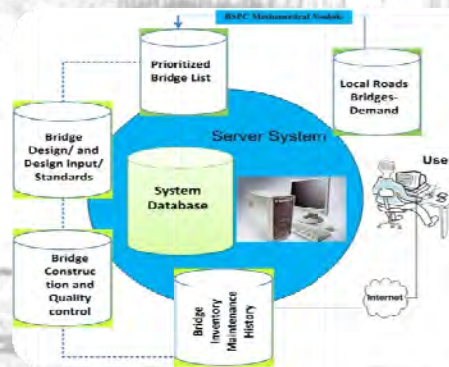




Bridge Information Management System – BIMS An Approach Paper

February 2013



Preface

This approach paper describes Bridge Information Management System (BIMS) for Local Road bridges in Nepal. This is prepared by Local Roads Bridge Support Unit (LRBSU) with the support and feedback from SDC.

Bridge Information and Management System is highly essential within the districts as well as within the Local Bridge Section at DoLIDAR. This paper will provide the overview BIMS system requirement, system development and usability of the system.

List of Abbreviations

BIMS	Bridge Information Management System
DDC	District Development Committees
DoLIDAR	Department of Local Infrastructure and Agricultural Roads
DoR	Department of Roads
DTO	District Technical Office
FY	Fiscal Year
GoN	Government of Nepal
LBS	Local Bridge Section
LRBP	Local Roads Bridge Programme
LRBSU	Local Roads Bridge Support Unit
LRN	Local Road Network
LRUC	Local Road User Committee
MFALD	Ministry of Federal Affairs and Local Development
SDC	Swiss Agency for Development Cooperation
SRN	Strategic Road Network
TA	Technical Assistance

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1 BACKGROUND

Local Roads Bridge programme (LRBP) is implemented since February 1, 2011 under the Bilateral Agreement between Government of Nepal and Swiss Government.

The initiation of Local Roads Bridge Programme (LRBP) has come from the understanding that one of the major causes of rural poverty in Nepal is lack of access to the markets and service centers due to the absence of adequately maintained local roads and lack of bridges connecting them. Without reliable motorable crossings on the rivers, people living in the area are not able to get maximum benefit from the roads constructed and also the investments made in road are not fully utilized. The programme aims to improve the living conditions of local people by facilitating them with better access and improved mobility.

2 CONTEXT

Local Roads Bridge Section/ Department of Local Infrastructure Development and Agricultural Roads at central level and DDCs/ DTOs are responsible for planning/budgeting/management and implementation of local roads bridges respectively. While it was understood about the roles of different agencies for planning, budgeting and implementation, it was equally important to learn about the status of this process, how bridges are planned, selected and built, how many bridges are existing, how many are required etc. During the period of initial years of Local Roads Bridge programme implementation, it was learnt that because of the importance of bridges on local roads, there were thousands of bridges in demand and the process of selection of bridges for construction are rather ad-hoc, political and not scientific and transparent. The contract management of bridges under construction is very poor, because of which, the status of progress and construction quality are less known to the districts as well as DoLIDAR. Although there is some centralized information, there is no systematic or reliable information about the inventory of existing bridges or bridges under construction. Many key information are either missing or some of them are even duplicated. This has led to much confusion, discrepancies and thus affected the bridge planning and decision making in a systematic and efficient way. Similarly, it is equally difficult to monitor the progresses and ensure construction quality and safety for those bridges under construction.

Considering these, it is very vital to have proper bridge information and management system within the districts as well as within the Local Bridge Section at DoLIDAR. In order to support this, Local Roads Bridge Support Unit (LRBSU) is developing an user-friendly web-based Bridge Information Management System (BIMS) that would essentially:

- Provide information, database and inventory of local road bridges at district and central levels;
- Systematize local roads bridge demand and selection process; and

- Share local roads bridge specific information with the public and other stakeholders with appropriate/concurrent access rights to different users.

