Technical Assistance Report

Project Number: 54222-001
Knowledge and Support Technical Assistance (KSTA)
December 2020

India: Promoting Advanced Biofuels Through High Technology

Asian Development Bank

CURRENCY EQUIVALENTS
(as of 9 November 2020)

Currency unit	–	Indian rupee (₹)
₹1.00	=	$0.0135
$1.00	=	₹73.976

ABBREVIATIONS

ADB	–	Asian Development Bank
bio-CNG	–	bio-compressed natural gas
BPCL	–	Bharat Petroleum Corporation Limited
COVID-19	–	coronavirus disease
FSSAI	–	Food Safety and Standards Authority of India
HPCL	–	Hindustan Petroleum Corporation Limited
IOCL	–	Indian Oil Corporation Limited
IREDA	–	Indian Renewable Energy Development Agency
MSW	–	municipal solid waste
NABARD	–	National Bank for Agriculture and Rural Development
OIDB	–	Oil Industry Development Board
PMO	–	project management office
RUCO	–	Repurpose Used Cooking Oil
SATAT	–	Sustainable Alternative Towards Affordable Transportation
TA	–	technical assistance

NOTE

In this report, "$" refers to United States dollars.

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KNOWLEDGE AND SUPPORT TECHNICAL ASSISTANCE AT A GLANCE

1. Basic Data **Project Number:** 54222-001

Project Name	Promoting Advanced Biofuels Through High Technology	**Department/Division**	SARD/SAEN
Nature of Activity	Capacity Development, Policy Advice, Research and Development	**Executing Agency**	Ministry of Petroleum and Natural Gas
Modality	Regular		
Country	India		

2. Sector **Subsector(s)** **ADB Financing ($ million)**

Total **0.00**

3. Operational Priorities

- ✓ Addressing remaining poverty and reducing inequalities
- ✓ Accelerating progress in gender equality
- ✓ Tackling climate change, building climate and disaster resilience, and enhancing environmental sustainability
- ✓ Strengthening governance and institutional capacity

Climate Change Information

GHG Reductions (tons per annum)	0
Climate Change impact on the Project	Low

ADB Financing

Adaptation ($ million)	0.00
Mitigation ($ million)	0.00

Cofinancing

Adaptation ($ million)	0.00
Mitigation ($ million)	0.00

Sustainable Development Goals

SDG 1.4
SDG 5.4
SDG 7.2
SDG 9.1, 9.4
SDG 10.1
SDG 12.2

Gender Equity and Mainstreaming

Effective gender mainstreaming (EGM) ✓

Poverty Targeting

General Intervention on Poverty ✓

4. Risk Categorization Complex

5. Safeguard Categorization Safeguard Policy Statement does not apply

6. Financing

Modality and Sources	Amount ($ million)
ADB	**0.00**
None	0.00
Cofinancing	**2.50**
Asian Clean Energy Fund under the Clean Energy Financing Partnership Facility (Full ADB Administration)	2.00
Republic of Korea e-Asia and Knowledge Partnership Fund (Full ADB Administration)	0.50
Counterpart	**0.00**
None	0.00
Total	**2.50**

Currency of Financing: US Dollar

I. INTRODUCTION

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. The TA is aligned with four operational priorities of Strategy 2030 of the Asian Development Bank (ADB).[2] The TA is included in ADB's country operations business plan, 2021–2023 for India.[3]

II. ISSUES

3. India is highly reliant on fuel imports, raising concerns about the country's energy security and economic and financial deficits. Imported fuels account for 85% of crude oil, 75% of liquefied petroleum gas, and 50% of liquefied natural gas on a consumption basis. Such fuels are used in industries, power generation, transportation, and cooking. Demand for nonfossil fuels is growing in India as well. For example, ethanol consumption has been outpacing domestic production for industrial chemicals, fuels, and beverages, and the coronavirus disease (COVID-19) pandemic has highlighted the serious shortage of ethanol for disinfectants. India is the world's third-largest energy consumer despite lower per capita energy consumption than other major economies. Therefore, it is projected to continuously drive fuel demand across wide-ranging sectors. This will require more fuel imports to meet rapid growth in the economy and motorization. India's import bill for fuels has already inflated significantly. Considering price fluctuation risks on fuel imports, it is important to promote alternative fuels that can be produced from domestic resources.

