# TERMS OF REFERENCE FOR CONSULTANTS

## I. Background

1. This knowledge and support technical assistance (TA) aims to support India's biofuel development using novel technology and sustainable business structures. Biofuels are a renewable energy source from organic matter, agricultural waste, and municipal solid waste (MSW). They can be used in energy, transport, manufacturing, and medicine in the form of bioethanol, biogas, and biodiesel. Especially, biofuels can be blended into low-carbon fuels for vehicles and treated as a key tool for green transportation. The TA will focus on advanced biofuels and will enable the preparation of specific development schemes with technical, financial, contractual, and capacity development arrangements; and viable business and operational models.[1]

2. Asian Development Bank (ADB) will engage firms and individual consultants and carry out procurement following the ADB Procurement Policy (2017, as amended from time to time) and its associated project administration instructions and/or staff instructions. A multidisciplinary team will be required to successfully execute the assignments. The terms of reference are outlined with the intent to remain flexible to respond to the requirements of the executing agency (EA) and implementing agencies (IAs); each consultant's outline terms of reference will include, but not necessarily be limited to the described tasks. The EA will be the Ministry of Petroleum and Natural Gas. The IAs will include public oil entities of the Indian Oil Corporation Limited (IOCL) and the Hindustan Petroleum Corporation Limited (HPCL), the Oil Industry Development Board (OIDB), and public finance institutions of the Indian Renewable Energy Development Agency (IREDA) and the National Bank for Agriculture and Rural Development (NABARD).

## II. Objective

3. The TA has four outputs on developing bioethanol, bio-CNG, and biodiesel plants; and adopting gender mainstreaming in the feedstock supply chains. The TA will finance studies and provide support to improve readiness for the investments.

4. **Output 1: Development schemes for bioethanol demonstration plants prepared.** In 2019, the government approved the Pradhan Mantri JI-VAN Yojana, a development plan to finance advanced bioethanol projects. The government has identified 12 bioethanol plants for demonstration purposes,[2] and investments of $1.7 billion–$2.0 billion will be required. The IOCL plans to develop the first pilot bioethanol project using nonfood biomass, mainly rice straw and other lignocellulosic feedstock, and scale up a subsequent project through a learning-and-doing approach. IOCL also intends to develop bio-CNG, waste-to-energy power generation, and plastic

[1] There are two generations of biofuels. First-generation biofuels come from surplus food crops, such as sugar, wheat straw, or vegetable oil. Second-generation biofuels, or advanced biofuels, come from nonfood biomass, such as agricultural residue, MSW, and nonfood energy crops grown on land unsuitable for crop production (such as bamboo).

[2] The plants' initial locations are (i) Haryana, Gujarat, and Uttar Pradesh for IOCL; (ii) Andhra Pradesh, Bihar, Punjab, and Uttar Pradesh for HPCL; (iii) Madhya Pradesh, Maharashtra, and Odisha for BPCL; (iv) Karnataka for Mangalore Refinery and Petrochemicals Limited; and (v) Assam for *Numaligarh Refinery Limited, which is owned by BPCL, IOCL, and the Government of Assam. Numaligarh is implementing its plant, and IOCL's Haryana plant is at an advance stage of development. All plants* are expected to use different types of feedstock suitable to each location's available resources, and their development stages are varied.

recycling plants on a pilot basis.[3] The HPCL has different project schemes in other locations. The TA will support at least two bioethanol plants.

5. **Output 2: Development schemes for bio-compressed natural gas demonstration plants prepared.** In 2018, the government launched the Sustainable Alternative Towards Affordable Transportation (SATAT) initiative to promote about $25 billion of investments in 5,000 bio-CNG plants. As of October 2020, more than 500 expressions of interest were received from energy companies and other private firms and entrepreneurs,[4] which are expected to have financing arrangements under the SATAT initiative with the OIDB and/or public financial institutions, such as the IREDA and the NABARD. Bio-CNG is supposed to be off-taken by public oil marketing companies and transported through their fuel station networks. Instead of liquefied petroleum gas, biogas can be distributed or cylindered for cooking in urban and rural areas. The TA will support at least 10 bio-CNG plants.

