Notice Inviting Request for Proposal

e-Tender Reference No – MA/AMRUT/2018/4

The Request for Proposal is invited by the **Bid Inviting Authority, the State Mission Director, AMRUT-West Bengal**, from reputed Consulting firms or Consortium having experience and acumen in such work as noted below in the eligibility as depicted hereunder for participating in the Bid from inception to completion of portal as per the Request for Proposal complete in all respect.

1. Bid Data Sheet

1. Name of Work: Formulation and Digitization of GIS-based Master Plan, Integration of various citizen-centric service-delivery based municipal e-governance services, Development of GIS/MIS dashboard for last mile visibility, Development of GIS applications for decision support and key insights, Automating workflows, Developing Mobile App, information dissemination and post implementation maintenance and support complete in all respect for 125 Urban Local Bodies including 55 AMRUT cities as well as areas under 20 Urban Development Authorities in the State of West Bengal.

The project consists of the following three components –

(i) Geo-database ground-truthing for AMRUT cities and GIS based map preparation and geo-database creation for non-AMRUT cities and Urban Development Authorities

(ii) GIS based Master Plan formulation for both AMRUT and non-AMRUT cities

(iii) GIS based portal development for 125 ULBs & 20 UDAs and MIS-GIS integration alongwith Mobile App & SMS alert system development which is to be deployed in the UD&MA Deptt

It should be understood that the system is not merely a GIS platform. The GIS based map and analytics is an important component of the system but the development of several applications for providing citizen services and MIS for the municipal bodies is an equally important component under the ambit of the overall solution, UD&MA Deptt. is very keen that analytics and MIS covers the workflow, events, service delivery and process turnaround times in relation to areas including but not limited to the following:

- Public Grievance Registration, Processing and Resolution
- Application for Trade License and issue thereof
- Birth & Death Registrations and issue of certificates
- Project Monitoring and controlling information
- Property holding database and tax collection
- Database on water bodies and green patches
- Solid Waste management- collection, transport and disposal
- Other citizen oriented applications

Transaction/workflow solutions are available for some of the above functionalities; they may require enhancements and modifications. For

rest of the functions, such workflow application would need to be developed.

The envisaged solution should also have provision to interface with some future systems and solutions which may come up e.g.

- Integrated finance and accounting system (Government Resource Planning)
- SCADA/IoT system on drinking water distribution network for real time taking/prevention of events (leakage, disruptions etc) and minimization of non-revenue water
- IoT and industrial automation in solid waste management

IoT on environmental parameters such as Co_x, NO_x etc.

2. Location of Work

State of West Bengal in 125 Urban Local Bodies, 20 Urban Development Authorities under Department of Urban Development and Municipal Affairs, Govt. of West Bengal

3. Bidder's Eligibility

- The bidder may be **a Consortium/or an individual Agency**. The lead company should be **more than 33% shareholder** of the consortium, AND
- The entity/bidder OR all of the entity/bidder in the consortium must be ISO certified and either a Company registered in India specified under Companies Act 1956-2013/ Society registered under Societies Registration Act, 1860/ Trust registered under Indian Trusts Act, 1882/ Partnership Firm registered under Limited Liability Partnership Act, 2008 OR research institute/educational institute/universities etc. AND
- The entity/bidder OR all the entity/bidder should have completed in business for the last 3 years as on date of publishing of this RFP
- The entity/bidder should have audited **turnover of not less than Rs. Five Crores for any of the 3 years of being in business (which may not be consecutive)** must apply. AND
- Only those entity/bidder who in the **last 3 years have handled assignments related to providing total GIS solution which includes**
  - GIS base maps creation for a single project for the area of not less than 100 sq.km, with consultancy fee of minimum Rs. 1.0 crores, Experience in conducting at least one door-to-door survey project with physical verification & measurements and geo-tagging, for minimum number of 1,00,000 assessments, in the last 5 years
  - Experience in preparation of one Statutory Master Plan/Development Plan for at least one city of planning area not less than 10 sq.km, and one Development Plan for at least one Metropolitan Region/Urban Development Authority Region with an area not less than 1000 sq.km and one Feasibility Report or Detailed Project Report for an area of minimum 1000 sq.km and preparation of City Development Plans for at least 5(five) towns/ULBs and preparation of GIS based Master plans of at least 5(five) towns/ULBs in the last 5 years
  - Bidder should have experience of UAV data capture and processing of Aerial images covering ULBs/Municipalities within India between 100

to 3000 Sq.Km or above and establishing Ground control points network using DGPS & Drones covering a minimum geographical area of 50 sq. km. in India and working on GIS base map using UAVs for building footprints with attributes like house number, address, road name, locality for municipal corporation /municipality having household of 1,00,000 or more each in last 3 years

- Workflow and process automation for State or Central Govt organizations and Experience in Commissioning of Web GIS portal for similar assignments and Commissioning of Web GIS Application portal integrated with Workflows and Commissioning of Machine learning based Auto detection of Point of Interest and Commissioning of MIS/GIS integrated Mobile Apps for State/ Central Govt Departments for at least 2 projects in last 5 years

- Relevant Work Completion Certificates or Demonstration of Live Links or Work orders along with payment certificate issued by competent authority
- International job experience certificate may be produced but preference will be given to work experience in India and job done for clients at PSU, Central & State government
- Work completion certificate or any other proof in support of work done has to be produced on company letter head. Also producing of ongoing work certificate will be considered but for that, copy of proof of job contract should be submitted; Demonstration of Live Links or Work orders along with payment certificate issued by competent authority will be also considered

5.	**Documents to be Submitted**	● **Office address of each of the bidder/participant of consortium, & Local Address in Kolkata (as required)** ● **Work Experience of last 5 years** as mentioned ● **Entity's Incorporation/Registration** Certificate along with Commencement of Business Certificate, Partnership Deed, Trust Deed and the like as the case may be. Other documents required include Service Tax Registration No./GSTN, PAN & TAN No etc. ● Support agreement/contract with GIS **software license provider**, the **Original Equipment Manufacturers (OEMs)** of IT/GIS software, including post-sales support activities for entire project duration (Implementation and O&M phase) ● **CVs of Key professionals and competence of the key professional staff (Declarations to be made in company letterhead in addition to CVs) for the assignment** ● **Brief write up on Understanding the ToR & Adequacy of the proposed work plan in response to ToR (**write-up should not exceed 500 words)
8.	**Validity Period**	RfP to be floated through e-tender. RFP submitted shall remain **valid up to 180 days** or till the time Bid Inviting Authority/Consultancy Evaluation and Review Committee announces list of the shortlisted agencies whichever is later.

9.	**Tenure of work**	Two years (**2 yrs**) and another 2 yrs thereafter for maintenance
10.	**Withdrawal of Bid:**	A Bid once submitted shall not be withdrawn within the validity period.
11.	**Acceptance of Bid:**	● State Mission Director, AMRUT-West Bengal reserves the right to accept or reject any or all Bids without assigning any reason thereto. ● State Mission Director, AMRUT-West Bengal reserves the right to withdraw / cancel the bid process at any stage, to amend / modify any of the provisions of the RfP document without any liability of whatsoever nature. Since this is an e-tendering process, all the required documents are to be submitted/published through online only. AMRUT Directorate shall not entertain any other mode of submission (post/courier/fax etc.) of RFP other than e-tender mode.
12.	**Intimation:**	● The qualified Bidders will be notified online about the acceptance of their Bid. If at any time during the evaluation process, AMRUT Directorate requires any clarification, they reserve the right to request such information from any or all of the agencies and the agencies will be obliged to provide the same within a reasonable timeframe.
11.	**Influence:**	Any attempt to exercise undue influence in the matter of acceptance of Bid is strictly prohibited and any Bidder who resorts to this will render their Bid liable to rejection.
12.	**Name and Address of the Bid Inviting Authority and nodal officer of the work**	State Mission Director, AMRUT-West Bengal Address: ILGUS Bhawan Campus, HC Block, Sector III, Salt Lake City, Kolkata-700106 Phone: +91 33 4601 7013; email: amrut.wb@gmail.com
13.	**Execution of work**	Bidders are liable to execute the service as mentioned in the Description of Assignment and Scope of Work.
14.	**Disqualifications:**	● RFP that has been found to be incomplete in content or attachments or authenticity shall not be considered for the purpose of qualification. ● If any information is received by AMRUT Directorate after the Bidder has been qualified to receive the Request for Proposal, which would have entitled the AMRUT Directorate to reject or disqualify the relevant Bidder, the AMRUT Directorate reserves the right to reject the Bidder at the time or at any time after such information becomes known to the AMRUT Directorate.
15.	**Special Terms and Conditions:**	● This notice constitutes no form of commitment on the part of the AMRUT Directorate other than to provide further information on the specific tasks to be undertaken as part of the RFP. Furthermore, this notice confers neither the right nor an expectation on any party to participate in the proposed process. Mere submission of RFP shall not entitle the participant for being shortlisted. ● The Entities/Bidders may only submit one RfP. If a bidder submits or participates in more than one Expression of Interest, all such Expression of Interest shall be disqualified. ● The Entity/Bidder shall bear all costs associated with the preparation and submission of the RfP and thereafter. AMRUT Directorate shall not,

under any circumstances, be responsible or liable for any such costs, whether direct, incidental or consequential.

- Only the courts at Kolkata (with exclusion of all other courts) shall have the jurisdiction to decide or adjudicate on any matter, which may arise out of or in connection with the bidding procedure.
- Intending entity/bidder may download the tender document from the website https://wbtenders.gov.in directly by the help of Digital Signature Certificate & necessary documents through e-Filling, (scanned copy to be submitted) (Details of which has been narrated in Section A under "Instruction to Bidders"). RfP will be submitted concurrently duly digitally signed in the website https://wbtenders.gov.in as per Tender Schedule.
- Prospective Entities/Bidders shall note carefully the minimum qualification criteria before bidding.
- At any stage of bid process and before and issuance of the work order, the bid inviting authority may verify the credential & other documents with the original of the lowest bidder if found necessary. After verification, if it is found that such documents submitted by the lowest bidder is false or misleading; in that case, work order will not be issued in favor of the bidder under any circumstances and if issued it will be withdrawn with necessary consequences under law.
- Where an individual person holds a digital certificate in his own name duly issued to him against the company or the firm of which he happens to be a director or partner, such individual person shall, while uploading any tender for and on behalf of such company or firm, invariably upload a copy of registered power of attorney showing clear authorization in his favor, by the rest of the directors of such company or the partners of such firm, to upload such tender. The power of attorney shall have to be registered in accordance with the provisions of the Registration Act, 1908.
- Bidder would be at liberty to point out any ambiguities, contradictions, omissions etc. seeking clarifications thereof or interpretation of any of the conditions of the Tender documents before the State Mission Director, AMRUT-West Bengal and/or appropriate authority at the UD&MA Department of the Govt. of West Bengal in writing by DD-MM-YYYY, and beyond such period no representation in that behalf will be entertained by the Bid Inviting Authority.
- The Bid Inviting Authority reserves right to have pre-Bid conference with the intending Bidders if deemed necessary depending upon nature of clarifications sought from Bidders within stipulated deadline.
- RfP documents should only be submitted online
- Any Corrigendum if required will only be uploaded in e-tender portal

Date and Time Schedule:

Sl.No.	Particulars	Date and Time
A.	Date of uploading of RfP (Online Publishing Date)	**01.03.2019, 15.00 hrs**
B.	RFP Documents download/start date (Online)	**02.03.2019,12.00 hrs**
C.	Seek Clarification Start Date and End Date	**03.03.2019, 10.00 hrs To 05.03.2019, 15.00 hrs**
D.	Date and time of Pre-Bid Meeting	**12.03.2019, 12.00 hrs**
E.	Bid submission starting (On line)	**13.03.2019, 10.00 hrs**
F.	Bid Submission closing (On line)	**27.03.2019, 15.00 hrs**
G.	Bid opening date for RfP	**29.03.2019, 15.00 hrs**
H.	Date of uploading list of shortlisted agencies (online)	**To be notified**

Sd/-

State Mission Director
AMRUT, West Bengal

2. Instructions To Bidders

Instructions to Bidder for e-Tendering as per Bid Inviting Authority are as follows

1. Accessing / Purchasing of BID documents

(i) At the start, Bidder must identify them for Bidding in two separate categories of work – (i) System Integrator Agency and (ii) Preparation of Base Map and formulation of GIS-based Master-Plan preparing Agency.

NOTE: Any Bidder can bid for both the categories, but, separately.

Any Bidder can bid for all the clusters

Only if Bidder identifies itself to be (i) System Integrator, then only submit bid for Cluster 0 or Model cluster; otherwise bid from among Clusters 1 to 11, all or any.

(ii) It is mandatory for all the Bidders to have a class-III Digital Signature Certificate (DSC) (with both DSC components ,i.e. signing and encryption in the name of authorized signatory who will sign the BID) from any of the licensed Certifying Agencies (Bidders can see the list of licensed CAs from the link (https://www.wbtenders.gov.in to participate in e-tendering of the Client)

(iii) DSC should be in the name of the authorized signatory. It should be incorporate capacity (that is in Bidder capacity). Please ensure the submission of document certifying the Class-III DSC.

(iv) To participate in the Bidding, it is mandatory for the Bidder to register their firm with e-tendering portal of the Client, to have user ID & password which has to be obtained by submitting the applicable fee & necessary documents. Validity of online registration is one year.

Following may kindly be noted:

(a) Registration should be valid at least up to the date of submission of Proposal;

(b) Proposals can be submitted only during the validity of the registration;

(c) The amendments / clarifications to the BID document, if any , will be hosted on the e-tendering portal https://www.wbtenders.gov.in;

(d) If the firm is already registered with e-tendering portal of Client and validity of registration is not expired the firm is not required a fresh registration.

(v) The complete BID document can be viewed / downloaded from e-tender portal https://www.wbtenders.gov.in, from the date & time mentioned in the Bid Data Sheet.

(vi) To participate in Bidding, Bidders have to pay through online mode a bid processing fee of Rs.1,00,000.00 including applicable GST) towards processing fee for BID (non-refundable). Additionally EMD is also to be furnished by the Bidder of amount of Rs. 5,00,000.00 (Rupees FIVE LAKH) through online according to **Finance Order No: 3975F(y) Dated: 28.07.2016**

(vii) Bank details of Client required for online mode:

Beneficiary Name –
Address –
Name of the Bank –
Branch address –
Type of Account –
Account No –
IFSC Code –

NOTE: Refund of Earnest Money of unsuccessful Bidder will be at the

earliest. No interest on the Earnest Money shall be paid. Moreover, Earnest Money will be forfeited (i) If the bid is withdrawn at any time before the validity period, or (ii) If the successful bidder fails to execute the contract and/or does not execute performance guarantee within the stipulated period, or even (iii) at any point of time, Bid Inviting Authority feels the bidder is underperforming and could not show cause the reasons of delay before the CERC committee to the members' satisfactions Adjustment of Earnest Money of successful Bidder will take place during the final payment.

2.	**Bid participation Fees**	• RFP Processing Fees of Amount Rs. 1,00,000.00 (Rupees ONE LAKH inclusive of GST), shall be paid by each of the participating bidders (i.e. Consortium/Agency) irrespective of no. of clusters they bid for, through online. • For the purpose of clarity, Scheduled Bank shall mean State Bank of India and its Associates, Nationalized Banks, Other Public Sector Banks and Private Sector Banks as per RBI regulations. RFP Processing Fees should be submitted along with the Bid documents by the bidders. • Bids not accompanied with the RFP processing fees shall be liable to be rejected by the client. • The bidder shall have to upload scanned copy of the demand draft on e-tendering website along with the other entire Bid documents within the timelines for bid submission.
3.	**Earnest Money Deposit**	●Earnest Money Deposit through Online of Rs. 5,00,000.00 (Rupees FIVE LAKH). ●EMD fees shall be submitted along with the Bid documents by the bidders. Bids not accompanied with the Earnest Money Deposit shall be liable to be rejected by the client.

2.	**Preparation & Submission of BIDs**	The Bidder may submit this BID online following the instruction at https://www.wbtenders.gov.in: (i) The documents shall be prepared and scanned in different files (in PDF or JPEG format such that file size is not more than 10 MB) and uploaded during the on- line submission of BID; (ii) Bid must be submitted online only through https://www.wbtenders.gov.in, using the digital signature of authorized representative of the bidder on or before the eligible date mentioned.
3.	**Modification / Substitution/ Withdrawal of BIDs**	(i) The Bidder may modify, substitute or withdraw its e- BID after submission prior the BID Due Date. No BID shall be modified , substituted or withdrawn by the Bidder on or after the BID Due Date &Time; (ii) Any alteration / modification in the BID or additional information supplied subsequent to the BID Due Date, unless the same has been expressly sought for by the Client, shall be disregarded; (iii) For modification of e-BID , Bidder has to detach its old BID from e-tendering portal and upload / resubmit digitally signed modified BID; (iv) For withdrawal of BID , Bidder has to click on withdrawal icon at e-tendering portal and can withdraw its e-BID; (v) It may specifically be noted that once a bid is withdrawn for any reason , a Bidder cannot re-submit thee-BID.

4.	**Opening & Evaluation of BIDs**	(i) Opening and evaluation of BIDs will be done through online process; (ii) The online payment facility for the submission of Registration Fee and Tender Processing Fee, which is payable to e-tender service provider, has been enabled on e-Tender Portal https://www.wbtenders.gov.in. The Bidders can pay registration Charges as applicable and Tender Processing Fees.
5.	**Method of Selection**	The selection method will be Quality-and Cost-Based Selection (QCBS). Techno-Commercial Evaluation on 80:20 basis. The total score is calculated by weighting the technical and financial scores and adding them as per the formula given in the **Selection Procedure.**

Selection Procedure

Agencies can submit BID in the mentioned bid response format and for the categories they have been evaluated during EOI stage. The categories are as below

1. Over all Central Software Development, System Integration, Base map creation, and Master Plan formulation works as mentioned in section 3.1 under categories of bidder as "System Integrator Agency for Model Cluster".
2. Base Map Creation and Formulation of Master Plan as mentioned in section 3.2 under categories of bidder.

Selection will be done on basis of 3-stage process.

I. **Pre-Qualification:** As part of the evaluation, the necessary Documents to be submitted as mentioned in "Information to Bidders".
II. The lead company should be more than 33% shareholder in the consortium
III. **Technical Evaluation:** The Consultancy Evaluation and Review Committee will carry out the evaluation of bidders who have met the Pre-Qualification criteria. The evaluation will be based on the following evaluation criteria and points system.
IV. The minimum score to Technical Score (S_t) required for opening of Financial Bid is 80.
V. The Point System for Technical Evaluation Criteria for System Integrator Agency is given below

S.no.	Criteria	Max Points
1	**GIS Base Map Creation Criteria**	**10**
1A	Experience in preparation of GIS base maps for a single project for the area of not less than 100 sq.km, in the last 5 years Per Project - 1 points for each Maximum Points - 3)	3
1B	Experience in preparation of GIS base maps for a single project with consultancy fee of minimum Rs. 1.0 crores or above, in the last 5 years Per Project – 1 point for each (Maximum Points- 4)	4

1C	Experience in conducting at least one door-to-door survey project with physical verification & measurements and geotagging, for minimum number of 1,00,000 assessments, in the last 5 years Per Project - 1 points for each (Maximum Points - 3)	3
2	**Formulation Master Plan Criteria**	**15**
2A	Experience in preparation of one Statutory Master Plan/Development Plan for at least one city of planning area not less than 10 sq.km, in the last 5 years, supported by valid documentary proof of approval (draft/final) Per project – 1 Point per city/ULB (Maximum points of 3)	3
2B	Experience in preparation of one Development Plan for at least one Metropolitan Region/Urban Development Authority Region with an area not less than 1000 sq.km, in the last 5 years, supported by valid documentary proof of approval (draft/final). Per project – 2 Points per MR/DA (Maximum Points of 4)	4
2C	Experience in preparation of one Feasibility Report or Detailed Project Report for an area of minimum 1000 sq.km, in the last 5 years Per Report – 2 Points per DPR (Maximum Points of 4)	4
2D	Experience in preparation of City Development Plans for at least 5(five) towns/ULBs, in the last 5 years	2
2E	Experience in preparation of GIS based Master plans of at least 5(five) towns/ULBs, in the last 5 years	2
3	**System Integration (Web GIS, Dashboards, Mobile Apps and ML etc.,)**	**30**
3A	Workflow and process automation for State or Central Govt organizations 2 Projects – 2 points (Additional each project 1 point to a maximum of 4 points)	4
3B	Experience in Commissioning of Web GIS portal for similar assignments mentioned in the RFP for Number of Cities or ULB's Minimum 2 ULBs – 2 points Above 2 ULBs, per ULB – 1 point Upto Maximum 6 points	6
3C	Commissioning of Web GIS Application portal integrated with Workflows Minimum 4 Applications – 2 points More than 4, per Application – 0.5 point Upto Maximum – 4 points	4
3D	Experience of development of Web GIS Application of at least 4 online service delivery modules for any ULB or Dev. Authority Minimum 4 Applications – 2 points Upto Maximum – 3 points	3
3E	Commissioning of Machine learning based Auto detection of Point of Interest as mentioned in the RFP such as Black Spot Monitoring,	8

	Green Cover, Pot Holes etc., Minimum 2 cities – 5 Points More than 2, per City – 1 Point Upto Maximum – 8 points	
3F	Commissioning of MIS/GIS integrated Mobile Apps for State or Central Government Departments Minimum 2 Applications – 2 Points More than 2, per Application – 1 Point Upto Maximum – 5 points	5
4	**Drone Survey Experience**	**10**
4A	Bidder should have experience of UAV data capture and processing of Aerial images covering ULBs/Municipalities within India. 100 sq. km to <= 500 sq. km. – 1 Points 500 sq. km to 2000 sq. km. – 2 Points More than 2000 sq.km – 4 Points	3
4B	Bidder should have experience of establishing Ground control points network using DGPS & Drones covering a minimum geographical area of 50 sq. km. in India from a single project	2
4C	Bidder should have prepared or should be working on GIS base map using UAVs for building footprints with attributes like house no, address, road name, locality for municipal corporation /municipality having household of 1,00,000 or more each in last 3 years Minimum 3 ULBs – 1 point Up to 5 ULBs – 2 point Upto Maximum – 3 points	3
4D	Bidder should give declaration to mobilise city-wise minimum 2 teams with micro UAV (Less than 2kg) for image collection	2
5	**Understanding the ToR & Adequacy of the proposed work plan in response to ToR**	**20**
6	**Qualifications as per submitted CVs and competence of the key professional staff (as per claims made in company letterhead in addition to CVs) for the assignment**	**15**
6A	1.Project Manager 2.Urban Planning Expert cum Civil Engineer 3.GIS Manager cum GIS Application Developer 4.Socio-Economic Expert 5.Transportation Engineer cum Urban Transport Planning Expert 6.Survey Manager cum Survey Database/MIS Expert 7.GPR Survey And Interpretation Expert 8.Software Developer cum Web Developer 9.Image Processing Expert 10. Photogrammetry Expert 11. GPR Survey And Interpretation Expert 12. GIS Developer/ Analyst 13. GIS Digitization Operator 14. Drone Surveyor 15. Field Surveyors Such experts in the name or equivalent capacity will be given 1 point each	

VI. The Point System for Technical Evaluation Criteria for Agencies

participating in Creation GIS Base map and Formulation of Master Plan is as given below:

S.no.	Criteria	Max Points
1	**GIS Base Map Creation Criteria**	**10**
1A	Experience in preparation of GIS base maps for a single project for the area of not less than 100 sq.km, in the last 5 years Per Project - 1 points for each Maximum Points - 3)	3
1B	Experience in preparation of GIS base maps for a single project with consultancy fee of minimum Rs. 1.0 crores or above, in the last 5 years Per Project – 1 point for each (Maximum Points- 4)	4
1C	Experience in conducting at least one door-to-door survey project with physical verification & measurements and geotagging, for minimum number of 1,00,000 assessments, in the last 5 years Per Project - 1 points for each (Maximum Points - 3)	3
2	**Formulation Master Plan Criteria**	**15**
2A	Experience in preparation of one Statutory Master Plan/Development Plan for at least one city of planning area not less than 10 sq.km, in the last 5 years, supported by valid documentary proof of approval (draft/final) Per project – 1 Point per city/ULB (Maximum points of 3)	3
2B	Experience in preparation of one Development Plan for at least one Metropolitan Region/Urban Development Authority Region with an area not less than 1000 sq.km, in the last 5 years, supported by valid documentary proof of approval (draft/final). Per project – 2 Points per MR/DA (Maximum Points of 4)	4
2C	Experience in preparation of one Feasibility Report /DPR for an area of minimum 1000 sq.km, in the last 5 years Per Report – 2 Points per DPR (Maximum Points of 4)	4
2D	Experience in preparation of City Development Plans for at least 5(five) towns/ULBs, in the last 5 years	2
2E	Experience in preparation of GIS based Master plans of at least 5(five) towns/ULBs, in the last 5 years	2
4	**Drone Survey Experience**	**10**
4A	Bidder should have experience of UAV data capture and processing of Aerial images covering ULBs/Municipalities within India. 100 sq. km to <= 500 sq. km. – 1 Points 500 sq. km to 2000 sq. km. – 2 Points More than 2000 sq.km – 4 Points	3

4B	Bidder should have experience of establishing Ground control points network using DGPS & Drones covering a minimum geographical area of 50 sq. km. in India from a single project	2
4C	Bidder should have prepared or should be working on GIS base map using UAVs for building footprints with attributes like house no, address, road name, locality for municipal corporation /municipality having household of 1,00,000 or more each in last 3 years Minimum 3 ULBs – 1 point Up to 5 ULBs – 2 point Upto Maximum – 3 points	3
4D	Bidder should give declaration to mobilise city-wise minimum 2 teams with micro UAV (Less than 2kg) for image collection	2
4	**Understanding the ToR & Adequacy of the proposed work plan in response to ToR**	**25**
5	**Qualifications and competence of the key professional staff for the assignment**	**15**
5A	1.Project Manager 2.Urban Planning Expert cum Civil Engineer 3.GIS Manager cum GIS Application Developer 4.Socio-Economic Expert 5.Transportation Engineer cum Urban Transport Planning Expert 6.Survey Manager cum Survey Database/MIS Expert 7.GPR Survey And Interpretation Expert 8.Software Developer cum Web Developer 9.Image Processing Expert 10. Photogrammetry Expert 11. GPR Survey And Interpretation Expert 12. GIS Developer/ Analyst 13. GIS Digitization Operator 14. Drone Surveyor 15. Field Surveyors Such experts in the name or equivalent capacity will be given 1 point each	

- **Relevant Work Completion Certificates or Work orders and Contract Agreements duly signed by concerned department should be submitted for evaluation of above Technical Criteria.**
- **The proposal of the Agencies who have cleared the minimum qualification score of 80% on technical score (S_t), only their financial proposal will be opened**

I. **Financial Evaluation:**

The cost indicated in the Financial Bid shall be deemed as final and reflecting the total cost of services and should be stated in INR only.