4. India experiences health hazards from severe air and water pollution, which is caused partly by burning crops and dumping waste in water. Crop burning after harvesting is one of the biggest causes of severe air pollution in major cities.[4] New Delhi's air quality worsens during post-harvest burning of crop residue in the fall and winter seasons. The capital was among 13 Indian cities in the 20 most polluted cities in the world.[5] Poor solid waste management is also a major concern in India's urban areas because of methane gas emissions from landfills and water contamination. Since advanced biofuels are produced from agricultural and biomass residue, MSW, and used cooking oil, increasing their use may promote waste recycling and have a

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[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] ADB. 2018. *Strategy 2030: Achieving a Prosperous, Inclusive, Resilient, and Sustainable Asia and the Pacific*. Manila. The TA will support (i) addressing remaining poverty and reducing inequalities; (ii) accelerating progress in gender equality; (iii) tackling climate change, building climate and disaster resilience, and enhancing environmental sustainability; and (iv) strengthening governance and institutional capacity.

[3] ADB. 2020. *Country Operations Business Plan: India, 2021–2023*. Manila. The TA first appeared in the business opportunities section of ADB's website on 20 July 2020.

[4] Other contributors include vehicular pollution, industrial emissions, thermal power plants, construction dust, waste burning, and household use of cheap and dirty fuels.

[5] World Health Organization (WHO). 2018. *WHO Global Ambient Air Quality Database (update 2018)*. Geneva.

significant positive environmental impact by alleviating pollution and greenhouse gas emissions[6], and reducing dumping of waste in water and landfills.

5. India is well-positioned to advance biofuels in terms of demand and supply capacity. More than half of India's land is agricultural and produces a massive amount of crop residue.[7] India generates about 62 million tons of MSW annually, and while 68% of annual MSW is collected, only 28% is processed or treated. As a result, about 80% of MSW is disposed in landfills or open dumps. The generation of MSW has been increasing at a high rate as urban areas expand. More MSW should be collected and recycled into valuable fuels. In rural areas, if agricultural waste can also be collected effectively as feedstock for biofuels, its sales will be able to supplement rural farmers' income and negate the need to burn crop waste. Thus, advanced biofuels can be produced locally and will not harm food security because of feedstock from waste unlike conventional biofuels produced from food. These can serve as a substitute for fossil fuels and reduce carbon emissions. Bioethanol and biodiesel can be blended in petrol and conventional diesel; bio-compressed natural gas (bio-CNG) can fuel gas-based vehicles (e.g., taxis, buses, and three-wheelers); and biogas can be used for cooking and power generation.

6. India faces technical and financial barriers in commercially producing biofuels. Despite strong demand and potential, India lags other countries in terms of biofuel production. The United States and Brazil are the largest biofuel producers, accounting for more than 70% of global production; India's production accounts for only 1%. Major constraints include (i) the absence of technology standards for biofuel commercial production, (ii) high biofuel production costs and financial viability risks, (iii) no feedstock supply chain mechanisms, (iv) no suitable pricing adjustment mechanisms, and (v) limited awareness about biofuels among farmers and local communities. These barriers have discouraged private investments and commercial financing in scaling up production and business.

7. To overcome the development barriers and enable the domestic biofuel market, the government approved the National Policy on Biofuels in 2018. The government outlined measures to improve biofuel production, set up biorefineries, develop new feedstock for biofuels, bring new technology for biofuel conversion, facilitate biofuel blends with conventional transport fuels, and create an enabling environment for domestic biofuel deployment.[8] The policy mandates that biofuels should be distributed and off-taken by public oil and gas companies, which have been requested to set up biorefineries with advanced technology to demonstrate their technology and commercial viability.[9]

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[6] 75% of India's overall energy consumption is sourced from fossil fuels (Enerdata. 2020. *Country Energy Report–India*. Grenoble). The biofuels are expected to help India improve climate change mitigation as well as energy security.