6. **Output 3: Development schemes for biodiesel demonstration plants prepared.** In 2019, the Food Safety and Standards Authority of India (FSSAI) initiated the Repurpose Used Cooking Oil (RUCO) initiative to collect and convert used cooking oil to biodiesel.[5] The RUCO initiative enabled authorized developers to collect and transfer inedible cooking oil from institutional and individual users to biodiesel refinery plants. Oil marketing companies launched a program to collect used cooking oil in 200 cities, and 56 companies have been identified to procure used cooking oil.[6] Public oil marketing companies have expressed interest to procure such biodiesel from energy companies and other private firms and entrepreneurs, which are expected to have financing arrangements with OIDB and/or public financial institutions in similar arrangements with the SATAT initiative. The TA will support at least six biodiesel plants.

7. **Output 4: Gender mainstreaming design for the biofuel value chain incorporated.** In India, more than 80% of rural women work in agriculture,[7] and many female waste pickers handle municipal waste disposal and recycling activities. Hiring these women to collect and segregate feedstock for biofuel and perform other related activities will increase their income-earning potential. Such opportunities will help empower rural and urban poor women and reduce gender and social disparities. Therefore, it is crucial to identify and establish women's equitable access and engagement in biofuel feedstock supply chains, including feedstock production, collection, storage, and related business marketing (e.g., income generation from selling biogas byproducts, such as organic fertilizers). These benefits can be resonated on a local level in organizing a women's support network at the demonstration plant sites, where awareness campaigns and training and job programs can be conducted in partnership with civil society and/or public and private parties.[8] The programs are expected to have at least 100 female participants.

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[3] Output 1 included these pilot projects because they are integral to IOCL's components.

[4] IOCL also plans a bio-CNG plant to produce compressed natural gas from press mud, which is residual matter in the filtration process of sugarcane juice.

[5] FSSAI is the food regulator, which intends to prevent consumers from reusing toxic and hazardous cooking oil, disposing them into drains, and polluting sewage and waterways.

[6] For example, McDonald's has already started converting used cooking oil to biodiesel in 100 outlets in India.

[7] In India, 85% of rural women are engaged in agriculture, and it is estimated that agriculture employs almost 80% of "economically active women" (National Rural Livelihoods Missions. 2015. *Mahila Kisan Sashaktikaran Pariyojana Agriculture Guidelines*. p. 1).

[8] While cases in other countries have shown the benefits of employing women in bioenergy processing, they also raised concerns that women are at a disadvantage when it came to wages, working conditions and benefits, training, safety, and health risks. Creating best practices in promoting gender sensitivity is critical to minimize risks and maximize opportunities.

8. **Key methods and activities with ADB value addition.** The development schemes in outputs 1–3 will be based on engineering studies, safeguard plans, financing plans, and implementation arrangements for the biofuel plants that will be supported under the TA. Six major activities will support their implementation. First, it is crucial to assess and select the most suitable high technology to convert various feedstocks to biofuel. The technical design will be reviewed and improved in terms of processing efficiency and based on a feedstock cost-and-benefit analysis. Given the number of commercial biorefineries in the world,[9] international best practices will be assessed with ADB and development partners for knowledge sharing.[10] Second, catalytic financing avenues and schemes will be studied to make biofuel demonstration projects financially viable. Advanced biofuel investments are capital-intensive and involve large risks, such as technology selection, feedstock availability, and the resultant financial viability gap. To break entry barriers and help demonstrate pilot implementation,[11] public sector finance will initially be driven to improve the investment climate and catalyze subsequent public–private partnerships and private investments, subject to due diligence studies. Third, it is essential to establish effective business models and efficient feedstock supply chain mechanisms (e.g., collection, storage, and transport methods; and their contractors). Biofuel feedstocks should be available sustainably. They are highly local by nature and managed through tailored supply contracts with local industries, municipalities, farmers, and private parties. Fuel offtake contracts should also be developed to ensure business sustainability. Fourth, relevant regulatory frameworks will be reviewed to assess if possible incentives, requirements, and standards are practicable. Proper pricing and transaction systems also need to be established. Fifth, all stakeholders and beneficiaries should be properly engaged in value chain development. The schemes will incorporate the effective gender mainstreaming practices in output 4. Stakeholder awareness and capacity will be improved through workshops, consultations, and partnerships with civil society to ensure inclusiveness and safeguard mitigations. Last, holistic development road maps and strategies will be prepared for biofuel network expansion. The road maps and strategies will have technical, economic, human resource, social, and environmental aspects to meet policy targets. The TA will provide phased support for knowledge and capacity enhancement and follow-on financial transactions, subject to financing due diligence during implementation.