It is expected that with a full-fledged BIMS in operation, the management of local roads bridges will be much more effective, efficient, and transparent. The BIMS is currently hosted by Local Roads Bridge Programme and its server on behalf of DoLIDAR, while it is still under the development and trial stage. Once the capacities of districts and DoLIDAR are gradually enhanced for its use, it will be transferred to DoLIDAR and Local Bridge Section in DoLIDAR will operate it.

3 BRIDGE INFORMATION MANAGEMENT SYSTEM (BIMS)

Bridge Information Management System (BIMS), is the web based information management, share and dissemination system for Local Roads Bridges. This is an integrated database system of local roads motorable bridges. This includes the different modules of bridge demand, bridge prioritization/ selection, construction and maintenance of local roads bridges.

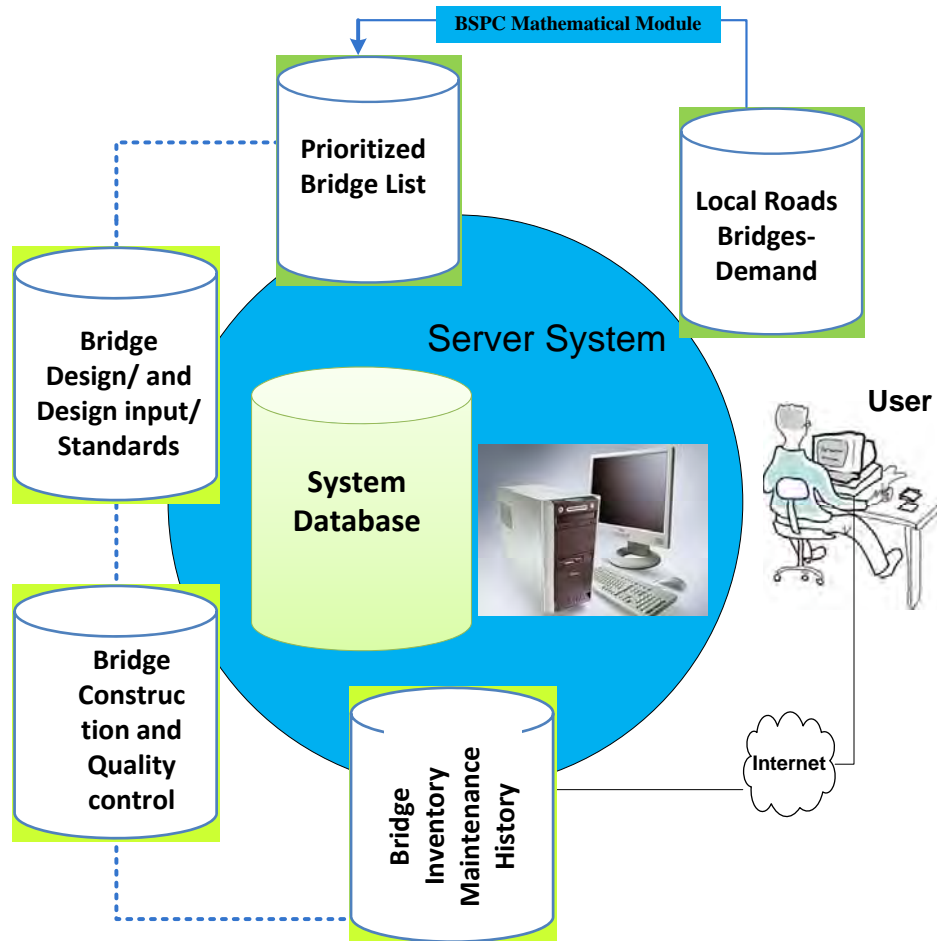


Figure 1: Prototype system Architecture for BIMS

4 OBJECTIVE OF BIMS:

The specific objectives behind the development of this online **BIMS** are summarized but not limited to following points:

- To have proper database/ information/inventory of local roads bridges at central and district level;
- To share the local roads bridge specific information with the public and other stakeholders;
- To systematize the bridge demand and selection process;
- To support on investment decision making for Local Roads Bridge section and districts for local roads bridges
- To improve the capacities of districts and DoLIDAR on bridge information management;
- To ensure transparency and make available the latest information available to everyone at anytime and at anyplace with internet connection;
- To incorporate with appropriate access rights to display different information to different users; and
- Provide concurrent access to the users

Following are the expected outcomes of aforementioned objectives.

5 EXPECTED OUTCOMES:

Outcome 1: DDCs/ DTOs and LBS/ DoLIDAR adopt bridge demand prioritization and selection process.

The system incorporates the bridge demand prioritization and selection criteria as part of its module. The bridge demand list will be entered in the system from the districts. The districts fills out forms for prioritization of bridges based on criteria described. Once the bridge on demand passed the basic criteria at district level, it is then forwarded to the center for applying selection criteria at the central level. Once the bridge passes all the criteria, it will then be entered as selected bridge in the system. It is assumed that the concerned authority whether it is District or DoLIDAR, proceeds for next stage of design and construction from prioritized bridges. During the programme period Local Roads Bridge Support Unit (LRBSU) together with LBS/DoLIDR will monitor the system. LRBSU will also support for design services for prioritized bridges and MFALD, LBS/DoLIDR allocates the budgets based on the system prioritized list.

Outcome 2: District and Central level authorities have improved information management system for Local Roads Bridges.

In the absence of BIMS, there is no proper planning and management system for local roads bridges. Currently, the bridge related information is very partial, managed both at district levels using different system and at DoLIDAR with different formats and system. The information are either incomplete or sometimes duplicated with no integrated system in place requiring cumbersome checks of data. After implementation of BIMS, it is therefore expected that national level bridge demand list; list of bridges selected that have passed the prioritization and selection criteria; and list of bridges in design, in construction and in maintenance stages with relevant information required for different user groups from district authorities, DoLIDAR, Ministry, Private sector (consultant and contractors), general public etc. LBS/DoLIDAR will monitor the system use by the district and provides feedback on the databases and information they have entered in the system.

6 MODULES IN THE PROPOSED BIMS

BIMS includes below different modules with different stages of bridge management from list of demand-screening/prioritization/selection – design and technical specification-construction management and maintenance history.

Module 1: Long List of Bridge Demand

Module 2: Bridge Demand/ Screening and Prioritization

Module 3: Bridge Design and technical specification

Module 4: Construction Management

Module 5: Maintenance History

Module 1: List of Bridge Demand

This is first module that consists of storing of data of all the bridges in the list of demand from all the districts. It provides the web based bridge demand entry form which can be access by authorized user for example: DDCs/DTOs. The user can fill the form and enter the data from the districts. This will only stores list of the bridge in demand with some key information (name of river, location – coordinates of left and right banks of proposed bridge, name of road on which it is proposed, name of the Village Development committee/s, name of the district, population to be benefited etc). User will have the opportunity to view the bridge list according to the selected districts.

Module 2 Bridge Screening, Prioritization and Selection

This module starts after storing the local roads bridge demands from different districts. It incorporates the bridge screening prioritization criteria approved by DoLIDAR and MFALD and hence the system automatically prioritizes the bridge demand in different 3 stages of bridge screening process. The user can view the prioritized list of bridges at different stages and the user interface will provide the simple query window so that user can make query in the database and can view the result through interface.

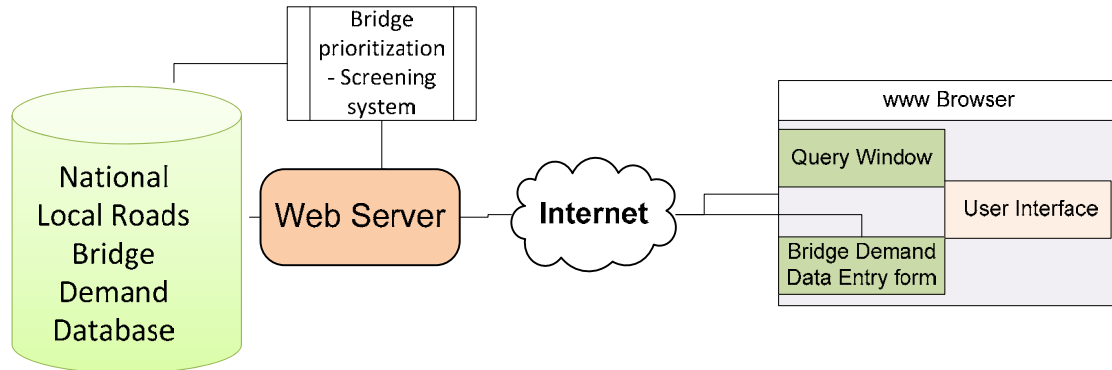


Figure 2: Prototype system for Bridge demand module in BIMS

Based on the resources available LBS/DoLIDAR and DDCs will select the number of bridges from the priority list for design procedure during that Fiscal Year (FY). The number of bridges to selected is guided by the budget available for bridge design /construction of that Fiscal Year.

Module 3: Bridge Design and Technical Specification

Once the bridge gets prioritized and selected through the 3 stage screening process, it proceeds to the detail survey and design stage. In this module, information on design inputs and parameters are incorporated. User interface provides the different input forms of bridge design through the web. Authorized user has facilities to change the certain design parameters, but the system will record when and who has modified the design parameters. All the technical information like span arrangement, foundation type, together with the detail cost estimation is incorporated in this module. Through the user interface, users can make query on bridge type, span arrangement, and foundation type etc. Furthermore, user can generate the bridge design technical reports through user interface for the specific bridge.

The module also provides the information and documents related to local roads bridge design guidelines, norms and standards developed by DoLIDAR assisted by under the Local Roads Bridge Support Unit (LRBSU).

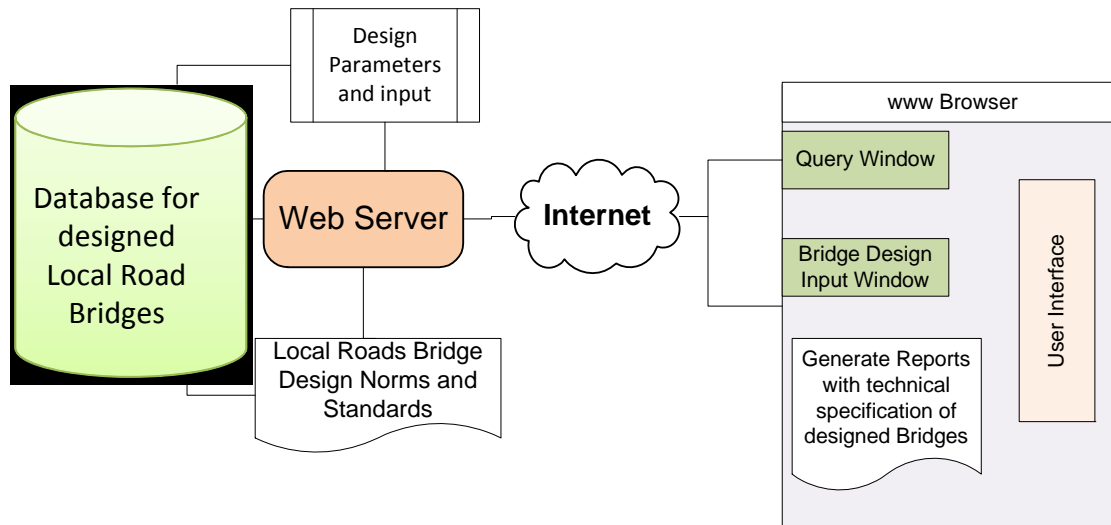


Figure 3 Prototype system for Bridge design and technical specification module in BIMS

Module 4: Bridge Construction Management

This is the most important module of the bridge information management system. When a bridge proceeds to construction stage, it is highly important to record the information systematically regarding regular progresses of construction with respect to physical outputs and financial delivery and quality control. This module will consist of the database/information that are related to bridge construction management and serves as a key portal for bridge construction contracts management

User interface provides the inputs forms such as worker details, construction updates, and construction supervision and quality control reports. Authorized user, for example site engineers/ sub-engineers can submit the reports through the web-based forms. User interface provides the query window and options for generating the reports with construction progress and quality control. Also it provides the facility to generate the bridge construction progress report, overview of the prototype is shown in the figure below:

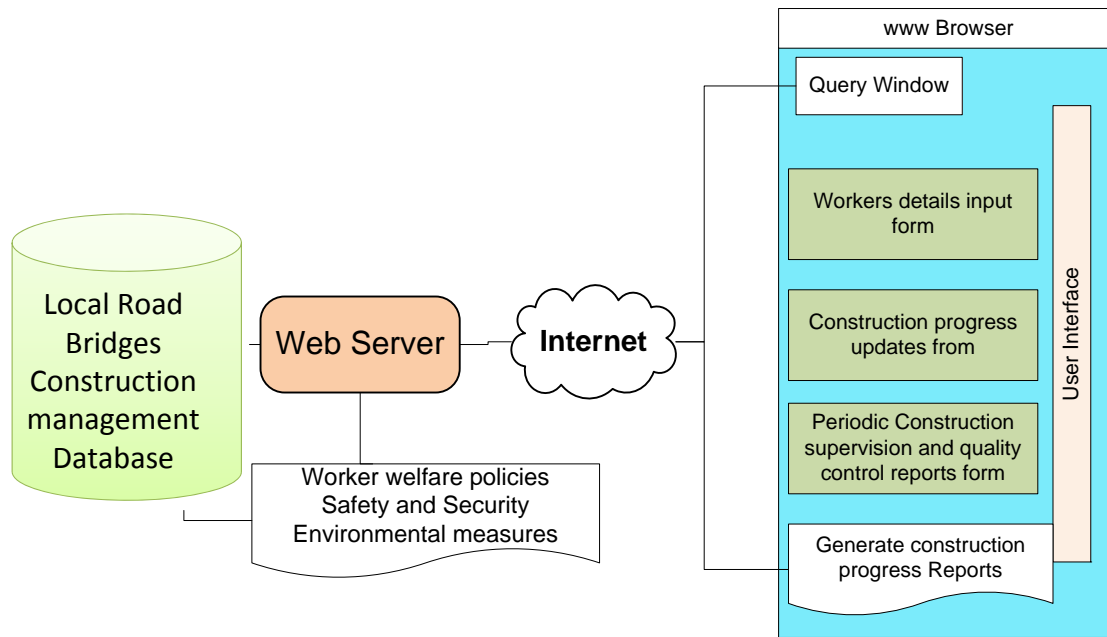


Figure 4 Prototype system for bridge construction management module in BIMS

Module 5: Maintenance History Module

This module will consist of the entire history on the maintenance of the local roads bridges. The system automatically generates the alert list of bridges to be maintained or repaired one the bridge construction is completed. In addition, it provides the entry form through the user interface to update the bridge inspection and conditions including regular and periodic maintenance activities of the bridge. Maintenance activities can be recorded in the database system using web based user interface. In the module the system categorizes the district wise bridge list requiring for minor/major/emergency maintenance. System automatically sends the auto-generated emails with bridge list to be checked to the authorities at local and central level. This provides the query window so that user can make query related to the maintenance history of the specific bridge. User can generate the reports regarding basic technical specification of bridge and the maintenance history of the specific bridge.

Bridge maintenance manual and guidelines will also be made available to the users in this module.

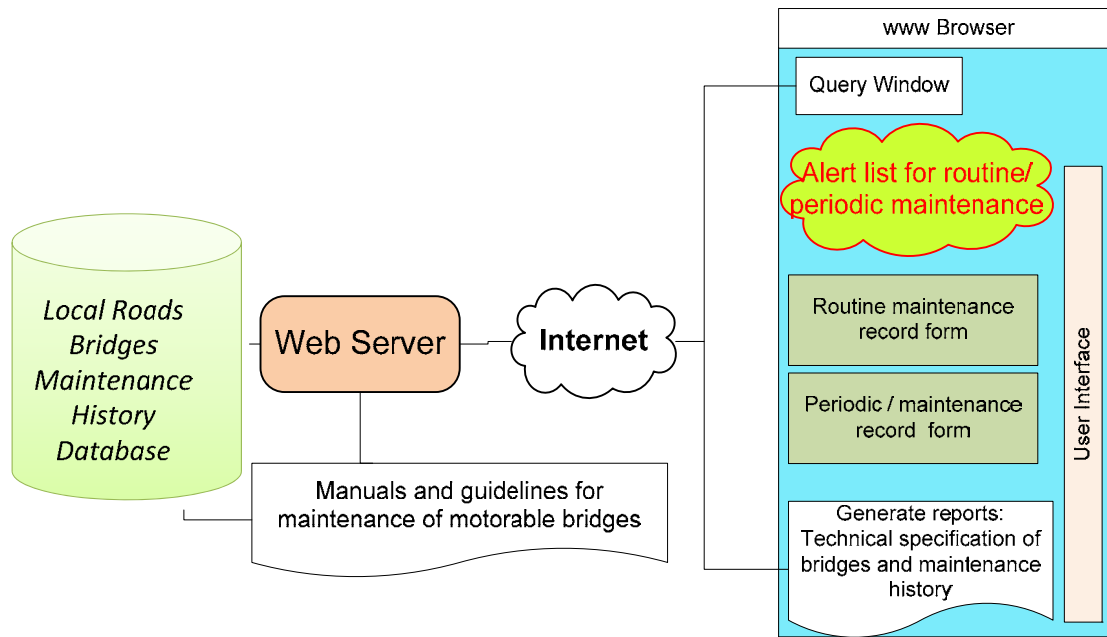
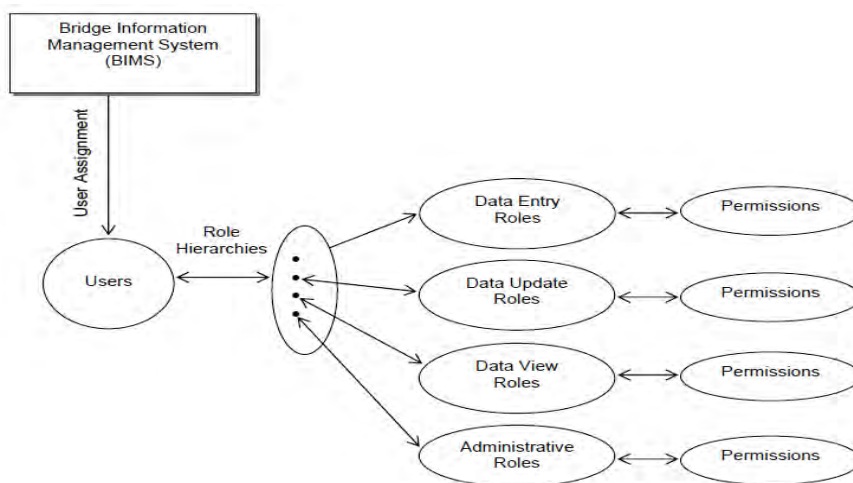


Figure 5 Prototype system for maintenance history module in BIMS

7 ACCESSIBILITY CONTROL AND LEVEL OF USERS

Based on the accessibility the users are categorized in different levels



For example:

Admin User (control the entire system)

Local authority/ site engineers/ LBS (Data inputs, report submission, querying, viewing)

General Public / wider global community (querying and viewing information)

8 INSTITUTIONAL ARRANGEMENTS:

The system is used by different organizations such as LBS/DoLIDAR, DDC/DTOs and others. According to the role and responsibilities of institutions/organizations they will have interest for different level of information and they have different roles in the system management. In the sustainability of the system these organization will have most important roles. Roles and responsibilities of those institutions are listed below.