The lowest Financial Proposal (F_m) will be given a financial score (Sf) of 100 points.

The financial scores (S_f) of the other Financial Proposals will be determined using the following formula:

$S_f = 100 \times F_m / F$; in which S_f is the financial score, F_m is the lowest Financial Proposal, and F is the Financial Proposal (in INR) under consideration

Final Selection: Proposals will be finally be ranked in accordance with

their combined technical (S_t) and financial (S_f) scores:

$S = S_t \times T_w + S_f \times F_w$; where S is the combined score, and T_w and F_w are weights assigned to Technical Proposal and Financial Proposal that will be 0.80:0.20.

6. Award of Contract

The Awarding of work will take place at the presence of all the successful Bidders in a meeting before the CERC members at the office of the Bid Inviting Authority on a notified Date and Time.

The Bids shall be opened in the sequence of Cluster 0, Cluster 1, Cluster 2 .. Cluster 10, Cluster 11 etc.

i. For System Integrator Agency

Only the Bidders achieving the highest combined score (S) will be the successful Bidder and will be awarded Cluster 0 or the Model Cluster only.

ii. For Agencies participating in Creation of Base map and Formulation of Master Plan

The highest Combined Scoring bidder will be given the opportunity to choose the number of clusters they would undertake for the works as per their capacity and capability. But single Bidder will not be given more than two clusters at the maximum.

The Consultancy Evaluation & Review Committee and Bid Inviting Authority however, holds rights to award more than one cluster to a Bidder after sufficiently evaluating the capacity and capability of the Bidders.

The other bidders will be given chance to choose the clusters they would undertake Works upon, in the order of ranking as per the Combined Score.

The Bid Inviting Authority if, at any point of time, during the implementation of work, feels any or more Bidders are underperforming, will take following actions –

(i) Issue One Warning Letter to underperforming Consortium/Agency, and given a time-period of one month (30 days) to upgrade the performance to the satisfaction of the Bid Inviting Authority.

(ii) For a repeat offender, the underperforming Consortium/Agency will be summoned before the CERC to show cause of the delay. If not satisfied by the reasons shown, an amount at the rate of 1% of total contract value of the bidder will deducted per month from the said month itself up to a maximum of 5% deduction of the total contract value.

(iii) For a still persisting offender, the clusters that the underperforming Consortium/Agency are working (one or both) will be taken away from them and awarded to the highest combined scoring Consortium/Agency or the next after that as per suitability at the rate which is minimum amongst the underperforming Agency and the awarding Agency. The Earnest Money of the under-performing Bidders will be forfeited also.

(iv) However, in case there are delays in work due to any reasons beyond the control of the Consortium/Agency, the bidder must submit monthly letters for each month of delay to the Bid Inviting Agency and each of the client city's Chairman/Chairperson/Executive Officer/CEO explaining the reasons of delay and if possible, the remedial policies. If required, the bidder may appeal before the CERC for any kind of penalty or its waiver.

7. Discussions/ clarifications with the successful bidder

This includes signing of a Contract Agreement with the Bid Inviting Authority which includes the proposed methodology (work plan) until completion of the work, staffing and any suggestions made by the firm to improve the Terms of Reference. The Client and Consultant will then work out final Terms of Reference, staffing, staff-months, logistics, and reporting which will be incorporated in the Contract. **Discussions/ clarifications** will be held at the office of the Bid Inviting Authority on date set by mutual convenience.

8. Deliverables, Time Line and Payment Schedule

8.1 The time schedule for various milestones to be achieved as under:

Sl. No.	Stage Report	No. of Copies of report book	No. of Days	Cumulative no. of Days	Payment Schedule
i)	Inception Report based upon site survey of client location, risk analysis, implementation plan, finalizing own local office, final BOQ etc.	10 + soft copy	Upto 15 from date of award	15	5% of the total cost on approval by CERC
i)	Functional Requirement Specification document, System Requirement Specification document, Requirements Traceability Matrix, Area wise Ground Survey Plan, Kick-off of Base Map preparation work	3 + Soft copy	Upto 90 Day from Date of Award	90	5% of the total cost on commissioning of work and submission of SRS
iii)	A) Mouza maps and cadastral map collection, Spatial attribute collection, Drone and DGPS based Map creation, preparation of Base Maps of non-AMRUT cities and vetting of Base Maps of AMRUT cities, B) Design of Technical Architecture, DB Schema, and Interfacing details, Workflow functional details, Machine learning and AI based Modules' design framework etc. and Approval of Base Map	10 + soft copy	320 days from date of approval of Inception Report	335 plus processing time*	20% of the total cost on approval by CERC
iv)	Draft Master Plan	2 copies each to each concerned city and 3 copies	60 from date of approval of Projected Requirements, Issues & Potentials	395 plus processing time*	15% of the total cost on approval by CERC

Sl. No.	Stage Report	No. of Copies of report book	No. of Days	Cumulative no. of Days	Payment Schedule
		to BIA + soft copy			
Vii)	Final Master Plan	2 copies each to each concerned city and 3 copies to BIA + soft copy	60 from the date of receiving feedback from the Client	455 plus processing time**	15% of the total cost on approval by CERC
x)	Unified MIS / GIS Application Details with Mock-ups	3 + Soft copy	100 from date of approval of Inception Report#	555 plus processing time*	5% of the total cost on approval by CERC
xiii)	UDMA App functional requirement with mock-ups, inform citizen, stakeholders on progress	3 + Soft copy	120 from date of approval of Inception Report#	675 plus processing time*	5% of the total cost on approval by CERC
xv)	Training and Capacity Building		60 from date of approval of Inception Report#	735 plus	5% of the total cost on approval by CERC
xvi)	Completion of the Project				Final 10% of the total cost on approval by CERC and satisfactory certificates received from each of the beneficiary cities and UDAs by the BIA in 2 equal monthly installments

*Note:*All are tentative. Processing time is the time between submission of the stage report and issue of the minutes for approval/ modification of the same and would be about 30 days.*

The period between the submission of stage report and its processing would not be included in the period of assignment.

#The Client will ensure that the total period for completion for the assignment does not exceed 24 months. The State Government may change the duration of time allotted for various stages as per size of the city.

***10 copies will include one copy each for TCPO &MoHUA, SUDA, Asansol Municipal Corporation, Howrah Municipal Corporation & Kolkata Municipal Corporation, 2 copies each for the Planning Department under UD&MA Dept. and State Mission Directorate (AMRUT); 20 copies includes separate copies for ULBs and also copies for TCPO, MoHUA, SUDA, UD&MA Dept. & AMRUT Directorate.*

8.2 The Consultant will be required to make a presentation before the Consultancy Evaluation & Review Committee (CERC) within a week of submission of each of the above reports. The observations/ suggestions of CERC will be incorporated in the next stage of submission. The period between the submission of Draft Master Plan and direction given to prepare Final Master Plan would not be included in the period of assignment for remuneration purposes.

8.3 The payment will become due on approval of the stage reports and on raising of bills/ invoice by the consultant after the approval of the stage report. The processing time of the payment will be 45 days for final payment and 30 days for all other payments.

9. Support by Consultant after approval of Final Master Plan

9.1 After approval of Final Master Plan, the Consultant will provide support for two year from the date of approval of Final Master Plan for the plan approval process, workshops, discussions and making presentations to various agencies/ departments, incorporating modifications if any, as and when required by the client for the publication of Master Plan. Client will also support at the time of public objections.

9.2 Regarding implementation of GIS based web portal, deployment and demonstration will be required by physically visiting each of the concerned offices. Regarding handhold training for the GIS based software, the Consultant will provide 4-weeks trainings to all concerned in maximum 2-phases during its support period when the Master Plans will be deployed via the GIS based software in the UD & MA Department.

9.3 Annual Maintenance for the GIS based software product will be up to three years after which the software AMC may be renewed as per requirement. During these three years the Consultant is required to make available sufficient numbers of domain experts preferably at the client space to address different problems and issues.

10. Procedure for Monitoring & Review of the Assignment

The Consultant's work will be monitored and reviewed by a Review Committee under the Chairmanship of Director, State Mission Directorate, Govt. of West Bengal. The composition of the Committee will be as follows:

Director (SUDA), Secretary (MED), Chief Engineer (KMDA-Water Supply), Chief Engineer (MED), State Mission Director (AMRUT), Chief Town Planner of UD&MA Dept, Director-General (KMDA), Representative of TCPO – Govt. of India, Finance Officer (SUDA) and other concerned officers of AMRUT and also other officials, experts chosen by the Bid Inviting Authority as and when required.

NOTE: The consultants shall submit each of the above-mentioned deliverables as per the schedule mentioned above. This will be followed by a presentation to the CERC within a week, wherein, the CERC members shall give their comments and suggestions in the form of feedback. Subsequently, the consultant will incorporate all such comments and suggestions in their next stage report.

Bidders are hereby instructed to put all the rates in the BOQ. And l1 Bidder will be decided on the total value of the BOQ, but not for individual Items.

Terms of Reference

1. Introduction of the Tender work

The purpose of Atal Mission for Rejuvenation and Urban Transformation (AMRUT) is to provide basic services (e.g. creating infrastructure related to water supplies, sewerage, urban transport, and develop green spaces like parks) to households and build amenities in cities which will improve the quality of life for all, especially the poor and the disadvantaged. The major components of the Mission are to (i) ensure that every household has access to a tap with assured supply of water and a sewerage connection; (ii) increase the amenity value of cities by developing greenery and well-maintained open spaces (e.g. parks); and (iii) reduce pollution by switching to public transport or constructing facilities for non-motorized transport (e.g. walking and cycling). Besides these, the Mission has identified eleven major reforms schemes. Urban Planning and City Level Plans is one of these schemes and Preparation of Master Plan in GIS

environments is considered as a sub-scheme under this scheme. The objective of this sub-scheme is to develop common digital geo-referenced base maps and land use maps using GIS for towns/ULBs to enable them to make more informed strategic decisions and this is where use of geo-spatial technologies are expected to contribute in the form of land use utility planning, urban planning and Master Plans. Master Plans provide the basis for infrastructure provision, effective land use management and utilization, spatial growth management, enable project planning, and urban management.

1.1. Planning response in India has generally not been able to keep pace with the rate of urbanization and formation of towns. As per information obtained from State Town & Country Planning Departments (STPD), only 24% of towns and cities have statutory Master Plans available all over India.

1.2. The number of urban settlements in India is witnessing relatively rapid growth and the percentage of India's population living in urban areas is expected to increase to nearly 40% by 2026 and cross 50% by 2051 (as per data by TCPO, Delhi). This means that a larger number of settlements, as well as a larger percentage of population, has to be planned for urgently to ensure economic growth of the nation and well-being of the people.

1.3. In order to meet the requirement, in the State of West Bengal, the work initiative for Formulation of GIS-based Master Plan for 125 Urban Local Bodies including 55 AMRUT cities as well as 20 Urban Development Authorities has been taken up. In this regard, State Mission Directorate, AMRUT-West Bengal under UD&MA Department is the Bid Inviting Authority and State Nodal Agency (SNA) for implementing the scheme in West Bengal and will work in coordination with the Planning cell under Chief Town Planner, UD&MA Dept.

1.4. The Government of West Bengal also intends to set up a state-of-the-Art GIS infrastructure with hardware servers, workstations and open source and commercial software within a proposed GIS cell and create GIS based web portal with dashboard for management of the GIS based Master Plans overlayed on newly developed Base Maps

1.4.1. Portal will host, visualize and access the base map, various layers and attributes created during the exercise for all ULBs and UDAs across the state.

1.4.2. Portal will support the creation of Master Plan according to the standard mentioned in AMRUT Sub-scheme Guideline (document available at https://amrut.gov.in/writereaddata/AMRUT-SubScheme_Guideline.pdf). The portal based software will develop a workflow for interaction between different stakeholders- Town Planners/Urban Planners, Chief Town Planner, other appropriate officials and public. The portal and software system also intends to create a Common Rule Based Master Plan data model for the state, defining all the attributes of the Master Plan.

1.4.3. There will be provision of unified GIS and MIS dashboards with actionable insights for various ULB services and operations as detailed under the "Details of Works". The System is intended to be an integrated GIS web portal that will communicate with various real-time workflow systems, databases and other legacy systems to bring on last mile visibility and decision support in a GIS and MIS format.

1.4.4. As upkeeping layers and inflow of near-Realtime data is very important for the usability and efficacy of these systems, UD&MA Department want to make use of advancement of Artificial Intelligence and Machine learning. Data acquired through selective service related to Drone survey and High-Resolution satellite data will be used for automatic extraction of various information and layers that will supplement these dashboards.

2. Brief Summary on Work

The work is to be carried out for all the 125 ULBs and 20 UDAs and is to be done with requisite local presence of bidder's team. The work is divided in two major categories, one is system integration which includes development of a central software including Web portal, GIS application, Workflows, Mobile Apps, Citizen Interfaces etc and other is to create Base Map and Formulate Master Plan with the help of drone based imagery and HDSI and include works on GCPs, digitization, Field Survey, stakeholder engagement etc. The central software will be done once and deployed across all the ULBs and UDAs, however the work of Base map creation and Formulation of Master plan will be done in clustered phases. The below are the list of works that is required to be carried out by bidders, and is further explained in the "Details of Works" Section"

2.1. Base Map Creation

This needs to be done for all the ULBs and UDAs as described in the details of work. The work will involve acquisition of raw imagery from Drone or High Definition Satellite Image, taking GCPs, doing Geo-referencing and Ortho Correction. Bidder will further extract and digitize, and then collect attribute and information through field and door to door survey as per the layers, attributes and information described in the "Details of works". For 55 Amrut cities (Mentioned below), the State Mission Directorate, Government of West Bengal has already placed order for base maps at a scale of 1:4000 from NRSC as per AMRUT Guideline and available layers are detailed under "NRSC Created Base Map" under "Details of Works", Bidder will be required to carry out additional work, if any or necessary for bridging the gap layers, attributes and information not covered in NRSC created base map, this may include acquisition of Drone based Raw Imagery or otherwise and GCP creation, Digitization and Field Survey.

2.2. Master Plan

Preparation and Formulation of Master plan as per the AMRUT guidelines and vision of the state will be carried by the bidder for all the 125 ULBs and 20 UDAs. The work will include setting the objectives and goals, stake holder engagement, collecting and analysing existing situation, setting up spatial strategy and preliminary plans, creation of the draft master plans etc.

2.3. Setting and Commissioning of GIS based web portal

For easy visualization and access of Base Maps and Master Plan, the bidder for the central software needs to build the central GIS based web portal and make sure that as and when each ULBs/UDAs base map and master plan is created it is validated and commissioned into the Web Geoportal. The portal will provide easy access to base map and master plan for all the stakeholders from any place over internet, it will further enable stakeholders to review, redline and publish the draft and update Master Plans.

2.4. Development, automation and commissioning of workflow

The bidder developing central software system is further expected to develop web enabled work flow automation for various services accessed by citizens, and provide a seamless and paperless one stop discovery platform for the citizens and department officials to interface, initiate, track, approve and pay for these services. Bidder is expected to engage with departments, ULBs and UDAs to understand the current workflows and processes to developed Software Requirement Specification which will be validated by State Mission

Directorate and Planning cell. Some of the ULBs are having existing IT system for basic work-flow and database management. Among these systems few of them are online and few of them are offline, bidder is expected to create the workflow for the ones which are offline and migrate the legacy database into the platform.

2.5. Integration with Existing Workflow and Other Online Systems

The bidder will be required to locally go and assess the list of the various existing systems as mentioned in the "Details of Works" section, and work to create necessary integration interfaces by designing and developing a common unified application catering all required ULB functions asked in the RFP, all by using some common logic etc.

2.6. Development of Citizen Interfaces for various services

All the citizen services are expected to be made available to citizen through digital media like Mobile Apps, SMS, EMAILS, WhatsApp etc. Bidder will be required to understand the requirement and develop necessary channels and infrastructures to enable these citizen centric interfaces.

2.7. Building and Commissioning of GIS based web Application and Dashboards

Bidder isrequired to make use of base map layers, master plan and real-time data and create GIS application that will provide last mile visibility into various layers, assets and processes, and provide actionable insights for decision support.

2.8. Development of Machine Learning based Automatic layer extraction from Drone Data and Satellite Data

Above dashboards, workflows, and applications will require large amount of near real-time data for correctness and efficacy of system. Govt of West Bengal wants to utilize the advancement into the area of Artificial intelligence and Machine Learning for automatic extraction and detection of anomalies, layers and information from high definition satellite image and drone image data.

2.9. Training, and Capacity Building

Bidder is expected to conduct classroom hands-on training on the system, master plan, work-flows and troubleshooting at client space.

2.10. Onsite Support and Maintenance for a period of 24 months from the date of commissioning, on-call basis within 24 Hrs on priority basis. Available support roster should be priorly shared with client.

3. Categories of Bidders

3.1. System Integrator Agency for Model Cluster.

This Consortium/Agency will be building the central software that will include work mentioned from section 2.3 to 2.10 for all the 125 ULBs and 20 UDAs. This agency will also be performing works under section 2.1 and 2.2 for all the ULBs and UDAs mentioned in the Cluster 0(model cluster). The entire suite if central Web GIS, Online workflow, citizen interfaces and Machine learning based works will be commissioned with cluster 0, which will be treated as a model cluster, and same will be replicated and commissioned for all the other clusters It will be System Integrator Agency's responsibility to onboard each of the ULBs and UDAs as and when their base map and master plans are digitally ready. This agency can further express interest to participate in other cluster as well for "Base map creation and Formulation of Master Plan" works.

3.2. Multiple Base Maps and Master Plan Agency

The Consortium/Agency participating for this part of the work will be required to execute the scope as per section 2.1 and 2.2 (i.e Base map creation and Formulation of Master Plan). This is the major part of the work, considering base map creation and master plan formulation is to be done for all of 125 ULBs and 20 UDAs. The work will be divided into various clusters of almost similar sizes, and mix of both AMRUT and non-AMRUT cities and geographically nearer UDAs.