## III. Scope of Work

9. The TA will be implemented over 2.5 years. The scope of works will be supported by (i) individual consultants, and (ii) a consulting firm and/or an association of consulting firms, both of which will be required to collaborate for all the tasks. The consultants will coordinate the TA implementation with ADB and the EA as well as IAs in the discussion, consultation, information-sharing and decision-making processes.

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[9] At least 12 lignocellulosic refineries operate commercially (excluding those with annual capacity of less than 10 million liters) in Brazil, Europe, the People's Republic of China, and the United States (International Renewable Energy Agency. 2019. *Advanced Biofuels: What Holds Them Back?* Abu Dhabi). Bio-CNG plants also operate in Brazil, Finland, and the United States. Plants that generate biogas from food waste, manure, and sewage from wastewater treatment operate across the world. Similar plants that refine biodiesel from used cooking oils operate in Brazil, Germany, Netherlands, and the People's Republic of China.

[10] Development partners are expected to include the Korea Environmental Industry and Technology Institute and the New Energy and Industrial Technology Development Organization. The TA will focus on successes and failures of developed and developing countries as well as lessons on policy, market pricing mechanisms, and technology. The knowledge product will be disseminated.

[11] The biofuel policy envisages incentive schemes, including tax credits, advance depreciation, differential pricing from first-generation biofuels, and viability gap funding. To reduce financial and commercial risks of biofuel investments, the policy mandated public oil marketing companies to provide offtake guarantees to purchase biofuels.

## A. Individual Consultants

10. The individual consultants will have 30 person-months comprising 10 experts:

### 1. Biofuel and Renewable Energy Specialist/Team Leader (International, 5 person-months)

11. The team leader should have at least bachelor's degree in related areas (Master's degree preferable), and minimum of 15 years of relevant professional experience in providing advisory services and specific experience in the biofuel and renewable energy sector. The consultant will closely work with the relevant stakeholders including ADB and the EA/IAs as well as relevant ministries and cofinanciers. As the project team leader among consultants, the consultant will be responsible for project management tasks and all the project outputs through coordination with other all consultants. The specific terms of reference will include, but not necessarily be limited to the following tasks:

(i) Prepare a work plan for the entire TA program to meet the requirements from comprehensive points of views in technical, institutional, commercial, financial, economic, regulatory, legal, and safeguard terms.
(ii) Select biofuel plants and their sites to be supported by the TA on reasonable selection criteria, and conduct biofuel subprojects' feasibility and design studies and capacity development activities.
(iii) Make the biofuel sector assessments and establish business models to make each type of biofuel projects implementable and sustainable.
(iv) Establish feedstock supply chain mechanisms with relevant consultants and promote awareness programs among the stakeholders.
(v) Prepare the EA's and IA's biofuel investment programs and strategies, and long-term development roadmaps, which can be aligned with ADB's result based lending (RBL), assess RBL requirements (e.g., disbursement linked indicators), and prepare its related assessments and documents.
(vi) Coordinate with other consultants to assure the quality of overall task outputs and timeframe required by ADB and the EA as well as IAs.
(vii) Conduct relations management among all the relevant stakeholders of the TA.
(viii) Support any dissertation product that can replicate the TA's findings and learnings to other areas/countries in collaboration with all other consultants.

### 2. Gas Market Specialist (International, 3 person-months)

12. The consultant should have bachelor's degree in related areas (Master's degree preferable), and minimum of 10 years of relevant professional experience. The specific terms of reference will include, but not necessarily be limited to the following tasks:

(i) Assess the biofuel market development by taking into account their imports, costs pricing, policies, global trends and demand and supply to provide the base to the investment programs and strategies and development roadmaps for each type of biofuels.
(ii) Assess operational, economic, social and environment benefits on account of biofuel value chain improvement in India, and assess risk mitigations.
(iii) Prepare recommendation to define concrete public sector roles, promote increased private sector participation in the biofuels sector to develop bankable projects, enhance technical skills and institutional capacity in biofuels development, and improve awareness of investments and finance.

