frequent in that municipality in last 10 years? What are top five hazards? Which hazard has caused maximum fatalities and maximum economic loss in the past 10 years? 3. Go to Real Time Module to see if real time stations for river/rainfall exists upstream/downstream or neighboring areas. 4. Go to Risk Info Page to acquire information on- <ul style="list-style-type: none"> o Which part of the municipality falls under 100 year return period flood hazard? o Which part of the municipality falls under landslide risk zone? o What is the level of earthquake risk for the municipality <p>Some of the critical decisions that can be inferred from above data for risk informed settlement planning-</p> <ul style="list-style-type: none"> o Gear up mitigation and preparedness for response for top 5 frequent hazards and for the hazard that has caused maximum human fatalities and economic loss o Revise settlement planning; relocate inhabitants from high landslide and flood risk zone, early warning for 100 year return period flood zone, and bioengineering at landslide and flood risk zone.
<p>Goal/Motivation: To engage in sustainable approaches of municipal development</p> <p>Legal Mandates: Flood plain management, land use management and safe settlement development as per LGOA, 2074</p>	<p>Challenges</p> <ul style="list-style-type: none"> o In the Damage and loss module, the info graphic shows the number of incidents and the Mayor has to select the hazards one by one from filter to find out which hazards are more frequent and which hazard caused maximum loss in the past. This makes the process tedious for him. The profile page shows only the information on total loss from all hazards in the municipality and doesn't disintegrate the data for each hazard. o Being less competent in technology and having very little knowledge on technicalities of risk, the mayor struggles to acquire and interpret the data from Risk Info module, especially on the hazard/ risk maps. <p>Issues</p> <ul style="list-style-type: none"> o In the current BIPAD system, the filter is such that the user has to select the district to acquire the list of municipalities (this doesn't comply with the spirit of federalism)
<p>Recommendations:</p> <ol style="list-style-type: none"> 1. For City planners and Mayors, who are mostly novice to advanced beginner in technology and DRRM, decision making for risk informed development can be facilitated by showing the following simple but power decision making information in Profile page in Summary Section - <ul style="list-style-type: none"> o Top five frequent key hazards in the municipality/province o Top five hazards in the past that caused maximum fatalities o Top five hazards in the past that caused maximum economic impact (See section 4.3 (3)) 2. Decision Support Tool for Risk: One eminent challenge for actors at local level is to understand the hazard/risk maps as they are might be less equipped to interpret the maps. The Profile module can be designed to show the hazard index, vulnerability index and risk index. Some key decision support elements are- What is the vulnerability index of palika? What are the top five risks? What is the multi hazard risk ranking of Palika? This information when triangulated with local knowledge on risk can better prepare palikas for disaster and transform their decision making. (For example; see the methodology adopted by ICIMOD to assign indices to risk, vulnerability and hazard on Multi-Disaster information System http://geoapps.icimod.org/npDisaster/mlra). However, assigning the indices will be possible in the future only if BIPAD becomes fully data -rich. 3. To comply with the spirit of federalism, the list of municipalities for selection in filter be made independent to districts. 4. Endorsing BIPAD web portal or simply providing the link of local level BIPAD platform is one way to ensure that BIPAD becomes part and parcel of local governance. 5. User Testing at local and provincial level: This will provide an opportunity to understand UI/UX constraints of users at local level and provincial level 	

Persona: Disaster Response Expert at Nepal Red Cross Society

Use Case 2: BIPAD for Fire Response

Characteristics

Governance level:

Local

Tech-know how:

Competent

DRRM competence:

Proficient

Problem statement: (Disaster Response Expert at Nepal Red Cross at Lalitpur is working with Local Disaster Management Committee to upgrade their fire response plan, for efficient fire response.)

Steps:

1. Log in to Municipal BIPAD system –The dashboard shows the alert on fire incident.
2. Go to- Incident module. Clicking on the incident shows the details on damage and loss for the incident (number of people and livestock dead) with a tab for –go to response.
3. Go to -Response page

For response, relief and rehabilitation planning, following information are available that can support decision making for response –

1. Nearby health facilities with direction
2. Nearby education institutions and banks
3. Nearby government bodies

Goal/Motivation:

developing an efficient fire response plan, providing humanitarian support

Challenges

The fire response planner wants to see whether a fire brigade can reach the incident site as the roads are too narrow in dense settlement areas, such as in Patan. He wants to know whether there are open spaces nearby where temporary camps can be placed for relief. This information is not yet embedded into the system.

Recommendations:

1. Decision Support Tool for fire response:

In dense settlement areas, for Kathmandu, Bhaktapur and Lalitpur, the road network be updated to differentiate between the wider roads for fire brigade and narrow road sections. This allows response planners to focus on fire preparedness through extinguishers and water bodies in dense areas.

2. Japan International Cooperation Agency (JICA)'s data on 83 open spaces in Kathmandu Valley can be embedded into response page, to support decision making on relief distribution among other uses of the data

Persona: NDRRMA CEO

Use Case 3: BIPAD for preparedness

Characteristics

Governance level:

Federal

Tech-know how:

Expert

DRRM competence:

Expert

Problem statement: (The NDRRMA CEO is interested in preparedness and planning for five natural hazards-flood, earthquake, landslide, lightning and forest fire)

Steps:

1. Log into National level BIPAD system
2. Go to- Damage and Loss module to acquire history of last 10 years for five natural hazards-flood, earthquake, landslides, lightning and forest fire. This module allows comparison between provinces and municipalities for loss and damage.
3. Go to -Risk Info module to acquire information on-
 - o Which part of the country is in flood hazard region (for 10, 100 and 200 year return period flood)?
 - o Which part of the country falls under high landslide risk?
 - o Which part of the country falls under high earthquake risk?
4. Go to- Real Time module to acquire information on-
 - o Where are the real time stream flow and real time rainfall gauging stations? Where on the flood hazard regions have the gaps on stream flow data?
5. Go to- Profile module to acquire information on-
 - o Which projects on preparedness are running on which parts of the country? Are there preparedness/ risk reduction projects for high risk areas?

