



**Ministry of Forests and Soil Conservation
REDD Implementation Centre**

**Develop National Database of Basic Attributes of all Forest Management Regimes and
Develop National REDD+ Information System or Registry**

Contract No: (FCPF/REDD/S/QCBS-24)



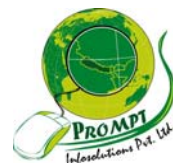
**Technical Working Document n. 4 to Final Report
System Requirement Study Report**

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List of Abbreviations

Term	Definition
AJAX	Asynchronous JavaScript and XML
CSS	Cascading Style Sheet
DED	Deputy Executive Director
ED	Executive Director
HH	Household
HTML	Hyper Text Markup Language
MIS	Management Information System
RFP	Request For Proposal
SO	Support Organization
SRS	Software Requirement Study
FRA	Forest Resources Assessment of Nepal Project
DOF	Department of Forests
TOR	Terms of Reference
VDC	Village Development Committee
DFO	District Forest Officer
DFRS	Department of Forests Research and Survey
CFUG	Community Forest User Groups(s)
DBMS	Database Management System
XHTML	Extensible HTML
XML	Extensible Markup Language
GIS	Geographic Information System
MRV	Measuring, Reporting and Verifying
REDD	Reducing emissions from deforestation and forest degradation
RL/REL	Reference Emission Level
WWF	World Wildlife Fund
FP	Forest Product

1. Introduction

1.1 Background

The project "*Develop National Data Base of Basic Attributes of All Forest Management Regimes and Develop National REDD+ Information System or Registry*" aims to develop harmonized monitoring, assessment and reporting National Forest Information System-National Forest Database for sustainable forest management. To achieve this target requirement study has been done. This included several subtask. It started with design of a brief questionnaire regarding existing forest information systems and databases.

We visited different divisions and departments also. Our main purpose was to gather information regarding how they are working at present and what kind of expectation they have from proposed develop system. So that a broad picture of requirement can be created.

This report speaks about the existing system environment & existing operating environment along with the proposed system environment & proposed operating environment.

1.2 Purpose

The purpose of this "Requirement Study Report" is to identify indicators for the development of "National Forest Database- National Forest Information System" and verify it from clients so that proposed developed system can be used to support the planning, implementation & monitoring of multi objective forest management activities. Besides this the NFD- NFIS also should have the ability to maintain current forest inventories and generate and retrieve spatial data (maps).

1.3 Scope

This Software Requirements Study Report provides a complete description of all the functions and specifications. The expected audience of this system are the Forest User Group, Districts, Department of Forest, Research & Survey, Department of National Park & Wild Life Conservation, Department of Soil Conservation & Watershed Management & Department of Plant & Resources.

The objective of this document is to present to NFD-NFIS users the first version of requirement specifications which will form the basis for the application architecture and design. The requirements specifications will be finalized based on the feedback/comments received from REDD Cell, World Bank & other entities on submission of first version of "Software Requirement Study Report".

1.4 References

Physical and Electronic Documents Referred:

- Contract (document between Agriconsulting spa Italy JV Prompt Infosolutions Pvt Ltd Nepal and REDD Cell Nepal, (Amended to REDD Implementation Center
- Institutional Profile
- Terms of Reference
- CFUG Guideline
- Annual Report & Analysis Book of CFUG
- Forest Carbon Measurement Guideline
- LFUG Forest and Animal Development Program's
- Framework Structure book of REDD+

Applications Referred:

- Existing System of CFUG
- MIS system of Ministry of Forest & Soil Conservation

Databases Referred:

- PV.Forest-2000.mdb
- Buffer zone Forest 2069-70(word Doc)
- Collaborative & Protected Forest (Excel)

Person Interviewed:

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- MrTika Ram Adhikari
- DrRajanPokhrel
- MrPemKannel
- MrPrakashMathema
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- JeevanKasla
- Yam BahadurMadhesi
- Suman Gupta
- Krishna Pd. Sapkota
- Ganesh Raj Acharya
- KarnaBahadurPandey
- Mr Yam BahadurMedhasi

1.5 Limitations

The review has been limited to technical aspects of forest management information systems. Another limitation to the extent of this review was the available time for the entire consultancy mission, which was six months.

2. The Overall Description

2.1 System Architecture

Three Tier application increases performance, scalability, flexibility, code reuse, and have a numerous of other benefits. In the three tier design, applications break down into three major areas of functionality:

- The data layer manages the physical storage and retrieval of data
- The business layer maintains business rules and logic
- The presentation layer houses the user interface and related presentation code

Inside each of these tiers there may also exist a series of sub-layers that provide an even more granular break up the functional areas of the application. Below mentioned figure outlines a basic three tired architecture along with some of the sub-tiers.