(iv) Recommend practical approaches for oil and gas sector to be evolved to meet climate change, environmental, social, and economic requirements.

### 3. Structured Finance Specialist (International, 3 person-months)

13. The consultant should have at least bachelor's degree (Master's degree preferable) in finance, economics, business administration, and minimum of 10 years relevant experience in areas of transaction advisory, risk management, loan appraisal, investment operations, investment banking, merge and acquisition , and/or project finance. Demonstrated experience is required for designing and/or operationalizing financial instruments, such as credit instruments, guarantees, risk sharing, and trust funds for banks and financial institutions. Experience with loan and investment documentation is preferable. The specific terms of reference will include, but not necessarily be limited to the following tasks:

(i) Prepare financing schemes and packages to support efficient financing on biofuel business through financial intermediary loans, and/or result based lending.
(ii) Promote financial modeling and structuring, taking into account financial instruments and risk sharing (e.g., risk guarantees) to ensure robust financial viability and clear financial terms (including payment and/or reflow triggers, etc.) in consultation with ADB and the EA as well as IAs.
(iii) Conduct capacity development of IAs for institutional financing activities.
(iv) Coordinate cofinancing with potential cofinanciers, such as the Clean Technology Fund, the Green Climate Fund, and other possible funds and financial agencies.
(v) Support finance institutions in establishing its structures to implement its business processes to assess and approve financing transactions
(vi) Formulate and provide training on financial instruments to build capacity and support their effective deployment.

### 4. Economic and Finance Analysis Specialist (International, 3 person-months)

14. The consultant should have bachelor’s degree in related areas (Master’s degree preferable), and minimum of 5 years of relevant professional experience. Experience in the energy sector is preferable. The specific terms of reference will include, but not necessarily be limited to the following tasks:

(i) Carry out financial and economic feasibility analysis of any identified projects following the ADB financial and economic due diligence requirements.
(ii) Evaluate corporate financial position and performance through modeling analysis in terms of profits, costs, and risks through all measures to assess key performance indicators.
(iii) Help engineers prepare the project cost estimates, including physical and price contingencies, and interest and charges during construction (including other financing charges, if any).
(iv) Review and assess the IAs’ financial management of corporate planning and budgetary control, financial and management accounting, cost accounting, internal control and audit system, and data processing, and assess capacity-building needs, and design the fund flow and disbursement mechanism for the ensuing financing.
(v) Identify the project rationale for public intervention which can be based on the failure of (a) markets to adequately provide what society wants, or (b) public institutions to deliver public goods or services.
(vi) Undertake and compare project benefits and costs in economic terms using with-project and without-project scenarios for each major project component. The basic criteria for

assessing the project economic viability will be economic net present value and economic internal rate of return for subprojects and total project.

**5. Legal Specialist (International, 2 person-months)**

15. The consultant should have bachelor's degree in related areas (Master's degree preferable), and minimum of 10 years of relevant professional experience. The specific terms of reference will include, but not necessarily be limited to the following tasks:

(i) Assess legal regulatory constraints for biofuel and waste-to-energy business environment and propose any action plans for regulatory and legal aspects.
(ii) Establish contract templates in the biofuel value chains and waste-to energy business with collaboration with other consultants.
(iii) Support actual contractual processes with relevant stakeholders in tendering, procurement, negotiation, and commercial and financial arrangements/agreements as necessary.

**6. Climate Change Specialist (International, 2 person-months)**

16. The consultant should have bachelor's degree in related areas (Master's degree preferable), and minimum of 10 years of relevant professional experience. Experience in climate change assessments of energy projects, in particular for advanced biofuel projects, and India's climate risk scenarios and policies, are preferable. The specific terms of reference will include, but not necessarily be limited to the following tasks:

(i) Assess the impacts of adaptation and mitigation in biofuel subprojects and assess the climate and disaster risks to the biofuel subprojects, and summarize the climate impact assessments following relevant ADB guidelines.
(ii) Incorporate climate adaptative engineering design with other consultants, specially the biofuel related engineers.
(iii) Identify tools and approaches to integrate climate change adaptation and mitigation measures in the planning and investment process.
(iv) Propose any strategies for climate change actions to minimize climate change risks.
(v) Prepare climate change assessment and climate risk and vulnerability assessment reports when the locations and activities are specifically identified or when any investment possibilities are foreseen.