Some of the critical decisions that can be inferred from above data for preparedness and planning-

1. Mobilize fund for preparedness and risk reduction activities for high risk areas based on risk/hazard maps.
2. Promote DRRM projects for high risk areas, curtail on duplication efforts.
3. Support for setting up new stream flow stations/rainfall stations / air pollution detectors and forest fire monitoring in regions of gaps
4. Use historical data as an evidence of risk to identify priority areas for integrating lightning early warning system
5. Use landslide risk maps to identify potential areas for installing/strengthening landslide early warning system
6. Enforce building codes, demolish and retrofit vulnerable buildings with priorities at high earthquake risk provinces/districts

<p>Goal/Motivation: Use technology and science to prepare for disasters and reduce risk</p> <p>Legal Mandates: Data management, analysis and research (<i>hazard specific</i>) and implementation</p>	<p>Challenges The data on risk/hazard comes with uncertainty and some data gaps; any decision based on risk needs to make provisions for uncertainty and contingency.</p>
<p>Recommendation Campaigns and trainings on risk communication while integrating BIPAD at local and provincial level will enhance people's ability to use risk maps for making decisions.</p>	

Persona: An ordinary citizen/bystander

Use Case 4: BIPAD for citizen reporting for response

<p>Characteristics</p> <p>Governance level: Local</p> <p>Tech-know how: novice</p> <p>DRRM competence: novice</p>	<p>Problem statement: <i>(An ordinary citizen sees a bridge collapse in a rural municipality. Two people walking along the bridge happen to fall along with the bridge. The witness calls the police but wants to report to BIPAD to further quicken the response work.)</i></p> <p>Steps</p> <ol style="list-style-type: none"> 1. Log into BIPAD 2. Click on Citizen Report option <p><i>(This opens the fields for reporting-description, hazard type, date and time of incident address with an option to upload an image. The incident reported by citizen is further verified by Nepal Police/local government before making it public; however the unverified incident is accessible to the authorized user at local government to take action immediately. Also, such reporting fills the data gaps for precise understanding of incidents.)</i></p>
<p>Goal/Motivation: To report an incident timely as a responsible citizen to ensure quick response</p>	<p>Issues A decision support system for citizen reporting is not yet established. For instance, how will the local government be notified of a citizen report? Who is the authorized body to receive the citizen reporting at first and what actions can they take based on the citizen report? Will the local police be notified simultaneously?</p>
<p>Recommendation Prepare and enforce an effective decision support system for citizen reporting-which entity is authorized for access? How will they be notified? What actions can be taken based on citizen report?</p>	

Persona: Member, Provincial Disaster Management Committee (PDMC)

Use Case 5: BIPAD for decision making on recovery

<p>Characteristics</p> <p>Governance level: Provincial</p> <p>Tech-know how: Advanced beginner</p> <p>DRRM competence: Competent</p>	<p>Problem statement: <i>(Multiple municipalities in the Terai region of the province were affected by flood. After initial response and relief works, Provincial Disaster Management Committee (PDMC) is in the process of finalizing the budget and overall plan for recovery, rehabilitation and reconstruction. A member of PDMC logs into BIPAD to acquire information to present to Provincial Disaster Management Committee and Provincial Disaster Management Council)</i></p> <p>Steps:</p> <ol style="list-style-type: none"> 1. Log in to Provincial BIPAD system 2. Go to –Damage and Loss module to acquire information on flood impact on: <ul style="list-style-type: none"> ○ Number of people dead/injured/missing ○ Total estimated loss ○ Infrastructure destroyed ○ Houses destroyed/affected ○ Livestock destroyed 3. Compare the loss and damage between municipalities <p>Some of the critical decisions for recovery-</p> <ol style="list-style-type: none"> 1. Authentic data from Nepal Police on number of incidents including loss and damage for each incident helps estimate the budget required for recovery, rehabilitation and reconstruction 2. Comparison of data between municipalities allows for prioritizing the budget and effort amongst municipalities, such that the most affected municipalities have access to budget and support from provincial government
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Goal/Motivation: To estimate and allocate budget for disaster recovery, rehabilitation and reconstruction

Legal Mandates: Carry out disaster response, recovery, rehabilitation and reconstruction at provincial level as per DRRM Act, 2017 and the Constitution of Nepal, 2015

Issues

Lack of standardization of incident reporting hinders post disaster analysis

Recommendation

Standardization of incident reporting and ensuring that it is well embedded in Nepal Police incident reporting system.

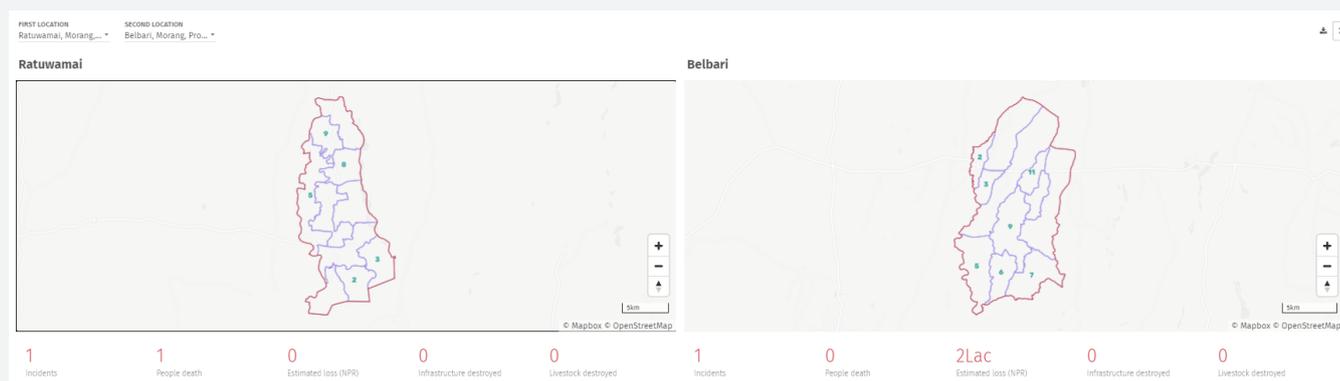


Figure 4 BIPAD for comparison between municipalities to plan rehabilitation and recovery efforts.