3.3. Scope summary between the two Agencies

Below figure illustrates the overall scope of two Agencies

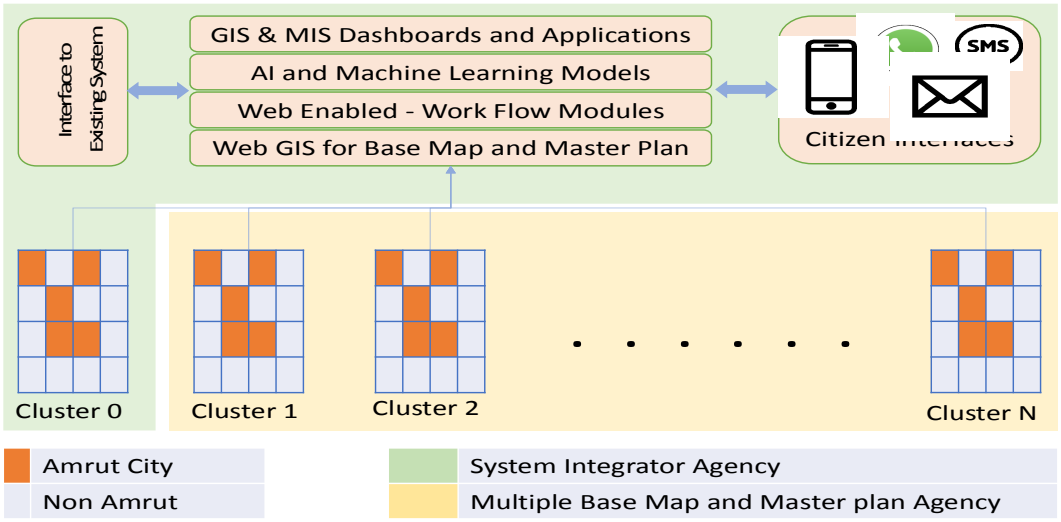

Figure 1:Scope summary between the two Agencies

4. Clustering

The 125 Urban Local Bodies and 20 Urban Development Authorities are categorized into the Clusters/Packages mentioned below

4.1.1. Cluster -0 (Model Cluster)

SN	Name of Town/Urban Local Body	Category	Population Census 2011	Area (Sq. KM)	Status under the Project	Development Authority
1	Bidhannagar Municipal Corporation	MC	6,18,358	65.76	KMA, AMRUT	KMDA, NKDA
2	South Dum Dum Municipality	A	4,03,316	17.50	KMA, AMRUT	
3	Panihati Municipality	A	3,77,347	19.38	KMA, AMRUT	
4	Kamarhati Municipality	A	3,30,211	10.90	KMA, AMRUT	

SN	Name of Town/Urban Local Body	Category	Population Census 2011	Area (Sq. KM)	Status under the Project	Development Authority
5	North Dum Dum Municipality	A	2,49,142	26.45	KMA, AMRUT	
6	Baranagar Municipality	A	2,45,213	7.12	KMA, AMRUT	
7	Dum Dum Municipality	C	1,14,786	9.73	KMA, AMRUT	

4.1.2. Cluster -1

SN	Name of Town/Urban Local Body	Category	Population Census 2011	Area (Sq. KM)	Status under the Project	Development Authority
1	Kolkata Municipal Corporation	MC	44,96,694	202.00	KMA, AMRUT	KMDA

4.1.3. Cluster- 2

SN	Name of Town/Urban Local Body	Category	Population Census 2011	Area (Sq. KM)	Status under the Project	Development Authority
1	Barasat Municipality	A	2,78,435	34.50	KMA, AMRUT	KMDA
2	Madhyamgram Municipality	B	1,96,127	21.56	KMA, AMRUT	
3	Habra Municipality	C	1,47,221	21.81	KMA, AMRUT	
4	North Barrackpore Municipality	C	1,32,806	13.60	KMA, AMRUT	
5	Basirhat Municipality	C	1,25,254	22.50	KMA, AMRUT	
6	Ashokenagar-Kalyangarh Municipality	C	1,21,592	20.50	KMA, AMRUT	
7	Bongaon Municipality	C	1,08,864	14.27	KMA, AMRUT	
8	New Barrackpore Municipality	D	76,846	6.89	KMA, AMRUT	
9	Baduria Municipality	D	52,493	22.00	Non-KMA, Non-AMRUT	
10	Gobardanga Municipality	D	45,377	13.50	Non-KMA, Non-AMRUT	
11	Taki Municipality	D	38,263	13.00	Non-KMA, Non-AMRUT	

4.1.4. Cluster -3

SN	Name of Town/Urban Local Body	Category	Population Census 2011	Area (Sq. KM)	Status under the Project	Development Authority
1	Bhatpara Municipality	A	3,83,762	33.96	KMA, AMRUT	KMDA
2	Naihati Municipality	A	2,17,900	11.55	KMA, AMRUT	
3	Barrackpore Municipality	C	1,52,783	10.61	KMA, AMRUT	
4	Halisahar Municipality	C	1,24,939	8.96	KMA, AMRUT	
5	Kanchrapara Municipality	C	1,20,345	9.07	KMA, AMRUT	
6	Titagarh Municipality	C	1,16,541	3.40	KMA, AMRUT	
7	Khardah Municipality	C	1,08,496	6.87	KMA, AMRUT	
8	Garulia Municipality	C	85,336	5.38	KMA, non-AMRUT	

4.1.5. Cluster -4

SN	Name of Town/Urban Local Body	Category	Population Census 2011	Area (Sq. KM)	Status under the Project	Development Authority
1	Howrah Municipal Corporation	MC	10,77,075	64.55	KMA, AMRUT	KMDA, HIT, GBDA
2	Maheshtala Municipality	A	4,48,317	44.18	KMA, AMRUT	
3	Rajpur-Sonarpur Municipality	A	4,24,368	49.90	KMA, AMRUT	
4	Uluberia Municipality	A	2,22,240	34.10	KMA, AMRUT	

SN	Name of Town/Urban Local Body	Category	Population Census 2011	Area (Sq. KM)	Status under the Project	Development Authority
5	Budge Budge Municipality	D	76,837	9.06	KMA, non-AMRUT	
6	Baruipur Municipality	D	53,128	9.50	KMA, non-AMRUT	
7	Diamond-Harbour Municipality	D	41,802	10.36	Non-KMA, Non-AMRUT	
8	Pujali Municipality	D	37,047	8.32	KMA, non-AMRUT	
9	Joynagar-Mazilpur Municipality	E	25,922	6.00	Non-KMA, Non-AMRUT	

4.1.6. Cluster -5

SN	Name of Town/Urban Local Body	Category	Population Census 2011	Area (Sq. KM)	Status under the Project	Development Authority
1	Kharagpur Municipality	B	2,07,604	321.00	Non-KMA, AMRUT	MKDA, HDA, DSDA
2	Haldia Municipality	B	2,00,827	109.65	Non-KMA, AMRUT	
3	Midnapore Municipality	C	1,69,264	18.36	Non-KMA, AMRUT	
4	Contai Municipality	C	92,226	17.25	Non-KMA, Non-AMRUT	
5	Tamluk Municipality	D	65,306	17.86	Non-KMA, Non-AMRUT	
6	Jhargram Municipality	D	61,712	21.40	Non-KMA, Non-AMRUT	
7	Panskura Municipality	D	57,932	17.04	Non-KMA, Non-AMRUT	
8	Ghatal Municipality	D	54,591	7.76	Non-KMA, Non-AMRUT	
9	Egra Municipality	E	30,148	17.00	Non-KMA, Non-AMRUT	
10	Chandrakona Municipality	E	23,629	16.58	Non-KMA, Non-AMRUT	
11	Ramjibanpur Municipality	E	19,611	15.83	Non-KMA, Non-AMRUT	
12	Khirpai Municipality	E	16,384	11.65	Non-KMA, Non-AMRUT	
13	Kharar Municipality	E	12,118	10.00	Non-KMA, Non-AMRUT	

4.1.7. Cluster -6

SN	Name of Town/Urban Local Body	Category	Population Census 2011	Area (Sq. KM)	Status under the Project	Development Authority
1	Siliguri Municipal Corporation	MC	5,13,264	41.90	Non-KMA, AMRUT	SJDA, GDA, CDA, JDA
2	Darjeeling Municipality	A	1,18,805	7.43	Non-KMA, AMRUT	
3	Jalpaiguri Municipality	C	1,07,341	12.98	Non-KMA, AMRUT	
4	Cooch Behar Municipality	D	77,935	8.29	Non-KMA, Non-AMRUT	
5	Alipurduar Municipality	D	65,232	9.75	Non-KMA, Non-AMRUT	
6	Kalimpong Municipality	C	49,403	9.17	Non-KMA, Non-AMRUT	
7	Dhupguri Municipality	D	44,719	14.90	Non-KMA, Non-AMRUT	
8	Kurseong Municipality	D	42,446	5.05	Non-KMA, Non-AMRUT	
9	Dinhata Municipality	D	36,124	4.55	Non-KMA, Non-AMRUT	
10	Mal Municipality	E	25,218	8.00	Non-KMA, Non-AMRUT	
11	Mathabhanga Municipality	E	23,890	4.00	Non-KMA, Non-AMRUT	
12	Tufanganj Municipality	E	20,998	2.49	Non-KMA, Non-AMRUT	
13	Haldibari Municipality	E	14,404	11.00	Non-KMA, Non-AMRUT	
14	Mirik Notified Area Authority	E	11,513	6.50	Non-KMA, Non-AMRUT	
15	Mekliganj Municipality	E	9,127	3.88	Non-KMA, Non-AMRUT	

4.1.8. Cluster -7

SN	Name of Town/Urban Local Body	Category	Population Census 2011	Area (Sq. KM)	Status under the Project	Development Authority
1	Raiganj Municipality	B	1,83,612	10.76	Non-KMA, AMRUT	
2	English Bazar Municipality	B	2,05,521	13.25	Non-KMA, AMRUT	
3	Balurghat Municipality	C	1,51,299	10.56	Non-KMA, Non-AMRUT	
4	Old Malda Municipality	D	84,012	3.24	Non-KMA, Non-AMRUT	
5	Gangarampore Municipality	D	56,217	10.29	Non-KMA, Non-AMRUT	
6	Islampore Municipality	D	54,340	11.40	Non-KMA, Non-AMRUT	
7	Kaliaganj Municipality	D	53,530	11.67	Non-KMA, Non-AMRUT	
8	Buniyadpur	D	46,236		Non-KMA, Non-AMRUT	
9	Dalkhola Municipality	D	36,930	15.95	Non-KMA, Non-AMRUT	

4.1.9. Cluster -8

SN	Name of Town/Urban Local Body	Category	Population Census 2011	Area (Sq. KM)	Status under the Project	Development Authority
1	Berhampore Municipality	B	1,95,223	31.42	Non-KMA, AMRUT	SSDA, PDA, TRDA, BKDA
2	Domkal	C	96,949		Non-KMA, Non-AMRUT	
3	Dhulian Municipality	C	95,706	6.25	Non-KMA, Non-AMRUT	
4	Jangipore Municipality	C	88,165	8.20	Non-KMA, AMRUT	
5	Bolpur Municipality	D	80,210	13.13	Non-KMA, Non-AMRUT	
6	Suri Municipality	D	67,864	9.47	Non-KMA, Non-AMRUT	
7	Rampurhat Municipality	D	57,833	16.32	Non-KMA, Non-AMRUT	
8	Kandi Municipality	D	55,632	12.97	Non-KMA, Non-AMRUT	
9	JiaganjAzimganj Municipality	D	51,790	11.66	Non-KMA, Non-AMRUT	
10	Sainthia Municipality	D	44,601	16.00	Non-KMA, Non-AMRUT	
11	Murshidabad Municipality	D	44,019	17.25	Non-KMA, Non-AMRUT	
12	Nalhati Municipality	D	41,534	7.85	Non-KMA, Non-AMRUT	
13	Dubrajpur Municipality	D	38,041	16.83	Non-KMA, Non-AMRUT	
14	Beldanga Municipality	E	29,205	3.29	Non-KMA, Non-AMRUT	

4.1.10. Cluster -9

SN	Name of Town/Urban Local Body	Category	Population Census 2011	Area (Sq. KM)	Status under the Project	Development Authority
1	Asansol Municipal Corporation	MC	11,52,443	326.48	Non-KMA, AMRUT	ADDA, BDA, MMDA
2	Durgapur Municipal Corporation	MC	5,66,517	154.20	Non-KMA, AMRUT	
3	Burdwan Municipality	A	3,14,265	26.30	Non-KMA, AMRUT	
4	Bankura Municipality	C	1,37,386	19.06	Non-KMA, AMRUT	
5	Purulia Municipality	C	1,21,067	14.00	Non-KMA, AMRUT	
6	Katwa Municipality	D	81,615	8.53	Non-KMA, Non-AMRUT	
7	Bishnupur Municipality	D	67,783	22.01	Non-KMA, Non-AMRUT	
8	Kalna Municipality	D	56,722	6.90	Non-KMA, Non-AMRUT	
9	Memari Municipality	D	41,451	9.00	Non-KMA, Non-AMRUT	
10	Gushkara Municipality	D	35,388	17.00	Non-KMA, Non-AMRUT	

SN	Name of Town/Urban Local Body	Category	Population Census 2011	Area (Sq. KM)	Status under the Project	Development Authority
11	Sonamukhi Municipality	E	29,085	11.65	Non-KMA, Non-AMRUT	
12	Raghunathpur Municipality	E	25,561	13.00	Non-KMA, Non-AMRUT	
13	Dainhat Municipality	E	24,397	10.36	Non-KMA, Non-AMRUT	
14	Jhalda Municipality	E	19,544	4.00	Non-KMA, Non-AMRUT	

4.1.11. Cluster -10

SN	Name of Town/Urban Local Body	Category	Population Census 2011	Area (Sq. KM)	Status under the Project	Development Authority
1	Kalyani Municipality	C	1,00,575	30.19	KMA, AMRUT	KMDA
2	Krishnagar Municipality	C	1,53,062	15.96	Non-KMA, AMRUT	
3	Santipur Municipality	C	1,51,777	25.88	Non-KMA, AMRUT	
4	Nabadwip Municipality	C	1,25,543	11.66	Non-KMA, AMRUT	
5	Chakdah Municipality	C	95,203	15.36	Non-KMA, Non-AMRUT	
6	Ranaghat Municipality	D	75,365	7.72	Non-KMA, Non-AMRUT	
7	Gayeshpur Municipality	D	58,998	22.63	Non-KMA, Non-AMRUT	
8	Haringhata	E	32,315	36.00	Non-KMA, Non-AMRUT	
9	Birnagar Municipality	E	30,799	6.00	Non-KMA, Non-AMRUT	
10	Taherpur Notified Area	D	20,894	2.01	Non-KMA, Non-AMRUT	
11	Coopers' Camp Notified Area	E	18,843	1.50	Non-KMA, Non-AMRUT	

4.1.12. Cluster -11

SN	Name of Town/Urban Local Body	Category	Population Census 2011	Area (Sq. KM)	Status under the Project	Development Authority
1	Serampore Municipality	B	1,81,842	17.60	KMA, AMRUT	KMDA, FSDA, TDA
2	Hooghly Chinsurah Municipality	B	1,77,259	17.29	KMA, AMRUT	
3	Chandannagar Municipal Corporation	MC	1,66,867	22.03	KMA, AMRUT	
4	Uttarpara-Kotrung Municipality	C	1,59,147	11.71	KMA, AMRUT	
5	Rishra Municipality	C	1,24,577	6.48	KMA, AMRUT	
6	Baidyabati Municipality	C	1,21,110	12.09	KMA, AMRUT	
7	Champdany Municipality	C	1,11,251	6.59	KMA, AMRUT	
8	Bansberia Municipality	C	1,03,920	9.07	KMA, AMRUT	
9	Bhadreswar Municipality	C	1,01,477	8.28	KMA, AMRUT	
10	Dankuni Municipality	C	94,936	19.50	Non-KMA, Non-AMRUT	
11	Konnagar Municipality	D	76,172	4.67	Non-KMA, Non-AMRUT	
12	Arambagh Municipality	D	66,175	34.75	Non-KMA, Non-AMRUT	
13	Tarakeswar Municipality	E	30,947	3.88	Non-KMA, Non-AMRUT	

4.1.13. List of Urban Development Authorities

1	Kolkata Metropolitan Development Authority – KMDA	11	Gangasagar Bakkhali Development Authority – GBDA
2	Asansol Durgapur Development Authority – ADDA	12	Tarapith Rampurhat Development Authority – TRDA
3	Burdwan Development Authority – BDA	13	Furfura Sarif Development Authority – FSDA
4	Digha Shankarpur Development Authority – DSDA	14	Bakreswar Development Authority – BDA

5	Haldia Development Authority – HDA	15	Patharchapuri Development Authority – PDA
6	Jaigaon Development Authority – JDA	16	Mukut Monipur Development Authority – MMDA
7	Midnapore Kharagpur Development Authority – MKDA	17	Tarakeswar Development Authority – TDA
8	Siliguri Jalpaiguri Development Authority – SJDA	18	Changrabandha Development Authority – CDA
9	Sriniketan Shantiniketan Development Authority – SSDA	19	Gajoldoba Development Authority – GDA
10	Newtown Kolkata Development Authority – NKDA	20	Howrah Improvement Trust – HIT

5. Details of Works

5.1. Base MAP Creation

5.1.1. Base map and Layers

Basemap refers to a collection of GIS data and orthorectified imagery that form the background setting of a map. Basemaps form the most crucial information for formulation of Master Plan. The base map for the area of interest must be developed using the latest high-definition satellite imagery or drone imagery and survey of all physical features, collection and super Collection and Superimposition of Town Survey Maps / Cadastral Maps, information obtained from Mouza maps and Mouza lists about existing Administrative Boundaries, Slum Boundaries, Infrastructure Details, Water bodies, Landmarks, Contours etc.

The selected bidder shall be required to generate all the data sets as per the design and standards documents of AMRUT, published as per AMRUT Guideline.

Following activities are to be covered under this part of the assignment:

I. Review of existing situation, collection of all available data from ULBs and Urban Development Authority, including Mouza information, population and other survey data, municipal boundary, Town survey maps, Cadastral maps, ward boundary maps, slum related data, colony boundary maps etc;

II. Data evaluation: Source and reliability, positional accuracy, attribute authenticity;

III. Design of proper grid and projection Universal Transverse Mercator coordinate system (UTM- WGS 84) for the whole ULB. Sliver Polygon Tolerance (SPT) (less than MMU) in m is <4 in 1:2000 scale;

IV. Geo-referencing of satellite imagery using sufficient number of Ground Control Points (GCPs) collected through Differential Global Positioning System (DGPS) survey;

V. Interpretation and digitization of all physical features from satellite imagery. The digitization process shall include vectorisation, symbolization, layering, edge matching, topological integrity, and data base linking;

VI. Geo-referencing and digitization of Cadastral Maps;

VII. Generation of contour overlay at 2 -5 meter interval using Stereo Satellite Data

VIII. Incorporation of locality, ward, zone and municipal boundaries;

IX. Database structure and design;

X. Integration of existing environmental, slum related and other data with base map.

5.1.2. As per Defined layers it needs to be extracted

S/No	Class and Sub-Class	As per Design and Standard Document		To be considered in addition to the Design and Standard Document
		Table No	Page No	
1	Road: Geo-Spatial Data Content	6	12	• In case of >7.5m width, Roads should be polygon • Also include Road Median feature
1a	Road Line GIS Data Structure	6a	12	
1b	Road Polygon GIS Data Structure	6b	13	
2	Rail – Geo-Spatial Data Content	7	13	• Also include Tram tracks and Circular Railways, From Station and To Station
2a	Rail Line	7a	14	
3	Bridges/Flyovers	8	14	
3a	Bridges & Flyovers	8a	14	
4	Water bodies	9	15	
4a	Water bodies Line	9a	15	
4b	Water bodies Polygon	9b	16	
5	Urban Land use/Land cover	10	16	• Include Class – SWM, Sub-class – unauthorised dumping place
5a	Urban Land use/Land cover Polygon	10a	22	• Include Road ID, Road Name, Ward No., Locality/Colony name, Land use detail, Construction type, Remarks • Include Traffic Island – ID, Road ID, Name, junction, Improvement status • Include Electric Transformer – ID, Road ID, Capacity (KW) • Include Heritage spots – ID, Road ID, Ward No., Locality, Type, Name, Description, Status • Include Dumper parking station
5b	Community Toilet	10b	23	
5c	Fire Station	10c	24	• Capacity, Type of infrastructure
5d	Garbage Collection Points/Dumper	10d	24	
5e	Landfill Sites and Dumping Yard	10e	25	
5f	Cell Towers, Wi-Fi Hotspots & Public Telephone Booth	10f	25	
5g	Slums	10g	26	
5h	Bus Stop	10h	26	• Include Bus shelter locality, ID & ward no and road name and ID
5i	Tree	10i	26	• Ward no, Locality, road name and ID
5j	Other Urban Landuse Points	10j	27	
6	Building Footprint	11	27	
6a	Buildings	11a	31	• Include Premises, Assesses & Door No • Occupancy Status (Owner/Tenant) • Boundary wall • Tower of Silence • Burning Ghat
7	Water Supply Network	12	32	• Include OHR Capacity status • Sub class-Water treatment plant ,

S/No	Class and Sub-Class	As per Design and Standard Document		To be considered in addition to the Design and Standard Document
		Table No	Page No	
				Geometry –Polygon, Attributes fields -- ID, Road ID, capacity, ward no, locality and description
7a	Water Supply Network Line	12a	33	
7b	Water Supply Network Points	12b	33	• Include Status (Functional/Defunct)
8	Storm Water Drainage Network	13	34	• Include Sub-class Drainage Pumping station, Geometry --polygon, Attribute field name—ID, Road ID, capacity, ward no, locality and description
8a	Storm water Drainage Network Line	13a	34	
8b	Storm water Drainage Network Points	13b	35	
9	Sewerage Network	14	35	• Include Sewerage Treatment Plant & Sewerage Pumping Station – Capacity • Include Compactor Station
9a	Sewerage Network Line	14a	36	• Include Sub class- Man hole, geometry -- point, Attribute field name—ID, Road ID, ward no and locality
9b	Sewerage Network Points	14b	36	
10	Power Supply Network	15	37	
10a	Power Supply Network Line	15a	37	
10b	Power Supply Network Points	15b	38	
11	Gas Distribution Network	16	38	
11a	Gas Distribution Network Line	16a	39	
11b	Gas Distribution Network Points	16b	39	
12	DEM Layer	17	40	
13	Contour	18	40	
13a	Contour Layer	18a	40	
14	Ground Control Points (GCPs) Layer	19	40	
14a	Ground Control Points	19a	41	• Include DGPS Photo, Reference Station (benchmark with Photo)
15	Cadastral Layer	20	41	
15a	Cadastral Layer	20a	41	
16	Administrative Boundaries	21	42	
16a	Administrative Boundaries	21a	42	
17	Planning Boundaries	22	42	
17a	Planning Boundaries	22a	43	
18	Municipal Boundaries	23	43	
18a	Municipal Boundaries	23a	43	• 1) Attribute name – Actual area • 2) Sub Class- Land value, Geometry – Text, Attribute field name—ID, Road ID, ward no and locality, land value in Rs.
19	Other Boundaries	24	43	• Colony boundary, slum boundary, Industrial Zone boundary
19a	Boundaries	24a	44	
20	Hazard Prone Areas	25	44	
20a	Hazard prone Areas	25a	44	
21	Hoardings/ Lollypops, LED Hoardings, Lampost Kiosk, Police Kiosk, Signal Kiosk, other Kiosk	--	--	• ID, Road ID, Ward No.,Owned By, • Locality,Name, Hoarding Category, • Hoarding Size,Location Status (Road • Side/ On Building) • (Authorized/Unauthorized),hoarding • municipal number

5.1.3. Acquisition or Collection of RAW Satellite Imagery (Purchase of High Resolution Satellite based RAW Imagery) with RPC

Consortium/Agency shall "Prepare GIS Base Map of Area of Interest (AOI)" using latest high-resolution satellite imagery or otherwise available imagery from client and survey of all physical features of the ULBs/UDAs, Collection and Super imposition of Town Survey Maps / Cadastral Maps, Mouza details, existing Administrative Boundaries, Slum Boundaries, Infrastructure Details, Water bodies, landmarks, Contours etc.

The Consortium/Agency shall be required to generate all the data sets as per the design standards of AMRUT

Use of data from alternative online sources without consent of client such as Google Earth/ Google Maps is strictly prohibited as this is strictly against the usage policies of the respective services. The consultant will be responsible for any legality and any such deviations will lead to disqualification of the consultant, and other penalties as applicable for breach of contract.

Agency will collect and use very high-resolution satellite data of spatial resolution of 50 cm or better, acquired from NRSC or other sources by the UD&MA Department. The department shall provide latest raw Satellite images which are acquired from NRSC

Deliverables will be –

Image Resolution	: 50 cm or better
Map Scale	: 1:4000 or better
Map Area Coverage	: ULBs and UDAs under the Scope with buffer area as per AMRUT Guideline.

Supplied format of Data : Digital images in TIFF format and hard copy images

5.1.4. Drone Imagery

5.1.4.1. Drone Acquisition Details

Desirably Drones should be micro-category, unmanned and up to 2 Kg as per DGCA compliance.

For the purpose of UAV data acquisition, it is mandatory to obtain necessary clearances from Local authority and other applicable agencies. Necessary clearances/permissions shall be obtained from authorized agencies as needed for flying drones of permissible capacity as per DGCA over the project area. DGCA's civil aviation requirements (CAR) for Drones are available at http://dgca.uk.in/cars/D3X-X1.pdf. Necessary support will be provided by the office of the State Mission Director, AMRUT-West Bengal and Planning Cell of Chief Town Planner.

Aerial Photography capturing High Resolution (≤4 cm or less GSD) Aerial Imagery/ Drone data should be captured for the ULBs. The digital aerial camera system must be equipped with GPS and inertial measurement unit (IMU) systems

It is required to procure High Resolution UAV imagery for the entire Area of Interest using high resolution digital camera mounted on a UAV for creation of ortho-rectified seamless mosaic and 3D visualization and measurements. Orthophoto files must be precisely edge matched and contrast and colour tone balanced to appear to be a continuous photographic image over the entire Area of Interest.