**7. Social and Gender Specialist (International, 3 person-months)**

17. The consultant should have bachelor's degree in related areas (Master's degree preferable), and minimum of 10 years of relevant professional experience. Work experience for development agencies like ADB is preferable. The specific terms of reference will include, but not necessarily be limited to the following tasks:

(i) Prepare social safeguard plans and frameworks for involuntary resettlement and indigenous peoples following the ADB Safeguard Policy Statement (2009) and other relevant requirements.
(ii) Undertake poverty and social analysis, using participatory methods to assess the type and significance of the project impacts on the poor, women, and other vulnerable groups, and prepare the documents of Summary Poverty Reduction and Social Strategy.

(iii) Conduct diagnostic assessment on safeguard system of IAs, and carry out gap analysis in accordance with ADB's safeguards requirements for result based lending.
(iv) Prepare gender assessments based on sex-disaggregated baseline data, and prepare gender action plans to highlight effective gender mainstreaming.
(v) Plan and conduct gender awareness enhancement programs and vocational training programs/workshop for biofuel related businesses employment.
(vi) Document and organize public consultations at least once in representative project sites, and invite local stakeholders to them. In case of environment category-A, carry out at least two public consultations (once during the early stages, and once when the draft EIA report is available and before loan appraisal).
(vii) Support communications with stakeholders including donors, civil society, NGOs, and media when applicable.

**8. Environmental Specialist (International, 3 person-months)**

18. The consultant should have bachelor's degree in related areas (Master's degree preferable), and minimum of 10 years of relevant professional experience. Work experience for development agencies like ADB is preferable. The specific terms of reference will include, but not necessarily be limited to the following tasks:

(i) Prepare environmental safeguard plans and frameworks following the ADB Safeguard Policy Statement (2009) and other relevant requirements.
(ii) Conduct diagnostic assessment on safeguard systems of IAs, and carry out gap analysis in accordance with ADB's safeguards requirements for result based lending.
(iii) Document and organize public consultations at least once in representative project sites and invite local stakeholders to them. In case of environment category-A, carry out at least two public consultations (once during the early stages, and once when the draft EIA report is available and before loan appraisal), but avoid selecting category-A type projects in the case of ADB financing.
(iv) Support communications with stakeholders including donors, civil society, NGOs, and media when applicable.

**9. Community Development Specialist (International, 3 person-months)**

19. The consultant should have bachelor's degree in related areas (Master's degree preferable), and minimum of 10 years of relevant professional experience. Work experience in India for development agencies like ADB is preferable. The specific terms of reference will include, but not necessarily be limited to the following tasks;

(i) Coordinate field activities on social mobilization of stakeholders including rural small entrepreneurs, farmer producer organizations, and municipalities, in collaboration with the social and gender specialist, environmental specialist, solid waste management specialist, and supply chain management specialist.
(ii) Make logistics and arrangements for meetings, workshops, and consultations, and coordinate stakeholders towards effective and efficient cooperation on TA implementation.
(iii) Building community partnership or awareness programs to address the lack of awareness on biofuel activities, which leads to enhanced capacities.
(iv) Provide training programs to farmers and MSW related parties about the biofuel value chain processes and benefit sharing opportunities with the supply chain development specialist.

(v) Support IAs in setting-up appropriate communication mechanisms and prepare advice on implementing and managing communication tools and other channels for communications with stakeholders.

### 10. Biofuel Advisor (International/National, 3 person-months)

20. The consultant should have bachelor's degree in related areas (Master's degree preferable), and minimum of 10 years of relevant professional experience. The specific terms of reference will include, but not necessarily be limited to the following tasks;

(i) Provide overall advise on the work plan, project design, and implementation arrangements to achieve the TA objectives and outputs in collaboration with other consultants.
(ii) Help resolve roadblocks and suggest steps to promote biofuel investment projects.
(iii) Conduct relations management with all other stakeholders, and support overall project activities.
(iv) Coordinate with other consultants to assure the quality of overall task outputs and timeframe required by ADB and the EA as well as IAs.
(v) Support any dissertation product that can replicate the TA's findings and learnings to other areas/countries in collaboration with all other consultants.