[7] More than 70% of crop residue is from cereal crops. Farmers use some crop residue for animal feeds and mulch but burn most of it.

[8] The policy targets blending 20.0% ethanol in petrol and 5.0% biodiesel in diesel by 2030. The baseline percentage of these transport fuels stood at about 2.0% for petrol and less than 0.1% for diesel.

[9] These include the Indian Oil Corporation Limited (IOCL), the Hindustan Petroleum Corporation Limited (HPCL), the Bharat Petroleum Corporation Limited (BPCL), and GAIL (India) Limited.

III. THE TECHNICAL ASSISTANCE

A. Impact and Outcome

8. The TA's impact will be increased use of domestic biofuels in energy and transportation, as aligned with the National Policy on Biofuels. The outcome will be enhanced readiness for investments in biofuel development and business.[10]

9. The TA will take a cross-sector approach to tackle various thematic issues, such as energy security, transport mobility, agribusiness, financial stability, air and water pollution, waste disposal, public health, climate change, and the urban–rural divide. The advanced biofuel market will provide opportunities to mitigate global warming, harness agricultural waste and MSW, create industries and jobs, and strengthen energy independence. This development is expected to have a transformational effect on the domestic economy and society as well as on regional cooperation through knowledge transfers to neighboring countries.[11]

B. Outputs, Methods, and Activities

10. 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.

11. **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,[12] and investments of $1.7 billion–$2.0 billion will be required. The Indian Oil Corporation Limited (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 recycling plants on a pilot basis.[13] The Hindustan Petroleum Corporation Limited (HPCL) has different project schemes in other locations. The TA will support at least two bioethanol plants.

12. **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,[14] which are expected to have financing arrangements under the SATAT initiative with the Oil Industry Development Board (OIDB) and/or public financial institutions, such as the Indian Renewable Energy Development

[10] The design and monitoring framework is in Appendix 1.

[11] ADB. 2018. *Technical Assistance for South Asia Subregional Economic Cooperation Regional Energy Cooperation*. Manila. Biofuel development is a knowledge sharing area under the South Asia Subregional Economic Cooperation.

[12] 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.

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

[14] 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.

Agency (IREDA) and the National Bank for Agriculture and Rural Development (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.

13. **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.[15] 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.[16] 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.

14. **Output 4: Gender mainstreaming design for the biofuel value chain incorporated.** In India, more than 80% of rural women work in agriculture,[17] 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.[18] The programs are expected to have at least 100 female participants.

15. **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,[19] international best practices

[15] 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.

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

[17] 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).

[18] 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.

[19] 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.

will be assessed with ADB and development partners for knowledge sharing.[20] 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,[21] 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.

C. Cost and Financing

16. The TA is estimated to cost $2.5 million, of which (i) $2.0 million will be financed on a grant basis by the Asian Clean Energy Fund[22] under the Clean Energy Financing Partnership Facility, and (ii) $0.5 million will be financed on a grant basis by the Republic of Korea e-Asia and Knowledge Partnership Fund, both to be administered by ADB.[23] The key expenditure items are listed in Appendix 2. The executing and/or implementing agencies will provide counterpart support in the form of counterpart staff, office accommodation, logistics and administration support, and other in-kind contributions.

D. Implementation Arrangements

17. ADB will administer the TA. The executing agency will be the Ministry of Petroleum and Natural Gas.[24] The implementing agencies will be IOCL, HPCL, OIDB, IREDA, and NABARD.[25] The relevant government authorities are the Ministry of Agriculture and Farmers' Welfare, the

[20] 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.

[21] 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.

[22] Established by the Government of Japan.

[23] TA implementation will follow each fund's specific requirements, including eligibility criteria for funding and monitoring and reporting requirements.

[24] The executing agency's project management office (PMO) will be set up at IOCL to liaise with ADB, consultants, and implementing agencies. The PMO will also coordinate procedural matters with these parties to support the executing agency.