5.1.4.2. Drone Survey Specifications

Components	Description
Coverage area	ULB wise area
GSD or Resolution	Upto 4 cms
Flight Height	Upto 400ft and/or as per DGCA Rules/Permits
Camera	Minimum 15 MP High resolution camera
Photography condition	Ground must be free of fog, snow, haze, dust; no precipitation and thunderstorm condition, during daylight period
Overlapping	60 % forward and 60 % lateral (Minimum overlap criteria)
Horizontal (XY) Accuracy	5-15 cms
Vertical (Z) Accuracy	15 cms
Equipment Capability	SSR Transponder or ADS-B Transponder, Barometric equipment, Automatic GPS tracking systems, Geo-fencing, Detect & Avoid sensor and anti-collision flashlight, RFID and GSM SIM, Autonomous Flight Termination System

5.1.4.3. Operational/ Flight Capabilities:

I. Drone should be capable of Vertical Take-off and Landing (VTOL)
II. Automated flight planning needed as per prevailing wind & weather conditions with manual backup for emergency controls. The flight lines must be designed to obtain and ensure full stereoscopic coverage of the project area.
III. Each flight line shall begin and end outside the periphery of the area assigned to be photographed with a view to ensure that a minimum of two principal focal points per flight line fall outside the area.
IV. Aircraft /Drone deployed for data acquisition should have a capability to cover an area of 1.5 to 2.0 sq. km per flight/mission.
V. The operator should have a capability to mobilise at least 2 UAV Teams per ULB/Town/UDA with adequate reserves of both manpower and aircrafts.
VI. Every operational team is desired to cover an average of 8-10 sq. km per day for an 8-hour operational period during each day.
VII. Operator should have the capability of doing pre-processing of data in field to check whether the data is free of any gaps.
VIII. Quality and continuity of images should be same.

5.1.4.4. Establishing precise Ground Control Network

Ground control Network should be carried out using Dual frequency GNSS / GPS in static mode. The GCPs collected through Differential Global Positioning System (DGPS) will be used for geo-referencing and improving the accuracy of the aerial data. The map projection and coordinates of the control points shall be in UTM grid and WGS 84 datum.

The Consortium/Agency shall also prepare and submit a report on the survey control. The coordinates and elevation information shall be tabulated and submitted along with the digital data of the control points.

5.1.4.5. Deliverables from UAV Acquired Data

Serial No.	Deliverable	File Format
1	Raw Images	.jpeg
2.	Orthomosaic	.tiff
3.	Digital Surface Model	.tiff
4.	Digital Terrain Model	.tiff
5.	Processing Report and Flight Details	.pdf

5.1.4.6. Other Details

Additionally, to perform functionalities like **Building Deviation, Green Cover, Road Bad Patches, Garbage littering, flood prone area delineation** the following activities must be considered:

I. The Consortium/Agency should be able to create a topographic map that portraying Z- information along with differences in terrain elevation by connecting points of equal elevation with contour lines or by colouring terrain according to varying altitudes. The contour interval should be less than or equal to **2–5 meter** (or better).

II. The Consortium/Agency must be able to automatically generate high-resolution 2.5D models from standard 2D photographs that can be viewed in the 3D software and analysed. Also, the agency must have the capability to support multi-processing over the network on multiple CPUs to enable robust processing of such large-scale data.

III. The processed data should have the ability to display and measure the horizontal distance, elevation difference and slope angle between two or more points in the 3D View.

5.1.4.7. Collection of Existing / Secondary Data and Maps from Local Agencies.

Collating and Pre-processing of data: Consultant should collate the collected data of various ULBs and Development authorities and digitize them as necessary defined in

the master plan details. Standardization of data into readable formats and structures, is also necessary before uploading them into spatial and non-spatial database.

The Consortium/Agency shall collect maps and secondary data from various authorities. Mouza maps and legacy data will be collected by successful bidder from different authorities, the payments and authorizations etc. will be taken care by the client, UD&MA Department. The survey and legacy data related reporting should come through ULB Chairman/Executive Officer or equivalent authority. Surveys will be under the supervision of the concerned ULB/UDA with prior permission taken by the Consortium/Agency to carry out such. Other information will be directly available from appropriate authority through proper channel.

A set of such maps that will form a part of the spatial database is illustrated below:

I. Master Plan /General Town Planning Schemes showing proposed land use zoning, transport network and sites designated for various public purposes.
II. Maps showing administrative boundaries of ULB jurisdiction, administrative and electoral wards, area/ block available with ULBs
III. Base Map/ Revenue Maps showing Cadastral Boundaries, layout plans available with ULB's.
IV. Maps/ Engineering drawings (computerised or scanned) of utilities like water supply, sewerage, storm, water drainage, solid waste disposal, roads and street lights along with the data available with ULB/ any other concerned Department.
V. Data regarding services like Fire Protection, Cremation and Burial Grounds, Slaughter Houses, Cattle Ponds, Parks, Gardens and Swimming Pools etc. In case such data is missing, this will form a part of the field survey/verification.
VI. Location of State and Central Government offices, railways and highways, all roads along with centrelines, post and telegraph offices, police stations, primary & high schools, colleges, universities, primary health centres, hospitals, banks, theatres etc. Also need to be located on the maps through field verification.
VII. Existing land use categories like residential including slums, industrial, commercial and healthcare, educational, sports and recreation facilities.
VIII. Property boundaries along with slum boundaries (Notified and Non-Notified).In case such data is missing, this will form a part of the field survey/Verification.
IX. All features mentioned above and those mentioned in Design and Standards documents under AMRUT Guideline should be collected along with the necessary attributes that will be later used for annotation.
X. Preparation of survey proforma for each of the layers to be generated.

5.1.5. DGPS Survey and Geo Referencing

To correct various geometric anomalies in raw satellite imagery, Ground Control Points (GCP) collected through Differential Global Positioning System (DGPS)

Survey will be used for Geo referencing of the imagery. Geo Referencing and Geo-coding of data should be on WGS-84 with projection on UTM, Coordinate units for Precision Decimal-Seconds. For the DGPS Survey, GCPs should be selected at well-defined sharp points clearly identifiable both on the ground and on imagery. One GCP per Sq. KM in case of Satellite imagery or 2 points per sq. km for Drone imagery and these should be evenly distributed over the Area of interest

The consultant/ agency shall prepare and submit a Report on survey control which includes executive summary of the survey, location and extent of the network of Primary Survey and Secondary Survey Control Points established, Field notes on survey control including sketches, details of instruments used for fieldwork, details of software used for processing the observed data, results summarizing the GPS observation data, map showing the network of all the control points and the points used for geo-referencing the satellite images with heights. The co- ordinates and heights for all the points shall be tabulated in a convenient and conspicuous location on the map and digital data of control points in .dwg and .shpformat, Personal Geodatabase format.

5.1.6. Ortho-rectification of Imagery (Satellite / Drone)

When you receive an unrectified image, there is distortion across the image caused by distortions from the sensor and the earth's terrain. By ortho-rectifying an image, the distortions are geometrically removed, creating a planimetric image at every location with consistent scale across all parts of the image. In other words, ortho-rectification is the process of stretching the image to match the spatial accuracy of a map by considering location, elevation, and sensor information. One can produce an accurately ortho-rectified raster dataset using the rational polynomial coefficients (RPCs), generally these are provided by the vendor, and an accurate digital elevation model (DEM)

The satellite Images shall be ortho-rectified using DGPS points and by using DEM generated from satellite stereo pair. Use of SRTM/ ASTER and other free DEM is not permitted. Geo-referenced images form the basis for the accuracy of all products to be derived from the satellite images. A Final Report on Ortho rectification of the satellite images shall be prepared and submitted to the Client. The report shall provide a narrative description of procedures adopted, Results of the preliminary check, constraints faced, Final listing of co- ordinates for all ground control points, Digital copies of all ground control points with photographs of the control points of Base and Rover from all four directions i.e. North, South, East, West.

5.1.7. Digitisation - Extraction of features from Ortho-rectified and Geo-referenced Imagery

Creation of Map Layers and Digitization of Map Asset Attributes help forming the ortho-mosaic imageries. The digitization process shall include vectorization, symbolization, layering, edge matching, topological integrity, and database linking with geo-database based on AMRUT design and standards. For the preparation of vector geodatabase projection, datum shall be designed same with the image data set for all the layers of each individual ULB.
In case of digitization, the data is to be checked for dimensional accuracy,

completeness, displacement, edge matching, symbology, and layering. All undershoots/ overshoots, dangling vertices shall get removed in the process.

Proper grid and projection shall be designed for the whole of the city/town. This is essential for proper representation of graphical data and location related to various layers being created which shall form part of GIS for the spatial analysis.

The extraction of features from satellite image shall also include the following

i. Buildings and Properties:

(a) Boundary - defined by compound wall of government building and other important landmarks (if observed from High-Resolution Satellite Imagery, as a closed polygon). Indicate government land separately. Mention layouts approved by sanctioning Authority.
(b) Wholesale markets/ vendor zones/ slum/ buildings of heritage importance shall be indicated.
(c) Restricted areas boundary {e.g. cantonment etc.}
(d) Land use Map (each land use in different layer) with all attribute details along with hierarchy of social and physical infrastructure.
(e) All structures are to be indicated as independent within the property by their plinth (at ground level).
(f) Any cluster / group of buildings identified in the Images are to be updated from the field input, representing the ground reality.
(g) The hierarchy of feature capture shall be – Parcel, plot, building and the database shall be built to identify individual assessments within the system.

ii. Roads system:

a) Lines for right of way of road (RoW)
b) Centre lines (CL) of roads
c) Carriageways- main and service roads by surface -asphalt, water bound Macadam, cart track
d) Medians
e) Traffic islands
f) Kerb lines
g) Footpaths
h) Storm water (road side)drains
i) Culverts
j) Bridges
k) Road over bridges(ROBs)
l) Road under bridges(RUBs)
m) Flyovers(Flyover).
n) Major trees of Importance by-point
o) Service roads.
p) Railway system including Rail, Metro Rail and Tramways
q) Station, yard, all structures, boundary
r) Railway land and track (Centre line)
s) Level crossings

iii. **Transport Terminals:** Truck Terminal, Transport Nagar, Bus Stops, Bus /Truck Workshops, Parking/ Multi Level Parking etc.

iv. **Storm water drainage system**

a) River (Perennial , Non Perennial)
b) Details of main town level drains with final, disposal points, water entrances and property connection
c) Drain types (nalla, outfall)
d) Size,
e) Shape,
f) Slope,
g) Material
h) Condition of drain, manhole and culvert
i) Location of bypasses
j) Details of outfalls in the river
k) Maintenance schedule
l) De-silting schedule and actual dates of achievement
m) Details of culvert, manhole, motors, dry wells and wet wells, gully pits, catch pits
n) Details of pumps in pumping station
o) Details of Sluice Gates, Penstock Gates

v. **Electricity system:**

a. Sub-stations 11KV /33 KV
b. High tension transmission (HT) lines at the base Poles for high tension transmission lines (HEP) Transformer centres (TC) etc.,
c. Electric Poles

vi. **Water supply system:**

a. Ground level Storage reservoirs (GLSR)/ Elevated level Storage Reservoirs (ELSR) boundary and all structures
b. Overhead tanks (OHT), boundary and all structures
c. Pumping stations, boundary and all structures.
d. Water supply system should include information from Source to the delivery point/and area of distribution

vii. **Underground drainage system:**

a. Pumping stations (boundary and all structures)
b. Sewage treatment plants(boundary and all structures)
c. Manholes, Gully pits, Catch pits

viii. **Solid Waste Management System**

a. Position of Garbage dumping
b. Ground Garbage collection points
c. Compactor station

ix. **Natural features:**

a. Physiography: slope/ relief/topography

b. Water bodies and hydrography (as related attribute data) information on HFL, LWL, FTL etc.

c. Reserved forests/ village forests/Protected Forest /Social Forestry (to be vetted by concerned department)

d. Landslide/ Flood prone/ other disaster-prone areas/Waste lands/Sandy Area/Salt Affected Area

e. Eco fragile areas and Geo-heritage sites.

x. **Other man-made features:** Man-made features in the contract area extracted from satellite images and mapped shall include:

a) Canals

b) Dams

c) Tanks

d) Reservoirs

e) Lakes/Ponds

xi. Plans based on spatial/ non-spatial data depicting the following shall also be submitted:

a) Regional location i.e. town's location with reference to its district, nearby salient feature like railway stations, airport etc.

b) Existing Tourism activity (if any)

c) Transportation survey (traffic survey, faulty junction etc accident zones, existing ROW)

xii. Any other feature mentioned in the Design and Standard document under AMRUT Guideline

To achieve desired standard of accuracy, it is suggestive to have a proper grid (10 Mts x 10 Mts) and projection shall be designed for the entire Area of Interest. This is essential for proper representation of graphical data which shall form part of GIS for the spatial analysis. In the case of digitization, the data is checked for dimensional accuracy, completeness, displacement, edge matching, symbology and layering. All undershoots /overshoots, dangling vertices shall be removed in the process. The method to be adopted for digitization shall conform to the standards prescribed under the guidelines. The consultant is responsible for achieving 100% accuracy for correcting true/ valid omissions and corrections identified by the client.

The accuracy standards for the final base map shall be as below:

1. Maximum allowed Root Mean Square(RMS)error : 1pixels
2. Location accuracy in GIS : <0.6m

The consultant is responsible for achieving 100% accuracy for correcting true/ valid omissions and corrections identified by the client. Consortium/Agency will be liable to fill gap (if any) of the satellite image due to cloud cover or any such, through other surveys/technology usage. Extra works, drone surveys etc. beyond the area quoted (if any) will be reimbursed on final data submission on pro-rata basis per Sq. KM.

5.1.8. Field and Door to Door survey for collection of attribute data consisting Demographic Survey and Basic Socio Economic Data Collection (which includes utilities like water line, gas pipe and sewarage Network etc)

Appropriate authority at the UD&MA department will make available the draft base map of the city obtained from NRSC to the Consultant and the consultant should capture the high-resolution imagery for value addition by collecting spatial attributes as per Design & Standards. Maximum time-period to be provided for this exercise is 1 month. After that, the draft base maps are to be sent back to NRSC to incorporate the attributes collected by the consultants on GIS database and generate draft final base maps. NRSC, after incorporating spatial attributes, will send the final maps generated to the competent authority/ ULB/ STPD for vetting and return within 1 month after which the final base maps will be generated by NRSC and supplied to UD&MA Dept. which will be used as an input for the master plan formulation

Sector-wise data collection and data analysis report of 25 Socio-economic and physical and other aspects are to be done by the Consultant. An indicative format is provided in the Design & Standards. In addition, primary surveys such as land-use survey, traffic & transport survey, household surveys, etc. are required to be undertaken as required under the relevant acts.

Databases to be created and surveys to be conducted are – landuse survey, socio-economic, traffic and transport and other surveys which will be as per the standard guidelines under AMRUT.

Urban and socio-economic data is to be used to study the existing situation, identification of issues and formulation of proposals and projections. While most of the data to be collected is secondary, some crucial data may be required to be collected from primary surveys. An indicative format for data collection is provided in the Design & Standards, which is to be modified as per the requirement of the West Bengal Town Planning and Development Act. Data analysis will be presented sector-wise, in the form of chapters in the draft Master Plan document. The final chapter on structure of the Master Plan will be as per the requirement of the West Bengal Town Planning and Development Act. Creation of Map Layers and Digitization of Map Asset Attributes are detailed as under.

a. Creation of Map layers like roads, drains, railways, parks etc as outlined in the master plan report from base map using desktop GIS tools
b. Databases to be created and surveys to be conducted – including land use survey, socio-economic, traffic and transport and other surveys which will be as per the requirement of the West Bengal Town Planning and Development Act.
c. Field Survey based collection of attribute data, parcel information and other map asset information. Collecting Property related information along with Geo-coordinates that will enable the application specific computations. This includes door-to-door survey of properties, measurement of properties (like from base map building polygons etc. to the client's satisfaction), data gathering, uploading image of property, updating data in Property tax database and supporting the assessment confirmation process. All tasks have to be taken up as per direction of the Planning cell under Chief Town Planner, UD&MA Dept.

The task is focused on detailed door to door survey of each property/ holding within ULB area. The Agency will also collect all other relevant information.

d. The Agency has to link the geo-property database in different tables with the Base Map. The agency shall also work on house numbering system for the respective ULBs and suggest /simplify it, fixing of number plate for each property, take digital photograph of each property and link it with the data base of the respective property in the GIS environment. The agency shall also integrate the data and maps collected from other assignments like socio economic survey, environment profile with Base Map of the respective town and update the Base Map. The agency will depute key professionals in respective ULBs and all the activities like data entry, data base generation &its linkage with base map with be done in the client space of respective ULBs by those deployed key professionals. Identified Nodal persons of ULBs may help with knowledge sharing.

During the Survey the agency should collect and verify each property

i. Parcel ID
ii. Residents Name
iii. Property Usage like Residential /Non-Residential/Mix etc.,
iv. Owner Name, Father/Husband Name of Owner, Property Address, Mobile number of property owner
v. Property Address must contain locality and road name
vi. Any contact telephone no.
vii. New (Existing)House Number, Old House Number (If any) Ward
viii. Number of electric connection, consumer ID etc
ix. Occupancy status: rented/self-occupied/mix
x. Total area on ground floor and total Built up area in case of individual buildings only
xi. Presence of Rain water harvesting system in Buildings/Apartments
xii. Facilities status like water connection, sewerage connection
xiii. Images of the property.

In case of Multi-storey Building (Commercial complex/Apartments) following information shall be also collected

i. Apartment/Building Name
ii. Total No. of Property
iii. Lift Facility
iv. Total built up area
v. Total number of floors excluding ground floor
vi. Total open space area
vii. Status of different facility like lift, power backup, parking, fire fighting
viii. Total no. of residential and non-residential properties
ix. Source of water for the building
x. Images of the building and individual property

In case of Commercial/ Industrial following additional information shall be also collected

i. Firm/Shop/Industry Name
ii. License Status–Yes/No
iii. Firm/Shop/Industry Owner Name and address
iv. License status and license no.
v. Shop area
vi. License validity date
vii. Business/Industry type
viii. Measurement detail – plot area, total built up area and its break up

Other information as mentioned in the format

ix. Floor wise built up area detail with roof type/house type, usage with floor detail
x. Age of Building

e. The selected consultant shall integrate the final database for each property with the base map data base and update the thematic layers of base map accordingly
f. The selected consultant shall take digital photograph of each property and it should be linked with respective data base of the building in base map
g. The agency should use Mobile App based survey and ensure that there is no paper based data collection
h. The agency must cover 100% of the project area
i. The agency must conduct topographic survey and DEM ground-truthing for the collected data

5.2. NRSC Created Base Map

NRSC will be generating geo-database on the satellite imagery by generating DEM from stereo data, generating GCP from DGPS survey and cadastral layers by using ULB-level information.

The NRSC supplied geo-database will contain administrative boundaries, planning boundaries, municipal boundaries and some other boundary information like Enumeration Block boundaries etc. and demarcation of Hazard prone areas as per information available with NRSC. There will also be standard layers (including Roads, Rail, Bridges & Flyovers, Water bodies & Wetlands etc. and building footprints of Residential & Commercial & Industrial areas, Educational Institutes, Health services facilities, Central & Railways & State Govt. properties, Public & Semi-public facilities like Banks & ATMs, Offices, P.S., P.O, Jail, Libraries, Fire stations etc., Religious buildings, Recreational facilities like parks, gardens, gyms, stadiums, open-air mancha etc., Public utilities like WTP, STP, OHR, GLR, pumping stations, electric substation etc., SWM facilities, Radio/TV/Satellite/Mobile towers, Heritage spots, Slums, Waste lands, Vacant lands, Bus/Train/Tram/Taxi/Auto/Rickshaw stands & Jetty/Harbour etc., Traffic islands & medians, Village areas adjacent, Trees & Tree clad areas & Reserve/notified forests/green belts, Agricultural lands, Pastures & Grazing lands & Tea/Coffee plantation etc., Bird sanctuaries & Zoo, other areas like slaughter house, poultry, dairy, quarry, brick kiln, dams etc. Also, all utility layers like Water Supply Network, Drainage Network, Sewage Network, Electricity Supply Network, Natural Gas Distribution Network database will be prepared from the data collected by ULBs) all based upon AMRUT Mission guideline.

Quality Assurance and Quality Check (QA/QC) of the above shall be carried out at the ULB levels by the ULBs engineers, surveyors before final geo-referencing/ortho-rectification by NRSC. The in-progress, as well as external QA/QC team for the work therefore may also require domain experts from other parastatal agencies or private organizations which may be hired as and when required.

The geo data layers missing from NRSC supplied base map should be generated by the Agency with respect to the layers mentioned earlier for maintaining uniformity across the System.

5.2.1. Ground Truthing

Ground truth refers to information that is collected "on location". This is especially important to relate image data to real features and materials on the ground. The collection of ground-truth data enables validation of Imagery data

Ground truthing involves taking geographic coordinates of the ground resolution cell with GPS technology and comparing those with the coordinates of the pixel of imagery being analysed.

Ground truthing exercise should be completed within 1 month of receiving the data, and returned to NRSC then to obtain the final Base Map for further work of Formulation of GIS-based Master Plan

5.3. The Final output of parts of the Base map should be in standard digital and GIS database formats.

The deliverables as part of the base map creation include

a. Satellite Data -Rectified satellite data along with GCP file in tiff format
b. DGPS Survey -The processed data of the DGPS survey
c. Final Base Maps and customized maps to be provided by the Consortium/Agency on 1:1000/1:2000/1:4000scale or as per any other specification as may be required by the client
d. Digital data of base map in DXF /DWG and SHP file/Personal geodatabase format along with soft copy of base map to a scale of 1:1000/1:2000/1:4000 scale (soft copy) for individual and the total town areas which shall contain the layers as explained in the above section
e. Digital Surface Model in TIFF format
f. Digital Terrain Model in TIFF format
g. Processing Report and Flight Details in pdf format

The GIS desktop software should support the following

- All types of raster formats and services like ERDAS IMAGINE, DTED, DEM, CEOS, JPEG, JP2, PNG, GeoTIFF, & Web Coverage Service (WCS, OGC standard), Web Map Service (WMS), OGC standard. Also it should support Tile layer from Vector and Raster layers for better performance and fast accessibility through WMTS or equivalent.

- Spatial adjustment tools including: Rubber sheeting, Transformation, Edge matching transfer Attributes.
- Software should be capable to Create SQLite Database/ Geo-package database.

5.4. Preparation and Formulation of Master Plan

5.4.1. Key Objectives and methodology of master plan creation

A Master Plan is the long-term perspective plan for guiding the sustainable planned development of the city. Master Plan lays down the planning guidelines, policies, and development code and space requirements for various socio-economic activities supporting the city population during the plan period. It is also the basis for all infrastructure requirements, considering changing Scenario and Increasing Spatial Analysis.

Updation and formulation of existing land use plan and notified Master Plan of city which includes demand assessment of infrastructure, employment, Residential development, commercial activities, industries etc., identification of issues, projected requirements, development strategy and draft proposals on the GIS base map and sector-wise data analysis, to be done by the Consultant. The deliverables in the form of, Base maps, shape files, collected data from different sources, thematic maps specified, data analysis reports, draft plan document, etc. wherever required URDPFI Guidelines, 2014 may also be referred. In this regard, also, the Design and Standards document as prepared by TCPO, Govt. of India is required to be followed strictly. It is easily available in the URL https://amrut.gov.in/writereaddata/designandStandards_AMRUT.pdf

The draft proposals will be in accordance with existing regional plans, district plans and will incorporate proposals of other departments, some of which are namely, Amritsar-Delhi-Kolkata-Industrial Corridor &East-West-Dedicated-Freight Corridor, East-Coast-Economic Corridor, Bengal Highway Corridor, Bangladesh-China-India-Myanmar Corridor, Kaladan Multi-modal Corridor, BIMSTEC Road Corridor, SAARC Highway & Railway Corridors, different SEZ under WBIDC & WBIIDC, "State Manufacturing Zones" in line with National Industrial and Manufacturing Zone (NIMZ) etc. The draft master plan will specify the aims and objectives for the development of the city/ town. Contents of the draft master/ development plan document will be as per URDPFI Guidelines and statutory provisions of other Planning Act

The master plan proposals will be in accordance with Existing, Regional plans and District plans, if any and will incorporate proposals of other departments of the state. The draft master plan will specify the aims and objectives for the development of the city. Contents of the draft master plan document will be as per and statutory provisions of the West Bengal Town Planning and Development Act. Zoning regulations, building rules and urban development policies of West Bengal government and wherever required the URDPFI Guidelines may be adopted. Updating of urban master plan is a continuous process. The utilization of GIS based urban planning and subsequent services also need development, setting up and continuous service providing facilities to be carried out by a set of trained personnel. There is requirement of trained manpower that will run the GIS lab henceforth.