## B. Consulting Firms

21. The firm consulting package will be 29 person-months comprising 9 experts:

### 1. Biofuel Development Specialist/Deputy Team Leader (International, 5 person-months)

22. Minimum qualification: The consultant should have at least bachelor's degree in related areas (Master's degree preferable), and minimum of 15 years of relevant professional experience in providing advisory services and specific experience in the biofuel field. The consultant must be familiar with technical feasibility studies with option analysis/choice of alternatives. The specific terms of reference will include, but not necessarily be limited to the following tasks:

(i) Conduct overall technological assessments as a detailed project report for each type of biofuel and waste-to-energy subprojects.
(ii) Establish their supply chain management to make those subprojects viable through suitable technological selection and related technical arrangements including information technologies (IT).
(iii) Establish technological standards based on feedstocks of agriculture residues and municipal solid wastes.
(iv) Document technical feasibility assessments for each of subprojects identified under the TA and prepare technical specification for each.
(v) Ensure the quality of assessments provided from each of the consultants, and coordinate as the deputy team leader with other individual consultants in liaison with the team leader of the consultant team.
(vi) Support any dissertation product that can replicate the TA's findings and learnings to other areas/countries in collaboration with all other consultants.

**2. Bioethanol Engineer/Chemist (International, 3 person-months)**

23. Minimum qualification: The consultant should have at least bachelor's degree in biological sciences of agricultural chemistry, or any related fields (Master's degree preferable), and significant work experiences in the second generation biofuel field at minimum of 10 years. The specific terms of reference will include, but not necessarily be limited to the following tasks:

(i) Assess and identify suitable technologies to be adopted to bioethanol plants identified under the TA, based on identification of feedstocks appropriate to efficient production.
(ii) Establish their supply chain management to make those subprojects viable through suitable technological selection and related technical arrangements.
(iii) Prepare detailed project reports, including cost estimates and specification based on least-cost design option.
(iv) Prepare bid documents for technological providers, design engineers, construction contractors.
(v) Prepare operation and maintenance guidelines.

**3. Biogas Engineer/Chemist (International, 3 person-months)**

24. Minimum qualification: The consultant should have at least bachelor's degree in biological sciences of agricultural chemistry, or any related fields (Master's degree preferable), and significant work experiences in the second generation biofuel field at minimum of 10 years. The specific terms of reference will include, but not necessarily be limited to the following tasks:

(i) Assess and identify suitable technologies to be adopted to biogas plants identified under the TA, based on identification of feedstocks appropriate to efficient production.
(ii) Establish their supply chain management to make those subprojects viable through suitable technological selection and related technical arrangements (in the case of MSW, specifically focus on efficient organic waste segregation methods).
(iii) Prepare detailed project reports, including cost estimates and specification based on least-cost design option.
(iv) Prepare bid documents for technological providers, design engineers, construction contractors.
(v) Prepare operation and maintenance guidelines.

**4. Biodiesel Engineer (International, 3 person-months)**

25. Minimum qualification: The consultant should have at least bachelor's degree in biological sciences of agricultural chemistry, or any related fields (Master's degree preferable), and significant work experiences in the second generation biofuel field at minimum of 10 years. The specific terms of reference will include, but not necessarily be limited to the following tasks:

(i) Assess and identify suitable technologies to be adopted to biodiesel plants identified under the TA, based on identification of feedstocks appropriate to efficient production.
(ii) Establish their supply chain management to make those subprojects viable through suitable technological selection and related technical arrangements.
(iii) Prepare detailed project reports, including cost estimates and specification based on least-cost design option.
(iv) Prepare bid documents for technological providers, design engineers, construction contractors.
(v) Prepare operation and maintenance guidelines.