In 2020, Morang district in Province 1 was affected by flood. This is the comparison of incidents at Ratuwamai and Belbari municipalities. Based on this data from BIPAD, at Ratuwamai, the relief can be directed towards providing compensation to the family of the dead whereas at Belbari, rehabilitation of the destroyed infrastructure will be needed.

Persona: DRR Researcher at an NGO

Use Case 6: BIPAD for evidence based response planning

Characteristics

Governance level:
Local

Tech-know how:

Competent

DRRM competence:

Competent

Problem statement: (The municipality is frequently affected by flood. The DRR Researcher at an NGO is trying to identify and prioritize new locations to build safe shelters, where people can evacuate to during floods. He is using BIPAD to help him gather evidence)

Steps:

1. Log in to Municipal BIPAD system
2. Go to-Damage and loss module to gather information on history of flooding incidents in last 10 years and the corresponding damage and loss in the municipality
3. Go to-Risk Info page on hazard section to analyze flood hazard maps
 - o Which part of the municipality falls under 5/10/50/100/200/250 year return period flood from Flood hazard map?
4. Turn on the OpenStreetMap (OSM) layer, such that the hazard map superimposes on the OSM layer
 - o Which areas of high flood depth have gaps in safe shelters?

The following decision can be made by above data and analysis through BIPAD

1. Identify priority areas for constructing safe shelters based on flood hazard map and spatial data from OpenStreetMap.

Goal/Motivation:

To design an evidence based project in flood prone areas

Challenges

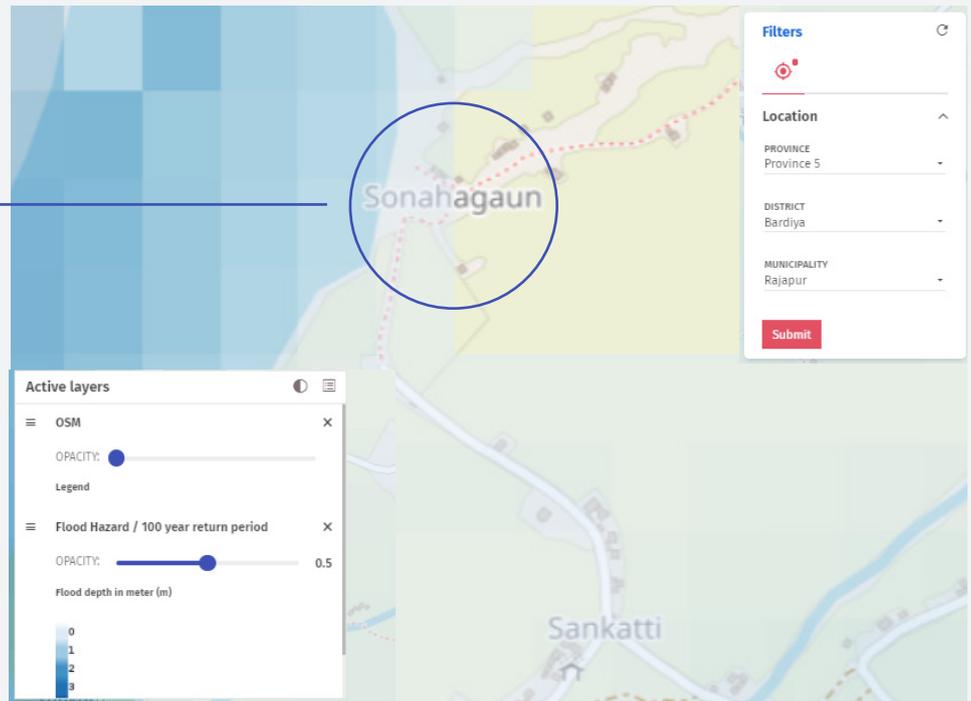
The DRR Researcher wants more evidence from the aspect of vulnerability; such as -where in the flood hazard region is the density of population high? This information on human dimension allows DRR Researcher to propose the priority areas for construction of safe shelter not just on the basis of hazard but also on the basis of vulnerability. No such information on human dimension is currently available.

Recommendations

Standardization of risk info module where raster layer can be featured below OSM layer for better visuals for users.

Integration of exposure data sets, such as building footprints with User Interface can enhance the usability of Risk Info module. The idea is that a user can select a specified area of interest to see the number of buildings within the area. This allows the user to have some sense on the density of population in the hazard prone areas.

Sonahagaun is a small village situated in flood plain region in Rajapur. It lies in flood hazard zone as evidenced by 100 year return period flood hazard map. The nearest safe shelter for people at Sonahagaun is at Sankatti. Based on BIPAD data (flood hazard maps, OSM layer), this village could be a possible priority location for constructing safe shelter.



Persona: Urban Planner

Use Case 7: BIPAD for DRR inclusive Urban Planning

Characteristics

Governance level: Provincial

Tech-know how: Advance Beginner

DRRM competence: Proficient

Problem statement: (The urban planner at the provincial government wants to propose new urban development plans for its municipalities. To ensure that the development plans take into account the DRRM aspects, she logs into BIPAD system.)

Steps

1. Log in to Provincial BIPAD system
2. Go to- Damage and Loss module to acquire information on- Which hazard is most frequent in the province in last 10 years? What are top three hazards? Which hazard has caused maximum fatalities and maximum economic loss in the past 10 years?
This module allows comparison of damage and loss between municipalities
3. Go to-Profile module to view and compare losses, resources and following demographics among municipalities- population, age group, household count, literacy
4. Go to-Risk Info page
 - o Which part of the province have high Flood hazard?
 - o Which part of the province falls under landslide risk zone as per landslide risk map?
 - o Which district/municipalities have high earthquake risk?
5. Go to-Capacity and Resource section of Risk Info page
 - o This module allows access to layers on education, health, finance, governance, tourism, cultural, industry, and communication.