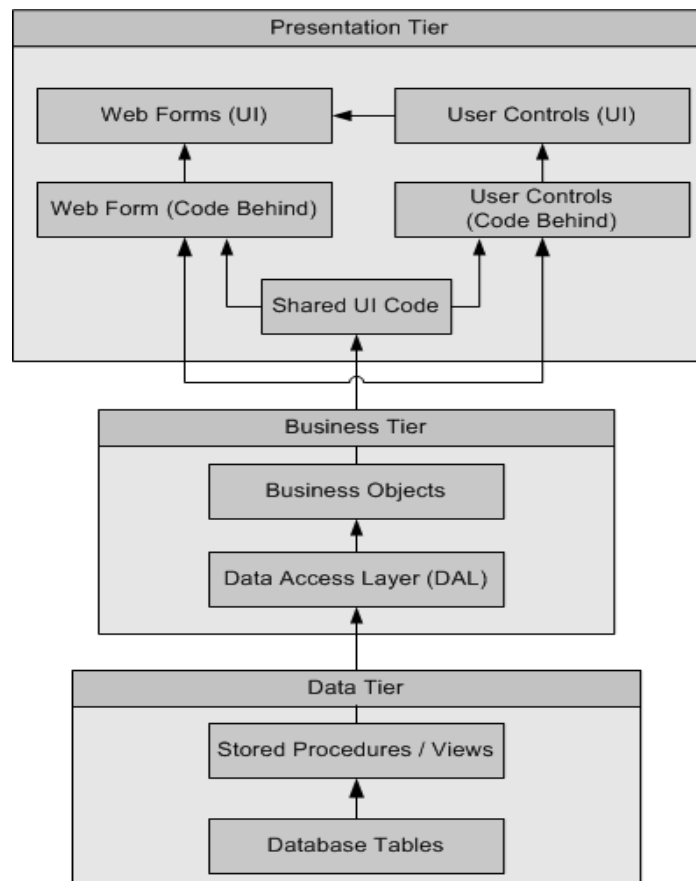


Figure 1 Three Tier System Architecture

2.1.1 The Presentation Tier

The markup file defines the look and layout of the web form and the code behind file contains the presentation logic. It's a clean separation because both the markup and the code-behind layers house specific sets of functionality that benefit from being apart. Designers don't have to worry about messing up code to make user interface changes, and developers don't have to worry about sifting through the user-interface to update code.

2.1.2 The Business Tier

A business object is a component that encapsulates the data and business processing logic for a particular business entity. It is not, however, a persistent storage mechanism. Since business objects cannot store data indefinitely, the business tier relies on the data tier for long term data storage and retrieval. Thus, business tier contains logic for retrieving persistent data from the data-tier and placing it into business objects and, conversely, logic that persists data from business objects into the data tier.

2.1.3 The Data Tier

In Data layer, tables define the physical storage of data in database. Stored procedure and views layer allow manipulating data as it goes into and out of those tables. Layer of stored procedures and views allows exposing the same logical structure by updating a views or stored procedure to account for the physical change without having to touch any code in business layer. When used appropriately, a layered design can lessen the overall impact of changes to the application.

2.2 System Environment

2.2.1 Existing System Environment

Under existing system study we got following difficulties.

- Lack of infrastructure for the management of data
- Difficulties in timely accessibility of data
- Difficulties for finding history
- Lack of user activities log.

- Lack of data accuracy & transparency.
- Time consuming reporting process.

Similarly many more obstacles are existed in existing environment of data management process.

2.2.2 Proposed System Environment

The NFIS will be developed to allow data holders to provide information for reporting activities. Users will have web-based direct access .They will be able to discover, integrate, and display current, authoritative, relevant, and accurate information about sustainable forest management.

The proposed NFD-NFIS will be developed to run smoothly in the existing system environment. The following System Environment is proposed just only as an option through which better performance can be achieved which could be a benefit in future .