Accordingly, Technical/non-Technical personnel (such as, Urban Planner/Resource Planner, Socio-Economic Planner, IT Expert, Senior GIS Professional, Junior GIS Professional, Field surveyor etc.) will be required to be placed in the field-office, namely, at office of SNA and/or individual town/ULBs

The master plan report will include, but not be limited to, the following aspects:

I. Location, physiography, linkages, climate, regional setting
II. Historical background
III. Brief description of city, review of existing Master/ Development Plan, issuesrelated to implementation of existing master plan as per URDPFI guidelines 2014
IV. Spatial growth of the town & direction, incorporation of new areas
V. Demographic data including population (urban/ rural, ward-wise, male &female), literacy rate, growth of population, workers and non-workers, occupational structure, etc shall be collected – as per current & past Census data.
VI. Road Network-existing and potential
VII. Rail network-existing and potential, including Metro and tramways
VIII. Other form of urban transport existing and potential
IX. Bridges and flyover existing and potentials
X. Urban landuse and land cover details existing and potential
XI. Building footprints and its use
XII. Existing slums and facilities in it
XIII. Trees and other green plantations, forests, gardens, green verges, parks
XIV. Other landuse points like ATM, Meteorological stations, Dairy booths etc.)
XV. Employment generating activities – existing and potential
XVI. Industries–existing and potential, their nature, employment etc.
XVII. Commercial activities including retail and wholesale business, warehousing and godowns, mandis, haat, rural markets, shopping malls, fee car parking etc.
XVIII. Government and semi government offices and government reserved areas.
XIX. Educational facilities (Govt. /Private) including universities, colleges(engineering, medical, arts, science, commerce, law, etc.), schools (higher secondary, secondary, middle, primary, nursery, etc.) vocational training centres, etc.
XX. Medical facilities (Govt. /Private) including hospitals and nursing homes, diagnostic & pathology labs, dispensaries, primary health centres, veterinary, ayurvedic, homeopathic, etc.
XXI. Social, cultural, sporting and other religious activity centres such as, hotels, resorts & restaurants, guest house, single screen cinema halls and multiplex, Theatres, creche, old-age homes, gym, therapy clinic, golf course, race course, tennis club, boating clubs, spa and massage centres, video game centres, public libraries, ceremony houses, local temples, mosques, gurudwara, church, free medical check-up centres etc.
XXII. Community facilities including toilet, cremation and burial grounds
XXIII. Physical infrastructure – electricity, water supply, sewerage, solid waste management, Treatment Plants, telephone (including Cell towers, Wi-Fi Hotspots and public telephone booths), Gas distribution network etc.
XXIV. Recreational facilities including parks, open spaces, mela grounds and playgrounds, stadiums, semi-public recreation, etc.
XXV. Agricultural use including dairies, orchards, nurseries, reserved forests, etc.

XXVI. Circulation network facilities including airport/railway stations and yards, road transport terminals, stands for buses and trucks, parking, etc.
XXVII. Cadastral Layers
XXVIII. Proposals/ commitments by Central/ State Government, concerned Local Body, development authority, etc.)
XXIX. All vacant lands under government ownership (non-built)
XXX. All forest lands clearly depicting forest and any other Land Preservation Act
XXXI. Places of tourist and heritage importance both natural and manmade including natural areas, designated grounds for fairs and festivals, etc.
XXXII. Legislative and Institutional Framework, institutional structure – municipal bodies, development authority, urban improvement trust, etc.
XXXIII. Planning boundaries
XXXIV. Municipal Boundaries
XXXV. Other Boundaries like EB, UFS, Mining areas
XXXVI. Action Plan, identification of projects and phasing, resource mobilization

All these layers shall be created in the format given in AMRUT Design and standards. The GIS software used for this purpose shall have capability of creating standard data model and shall have registration facilities especially for Cadastral Maps.

5.4.2. Existing Situation Assessment

A comprehensive assessment of the existing situation and identification of the general trends of socio-economic development at the regional level. Furthermore, assessment of available data and information and accuracy of this data in terms of quantity, quality and its adequacy for the purpose of the preparation of the intended Master Plan. Therefore, the Consultants shall collect all available data and conduct all necessary surveys and researches as described and as required for the assignment.

5.4.2.1. Data Collection and Review and Documentation of Policies, Strategies and Plans:

The task will draw a comprehensive picture of the existing socio-economic conditions, physical characteristics both built up and natural and assembly and appraisal of all of the data in order to identify existing development trends and issues. Furthermore, the Consultants shall fully comprehend all existing policies, plans, strategies and laws that influence the planning practices and execution of the approved plans. The activities to be carried in this Task are as follows:

I. Review of all sectoral policies, strategies and plans on regional economic development, industrial policy, tourism and heritage conservation, PPP framework, protection of environmental resources etc.

II. Compile all available spatial and attribute data, regarding existing conditions in the Project Area but not limited to the following areas:

a) Socio-economic data including economic base characteristics of various economic sectors (agriculture, animal husbandry, fisheries, industry and tourism), employment, population and demographic characteristics, industrial base, prevalent sectors and output, etc.

b) Environment and Natural Resources including forests. rivers, lakes and other water resources and protected areas, natural drainage areas and flooding areas, ravines, sanctuaries/bio-diversity areas, mining and quarrying, high value natural scenic sites, geo- heritage areas including the heritage areas etc related to the environmental concerns.

c) Physiographic and geology including climate, winds, topography, geology, natural risk sites etc.

d) Human settlement hierarchy, function and distribution: including urban and rural settlements/habitats.

e) Built-up environment and existing landuse.

f) Transportation infrastructure including road based, rail based, waterways and air transport and networks including the projects in pipeline or policy.

g) Physical infrastructure data including water supply and networks, Electricity supply and network, sewerage system, telecommunication, solid waste treatment facilities.

h) Social infrastructure data including hierarchy of educational, health and other community facilities, their distribution and accessibility.

i) Projects under implementation including the inventory of all infrastructure, housing and real estate projects under construction.

j) Review of previously prepared Master Plan for the ULB area with special emphasis on the violations and suggestions for the same.

III. Having accomplished the above activities, Consultants shall:

a) Assess the quality and quantity of data available at the regional and other hierarchal levels.

b) Identify the gaps in terms of information needed and the approach and methods to overcome such deficiency.

Conduct all necessary field studies and surveys to update missing data and information needed for preparation of the Project

5.4.2.2. Base Map Preparation:

The base map prepared by the consultant in consultation with UD&MA and approved by the committee shall be used for this task.

5.4.2.3. Stakeholder Consultation

I. The Master Plan shall adopt participatory approach by conducting interactive sessions. Therefore, consultants shall devise effective strategy to conduct consultation with stakeholders including civil society of both urban and rural areas, agriculture community, industrialists, traders, elected representatives, academicians, government and non-governmental organizations.

II. A minimum number of various levels of consultations and workshops at village level shall be conducted. However, Consultants may propose additional number of consultations, if needed.

III. Additionally, the consultant should carry out one-to-one interactions with key players in the industrial sector in West Bengal on their views on industrial growth in ULB/UDA region (format for industry interactions to be finalised in consultation with the Authority)

IV. The entire expenditure on conducting workshops/meetings shall be borne by the consultant only

5.4.3. Vision for 15 years and Strategy Formulation

Based on the detailed analysis and assessment of the development status and current trends in the Project Area carried out, the Agency shall develop alternative strategies to achieve the goals and objective mentioned above.

The Agency shall carry out, but not limited to, the following:

- Identification of opportunities, strengths and weaknesses and threats for the development of Urban Development & Municipal Affairs Department
- Formulate a Development Vision for next 15 years
- Suggestions or alternate solutions for the violations in comparison with previous master plan, the provisions of previous master plan that needs to be amended as per the present need.
- Make a realistic demand assessment on key economic activities and employment opportunities - Demand Assessment to analyse future development prospects, identify target sectors / markets based on the competitive and comparative advantage to enhance the pace of economic development, and ensure balanced development
- Finalize on industries within each sector in which the local area holds clear advantage like local skill availability, market access, raw material availability, external infrastructure quality and linkages.
- Development of a product mix to be used as a basis for the preparation of the final landuse plan which will include among other things, a list of industries and activities with land requirements
- Demographic projection up to next 15 years and estimate future demand on housing and other physical and social infrastructure.
- Evolve 2-3 alternative scenarios for spatial growth up to next 15 years.
- With inputs from transportation model, and other key parameters evaluate various alternative scenarios and finally choose preferred alternative
- Each of proposed alternatives shall discuss the following:
  - I. The vision of the regional/City spatial structure and the likely scale of development in the context of demographic trends, including migration patterns and housing issues.
  - II. The implications of the above on the distribution of population and activities and on the land use and environment.
  - III. The role and feasibility of developing growth centres that can attract inward investment and efficient infrastructure
  - IV. Economic sector development and employment generation
  - V. The distribution of population and economic activities and urban rural linkages and the development of rural economy and necessary infrastructure to sustain.

VI. The holding capacities of various environmental factors to be assessed for sustainable development for example, availability of potable drinking water sources till horizon year.

VII. Identification of key commercially viable real estate / infrastructure projects that can be taken up or other government agencies based on a detailed real estate market assessment

VIII. Regional and Urban Infrastructure in terms of transport, water supply, power and communication, urban environment quality including waste management and effective drainage.

IX. The Management of Environment, and Natural Resources

5.4.4. Spatial Strategy and Preliminary Plans

I. Upon approval of the preferred strategy, the Consultants shall formulate the final spatial strategy and the resultant preliminary land use plan. The preliminary land use plan shall be prepared to the detailed level described below and by incorporating all comments and feedback from the Authorities.

   a. General zoning covering the whole Project Area and defining clearly all types of land uses including open space, protected and productive areas. The landuses assigned shall be as far as possible demarcated by the physically verifiable features eg. road, river, drain, canal, extreme level difference, forest boundary etc.
   b. Transportation Plan: -structure plan for road network with hierarchy of roads and rail /metro / ropeway network.
   c. Trunk level water supply system, sewerage and storm water drainage system
   d. Social Infrastructure including health, education, recreation, sports etc.
   e. Commercial centres at various levels.
   f. Solid waste and waste water treatment and disposal facilities.
   g. Major resources and distribution system of water, power, sewerage disposal system.
   h. Heritage conservation system
   i. Micro level planning to promote different kinds of tourism i.e. heritage, pilgrimage, adventure, medical etc.
   j. Conservation of ecosystem and water bodies and action plans for water harvesting
   k. Division of the Development Area into zones for the further preparation of Zonal Development Plans. The division shall be based on physically verified features and upon technical logic.

II. Strategy report will include the following:

   a. Regional Setting
   b. Current socio-economic condition and trends
   c. Projections based on current trends
   d. Opportunities and challenges
   e. Proposed development strategy
   f. Projections based on the proposed strategy
   g. Spatial implications of the proposed strategy
   h. Consultants shall prepare action plans for short and medium term

III. The other reports of Preliminary Draft Master Plan shall include the following:

a. Transport Sector Plan
b. Strategic Environmental Action Plan including solid and sewage disposal plan.
c. Strategic Real Estate and Industrial Development Plan
d. Development control and zoning regulations.

5.4.5. Final Preparation of Draft Master Plans

- The Consultants shall submit the draft final reports separately for each city incorporating the outputs of all the previous tasks including the feedbacks from the consultative workshops and the inputs of the Steering Committee.
- The draft Report shall particularly include a phase wise implementation plan. The phases of implementation plan shall coincide with the Five-Year Plans, identify the implementing agencies such as government department, parastatals or private agencies and sources of finances.
- The report shall be in MS Word and Maps in.shp, Personal geodatabase & .dwg formats, both in hard and soft copies.
- The maps shall include GIS Base Map, Existing Land Use Map and proposed land use (GTP Scheme / Master Plan) to a scale of 1:2000, 1:4000 and 1:8000

5.4.6. Training and Assistance to UDMA on Master Plans, Reviews and Incorporation of Feedbacks

The agency should organize and conduct workshops/training for all the concerned Administrators, officials and other relevant stakeholders of the West Bengal Urban Development and Municipal Affairs Department during its support period when the master plans will be deployed via the GIS based software.

5.5. Setting and Commissioning of Web GIS

Setting up and commissioning of Geo-portal and Geo Database with necessary hierarchy-based logins. Geo-portal should be made available for all the 125 ULBs and 20 Urban Development Authorities. The architecture needs to be designed to meet the performance with spatial, on spatial and various functional workflows of fully functional for the project area. If any license structure exists, it should be provided considering lifetime use, with unlimited number of users and unlimited number of layers, objects and interfaces by any ULBs, development Authorities or user within West Bengal Urban Development &Municipal Affairs.

The Web GIS Application and Dashboards should have an uniform look and feel and must be easy for the users to navigate. The various pointers that the Web GIS Application and Dashboards must have are listed below:

5.5.1. User friendly and scalable

The system should have a user friendly, interactive and responsive graphical user interface (GUI). The GUI should be Web-browser based. It should provide safeguards to prevent data corruption and system failures.

5.5.2. Intuitive to use

The proposed system should perform validation checks and display user friendly messages failures

5.5.3. Platform independent and responsive (should load on all device sizes laptops, Desktops, TV Screens, Mobile, Tablet etc.)

The system should provide consistent screen layouts and access methods across all modules so that they look and behave the same across multiple platforms and devices. The user should be allowed to toggle between map and data views and there should be a provision to tile the views. The system should be compatible with all standard web browsers viz Internet Explorer, Google Chrome and Mozilla Firefox

5.5.4. Ability to add any number of data layers

The system should provide the user to display and manage data layers. For example, the user may want to add data layers pertaining to the Boundaries, Building/Properties, Infrastructure etc.

5.5.5. Ability to view any combination of the data layers present in the system

The system should enable the user to manage and display layers. For example, the user may want to view multiple layers such as Banks, Road Networks, Buildings etc. on top of a Base Map layer such as Open Street Map or equivalent. The selection/un-selection of layers should be seamless.

5.5.6. Data discovery

The proposed system should act as a repository of Information for the State. Since it serves as a single point of search, the system should be able to search data spatially or by manipulating geo-portal layers, by keyword or by querying the database.

5.5.7. Ability to share data entered in the geo-portal by way to web-services in real time

The Geo-portal should be designed with the functionality that the various layers that are added into the system, can be shared by the user via APIs from the system. These APIs should serve the data in a consumable format that can be directly hosted.

5.5.8. Ability to seamlessly bring various spatial and non-spatial into one platform and host various possible use cases

The system should facilitate serving both spatial and non-spatial data emanating from various sources seamlessly. The system should provide a querying system that would facilitate in decision making. For example, if the repository has data related to buildings and the Property Tax being paid, then the system should be able to handle querying capabilities such as,

- Locate the buildings that belong to a particular ward
- Locate buildings where the Property Tax have been paid or not been paid
- The total property tax that has been collected or pending.

Similarly, the System Integrator must envisage other related scenarios for the various data that would be part of the scope of this system

5.5.9. Should deploy Big Data compliant databases to efficiently manage the large and continuously growing data

As the system would contain data from different sources, the quantum of data getting stored would be large also the size of the data would increase over a period of time. This requires that the system should be highly scalable and reliable.

5.5.10. Creation of GIS and non-spatial database

5.5.10.1. Database specification

The database is designed to store different types of data in different servers to leverage the efficiencies of each type of database. The database can be either open source or any industry standard database. The databases are used for the respective purposes as mentioned below.

- **Secure Transactions:** Transactions work as a single unit, which means unless and until every individual operational stage is successfully completed, the transaction is not cleared. So, if an operation fails at any stage, the entire transaction happening within that group fails.
- **On-Demand Scalability:** It should be designed to handle large amounts of data across many commodity servers
- **High Availability:** The database should be designed to process millions of queries and thousands of transactions while ensuring unique memory caches, full-text indexes and optimum speed.
- **Reliability:** Protecting sensitive information
- **Quick-Start Capability**
- **Peer to Peer Architecture**
- **Elastic Scalability:** Database should be easily scaled-up or scaled-down.
- **High Performance**

5.5.10.2. Migration of the Data

The legacy data and data collected from the departments should be migrated to either an open source database or industry standard database. The database should follow the specifications/features mentioned above.

5.5.11. Creation of Geo-portal

5.5.11.1. Base Maps

The Geo-portal would display categorized view of the layers. This categories include

- Boundaries – District, ULB, Slums
- Infrastructure – Road, Sanitation, Drinking Water, Electricity, Others
- Natural Resources – Streams/Canals, Contours, Trees
- Transportation – Railways, Roads, Bus
- Building/Property – Parcel, Landmarks
- Public Services – Public Tap, Hand Pumps, Community Toilets, Public Toilets, Tube Wells

- Religious – Places of Worship
- Financial Services – ATM, Banks
- Health – Hospitals, Diagnostic Centres, Clinics
- Education – Private, Government
- Market – Shops, Shopping Complex
- Lifestyle – Hotels, Lodge, Restaurant, Function Halls
- Industries – Mills, Workshops
- Emergency Services – Fire Stations
- Other relevant layers

The portal should also display relevant legend

The Geo-portal would display scale based features based on the administrative hierarchy as given below,

District > ULB > Ward > Locality > Assessment

Apart from displaying the data in Map View, the user can also display the tabular view of the feature. The attributes that would be displayed would be in accordance to the attribute information mentioned above. For Example, In assessment view, when clicked on a particular assessment, the user attributes such as Property type, Assessment ID, Owner Name, Mobile Number, Collections, Due year, Balance etc. must be shown.

The various stakeholders of the portal can perform various analytics on the displayed data such as Filter, Query, Thematic Maps, Trend Charts, Rule based symbology, Buffer Analysis, Measurement tools, search etc.

5.5.12. Master Plan

5.5.12.1. All Plans / Layer-wise / Time series view

The Portal should provide tools to the user that would facilitate in creation of Master Plan

i) The GIS/MIS Dashboard for the Chief Town Planner, GIS experts, Urban Planners, Engineers and IT experts to have an overview of all the towns in the city in terms of following. The Dashboard shall facilitate the Planners, Engineers, IT experts to allocate the towns to relevant planning personnel/executives for Master Plan creation.

a) AMRUT town or not
b) Master Plan existing or not
c) The Landuse
d) The population
e) The projected population
f) The Town location- Hill, Plains, Plateaus
g) The type of town: educational, industrial, tourist, heritage etc.

ii) The GIS/MIS Dashboard for town planners, urban planners, engineers to see the status of their allocated towns in terms of above-mentioned criteria.

iii) Along with the layers specified in the AMRUT Guidelines the Rule-based data model shall also have other GIS layers as part of data model like

a. Demographic data
b. Population projection
c. Urban Sprawl

d. DEM
e. The natural topographic
f. Drainage
g. Hypsographic
h. Lithological
i. Geological spatial data

iv) Web Based Tools should be provided to update the Master plan data at different levels from Super Admin to Admin to Nodal Agencies to Executing Authorities to Urban Local Bodies. The upgradation will be done as per their jurisdiction/role mapped.

v) The common UD & MA Mobile Application must be created, that should support field surveys of the Master plan and Citizens feedback in the Master plans.

vi) The Web based Application shall have tools for performing site suitability analysis to identify of best suitable land for different types of uses in Master plan like residential, industrial, commercial etc. based on the Geographical layers.

vii) The Portal shall have a Workflow designed for Interaction between different stakeholders of the Master Plan preparation process including the Public, when the master plan is notified.

viii) The portal shall have provision to integrate the GIS master plan with the MIS and different citizen centric e-governance modules.

ix) Perform Time-Series Analysis to visualize changes in the demography, topography and physical structures over a period

x) The system should be able to provide the user capability to identify the gaps as per the existing master plan in comparison with ground reality

5.5.13. Editing and versioning of Master plan and base map layers

The portal should provide mechanism to update the base map features.

Editing of base map features would involve either editing the attributes or creating or editing existing features.

In case of editing of attributes, the admin user should be able to update the attributes directory. All analytics that are dependent on the attribute filed would be updated dynamically.

There may be scenarios where in there may features missing in the base map but exists on the ground. The admin user should be able to mark this feature on the map with appropriate comment and pass on the information to the Town planner.

The town planner after due verification would update the base map feature and re-publish the data. The software should also provide a mechanism to send notifications to the concerned authority when such deviations are observed. The software should provide tools to draw new features and annotate them.

5.5.14. Web GIS Features

Key Functional and Technical specifications of the Web Based Applications, platforms and Databases are as follows:

- Database should be capable of maintaining data history, version management and conflict detection.
- Database should support database check in – check out / replication functionalities hence maintaining the parent child relationship of Master Database.

- Software should support Geodata service and Geometry service through WFS/WMS.
- Software should support Cloud Environments like Amazon Web Services (AWS) or Microsoft Azure or such other equivalent
- GIS system should be capable to manage maps, satellite images, GIS data of various points of interest information, infrastructure and assets etc.
- It should provide access to whatever available free Online 2D, Street, Base map, imagery Services for location reference.
- GIS system should have a portal for administration that lets administrators to add, update, manage and maintain city GIS data and user management, Content Sharing and capability to build various GIS applications
- Software should have option to create pre-configured dynamic dashboards which can easily be configured hence minimizing customization.
- Should be capable of Content Management (like, manages content locations and marks relevant content as Authoritative) and Organization User Management (e.g. User can manage all aspects of inviting and managing User, including adding to groups and resetting passwords) for Managing content for different projects and role based access management.
- The software should support Open Geospatial Consortium (OGC) Services such as WMS, WFS, WCS, and GeoJSONetc along with GML, KML, etc.
- The bidder should submit Manufacturer's Authorization Form (MAF) from Original Equipment Manufacturer (OEM) of the software in case of licensed software or Self Declaration in case of Open Source.
- The Software should be able to import / export data from / to various formats like .dxf, .shp (shape files), Personal Geodatabase coverage file, .mif (MapInfo), .gml, .kml, .gpx. , Geo PDF GeoJSON, GeoRSS/SqlLite etc. Also the proposed software should have function to import / export tabular data such as .xlsx/ .csv/ .dbf, etc.
- Software should allow users to export results to various file formats like EMF, BMP, TIFF, JPEG, PDF, etc
- The proposed software should support HRSI (High Resolution Satellite Imagery) and low resolution satellite images (panchromatic & multispectral) such as IKONOS, Quick bird, Geoeye, Worldview, CARTOSAT, EROS, LISS-IV, LISS-III, AWIFS, RISAT-1, KALPANA-1, INSAT3A, INSAT3D, PROVA-V, and/or in generic raster formats like TIFF, GEOTIFF, JPG etc.
- The software should support image format such .tif, geotiff, .img, .hdr, .h4, .h5, DTED, DEM, CEOS, .jpeg, etc. Also preferably, the software should also support LiDAR data file format such as *.las/ *.isd/ *.pcg etc.
- The GIS server should be highly scalable
- Software/Application should support deployment in clustered environments: Active-Active, Active-Passive; should be highly available
- The software should provide open API to visualize the published Services

- Should support multiple numbers of Editing and Viewing by desktop, web browser and mobile clients.
- Server application should record various service statistics, such as total requests, average response time, and timeouts, and reports this information in Manager console for better monitoring and performance optimization of services
- Should have Editing Application Functionalities like simultaneous Feature editing, isolated editing in separate layers, modify, merge, split operations, specify an Exact X, Y location, modify and create attribute values, maintain attribute values through defined rules etc.
- Should support server-side geo-processing tasks
- The server should have the capability to query across multiple map services.
- Should support to centrally managed data, tools, maps, and applications
- The database should support Replication across multiple commercial databases in connected and disconnected environments
- Server should be able to support read-only site mode. (This is intended to disable publishing new services and blocks most administrative operations during production.)
- Software should support a Service Oriented Architecture (SOA) (GIS on the enterprise service bus).
- It should have ready to use web-based geoportal/Apps for Field, Office, community and Application developers.
- Should have out of the box Web Application Functionalities like pan, zoom, identifying features on a map, measure distance, interactive north arrow, magnification window, overview window/ find place, query attribute, search attribute, editing, geo-processing tasks, adding base maps etc.
- System tools can analyse patterns and aggregate data in the context of both space and time -Space-time (spatiotemporal) analysis using time slider over web.
- Server Software should support Dynamic map service/WMS
- Server Software should support Geocoding service/ OGC OpenLS (Open Location Service). Server Software should support OGC map service and OGC WMS, WFS, services along with OGC compliance certificates.
- Server Software should support Geo-processing service
- Software should support Token model authentication and the built-in User Store/LDAP
- Should have built in user management along with Active Directory and LDAP
- "Should support the option to use Enterprise Logins -
- Integrate with a SAML 2.0 Identity Provider (IdP) or LDAP to provide Web Single Sign On"
- Software should support to encrypt data-in-transit by enabling HTTPS
- Log events of interest such as who is publishing services for the Logging and Auditing purposes.