[25] IOCL and HPCL will handle output 1, while all implementing agencies will handle outputs 2–4.

Ministry of New and Renewable Energy, and the Ministry of Housing and Urban Affairs.[26] Implementation arrangements are summarized in the table.

Implementation Arrangements

Aspects	Arrangements		
Indicative implementation period[a]	January 2021–June 2023		
Executing agency	Ministry of Petroleum and Natural Gas		
Implementing agencies	Indian Oil Corporation Limited, Hindustan Petroleum Corporation Limited, Indian Renewable Energy Development Agency, National Bank for Agriculture and Rural Development, and Oil Industry Development Board		
Consultants	To be selected and engaged by ADB		
	Firm: QCBS (quality–cost ratio of 90:10)	International expertise (29 person-months)	$1.15 million[b]
	Individual: individual selection	International expertise (27 person-months) National expertise (3 person-months)	$1.13 million[c]
Disbursement	Disbursement of TA resources will follow ADB's *Technical Assistance Disbursement Handbook* (2020, as amended from time to time). Arrangements for disbursement from multiple funding sources (e.g., front-loading ADB-administered funds, cost sharing, or pro rata) will follow each trust fund's implementation guidelines and agreed with the cofinanciers.		

ADB = Asian Development Bank, QCBS = quality- and cost-based selection, TA = technical assistance.
[a] The implementation period starts from the expected month of commitment or signing.
[b] Includes remuneration and per diem, travel, reports and communications, miscellaneous administration and support costs, and contingencies (3.5% of other costs).
[c] Includes remuneration and per diem, travel, and contingencies (3.5% of other costs).
Source: Asian Development Bank.

18. **Consulting services.** ADB will engage the consultants following the ADB Procurement Policy (2017, as amended from time to time) and its associated project administration instructions and/or staff instructions.[27]

E. Governance

19. The integrity due diligence was conducted on IOCL, HPCL, OIDB, IREDA and NABARD and no significant integrity risks were identified.

IV. THE PRESIDENT'S DECISION

20. The President, acting under the authority delegated by the Board, has approved the Asian Development Bank administering technical assistance not exceeding (i) the equivalent of $2,000,000 to be financed on a grant basis by the Asian Clean Energy Fund under the Clean Energy Financing Partnership Facility, and (ii) $500,000 to be financed on a grant basis by the Republic of Korea e-Asia and Knowledge Partnership Fund for Promoting Advanced Biofuels Through High Technology, and hereby reports this action to the Board.

[26] The executing agency will coordinate the TA with the ministries for finance, agriculture, environment, transport, and urban development; and with state and local municipalities. Specifically, agribusiness will be coordinated with the Ministry of Agriculture and Farmers' Welfare, renewable energy technical standards with the Ministry of New and Renewable Energy, and waste management with the Ministry of Housing and Urban Affairs.
[27] Terms of Reference for Consultants (accessible from the list of linked documents in Appendix 3).

DESIGN AND MONITORING FRAMEWORK

Impacts the Project is Aligned with Use of domestic biofuels in energy and transportation increased by 2030 (India's National Policy on Biofuels, 2018)			
Results Chain	**Performance Indicators**	**Data Sources and Reporting Mechanisms**	**Risks and Critical Assumptions**
Outcome Readiness for investments in biofuel development and business enhanced	By 2024: a. At least 4 bioethanol plants financed for implementation (2020 baseline: 2) (OP 3.1.5) b. At least 11 bio-CNG plants financed for implementation under the SATAT initiative (2020 baseline: 1) (OP 3.1.5) c. At least 6 biodiesel plants financed for implementation under the RUCO initiative (2020 baseline: 0) (OP 3.1.5) d. Concrete gender mainstreaming frameworks adopted by 2 companies for biofuel projects (2020 baseline: 0) (OP 2.3.2)	a–d. Annual reports of oil marketing companies, TA completion report	Economic slowdown and market decline affect energy demand and prices. Technological changes lead to adverse shift to other energy types.
Outputs 1. Development schemes for bioethanol demonstration plants prepared	By 2023: 1a. Engineering studies with suitable technology adoption for 2 additional biorefinery plants prepared (2020 baseline: 2 plants) (OP 3.3.2) 1b. Safeguard plans, financing plans, and supply chain mechanisms (including feedstock sustainability assessments, supply contracts, and gender mainstreaming schemes) established (2020 baseline: not applicable) (OP 1.2.2)	1a. Engineering design assessments 1b. Safeguard assessment reports, financing due diligence assessments, supply contracts	Prolonged consensus building among stakeholders may delay finalization of project direction and design. Due diligence studies may assess the demonstration projects to be unfeasible and unviable for investments because of exogenous factors (e.g., sharp reduction in oil prices).
2. Development schemes for bio-CNG demonstration plants prepared	2a. Technical studies with suitable technology adoption for 10 additional pilot bio-CNG plants under SATAT prepared (2020 baseline:1) (OP 3.3.2)	2a. Engineering design assessments	COVID-19 may affect the consultants' activities and potential investors' business appetite.

