

Terms of reference (ToR) for the procurement of services

CONFIDENTIAL

Life Cycle Assessment (LCA) of Various Key Bio-Energy Technologies for Developing Framework for Sustainable Design and Deployment of Bio-Energy Program at National and Sub-National Level	Project number/cost centre: G-011848
---	---

0.	List of abbreviations	2
1.	Context.....	3
2.	Tasks to be performed by the contractor	4
3.	Concept.....	7
	Technical-methodological concept	7
	Project management of the contractor (1.6)	8
4.	Personnel concept.....	8
	Expert 1: Team leader / LCA Expert.....	8
	Key expert 1: Technology Expert.....	9
	Key expert 2: Energy Modeling Expert	9
	Key expert 3: Energy Analyst	10
5.	Eligibility Requirement.....	11
6.	Costing requirements	11
	Sustainability aspects for travel	13
7.	Requirements on the format of the tender	13

0. List of abbreviations

LCA	Life Cycle Assessment
AVB	General Terms and Conditions of Contract for supplying services and work
ToRs	Terms of reference
IEP	Implementation of Energy Plans

1. Context

India is the 3rd largest emitter of greenhouse gases in the world at present. Being a large and growing economy with young population base, the emissions can only be expected to increase in the future. Climate change is a global issue, and there is global focus on emissions reduction to combat this, India will play a major role in ensuring a clean future.

Recognizing the importance to reduce the carbon emissions, India has set ambitious targets for clean energy and committed to reduce Emissions Intensity of its GDP by 45 percent by 2030, from 2005 level. By 2070, India has set a goal of achieving carbon neutrality by adopting non-fossil-based energy technologies. In this regard, Government (both at national and sub-national level) has shown interest to design/develop several schemes to promote bioenergy/biofuel/biomass sector.

The Implementation of Energy Plan (IEP) is a bilateral cooperation project carried out by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ). In India the program is implemented in partnership with the Indian Ministry of New and Renewable Energy (MNRE) and supporting its partner states (namely Goa, Assam, Punjab, West Bengal, Odisha and Uttarakhand) in implementing State energy Plans. The IEP project is currently scheduled to be implemented over a period of three years (April 2024 - March 2027).

Broadly, 4 key outputs are planned under the IEP project, as below.

- **Output 1:** Assisting federal authorities in translating their energy plans into concrete strategies for targeted RE implementation.
- **Output 2.** Providing target group specific RE training to Indian government officials.
- **Output 3.** Assisting Government institutions, responsible for promoting RE, for improving policies, regulations and programmes
- **Output 4.** Assisting political decision-makers and government officials in designing and implementing innovative approaches for gender-responsive RE promotion.

This proposed assignment, “Life Cycle Assessment (LCA) of Various Key Bio-Energy Technologies for Developing Framework for Sustainable Design and Deployment of Bio-Energy Program at National and Sub-National Level”, aims to fill these critical gaps by establishing a comprehensive, market-specific LCA framework. The framework will be aligned with international standards (ISO 14040/44) and tailored to local feedstocks, technologies, and socio-economic contexts.

The assignment will systematically evaluate environmental impacts from cradle to grave across major biomass-to-energy as well as biomass-to-fuel pathways—such as biogas, green hydrogen (via gasification and pyrolysis), 2G ethanol, sustainable aviation fuel, and co-firing pellets. The outcomes will provide IEP’s state partners and policymakers (at both national and sub-national level) with credible emission benchmarks, sustainability indicators, and policy insights to guide technology prioritization, green finance, and rural bioeconomy development.

Besides environmental impact assessment, the assignment will also assess techno-commercial viability of such technologies under various market conditions and for the different business models/value chains.

2. Tasks to be performed by the contractor

The organization shall complete the following key tasks in coordination with and in alignment with IEP's state partners, MNRE, key technology providers (nationally /internationally), other research institutes and major think tanks working in this domain.

Task 1: Bioenergy Process Modelling

- Develop detailed mass and energy balances for selected biomass-based following technologies (this list is indicative and not exhaustive):
 - Compressed biogas (CBG)
 - Biomass-to-green hydrogen (gasification and pyrolysis routes)
 - Biomass briquettes / pellets for industrial heat and co-firing applications
 - Biomass cogeneration (loose and densified feedstock)
 - Biomass to power, 2G ethanol, green methanol, and sustainable aviation fuel.
- Create emission inventories linked with major feedstocks such as paddy straw, pine needles, cotton stalk, sawdust, press mud, etc. , which contributes approx. 70-80 % national feedstock
- Develop a feedstock-based technology allocation framework to identify optimal utilization routes.