The following critical information for decision making on urban planning are available -

1. Information on areas of high risk/hazard zone for settlement planning in the province
2. Information on areas with resources gap (hospitals/health posts/schools/banks/industries, etc.), where the development projects can be prioritized
3. Comparative data between municipalities for prioritization for development activities

Goal/Motivation:

To propose evidence based development plans for the province

Legal Mandates:

Promote city resilience as per National Urban Development Strategies (NUDS)

Issues

In the current BIPAD system, the available data on resources are derived from OpenStreetMap, which needs ground truthing to drive development related decisions.

Recommendations:

For City planners , who are mostly novice to advanced beginner in technology and DRRM, decision making for risk informed development can be facilitated by showing directly in Profile module in Summary section -

- o Top five frequent key hazards in the municipality/province based on Damage and Loss data
- o Top five hazards in the past that caused maximum fatalities
- o Top five hazards in the past that caused maximum economic impact
- o Top five risks, -Assigning Multi-hazard risk index and vulnerability index for municipalities

BIPAD to set standards and principles for the local governments for collection and validation of capacity and resources data

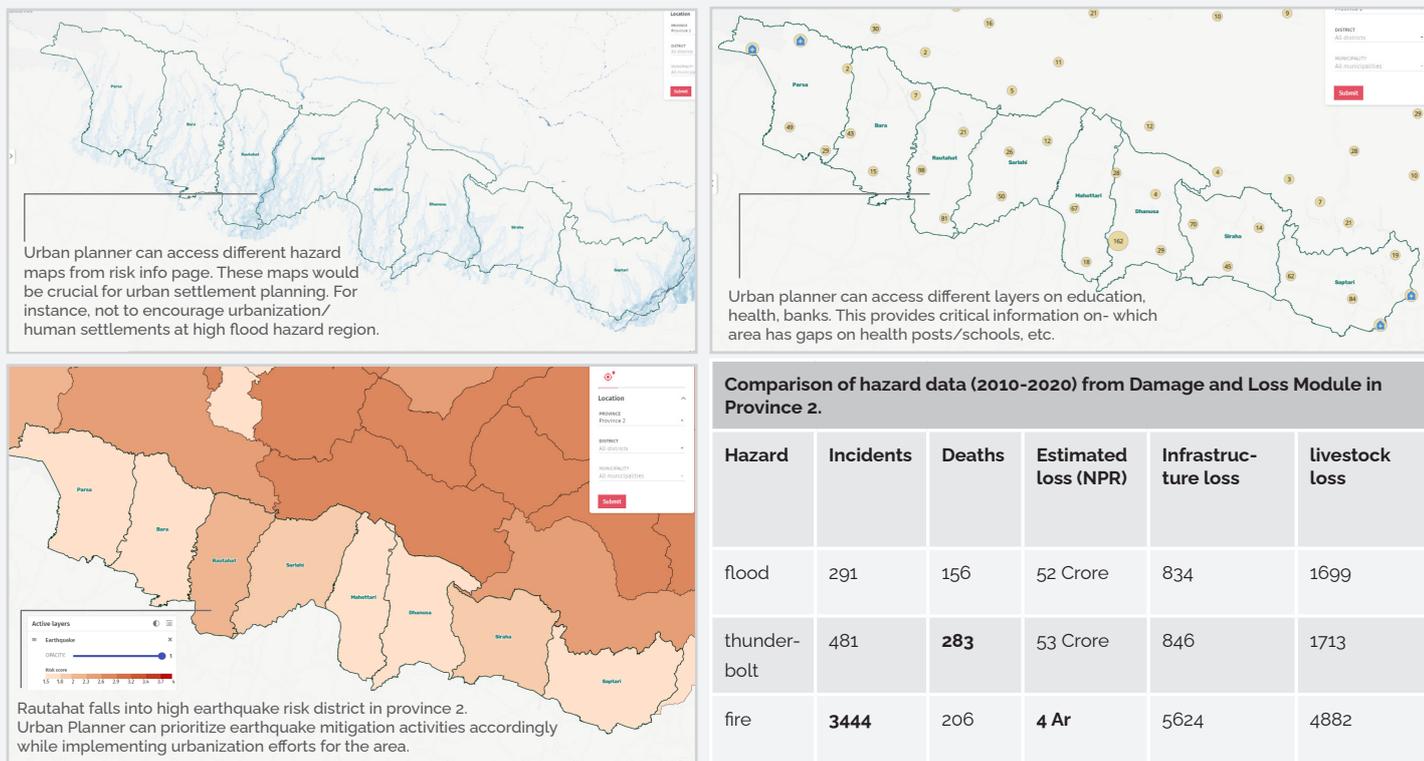


Figure 6 BIPAD for decision making in the context of DRR inclusive urban planning

Persona: Ministry of Home Affairs (MoHA) official

Use Case 8: BIPAD for Disaster Governance

Characteristics Governance level:

Federal

Tech-know how:

Proficient

DRRM competence:

Competent

Goal/Motivation:

To mobilize BIPAD as a platform for monitoring and governance

Problem statement: (A set of 38 indicators was identified to measure global progress in the implementation of the Sendai Framework for Disaster Risk Reduction (SFDRR). These indicators will measure progress in achieving the global targets of the Sendai Framework²⁵. Additionally, the custom targets and indicators are nationally defined by Member States to measure their progress against the four priorities of the Sendai Framework. The Sendai Framework Monitor also functions as a management tool to help countries develop disaster risk reduction strategies, make risk-informed policy decisions and allocate resources to prevent new disaster risks. The Ministry of Home Affairs (MoHA) official aim to use BIPAD for data on Sendai Monitoring indicators and to measure their progress against Nepal Disaster Risk Reduction National Strategic Plan of Action (2018-2030).)

Steps:

1. Log in to BIPAD system.
2. Go to-Damage and loss module to acquire information on damage and loss.
3. Go to -Profile module and Project section
 - o This section allows the users to view DRRM projects, project funds, location, and other information related to the project.
4. Go to-Indicators section of Profile module to track/view/analyses the progress on DRRM

BIPAD will be critical for decision making for DRRM governance in following ways-

1. BIIPAD will support National Government's priorities for monitoring progress on SFDRR and Nepal Disaster Risk Reduction National Strategic Plan of Action (2018-2030). This will show the gaps and necessary actions/policy decisions to be taken to meet those targets
2. BIPAD's project section allows the user to see if there is any duplication in projects and also opens avenues for partnership among the DRRM projects.