Results Chain	Performance Indicators	Data Sources and Reporting Mechanisms	Risks and Critical Assumptions
	2b. Safeguard plans, financing plans, and supply chain mechanisms (including feedstock sustainability assessments, supply contracts, and gender mainstreaming schemes) established (2020 baseline: not applicable) (OP 1.2.2)	2b. Safeguard assessment reports, financing due diligence assessments, supply contracts	
3. Development schemes for biodiesel demonstration plants prepared	3a. Technical studies with suitable technology adoption for 6 pilot biodiesel plants under the RUCO initiative prepared (2020 baseline: 0) (OP 3.3.2) 3b. Safeguard plans, financing plans, and supply chain mechanisms (including feedstock sustainability assessments, supply contracts, and gender mainstreaming schemes) established (2020 baseline: not applicable) (OP 1.2.2)	3a. Engineering design assessments 3b. Safeguard assessment reports, financing due diligence assessments, supply contracts	
4. Gender mainstreaming design for the biofuel value chain incorporated	4a. Gender awareness programs conducted at demonstration project sites, with at least 100 female participants increasing their knowledge about feedstock supply chains (2020 baseline: 0) (OP 2.3.1) 4b. Vocational training programs conducted at demonstration project sites, with at least 100 female participants increasing their knowledge about employment at biofuel-related businesses (2020: 0) (OP 2.3.1)	4a. Workshop program documents (including assessment and evaluation of awareness improvements) 4b. Training materials and workshop program documents (including assessment and evaluation of training skills)	

Key Activities with Milestones

1. Development schemes for bioethanol demonstration plants prepared

1.1 Organize the TA inception workshop (Q1 2021)
1.2 Assess feedstock availability and supply chain mechanisms (Q2 2021)
1.3 Facilitate contractual arrangements among project stakeholders (Q3 2021)
1.4 Conduct site visit for lessons from any successful cases (Q3 2021)
1.5 Finalize technology selection and preliminary technical design (Q4 2021)

1.6 Finalize safeguard assessments (Q4 2021)
1.7 Assess investment and financing options and risk mitigation plans (Q1 2022)
1.8 Assess improvements of regulatory frameworks toward future scale-up (Q3 2022)
1.9 Conduct knowledge dissemination seminars (Q1 2023)

2. Development schemes for bio-CNG demonstration plants prepared
2.1 Organize the TA inception workshop (Q1 2021)
2.2 Assess feedstock availability and supply chain mechanisms (Q2 2021)
2.3 Facilitate contractual arrangements among project stakeholders (Q3 2021)
2.4 Conduct site visit for lessons from any successful cases (Q3 2021)
2.5 Finalize technology selection and preliminary technical design (Q4 2021)
2.6 Finalize safeguard assessments (Q4 2021)
2.7 Assess investment and financing options and risk mitigation plans (Q1 2022)
2.8 Assess improvements of regulatory frameworks toward future scale-up (Q3 2022)
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3. Development schemes for biodiesel demonstration plants prepared
3.1 Organize the TA inception workshop (Q1 2021)
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3.4 Conduct site visit for lessons from any successful cases (Q3 2021)
3.5 Finalize technology selection and preliminary technical design (Q4 2021)
3.6 Finalize safeguard assessments (Q4 2021)
3.7 Assess investment and financing options and risk mitigation plans (Q1 2022)
3.8 Assess improvements of regulatory frameworks toward future scale-up (Q3 2022)
3.9 Conduct knowledge dissemination seminars (Q1 2023)