- Software should have a comprehensive toolset to design and edit urban layouts with streets, blocks and parcels. Street constructions such as roundabouts or block subdivisions are controlled via parametric interfaces.
- Software may preferably, but not compulsorily support Easy-to-use editing tools for the quick sketching and texturing of 3D building models.
- Software should Support Rules files are authored and modified in the Label Rule Editor. The scripting editor includes features such as syntax highlighting and command completion.
- Software may preferably, but not compulsorily Support integration with 3D/CAD applications, GIS platform supports the well-known formats OBJ/DXF. The exporter can collect textures into a single folder for easy re-use and sharing with other tools.
- Software should Support import of Street networks and footprints of real world cities from OpenStreetMap into GIS platform in shapefile format. This allows for a quick generation of urban surroundings based on existing streets or building footprints
- Software should Support Importing GIS data, such as streets, building footprints and parcels, into GIS platform from either File Geodatabase (.gdb) or Shapefile (.shp) format. Feature attributes can also be imported and used to drive the procedural rules.
- Software should publishdirectly on the web for sharing, analysis results or design proposals with decision makers or the public.
- Software should integrate 2D/3D polygons for the buildings, and be able to compute the built-up area, building height, offset from the road and compare against the property information in a parcel to check compliance.
- Software should be able to Support machine learning algorithms on various drone and satellite-based imageries and detect various point and areas of interest. System should be able to foster deep learning and convoluted neural network-based algorithms.
- Software should Support seamless integration with external data centres, so as to bring near Real time view in the Geo-portal. It should be able to catalog spatial and non-spatial data and make accessible over web through REST interfaces.
- Software should Support various open source databases to manage spatial and non-spatial data. It should host Bigdata architecture like CASSANDRA/POSTGRESQL/ORACLE.
- Software should Support Import and export of data in Google's Keyhole Markup Language (.kml/.kmz) allows for the exchange of geo-referenced data with tools such as any GIS platform or Google Earth
- GIS Software should be capable to View and create maps, manage satellite images, GIS data of various points of interest information, infrastructure and assets etc.
- GIS Software should provide access to free Online 2D, Street, Basemap, imagery Services for location reference over geoportal in web.

- The software should support feature data (Point, line, polygon) as input data type and tabular data. It should be able to connect to spatial database like Oracle/POSTGRESQL/SQLSERVER directly without using any library/software
- Thematic classifications like: Single symbol, Unique value, Match to predefined style, graduated colours or symbols, Proportional symbols, Dot density mapping and/or Chart mapping including pie and bar chart and/or Bivariate and multivariate data rendering.
- The software should be able to present visualization of pre-assessed Terrain Analysis output like TIN Contour with Index Contours, DEMs preferably, but not compulsorily with Hillshade and Sun Position Control, DEMs preferably, but not compulsorily with Shaded Relief Using Hillshade and Elevation, Terrain Contour with Index Contours, Terrain Face, Aspect, Elevation, Slope etc.
- Should support 2D animations with time series data support and historical play back of event data over web.
- Features should support file attachments, which should provide a flexible way to store additional information in any format related to your features.
- Software should have inbuilt tools to Display Real-Time Location Points from a GPS Receiver, Dynamically Center the Map on the Current GPS Point and Store GPS points in a Log File
- Create group layers from multiple data sources including vector overlays on top of raster data.
- Software should have the capability to do Spatial references including the ability to customize and save the custom settings.
- Set may preferably, but not compulsorily display projection of map using predefined or custom parameters (includes specifying geographic coordinate system or datum) and/or should allow reprojection into different projection system over web application
- Software may preferably, but not compulsorily perform On-the-fly joins between different database tables
- Create statistics & various statistical operations, viz. create charts and reports, Sort tables by multiple attributes, populate values based on expression, Summarize data.
- Should be able to plot data on the map directly from the tables.
- Import/Export metadata/data should be supported
- Should be able to operate on Windows Vista, and Windows 7, 8, 10 with upgraded packs.
- Should support publishing and encryption of GIS maps for the purpose of Viewing and Querying GIS data by multiple royalty free GIS data readers
- Software should have the facility of time slider user interface controls to visualize temporal data
- Should support python scripting language for development of customized workflow
- Software should be able to provide an Emerging/hotspot analysis

- Software should be able to navigate to the specified co-ordinates
- Software should allow you to play user uploaded video files in your map without any customization.
- Software should have capability to Splits an input dataset by unique attributes or interactively
- Should have tool to Split an input data by unique attributes or interactively
- Should support rule-based Symbology and cartographic representations of map entities.
- Should be able to store spatial Data in industry standard RDBMS Format
- Should allow you to define a spatial query against SQL spatial types in a spatial database to create a layer (query layer) that can be viewed and queried in GIS Software and publish those query layers through GIS server software.
- Reshape and Move a Feature to Align One Specified Point with Another (Warp), Resize a Feature Symbol by Resizing Its Bounding Box, Orient a Symbol to a Specific Angle.
- On-the-fly automatic labelling, multi-labelling, interactive labelling, rotation of labels from an attribute field, interactive label placement, predefined label styles & finally save labels as a data layer
- The software also should support simultaneous editing by multiple users and long transactions capabilities with advanced rule-based editing in standard databases (either open source or COTS databases)
- Software should Calculates distance and additional proximity information between the input features and the closest feature in another layer and tool should be there to write results to a new stand-alone table and supports finding more than one near feature using buffer.
- Software licensing should be there or at least optimised to base upon all available cores of physical servers
- Software should provide Drawing tools to create new point, line and Area features
- Software should provide capability to take Snapshot (Screen capture) of displayed data
- Software should display the Co-ordinate read out at the mouse pointer location
- North Arrow and Map Scale according to drill down should be displayed
- The software may preferably, but not compulsorily be capable to perform a 3D walk through

5.6. Integration with Existing Work-Flow Modules

The system integrator will integrate all existing applications and legacy databases developed by the ULBs and integration of various citizen centric service delivery based municipal e-governance modules for providing citizen centric and other services by designing and developing a common unified application catering to all required ULB centric service delivery functions as per RfP using a common logic. The existing modules with the

necessary changes/modifications and new modules are to be developed as and when required. The system integrator should upload, migrate and integrate legacy data as applicable.

The below table shows the various existing application details –

S. N	Current technology	No. of Disparate Systems	Current Technology	Backend	Database	Services	Exchange of Data types
1	Property Tax & Assessment system						
2	Birth, Death, Cremation Registration						
3	Trade License Enlistment Accounting						
4	Building Plan Administration& Building Permission system						
5	Water Works Management System						
6	Payroll						
7	Financial Accounting System Module						
8	Public Grievance & Redressal System						
9	Infrastructure Management System						
10	ULB Information System						
11	Ward Wise Management System						
12	Health System						
13	School Information System						
14	Admin Module						
15	Other ULBs or Municipalities system						
16	Other Input channels						
17	Existing UDMA App						

5.7. Development of Work-Flow Modules

The processes of the department can be performed using the Workflow modules that is provided with the system as listed below:

5.7.1. Property and Land Tax

West Bengal Urban Development& Municipal Affairs department and some Municipalities have operational property tax assessment and collection system. The Module should integrate with the existing systems and allow the citizens to perform various Property and Land Tax related actions.

5.7.1.1. Knowing Dues, and assessment details

The system must provide the user with capabilities of knowing the due amount and the details pertaining to the assessment. The user must be

able to provide attributes such as Name, Assessment ID etc. to know the information.

5.7.1.2. Pay Tax Current, Due and Advance.

The system must also provide the user with the capability to pay taxes, the user may pay

i. Current Tax
ii. Tax that is due
iii. Advance Tax

5.7.1.3. File new assessment request

The system must provide the user with the capability to raise new file assessment requests. These new assessment requests must provide the user with an unique tracking that can be used future for reference.

5.7.1.4. Raise necessary alerts to user and administration under noncompliance

The system must be capable of raising alerts to the user and the administration authorities in the event of any non-compliance such as wrong tax amount being paid or wrong assessment of tax amount.

5.7.1.5. Integration with Existing System

5.7.1.5.1. Details of Existing System

The system should be able to integrate details of the Property tax and other details from the Existing system.

5.7.1.5.2. Legacy Data – Status

The system should be able to integrate status details of the Property tax from the Legacy system data.

5.7.1.6. Integration to GIS / MIS Dashboard

The system must able be capable of providing the integration of the data into the GIS/MIS Dashboards.

5.7.1.7. Citizen Interfaces

The Agency should ensure that the citizen interfaces such as knowing the dues, payment of taxes etc. are

5.7.2. Public Grievance Redressal system

5.7.2.1. What Grievances can be logged

The system should have the ability to log grievances and categorize them for the administrators to take actions. These grievances could be Desilting of Drain, Removal of Garbage, Issues related to drinking water supply etc. However, the system should also be able to categorize these grievances into categories such as Public Health and Sanitation, Administration, Revenue etc.

5.7.2.2. Accept Grievances from multiple channel like SMS, WhatsApp, Emails, specific UD&MA App, Paper based etc.

The Agency must ensure that the system is capable of accepting grievances from multiple channels like UD&MA App SMS, WhatsApp, E-Mails, Paper based etc.

5.7.2.3. Track progress of grievance

The system should provide the capability for the users to track the progress of the various grievance raised by the citizens.

5.7.2.4. Automatic SLA assignment

The system should have the ability for the grievance to automatically get assigned to the SLA

5.7.2.5. Escalations to functionaries as applicable

The system should provide the user with the ability to escalate the grievances raised by them to the respective functionaries.

5.7.2.6. Communicate with citizen on status

The system should be able clearly communicate with the citizens on the status of the various grievance that are being raised.

5.7.3. Garbage and Black spot management

5.7.3.1. Automatic identification using geospatial data and citizen requests

The system should be able to automatically identify the Black Spots/Garbage dump based on either machine learning based algorithms on drone data or from the requests raised by the citizens. This should be based on the geospatial data and the citizen requests.

5.7.3.2. Workflows for cleaning and maintenance

The system should be capable of alerting the administrators or planners for the cleaning and maintenance of the identified Black Spots/Garbage dumps.

5.7.3.3. Communication to citizens

The system should be able clearly communicate with the citizens on the status of the various grievance that are being raised.

5.7.3.4. Garbage tracking and management for Garbage Truck

The Agency must ensure that the system has the ability to monitor and manage the Garbage cleaning and the Garbage trucks that are being used for the cleaning.

5.7.3.5. Garbage dump yard monitoring

The agency must ensure that the system has the functionality of monitoring the Garbage dump yard. The system should be able to assist the administrators towards regular monitoring. The status on dump yard fill can be manually entered by the people or it can come automatically from IoT sensors.

5.7.3.6. Citizen based feedback

The system should be able to provide a mechanism for the citizens to provide feedback on the Garbage being cleared and any other

5.7.3.7. Direct observance

The agency must also enable the system to integrate data with the direct observance data from the sites which would be used by the administrators.

5.7.3.8. IoT based feedback on 20 locations

The agency must provide the system with capability to provide IoT sensor based feedback on 20 locations where the IoT based sensors would be installed. The sensor should use ultra-sonic based waves to measure the level of the dump yard, and should have inbuilt algorithm for filtering unwanted noise or obstruction, and have temperature compensation . The agency needs to make sure the installation and commissioning of the sensor along with GSM based telemetry system with battery back-up of 2 days, and power supply from local source. Local power supply point will be made available from the client side.

5.7.3.9. Trigger Workflow for dump-yard cleaning

The system must be equipped with the mechanism to trigger workflow for the dump-yard cleaning.

5.7.4. Birth and Death certificate Management

The Agency must ensure that the system will integrate with existing system and legacy database and allow citizen, officers and others to perform various actions related to the Birth and Death certificates.

5.7.4.1. Register the details of Birth and Death

The system should be able to provide the user with the ability to register the details pertaining to the Birth and Death

5.7.4.2. Upload the documents, Pay the requisite charges

The system should have the capability to facilitate the users to upload the required documents and pay applicable charges.

5.7.4.3. Track Status through ticket Number

The agency must ensure that the system enables the user to track the status through a unique ticket number.

5.7.4.4. Request for modification

The system must also be capable for handling any request for modification pertaining to the Birth and Death Certificates.

5.7.4.5. Issue e-certificates

The agency must ensure that the Issuance of e-certificate from the system to the user specified e-mail ID is provided. However, the issue of e-certificate would be allowed only when the user has satisfied all the criteria required without any deviation.

5.7.5. Financial Accounting - Integration with existing systems and workflows

5.7.5.1. Payment and receipt of all services like property tax, trade license fee, building Plan fee.

The agency must ensure that the user is provided with the payment option for all services like Property tax, license fee, Building Plan fee etc. The agency must also ensure that the system is updated with the successful transactions and receipt for the successful payments is provided to the users.

5.7.5.2. Generate and view financial reports

The agency must ensure that the system is able to perform operations such as generation, viewing and printing of the below listed for the users

- Cash book
- Income Expenditure
- Receipt Payment
- Ledger
- Trial Balance

The system should follow the West Bengal ULB Accounting Manual and West Bengal Municipal (Finance and Accounting) Rule, 1999 to create and publish the following

- Balance Sheet
- Income Expenditure

The Agency must also ensure that the system is able to perform pre-defined analytics based on the above mentioned

5.7.5.3. Integration with other modules

The system must have the ability of providing the integration of the data with the other modules.

5.7.6. Automated Road Quality and Potholes identification

5.7.6.1. Create workflows to handle the bad roads and potholes identified through machine learning or citizen feedback

The agency must provide the system with the capability of alerting the concerned administrator or planners to handle bad roads and potholes.

- The bad roads and potholes are identified through Machine Learning techniques or through Citizen raised feedback

5.7.6.2. Assess quality of work done through drone data or citizen feedback.

The Agency must ensure that the system is able to assess quality of work done through the below listed

- Drone Data
- Citizen feedback Data

5.7.7. Building Permission Management System

5.7.7.1. Apply for new permission

The Agency should ensure that the system provides the user with the capability to apply for new permission in the Building Permission Management System

5.7.7.2. Apply for occupancy Certificate

The Agency should ensure that the system is provided with the capability for the user to apply for occupancy certificate.

5.7.7.3. Identify deviations through Geospatial Data

The system provided by the Agency must be able to identify the deviations of the buildings from the Building Permission Management System through the Geospatial Data.

5.7.7.4. Trigger workflow to respective ULB staff for corrective action

The Agency must ensure that the system is capable of alerting the respective ULB staff for corrective actions when a non-compliance issue is identified.

5.7.7.5. File for regularisation

The agency should also ensure that the system is able to provide the user with the ability to file for regularization under the Building Permission Management system.

5.7.7.6. Pay Dues (Normalisation fees, charges etc.)Death and Birth Certificate

The Agency must also ensure that the system provides the user with the ability to pay dues for the Birth and Death Certificate as listed below

- Normalization Fees
- Charges
- Etc.

5.8. Development of Citizen Interfaces for various services

5.8.1. Mobile Application:

The mobile Application that is to be developed should act as an interface between the field information and aimed at providing the information that can be shared easily by the field officials.

The Designing and developing of mobile applications (android based & iOS mobile app) that helps with the geo-tagged images and other data that can be loaded and to help users to interact for getting solutions for the fields-based queries.

All Workflow related services should be able to be catered by the Mobile application such as the below but not limited to:

- **User Registration:** The various users of the mobile App must be able to register themselves with ease and the information such as name, email ID, Phone number etc. must seamlessly get updated with the common database that stores all the mobile application related information.

- **Initiation of Request / Tickets / Issues / Complaints:** The registered users of the mobile application must be able to initiate requests, raise tickets, issues, complaints etc. from the mobile application itself.
- **Forms:** The user must be able to fill various forms that are part and parcel of any of the above mentioned. The user must have a seamless experience in filling these forms via the mobile application.
- **Images:** The application must provide the user with the option to upload images either from their gallery or by using the camera in their smartphone to upload a picture after capturing.
- **Geo-tagging**: Application is a user-friendly mobile and Geospatial based solution which enables data collector to systematically record generated assets with spatial position (Longitude, Latitude and Attribute), Time stamped with geo-tagged photograph. This mobile app will provide a platform to control web application to store Geospatial database on web platform
- **Tracking Request**: The user must be provided with the ability to track the requests made via the mobile application. They should be able to track the progress of their tickets raised or the complaints made etc.
- **Modules for Workflow Approvals based on logins:** The mobile application must have modules for the workflow approvals based on logins. For example, when a ticket was raised with respect to the garbage being dumped and a citizen raises a ticket, an administrator for the work module must be able to approve on successful removal of the garbage.
- **Payment System:** The mobile application must provide the user with the option for payments of the various applications via the common mobile application. The application must be able to support the popular payment gateways
- **Technical Features**
    - **Work Offline:** The mobile application must have the ability to work in the offline mode when there is no/poor internet connection. The details those were entered in the offline mode must directly be pushed to the online database when the internet connection is available/stable
    - **Auto Login:** The mobile application should also have the option for auto login
    - **OTP:** The mobile application should have the option for generating One Time Passwords based on the user's action in the mobile application such as registering themselves with an associated mobile number, the application such be able to provide an one time password for the validation.
    - **Notification:** The mobile application should be able push notifications to the users based on the actions taken by the administration office. Such as updates on the tickets raised, successful completion of registration etc.
    - **Web XML based edits on App pages by admin module:** The mobile application should be able to directly update the contents such as additional fields in the forms etc. without updating the application into a newer version.
    - **Android/iOS:** The mobile application should have both the Android and iOS versions of the application and all the functionalities present in the application must be the same in both the environments.

- **SMS Module**

- **Admin Module:** The admin module should be provided that will allow the system admin to add / modify SMS server details, and manage activity like start, hold, and stop the SMS services.
- **SMS to all alerts / notification / tracking of all types of workflows:** The mobile application must have the ability within the SMS module that would help the administrators to push out SMS to the users of interest.
- **Self-managing Database from user profiles:** The mobile application should have the ability for the database to automatically update from user profiles of the mobile application without any effort from external environment apart from the mobile application.

- **E-MAIL Module**
  - **Admin Module:** The admin module should be provided that will allow the system admin to add / modify Email server details, and manage activity like start, hold, and stop the Email services.
  - **E-MAIL to all alerts / notification / tracking of all types of workflows:** The mobile application must have the ability within the E-MAIL module that would help the administrators to push out E-MAIL to the users of interest.
  - **Self-managing Database from user profiles:** The mobile application should have the ability for the database to automatically update from user profiles of the mobile application without any effort from external environment apart from the mobile application.

- **WHATSAPP Module**
  - **Admin Module:** The admin module should be provided that will allow the system admin to add / modify WhatsApp server details, and manage activity like start, hold, and stop the WhatsApp services.
  - **WHATSAPP to all alerts / notification / tracking of all types of workflows:** The mobile application must have the ability within the WHATSAPP module that would help the administrators to push out WHATSAPP to the users of interest.
  - **Self-managing Database from user profiles:** The mobile application should have the ability for the database to automatically update from user profiles of the mobile application without any effort from external environment apart from the mobile application.