²⁵Measuring implementation of the Sendai Framework, UNDRR <https://sendaimonitor.undrr.org/>

<p>Legal Mandates: Member states of Sendai Framework for Disaster Risk Reduction (SFDRR) entitled to measure and report their progress in achieving SFDRR. Additionally, national government entitled to monitor priorities as per National Disaster Risk Reduction Strategic Action Plan (2015-2030)</p>	<p>Challenges The current damage and loss data and Project Management Information System (PMIS) need standardization to facilitate monitoring</p>
<p>Recommendations</p> <ol style="list-style-type: none"> 1. Develop minimum standards and metadata for disaster-related data in harmony with Sendai Framework Reporting Indicators (38 main indicators to measure the 7 Global targets) 2. Set up a regulatory mechanism that ensures all project holders (government/non-government) report on PMIS system. 	

Persona: DRR focal Person of a Municipality

Use Case 8: BIPAD for Disaster Governance

<p>Characteristics Governance level: Federal Tech-know how: Proficient DRRM competence: Competent Goal/Motivation: To mobilize BIPAD as a platform for monitoring and governance</p>	<p>Problem statement: <i>(The DRR focal person of a municipality is responsible for wide range of activities under DRRM. Some of her tasks under preparedness for response are to disseminate early warning to the at risk communities, make emergency plans to evacuate and support community preparedness activities before the onset of hazards. She is using BIPAD to help her make decisions on early warning and community preparedness.)</i></p> <p>Steps</p> <ol style="list-style-type: none"> 1. Log in to Municipal BIPAD system 2. Go to-Real Time Page to view real time data on rainfall, river flow, air pollution, forest fire, earthquake with indicators for -below warning level, above warning level, above danger level. 3. Go to- Damage and loss module to acquire information on the history of disaster s in the municipality. 4. Go to -Risk Info Page to acquire information on- <ul style="list-style-type: none"> o Which part of the municipality falls under 100 year return period flood based on Flood hazard map? o Which part of the municipality falls under landslide risk zone as per landslide risk map? o What is the earthquake risk in the municipality? <p>Based on real time information, historical data and risk, BIPAD supports following decision making-</p> <ol style="list-style-type: none"> 1. To disseminate timely early warning for storm and flood, to evacuate 2. To enhance emergency response based on real time data on air pollution, forest fire, earthquake, storm and flood 3. To identify the location of maximum impact and mobilize response timely 4. To prioritize the location within the municipality for community level preparedness activities
<p>Goal/Motivation: To mitigate and prevent disasters Legal Mandates: Prepare and warn communities against disaster for preparedness for response as per LGOA, 2074, and DRRM act, 2017.</p>	<p>Challenges</p> <ol style="list-style-type: none"> 1. In the Real Time module, the DRR researcher sees that a hazard has reached its warning level. He wants to acquire further spatial data for that particular station. But, the capacity and resources linked to incident in response page is not available for alerts on warning level and danger level. 2. Fails to fully comprehend the decision making elements of BIPAD without proper training on BIPAD as well as fail to interpret the uncertainty associated with risks in daily practice.
<p>Recommendations:</p> <ol style="list-style-type: none"> 1. Warnings linked to resources and spatial data (similar to incident) would allow efficient planning for early action based on early warning 2. Training on BIPAD at local level to be focused on the technicalities of BIPAD but also on efficient decision making through BIPAD. 	

04

FINDINGS AND RECOMMENDATIONS

Findings and Recommendations

This section presents findings and recommendation across three broad categories-

1. Who makes the decision through BIPAD?
2. What decisions are supported by BIPAD?
3. How enhance the system for decision making?

4.1 Decision makers: Who makes the decisions through BIPAD?

Who are the users at local, provincial and federal level government, their motivation and their role in BIPAD data ecosystem?

How can BIPAD system help the users at local, provincial and federal level to fulfill their legal mandates?

Disaster Managers and Planners: BIPAD caters to wide range of users at all three spheres of governance, from government agencies, non-government organizations, politicians, academicians, researchers, civil society, development sector professionals; however, these users make decisions differently, under different time pressure, with different types of information.

It becomes important to categorize the users into two broad sets – “Disaster Managers” and “Planners”¹⁶. In particular, the decisions made by disaster managers from the onset of hazards, early warning, response and early recovery are quite different from those made by “Planners” for long term recovery, preparedness, risk reduction and risk-informed development. Disaster Managers have to make choices fast using whatever information is on hand, their past experience and instinct, following established protocols if any, and are motivated on mobilizing resources on ground fast enough to save lives and reduce further human and economic loss. Their requirement is quick information and can compromise

on details/precision to some extent. In contrast, planners seek for detailed and reliable information to help make good decisions. They have the privilege of a longer time span to ponder over the information, analyze the data and use BIPAD in conjunction with other sources.

To drive decision making at all three spheres of governance, BIPAD has to cater to two entirely different kinds of information needs – “Fast information” and “Slow but reliable and detail information”¹⁷. The modules on Incident Reporting, Dashboard and Real Time need focus on quick relay of information to drive response decisions whereas Damage and loss, Risk Info and Profile modules need focus on data standards, accuracy, details, metadata, references, etc.

Novice to Experts: Decision making is a process of choice that can be rational or irrational¹⁸. Rational decision makers follow a sequence-identifying problem, generating alternatives, selecting a solution and evaluating the outcome¹⁹. The non-rational decision makers are characterized as having limited information process capacity and follow heuristic technique and shortcuts. They don't want data but information to act upon.

Rational decision making through BIPAD stems from ease in using technology and predisposed knowledge in the sector of disaster. The decision makers, either disaster manager or planners, have individual level of convenience in using technology and have varying degree of understanding of DRRM based on academics, experience and designated role. The Novice to Advance Beginner in using digital platform would seek intuitive tools and easy user interface, whereas someone who is technologically proficient would have the patience to explore the platform. For instance, an important decision maker, such as a Mayor or Deputy Mayor but who is just an

¹⁶Platt S (2015). A decision-making model of disaster resilience and recovery. SECED 2015 Conference: Earthquake Risk and Engineering towards a Resilient World 9-10 July 2015, Cambridge.