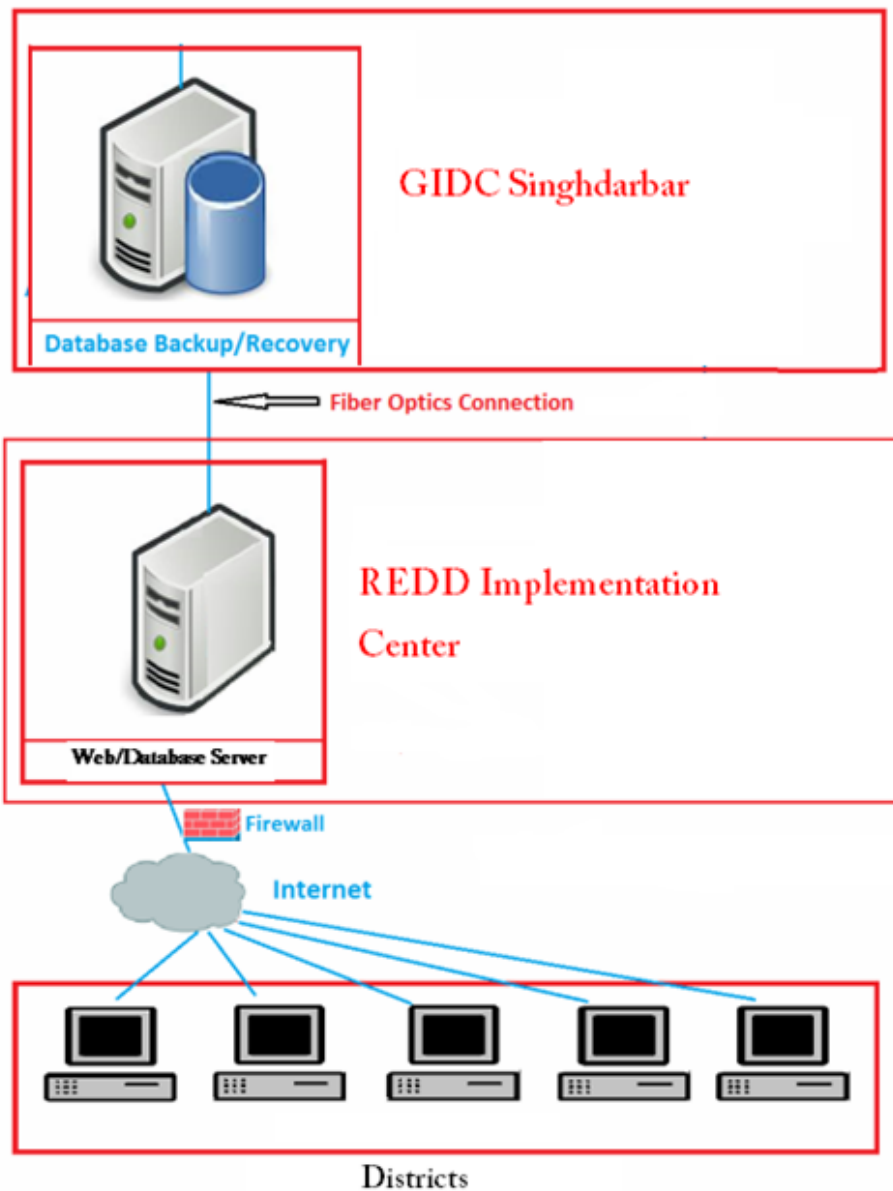


Figure 2 Proposed System Environment

The “NFD-NFIS” Shall be operated from the Web Server. User connects to the Web Server, Web Server will then interact with the Database, which allows the program to transfer data to and from a database.

Alternate/backup server also exists which comes in action if the main web server fails.

2.3 Product Perspective

As can be seen, the proposed “NFD- NFIS” will not only replace some of the existing small systems along with manual process system but will also provide enhanced functionality. Further, as per the requirement as mentioned in TOR all divisions/departments will be integrated into the main application to make the entire application function as an Integrated National Forest Information System.

The overall objective for NFD- NFIS is generally to achieve a situation with

- Timely access to consistent, accurate data
- Sharing of data for collaborative decision-making
- Improved communications across departments and levels
- Reduced duplication of tasks and efforts
- Fast, efficient service to both governmental offices and the public

2.4 Product Features

The NFD-NFIS is envisaged as an integrated system which will be used to support the planning, implementation and monitoring of multi-objective forest management activities. It can be used for strategic, tactical and operational planning and implementation, and operational control in and across administrative units and levels of the organizational hierarchy .The components of the NFD- NFIS shall be linked with Geographic Information System.

Different reports are needed during the business process of forest management activities which is managed by Report Management. Certain Standard Reports are pre-defined in the NFD- NFIS and other reports can be generated dynamically as per the requirements of users.

2.5 User Characteristics

This section names and describes the various users of NFD- NFIS.

S.No	User	Description
1	Super Administrator	Super Administrator are those who controls the NFIS-NFD and will have all the authorities on this system. Key activities of Super Administrator are as follows: <ul style="list-style-type: none">• Create user type "Division Admin"• View site log activity• Manage site contents• Manage lookup tables
2	Division Admin	<ul style="list-style-type: none">• Create User Type "District Users "• Manage District Users• Manage "Gallary", "Events", "News" and "Upload Files"• Report Generation
3	District Users	<ul style="list-style-type: none">• Insert,Update,Delete district level data• Report Generation
4	General Users:	View Published Reports

Table 1 User Characteristics

2.6 Design & Implementation Constraints

As mentioned, the Design and Implementation constraints are:

Operating System:Linux

Implementation language: PHP

Framework:Codeignitor

Database: PostgreSQL

User interface: HTML, XHTML, CSS

Client Side Script: JavaScript, AJAX

AJAX is a web technology which enables to send data to server from client asynchronously. It will be used widely in NFIS-NFD where ever data are to be retrieved and saved instantly according to the user activity within a single page.