4. Gender mainstreaming design for the biofuel value chain incorporated
4.1 Organize the TA inception workshop (Q1 2021)
4.2 Assess overall gender action plans (Q3 2021)
4.3 Prepare gender awareness programs (Q4 2021)
4.4 Prepare vocational training programs for mainstreaming gender participation (Q4 2021)
4.5 Start gender awareness programs with female participation (Q1 2022)
4.6 Start vocational training programs with female participation (Q3 2022)
4.7 Conduct knowledge dissemination seminars (Q1 2023)

Inputs
Asian Clean Energy Fund under the Clean Energy Financing Partnership Facility: $2,000,000
Republic of Korea e-Asia and Knowledge Partnership Fund: $500,000

Note: Oil marketing companies will provide counterpart support in the form of counterpart staff, office and housing accommodation, office supplies, secretarial assistance, domestic transportation, and other in-kind contributions.

bio-CNG = bio-compressed natural gas, COVID-19 = coronavirus disease, OP = operational priority, Q = quarter, RUCO = Repurpose Used Cooking Oil, SATAT = Sustainable Alternative Towards Affordable Transportation, TA = technical assistance.

Contribution to Strategy 2030 Operational Priorities:
The expected values and methodological details for all OP indicators to which this TA will contribute results are detailed in Contribution to Strategy 2030 Operational Priorities (accessible from the list of linked documents in Appendix 3 of the TA report).
Source: Asian Development Bank.

COST ESTIMATES AND FINANCING PLAN
($'000)

Item	Amount
A. Asian Clean Energy Fund[a] under the Clean Energy Financing Partnership Facility	
1. Consultants	
a. Remuneration and per diem for international consultants[b]	1,655.0
b. Out-of-pocket expenditures	
i. International and local travel	250.8
ii. Surveys	0
iii. Training, seminars, and conferences	0
iv. Reports and communications	0
v. Miscellaneous administration and support costs	0
2. Contingencies	94.2
Subtotal (A)	**2,000.0**
B. Republic of Korea e-Asia and Knowledge Partnership Fund[c]	
1. Consultants	
a. Remuneration and per diem for international consultants[b]	292.0
b. Out-of-pocket expenditures	
i. International and local travel	44.3
ii. Surveys[d]	70.0
iii. Training, seminars, and conferences[e]	77.8
iv. Reports and communications	4.0
v. Miscellaneous administration and support costs[f]	2.4
2. Contingencies	9.5
Subtotal (B)	**500.0**
Total	**2,500.0**

Note:
The technical assistance is estimated to cost $2,500,000, of which contributions from the Asian Clean Energy Fund and the Republic of Korea e-Asia and Knowledge Partnership Fund are presented in the table. The implementing agencies will provide counterpart support in the form of counterpart staff, office accommodation, office supplies, access to documents and information, and other in-kind contributions. Ineligible and/or eligible expenditure items are subject to trust fund requirements.

[a] Established by the Government of Japan and administered by the Asian Development Bank.
[b] The Asian Clean Energy Fund will support outputs 1 and 2, while the Republic of Korea e-Asia and Knowledge Partnership Fund will support outputs 3 and 4.
[c] Administered by the Asian Development Bank.
[d] Includes vehicle hire for land transport.
[e] Includes resource persons and site visits inside and/or outside India.
[f] Includes administrative staff, consumable office supplies, and software costs.

Source: Asian Development Bank estimates.

LIST OF LINKED DOCUMENTS

http://www.adb.org/Documents/LinkedDocs/?id=54222-001-TAReport

1. Terms of Reference for Consultants
2. Contribution to Strategy 2030 Operational Priorities