¹⁷Platt S, So E, Bevington J, Verrucci E and Pittore M (2014a) Thinking Fast Thinking Slow: bridging the gap between research and practice in disaster recovery. 2ECEES Conference, Istanbul August.

¹⁸Platt S (2015). A decision-making model of disaster resilience and recovery. SECED 2015 Conference: Earthquake Risk and Engineering towards a Resilient World 9-10 July 2015, Cambridge.

¹⁹Kinicki A (2008) Organisational Behaviour. Small Business toolkit. NSW Government

advanced beginner in disaster sector, could overlook data, avoid analysis from data but rely solely on decision making information shown in the portal. In contrast, DRRM experts seek for reliability of data, explore and analyze data for rational decision making.

In this context as well, BIPAD has to cater to two broad categories of decision makers-"rational decision makers" and "non-rational decision makers". User testing at local and provincial level will be helpful to understand the UI/UX needs of this category of users. One recommendation emanating from this research for non-rational decision makers is to design the profile module to convey succinct information on top risks and top hazards of the municipality or province, such that the non-rational decision makers can act upon the information without having to analyze data across other modules. See section 4.3(3).

Users versus Data Contributors: As envisioned by BIPAD, the data in the portal would come from wide range of stakeholders. The functionality of BIPAD is contingent on its data contributors. As the institutionalization of BIPAD at local and provincial level is initiated, it becomes equally crucial to create standards for data collection across all three levels for all aspects of the system. Similarly, training on data contribution would be necessary to ensure coherence in data contribution.

National to International Commitments: BIPAD embeds independent platforms for municipal and provincial governments within its national system. In essence, this resonates with the Constitution of Nepal's sole authority for DRRM to local government and concurrent authority shared by all spheres of government. The data linkage and partnership across government bodies facilitate all the spheres to exercise their concurrent roles. For instance, provinces can govern through their integrated platform, which embeds data coming from all the municipalities within the province.

BIPAD is rightly placed to support local government's mandates on DRRM as per Local Government Operationalization Act (LGOA), 2017. BIPAD can facilitate decision making across following mandates as stated in LGOA,

1. DRRM data management, research, innovation
2. Safe settlement development
3. Local level disaster preparedness
4. Flood and landslide risk mitigation
5. Flood plain management and land use management
6. Assessment and mapping of risk and vulnerability

7. Co-ordination and collaboration with provincial government, communities, NGOs and private sector
8. Allocation of funds
9. Monitoring and evaluation of DRR programs
10. Local level disaster related data collection, research and innovation
11. Local level emergency operation

Similarly, the DRRM Act 2017 has designated roles/responsibilities to different spheres of government. Among many other aspects of the act, BIPAD supports NDRRMA to evaluate DRRM performance, to advise governments based on evidence, to facilitate on expert level research, to allocate budget, and to manage external partners.

BIPAD supports provincial government to carry out their DRRM roles at provincial level by facilitating on making policy, plans and programs. BIPAD supports coordination of provinces with municipalities. BIPAD facilitates Provinces to make evidence based decisions on evacuation of population, temporary shelters, and relief distribution.

BIPAD facilitates local government to formulate their local disaster management plan, for budget allocation, for co-ordination with government and non-government stakeholders.

Similarly, BIPAD serves as management tool for all spheres of government to monitor their progress on Sendai framework and Nepal Disaster Risk Reduction National Strategic Plan of Action (2018-2030), mostly through PMIS and Indicators section in Profile module.

4.2 Outline of decisions: What decisions are supported by BIPAD?

What elements of different BIPAD modules can be used for decision making at local, provincial and federal level government?

Multi-sectorial decision making: BIPAD for decision making in all aspects of DRRM cycle, governance, budget allocation, development and private sectors:

BIPAD supports decision making to all aspects of DRRM cycle from preparedness, early warning, response, recovery and rehabilitation as shown in Table 1. In the current version, due to data gaps and lack of data standardization, certain decisions have to be made based on tacit assumptions. Information derived from the portal would be based on quantitative data, which might need supplementary qualitative information from other sources at times. Crisis managers might have to act immediately based on qualitative information from other sources due to time constraints. While BIPAD does encompass most quantitative data as a one stop solution for disaster related data and information to drive decisions, it should not be considered as replacement or representative for other qualitative information.

When PMIS system and indicators become fully operational in BIPAD, this will further function as governance tool for monitoring progress against national and international commitments for DRRM as discussed above. Planners can accommodate BIPAD in everyday decision making for budget allocation and for designing projects.

Apart from DRRM actors, BIPAD has the prospect to allure development sector and private sector through its vast pool of spatial data when local and provincial levels contribute and validate those data. The labyrinth of spatial information to be available in BIPAD, such as location of hospitals, schools, government offices, restaurants, banks, etc., can support strategic decision making for related development partners. For instance, which municipality needs new school? Where is the need for health centers? Private sectors can use BIPAD for finding the strategic locations for opening new hotels/restaurants/industries and businesses.

Thus, there are limitless possibilities on ideating innovation not just in the sector of DRRM but in other sectors as well. It also rests as an inspiration for other sectors to transform their databases into an open and evolving digital platform.

4.3 Decision support: How to enhance the system for decision making?

How can the modules be adapted to meet the needs of the users at all three spheres of government?

What additional support features and decision-making tools can be developed and embedded within BIPAD system to enhance disaster risk reduction and management in Nepal?

User Testing: While BIPAD attracts actors from wide range of sectors, the main targeted groups are DRRM actors, who can potentially make impactful decisions on DRRM and hence support national interest in disaster risk reduction. User testing at the local and provincial level involving key DRRM actors from government, non-government, private, civil society, academy and research would be helpful to upgrade the system based on research on UI/UX needs of these user personas.