2.7 Naming Convention

The Naming Convention which will be adopted during the project is listed below:

Type	Naming Convention	Examples
Namespaces	Use CompanyName.Technology as root namespace.	REDD.PHP.NFIS.BusinessLogic
Assemblies	Use same convention as namespace, but end with dll	REDD. PHP.DataAccess.dll
Classes and Structs	Pascal case with appropriate noun.	BalanceSheet

Interfaces	Same as above but starting with capital letter I	IAccountRules
Private variables	Start with underscore m_ and use pascal case.	BalanceSheet m_BalanceSheet
Local variables	Use camel case	String strFirstName
Parameters	Use pascal case started with small case letter p.	pMessage
Methods	Use pascal case started with verb	GetBalancesheetReport(...)
Properties and enumerations	Use pascal case started with P_ and E_ repectively.	P_BalanceSheet E_AccountTypes
Controls	Use camel case started with prefix related to that particular control	Button: btn ComboBox: cbx ListView : lv ListViewItem: lvi TextBox : txt Dialog : dlg Form : frm Etc
Primitive types	Use camel case started with prefix of that type.	bool m_bFlag int m_iCounter float m_fTotal
Event	Appropriate Event name with EventArgs as suffix and instance as e while passing as parameter.	ExchangeRateChangedEventArgs e

Exception	Use ex as instance of exception.	SqlException ex
Database Table	Use pascal case with prefix tbl_	tbl_Forest_Type
Database view	Use pascal case with prefix vw_ followed by table name tablename_	vw_Forest Type_List Forest Type
Database stored procedure	Use pascal case with prefix sp_ followed by table name tablename_	sp_Forest Type_Get Forest_Type
Database function	Use pascal case with prefix fnc_	fnc_SumSalary
Database name	Use db_ as prefix followed by module name.	db_NFIS

Table 2 Naming Convention

2.8 Assumption & Dependencies

The new system is developed referring to the all the existing system, the Terms of Reference and the new requirements. We assume the details we were provided with were correct and valid.

3. Specific Requirements

3.1 Hardware /Server Requirements

S. No.	Description	Input	
		Unit	Quantity
1	Server: Quad core processor at least	No	2
2	Windows 2012 Server/	No	2
3	SQL server: 2012	No	2
4	Server Racks: 6 U	No	2
5	Power backup with hybrid system	No	1
6	AC: 2T	No	1
7	Internet: 5 MBPS	M	12

Table 3 Hardware Requirement Details

3.2 Functional Requirements

3.2.1 Understanding of Work Flow

During the requirement gathering process we studied existing work flow of all management regimes. On the basis of our study "Understanding of Work Flow" has been designed.

For detailed Understanding of Work Flow, please refer **Appendix A**

3.2.2 Reporting

This section details all the reports that are required to be provided from the NFIS- NFIS Application based on the TOR and requirements captured during the meetings, documents and existing system. The list of these reports is listed below.

Major reports will be:

- a. **Standard Reports:** Standard reports are fixed reports. Certain important reports will be identified and produced as Standard Reports like managerial report, annual report etc
- b. **Consolidated Reports:** Different reports will be merged to a single report and can be exported to Excel format which helps the user to manipulate different reports at a time.
- c. **Dynamic Reports:** Dynamic reports are those which will be produced dynamically. Different options of tables from database will be provided to the user to select from and the report will be generated according to the selected tables. This helps to produce reports according to the user's requirement. The flow chart of how dynamic reports are generated is shown below:

List of Standard Reports:

- ✓ Single Forest User Group
- ✓ By District (all Forest User Group)
- ✓ By District (aggregated values)
- ✓ By Development Region (aggregated values)
- ✓ By Physiographic Region (aggregated values)
- ✓ National (aggregated values)

Details of Report:

- General Information of Forest User Groups
 - ✓ Code
 - ✓ Area
 - ✓ Forest Condition
 - ✓ Cast
 - ✓ Timber Production
 - ✓ Growing Stock Report
 - ✓ Demand & Supply Report
 - ✓ Revision History Report

- Social Profile of Forest User Group
 - ✓ Well being and caste/ ethnicity status
 - ✓ Gender
 - ✓ Governance
 - ✓ Social development activities
 - ✓ Economy and Finance
 - ✓ Income generation activities
 - ✓ Details of income and expenses

- Forests and forestry
 - ✓ Status of Forest Operational Plan
 - ✓ Forest Inventory
 - ✓ Forest Protection
 - ✓ Forest Management and Silviculture
 - ✓ Forest Production & Sales
 - ✓ Forest Offences
 - ✓ Forest Encroachment
- Information on Wildlife

4. Non Functional Requirements

4.1 Security

At a network protocol level SSL can be employed to secure encrypted data exchange. In the proposed NFD- NFIS, the users need to be authenticated in order to access the system resources and the access is granted as per their roles. For example, Accessibility of user also depends on the management regime. Once the status of the project information is forwarded to upper level and status is changed by upper level officials then the lower level users who forwarded the information also cannot change or edit that information.