5.8.2. Data collection and the step by step Upload procedure for using the app

- Select appropriate application
- GPS capture
- Taking photograph of the work
- Adding information if any, about the work
- Sending the collected information to Geospatial Portal

The Mobile application should be

- Enabling Department users and field staff to update data through mobile application from remote places to the geospatial server
  - with an admin or hierarchy-based module to ensure that the data pertaining to their jurisdiction alone can be uploaded/edited

- Enabling seamless data synchronization in the Data server to avoid repetition and data redundancy
- Integrated for seamless data flow and workflow Management between the server and the other field level data

5.8.3. The Functional Overview of the Mobile Application

1.	The software in discussion involves a Web, Android and iOS components.
2.	Using the Android or iOS Software, a field officer captures the Photos (Latitude, Longitude), Field details and activity details.
3.	Once captured, these details will be stored to the server and are available in the web application
4.	**Inputs from the field:** ▪ Offline data capture ▪ Media (photos) enriched location information ▪ Dropdowns, lists, input boxes and comments based on custom forms ▪ Review data attributes directly in the app ▪ Listen to audio and view images ▪ Real time GPS location ▪ View and explore maps in the field
5.	**Modules : (For all work-flow and services to citizen)** ▪ User Registration Module ▪ Field Users and Line Departments Registration ▪ User Login ▪ Reset Password ▪ Change Password ▪ Edit Profile (individual users) ▪ Capture asset Details ▪ Edit information ▪ Capture asset latitude and longitudes ▪ Photographs

5.9. Building and Commissioning of Web GIS Application and Dashboards

The Geo-portal must have the general features as listed in the table below

Geo-portal Features	▪ GIS System should have the Geo-portal for the purpose of administration that lets administrators to add, update, manage and maintain city GIS data and user management, content sharing etc. ▪ This GIS based system, preferably but not compulsorily, should have features to create other web based applications, create sites using templates, support adding of customizable widgets etc. ▪ For the Geo-portal, appropriate legends must be provided to the users for easy comprehension of the specific applications ○ Such as Percentage of Tax collected, ULB Grade, Open complaints outside SLA etc. ▪ The user must be provided with a dynamic widget that shows the

	various values based on area of selection, zoom or hover such as Tax Collected, Open complaints etc. o These values must update itself as the user switches to specific applications ▪ The dynamic widget should display trends across various Districts/ULBs that are applicable for that specific application ▪ The user must be able to visualize the data both in Map and data view at each level of drill-down for specific applications o The user must be able to navigate across administrative hierarchy (District > ULB > Ward > Locality > Assessment) using the widget ▪ The system should provide the user with the capability to filter and view the data across administrative hierarchy ▪ The predefined base layers with relevant dynamic styling (color, shading, transparency etc) should be presented based on zoom levels, application, area, and aggregated data. ▪ The software, preferably but not compulsorily, possess ability to share maps and layer packages which can be used in desktop applications. ▪ The system should also have re-direct links to take the user to any relevant external dashboards (if available)
General Features	The Geo-portal should have other features that would be common in all levels of drill-down ▪ Link to go back to the home screen ▪ Full Screen mode ▪ Application Control or a view where the user can switch from one application to the other application ▪ Zoom In/Zoom Out functionality ▪ Ability for the user to Pan across the map ▪ The system should also have a Zoom by Rectangle option where the user is able to zoom a map based on user defined rectangle. ▪ There should be a cataloguing system for stored data because as per present availability in market, it is understood, that if not otherwise implemented with higher technologies, handling high volume of vector, scanned Map, Drone data and Satellite Image and OGC CAT CSW requires some OGC certified cataloging system ▪ The systems should preferably but not compulsorily, possess feature like, High Volume Image streaming service for streaming drone imagery ▪ The system should provide the user with layer control that would be used in managing various layers that the user may require to overlay for decision support or getting insights ▪ Administrator/Users should have capability based on role based mapping of few features, preferably but not compulsorily, such as- o content management like, location managing, marking certain relevant content exclusively for authority's use etc. o user management like inviting new users and managing those, setting up groups and roles, resetting passwords. ▪ The user should have a seamless experience in drilling down the

	data from a State to the lowest possible granularity ▪ The user must be provided with a capability to identify features that are near to the user defined Area of Interest ▪ The system should provide the tools for measuring the distance (segment and cumulative) and area • User should able to perform multiple queries on the dashboard and results should be visualized on the map. ○ Spatial queries with user attributes such as name, Assessment ID, Mobile Number etc. ○ Query the hierarchical administrative boundaries such as District, ULB, Ward, Locality, Assessment etc.
Other preferable Technical Features of Software/GIS Application in the web	▪ Data history archiving, managing ▪ Maintain parent-child relationship at Master Database level ▪ Support deployment onsite on physical hardware, in cloud either using VMware or by IaaS providers ▪ Support feature data (viz. point, line, polygon) as input data type ▪ Support and manage maps, satellite images, GIS data of various points of interest information, infrastructure and other assets etc. ▪ Provide access to free online 2D, 3D, street-views, base maps, imagery services for location references at least ▪ Portal that at least lets administrator add, modify, update, manage, and maintain city GIS data, do user management, do content sharing, ▪ Build various GIS application, create websites on templates, support adding widgets for minimum customization, create dynamic dashboard ▪ Software should support seamless visualization and sharing of data, maps, apps, 2D & 3D scenes with role-based users ▪ Software should support user-friendly applications for map-centric field data collection, form based surveys, maintenance of field-crew ▪ Preferably, software should be able to make queries across multiple map services and support centrally managed data, models, tools etc. ▪ Software must add features to be used in Apps for field-level, office-level, community-level and development-level users. ▪ Software should support standard Web Server/Other App Servers like IIS, Apache, Tomcat, Web sphere, Web logic and other standards ▪ Server should support at least up to Windows 64-bits and LINUX 64-bits OS, should support OGC, and open web services like Map, WMS, WFS, WCS, KML and GeoJSON ▪ The software should be developed with such a GPS-enabled Mobile App that allows dynamic queries and update the server remotely. ▪ The server administration feature should be able to prevent unauthorized users from accessing cached pages from web browser
Dynamic Legend	The legend must be dynamically updated depending upon the level of details being displayed
Static Layers	The system should contain several static base map layers
Feature Information	The system should be able to display the information associated with the feature at different levels of drill-down

Query functionality	• The System Integrator should utilize the Archived Data and integrate with Real-Time data to help the user understand and analyse the monthly trends pertaining to the application specific Geo-portal • The system should be capable of Integrating Spatial and Non-spatial data and should fetch the result based on the geospatial query / search • The system should provide spatial and attribute Query modules that would facilitate fetching results based on the geospatial query or search criteria
Editing & Analysis	• The system should, preferably but not compulsorily, have functionalities like undo/redo operational features, simultaneous and isolated editing feature both layer-wise and figure-wise i.e. modify, merge, split, specify locations etc., modification option for changing attribute values etc. • The system should, preferably but not compulsorily, have high-end geo-processing tools and core analysis functionalities, analytical feature tools for site selection of planning, overlay analysis, distance and direction calculation feature, tool to analyze patterns and aggregate data by spatio-temporal analysis
Sort Functionality	• All the information in the system that is shown to the user in data view ○ User must be provided with capability to sort data either in ascending or descending order
Nearby Place search	The user must be able to perform a search within a certain radius at an area of interest. For example, the ATMs/Banks within 1 Km of Radius.
Application wise search filters	The system should be capable of having application specific filters for the users to perform any search. For example, a search to filter details pertaining to property tax forall residential properties within an ULB or an Area of interest.
Type of View	District > ULB > Ward > Locality > Assessment
ERP Integration	The system should be capable of integration to the available ERP at the UD&MA Dept.

5.9.1. Property Tax

5.9.1.1. Purpose and Objective of Dashboard

Property tax is the annual amount paid by a land owner to the local government or the municipal corporation of his area. The property includes all tangible real estate property, his house, office building and the property he has rented to others.

The municipal corporation of an area assesses and imposes the property tax annually or semi-annually. The tax amount is based on the area, construction, property size, building etc. The collected amount is mainly used for public services like repairing roads, construction schools, buildings, sanitation etc. Property tax comprises taxes like lighting tax, water tax and drainage tax.

The dashboard should be dynamic, accessible online via web browser (and preferably offline also) with options to upgrade its configuration in future to add changes and updates as desired by UD&MA Dept and/or city authorities. The purpose of the Property Tax dynamic dashboard is to bring spatial visibility into the collection of the property taxes for the entire State up to the lowest granular level of a ward level. Spatial dashboard will have different views and information consoles for different hierarchy of users.

Apart from bringing the Geospatial visibility, the dashboard helps the various users towards

- Getting actionable insights
- Dynamic visibility at State, ULB, Ward or Zone, or parcel level.
- A querying tool that helps in day to day operations

The dashboard is expected to be integrated with different workflows, such as allocation of Master Plans, Status of Master Plan preparation, public comments on Master Plans and other such innovative features.

Source of Data: Base Map and Property Tax specific ERP data

GIS Application Layers: Building/Property – Parcel, Landmarks, Boundaries – District, ULB, Slums, Infrastructure – Road, Sanitation, Drinking Water, Electricity, Others, Natural Resources – Streams/Canals, Contours, Trees, Transportation – Railways, Roads, Bus, Public Services – Public Tap, Hand Pumps, Community Toilets, Public Toilets, Tube Wells, Religious – Places of Worship, Financial Services – ATM, Banks, Health – Hospitals, Diagnostic Centres, Clinics, Education – Private, Government, Market – Shops, Shopping Complex, Lifestyle – Hotels, Lodge, Restaurant, Function Halls, Industries – Mills, Workshops, Emergency Services – Fire Stations

5.9.1.1.1. Show the total amount collected across the State

Information about the total amount of property taxes or water charges collected across all ULBs/within ULBs at any point in time.

5.9.1.1.2. The target covered & the deviation from last year

Details about the total amount of property taxes or water charges collected across all ULBs/within ULBs at any point in time.

5.9.1.1.3. ULB wise, % of Tax collected/coverage

Help the user to understand and analyse the total amount of Taxes or charges collected, the percentage of Tax covered. This should also help the user to analyse the same at an ULB level.

5.9.1.1.4. Monthly Trend of cumulative Property/Water Taxes Collections

User must be able to comprehend and analyse the monthly trends pertaining to the cumulative property taxes and the water taxes that are collected.

5.9.1.1.5. Query functionality (District, ULB, Ward, Locality, Assessment)

User should able to perform multiple queries on the dashboard and results should be visualized on the map. Some of the queries could include but not limited to

I. Spatial queries with user attributes such as name, Assessment ID, Mobile Number etc.
II. Query the hierarchical administrative boundaries such as District, ULB, Ward, Locality, Assessment etc.

5.9.1.1.6. Defaulters

Summary of the Top 100 defaulters should be provided in map with the capability for the user to drilldown from State level to an ULB level.

5.9.1.2. Dashboard View

5.9.1.2.1. Collections

The dashboard view must have MIS/GIS representations of the collections of Property Taxes and Water charges, it should have the details such as listed below

I. Collections as on date
II. Proportional Demand from Start of Financial Year to current Date
III. Cumulative Collections from Start of the financial year to current date
IV. Percentage Achievement with respect to the target
V. Collections comparison (Last one-year time period from as on date)
VI. Variation in percentage

- In GIS view, the System Integrator must show the percentage of Tax that has been collected at a whole ULB level say >80%, 60-80% etc.
- The user should be able to view spatially the various property details for Residential & Non-Residential properties along with filtering capability to see the paid status. The user should be able to click on any assessment to view the details of the assessment such as Assessment ID, Name, Paid status etc.

5.9.1.2.2. District Wise summary, Drill down to ULB

District Wise Summary of the collections data should be provided for the users' consumption with ability for a drill down from a State level to an ULB level.

5.9.1.2.3. DCB

The dashboard should provide the user with a Demand Collection Balance (DCB) book where the user is provided with the information pertaining to the amount to be collected, actual collection and the amount yet to be paid.

5.9.1.2.4. Transactions/Type of water connection

The transactions and the type of water connection should be shown along with a District Wise Summary of the collections data with ability for a drill down from State level to an ULB level.

5.9.1.2.5. Top & Bottom performers

Summary of the top and bottom 10 performers for the ULBs and also for the various functionaries such as bill collector, Revenue inspector, Revenue officers etc. These data should be provided with ability for a drill down from State level to an ULB level.

5.9.1.2.6. Defaulters

Summary of the Top 100 defaulters should be provided with ability for a drill down from State level to an ULB level.

5.9.2. Public Grievance Redressal

5.9.2.1. Purpose and Objective

Public grievance system lets any citizen to raise their problems, grievance or requests to the State Departments. It must have feedback feature to understand the quality of the redressal.

Grievance Redressal is the managementand governancerelated process that primarily covers the receipt and processing of complaints from citizens and consumers, includes actions taken on any issue raised by them to avail services more effectively.

The purpose of the Public Grievance Redressal dashboard is to bring spatial visibility into the collection of the property taxes for the entire State upto the lowest granular level of a ward level.

Apart from bringing the Geospatial visibility, the dashboard helps the various users towards

- A decision support system for prioritizing the various grievances raised by citizens
- Helping an administrator to monitor the type of grievance raised and the rating/feedback of the citizens on closed complaints
- A tool that helps in day to day operations to find grievances within SLA

Source of Data: Base Map, Citizen Satisfaction/feedback via Mobile App and ERP Data

GIS Application Layers: Complaints, Building/Property – Parcel, Landmarks, Boundaries – District, ULB, Slums, Infrastructure – Road, Sanitation, Drinking Water, Electricity, Others, Natural Resources – Streams/Canals, Contours, Trees, Transportation – Railways, Roads, Bus, Public Services – Public Tap, Hand Pumps, Community Toilets, Public Toilets, Tube Wells, Religious – Places of Worship, Financial Services – ATM, Banks, Health – Hospitals, Diagnostic Centres, Clinics, Education – Private, Government, Market – Shops, Shopping Complex, Lifestyle – Hotels, Lodge, Restaurant, Function Halls, Industries – Mills, Workshops, Emergency Services – Fire Stations

5.9.2.1.1. Show the status and types of complaints across the ULBs / Wards.

The user should be shown the status and the types of complaints across ULBs, Wards etc.

5.9.2.1.2. Open complaints outside SLA

The system should enable the user to view all the open complaints outside SLA with appropriate legends

5.9.2.1.3. Top 10 Open Complaints (Categorise)

The system should enable the user to view the top 10 open complaints at any point of time. These complaints must be categorized so that the respective department can take actions.

Also, the dashboard should have Department and Ward wise view of the top 10 open complaints. The user must be provided with capability to sort data either in ascending or descending order.

5.9.2.1.4. District Wise number of complaints (% of complaints within and Outside SLA)

The System should provide the user to view the District Wise number of complaints along with the percentage of complaints within and Outside SLA.

5.9.2.1.5. Query functionality (District, ULB, Ward, Locality, Assessment)

User should able to perform multiple queries on the dashboard and results should be visualized on the map. Some of the queries could include but not limited to

I. Spatial queries with user attributes such as name, Assessment ID, Mobile Number etc.
II. Query the hierarchical administrative boundaries such as District, ULB, Ward, Locality, Assessment etc.

5.9.2.2. Dashboard View

5.9.2.2.1. Grievance Dashboard (Top 10 complaint types and Open/Closed)

Summary of the top 10 complaint types along with their status Open/Close etc.

5.9.2.2.2. District Wise summary, Drill down to ULB

District wise summary of the collections with ability for a drilldown from a State level to an ULB level.

5.9.2.2.3. SLA Dashboard

The Grievance Dashboard View must have the following components

I. No. of Complaints (Total/Open/Close)
II. Closed (Within SLA/Outside SLA)
III. Open (Within SLA/Outside SLA)
IV. Ageing of Grievance (Within a Week old, 1 Week to 1 Month, 1 Month to 3 Months, Greater than 3 Months)

5.9.2.2.4. Complaints Dashboard

District Wise Summary of the count of the open complaints, re-opened complaints and closed complaints must be provided with ability for a drilldown from a State level upto an ULB level.

The user must also be able to find the information related to the type of complaints such as complaints regarding schools, voters' list etc. along with their category such as administration, Public Health etc.

5.9.2.2.5. Source of complaints getting raised

The user must be shown the various sources from where the complaints are getting raised along with the type of complaint. The source could either be phone calls, web Portal, Mobile Application, Citizen Portal etc.

5.9.2.2.6. Citizen Satisfaction

The user must be able to know the rating/feedback provided by the citizens (via the Mobile App or the IVRS) for the various complaints closed by the department. District Wise Summary of the rating of the complaints getting closed should be provided for the users' consumption with ability for a drill down from a State level up to an ULB level.

5.9.2.2.7. GIS Data update Module

- The system should enable minimum 5 authorised user per ULB , to update the GIS data

- Using drawing/designing/digitising tool along with Edit tool in the authorised workflow . There should be -
    - Template to take printout
    - Advanced digitising tools should be developed for editing
    - Ability to digitise in scale-based environment
    - Predefined workflow need to be created for authorised user and system should allow offline editing also in case non connectivity in the ULB level.
    - System Administrator at central level should be able to design the workflow for the data collection at the ULB level

5.9.3. Building Permission & Plan Approval - Drone based assessment

5.9.3.1. Purpose and Objective:

Building Plan permission system refers to the approval required for construction, expansion, significant renovation etc. It is usually given in the form of a building permit. Generally, the new construction must be inspected during construction and after completion to ensure compliance with national, regional, and local building codes.

Failure to obtain a permit or deviating from a permitted construction can result in fines, penalties, and demolition of unauthorized construction.The criteria for planning permission are a part of urban planning and construction law, and are usually managed by town planners employed by State or local governments.

The purpose of the Building Compliance Dashboard is for bringing spatial visibility into the buildings that are compliant with the permission management and also provides a comparative view of building changes within a time period.

The building compliance dashboard helps the various users to view the building compliance for the entire State upto the lowest granular level of buildings.

Apart from bringing the Geospatial visibility, the dashboard helps the various users towards

- Getting actionable insights based on building change detection between defined period
- A decision support system for the administrators to take corrective measures on buildings that are non-complaint with building permission management system
- An interactive tool that helps to view the buildings that were non-compliant earlier but later rectified

Source of Data: Base Map, Drone Survey (Validation), ERP Data, Building Permission, Management Data

GIS Application Layers: Boundaries, Ortho Layers, Drone assessment and building layer

5.9.3.2. GIS Dashboard

Query functionality (District, ULB, Ward)

User should able to perform multiple queries on the dashboard and results should be visualized on the map. Some of the queries could include but not limited to

I. Spatial queries with user attributes such as name, Assessment ID, Mobile Number etc.
II. Query the hierarchical administrative boundaries such as District, ULB, Ward, Locality, Assessment etc.

5.9.3.3. Building Compliance in GIS and 3D visualisation view

As a part of Building Permission Management, the drone-based data collected for the buildings along with the base map data available with the Department, would be used to identify/detect the deviations, offsets etc. The System Integrator with this Real-Time information must be able to view the data in a 3D perspective.

The 2D/3D supportive geo-portal should be plug-in independent and GPU supportive. It requires ability to run Spatial Models on Drone data over the web using standard/OGC service and Store the resultant data. The portal must have capability to search available raw imagery in the system.

The system should be able to scale up for 3D geo-portal and analysis in 3D geo-portal

5.9.3.4. Categorisation of Buildings being fully compliant, Building or Height Deviation, Unauthorised, to be surveyed

The system should have the capability to perform Machine Learning and Artificial Intelligence based modelling and/or procedural modelling techniques to categorize the Buildings that were/are constructed as

I. Being fully compliant
II. Building or Height Deviation
III. Unauthorized construction, Deviation, Addition etc.
IV. To be surveyed

5.9.3.5. Information such as (Owner name, Building ID, Contact Information etc.) pertaining to each building

The system must provide the user with information such as Owner Name, Building ID, No. of floors present, Offsets, Contact Information etc. pertaining to each building.

5.9.3.6. Swipe functionality to compare with past recorded data

The user must be able to view his data in 3D perspective. The user should also be able to detect changes by comparing the historic data with the current data using swipe functionality.

5.9.3.7. Dashboard View

5.9.3.7.1. Unauthorised Construction, addition, deviation

The user should be able to view and comprehend, the unauthorized Constructions, floors added or deviated buildings from the Building Management compliance system

5.9.3.7.2. Deviation corrected

The user should be able to view the buildings that were previously deviating from the Building Management Compliance Data, subsequently corrected and complying with the Building Permission Management.

5.9.3.7.3. No deviation

The user should be able to view the buildings that are not deviating or conforming to the compliance of the Building Permission Management.

5.9.3.7.4. Others

The user should also be able to view other buildings/constructions that are not classified under any of the above mentioned but are still part of the Drone surveyed data

5.9.4. Water Supply and Water Charges

5.9.4.1. **Purpose and Objective:**

Water Chargesis the price assigned to water supplied by a public utility through a piped network to the citizens. These charges are not for water itself, but to recover the costs of water treatment, water storage, transporting it to citizens, collection and regular supply of water to the households.

The purpose of the Water Supply and Water Charges Dashboard is for bringing spatial visibility into

- The water being supplied to households
- The amount of tax that is being collected through the supplied water

This dashboard can bring spatial visibility for the entire State upto the lowest granular level of buildings.

Apart from bringing the Geospatial visibility, the dashboard helps the various users towards

- Getting actionable insights on the Water Supply Network and to improveefficiency in supplying water to households
- A decision support system to assist the administrators to monitor the connections coverage

Source of Data: Base Map and Web Services/ERP Data

GIS Application Layers: Water Supply, Building/Property – Parcel, Landmarks, Boundaries – District, ULB, Slums, Infrastructure – Road, Sanitation, Drinking Water, Electricity, Others, Natural Resources – Streams/Canals, Contours, Trees, Transportation – Railways, Roads, Bus, Public Services – Public Tap, Hand Pumps, Community Toilets, Public Toilets, Tube Wells, Religious – Places of Worship, Financial Services – ATM, Banks, Health – Hospitals, Diagnostic Centres, Clinics, Education – Private, Government, Market – Shops, Shopping Complex, Lifestyle – Hotels, Lodge, Restaurant, Function Halls, Industries – Mills, Workshops, Emergency Services – Fire Stations

5.9.4.2. GIS Dashboard

The system must have the capability to provide the ULB grade (in terms of quality, quantity and sources) of water supply across the State

5.9.4.2.1. Water supply Network Construction Material & Type

The System should utilize data pertaining to water supply network construction material & type. These data would be utilized in viewing the type of network, viz distribution line, service line or the pumping line etc., and Construction Material such as RCC, GI, PVC etc. Also preferably but not compulsorily, the system should be able to handle water pipeline modelling along with tracing upstream and downstream network model.

5.9.4.2.2. Water supply data through data entry by officials.

The system should have the capability for the users to enter data with respect to the water supply data

I. Treatment plan
II. OHSR
III. Zones

5.9.4.2.3. Diameter of Pipes in Network

The System must leverage on the data pertaining to the Diameter of pipes in water supply network, for the user to be provided in GIS view, the ability to filter the network of pipes in the area of interest, based on the diameter of the pipes. The diameters could vary from 0-100mm, 101-200mm, 201-300mm etc.

5.9.4.2.3.1. Maintenance and Overhauling

The system must utilize the data towards bringing visibility into the maintenance and overhauling

The system must also provide the user with the status on maintenance through Data entry

5.9.4.3. Dashboard view

5.9.4.3.1. Connections coverage

The dashboard must also show the users in GIS, with the status of the connections coverage such as Households covered, No coverage and Network length at levels such as State, District, ULB etc.

5.9.4.3.2. Annual & Monthly Targets, Achievement, % Achievement

The dashboard must show the users, the Annual & Monthly targets, Achievement & the percentage of achievement of the number of connections for water supply.

5.9.4.3.3. Water supply & quality Monitoring

The system must have the capability to leverage on the data of Water Quality to provide the type of drainage that a particular ULB consists of. The user must also be provided with the ULB grade, in terms of Quality, Quantity and the Sources. The quality of water data would be the samples that are tested for the residual chlorine, where the samples would contain more than or less than 0.2 PPM of Chlorine.

5.9.4.4. Tank Deliveries Monitoring

The system should use the data of the department to help the user by providing the status of the water tankers those were engaged and the trips that were made. This should be at a daily frequency where the users are made aware of the day's status.

5.9.5. Road Quality and potholes

5.9.5.1. Purpose and objectives:

Roads form the important connect towards the connectivity to the last mile. The National and State Highways are the lifeline of transportation of many goods. The Road Quality needs to be monitored to ensure the road transportation is at the optimum.

The purpose of the Road Quality and Potholes Dashboard is for bringing spatial visibility into the road quality and potholes for the entire State upto the lowest granular level of buildings.

Apart from bringing the Geospatial visibility, the dashboard helps the various users towards

- Getting actionable insights on the Quality of Roads

- A decision support systemto assist in road construction progress monitoring
- A querying tool that helps in day to day operations of prioritizing locations to repair roads

Source of Data: Base Map and ML over Drone Data

GIS Application Layers: Road network layer, Drone Assessment, Ortho Layer, Building/Property – Parcel, Landmarks, Boundaries – District, ULB, Slums, Infrastructure – Road, Sanitation, Drinking Water, Electricity, Others, Natural Resources – Streams/Canals, Contours, Trees, Public Services – Public Tap, Hand Pumps, Community Toilets, Public Toilets, Tube Wells, Religious – Places of Worship, Financial Services – ATM, Banks, Health – Hospitals, Diagnostic Centres, Clinics, Education – Private, Government, Market – Shops, Shopping Complex, Lifestyle – Hotels, Lodge, Restaurant, Function Halls, Industries – Mills, Workshops, Emergency Services – Fire Stations

5.9.5.2. GIS Dashboard

5.9.5.2.1. Monitor Road Quality through Citizen reported Data

The system should be able to assist the user in Monitoring the Road Quality through citizen reported data. The system may, preferably include Multilevel Linear Referencing System in the road network to have better response to citizens grievance redressal on road quality. The road quality must be easily comprehended by the user through appropriate legends such as Good Roads, Bad Roads or Ditches.

The system Integrator must also enable the user to identify the roads those were repaired from the previous drone survey.

5.9.5.3. Identify pot holes and bad patches of road using Machine learning and Artificial Intelligence algorithms

The drone survey would act as a base on which further analysis could be made. The System Integrator must use Machine Learning and Artificial Intelligence algorithms to identify pot holes and bad patches of road.

5.9.5.4. Classification of Road Construction material type (Asphalt, WBM & Concrete)

The system must leverage on the data pertaining to the road construction material type to help the user to understand in a GIS view, the construction material type that is being used for the construction of the roads such as Black Top, Water Bound Macadam (WBM) & Concrete by the use of appropriate legends to explain the same.