The bidder is expected to include following topics in their technical proposal:

- Detailed modelling approach and tools
- Readiness in terms of data availability and prior experience
- Key technical and risks and proposed mitigation strategies.

Besides the above the bidder is expected to mention their USP regarding modelling of this kind

Task 2: Life Cycle Assessment (LCA)

- Conduct cradle-to-grave LCAs following ISO 14040/44 guidelines using “1 MJ of useful energy delivered” as the functional unit.
- Perform Life Cycle Inventory (LCI) data collection through primary (surveys, experiments) and secondary sources (such as State database, MNRE, IARI, CPCB, literature and market information).
- Quantify midpoint and endpoint environmental indicators including GHG emissions, water use, land use, acidification, eutrophication, and human/ecosystem impacts using established LCA tools (e.g., SimaPro, GaBi).

The bidder is expected to include following topics in their technical proposal:

- LCA methodology and modelling approach
- Experience with ISO-compliant LCA studies

- Risk perception related to data gaps, assumptions, and regional variability, along with mitigation measures.
- Comparison of various LCA tools (preferably license free software) and reason of selecting specific software including financial (license and upgradation cost) and legal implications.

Task 3: Sensitivity and Hotspot Analysis

- Identify environmental hotspots within the biomass supply chain and technology processes.
- Conduct sensitivity and uncertainty analyses on critical parameters such as transport distance, feedstock moisture content, and process efficiency.
- Parameters for sensitivity and hotspot analysis will be jointly decided with key stakeholders mainly government entities.

The bidder is expected to include following topics in their technical proposal:

- Parameters for sensitivity analysis
- Analytical approach and tools
- Experience in sensitivity analysis

Task 4: Techno-Commercial Feasibility Assessment

- Develop framework for technical and commercial feasibility assessment of bioenergy technologies under various market conditions and business models
- Develop a feasibility assessment tool based on the approved methodology and market information
- Sensitivity assessment using various critical parameters (such as Feedstock Management; Scale and Integration; Policy & Incentives; Risk Mitigation etc)
- Develop techno-commercial assessment report.

The bidder is expected to include following topics in their technical proposal:

- Proposed framework for development of business models for specific technologies
- Readiness to develop decision-support tools for selecting certain technology.
- The selection of parameters will be discussed in consultation with government.

Task 5: Policy Integration and Capacity Building

- Translate LCA findings into actionable policy recommendations aligned with National and sub-national key mission/program etc (such as India's Panchamrit, Net Zero 2070, Goa's Bio-energy program, SATAT, and National Bioenergy Programme goals etc).
- Conduct at least two (02) sub-national and one national stakeholder workshop and targeted training sessions for Govt. officials, researchers, and industry participants on LCA tools and sustainability benchmarking.
- Support dissemination through policy briefs, peer-reviewed publications, and technical reports.

In addition to the (national/sub-national) Government actors, the research organization is required to work in close collaboration with the critical state departments/agencies (such as Agriculture, Forestry, UBL, MSME etc), actors/stakeholders in bio-energy supply chain (i.e. manufacturers, technology users, traders, farmers, Farmer Producers Organizations etc (FPOs) etc). Designing LCA may also requires involvement of the following key stakeholders, to factor in their core expertise and experience.

- a. BIS and similar apex institutes
 - b. Gas distributors/Oil Marketing companies etc.
 - c. Financial Institutes, Investors, development banks
 - d. Bi/multilateral agencies
 - e. National / international think tanks
 - f. Trade and commercial association working in/for bio-energy sectors
- The contractor manages costs and expenditures, accounting processes and invoicing in line with the requirements of GIZ.
 - The contractor reports regularly to GIZ in accordance with the current AVB of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

In addition to the reports required by GIZ, the contractor submits the following reports:

- Inception report
- Brief quarterly progress reports.