### 5. Solid Waste Management Specialist (International, 3 person-months)

26. Minimum qualification: The consultant should have bachelor's degree in related areas (Master's degree preferable), and significant work experiences in the solid waste management field at minimum of 10 years. The specific terms of reference will include, but not necessarily be limited to the following tasks:

(i) Assess agricultural residues and MSW availability and management for subproject identified under the TA, and propose specific activities in practice to improve waste control management in technical and institutional aspects.
(ii) Propose effective and sustainable waste management and pollution control systems to be integrated with subprojects of biofuels and waste-to-energy.
(iii) Make clear engagement with farmers producer organizations, municipalities, and communities to promote sustainable waste collection mechanisms of recyclable waste resources, and develop feedstock supply contract templates and methodologies in collaboration with other consultants.
(iv) Assess positive and negative environmental and socioeconomic consequences.

### 6. Supply Chain Management Specialist (International, 3 person-months)

27. Minimum qualification: The consultant should have bachelor's degree in related areas (Master's degree preferable), and significant work experiences in the supply chain management field at minimum of 10 years. The specific terms of reference will include, but not necessarily be limited to the following tasks:

(i) Assess the existing feedstock supply chain based on feedstock availability estimates (e.g., quantity and quality).
(ii) Establish feedstock supply chain mechanisms, considering operational practices, technologies, and market systems.
(iii) Conduct feedstock supply contracts through bids, negotiations, and business engagements with feedstock suppliers, collectors, storge managers, and transporters in the entire supply chain.
(iv) Establish biofuel subproduct (e.g., bio-manure and bio-slurry organic fertilizers) supply chain mechanisms in a market-oriented approach.
(v) Develop the above contract templates, methodologies, and pricing mechanisms in collaboration with other consultants, and propose supply value chain business models.
(vi) Provide training programs to farmers and MSW related parties about the biofuel value chain processes and benefit sharing opportunities with the community development specialist.
(vii) Assess the impacts on the food security along with biofuel business development and propose any mitigation measure plans.

### 7. Biomass Energy (Power Generation) Specialist (International, 3 person-months)

28. Minimum qualification: The consultant should have bachelor's degree in related areas (Master's degree preferable), and significant work experiences in the biomass power generation field at minimum of 10 years. MSW-to-energy generation plant's design experience is preferable. The specific terms of reference will include, but not necessarily be limited to the following tasks:

(i) Assess and identify suitable technologies to be adopted to MSW base power generation plants identified under the TA.
(ii) Establish their supply chain management to make those subprojects viable through suitable technological selection and related technical arrangements (specifically focus on efficient organic waste segregation methods of MSW).
(iii) Prepare detailed project reports, including cost estimates and specification based on least-cost design option.
(iv) Prepare bid documents for technological providers, design engineers, construction contractors.
(v) Prepare operation and maintenance guidelines.

**8. Biomass IT database Specialist (International, 3 person-months)**

29. Minimum qualification: The consultant should have bachelor's degree in related areas (Master's degree preferable), and significant work experiences in the biomass power generation field at minimum of 5 years. Database design experience is required. The specific terms of reference will include, but not necessarily be limited to the following tasks:

(i) Propose any IT usage to make effective management of feedstock resources to be used by subprojects identified under the TA.
(ii) Design the database system of biofuel feedstock availability for subprojects in collaboration with the GIS and remote sensing specialist.
(iii) Develop a comprehensive database system for feedstock resource mapping, including raw data files on a pilot basis.

**9. GIS and Remote Sensing Specialist (International, 3 person-months)**

30. Minimum qualification: The consultant should have bachelor's degree in related areas (Master's degree preferable), and significant work experiences in the biomass power generation field at minimum of 5 years. Preferred experience may include remote sensing, satellite imagery, and/or geographic information systems (GIS), which is related to feedstocks/resources assessment, mapping, monitoring, and surveillance systems. The consultant may also have professional experience in satellite image processing and interpretation, vector data processing and management, and communication with international customers. The specific terms of reference will include, but not necessarily be limited to the following tasks:

(i) Propose any IT usage, in particular of GIS and remote sensing to track effective management of feedstock resources to be used by subprojects identified under the TA.
(ii) Design GIS and remote sensing systems to track biofuel feedstock availability for subprojects in collaboration with the biomass IT database specialist.
(iii) Develop a comprehensive GIS and remote sensing systems for feedstock resource mapping, including raw data files on a pilot basis.