SN	Organization/ Institutions	Roles/ Responsibilities	Remarks
1	DDCs/ DTO	<ul style="list-style-type: none"> • Supports in collecting bridge demands data • Submit the bridge demand made by the public to the DDC council for approval • Monitor/update/upload the district Bridge demand list in the database • Record the bridge demand of all districts in one system and check for selection and update regularly • Record and update bridges in design stages • Record and update bridges in construction stages • Record and update bridges in different conditions after construction • Record and update information on bridge inspection for bridges on operation • Record and update information on bridge maintenance • Generate specific reports 	
2	LBS/DoLIDAR	<ul style="list-style-type: none"> • Maintain and update the information of centrally executed bridges in the system • Coordinate with DDCs/ DTOs for information / update system to have consolidated bridge inventory • Build capacities of districts through supports and directives to apply and implement BIMS • Monitoring of overall system implementation by district authorities • Implement data sharing policies with other departments within DoLIDAR • Use of BIMS in planning and management local roads bridges in Nepal • Generate specific reports 	

4	MFALD/DoLIDAR	<ul style="list-style-type: none"> • Monitoring LBS/DoLIDAR managed information and information system • Generate specific reports any time for use of dept and ministry anytime • Formulate and implement different policies using the BIMS 	
5	LRBP	<ul style="list-style-type: none"> • Development of the system and system implementation • Assist LBS/DoLIDAR and DDCs/DTOs for system implementation • Capacitate LBS/DoLIDAR and DDCs/DTOs for the use of BIMS 	
6	DoR	<ul style="list-style-type: none"> • Get access on local roads bridge specific information and use this information as reference for planning of bridges under DoR. 	
7	Other Projects	<ul style="list-style-type: none"> • Use local roads bridge specific data from BIMS and reduce duplication in planning. • Be informed about the local roads bridges specific activities/ information. 	
8	General Public	<ul style="list-style-type: none"> • View and access information on local roads bridge management in Nepal 	

9 BENEFITS AND BENEFICIARIES

The BIMS is a decision support system for management of bridges on local roads by the authorities (DDCs and DoLIDAR). The benefits using BIMS can be summarized but not limited to the following;

- It provided sources for fact base reporting on local roads bridge management;
- Bridge specific investment, technology used, bridge design techniques, bridge construction management and quality control mechanism can be analyzed using the system;
- Common platform for bridge specific information management and sharing;
- Improve in effectiveness, efficiency and transparency of DDCs/DoLIDAR on bridge management;

9.1 Beneficiaries

The beneficiaries for the system are envisioned at different levels as given below:

WHO	WHY
Government (MFALD, DoLIDAR and DDCs) at Policy Level	<ul style="list-style-type: none"> ▪ Formulating Policies, planning & resource allocation, and monitoring
Government (DoLIDAR and DDCs), Private sector (consultants and contractors) at Execution and Management Level	<ul style="list-style-type: none"> ▪ Implement fair bridge selection process, design and implement standards, monitoring : Physical - Financial progress, management of information and fact base reporting, to reduce duplication (for example: LBS/ DoLIDAR, DDCs/ DTOs) ▪ Access to information, follow the norms and standards (for example: Consultant, Contractor, and bridge professionals)
Public Level/ Wider Audience	<ul style="list-style-type: none"> ▪ View information and be informed about the status of demand they made. ▪ Be informed about the activities of the state in the sector of local roads bridges