Certain milestones and Deliverables, as laid out in the table below, are to be achieved during the contract term:

The following outputs shall be submitted by the contractor in line with the approved schedule and reviewed by GIZ and concerned Govt officers/stakeholders/actors, which will be decided by GIZ:

D1. Inventory and Modelling Report – Comprehensive database of biomass feedstock characteristics, energy and mass balance data, and emissions inventory.

D2. India-specific LCA Framework Report – Cradle-to-grave life cycle impact assessment across selected biomass-to-energy pathways.

D3. Sensitivity and Hotspot Analysis Report – Identification of critical environmental hotspots and recommendations for mitigation.

D4. Techno-commercial assessment report

D5. Policy Recommendations and Stakeholder Engagement Report – Policy briefs, training materials, and documentation of workshops conducted.

D6. Final Consolidated Project Report – Summarizing methodology, datasets, analyses, results, and policy implications for sustainable biomass deployment in India.

Milestones/partial works	Date/location/responsibility	Criteria for acceptance
Task 1: Bioenergy Process Modelling	Within 2 months from signing contract	Submission of deliverables D1
Task 2: Life Cycle Assessment (LCA)	Between month 1 and month 3	Submission of deliverables D2
Task 3: Sensitivity and Hotspot Analysis	Between month 2 and month 5	Submission of deliverables D3
Task 4: Techno-Commercial Feasibility Assessment	Between month 2 and month 6	Submission of deliverables D4
Task 5: Policy Integration and Capacity Building	Between month 4 and month 9	Submission of deliverables D5 and D6

The anticipated contract period for assignment is 8 months, not exceeding December 2026.

3. Concept

In the tender, the tenderer is required to show how the objectives defined in Chapter 2 (Tasks to be performed) are to be achieved, if applicable under consideration of further method-related requirements (technical-methodological concept). In addition, the tenderer must describe the project management system for service provision.

Note: The numbers in parentheses correspond to the lines of the technical assessment grid.

Technical-methodological concept

Strategy (1.1): The tenderer is required to consider the tasks to be performed with reference to the objectives of the services put out to tender (see Chapter 1 Context) (1.1.1). Following this, the tenderer presents and justifies the explicit strategy with which it intends to provide the services for which it is responsible (see Chapter 2 Tasks to be performed) (1.1.2).

The tenderer is required to present the actors relevant for the services for which it is responsible and describe the **cooperation (1.2)** with them.

The tenderer is required to present and explain its approach to **steering** the measures with the project partners (1.3.1) and its contribution to the **results-based monitoring system** (1.3.2).

The tenderer is required to describe the key **processes** for the services for which it is responsible and create an **operational plan** or schedule (1.4.1) that describes how the services according to Chapter 2 (Tasks to be performed by the contractor) are to be provided. In particular, the tenderer is required to describe the necessary work steps and, if applicable, take account of the milestones and **contributions** of other actors (partner contributions) in accordance with Chapter 2 (Tasks to be performed) (1.4.2).

The tenderer is required to describe its contribution to knowledge management for the partner (1.5.1) and GIZ and to promote scaling-up effects (1.5.2) under **learning and innovation**.

Project management of the contractor (1.6)

The tenderer is required to explain its approach for coordination with the GIZ project. In particular, the project management requirements specified in Chapter 2 (Tasks to be performed by the contractor) must be explained in detail.

The tenderer is required to draw up a **personnel assignment plan** with explanatory notes that lists all the experts proposed in the tender; the plan includes information on assignment dates (duration and expert days) and locations of the individual members of the team complete with the allocation of work steps as set out in the schedule.

Details about backstopping

The tenderer is required to describe its backstopping concept. The following services are part of the standard backstopping package, which (like ancillary personnel costs) must be factored into the fee schedules of the staff listed in the tender:

- Service-delivery control
- Managing adaptations to changing conditions
- Ensuring the flow of information between the tenderer and GIZ
- Assuming personnel responsibility for the contractor's experts
- Process-oriented steering for implementation of the commission
- Securing the administrative conclusion of the project

4. Personnel concept

The tenderer is required to provide personnel who are suited to filling the positions described, on the basis of their CVs (see Chapter 7), the range of tasks involved and the required qualifications.

The below specified qualifications represent the requirements to reach the maximum number of points in the technical assessment.

Expert 1: Team leader / LCA Expert

Tasks of the team leader

- Overall responsibility for the advisory packages of the contractor (quality and deadlines)
- Coordinating and ensuring communication with GIZ, partners and others involved in the project
- Personnel management, identifying the need for short-term assignments within the available budget, as well as planning and steering assignments and supporting local and international short-term experts
- Regular reporting in accordance with deadlines

Qualifications of the team leader

- Education/training (2.1.1): Post Graduate degree in renewable energy/energy modeling etc.
- Language (2.1.2): C1-level language proficiency in English.
- General professional experience (2.1.3): 8 years of professional experience in energy-related research topics, preferably renewable energy
- Specific professional experience (2.1.4): 5 years in energy modelling tools / platforms and 2 years in conducting life cycle assessments.
- Leadership/management experience (2.1.5): 2 years of experience as a lead or co-lead of research projects.
- Regional experience (2.1.6): 5 years of experience in projects in India
- Development cooperation (DC) experience (2.1.7): 2 years of experience in projects funded by multilateral donors, government agencies, and international foundations.

Key expert 1: Technology Expert

Tasks of key expert 1

- Provide expertise in selecting relevant technology for LCA analysis, including process flow diagrams and key operational parameters.
- Provide expertise in technical know-how including working and advancements in specific technology
- Provide and validate technology-specific data (efficiencies, inputs, emissions, lifetimes).

Qualifications of key expert 1

- Education/training (2.2.1): Master of Technology in energy/renewable energy referable).
- Language (2.2.2): B2-level proficiency in English (mandatory requirement)
- General professional experience (2.2.3): 5 years of experience in energy sector
- Specific professional experience (2.2.4): 3 years of experience in applied research in bioenergy related projects.
- Leadership/management experience (2.2.5): Not applicable
- Regional experience (2.2.6): 5 years of experience working in India
- Development Cooperation (DC) experience (2.2.7): Not Applicable
- Other (2.2.8): Not Applicable

Key expert 2: Energy Modeling Expert

Tasks of key expert 2

- Model energy flows and balances across bioenergy pathways for integration into the LCA framework.
- Quantify electricity, heat, and fuel outputs under defined operating profiles and load factors.

- Develop and assess energy scenarios reflecting different deployment scales and future energy mixes.
- Ensure consistency between energy modelling outputs and LCA inventory requirements.
- Validate energy-related results and support interpretation of energy performance indicators.
- Contribute energy-modelling inputs to reporting and stakeholder review processes.

Qualifications of key expert 2

- Education/training (2.2.1): Master of Technology in energy/chemical/industrial Engineering
- Language (2.2.2): B2-level proficiency in English (mandatory requirement)
- General professional experience (2.2.3): 5 years of experience in data analytics, preferably in energy sector.
- Specific professional experience (2.2.4): 3 years of experience in conducting energy modelling using various modelling tools.
- Leadership/management experience (2.2.5): Not applicable
- Regional experience (2.2.6): 5 years of experience working in India
- Development Cooperation (DC) experience (2.2.7): Not Applicable
- Other (2.2.8): Not applicable.

Key expert 3: Energy Analyst

Tasks of key expert 3

- Collect, clean, and harmonise data from multiple sources for LCA and energy modelling.
- Manage datasets, assumptions, and metadata to ensure traceability.
- Conduct data quality checks, gap analysis, and uncertainty screening.
- Support consistent data transfer and parameterisation across models and tools.
- Prepare datasets, tables, and figures for analysis, reporting, and review.

Qualifications of key expert 3

- Education/training (2.2.1): Master of Technology in energy /renewable enerery/ energy modeling
- Language (2.2.2): B2-level proficiency in English (mandatory requirement)
- General professional experience (2.2.3): 5 years of experience in energy sector.
- Specific professional experience (2.2.4): 2 years of experience in data analysis of products / technologies related to sustainable technologies.
- Leadership/management experience (2.2.5): Not applicable
- Regional experience (2.2.6): 5 years of experience working in India
- Development Cooperation (DC) experience (2.2.7): Not Applicable
- Other (2.2.8): Not Applicable

Soft skills of team members

In addition to their specialist qualifications, the following qualifications are required of team members:

- Team skills
- Initiative
- Communication skills
- Socio-cultural skills
- Efficient, partner- and client-focused working methods
- Interdisciplinary thinking

5. Eligibility Requirement

The bidder shall meet the following conditions to be eligible for participating in the tender.

I. Commercial Eligibility Requirements

- The institute should be a registered entity in India under the Companies Act.
- Average turn-over for the last three years should not be less than EUR 70000. Please check Euro rate- [InforEuro, the exchange rate of the Euro currency](#)
- The consultant must have an average of 20 managers and employees from the past 3 calendar years.

II. Technical Eligibility Requirements

The consultant must have a minimum of 3 reference projects and 1 reference project in India in the technical field of LCA of bio energy technologies and process modelling with a minimum commission value of 25000 Euros.

III. Weighted Criteria

1. Technical Experience
 - Modelling of various Bio-energy Processes and sensitivity
 - Cradle-to-grave LCA following international benchmark .
 - Techno-commercial assessment of technology.
 - Designing national/sub-national policy research and framework design
 - Designing and imparting of training on innovative topic
2. Regional Experience: India
3. Experience of development projects

Bidder must refer to grid for assessing eligibility and Annexure A of bidding documents for more details.

6. Costing requirements

Specification of inputs

Fee days	Number of experts	Number of days per expert	Total	Comments
Designation of TL/key expert/short-term expert pool	1	30	30	-
Key Expert 1	1	50	50	-
Key Expert 2	1	50	50	-
Key Expert 3	1	30	30	-
Travel expenses	Quantity	Number per expert	Total (INR)	Comments
Per-diem allowance in country of assignment	20	-	-	-
Overnight allowance in country of assignment	20	-	-	-
Transport	Quantity	Number per expert	Total (INR)	Comments
Domestic flights (round trips)	10	-		Flights within the country of assignment during service delivery
CO ₂ compensation for air travel <i>Please refer to document 1.1 CO₂ Emission offset details</i>	10 (round trips)	-		A fixed budget of EUR 50 (per flight) is earmarked for settling carbon offsets against evidence
Travel expenses (car) • Local cabs / taxi	40 nos. (round trips)	-	-	Travel within the country of assignment, transfer to/from airport etc.
Other costs	Number	Price	Total	Comments
Workshops (assume 40-50 participants, good hotel or seminar hall equipped with quality audio/visual systems, workshop kits etc)	3			The budget contains the following costs workshops (at national / state level).

Roundtables (assume max participation of 25-30 experts)	4			• Venue cost • Food cost • Other cost associated with the workshop. • The above list is indicative, not exhaustive.
Other costs including Report designing & Printing cost (Assume 100 copies of max 3 different reports/documents)	-	-		The budget contains the following costs – Report designing, printing, Other cost associated with dissemination of project deliverables.

All business travel must be agreed in advance by the officer responsible for the project

Sustainability aspects for travel

GIZ has undertaken an obligation to reduce greenhouse gas emissions (CO₂ emissions) caused by travel. When preparing your tender, please incorporate options for reducing emissions, such as selecting the lowest emission booking class (economy) and using means of transport, airlines and flight routes with higher CO₂ efficiency. For short distances, travel by train (second class) or e-mobility should be the preferred option.

CO₂ emissions caused by air travel must be offset. GIZ specifies a budget for this, through which the carbon offsets can be settled against evidence.

7. Requirements on the format of the tender

The structure of the tender must correspond to the structure of the ToR. In particular, the detailed structure of the concept (Chapter 3) should be organized in accordance with the positively weighted criteria in the assessment grid (not with zero). The tender must be legible (font size 11 or larger) and clearly formulated. It must be drawn up in English.

The complete tender must not exceed 15 pages (excluding CVs). If one of the maximum page lengths is exceeded, the content appearing after the cut-off point will not be included in the assessment. External content (e.g. links to websites) will also not be considered.

The CVs of the personnel proposed in accordance with Chapter 4 of the ToRs must be submitted using the format specified in the terms and conditions for application. The CVs shall not exceed 4 pages each. They must clearly show the position and job the proposed person held in the reference project and for how long. The CVs is to be submitted only in English.

Please calculate your financial tender based exactly on the parameters specified in Chapter 6 Quantitative requirements. The contractor is not contractually entitled to use up the days, trips, workshops or budgets in full. The number of days, trips and workshops and the budgets will

be contractually agreed as maximum limits. The specifications for pricing are defined in the price schedule.