Training and Capacity building: Training at the local level would be pertinent for learning to use BIPAD. However, to ensure that it is an immediate part and parcel of everyday work environment, BIPAD training be designed to embed decision making aspects relevant to the personas. This involves not just learning to use portal but parallel training on the concepts of disaster risk reduction. Separate training would be necessary for data contributors, who would require capacity building, at first, to understand the synergistic effect of data contribution. Another parallel training that can potentially synergize the training impact at local and provincial level is on risk communication. As decision making based on risk comes with uncertainty, even proficient DRRM actors might face dilemmas in judgments. Thus, it will be helpful to engage experts on risk communication while conducting trainings.

Data standardization: Incoherent data can only confuse its users and add more uncertainty to decision making. Thus, all modules need standardized data collection format. Standardization can be done relevant to national and international commitments wherever applicable. For instance, the impact and usability of damage and loss would be greatly enhanced if it is standardized as per Sendai reporting formats as far as practicable. For summarizing the risk through indices, the methodology can be harmonized with Inform Risk Index²⁰.

²⁰INFORM GRI is a global open-source risk assessment for humanitarian crises and disasters, <https://drmhc.jrc.ec.europa.eu/inform-index>

Standard Protocols: A Standard protocol on data relay is another important aspect especially for incident data, real time data, citizen reporting and situation report. Challenge in designing such protocols is to create a right balance between fast information against validated reliable information. The usability of such data demands that the information is relayed fast enough to drive response/relief actions by crisis managers. Also, important would be to set up regulatory mechanism that ensures all project holders (government/non-government) report on PMIS system.

Module Specific Recommendations:

? **Incident:** Decision making through response section of the Incident module critically depend on response resources. It would be important to standardize the list of contents for response. One aspect is to review the needs of urban environment and rural municipalities. For instance, in urban areas, response and rescue would be decisive based on whether access roads are narrow or wide. In rural areas, accessibility of roads (motorable or tack, one way or two way) could guide the rescue/response decisions. Similarly, spatial data on open spaces in urban areas would be critical for emergency services. Standardizing the attributes of capacity and resources sections and adding such data accordingly is one way to further enhance response decisions.

@ **Real Time:** The data on warnings or real time stations when linked to resources/spatial data allow decision making for early action. Currently, only incidents are linked to response page, which means incidents are connected to spatial data but early warnings are not; conceptually both need to be linked to resources. Treating early warnings from real time page as incidents so as to link them with spatial data will allow decision makers to review the spatial information related to the warning.

┌ **Profile:** For City Planners at local level, for mostly novice to advanced beginner in technology and DRRM, for decision makers who follow heuristic technique, decision making can be facilitated by summarizing the damage and loss data directly in Profile module in Summary section. Some key summarized information could be-

- Top five frequent key hazards in the municipality/ province based on Damage and Loss data
- Top five hazards in the past that caused maximum fatalities

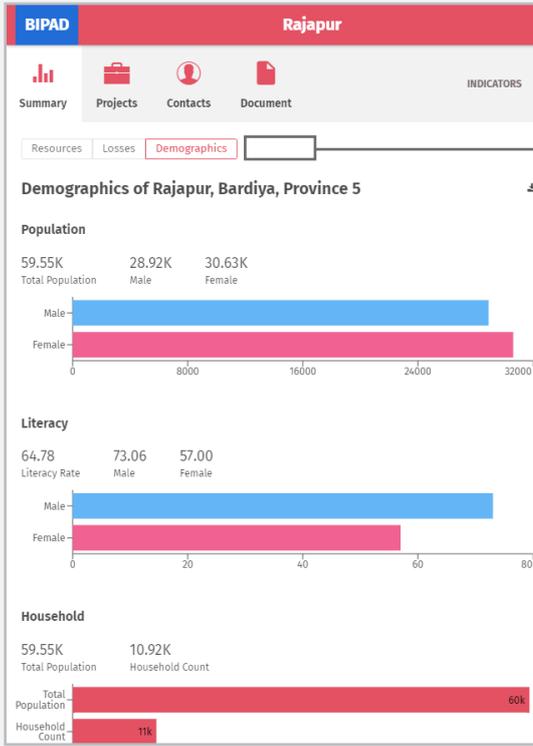
- Top five hazards in the past that caused maximum economic impact
- Top five risks, multi-hazard risk index, vulnerability index (When exposure and vulnerability data are integrated, then the system will be well positioned to show the risk index and vulnerability index)

The aforementioned recommendations are visually summarized in the next page.

R **Risk Info:** The current Risk Info module allows distinguishing hazard prone areas for some of the hazards but due to very little or non-existent data sets for exposure and vulnerability in Nepal's DRRM landscape, the user cannot perceive the vulnerability and exposure within the hazard prone area. While the OpenStreetMap fills some of the gaps in depicting exposure data for areas that have been well mapped, the existing data set doesn't support expert level risk analysis. Here, BIPAD reveals a crucial gap that needs to be filled through expert level technical research by the concerted effort of national level DRRM actors and beyond. Decision making on risk is reasonable only when the information on hazard section is complemented by exposure and vulnerability data.

Until any such data are generated through research, integration of exposure data sets, such as building footprints with User Interface can enhance the usability of Risk Info module. If a decision maker can select a specified area to visualize and quantify the number of buildings (with attributes) within the hazard area, this allows explicit judgment on the density of population in the hazard prone area of interest.

Until the geocoded vulnerability data are available through national census, the only option is to rely on local level data and sparse research if available.

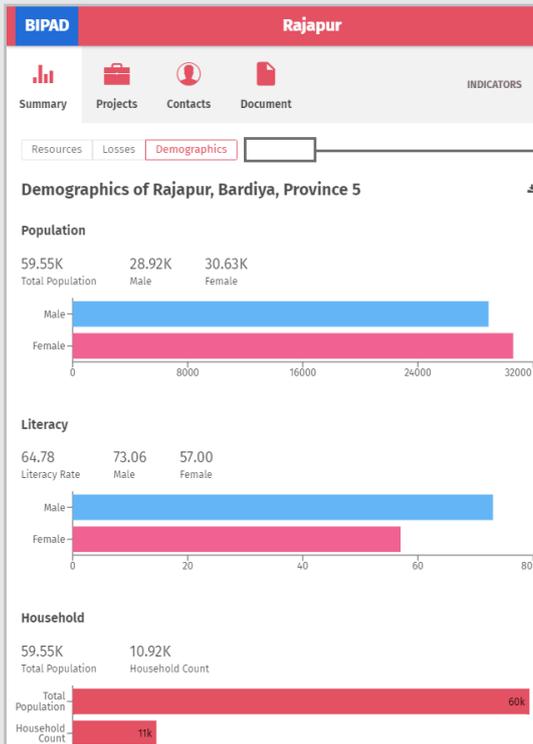


Summarized information on hazards for quick decision making for Planners

Top hazards of Rajapur

- Name and Info graphic for top five frequent key hazards in the municipality
- Name and Info graphic for top five frequent key hazards in the past that caused maximum fatalities
- Name and Info graphic for top five frequent key hazards in the past that caused maximum economic impact

Data to be based on historical data from damage and loss



Summarized information on risks for quick decision making Planners

Risk Indices

- Multi Hazard Risk Index for the municipality
- Vulnerability Index
- Name and Info graphic for top five risks for the municipality

Data to be based on risk analysis once the system fully embeds vulnerability and exposure datasets (future work)

Figure 7 Summarized information on hazards and risks for quick decision making for Planners

Synopsis of Findings

HOW BIPAD CAN BE USED FOR DECISION MAKING IN FEDERAL, PROVINCIAL AND LOCAL LEVEL?

<p>WHO MAKES The DECISIONS?</p>	<p>Who are the users at local, provincial and federal level government, their motivation and their role in BIPAD data ecosystem?</p>	<ol style="list-style-type: none"> 1. Wide Range of Stakeholders at all three spheres: politicians, academicians, researchers, civil society, civil servants, professionals at NGO/INGO 2. Primary users are DRRM related stakeholders, however BIPAD supports decision making in other sectors- development and private sectors. 3. Two broad sets of users- "Disaster Managers" and "Planners" "Disaster Managers"- who have to make choices/decisions fast for the onset of hazards, early warning, response and early recovery. Their requirements are fast information/can compromise on precision/details. "Planners"- who are involved in long term recovery, preparedness, risk reduction and risk-informed development. Their requirement is detail and reliable information; doesn't have to be quick information. 4. Broad set of users at local level with knowledge of technology ranging from novice, advanced beginner, competent, proficient and expert. Similarly, there are users with novice to expert level DRRM knowledge. Novice and advanced beginners might fall victim to non-rational decision making as they rely on heuristic techniques and their requirement is shortcut information. Competent to expert users seek for reliability of data and analyze data for rational decision making. Their need is detail and reliable data. 5. End Users and Data Contributors at all three spheres.
	<p>How can BIPAD system help the users at local, provincial and federal level to fulfill their legal mandates?</p>	<ol style="list-style-type: none"> 1. BIPAD national portal with independent platforms for provincial and local level resonates with the Constitution of Nepal's sole authority for DRRM to local level and concurrent authority to all spheres. 2. BIPAD supports 753 local governments and their staffs for decision making for almost all 12 clauses under DRRM as per Local Government Operationalization Act, 2017 3. BIPAD supports decision making towards fulfillment of responsibilities by all three spheres for all cycle of DRRM as per Disaster Risk Reduction and Management Act, 2017 4. BIPAD has the potential to act as Management tool/Governance tool for budgeting, program design and for monitoring progress against DRRM commitment at all three spheres, such as Nepal Disaster Risk Reduction National Strategic Plan of Action (2018-2030) and international commitments such as Sendai framework.
<p>WHAT DECISIONS?</p>	<p>What elements of different BIPAD modules can be used for decision making at local, provincial and federal level government?</p>	<ol style="list-style-type: none"> 1. BIPAD supports decision making in all aspects of disaster cycle. 2. Multi sectorial decision making: (DRRM, development, and private sector) 3. Governance Tool (Budget allocation, monitoring progress, and intergovernmental data sharing) 4. One stop Solution for Quantitative data but not a panacea for all DRRM problems <p>Modules and their relevancy to DRRM cycle for decision making</p> <p>Dashboard: Response and hazard impact analysis</p> <p>Incident: Emergency Response, recovery, rehabilitation, hazard impact analysis, damage and loss estimation</p> <p>Damage and loss: Recovery, Rehabilitation, Relevant for comprehending history, some aspects of Post Disaster Need Analysis, future planning</p> <p>Real Time: Early Warning and early response</p> <p>Risk Info: Risk reduction, risk informed development</p> <p>Profile/PMIS: Risk informed development and DRRM governance</p>

HOW TO ENHANCE THE SYSTEM TO SUPPORT DECISION MAKING	How can the modules be adapted to meet the needs of the users at all three spheres of government?	<ol style="list-style-type: none"> 1. Through User Testing (key DRRM actors at local and provincial level) 2. Training and capacity building (for using BIPAD, for decision making through BIPAD, for risk communication, for data contributing) 3. Data standardization across all modules 4. Standard protocol on data relay (especially for incidents, citizen reporting, situation report). The usability of such data demands that the information is relayed fast enough to drive response/relief actions by crisis managers. This calls for balance between fast information against validated detail information. 5. Regulatory mechanism to ensure data is contributed to PMIS and capacity & resources by all stakeholders
	What additional support features and decision-making tools can be developed and embedded within BIPAD system to enhance disaster risk reduction and management in Nepal?	<ol style="list-style-type: none"> 1. Incident Module: Standardizing the attributes and list of response resources (based on response needs) is one way to further enhance response decisions. 2. Real Time: Real time stations/ warnings to be linked with capacity and resources for response. This allows decision making for response not just post-incident but also for early action based on early warnings from Real Time page. This can be embedded by treating early warnings as incidents for response. 3. Profile: Summarized information on hazard and risks, risk ranking to support decision making for novice to advance beginner in technology and DRRM 4. Risk Info: Integrating building footprints in exposure section and embedding a feature to calculate number of households within user's selected area of interest. This will aid decision making in identifying the exposed population. 5. The modules on Incident Reporting, Dashboard and Real Time need focus on quick relay of information to drive "Response Decisions" whereas damage and loss, Risk Info and Profile modules need focus on data standards, accuracy, details, metadata, and references to drive "Planning Decisions".



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