5.9.5.5. Road type (National& State Highways, Roads & Streets)

The System must use the Road Type data from the layers created and provide the user the information in a GIS view, the type of road that is present in the area of interest such as National or State Highways, Roads and Streets. This should be done by the use of appropriate legends to explain the same.

5.9.5.6. Query functionality (District, ULB, Ward)

User should able to perform multiple queries on the dashboard and results should be visualized on the map.Some of the queries could include but not limited to

I. Spatial queries with user attributes such as name, Assessment ID, Mobile Number etc.
II. Query the hierarchical administrative boundaries such as District, ULB, Ward, Locality, Assessment etc.

5.9.5.7. Dashboard

5.9.5.7.1. Total Road Network Length covered

The system integrator must ensure that the user is given the information regarding the total road network length that is covered in GIS view. This should contain appropriate legends for the user to comprehend the information.

5.9.5.7.2. Road Construction Progress Monitoring

In a GIS View, the system must provide the user with the Road Construction Progress Monitoring that helps them in understanding the status of the various roads that are being constructed along with appropriate legends for the users to easily comprehend this information.

5.9.5.8. Road Quality

The system should help the user to visualize in GIS view, the quality of roads in the area of interest. It should be able to help the user to understand the stretch of good and bad roads.

5.9.6. Black Spot/garbage dump monitoring

5.9.6.1. Purpose and Objective

Solid waste is the unwanted solid materials generated from human activities in residential, industrial or commercial areas. It may be categorised based on the below

- Origin - Domestic, Industrial, Commercial etc.
- Contents - Organic material, Glass, Metal, Plastic etc.
- Hazard potential - Toxic, Non-toxic, Flammable, Radioactive etc.

Solid Waste Management reduces or eliminates the adverse impact on the environment & human health. Several processes are involved in effectively managing waste for a municipality. These include monitoring, collection, transportand disposal. The waste that gets dumped in a locality leads to a black spot or garbage dump.

The purpose of the Black Spot/ Garbage Dump monitoringDashboard is for bringing spatial visibility into the Black Spot or the garbage dump monitoring for the entire State upto the lowest granular level of buildings.

Apart from bringing the Geospatial visibility, the dashboard helps the various users towards

- A decision support system for the administrators to work on the zones that are prone to be black spots
- A dashboard for the administrators to monitor the progress of removal of black spots
- A querying tool that helps in day to day operations of prioritizing locations to clear black spots

Source of Data: Base Map, Manual Survey - For Garbage, ML over Drone Data

GIS Application Layers: Black Spot Layer, Green Spot Layer, Boundaries, Ortho Layers, Drone assessment

5.9.6.2. Drone based assessment

The System Integrator should utilize the Archived Data and integrate with Real-Time data of the Drone Based Assessment which would be used for further analysis for finding the Black Spots or Garbage dump.

5.9.6.3. Machine Learning & Artificial Intelligence based classification of Garbage/Black spots

The System Integrator should utilize the Drone surveillance Data to perform Machine Learning and Artificial Intelligence based modelling techniques to identify the Garbage spots. This software should be widely used. The system, preferably, should also use object-oriented classification for this.

Compare the Black Spots/Garbage dump in the previous drone survey with the current drone survey and check for cleaned/removed spots.

5.9.6.4. Integration of Drone data with manually surveyed data Query functionality (District, ULB, Ward)

The System must leverage on the Drone surveillance Data along with the manually surveyed data. The system should further perform analysis such as Compare the Black Spots/Garbage dump in the previous drone survey with the manually surveyed data and provide the user with information regarding

- The areas those were cleaned since the last drone survey
- Newly identified black spots in the latest drone survey

5.9.6.5. Dashboard

5.9.6.5.1. Total % Black-spots per sq. km

The system should be able to help the user in understanding the information pertaining to the Total Blackspots per sq. km.

In GIS view, the user of the various categories of blackspots such as Desiltination of drains, Removal of Debris, Stagnation of Water etc.

The dashboard should allow the user to obtain information such as Location Co-ordinates, Category, Last Inspection date, Election Ward No. etc. by clicking on the Black spot in GIS view.

The dashboard must also enable the user to understand in GIS view the types of spots such as Black Spots, Green Spots, Eligible for Black Spot, Eligible for Green Spot, Eligible for removal present in the area of interest.

The user must also be able to filter the various types of Spots mentioned above, along with the category of spots such as School Toilets, Removal of Debris, dumper bins etc.

5.9.6.5.2. Total % Black-spots cleaned during drone assessment

The system should be able to provide the user with the information towards the total percentage Blackspots cleaned during the drone assessment.

5.9.6.5.3. Ranking based on % of black-spots

The system should also provide the user with the information pertaining to the ranking of various Districts/ULBs/Wards based on the blackspots those were cleaned/removed/ total no. of blackspots present per sq. km.

5.9.6.5.4. Categorisation of Black-spots (Destination of drains, Removal of Debris, Stagnation of Water)

The system should be able to provide the user in GIS, with the categorization of the blackspots such as Desiltation of drains, Removal of Debris, Stagnation of Water etc.

Web portal should give user OGC-WFT based (or equivalent) digitising tool for digitising in the web portal for marking Blackspot in Drone Imagery, these data should be directly ingested in to the database

5.9.7. Greenspace/Vegetation Coverage Index

5.9.7.1. Purpose and Objective

The Greenspace/Vegetation Coverage Index is meant to measure the changes of the green vegetation in Urban areas - i.e. shrubs, trees, pasture land, crop land, etc. – in order to monitor progress on the urban Green Space target. The index will provide information on the changes in the vegetation cover and, as such, will provide an indication of the status of the conservation of Greenery in the environment.

The purpose of the Greenspace Coverage Index Dashboard is for bringing spatial visibility into the vegetation cover for the entire State upto the lowest granular level of buildings.

Hence, effectively a dedicated spatial model is expected to be built which will utilise satellite image/drone multispectral data as obtained, thus identifying the greenspace/vegetation coverage index via temporal data etc.

Apart from bringing the Geospatial visibility, the dashboard helps the various users towards

- Getting actionable insights on zones where the Greenspace/Vegetation Coverage Index can be improved
- A decision support system to help planners to identify new zones to increase plantation
- A querying tool that helps in day to day operations to identify regions where targets are met/deficit

Source of Data: Base Map, Drone – DEM, ML over Drone Data

GIS Application Layers: Boundaries, Ortho Layers, Drone assessment and Road Layer, Green Space Layer

5.9.7.2. Automatic identification and classification of vegetation through geospatial data

The system integrator must utilize the drone-based assessment data and create a system that should be able to perform Machine Learning based modelling techniques to automatically identify and classify the vegetation using Geospatial data.

5.9.7.3. Calculation of index at various Ward and ULB level

The system should also be able to calculate the Greenspace/Vegetation Coverage Index at various levels such as ward, ULB and district based on sq.km of green cover area. This index should be a normalized index to perform further analysis and ranking.

5.9.7.4. Tracking of new plantations and depletion of green cover

The system Integrator must ensure that the new plantations, depletion/encroachment of green covers are being tracked. The system must be able to provide the user with this information through appropriate legends such as Green Cover being low, medium or high vegetation.

5.9.7.5. Query functionality (District, ULB, Ward)

User should able to perform multiple queries on the dashboard and results should be visualized on the map. Some of the queries could include but not limited to

- Spatial queries with user attributes such as name, Assessment ID, Mobile Number etc.
- Query the hierarchical administrative boundaries such as District, ULB, Ward, Locality, Assessment etc.

5.9.7.6. Dashboard

5.9.7.6.1. Targets (Annual, Monthly, Achievement)

The system should ensure that the users are able to understand the targets set (No. of trees planted) to improve Greenspace/Vegetation Coverage Index. The targets shown to the user should be at a frequency of

- Annual
- Monthly

The user should also be equipped with information of an achievement percentage that translates to the Achievement Targets.

The system should automatically identify number of trees in the plantation area using automated Multilevel Linear Referencing System based feature identification from Drone/ satellite image. It is expected that there should be real-time image streaming for looking at pre & post tree plantation data.

5.9.7.6.2. Categorisation based on Greenspace/Vegetation Coverage Index

The system must be provided in a GIS view, for the user to view the green cover in categories of low, medium or high vegetation. Preferably, the system should automatically identify from catalogued metadata of temporal satellite image and run the spatial model (e.g. via OGC WPS or equivalent technology) to find the Greenspace coverage change and thus update the dashboard.

5.9.7.6.3. Monitoring percentage Green coverage

The system should help the user to view the different areas based on the percentage of greenspace/vegetation cover to monitor the change in the Green Space Index.

5.9.8. Water Body and encroachment

5.9.8.1. Purpose and Objective

The purpose of the Water Body and encroachment Dashboard is for bringing visibility into the water cover and encroachment for the entire State upto the lowest granular level of buildings.

Source of Data: Base Map, Drone Survey Data, ML over Drone Data, Temporal, satellite Image etc. It is expected that spatial Models will be created to use OGC WPS or equivalent service for finding out and/or identify changes of Water Body in comparison to any priorly available data

GIS Application Layers: Boundaries, Ortho Layers, Drone assessment, Canal, Streams and Ponds

Apart from bringing the Geospatial visibility, the dashboard helps the various users towards

- Getting actionable insights on zones where the water body regions are getting encroached
- A decision support system to help planners to decrease the encroachments in regions where possible

5.9.8.2. Query functionality (District, ULB, Ward)

User should able to perform multiple queries on the dashboard and results should be visualized on the map. Some of the queries could include but not limited to

- Spatial queries with user attributes such as name, Assessment ID, Mobile Number etc.
- Query the hierarchical administrative boundaries such as District, ULB, Ward, Locality, Assessment etc.

5.9.8.3. Dashboard

5.9.8.3.1. Encroached Area

In GIS view, the user must be able to understand the area that is being encroached with appropriate legends to show the encroachments.

5.9.8.3.2. % Encroached

In GIS view, the user must be able to show the percentage of area being encroached.

5.9.8.4

5.9.9. Town Planning Workflow

It is mandated that there shall be a standardized Data Model integrated with MoUD's Guidelines and workflow based Simple-to-use integrated Dashboards, Web & Mobile Apps to empower.

Source of Data: Base Map, Citizen Satisfaction/feedback via Mobile App and collaborative mapping effort amongst town planners.

Data modal requirements:

- Data shall be rule based. Adhere to Cartographic Rules as well as rules of the specific layers
- Data Model shall include the Layers specified in AMRUT guidelines
- Data Model shall include the layers required for the Master plan preparation
- Data Model shall include the forms to be submitted with Master plans

Application Modules

- Workflow to Allocate master plan to any town planner/consultant
- Workflow to check what is the towns allocated and what is the status
- The Communication of the Master plan status. It shall include file noting and status history.
- Master plan Toolkit for downloading data model.
- Land Suitability Modelling tool for making alternative plans
- Tools to incorporate Zonal Byelaws over landuse to be displayed on the portal

- Workflow for reviewing the master plan at different level and approving and disapproving with redlining facilities
- Mobile Applications for marking the changes in landuse during survey
- Tools to visualise the vector and raster layers simultaneously

5.10. Development of Machine Learning based Automatic layer extraction from Drone Data and Satellite Data

The system integrator must use the artificial neural networks to solve challenging problems that would part of the scope of work. The system must use of large amounts of available data to train a neural network to generalize to a particular problem, Deep Learning employs the power of neural networks.

The system Integrator must leverage on modelling techniques& algorithms that are specific to the problem to be solved. The system Integrator must be able to architect, host and run various machine learning algorithms including deep learning neural networks likeCNN, RNN and DNN in their solution to provide automatic identification of various components where required.

The system integrator must use all the sets such as Training set, Validation set and Test set while training the system.

The system Integrator must ensure that the model is not over-fit or under-fit. For this purpose, the system integrator must understand how the accuracy and loss of the model varies per epoch. The validation accuracy must be monitored to gauge the number of epochs required to train a model without over-fitting it.

This system should be progressive in nature, as the system keeps getting more data the model should be able to use it automatically and enhance its accuracy.

- Agency should automate self-training of these machine learning models: The agency must leverage on the data available from the department to automate the self-training component of the solution. This would generally include the agency to add as many sets of data that can be labelled to provide the system with the initial information required to classify. This should be followed by an automation process for the solution to get trained by itself.
- Agency to use ML platform where models can be added, modified or deleted at a later stage by the department.
    - The agency should ensure that there are pre-defined models available in the ML platform and is provided with the capability for the department to
        - Add
        - Modify
        - Delete
    - This would ensure that the department is able to get desired outputs from the pre-defined or the new model that is being created
- Agency to provide facility where department officials can keep adding the training data for increasing the accuracy.
    - The agency should ensure that the training data of the ML platform is provided with the capability for the department to add more training sets

- This would ensure that the department can control the quality of the output being controlled via the updated training set

5.11. Infrastructure, Software Stack and Licensing

5.11.1. Open source and COTS:

While there are different benefits between choosing Open source and COTS tools and software options, the System Integrator is solely responsible for choosing between COTS and Open Source.

5.11.2. Database

The system should have a reliable database to handle large amounts of data. The Agency should also ensure that the database is designed in such a way that the retrieval of various data sets requires minimal time and effort. The database can be Open source or Industry standard.

The database should possess the general properties of

- Atomicity
- Consistency
- Isolation
- Durability

5.11.2.1. Technologies

The agency should use the emerging technology capable of handling large amounts of data and requests. It should be designed in such a waythat it is capable of handling below listed but not restricted to

- Store Platform data such as location data and other metadata required for generating the boundaries and others in the UI
- Store spatial and non-spatial data for various application specific features
- Perform required analytics
- Process GeoSpatial data

5.11.2.2. Clustering

The agency must also provide the system with “clusters” of servers. This would enable the system to be more reliable in case of any data server failure. It would also ensure that the system provides the following but not limited to properties such as

- High Availability
- Efficient Read/Write capability
- Fault tolerance
- Improved performance

5.11.3. Back-End

The Database Schema should be designed to handle generic data in the database, and should be developed based broadly but not limited to the following parameters:

- **Parent entity:** The entity for which data is being stored. It could be a District, ULB or any other entity which shall be decided based on the size of data to be stored for that particular entity.

- **Entity type:** The type of entity for which data is to be stored for the above Parent entity. It could be a Location, ULBs, UDAs etc.

- **Time period:** This could be a Day, Month, Year etc. for which the data is required for a specific application.

- **Sub time period:** This could be the further granularity of time for which we are storing data for the above Time period. For example, for a Month time period might also require the data at a Day sub time period.

- **Event type:** The data shall be segregated based on the event type to determine whether it is raw incoming data or processed and aggregated data

- **Entity uuid:** Unique id to determine this data is for which particular entity

- **Component type:** The type of data being stored.

5.11.4. Presentation layers

- The presentation layer enables interaction of the database and provides visualization to the user through web pages various devices such as
    - Desktops
    - Laptops
    - Tablets
    - Mobile Phones
- This layer interacts with the Service Layer to render the Business Data, Analytics and Visualizations in the form of Heat Maps or Interactive Charts and Graphs.
- The presentation layer also enables the users to download data or upload data into the system

5.11.5. Infrastructure sizing

- The Agency must plan and publish the infrastructure to implement the functionalities in scope.
- This would be a tentative infrastructure and database sizing that would be discussed with West Bengal Urban Development and Municipal Affairs Department and finalized.

5.11.6. Licensing

The below listed would be the broad licensing terms

- Lifetime licensing with free upgrades on any future releases
- The system should have unlimited number of users, layers and ULBs
- Sufficient number of servers shall be included as per the need during the implementation phase based on performance and data
    - This must be after considering all the ULBs and UDAs mentioned in the RFP

5.12. Training and Capacity Building

5.12.1.1. Training of the Trainers
5.12.1.2. Workflow
5.12.1.3. System training
5.12.1.4. Vernacular
5.12.1.5. Easy visualization

The agency should organize and conduct workshops/training during the project period. The participants of the workshop would be the Administrators and concerned elected representatives of ULBs, officials and other relevant stakeholders of the West Bengal Urban Development and Municipal Affairs Department. The trainings during the project period would be focussed on conducting workshops on the work progress, training on how to navigate the dashboard, capabilities and features of the Geoportal, Basemap editing, Redlining, database updation etc.

Training of key stakeholders is essential for ensuring that the software developed is actually put to use. Hence, the SI shall ensure a proper training to the designated end-users on the ERP system so as to make them well conversant with the functionalities, features and processes built in the proposed system, up to a certain level of satisfaction of the client.

Training Plan:

- The agency shall provide comprehensive and detailed training plan describing the proposed approach & methodology, calendar/ timelines, course contents, course duration, training materials, training tools, training logistics, etc.
- The content of the training plan and schedule shall be prepared by the Consortium/Agency in consultation with appropriate authorities at UD & MA Dept. at an appropriate time period.
- Training Overview: The training overview shall be provided to UD&MA Dept. approved CERC and other stakeholders before beginning of each training phase. The agency shall incorporate the changes suggested/ inputs provided by the UD & MA during the training overview.
- The agency shall arrange separate training sessions for different categories of participants in batches (if required) at client space upon directions.
- Training could have multiple sessions as per the need and requirement of the project/application. Hence, the System Integrator shall conduct Training Needs Analysis of all the concerned staff of UD&MA Dept. as well as 125 ULBs and 20 UDAs and plan out a systematic training plan. There should be sufficient number of trainers in every training session for conducting the training program. Training roster should be circulated in advance to provide maximum training benefit.
- **Assessment of Training Effectiveness:** Evaluate effectiveness of training programs and workshops by obtaining formal feedback from each participant after completion of each training program/ workshop.
- The requisite training infrastructure like space, seats, projector with screen etc. shall be mostly provided by the UD & MA in consultation with SIA.
- The training shall be organized by the SI wherein specialised logistics and supportive facilities (if any), apart from the above-mentioned facilities, should be arranged by the SIA only, and all associated cost such as food, shall be borne by the SIA.

- The SIA shall provide training material like handouts, user manual (role base), the language of training manual shall be in English, unless otherwise requested by the UD&MA Dept.
- The training content and mode of delivery must be approved by UD & MA. Training material should be provided in hard and soft copies both. The SI shall ensure that all the training documentation in Hardcopy and Softcopy is in place (user training, operation procedures, visual help-kit etc.) before beginning of each training session.
- The cost incurred on carrying out the training at prescribed location(s) shall be borne by the SIA which includes trainer's and other support team member's fees/ salary along withall incidental expenses like travelling, lodging-boarding, food and local conveyance etc.

5.13. Maintenance

The Agencies must extend complete maintenance and support for two years in all aspects post implementation for 125 Urban Local Bodies including 55AMRUT cities as well as areas under 20 Urban Development Authorities in the State of West Bengal.

5.14 Software Security

The System Integrator will be responsible for engaging STQC or such to conduct the assessment / review for the system before "Go Live". The UD&MA Dept, Govt. of West Bengal shall have the right to audit and inspect all the procedures and systems relating to the provisioning of the services. If there is any change / addition in the application's functionality then the SI will have to obtain the STQC Certification for the changes / additions.

System Integrator shall ensure compliance to all mandatory government regulations. The security services should cover the user profile management, authentication and authorization aspects of security control. This service should run across all the layers since service components from different layers will interact with the security components. All public contents should be made available to all users without authentication.

System Integrator shall ensure the following points are duly addressed for successful completion of STQC Certification:

- Successful completion of Application Audit. Application audit will include:
  A. Functionality audit that will map the functionality delivered to the FRS agreed upon during development phase.
  B. Identify the nature and type of transactions being processed by the application systems.
  C. Determine systematic measures implemented to control and secure access to the application programs and data including password controls, user authentications, roles and responsibilities, audit trails and reporting, configuration and interface controls, etc.
  D. Review of database structure including

1. Classification of data in terms of sensitivity & levels of access
2. Security measures over database installation, password policies and user roles and privileges
3. Access control on database objects – tables, views, triggers, synonyms, etc.
4. Database restoration and recoverability
5. Audit trails configuration and monitoring process

6. Network connections to database

E. Review of Network and Website will include:

1. Penetration and vulnerability testing

2. Security exposures to internal and external stakeholders

F. Definition and Implementation of Security Policies and Controls will include:

1. Define and implement backup process, including schedule, storage, archival and decommissioning of media

2. Define physical access controls review (over DC and other critical area)

3. Define IT Change Management process, Incident Management process – covering identification, response, escalation mechanisms

4. Define and implement Anti-virus (malware) controls – patching, virus definition file update

OWASP Top 10 standard should be mapped in the secure coding guidelines to cover all major vulnerabilities.

- Validation checks should be incorporated into the application to detect anycorruption of information through processing errors or deliberate acts.
- Data output from an application should be validated to ensure that the processing of stored information is correct and appropriate to the circumstances
- Should implement secure error handling practices in the application

Application level security should be provided through leading practices and standards including the following:

- Prevent SQL Injection Vulnerabilities for attack on database
- Prevent XSS Vulnerabilities to extract user name password (Escape All Untrusted Data in HTML Contexts and Use Positive Input Validation)
- Secure Authentication and Session Management control functionality shall be provided through a Centralize Authentication and Session Management Controls and Protect Session IDs from XSS
- Prevent Security Misconfiguration Vulnerabilities (Automated scanners shall be used for detecting missing patches, misconfigurations, use of default accounts, unnecessary services, etc. maintain Audits for updates
- Prevent Insecure Cryptographic Storage Vulnerabilities (by encrypt off-site backups, ensure proper key storage and management to protect keys and passwords, using a strong algorithm)
- Prevent Failure to Restrict URL Access Vulnerabilities (By providing authentication and authorization for each sensitive page, use role-based authentication and authorization and make authentication and authorization policies configurable
- Prevent Insufficient Transport Layer Protection Vulnerabilities (enable SSL for all sensitive pages, set the secure flag on all sensitive cookies and secure backend connections
- Prevent ID Redirects and Forwards Vulnerabilities

For effective prevention of SQL injection vulnerabilities, SI should have monitoring feature of database activity on the network and should have reporting mechanism to restrictor allow the traffic based on defined policies.

5.15 Quality Control/Audits

UD&MA Dept., at its discretion, may also engage independent auditors to audit any/some/all standards/processes. SI shall support all such audits as per calendar agreed in advance.

The result of the audit shall be shared with System Integrator who must provide an effective action plan for mitigations of observations/non-compliances, if any.

System Integrator should comply with all the technical and functional specification provided in various sections in the RfP and contract.

Bid Submission Format

The Bid is submitted for the works of –

(Multiple selections allowed) (Please Tick)

1. Over all Central Software Development, System Integration, Base map creation, and Master Plan formulation works as mentioned in section 3.1 under categories of bidder as "System Integrator Agency for Model Cluster".	
2. Base Map Creation and Formulation of Master Plan as mentioned in section 3.2 under categories of bidder.	

The Bid is submitted for the clusters –

(Multiple selections allowed) (Please Tick)

S. No.	Type of work	Choice of cluster other clusters
1	**System Integration for Central Software Platform with Base Map creation & Master Plan Formulation**	**Cluster 0 (Model Cluster)**
2	**Base Map creation & Master Plan Formulation**	**Cluster 1**
3	**Base Map creation & Master Plan Formulation**	**Cluster 2**
4	**Base Map creation & Master Plan Formulation**	**Cluster 3**
5	**Base Map creation & Master Plan Formulation**	**Cluster 4**
6	**Base Map creation & Master Plan Formulation**	**Cluster 5**
7	**Base Map creation & Master Plan Formulation**	**Cluster 6**
8	**Base Map creation & Master Plan Formulation**	**Cluster 7**
9	**Base Map creation & Master Plan Formulation**	**Cluster 8**
10	**Base Map creation & Master Plan Formulation**	**Cluster 9**
11	**Base Map creation & Master Plan Formulation**	**Cluster 10**
12	**Base Map creation & Master Plan Formulation**	**Cluster 11**

_____

Name of Signatory & Contact No:
Designation of Signatory:
Name of Company:
Date: