LOCAL GOVERNANCE REFORM PROJECT (LGRP)

This is to generate Expressions of Interest (EOI) for this requirement. Please go to https://cms.adb.org/ under LGRP Selection # 199257 to submit your EOI. Deadline for submission of EOI is on 12 June 2024.

TERMS OF REFERENCE

CAMA and GIS Systems (OP2/QCBS-003)

Computer Assisted Mass Appraisal (CAMA) System with GIS Technology

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Contents

ACRONYM

ADB	-	Asian Development Bank
AI	-	Artificial Intelligence
API	-	Application Program Interface
AR	-	Assessment Roll
ANN	-	Artificial Neural Network
BIR	-	Bureau of Internal Revenue
BLGF	-	Bureau of Local Government Finance
BSP	-	Bangko Sentral ng Pilipinas
BUCC	-	Base Unit Construction Cost
CAD	-	Computer-Aided Design
CAMA	-	Computer-Aided Mass Appraisal
CPD	-	Continuing Professional Development
COTS	-	Commercial Off The Shelf
CY	-	Calendar Year
DBM	-	Department of Budget and Management
DCS	-	Data Collection Sheets
DEA	-	Data Envelopment Analysis
DOF	-	Department of Finance
EA	-	Executing Agency
GA	-	Genetic Algorithm
GIS	-	Geographical Information System
GOP	-	Government of the Philippines
GWR	-	Geographically Weighted Regression
GWPCA	-	Geographically Weighted Principal Component Analysis
IA	-	Implementing Agency
LGRP	-	Local Governance Reform Project
LGU	-	Local Government Unit
LRA	-	Land Registration Authority
LVRS	-	Location Value Response Surface
MAG	-	Mass Appraisal Guidebook
MRA	-	Multiple Regression Analysis
NGA	-	National Government Agency
OLI	-	Other Land Improvements
PDP	-	Philippine Development Plan
RDBMS	-	Relational Database Management System
RCN	-	Reconstruction/Replacement Cost New
RPIS	-	Real Property Information System
RPT	-	Real Property Tax
RPTA	-	Real Property Tax Administration
RPU	-	Real Property Unit
RST	-	Rough Set Theory
SEM	-	Spatial Error Model
SLM	-	Spatial Lag Model
SMV	-	Schedule of Market Value
SVM	-	Support Vector Machine
TOR	-	Terms of Reference
UAT	-	User Acceptance Test
UI	-	User Interface
UX	-	User Experience
3rd Party	-	Third Party System (external systems, i.e. eGovPH App or any National Government Systems, RPTA Systems, in-house or private provider)

I. OVERVIEW

ADB has provided the LGRP, herein referred to as the Project, to the GOP to help improve the local government revenue mobilization in order to upscale local public service delivery and strengthen local governance. In line with the PDP for CYs 2017-2022, the project is aimed to enhance and to provide efficient, effective, and equitable public service delivery at the LGU level. Hence, the outcomes on service delivery ability and local governance performance of LGUs improved. This project will likewise strengthen the policy and administrative environment for enhancing local own-source revenues from RPTs by instituting reforms in real property valuation and assessment.

The Project has four (4) outputs: (i) institutional development and policy support for property valuation strengthened, (ii) property tax valuation database and information systems implemented, (iii) real property taxation of selected LGUs enhanced, and (iv) local assessors professionalized and capacity of LGUs strengthened. The EA of the Project is the BLGF of the DOF. The IAs are the BIR, BLGF, DBM, DICT, and the DILG.

The objective of this assignment is to support BLGF in the implementation and monitoring of the Project activities and in ensuring the delivery of overall outputs. In particular:

1. Promote accuracy and timeliness in real property valuation information
2. Enhance transparency and accountability in the reporting of real property-related transactions

II. PROJECT DESCRIPTION

A. PROJECT OVERVIEW

The CAMA System shall be developed for the automated mass appraisal of properties through the use of various mass appraisal models or statistical models, entry, maintenance and clean-up of sales and property data, and the development of uniform values. The system shall employ the latest CAMA models under AI Models and GIS Models to populate the value reference in the drafting of the SMV. It shall automate the creation of proposed SMV that is reflective of the real estate market trends and transactional values, compliant with the MAG. Ultimately, it will facilitate the submission of the proposed SMV from the LGU level and allow for the review and certification at both regional committee and central committee. It is appended with GIS technology to allow spatial data preparation, visualization and analysis of multi-layered thematic maps of properties and valuation information as input to CAMA system. It shall deliver reliable, accurate, and defensible results.

B. TIMELINE

The engagement of the FIRM for the CAMA with GIS Project is planned for twenty-one (21) months, subject to project extension if applicable or when needed based on the recommendation of the BLGF and the approval of ADB. The Project will only be awarded if the project extension has been approved. Commencement is expected within the 4th quarter of 2024 and fully operational by July 1, 2026.

C. COST COVERAGE

The estimated contract cost for the Firm is inclusive of taxes, and shall cover the FIRM's management cost and salary of key experts and staff, during the development period, notwithstanding project duration extension by ADB and the BLGF. The cost shall also cover the FIRM's contingencies, per diem and all travel related expenses during direct visits to LGUs, product licenses or subscription fees, and other necessary expenses related to the delivery of the Project.

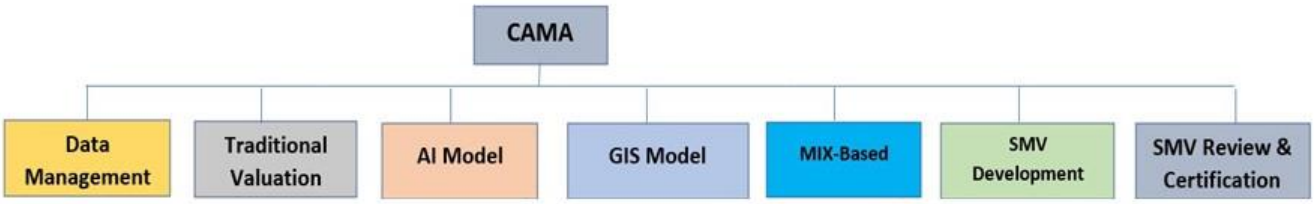
BLGF will provide to the FIRM's staff the necessary working space, network connection, and internet connection required for the project, when working at the BLGF Head Office or Regional Office.

D. DEVELOPMENT METHODOLOGY

Preferred project management for the development of the CAMA with GIS is AGILE Software Development. Due to complexity of the Project vision and the uncharted application to local property valuation of CAMA AI models and GIS models, changes in the vision, design and practicality require that the development is responsive. Flexibility must be embodied to ensure that the development will address real and actual scenario in mass appraisal needs of the LGUs and other stakeholders. The FIRM is expected not to be limited by the suggested structure, process flow and module in this TOR as the development of the Project must be able to adapt to changes encountered and gaps discovered. AGILE method is envisioned to be relatable to the Project as the FIRM must interact directly and continuously with the LGU Assessor's Office, being the direct end user, and the stakeholders such as the BLGF and the DOF, being the regulating and supervising agencies.

For the CAMA and GIS systems (other than the BLGF additional modules to be developed), the FIRM may use and implement COTS CAMA and GIS, provided they are the owner or an accredited partner implementor of that product or company. The FIRM has prior experience in implementing, customizing, and integrating the product to meet the major requirements of the project. All licenses and subscription fees should be shouldered by the FIRM especially if the CAMA and GIS to be provided is offered as Software as a Service (SaaS).

The CAMA System consists of six (6) components:



a. **Data Management**, an integral component of the system responsible for the building of the sales database to be used in automated mass appraisal, wherein, data from the RPIS and other RPTA System;

b. **Traditional Valuation**, automation of valuation using the three (3) approaches such as Market Data, Cost and Income approach but for application to multiple properties not yet considered as a mass appraisal activity;

c. **AI Model**, the component utilizes machine learning through various AI models developed in order to arrive at recommended values for proposed SMV generation;

d. **GIS Model**, uses the GIS technology and spatial information in developing mass appraisal values;

e. **Mix-Based Model**, combination of all models and methods;

f. **SMV Development**, automates the development of SMV for common property classification such as residential, commercial, industrial and agricultural, as well as the development of the BUCC;

g. **SMV Review & Certification**, automates the submission of proposed SMV by the LGU and the review & approval by the Regional and National committees.

E. PROJECT DEVELOPMENT TEAM

Proposing entities will determine the number and the nature of experts they will require to achieve the objectives of the contract, following their own proposed approach and Terms of reference: Entities must also describe their experience in the Philippines. However, BLGF requires a minimum of team composition of experts as shown in Project Team section of this document. In addition, the proposing entities should also include in their technical proposal, in the personnel work plan and in their financial proposal all their "non-key experts" required in accordance with their proposed approach and methodology. The proposing entity must also determine and indicate the number of person-months for which the entity needs each key or non-key expert. All experts engaged under the contract, whether key or non-key experts, must be citizens of one of the ADB member countries.

F. SYSTEM ARCHITECTURE

The system should be modular where the components can be separated or integrated easily. The components must be well defined so that modules can be reused where and when required, with adoption of the modular approach of design. The FIRM must identify some of these modules and describe it in its technical proposal document how this would be achieved.

It is expected that FIRM would add more value to the solution by adding features, incorporating suggestions and recommendations, which will address High Availability, Security, Scalability, Manageability and boost its Performance.

The system must also make use of any latest, top and stable front-end User Interface frameworks.

The reports will have to be generated in text and/or tabular form, as well as in graphical form. The report generation in the system has two (2) categories, (a) the standard reports specified in this document, and (b) ad hoc reports. The standard reports will be designed and installed during the implementation and for ad hoc reports. The system should have a customized Query Builder and report generator feature. Every report must have a facility to generate it in MS Excel Sheet, MS Word, PDF or as HTML format.

Security Features

The software must have the built-in standard security features pertaining all the checks and balances, to ensure that the integrity of data and the software does not have any bugs

which mistakeably or by design, permit the users to tamper, alter or modify any data without the appropriate permissions.

The software should have the highest degree of security in the design. The FIRM must apply a suitable security component required by the system. The following are some of the system security features, but not limited to:

- Secured User's Login procedure
- Ability to maintain a history of passwords for user-defined time period that prevents the user from re-using old passwords
- Ability to allow account passwords to "expire" requiring users to enter a new password at system defined interval
- Ability to identify a user's password after answering a secret question correctly
- Ability to notify System Administrator or Security Administrator of multiple failed login attempts
- Ability to lock users out of the system after a System Administrator defined number of failed login attempts
- After a user defined number of days of inactivity, an account may be automatically locked
- Ability to notify System Administrators when an account is locked
- Ability to provide a tickler or notification feature to prompt for follow up action
- Two-Factor Authentication (2FA) for selected and sensitive transactions
- Multi-level approval functionality
- Access to the database should be based on the user's roles and permissions
- Built-In Audit Trail
- Passed through series of vulnerability test
- Complete with SSL Certificate and other security configurations
- Safe and hack resistant code

The FIRM should ensure that the system developed are secured so that both the back-end system and front-end user are not exposed to any kind of data manipulation and threat to the whole system. Should there be any problem to arise related to it, the FIRM must have proper protocol measures in place. The System shall be scanned with vulnerability testing tools after each version deployment. The FIRM shall be responsible to fix any related vulnerabilities.

Back-Up and Recovery Plan

The FIRM must submit a comprehensive Business Continuity Plan and Full Report of the Off-Site Location of the Database. Off-Site Database Back-Up must be safely kept both online (Cloud) and off-site. In addition, the FIRM must address the following:

- Database Full Back-Up must be conducted on a daily and/or weekly incremental basis
- Source Code Files Back-Up must be conducted on a daily basis, or whenever changes take place
- Full Back-Up of the Database and Source Code must always be kept in a safe location, subject to standard location protocols

G. TRANSFER OF TECHNOLOGY

The FIRM should propose suitable methods for transfer of knowledge to the BLGF and all other Users for the sustainability of the system.

After each version or modules complete development, the FIRM through its Testers, must conduct a User Acceptance Testing (UAT) / stress testing of the developed software, and must pass the approval of the Quality Assurance Specialist and the client (BLGF, LGUs, NGAs and other Private partners). All bugs must be reported, documented and fixed.

The bugs are classified into two (2) categories: Critical and Non-Critical. The Critical bugs are those which halt the system and the normal functions of LGUs, BLGF or any other Agency affected by the system's malfunction. Otherwise, it will be Non-Critical. The FIRM must give an immediate attention to the Critical bugs and attend to them as soon as possible, and must be fixed within twenty-four (24) hours after receiving the complaint from the client. The Non-Critical bugs should be fixed within three (3) calendar days. However, in some exceptional cases, the FIRM may request or negotiate for a time extension, subject to the approval of the client.

Training of Trainers / Users

The FIRM must provide a comprehensive series of training/workshop sessions to trainers and end-users on the operation of the CAMA and GIS, in accordance with the proposed activities, required experts, and the frequency of training and workshops as stated in section XXIII (Activities with on-site visits to Prototype LGUs) of this document.

The FIRM must provide an adequate training to the System Administrator from the BLGF and LGUs, to ensure that maintenance, routine checks, back-up and recovery issues can be handled in-house, even after the expiry of the project period.

The firm must provide a tailored training plan and curriculum for each level and function of the staff it trains. All training materials must be documented in a training manual and provided to BLGF upon completion of the training. The bid response must include a training plan, including the type and amount of training required, and the level of pre-existing IT knowledge needed to receive the training effectively.

The FIRM shall submit a Training Schedule and Training Curriculum to BLGF for approval prior to the delivery of any training.

The Firm shall provide all material for all aspects of training, including the provision of user training manuals, and where possible online training for dissemination.

The FIRM shall either:

a) Identify the trainees and approve the Training Schedule and Training Curriculum; or

b) provide feedback and details of any required changes to the Training Schedule and Training Curriculum;

The FIRM shall promptly incorporate any required changes and resubmit the training schedule and training curriculum to BLGF. The training plan must include assessments to measure the success of training and knowledge transfer. It must be submitted to BLGF/LGU for review and confirmation that the knowledge transfer has been successful.

Source Code Ownership and Other Intellectual Property Rights

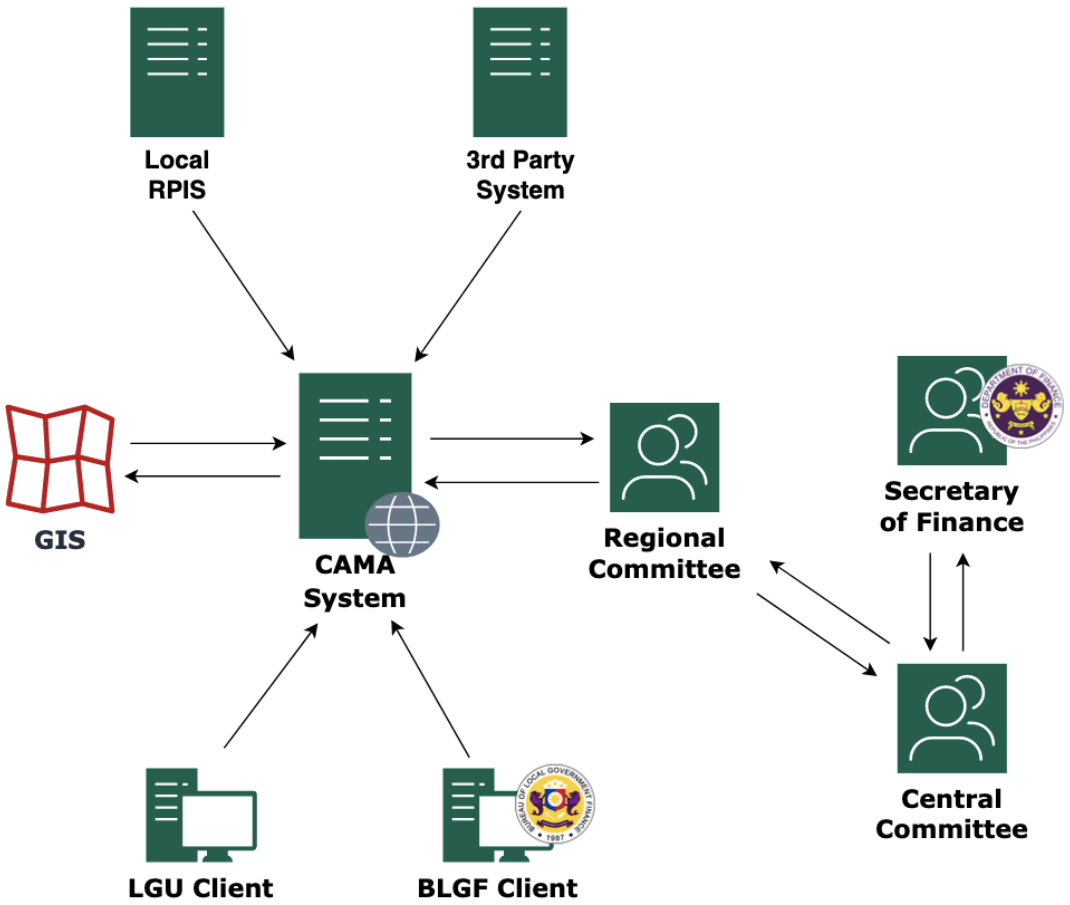
Ownership of the source code depends on the type of product and software development approach being offered by the FIRM.

Particularly, with BESPOKE, MOTS or any middleware to be produced and customized to fit the needs of the project, BLGF will be the rightful owner of the Source Code and all Intellectual Property Rights associated with the system (its modules, all the components and as a whole) unless otherwise stipulated in the service contract. The FIRM will have no right to commercially use or apply the very same software package elsewhere.

However, the database that will be built in the project will be owned by the BLGF regardless of the approach or type of product being offered.

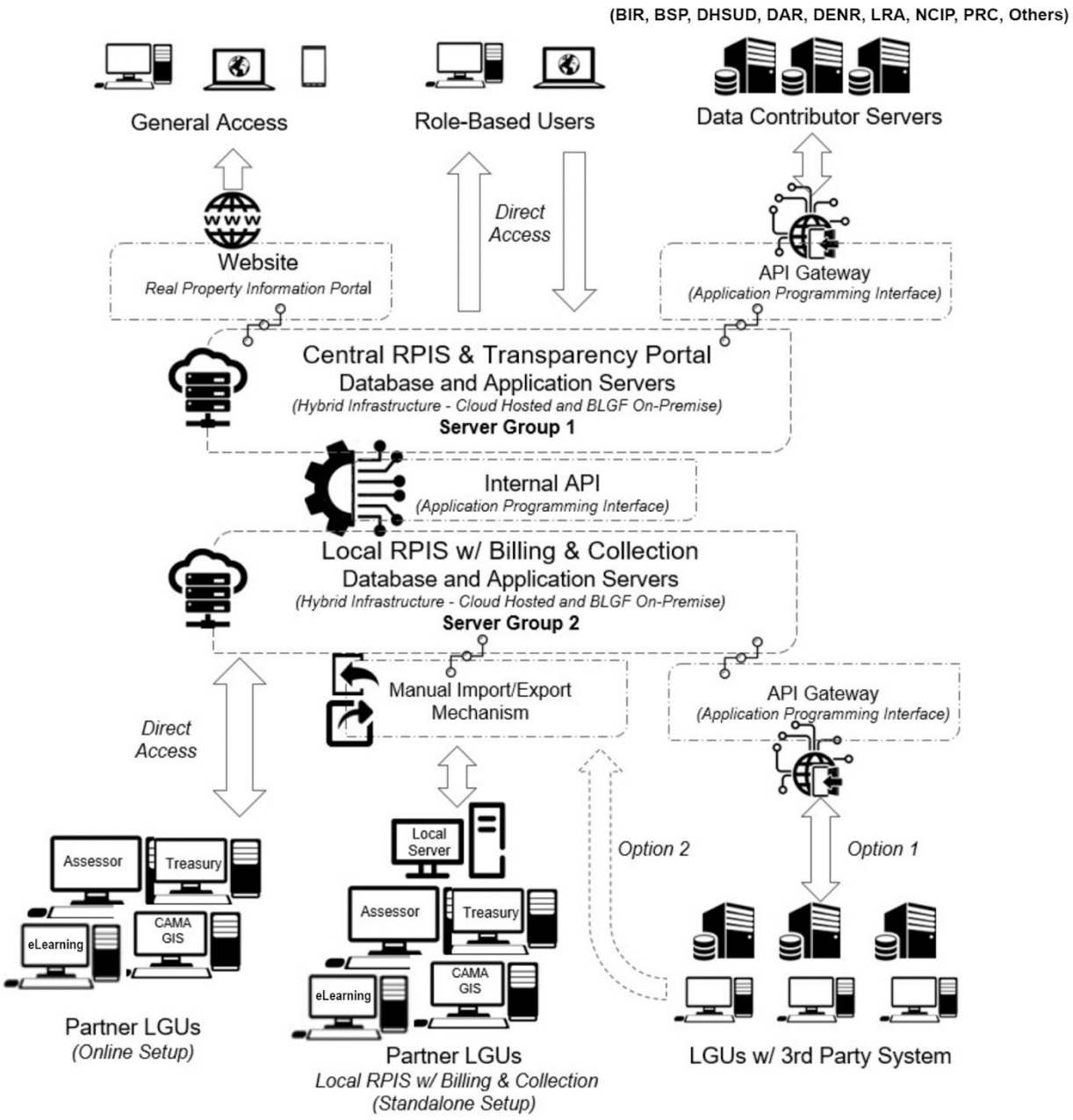
III. SYSTEMS OVERVIEW DIAGRAM

A. CAMA Diagram



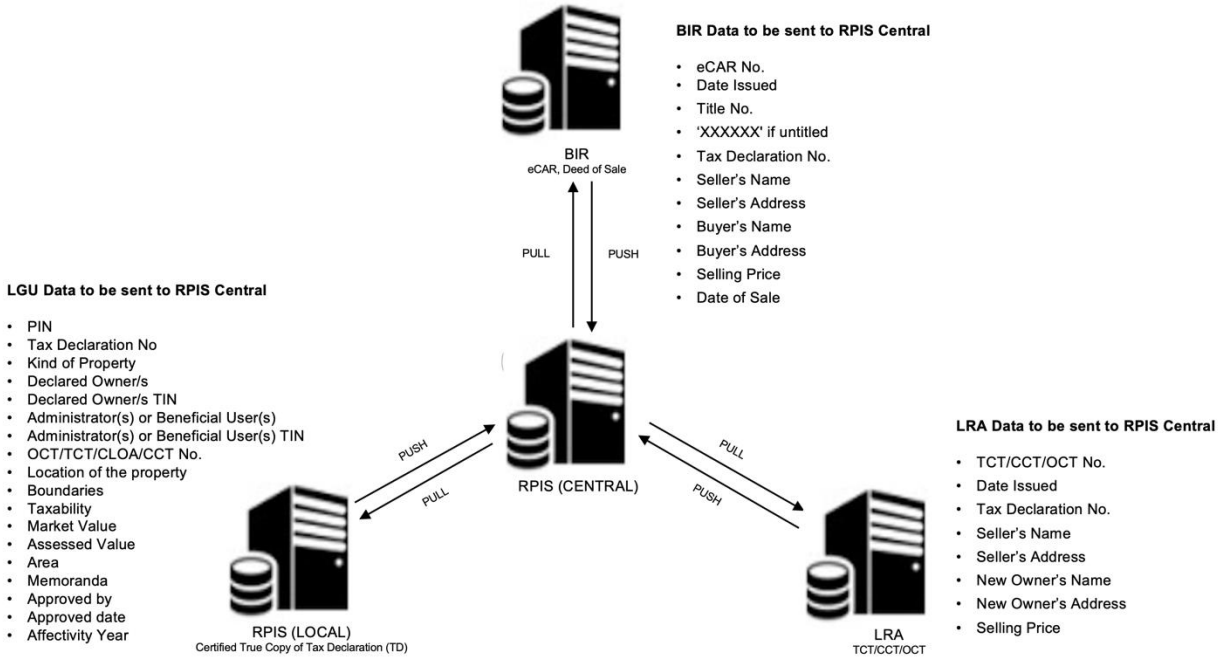
B. LGRP Diagram

Comprehensive LGRP System - CAMA with GIS being integrated with RPIS, eLearning and other systems



C. Proposed Data Sharing

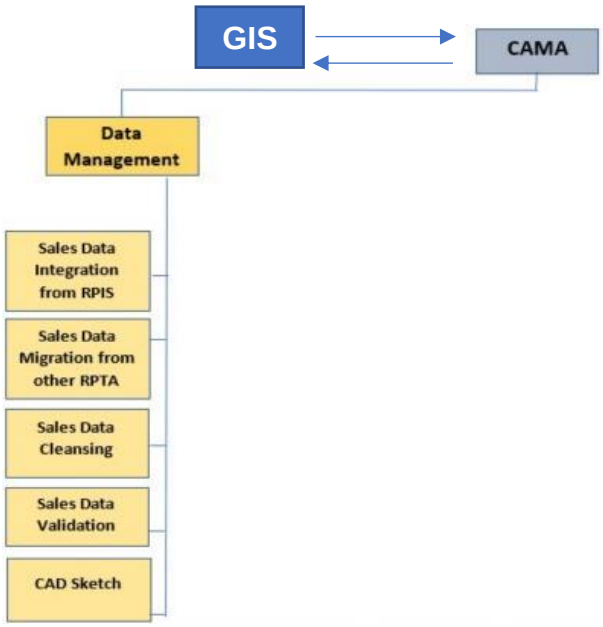
Below is a sample proposed data sharing diagram between partners (LGUs, BIR and LRA).



IV. STRUCTURE

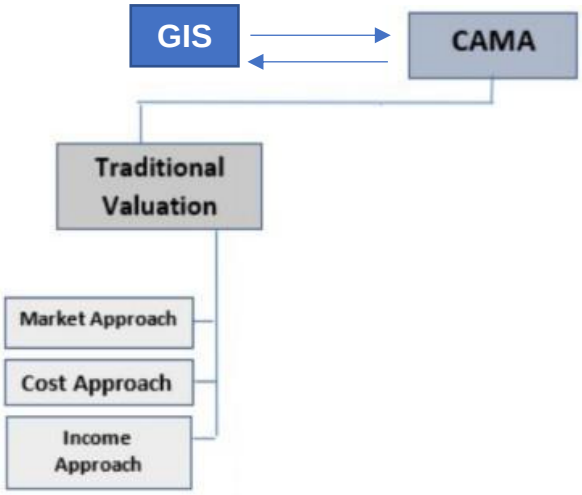
A. Data Management

Consists of five (5) sub-modules that aims to integrate the sales data from the RPIS or migrate the sales data from other RPT Systems used by an LGU. It also features data cleansing and validation for ready use in the valuation approaches or the CAMA Models to be selected.



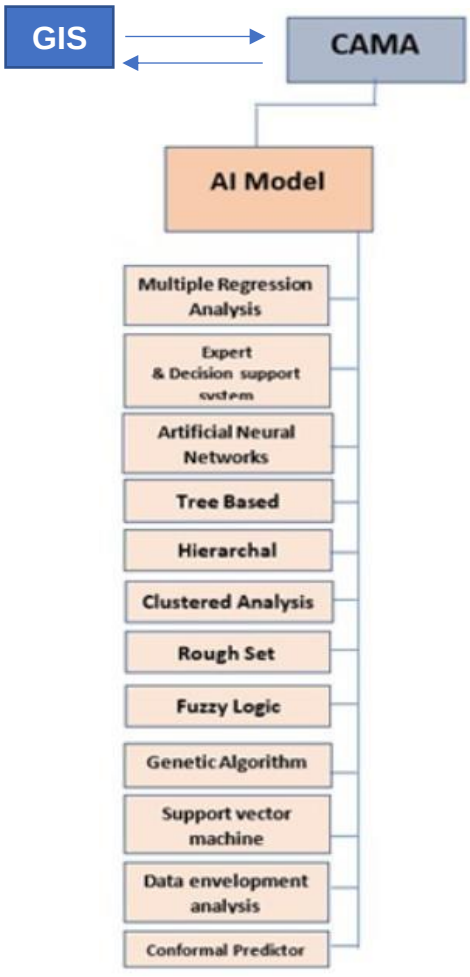
B. Traditional Valuation

The sub-modules reflect the three (3) valuation approaches, as this module/process automates the traditional valuation of multiple properties not yet requiring mass appraisal process per se.



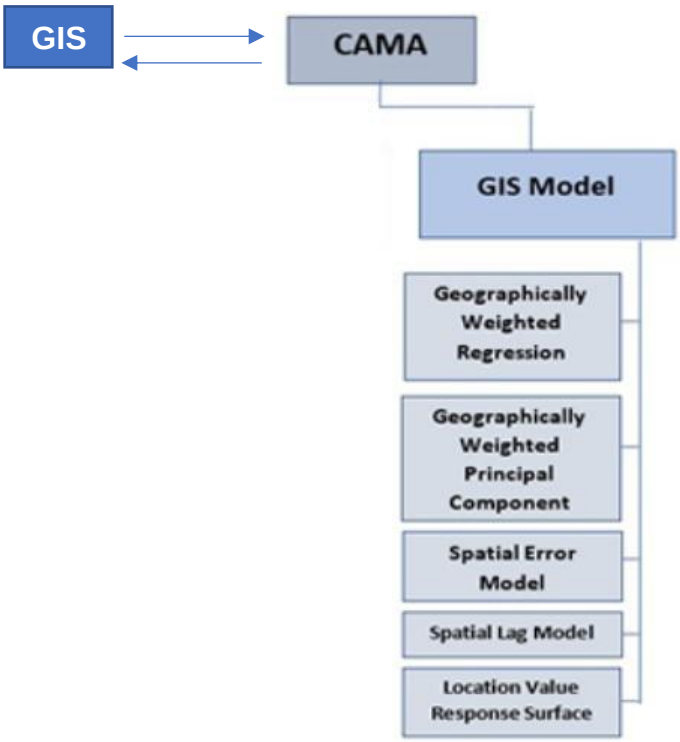
C. Artificial Intelligence Models

Features twelve (12) sub-modules based on widely popular AI Models and the latest groundbreaking devised CAMA AI models, such MRA, Export & Decision support system, ANN, Tree Based, Hierarchal, Cluster Analysis, Rough Set, Fuzzy Logic, Genetic Algorithm, Support Vector Machine, Data Envelopment Analysis, and Conformal Predictor.



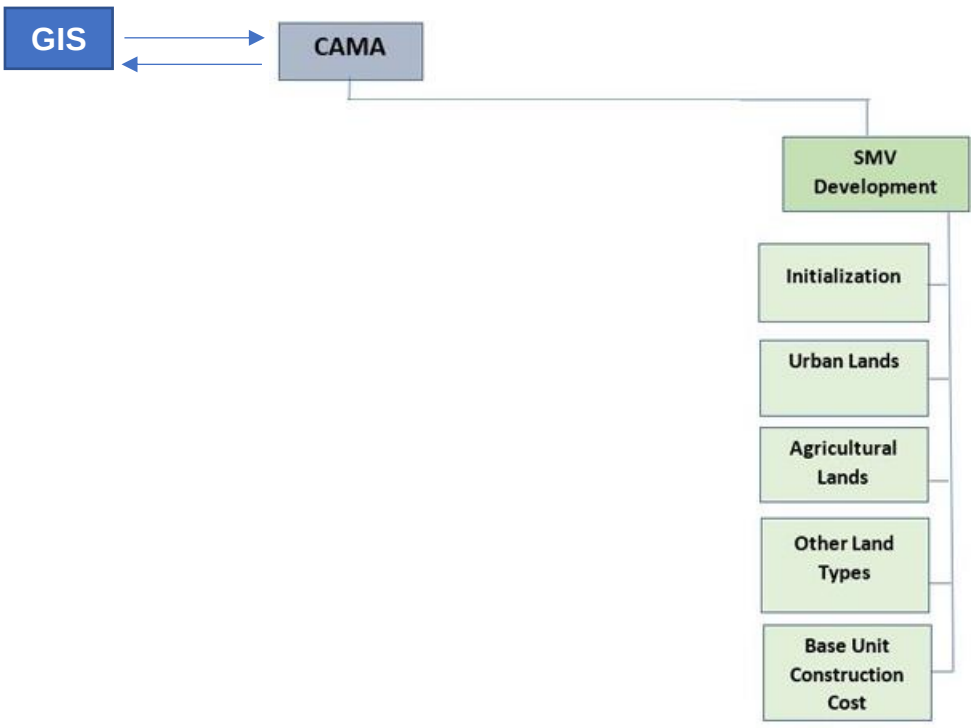
D. GIS Models

Based on widely used GIS Models and the groundbreaking models, consisting of six (6) sub-modules that features GWR, GWPR, SEM, SLM, LVRS and MIX-Based models as hybrid.



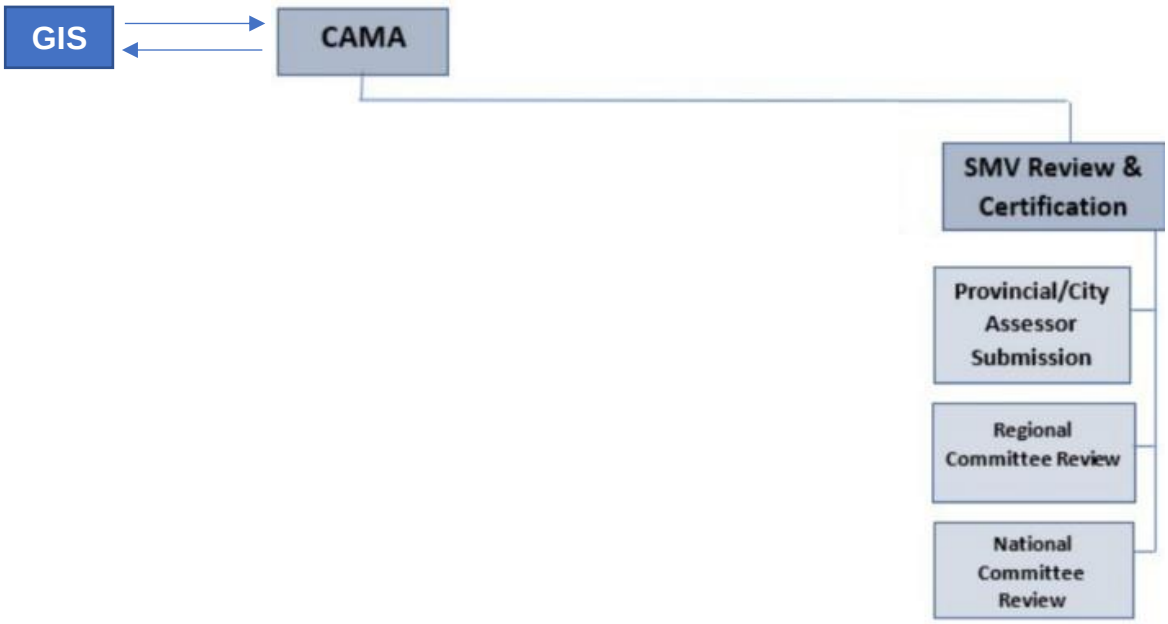
E. SMV Development

Actual generation of SMV for common property classification, including the generation of building unit construction cost, based on the values generate from either the AI, GIS, and MIX-Based models



F. SMV Review and Certification

Automation of the submission and approval LGU's generated proposed SMV, consisting of three (3) sub-modules pertaining to the Assessor's dashboard, the Regional Committee and Central Committee reviewer's dashboard.



V. SYSTEM FEATURES AND FUNCTIONALITIES

GENERAL FEATURES

1. Installation of API for LGUs that will facilitate data integration and interoperability to 3rd Party Systems;
2. Data integration of databases on real property information, business permits, sales information, bank appraisal, rentals, leasing, GIS data and other sources;
3. Creation of user account;
4. Data analytics;
5. Dynamic Map viewing;
6. Enable encoding and be able to process data and generate reports;
7. Have an audit trail;
8. Ability to do CRON jobs for database backup and data redundancy;
9. Ability to import data files;
10. Ability of the system to export data in various standard digital (electronic) formats including, but not limited to MS Excel, MS Word, PDF, XML, or Comma Separated Value (CSV);
11. All system reports (ad-hoc and standard) can be saved utilizing industry standard digital (electronic) formats including, but not limited to MS Excel, MS Word, PDF, or Comma Separated Value;
12. Ability to print standard form letters based upon system data and user defined parameters. Standard form letters should have "mail merge" functionality and should support standard Word Processing applications including, but not limited to, MS Word;
13. With built-in Content Management System (CMS) to manage the user administration, roles, permission, web content, rules and other parameters;
14. Enable 3rd party system integration using secured and encrypted API; and

15. There should be provisions for future development of integration features of the system through web services and other similar technologies to enable the system to interact with the third-party systems;

A. DATA MANAGEMENT FEATURES

i. Integration of sales data and real property values from the RPIS to the CAMA system;
ii. Migration of sales data and real property values from other RPTA systems being used by the LGUs, other than the RPIS;
iii. Cleansing of sales data and real property values being considered as inputs for the mass appraisal; and
iv. Validation of sales data and real property values cleansed, generating the market area being selected, updating and comparing data from Field Inspection Form and coding for integrity of the data as to reliability;

B. TRADITIONAL VALUATION FEATURES

i. Multiple property valuations using Market Data Approach;
ii. Multiple property valuations using Cost Approach; and
iii. Multiple property valuations using Income Approach

C. AI MODEL FEATURES

i. Mass appraisal by performing statistical method to predict the real property value as referenced to property attributes, taking into account the causal relationships between the predictors and the outcome, using Multiple Regression Analysis or Hedonic Regression;
ii. Integration of Statistical packages available such as SPSS, NCSS, R etc.
iii. Develop mass appraisal values by employing Decision Support System, with the functionality of a combined data-driven and knowledge-driven system;
iv. Generate mass appraisal values using the Artificial Neural Networks model which takes into account static and dynamic models, considering the construction and operational characteristics of real properties, including parameters dictating the economic state, employing the use of heat maps;
v. Produce mass appraisal values using multiple strands of splitting rules starting from the top of the tree, predicting continuous variables for regression through M5 tree model, as well as combining of decision tree model with linear regression known as M5P tree model, and use of non-parametric regression such as multivariate adaptive regression splines or MARS;
vi. Generate mass appraisal values by using time series model or Hierarchal Trend, modelling the time-dependence of the selling prices;
vii. Come up with mass appraisal using Cluster Analysis, classifying data into different classes or clusters, through the employ of hierarchical clustering, partitioning clustering, grid-based clustering, density-based clustering, fuzzy-based clustering and model-based clustering;
viii. Perform mass appraisal by creating a logical link between the characteristics of a real estate unit and its market price, referred to as the Rough Set Theory;
ix. Apply fuzzy logic, fuzzy prepositions and fuzzy numbers to conduct mass appraisal;
x. Arrive at mass appraisal values by applying evolutionary polynomial and/ or ridge regression with genetic algorithms, simulating the natural selection and genetic mechanism of Darwinian biological evolution;
xi. Utilize Support vector machine algorithms in identifying the supporting vectors related to price variances, and forecast real property values variances;
xii. Evaluation of the value range for real estate units;

xiii. Apply a Data Envelopment analysis to a database comprising the real property prices and features of the units, selecting a number of observed units, with inputs and outputs for the determination of the subset composed of efficient units, arriving at considered benchmarks and defining the segments of the enveloping surface; and
xiv. Using Conformal Predictor, provide prediction intervals of estimated real property values which are reliable at a confidence level set

D. GIS MODEL FEATURES

i. Mass appraisal by utilizing Geographically Weighted Regression, imputing the local spatial structure to the linear regression model, creating market segmentation by detecting submarket;
ii. Perform mass appraisal using Geographically Weighted Principal Component Analysis, integrating to a modified data-driven method, mitigating the spatial heterogeneity and defining submarkets, taking into consideration spatial contiguity and attribute similarity;
iii. Generate improved MRA results by using Spatial Error Model that builds on spatial dependence of the error terms;
iv. Generate improved MRA results by using Spatial Lag Model, focusing on spatially lagged dependent variable of the regression model, determining a locational baseline value or location-adjustment factor; and
v. Generate mass appraisal values using Location Value Response Surface, thereby arriving at the computation for location adjustment factor based on the spatial distribution of prices, determining the variance between actual values and forecasted values produced by the MRA model with disregard of location, and develop interpolation grid that reflects the influence on property of the location ratio factors
vi. Able to edit, compile, add new features and related information;
vii. Ability to search and browse parcels and query any spatial database related to the real property database;
viii. Should be able to draw/digitize point, line and polygon;
ix. Should have built-in map creating technology with different interactive layers forstoring information;
x. Geo-referencing, geo-processing, geo-editing must be enabled or built-in to the software;
xi. With geo-database, shape file, relational database, access-based database, xml database/oracledatabase, PL/SQL, CAD file features;
xii. The output file must be in shape file, geo-database, kml, xml, pdf format, jpeg format, MS word, MS excel formats;
xiii. Capability to link with other necessary database for further analysis such as RPIS, Tax Payer, Billing and Collection, etc.;
xiv. Must have report generating capability, interactive mapping capability, statistical analysis and mathematical analysis capability;
xv. The software should have the capacity to adapt new macros for different applications;
xvi. User friendly, easy to operate data processing and mapping software for GIS data input;
xvii. Supports android and apple mobile/smart phones;
xviii. Compatible with Windows/Linux/Mac Operating Systems;
xix. With secured and encrypted password; and
xx. Must have SSL security certificate
xxi. Compatibility with any kind of browser and device; if this is feasible

E. MIX-BASED MODEL FEATURES

i. Develop hybrid thinking, combining multiple forecast models to arrive at weighted average of component forecasts, to produce more accurate values; and
ii. Develop mass appraisal values by combining traditional valuation with AI and GIS methods

F. SMV DEVELOPMENT FEATURES

i. Initialization of SMV development by determining the sub-market area and conducting data analysis on BUCC, Depreciation Table, OLI, and RCN among others;
ii. For Residential: generate sampling from data sets such as simple, random, stratified or cluster; conduct rounding and sorting of unit values, and ranging of unit values; generation of frequency table and graph, collapsed table, and sub-class unit value; generation and application of adjustment factor; and imputation of time adjustment, including generation of time adjustment table, detection of abnormality, generation of percentage increment table and unit value table;
iii. For Commercial and Industrial: Perform generation of ground rent, including generation of capitalization rate, unit value table, sub-class unit value; generation and application of adjustment factor; revision of sub-class criteria, and generation and application of value adjustments including, but not limited to irregular lots and use of stripping method;
iv. For Agricultural, development of values using the 3 Appraisal approaches: Sales Comparison, Cost, and Income approaches; and
v. Development of Base Unit Construction Cost table

G. SMV REVIEW & CERTIFICATION FEATURES

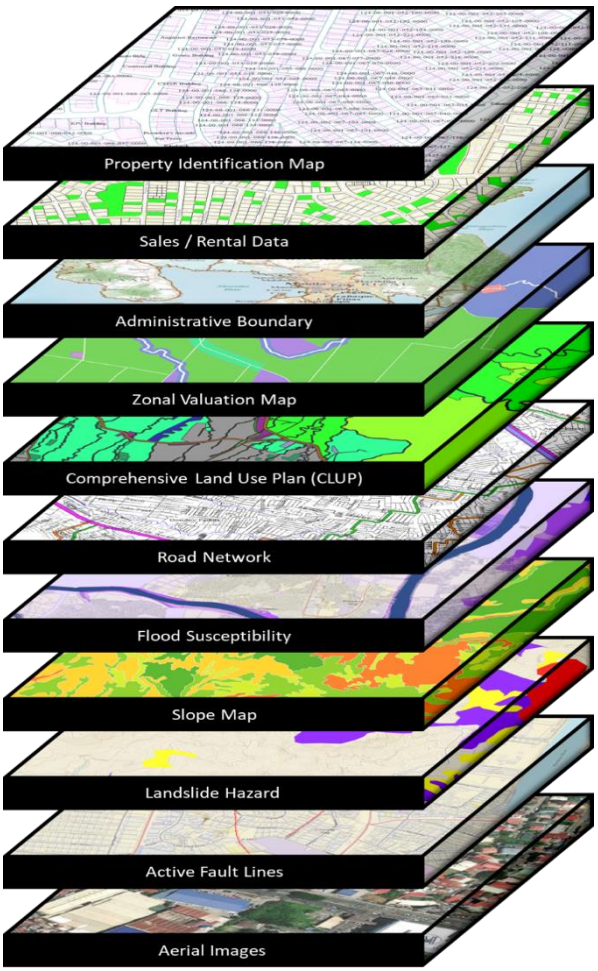
i. Generation of report of the proposed SMV by the Provincial or City Assessor;
ii. Dashboard system to monitor status of submission by the LGU;
iii. Submission of the proposed SMV to the Regional Committee;
iv. Real time review and approval by Regional Committee;
v. Endorsement by Regional Committee to the National Committee;
vi. Dashboard system to monitor status of submissions received from LGU and endorsed to National Committee;
vii. Real time review and approval by National Committee;
viii. Endorsement by the National Committee to the Secretary of Finance; and
ix. Dashboard system to monitor status of endorsements received from Regional Committee, including returned for revision, and endorsed to the Secretary of Finance

The BLGF CAMA system shall be a standalone application capable of retrieving, sending data and interfacing to other systems such as, but not limited to the following:

1. CENTRAL RPIS
2. LOCAL RPIS
3. GIS
4. Other systems from other NGAs and LGUs

It shall connect directly to available databases for data sharing and updating when the system is online. Manual import and export shall also be an option for offline or disconnected processing.

The CAMA tables shall be linked with the GIS spatial table in order to share data necessary for spatial analysis. The GIS shall generate information required by the CAMA system for statistical analysis using spatial overlay and processing. Each available thematic layer related to valuation included but not limited to the list below shall be processed and analyzed.



The spatial processing shall generate individual scores and weights for each real property unit and shall be recorded in the GIS database. The completed table shall be exported to open standard format such as Comma Separated Values (CSV) file.

The CAMA system shall be able to accept information directly from the GIS when connected. Alternatively, the generated CSV file shall be imported to the CAMA database.

VI. SYSTEM MODULES

A. Data Management

Facilitates the management of sales data to be used for the mass appraisal from the LGU's records, which features integration of data from the RPIS or migration of data from other RPTA system currently used by the LGU's through use of API.

a. Sales Data Integration from RPIS
Allows for the incorporation of the sales data from LGU's subscribed and installed with RPIS.

b. Sales Data Migration from other RPTA
Enables the CAMA with GIS to tap on the sales database of the LGU's that uses RPTA System other than the RPIS.

c. Sales Data Cleansing
Raw sales data siphoned into the system is cleansed of records that are incomplete or unusable to the mass appraisal process.

d. Sales Data Validation
Data cleansed are evaluated of they are valid and accurate, and quality is determined through the assignment of integrity codes.

e. CAD Sketch
Option to perform sketching, especially of boundaries and lot & improvement sketch in the records.

B. Traditional Valuation

Enables the application of valuation approaches on multiple properties to arrive at a market value

a. Market/Sales Data Approach
Allows for valuation through estimation of the value of a subject property through analysis of sales price of a similar property. Recommended when sufficient current sales records are available.

b. Cost Approach
Applicable for the valuation of building and improvement, based on the cost of the replacement or reconstruction of the property of same use, materials, design and standards.

c. Income Approach
Can be used in the valuation of commercial and industrial properties, contingent on the availability of income and expense data, income multipliers and overall rates, and return on investment.

C. AI Model

Performs automated mass appraisal through the use of machine learning and algorithms, imitating human thinking behavior and analysis.

a. Multiple Regression Analysis
Uses statistical method in the forecast of real property values.

b. Expert & Decision Support System
Employs the combination of data-driven and knowledge-driven decision system to generate predicted property values.

c. Artificial Neural Networks
Resembles human thinking through neural networks that analyzes the characteristics of the real properties to generate mas appraisal values.

d. Tree Based Model

Uses Decision Tree model in determining sales prices, through combination with regression, multivariate adaptive regression, and linear regression.

e. Hierarchal Model
Relies on time series data of sales, to model the price of property and come up with forecast.

f. Clustered Analysis
Generates values based on analysis of data using various clustering models.

g. Rough Set Theory Model
Analyses logical link of property characteristics and real properties.

h. Fuzzy Logic Theory Model
Performs series of intricate mathematical and fuzzy logic computations to forecast property values.

i. Genetic Algorithm
Simulates natural selection and Darwinian application in the forecasting of property values.

j. Support Vector Machine
Analyzes vectors in relation to price variance to arrive at property values.

k. Data Envelopment Analysis
Generates subsets of efficient units from the database to be used as benchmarks.

l. Conformal Predictor
Predicts the intervals of real property values.

D. GIS Model

Performs automated mass appraisal through the use of spatial data of the property, coupled with statistical operations and algorithms.

a. Geographically Weighted Regression
Utilizes local spatial structure together with linear regression.

b. Geographically Weighted Principal Component Analysis
Integrates principal component analysis to a modified data-driven method, addressing spatial heterogeneity and defining submarkets.

c. Spatial Error Model
Yields improved MRA results contingent on spatial dependence of error terms.

d. Spatial Lag Model
Generates value by determining locational baseline value.

e. Location Value Response Surface
Allows the determination of the variance between actual values and forecasted values produced by the MRA, disregarding location, and produce interpolation grid.

E. MIX-Based Model

a. Multiple Model
Generates values based on combination of multiple Models.

b. AI – GIS Mix
Allows the interplay or combination of different models under each AI and GIS model.

F. SMV Development

a. Initialization
Initializes the definition of sub-market area and the conduct of data analysis of RCN, BUCC, Depreciation schedule and OLI.

b. Urban lands
Facilitates the development of proposed SMV for residential, commercial and industrial urban properties.

c. Agricultural lands
Generates the proposed values for incorporation to the proposed SMV of agricultural properties.

G. SMV Review and Certification

a. Provincial/City Assessor Submission
Enables the local assessor to submit the proposed SMV for approval by the Regional and Central Committee.

b. Regional Committee Review
Dashboard for the Regional Committee for the conduct of review, rejection and recommending approval of the proposed SMV submitted by the LGU.

c. National Committee Review
National Committee's dashboard for the review and recommendation for approval to the Secretary of Finance of the proposed SMV, along with the issuance of certification.

VII. SYSTEM COMPONENTS

1. **Real Property RDBMS** (relational database management system)
A secure and reliable system for storing and managing local real property data, installed on a local server within the premises of the LGU.

2. Field Data Collection Module
A real property data collection module installed in mobile devices w/ data synchronization capability (online and post processing options).

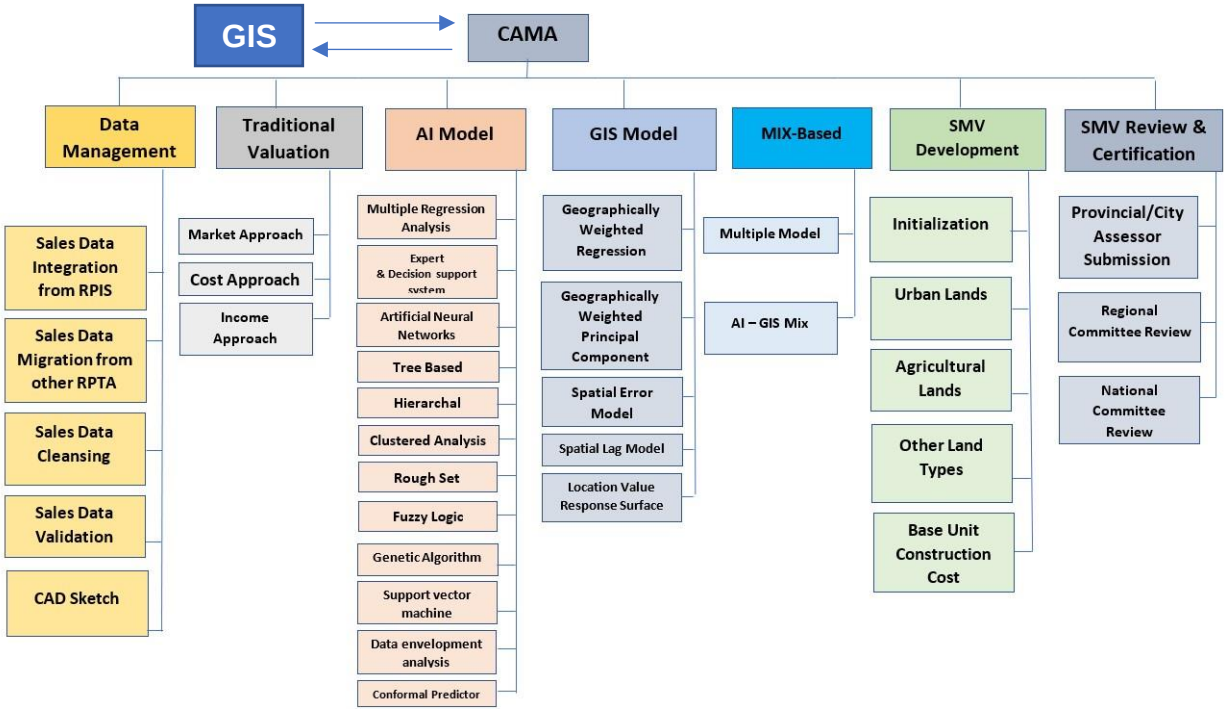
3. **Ratio Studies**
Quality testing of the property mass valuation and assessment results through statistical routines/analysis such as but not limited to COD, PRD, etc.

4. Geographic Information System
A commercial off-the-shelf (COTS) software capable of performing automated processes standard in tax mapping and assessment operations.

5. **Local Systems API (Application Programming Interface)**
   A tool enabling the local applications to exchange data and functionality easily and securely to external third-party developers and internal departments within the LGU.

6. **Cloud Infrastructure**
   A fast, high-availability and secure platform where the National Committee review and approval of SMV shall be installed and run. This shall have a redundancy setup within the BLGF Data Center.

VIII. SYSTEM PROCESS FLOW



The system's overall process starts with the user from the local assessor's office logging-in into the system that leads to the main dashboard. At the main dashboard, the user has access to the five (5) main modules. In order to start the mass appraisal and or generation of SMV, the user must be able gather the sales data to be used. The user begins with the Data Management Module where the user can cull the sale data they need. If the LGU has an RPIS (RPTA system to be developed also under the LGRP) installed, the CAMA with GIS will just integrate the data into the system. On other hand, if the LGU has a different RPTA system such as i-TAX, e-TRACS, AMELYAR, and others, the CAMA with GIS will migrate the data from these systems. Both integration and migration modules will be powered by an API to ensure seamless connection between systems. The user is then given the option to initiate data cleansing and validation to ready the sales data for the run of the automated mass appraisal. Optionally, the user is provided with the function to update some of the data with sketches using CAD.

After building up the database, the user can now select to perform a traditional valuation on multiple properties or perform mass appraisals using AI models and GIS models. The traditional valuation module should allow the user to perform a valuation on multiple properties using the Market/Sales Data Approach, Cost Approach, or Income Approach. The user selects this if multiple properties are involved but not overwhelmingly considered as for mass appraisal. When the user now decides to perform a full-scale mass appraisal, the user can select which main CAMA models to employ, whether AI or GIS. If the user chooses the module for AI, they are given the option to select among twelve (12) AI Models that they think are applicable to their LGU and sales data gathered. The system will simulate the mass appraisal values and the user can

generate the values into a data set and report which can later be used when generating the SMV. The same for GIS Models module, the user is provided with six (6) models at their disposal to generate CAMA values. The GIS Model module will especially utilize the GIS component of the system. The user has an option to explore mix and matching of the models under the Mix-Based Models. All the data set or values generated will also be paired with graphs, tables, forecast for certain period, as well as multi-layers of thematic maps describing and characterizing the values visually.

The user is also provided the module for SMV development if the LGU wishes already to use the data sets to draft a Proposed SMV. The module follows the SMV development procedure in the MAG, applying initialization of the data sets before the user begins the actual SMV drafting. The user is provided with the option to select the particular property type that a Proposed SMV is to be generated, generate the values for each property type option. The module also provides for the generation of the BUCC.

The user upon completion of the SMV development can either save it for meantime and perform another simulation or proceed with submission for approval and certification. The Provincial Assessor's Office covers the SMV for municipalities and component cities, as such, they can make the submission for their jurisdiction. Cities outside the control of the provinces can also move to submit the proposed SMV for approval and certification. Users from both LGU types are provisioned with a module on automated preparation of the proposed SMV, following the prescribed format in both MRPAAO and MAG, packaging the drafted SMV with the thematic maps, data sets used, value/data collapsing table, depreciation table, RCN table, Land Value Map, and other prescribed reports for SMV drafts, including the BUCC table. The packaged submission will be transmitted to the Regional Committee for review and approval, and can be monitored by the user LGU in the dashboard for status updates, notwithstanding revision instructions. The Regional Committee will have its own dashboard to monitor submissions received, rejected for revision, and endorsed for approval to the National Committee. The National Committee will equally have its own dashboard to monitor endorsements received, rejected for revision, and endorsed for final approval of the Secretary of Finance. Additionally, it shall have the option to generate a Certification of the approved SMV.

IX. Data Management Process

- a.1 Data Integration from RPIS
- a.2 Data Migration from other RPTA Systems
- a.3 Data Cleansing
- a.4 Data Validation
  - a.4.1 Market Area Selection
  - a.4.2 Field Inspection Entry Form
  - a.4.3 Data Integrity Coding
    - 1 = Highly Reliable
    - 2 = Reliable
    - 3 = Guide Only
    - 4 = Likely Unreliable
    - 5 = Highly Unreliable

X. Traditional Valuation Process

- b.1 Market/Sales Data Approach
- b.2 Cost Approach
- b.3 Income Approach

XI. AI Model Process

- c.1 Multiple Regression Analysis
- c.2 Expert & Decision Support System

c.3 Artificial Neural Networks
c.4 Tree Based Model
c.5 Hierarchal Model
c.6 Clustered Analysis
c.7 Rough Set Theory Model
c.8 Fuzzy Logic Theory Model
c.9 Genetic Algorithm
c.10 Support Vector Machine
c.11 Data Envelopment Analysis
c.12 Conformal Predictor

XII. GIS Model Process

d.1 Geographically Weighted Regression
d.2 Geographically Weighted Principal Component Analysis
d.3 Spatial Error Model
d.4 Spatial Lag Model
d.5 Location Value Response Surface

XIII. MIX-Base Model Process

e.1 Multiple Model
e.2 AI – GIS Mix

XIV. SMV Development Process

- f.1 Initialization
  - f.1.1 Sub-Market Area
    - f.1.1.1 Location
    - f.1.1.2 Classification
    - f.1.1.3 Property Income Class
  - f.1.2 Data Analysis
    - f.1.2.1 Base Lot Description Assignment
    - f.1.2.2 Sub-Market Area Cross-Referencing
    - f.1.2.3 Base Unit Construction Cost
      - f.1.2.3.1 Individual BUCC Computation
      - f.1.2.3.2 BUCC Table Generation
    - f.1.2.4 Replacement Cost New
      - f.1.2.4.1 RCN Computation
      - f.1.2.4.2 RCN Table Generation
    - f.1.2.5 Depreciation Table
      - f.1.2.5.1 Depreciation Computation
      - f.1.2.5.2 Depreciation Table Generation
    - f.1.2.6 Other Land Improvements
      - f.1.2.6.1 Individual OLI Computation
      - f.1.2.6.2 OLI Table Generation
- f.2 Urban Lands
  - f.2.1 Sampling
    - f.2.1.1 Simple Random
    - f.2.1.2 Systematic
    - f.2.1.3 Stratified Random
    - f.2.1.4 Cluster
    - f.2.1.5 Full Record (No Sampling)
  - f.2.2 Residential
    - f.2.2.1 Sales Comparison
      - f.2.2.1.1 Rounding and Sorting of Unit Value
      - f.2.2.1.2 Ranging

f.2.2.1.3 Generation of Frequency Table ang Graph
f.2.2.1.4 Generation of Collapsed Table
f.2.2.1.5 Generation of Sub-Class Unit Value
f.2.2.1.6 Adjustment Factor
f.2.2.1.7 Revised Sub-classification Criteria
f.2.2.2 Time Adjustment
f.2.2.2.1 Time Adjustment Table
f.2.2.2.2 Abnormality Detection
f.2.2.2.3 Generation of Percentage Increment Table
f.2.2.2.4 Generation of Unit Value Table

f.2.3 Commercial / Industrial
f.2.3.1 Capitalization of Ground Rent
f.2.3.1.1 Rental Data Integration from RPIS
f.2.3.1.2 Rental Data Migration from other RPTA Systems
f.2.3.1.3 Generation of Capitalization Rate
f.2.3.1.4 Generation of Unit Value Table
f.2.3.1.5 Generation of Sub-Class Unit Value
f.2.3.1.6 Adjustment Factor
f.2.3.1.7 Revised Sub-Classification Criteria
f.2.3.2 Value Adjustments
f.2.3.2.1 Triangular and Irregular Lots
f.2.3.2.2 Stripping Method

f.3 Agricultural
f.3.1 Sales Comparison
f.3.2 Income Approach
f.3.3 Cost Approach
f.3.4 Value Adjustments

XV. SMV Review and Approval Process

g.1 Provincial/City Assessor Submission
g.1.1 Generation of Draft Proposed SMV Document
g.1.2 Transmittal of Proposed SMV for Review
g.1.2 Status Monitoring
g.2 Regional Committee Review
g.2.1 Notification of Pending for Approval
g.2.2 Review, approval, and rejection of proposed SMV
g.2.3 Transmittal Proposed SMV to National Committee
g.2.4 Summary Report
g.2.5 Status Monitoring
g.3 National Committee Review
g.3.1 Notification of Pending for Approval
g.3.2 Review, approval, and rejection of proposed SMV
g.3.3 Transmittal Proposed SMV to Secretary of Finance
g.3.4 Summary Report
g.3.5 Status Monitoring
g.3.6 Generation of Certification

XVI. TASKS OF FIRM

a. Conduct consultations with BLGF and selected stakeholders on the design, scope, components, and modules of a CAMA system with GIS integration; ensure at least 50% of women participants in this consultation and all other consultations, workshops, and training performed under this TOR;
b. Design a draft CAMA system with GIS integration and submit this to BLGF as a Draft Inception Report;
c. Conduct a consultation workshop with BLGF and selected stakeholders on the design for the purpose of comments and recommendations;
d. Finalize the detailed design of the CAMA systems with GIS modules incorporating the comments and recommendations from the workshop and submit this as an Inception Report;
e. Develop and code the CAMA system;
f. Customize the GIS software;
g. Update/create GIS/GPS Inventory Sheet;
h. Introduce geo-location capturing in all kinds of survey forms and build digital format for software used;
i. Prepare technical specification and list of materials for implementation of the GIS system;
j. Process GPS data and conversion to GIS data format;
k. Verify accuracy of field data of geographical locations;
l. Keep records and correct erroneous data;
m. Upload/digitize map;
n. Process geo-referenced image information;
o. Prepare Base Maps;
p. Conduct stress tests on the system components, including the document issues, problems, and errors;
q. Identify system weaknesses and flaws and recommend actions to address these in a draft Interim Report;
r. Conduct consultations on the Interim Report with BLGF for approval of the recommended actions;
s. Implement the remedies to the system and document the outcome in the Interim Report;
t. Provide additional manpower to assist the ten (10) selected LGUs in spatial database buildup, digital map conversion, migration, and cleanup;
u. Conduct a workshop to present the full system to BLGF and selected stakeholders;
v. Draft the administrators and user's manual; ensure the use of gender-fair language;
w. Conduct training for selected BLGF personnel on the maintenance and operation of the system;
x. Install the system in ten (10) selected LGUs and conduct the required hands-on training of personnel;
y. Conduct stress tests on the systems in coordination with BLGF;
z. Provide web service guide
aa. Submit a Final Report on describing and detailing the full system; the outcome of the system implementation and recommendations for future work; and
bb. Submit all documentation to the BLGF including but not limited to source codes with sufficient comment, data dictionary, system documentation, user, administrator, risk management, risk management plan, communication plan, business continuity plan, and versioning of the technical documentations, maintenance and all other manuals;
cc. Provide after-sales service or support as agreed upon in the Bid Document and Contract; and
dd. Ensure all genders are represented as part of the project team.

XVII. DELIVERABLES

a. Users and Administrators' Manuals *(month 6-21)*;
b. Development of CAMA and dynamic GIS *(month 3-21);*
c. Source codes and other system documentation *(month 21)*;
d. Minimum system components and modules installed in the BLGF and selected LGUs as provided in the Bid Document and Contract listed, but not limited to the items below:

1. COMPUTER-AIDED MASS APPRAISAL (CAMA) *(month12)*

The system facilitates the automated mass valuation, applying the recent AI and GIS CAMA Models, to generate values for the development of the proposed SMV. The system must be in full compliance with the Mass Appraisal Guidebook (MAG), International Valuation Standards (IVS), and the leading concepts and theories in CAMA. It includes the in-system submission, review, and approval of the generated proposed SMV.

2. GEOGRAPHIC INFORMATION SYSTEM (GIS) *(month 15)*

Technical Proposal shall include ten (10) Perpetual licenses that are either floating or transferrable to another computer unit. As proof of compliance, it must contain the unamended GIS Software Documentation from the manufacturer. It must feature an extensive and varied data format, that possesses direct access to various types of geospatial data right out of the box without an additional license purchase. Access to Online-Data is required, allowing real-time streaming of web-based data sets or exporting to a local file for offline use. It must support reading and writing data from the most common spatial databases such as MS SQL Server, MySQL Spatial, Oracle Spatial, PostGIS/PostgreSQL, and SpatiaLite/SQLite. Moreover, the GIS software must be able to perform the following data processing:

1. Reprojecting
   Reprojection of any layer to another system before export, regardless of native projection parameters. Must be built-in in the software and allows configuration by the users depending on their requirements.

2. Attribute Management
   Allows full attribute editing and processing, with standard attribute search capability, featuring powerful search and replace tool.

3. Batch Processing
   To streamline a data processing workflow, the software must have a batch processing function that allows multiple selected files, or all compatible files within a specified folder, to be converted, reprojected, gridded, and renamed.

4. Geocoding
   Allows assignment of real-world coordinates to an imported database of addresses, utilizing either preconfigured online service or a user-imported road network, determining the point representing the location of each address. Has the option to export in tabular form or plot on the map.

5. Image Rectification
   Importing of image files to create a geographically aligned and scaled raster layer.

6. Digitizing
   Features an array of digitizing tools that allows creating and/or editing features on the map, as well function for standard point line and area creation. Also allows specialized geometric features such as range rings, grids, and buffer areas. Features advanced coordinate geometry input that will allow object creation on the map through encoding of geometric dimensions. Includes editing functions such as rotating, scaling, and moving features on the map. With regards to ability to effect modifications, it can be applied to entire features or to individual vertices to the shape and size of a feature. Lastly, it must possess scripting and batching tools for automation of GIS processing tasks.

7. Flexible View Interface
   Supports multi-view map display, allowing display of multiple docked map windows, in either top-down 2D rendering and/or oblique 3D viewing, which is independently zoomable and can be panned and can be resized to make the most efficient use of the available screen space.

8. Spatial Operations
   Capability to perform standard operations such as Intersection, Union, Difference, Symmetric Difference, Intersects, Overlaps, Touches, Contains, Equals, Within, and Disjoint. Entails also support for spatial operations scripting.

9. Feature Rendering
   Features pre-installed or custom symbols can be attributed to points, as well as the application of multiple line styles and weights to linear features. Provides solid or patterned fill shading on area features. Able to reflect feature style as attribute data for the creation of thematic maps.

10. Map Printing and Web Publishing
    Supports all standard and customized page sizes including large format or plotter printing.

11. Cartographic Publishing
    Includes cartographic elements such as a scale bar, compass rose, and map legend within the layout frame and supplementary text. Allows easy incorporation of corporate branding graphics to the design, with option to save as a template.

12. PDF Generation
    Capacity to generate PDF file, including option to create a Geospatial PDF from the current page layout, with the resulting file also including coordinate information and individual layer characteristics to allows display of inherent geographic details in other PDF reader.

13. Web Tile Exporting
    Option to export the current map view as a series of web-ready raster tiles that are compatible with common online map formats, such as Google and Bing Maps.

14. 3D Data Rendering
    3D Viewer, can be docked and linked to the 2D map, enabling automatic replication of panning, zooming, and adding vector features in both windows, and provisions function to select and measure features in the 3D viewer.

15. Linear Profiling/Line of Sight
    Visualization option allowing Path Profile display, rendered as a terrain cutaway in the 3D View. Allows profiling of line feature on the map to create a cross-sectional view of the underlying terrain. Includes line of sight calculation for visualization of any obstructions interfering with the view along the profile path.

XVIII. PREPARATION OF PROPOSAL

In addition to fully accomplishing the request for proposal template, proposing entities are requested to prepare a detailed description of how they intend to deliver on the outputs of the contract in the section of their proposal called “Approach and Methodology.” In this narrative, entities should be explicit in explaining how they will achieve the outputs and include any information on their existing activities upon which they may eventually build as well as the details of what staff will comprise the project team.

Each key and non-key expert included in the proposal must submit a curriculum vitae (CV). Only the CVs of key experts will be scored as part of the technical evaluation of proposals. The CVs of non-key experts will not be scored but will be evaluated on a pass/fail basis, based on the merits of the CV against the proposed position/task assignment for each expert. The credentials of non-key experts, as well as the design of the team as a whole (including the appropriateness of the level of inputs (Home, Field, Total), will be taken into account in the evaluation of Quality of Approach and Work Plan and Personnel Schedule criteria.

All positions under the contract, both key and non-key experts, must be included and budgeted for in the financial proposal in accordance with the person-month allocation required for each as defined by the proposing organization. Proposals should include a detailed budget covering both consultancy fees and other costs of activities, and charges.

XIX. ADDITIONAL REQUIREMENTS FOR TECHNICAL PROPOSAL

As proof of the interested FIRM’s general understanding of the system requirements indicated in this TOR, the FIRM is required to include in its Technical Proposal the initial draft system design covering, but not limited to the following:

a. Database backup plan
b. Application redundancy
c. Audit trails
d. Security
e. System diagrams
f. Flowcharts
g. Wireframes and/or Mockups
h. Content Management System (CMS)
i. Role based Access Control Level
j. Version Control Tool

XX. QUALIFICATIONS

A. FIRM (INTERNATIONAL)

The Firm shall have the following qualifications:

a.1 At least five (5) years of experience in developing, designing, and implementing software related to CAMA, statistical analysis, machine learning or artificial intelligence, and geographic information systems.
a.2 Must have successfully implemented/managed at least three (3) similar projects, including ongoing projects.
a.3 Proof of undertaking similar contracts of at least US$ 1 Million as the Single Largest Completed Contract (SLCC);
a.4 The FIRM must have a secured, physical software development office within NCR which are open for regular visits from PMU and PMO team members;
a.5 Similar international experience is an advantage;
a.6 An equal opportunity employer;
a.7 SEC Registration/License; Local Business Permit; Domestic or Foreign Corporation:
- a.7.1 A local IT contractor is required to establish a Philippine corporation, to implement the project; it may be the sole contractor without subcontractors, or may engage subcontractors but in this case assume responsibility for the entire project; a foreign IT subcontractor, if any under the local IT contractor, is required to establish either a Philippine corporate subsidiary, or a foreign branch office, to implement the project;
- a.7.2 A foreign IT contractor is required to establish a Philippine corporate subsidiary, or establish a foreign branch office, to implement the project; it may be the sole contractor without subcontractors, or may engage subcontractors but in this case assume responsibility for the entire project; a foreign IT subcontractor, if any under the foreign IT contractor, is required to establish either a Philippine corporate subsidiary, or a foreign branch office, to implement the project;
- a.7.3 The foreign IT contractor, that is the sole contractor without subcontractors, must prepare a continuity plan for the proper transfer of technology to the project owner, for the long-term sustainability of the project;
- a.7.4 The foreign IT contractor, that is either the main contractor or subcontractor, must ensure the proper transfer of technology to its local partner, to the extent of building the capacity of the said partner, for the long- term sustainability of the project;
- a.7.5 The presence of local staff who qualify as key members of the project team, shall be necessary for qualification; this requirement applies to both the local and foreign IT contractors;
- a.7.6 The contractor awarded the contract shall not subcontract the project or any part thereof to any other party, whether local or foreign, without the consent and approval of the project owner.

a.8 Must have ISO 27001:2013 – Information Security Management System Certification and at least one (1) of the following certifications:
- a.8.1 ISO 9001:2015 – Quality Management System
- a.8.2 ISO 20000-1:2011 – IT Service Management System
- a.8.3 ISO 22101:2012 - Business Continuity Management System
- a.8.5 PCIDSS certified

a.9 Other experiences:
- a.9.1 Have a greater public reach and nationwide coverage.
- a.9.2 Have experience and expertise in Commercial Grade Data Centers.
- a.9.3 With Cloud service partnerships with the major cloud service providers.

a.9.4 Must have had experience in setting up and providing internet connectivity to local government units.

B. PROPOSED MINIMUM TEAM COMPOSITION

The Project Team shall include, but is not limited to the following key and non-experts:

#	Description
	Key Experts
1	Project Manager (PM)
2	Business Analyst (BA)
3	Technical Analyst (TA)
4	Artificial Intelligence Expert (AIE)
5	Assessment and Valuation Expert (AVE)
6	Statistician (STAT)
7	TL-Senior Front-End Developer/Programmer (SFED)
8	Front-End Developer/Programmer (FED)
9	Web Developer/Designer (WDD)
10	TL-Database Administrator/Network/Cloud Security Specialist (DBA/NCSS)
11	Back-End Developer (BED)
12	TL-GIS Specialists (SGISS)
13	GIS Developer/Programmer (GISD)
	Non-Key Experts
14	Quality Assurance/System Administrator (QA/SYSAD)
16	System Tester/Help Desk (ST/HD)
16	Data Encoders (DE)

b.1 Project Manager (PM)

b.1.1 The PM shall perform the following functions:

b.1.1.1 Collaborate with the PMU and PMO Output2 team leaders for planning and overseeing the CAMA with GIS development and rollout, to ensure they are completed in time and within budget;

b.1.1.2 Coordinate the development of user manuals, training materials, and other documents as needed, to enable successful implementation and turnover of the system to BLGF;

b.1.1.3 Be available for regular PMU and PMO meetings in the BLGF office; and

b..1.1.4 Other necessary and related task attributable to the position for the completion of the project.

b.1.2 The PM shall have the following qualifications:

b.1.2.1 Minimum 8 years of proven work experience as Project Manager;

b.1.2.2 Work experience and knowledge of Java, Python, R, C++, C#, Scala and other advance programming languages relevant to machine learning;

b.1.2.3 Working knowledge in Statistics and Actuarial Science, including statistical and algorithmic models;

b.1.2.4 Familiarity with deep learning and machine learning algorithms and the use of popular AI/ML frameworks;
b.1.2.5 Proven working knowledge and part of a development and integration project in GIS and API Integration like: OpenStreetMap, MapBox, Google Map API, QGIS and any mapping related software/system;
b.1.2.6 Involved in the Implementation of minimum 3 System Development Projects that were used in production;
b.1.2.7 Proven work experience in Project Management on GIS-related systems;
b.1.2.8 Work experience and knowledge in SDLC, TLDC and Agile Development;
b.1.2.9 Work experience and knowledge in Database Management like MySQL, MariaDB, Oracle or Microsoft SQL;
b.1.2.10 Work experience and knowledge in API Development and Integration;
b.1.2.11 Please state or provide GIS-related projects that you were involved in and that the system is being used in the market; and
b.1.2.12 Education and training certification/s related to assigned role for this project.

b.2 Business Analyst (BA)

b.2.1 The BA shall perform the following functions:

b.2.1.1 Collaborate with the PMU and PMO Output2 team leaders and Project Manager to determine the scope and vision of the CAMA with GIS project;
b.2.1.2 Be available for regular PMU and PMO meetings in the BLGF office;
b.2.1.3 Conduct interviews to gather customer requirements via workshops, questionnaires, surveys, site visits, workflow storyboards, use cases, scenarios, and other methods;
b.2.1.4 Translate conceptual requirements into functional requirements in a clear manner that is comprehensible to CAMA with GIS developers/project team;
b.2.1.5 Provide guidance and/or instruction to junior staff members of the CAMA with GIS development team; and
b.2.1.6 Other necessary and related task attributable to the position for the completion of the project.

b.2.2 The BA shall have the following qualifications:

b.2.2.1 Minimum 8 years of proven work experience as a Business Analyst;
b.2.2.2 Minimum 5 years of proven work experience as a Statistician, Mathematician, and Actuarial Science, including statistical and algorithmic models;
b.2.2.3 Minimum 5 years of proven work experience in deep learning and machine learning and the use of popular AI/ML frameworks;
b.2.2.4 Proven working knowledge and experience in systems development with statistical analysis, artificial intelligence and GIS;
b.2.2.5 Work experience and knowledge in SDLC, TLDC and Agile Development;

b.2.2.6 Work experience and knowledge in Database Management like MySQL, MariaDB, Oracle or Microsoft SQL;
b.2.2.7 Work experience and in Code Versioning like GitLab, GitHub, or Bitbucket;
b.2.2.8 Work experience and knowledge in API Development and Integration;
b.2.2.9 Knowledge in Statistical Software/Package (Eviews, SPSS, Stata); and
b.2.2.10 Education and training certification/s related to the assigned role for this project.

b.3 Technical Analyst (TA)

b.3.1 The TA shall perform the following functions:

b.3.1.1 Translate requirements defined by the Business Analyst - CAMA with GIS into technical specifications;
b.3.1.2 Responsible for issues connected with the integration between external providers, or those regarding hardware requirements of the CAMA with GIS; and
b.3.1.3 Other necessary and related task attributable to the position for the completion of the project.

b.3.2 The TA shall have the following qualifications:

b.3.2.1 Minimum 5 years of proven work experience as a Technical Analyst;
b.3.2.2 Proven working knowledge and experience in systems development and integration projects;
b.3.2.3 Proven work experience in preparation of Functional and Technical Requirements Specifications;
b.3.2.4 Work experience and knowledge in SDLC, TLDC and Agile Development;
b.3.2.5 Work experience in deep learning and machine learning and the use of popular AI/ML frameworks;
b.3.2.6 Work experience and knowledge of Java, Python, R, C++ and other advance programming languages relevant to machine learning;
b.3.2.7 Work experience and knowledge in Database Management like MySQL, MariaDB, Oracle or Microsoft SQL;
b.3.2.8 Work experience and in Code Versioning like GitLab, GitHub or Bitbucket;
b.3.2.9 Work experience and knowledge in API Development and Integration;
b.3.2.10 Work experience and knowledge in HTML5, CSS, Java Script, NodeJS, JS Frameworks, PHP or Microsoft Frameworks; and
b.3.2.11 Education and training certification/s related to the assigned role for this project.

b.4 Artificial Intelligence Engineer (AIE)

b.4.1 The AIE shall perform the following functions:

b.4.1.1 Translate requirements defined by the Business Analyst - CAMA with GIS into technical specifications;
b.4.1.2 Design and develop AI models to meet project requirements;
b.4.1.3 Convert AI/ML models into APIs that other developers can use;
b.4.1.4 Perform statistical analysis on big data set; and

b.4.1.5 Other necessary and related task attributable to the position for the completion of the project.

b.4.2 The AIE shall have the following qualifications:

b.4.2.1 Minimum 5 years of proven work experience as an Artificial Intelligence Engineer;
b.4.2.2 Proven working knowledge and experience in systems development and integration projects;
b.4.2.3 Proven work experience in computer science, data science, software development, or another related field;
b.4.2.4 Solid understanding of common programming languages used in AI, such as Python, Java, C++, C#, Scala, and R;
b.4.2.5 Advanced knowledge of statistical and algorithmic models, as well as of fundamental mathematical concepts;
b.4.2.6 Experience working with large data sets and writing efficient code capable of processing large data streams at speed;
b.4.2.7 Work experience and knowledge in SDLC, TLDC and Agile Development;
b.4.2.8 Work experience in deep learning and machine learning and the use of popular AI/ML frameworks;
b.4.2.9 Work experience and knowledge in Database Management like MySQL, MariaDB, Oracle or Microsoft SQL;
b.4.2.10 Work experience and knowledge in API Development and Integration; and
b.4.2.11 Work experience and in Code Versioning like GitLab, GitHub or Bitbucket;
b.3.2.12 Work experience and knowledge in HTML5, CSS, Java Script, NodeJS, JS Frameworks, PHP or Microsoft Frameworks; and
b.4.2.13 Education and training certification/s related to the assigned role for this project.

b.5 Assessment and Valuation Expert (AVE)

b.5.1 The AVE shall perform the following functions:

b.5.1.1 Translate requirements defined by the Business Analyst - CAMA with GIS into specifications relative to CAMA;
b.5.1.2 Work with the AIE1 in the development of AI models and the GISS in the development of GIS models to meet project requirements;
b.5.1.3 Evaluate and propose the viable adaptation of the models in the local valuation setting in the Philippines;
b.5.1.4 Provide necessary technical guidance and input in the computation of values using Market/Sales Data Approach, Cost Approach, and Income Approach;
b.5.1.5 Provide technical inputs in the automated generation of depreciation tables, adjustment factors, RCN, and other related valuation tables;
b.5.1.6 Develop working models in determining variegated schedules of base unit construction costs of buildings, depending on the type of usage (e.g., residential condominium, commercial establishment, academic institution, office, hotel, etc.);
b.5.1.7 Stocktaking of local practices on the development of base unit construction costs of buildings;
b.5.1.8 integrate Whole Building Design Guide of the U.S. National Institute of Building Sciences or equivalent guidance framework

espoused by the National Building Code (NBC) of the Philippines; including the Philippine Green Building Code, which is a referral code of the NBC; and

b.5.1.9 Develop a building cost estimation model, with the functionality of providing variegated cost estimations vis-à-vis the types of buildings according to usage.

b.5.2 The AVE shall have the following qualifications:

b.5.2.1 Minimum 10 years of proven work experience as Appraiser, expert in Mass Appraisal and CAMA;
b.5.2.2 Licensed real property appraiser/valuer;
b.5.2.3 Advanced degree in architecture, civil or structural engineering, or real property valuation;
b.5.2.5 Advanced knowledge of statistical models as well as of fundamental mathematical concepts;
b.5.2.7 Solid background in real estate economics; and
b.5.2.8 Education and training certification/s related to the assigned role for this project.

b.6 Statistician (STAT)

b.6.1 The STAT shall perform the following functions:

b.6.1.1 Assist the BA1, VE1, AIE1and TA1 translate conceptual requirements into functional requirements in a clear manner that is comprehensible to CAMA with GIS developers/project team;
b.6.1.2 Provide guidance and/or instruction to junior staff members of the CAMA with GIS development team; and
b.6.1.3 Other necessary and related task attributable to the position for the completion of the project.

b.6.2 The STAT shall perform the following qualifications:

b.6.2.1 Minimum 5 years of proven work experience as a Statistician, Mathematician, and Actuarial Science;
b.6.2.2 Education and training certification/s related to the assigned role for this project;
b.6.2.3 Knowledge in Software Development;
b.6.2.4 Knowledge in Statistical Analysis; and
b.6.2.5 Knowledge in Statistical Software/Package.

b.7 **TL-Senior Front-end Developer/Programmer (SFED)**

b.7.1 The SFED shall perform the following functions:

b.7.1.1 Assist the Senior Network System Administrator in BLGF viz the FIRM contracted for the development of the CAMA with GIS;

b.7.1.2 Take lead in coding the module, which will ensure that the RPIS lodged at BLGF-CO would unify and integrate the foregoing deployed systems in the field, with regards to the deployment and testing of the integrated property assessment, billing and payment system that are to be deployed in pilot LGUs;
b.7.1.3 Assist the Senior Network System Administrator in developing the technical capacity of BLGF's regional offices, pertinent to the 4 above-mentioned IT systems, towards providing technical assistance in resolving (IT-related) technical issues that may

arise in all of the pilot LGUs - both during and beyond Project implementation;

b.7.1.4 Assist the Senior Network System Administrator in coding the module that would operationalize the model data exchange platform (i.e., within the RPPIS) being established preliminarily between BLGF, LRA, and BIR, which would eventually extend to the BSP, its regulated financial community, and other entities that would later intend to collaborate with the BLGF; and

b.7.1.5 Perform other tasks as may be identified and deemed appropriate by the corresponding (i) BLGF Technical Lead and (ii) Output Manager of the PMU.

b.7.2 The SFED shall have the following qualifications:

b.7.2.1 Must have a degree in Computer Science, Information Management, or a related field

b.7.2.2 Must have at least three (3) years of experience in coding databases and systems;

b.7.2.3 Excellent communication skills (written and verbal);

b.7.2.4 Experience working with LGUs and/or National Government Agencies; and

b.7.2.5 Work experience on similar projects under development partners or private sector companies that have international/global operations is an advantage.

b.8 Front-end Developer/Programmer (FED)

b.8.1 The FED shall perform the following functions:

b.8.1.1 Assist the Senior Programmer and the BLGF Output 2 team viz. the FIRM contracted for the development of the CAMA with GIS; and

b.8.1.2 Perform other tasks as may be identified and deemed appropriate by the corresponding (i) BLGF Technical Lead and (ii) Output Manager of the PMU.

b.8.2 The FED shall have the following qualifications:

b.8.2.1 Must have a degree in Computer Science, Computer Programming, or related field;

b.8.2.2 Must have at least three (3) years of experience in coding databases and systems;

b.8.2.3 Excellent communication skills (written and verbal);

b.8.2.4 Experience working with LGUs and/or National Government Agencies; and

b.8.2.5 Work experience on similar projects under development partners or private sector companies that have international/global operations is an advantage.

b.9 Web Developer/Designer (WDD)

b.9.1 The WDD shall perform the following functions:

b.9.1.1 Design responsive, best practice and efficient landing pages;

b.9.1.2 Integrate client data, and system features and functionalities into websites;

b.9.1.3 Optimize the website to its maximum speed and scalability;

b.9.1.4 Conduct website stress testing;

b.9.1.5 Closely coordinate with the front-end and back-end developers for efficient integration of the web page and its applications;
b.9.1.6 Create stable website functions across all devices; and
b.9.1.7 Perform other tasks as may be identified and deemed appropriate by the corresponding (i) BLGF Technical Lead and (ii) Output Manager of the PMU.

b.9.2 The WDD shall have the following qualifications:

b.9.2.1 Must have a degree in Computer Science, Computer Programming, Graphic Design, or related field;
b.9.2.2 Must have at least three (3) years of experience in programming tools and techniques, visual design skills, and web graphic design;
b.9.2.3 Excellent communication skills (written and verbal);
b.9.2.4 Experience working with LGUs and/or National Government Agencies; and
b.9.2.5 Work experience on similar projects under development partners or private sector companies that have international/global operations, is an advantage.

b.10 TL-Database Administrator / Network / Cloud Security Specialist (DBA/NCSS)

b.10.1 The DBA/NCSS shall perform the following functions:

b.10.1.1 Collaborate with the PMU and PMO team leaders, Project Manager, Business Analysts, and Technical Analysts in planning the hybrid infrastructure with combined secure cloud and on-premises system requirements and constructing, validating, and deploying the system;
b.10.1.2 Monitor and detect malicious activity once the system is deployed;
b.10.1.3 Other necessary and related task attributable to the position for the completion of the project.
b.10.1.4 Create, implement and maintain database standards, protocols and policies;
b.10.1.5 Database administration of processes and its tools, configuration, software upgrade, even the testing activity;
b.10.1.1 Manage database security, integrity, audit trails, incidents, problems and forensic issues;
b.10.1.7 Database monitoring of resource usage, transaction volumes, and the like;
b.10.1.8 Regular backup, archiving and storage management; and
b.10.1.9 Perform other tasks as may be identified and deemed appropriate by the corresponding (i) BLGF Technical Lead and (ii) Output Manager of the PMU

b.10.2 The DBA/NCSS shall have the following qualifications:

b.10.2.1 Minimum 5 years of proven work experience as Network and Cloud Security Specialist;
b.10.2.1 Proven working knowledge and part of a development and integration project in GIS and API Integration like OpenStreetMap, MapBox, Google Map API, QGIS, and any mapping related software/system;
b.10.2.1 Involved and part of the Implementation of minimum 3 System Development Projects that were used in production;

b.10.2.1 Proven work experience and knowledge in Design, Implementation, and Management of the following: Hybrid Cloud, WAN, Security Cloud, Network, and Application;
b.10.2.1 Work experience and knowledge in SDLC, TLDC, and Agile Development;
b.10.2.1 Work experience and knowledge in Database Management like MySQL, MariaDB, Oracle, or Microsoft SQL;
b.10.2.1 Work experience in Code Versioning like GitLab, GitHub, or Bitbucket;
b.10.2.1 Work experience and knowledge in API Development and Integration; and
b.10.2.1 Education and training certification/s related to the assigned role for this project.

b.11 B**ack-End Developer (BED)**

b.11.1 The BED shall perform the following functions:

b.11.1.1 Focus mainly on developing business logic and data layers of the Central RPIS; and
b.11.1.2 Other necessary and related task attributable to the position for the completion of the project.

b.11.2 The BED shall have the following qualifications:

b.11.2.1 Minimum 5 years of proven work experience as a Back-End Developer
b.11.2.2 Involved and part of the Implementation of minimum 3 System Development Projects that were used in production;
b.11.2.3 Keen on developing a good API and distributed computing system;
b.11.2.4 Work experience and knowledge in SDLC, TLDC, and Agile Development;
b.11.2.5 Work experience and knowledge in Database Management like MySQL, MariaDB, Oracle or Microsoft SQL;
b.11.2.6 Work experience and in Code Versioning like GitLab, GitHub or Bitbucket;
b.11.2.7 Work experience and knowledge in API Development and Integration;
b.11.2.8 Work experience and knowledge in of common programming languages used in AI, such as Python, Java, C++, C#, Scala, and others;
b.11.2.9 Education and training certification/s related to the assigned role for this project.

b.12 **TL-Senior GIS Specialist (SGISS) - INTERNATIONAL**

b.12.1 The SGISS shall perform the following functions:

b.12.1.1 Responsible for the preparation, migration and clean-up of the national spatial database and various thematic maps to be included in the map viewing features of the RPIS.; and
b.12.1.2 Other necessary and related task attributable to the position for the completion of the project.

b.12.2 The SGISS shall have the following qualifications:

b.12.2.1 Minimum 5 years of proven work experience as GIS Specialist

b.12.2.2 Proven work experience in thematic mapping, spatial operations, and map publishing;
b.12.2.3 Work experience and knowledge in Database Management like MySQL, MariaDB, Oracle, or Microsoft SQL;
b.12.2.4 Work experience and knowledge in using various GIS software like QGIS, Global Mapper, ESRI GIS, or AutoCAD Map; and
b.12.2.5 Education and training certification/s related to the assigned role for this project.

b.13 TGIS Developers/Programmers (GISD)

b.13.1 The GISD shall perform the following functions:

b.13.1.1 Responsible for coding user-side applications, including visual elements like menu bars, clickable buttons, and the overall layout of the CAMA with GIS; and
b.13.1.2 Other necessary and related task attributable to the position for the completion of the project.

b.13.2 The GISD shall have the following qualifications:

b.13.2.1 Minimum 5 years of proven work experience as a Front-End Developer;
b.13.2.2 Involved and part of the Implementation of minimum 3 System Development Projects that were used in production;
b.13.2.3 Keen on developing a good User Interface (UI) and User Experience (UX);
b.13.2.4 Work experience and knowledge in SDLC, TLDC, and Agile Development;
b.13.2.5 Work experience and knowledge in Database Management like MySQL, MariaDB, Oracle, or Microsoft SQL;
b.13.2.6 Work experience in Code Versioning like GitLab, GitHub, or Bitbucket;
b.13.2.7 Work experience and knowledge in API Development and Integration;
b.13.2.8 Work experience and knowledge in HTML5, CSS, JavaScript, NodeJS, JS Frameworks, PHP, or Microsoft Frameworks;
b.13.2.9 Work experience and knowledge in of common programming languages used in AI, such as Python, Java, C++, C#, Scala, and others; and
b.13.2.10 Education and training certification/s related to the assigned role for this project.

The FIRM has the flexibility to assign experts from International to National or vice versa depending on the FIRM's preference and expert qualifications.

C. REPORTING REQUIREMENTS AND TIME SCHEDULE

The FIRM shall submit a regular monthly and quarterly progress reports, and annual accomplishment report to the BLGF and ADB. Three (3) copies of the reports required by the TOR must be submitted to the BLGF Executive Director for review and approval. Aside from these regular progress and accomplishment reports, the FIRM shall also participate and prepare necessary documents, information and activities for the conduct of project mid-term and completion reports.

The selected firm shall meet with BLGF at least (twice) a month during the project duration to discuss activities, issues, concerns, and related action plans The selected firm shall submit monthly reports detailing work progress, issues, and concerns, and next steps in relation to the project as part of the deliverables.

The FIRM shall also provide electronic copies of the following reports:

Activities and Reporting	**Timeline and Terms**
Inception Report	Within 4 weeks after mobilization of the contract
Monthly Progress Report	Last working day of each month
Quarterly Progress Report	Last working day of each quarter
Annual Report	Every 15th of December of each year
Project Completion Report	Thirty days after completion of the ADB Project

1. Inception Report. The Inception Report which will be submitted within four weeks after the contract has been awarded shall include the following information: Project Work Plan, Milestones and target deliverables, Project Team composition, proposed approach and methodology.

2. Monthly/Quarterly Progress Report. Prepare project status report, activities performed, deliverables, issues, and challenges encountered and its proposed action plan.

3. Project Completion Report. Prepare a comprehensive report summarizing the project implementation activities and deliverables.

Reports shall be printed in 3 copies – BLGF (2 copies) and ADB (1 copy) and an electronic copy (submitted in USB). All reports shall be submitted and addressed to:

Officer's Name	:	**Consolacion Q. Agcaoili**
Position	:	Executive Director
Office	:	Department of Finance-Bureau of Local GovernmentFinance (BLGF)
Telephone	:	+632 8527-2780
Email address	:	executivedirector@blgf.gov.ph
Office Address	:	8th Floor, EDPC Bldg., BSP Complex, Roxas Blvd., Manila

D. PROJECT MILESTONES

The firm must identify milestones in a project work plan to show overall progress and as an indicator of compliance with an established project schedule. While the firm may propose their own milestones, typical milestones might include:

Stage	Milestones	Month of Completion
Stage I	Project Kick-Off Meeting & Contract Signing	M1 (1 Month)
	Preliminary Assessment URS and FRS Document	
	Finalization of System Requirement Specifications (SRS) based on URS and FRS	
	Inception Report, Project Work Plan, SRS sign-off	
Stage II	Architecture Design and Prototype Development	M2-M3 (2 Months)
	High Level and Security Design Document	
	Design documents & prototype acceptance sign-off	
Stage III	Applications development and deployment	M4-M11 (8 Months)
	Unit testing, Load testing, and Integration testing	
	Testing Documentation (including details of defects/bugs/errors and their resolution)	
	User Training and Workshops	
	System Dry Run	
	Delivery Sign-off	
Stage IV	System Deployment, System Parallel Run and UAT	M12-M14 (3 Months)
	System stabilization and User Acceptance Testing	
	UAT Sign-off	
Stage V	User Training/Workshops	M15-M16 (2 Months)
	Deploy CAMA to LGUs	
	Deploy CAMA to BLGF Central and Regional Offices	
	Deploy CAMA with GIS integration	
	GO LIVE	
Stage VI	System Implementation, Monitoring and Stabilization, submission of source codes and turn-over of all required documents. Acceptance Sign-off	M17-M21 (5 Months)
Stage VII	Project Exit Sign-off	

E. ACTIVITIES WITH ON-SITE VISIT TO PROTOTYPE LGUs

Below is BLGF's proposal activities for site visit to prototype LGUs, while firm may identify the proposed number of visits, days and experts required per activity.

#	Activities	No. of Key Experts per visit	Freq. of visits	No. of LGUs / Regions	No. of LGUs / Regions Outside NCR	Total no. of travels per Key Expert	Total no. of travels	No. of Days per visit	Total No. of Days	Total No. of Days with Per Diem (Outside NCR)
1	Data Gathering (meeting and coordination with LGUs and NGAs)	3	3	15	5	45	135	5	675	225
2	Analysis and Design									
3	Design presentation to Users (BLGF, DOF, LGUs, NGAs)	3	3	3	2	9	27	3	81	54
4	Development / Coding									
5	Data Migration / Encoding	10	4	10	5	40	400	10	4,000	2,000
6	Installation, Deployment, Testing and Apply fixes, User Acceptance Test (UAT), Training and Workshops	3	8	13	5	104	312	5	1,560	600
7	Parallel Run / Dry Run	3	2	13	5	26	78	5	390	150
8	Launching / Go-Live	3	1	13	5	13	39	5	195	75
TOTAL		25	21	67	27	237	991	33	6,901	3,104

- Follow-up meetings, technical support and/or trouble shooting can be done on-site, online or remote administration
- For mass data encoding, the FIRM has the option to hire stay-in or local encoders (if applicable)
- For trainings, workshops, data gatherings and other related activities, the FIRM has the option to do it per cluster

F. PERIODIC PERFORMANCE EVALUATION

The individual consultants will be subject to a joint semestral evaluation by the BLGF. The FIRM, on the other hand, will be subject to an annual evaluation by the BLGF.

1. Project Management Review

BLGF would review the progress of the project at regular intervals. The FIRM should send monthly status reports to the BLGF. The FIRM has to obtain necessary concurrence from the BLGF if there are any slippages in the deliverables (Expected deliverables from the FIRM).

2. Acceptance Criteria

a. The BLGF will accept the commissioning and project Sign-Off only after getting an acceptance letter from all respective agencies.

b. A team comprising of representatives from the BLGF, selected FIRM, and other member of the project, will verify if all the components of the solution are working fine and if the stakeholders are satisfied with the system enhancement.
c. Acceptance by the BLGF is subject to satisfactory responses from the users and relevant line agencies.
d. Acceptance letter shall be issued within thirty (30) calendar days.

G. PAYMENT SCHEDULE

Stage	Project Deliverables	Month of Completion	% of Payment
Stage I	Inception Report, Project Work Plan, SRS Sign-off	M1	5%
Stage II	Design documents and prototype acceptance Sign-off	M3	10%
Stage III	Applications development and deployment Delivery Sign-off	M11	20%
Stage IV	System Deployment and UAT Sign-off	M14	10%
Stage V	User Training/Workshops, GO LIVE	M16	30%
Stage VI	System Implementation, Monitoring and Stabilization	M17–M20	
Stage VII	Submission of source codes and turn-over of all required documents, Acceptance Sign-off, Project Exit Sign-off	M21	25%
TOTAL			**100%**

***RELEASE OF PAYMENT**

Payment shall be released to the FIRM upon completion of the corresponding deliverables in each stage.

H. PROJECT SIGN-OFFS

- SRS Sign-off
- Design Documents and Prototype Acceptance Sign-off
- Delivery Sign-off
- UAT Sign-off
- Source Code Sign-off
- Project Exit Sign-off

Each sign-off will have the attachment of detailed reports submitted to the BLGF.

I. The FIRM needs to submit a detailed project work plan on the commencement of the project. The BLGF may also prioritize the deliverables and can ask the FIRM to incrementally implement the high priority items initially during the Development Phase. The BLGF would conduct periodic reviews and audits of the work done by the FIRM.
II. The payment of the product and services will be based on deliverables dependent

on approval of all deliverables associated with that time period. The basis of payment of the FIRM will be percentage of the overall contract value through the duration of the contract. All payments will be done after verification of the FIRM's bill and signed by BLGF.

I. REPORT REQUIREMENTS AND AFTER SALES SERVICE

a. Provide after sales service as agreed upon in the Bid Document and Contract.
b. After sales service will include internal staff and capacity building in maintaining and implementing the System.
c. Compile and submit documentation of enhancements, troubleshooting performed, and/or applied fixes as may be required by the system.
d. After Sales Service will be for two (2) years to ensure that all bugs and issues on the system will be addressed. During this period, the Firm will provide the minimum recommended Team of Experts and staff, including one (1) Senior Front-End Developer / Programmer (SFED), one (1) Front-End Developer/Programmer (FED), one (1) Quality Assurance / System Administrator (QA/SYSAD), one (1) System Tester / Help Desk (ST/HD), one (1) Back-End Developer (BED), one (1) Database Administrator / Network / Cloud Security Specialist (DBA/NCSS), one (1) Senior GIS Specialists (SGISS). This Team will be reporting regularly during the first 12 months of the period. As stated in the COST COVERAGE section of this TOR, the expert's salary during this period must be imputed to the total BID AMOUNT as this shall be borne by the FIRM.

J. WARRANTY

The FIRM must warrant that the Software to be deployed and furnished to BLGF under the Agreement, will conform in all material respects with the Specifications contained in or developed in accordance with the Contract Documents, and will be: (1) deployed and conveyed to BLGF with good and merchantable title, free and clear of all security interests, Liens, encumbrances or claims of Company, Sub-Contractors and third party suppliers, (2) free of any claim of infringement, misappropriation, unfair competition, or violation of any third party Intellectual Property right, (3) created and delivered in accordance with the then-prevailing applicable Laws, and industry standards and practices, and (4) fully tested in accordance with the Contract Documents.

1.1 GENERAL

1. The Warranty Period commences after the Final Acceptance of the Software System.

2. Software System Warranty Duration is two (2) years.

   Within the two-year-period warranty, the FIRM is required to supply and provide the IT (preferably the same Experts or part of the original team) as support staff for BLGF Central Office and Regional Offices, for two (2) years, at the start of the warranty period.

3. FIRM warrants that the system response/processing times shall be according to the requirements detailed in this TOR.

4. FIRM warrants that the Software System will work with all proposed third-party systems and products.

5. The FIRM warrants that the Software System conforms to the Detailed System Requirement Specifications without defects.

6. The FIRM warrants that the Software System will support unlimited transactions.

7. Software System corrections and adjustments shall be provided at no additional cost to the BLGF during the term of the warranty period.

8. Malfunctions in the Software System reported to the FIRM within the warranty period shall be remedied at no additional cost by the FIRM with regards to the operation conditions within the time-limits stated in this TOR.

1.2 **PERFORMANCE SECURITY**

Within 28 days of the notification of contract award, the FIRM shall provide a Performance Security of ten percent (10%) of the contract price, in the form of a bank guarantee, payable to BLGF as compensation for any loss resulting from the FIRM's failure to complete its obligation under the contract.

The Performance Security shall be returned to the FIRM after complete delivery, completion, commissioning and acceptance of the requirements of Section 6.

1.3 **WARRANTY SECURITY**

The FIRM must issue a Warranty Security on or before the completion of deliverables in **PROJECT MILESTONES** stated in **Stage VI** "System Implementation, Monitoring and Stabilization, Acceptance Sign-off " in the amount equivalent to **25%** of the total value of the contract. This Warranty Security shall be returned to the FIRM not later than 28 days following the date of completion of the FIRM's warranty obligation.

K. CONFIDENTIALITY

1. The FIRM shall ensure that all its services procured from project funds or used by the consultants and project staff in carrying out the services will not violate or infringe on any industrial property or intellectual property right or any third-party claim. All Consultants, Project Staff , and the FIRM shall indemnity the BLGF from and against any and all claims, liabilities, obligations, losses, damages, penalties, action, suits, proceedings, demands, costs, expenses, and disbursements that may be imposed on, incurred by, or asserted against BLGF by reason of infringement or alleged infringement of the Consultant, Project Staff or FIRM in carrying out the Services of any intellectual or industrial property right.

2. The Consultant, Project Staff and the FIRM shall ensure that writings, textual matter, drawings, photographs, pictures, maps and diagrams, and all materials submitted to BLGF are either (i) original with the Consultant, Project Staff, in all respects and do not infringe the copyright or intellectual property of any third party; or (ii) if there be

any part of the writings, textual matter, drawings, photographs, picture, maps, diagrams, and the material, which are not of the Consultant's or Project Staff's original work, the Consultant, Project Staff, and/or the FIRM, has obtained/cleared all copyright permissions, paid all copyright or other fees for textual matter, drawings, photographs, pictures, maps, diagrams and materials to be reproduced, and the reproduction does not infringe the copyright or intellectual property of any third party. The Consultant shall ensure that all the materials submitted are original or properly cited and quoted, with permission to use extensive passages received from the author/publisher (with proof of permission attached).

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