Followings security measures are implemented to secure the application

- Input Validation: Validation is performed in all data entry cases. The following validations are implemented:
 - Required field validation:
 - Range validation (age, date range, amount) and
 - Expression validation (date, e-mail, number)
- Authentications: Through username and password users are authenticated.
- Authorization: Through user groups, authorized users are granted access to resources.
- Session Management: User sessions are handled to protect the interaction between user and web application.

- **Cryptography:** Users password is encrypted.
- **Exception Management:** Unexpected exceptions may arise during the execution of process. These exceptions are well handled by showing friendly error information revealing the details of the failure.
- **Logging:** Security related events are maintained in log files which track the user's operations.

4.2 Performance Requirements

The performance requirement of the system includes the availability, testability, maintainability and ease-of-use. The purposed NFD-NFIS is structured in such a way that it can be easily navigated. The system will be delivered only after it will be rigorously tested as per the test plan in order to provide maximum performance to the system user.

4.3 Software Quality Attributes

The quality attributes of the system refers to how well the system behaves, which includes the attributes as fault-tolerance, backward compatibility, extensibility, reliability, usability, etc. of the system. The proposed system is designed to handle all these issues efficiently with maximum possible flexibility.

4.4 Browser Compatibility

The NFIS-NFD application shall be designed to work with commonly used web browser technologies such as Internet Explorer Version 5.0 and Netscape Navigator Ver. 6.0 or higher.

4.5 System Help & Errors

4.5.1 Context Sensitivity Help

A detailed context sensitive help shall be provided at screen level. Clicking on the Help icon shall load the help for the corresponding screen the user is on.

In addition, tool tips shall be provided on links specific to those where additional help may be required, as the link text cannot be made self-explanatory.

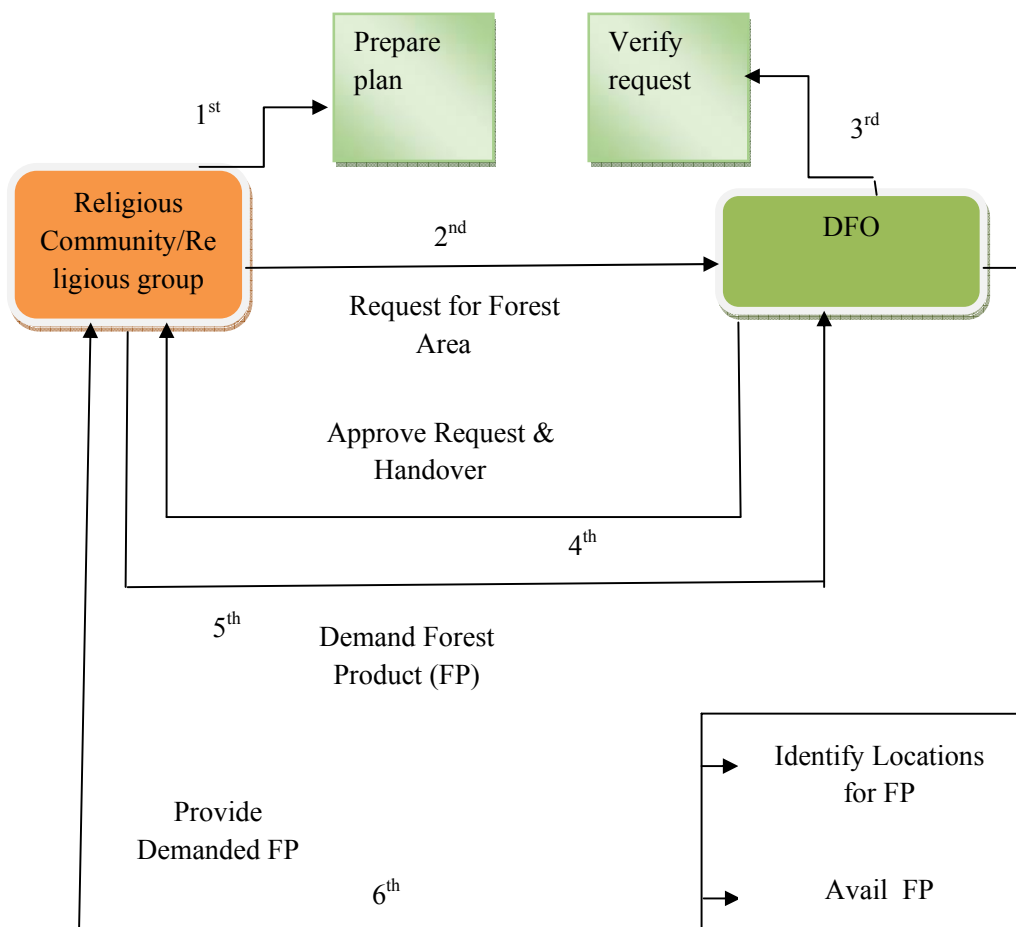
4.5.2 Messages

All messages flashed to the end users shall be categorized into one of the following types:

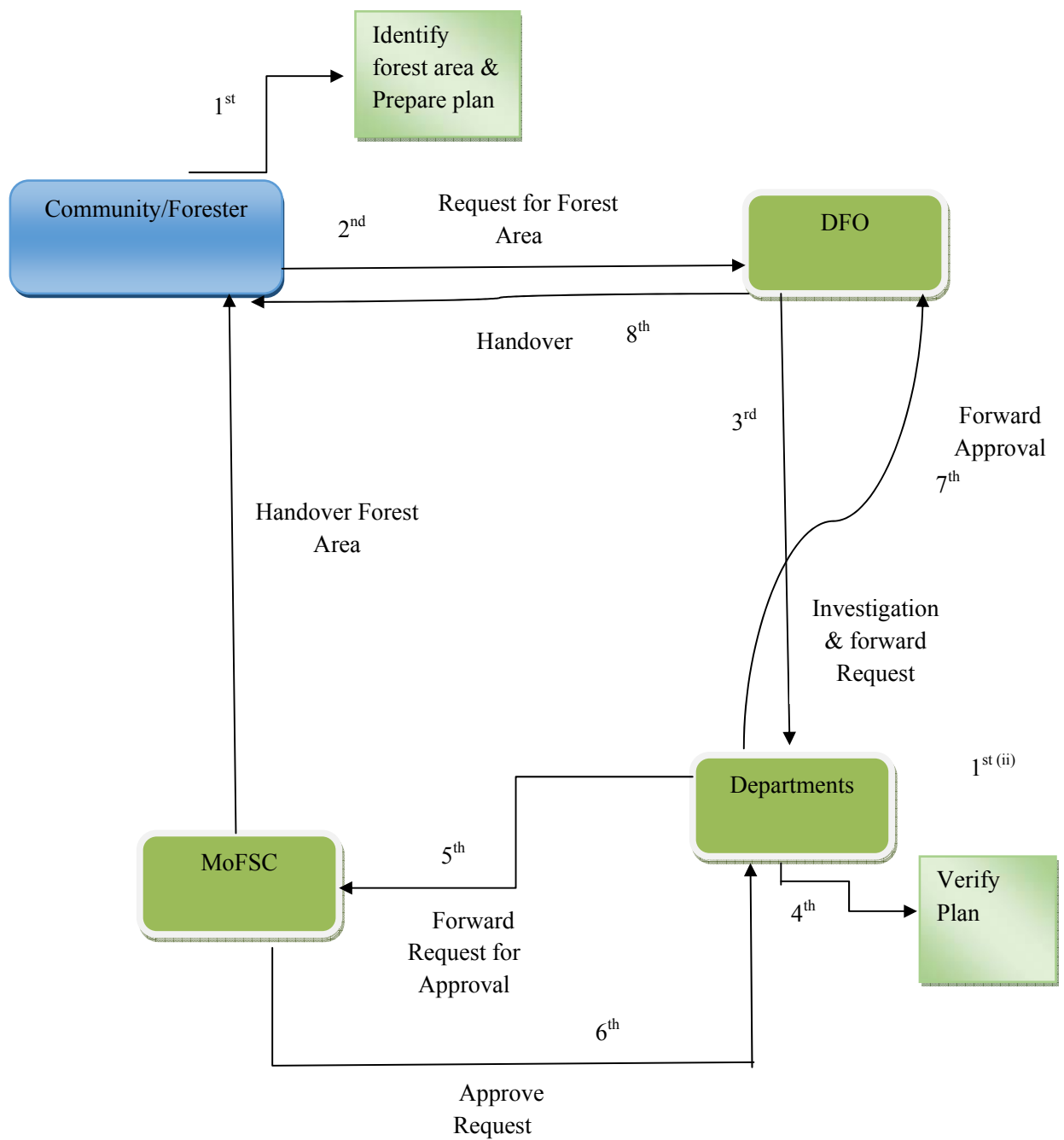
- **Error:** These will be those conditions where the user has entered data clearly violating the established business rule and allowing the user to proceed shall affect system integrity.
In such a case, a clear error message shall be flashed to the user and the user will not be allowed to proceed further until the invalid data input by the user has been corrected.
- **Warning:** These will be those conditions where the user has entered data clearly violating the established business rule but allowing the user to proceed further shall NOT affect system integrity.
In such a case, a warning message shall be flashed to the user with the user will have the option to ignore the warning and continue or correct the data and proceed ahead.
- **Note:** These kinds of messages will be flashed to the user whenever the application needs to convey status or relevant information to the user, which will aid the user in application use.

Appendix A: Understanding of Work Flow

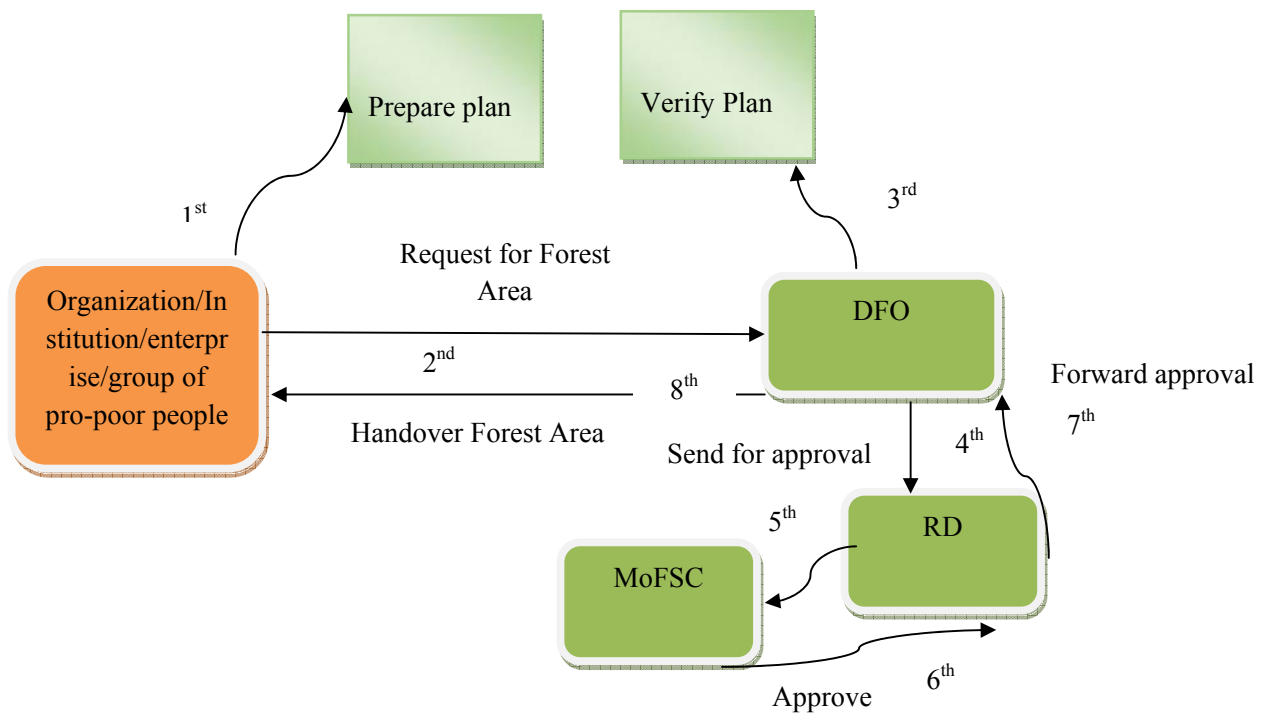
Religious Forest



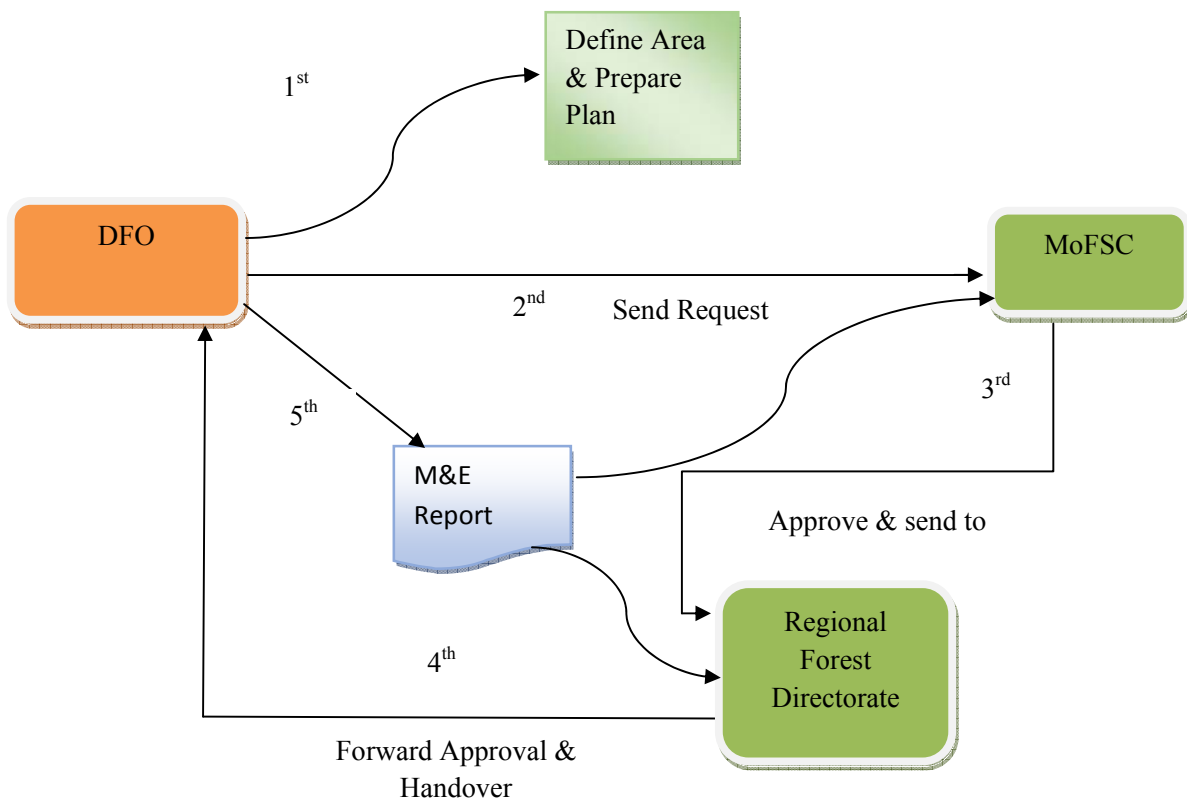
Collaborative Forest



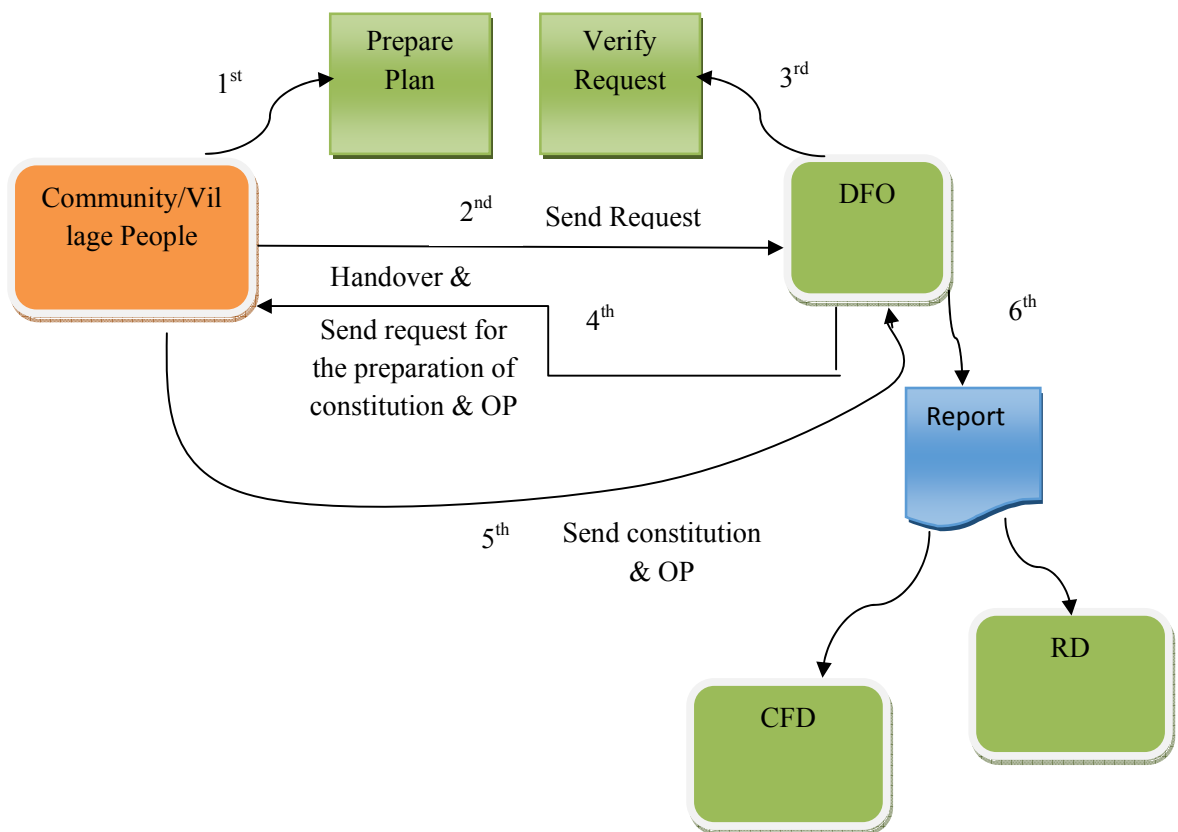
Leasehold Forest



Gov. Managed Forest



Community Forest



Private Forest

