



**Verified Carbon
Standard**

BIODIESEL PROJECT BY KOTYARK INDUSTRIES LIMITED



**INFINITE
SOLUTIONS**

Document Prepared by: Infinite Solutions

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1 PROJECT DETAILS

1.1 Summary Description of the Project

Biodiesel Project by Kotyark Industries Limited (hereafter referred to as “the Project”) is located within the Economic and Technological Development Zone in India¹. The project is constructed and operated by Kotyark Industries Limited and is designated to produce biodiesel with capacity of 500 KL per day from the feedstock to produce biodiesel, from the vegetable oils. The by-products produced like glycerol; bio-waste is sold out. The scenario existing prior to the implementation of the project activity was business as usual, with users consuming fossil fuel without the proposed biodiesel mix. There are not any existing alternatives to the project activity. The project’s contribution to sustainable development is made through the creation of an industrial sector, biodiesel production, non-existent in the country in the baseline scenario. It reduces emissions from the combustion of fossil fuels. The installed production capacity of the production plant is:

Particular	Type	Quantity with Unit
Bio Diesel	Product	500 KL PER DAY
Glycerin	By Product	70 KL PER DAY

The location of the project.

F-86 to F-90, RIICO Industrial Area, Swaroopgunj. Dist: Sirohi, Rajasthan – 307023 India and Geo-coordinates of the project activity is mentioned in Section 1.12.

After commissioning, the Project is expected to reduce greenhouse gas emissions by reducing emissions from the combustion of fossil fuels of approximately 238,373 tCO_{2e} annually.

The project will also contribute to sustainable development in the following aspects:

- Transform the waste oil/fat into useful energy resources and thus preserve limited fossil fuel resources.
- Along with CO₂ reductions, the project will contribute to the sustainable development by reducing other pollutants such as SO₂, NO_x and CO due to fossil fuel combustion.
- Promoting the local economic development and improving the level of people’s life by providing potential job opportunities to residents.

¹ These estimations are based on the preliminary feasibility study conducted for the project’s eligibility to apply voluntary emission scheme. Estimated GHG emission reductions or removals (tCO_{2e}) are going to be measured in detail and finalized in accordance with the methodologies applied to the project in the final version of this PD which will be submitted to a Designated operational Entity (DoE) for the project’s validation

<u>Audit Type</u>	<u>Period</u>	<u>Program</u>	<u>VVB Name</u>	<u>Number of years</u>
Joint Validation and Verification	15-September -2020 to 31-March-2022	Verified Carbon Standard (VCS)	TUV SUD	1 Year 7 months
<u>Total</u>				1 Year 7 months

1.2 Sectoral Scope and Project Type

The project falls into following sectoral scopes:

05: Chemical industry

07: Transport

The project is not a grouped project.

Methodology: ACM0017: Production of biofuel, Version 4.0³

1.3 Project Eligibility

As per section 2.1.1 of VCS Standard (version 4.4)², the scope of the VCS Program includes:

1) The six Kyoto Protocol greenhouse gases:

The project operated by Kotyark Industries Limited is designated to produce biodiesel from the vegetable waste oils and Fat. The biodiesel is replacing diesel used in the various vehicles and stationary applications for e.g. Diesel generators.

It reduces emissions from the combustion of fossil fuels, which is helping in emissions of CO₂ and Nitrous oxide greenhouse gases.

2) Ozone-depleting substances:

Not Applicable

3) Project activities supported by a methodology approved under the VCS Program through the methodology approval process:

Not Applicable

4) Project activities supported by a methodology approved under an approved GHG program, unless explicitly excluded (see the Verra website for exclusions).

² <https://verra.org/wp-content/uploads/2022/12/VCS-Standard-v4.4-FINAL.pdf>

The applied methodology ACM0017 (Version 4.0) of the project is approved under CDM Program, which is a VCS approved GHG program.

5) Jurisdictional REDD+ programs and nested REDD+ projects as set out in the VCS Program Document Jurisdictional and Nested REDD+ (JNR) Requirements.

Not Applicable

1.4 Project Design

The project has been designed to include a single installation of an activity.

Eligibility Criteria

This is not a grouped project and the project includes a single location.

1.5 Project Proponent

Organization name	Kotyark Industries Limited
Contact person	Mr. Gaurang Shah
Title	Chief Managing Director
Address	2nd Floor, A-3 Shree Ganesh Nagar Housing Society, Ramakaka Temple Road, Chhani, Vadodara – 391740. Gujarat, India
Telephone	+91-9978967732
Email	info@kotyark.com

1.6 Other Entities Involved in the Project

Organization name	Infinite Solutions
Role in the project	Project Consultant
Contact person	Mr. Jimmy Sah
Title	Chief Operating Officer
Address	Milinda's Manor, 214-215, 2, RNT Marg, Indore, Madhya Pradesh 452001

Telephone	+91-9644130430
Email	jimmy@infisolutions.org

1.7 Ownership

As per section 3.7.1 of the Verra Project Standard Ver. 4.4, The Project is owned by M/s Kotyark Industries Limited, which is the project participant of the Project. The ownership is demonstrated through Consent to Operate of Rajasthan State Pollution Control Board.

1.8 Project Start Date

The project start date is 15-September-2020, as the operation start date.

The project activity at Swaroopgunj site was commissioned and started operation on 15-September-2020 which is considered as the project start date.

1.9 Project Crediting Period

Crediting Period Type: Renewable (Renewable twice for a total of 21 years)

First Crediting Period Start date: 15-September-2020

First Crediting Period End date: 14- September -2027

(Start and end dates included)

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	
Large project	✓

Year	Estimated GHG emission reductions or removals (tCO _{2e})
Year 1	238,373
Year 2	238,373
Year 3	238,373
Year 4	238,373
Year 5	238,373

Year 6	238,373
Year 7	238,373
Total estimated ERs	1,668,611
Total number of crediting years	7
Average annual ERs	238,373

1.11 Description of the Project Activity

Bio-diesel Project involves preparation of Biodiesel from waste vegetable oils through a chemical process. The product “Bio-diesel” is an eco-friendly and pollution free product and hence is an excellent source of renewable energy. Biodiesel refers to a non-petroleum-based diesel fuel consisting of short chain alkyl (methyl or ethyl) esters, made by transesterification of vegetable oil or animal fat (tallow), which can be used (alone, or blended with conventional Petro-diesel) in unmodified diesel-engine vehicles. Pure Biodiesel is biodegradable, nontoxic and essentially free of Sulphur and aromatics. Chemically, Biodiesel is referred to as mono-alkyl esters of long chain fatty acids derived from renewable carbohydrate sources as opposed to petroleum or coal, which are hydrocarbon sources. The plant will be having an installed capacity of 500 KL per day.

Bio- Diesel can be manufactured through following process:

Vegetable oils can be converted to fatty acids, which in turn are converted to esters. Vegetable oil can also be converted to methyl or ethyl esters directly, using acid or base accelerate (catalyze) the transesterification reaction.

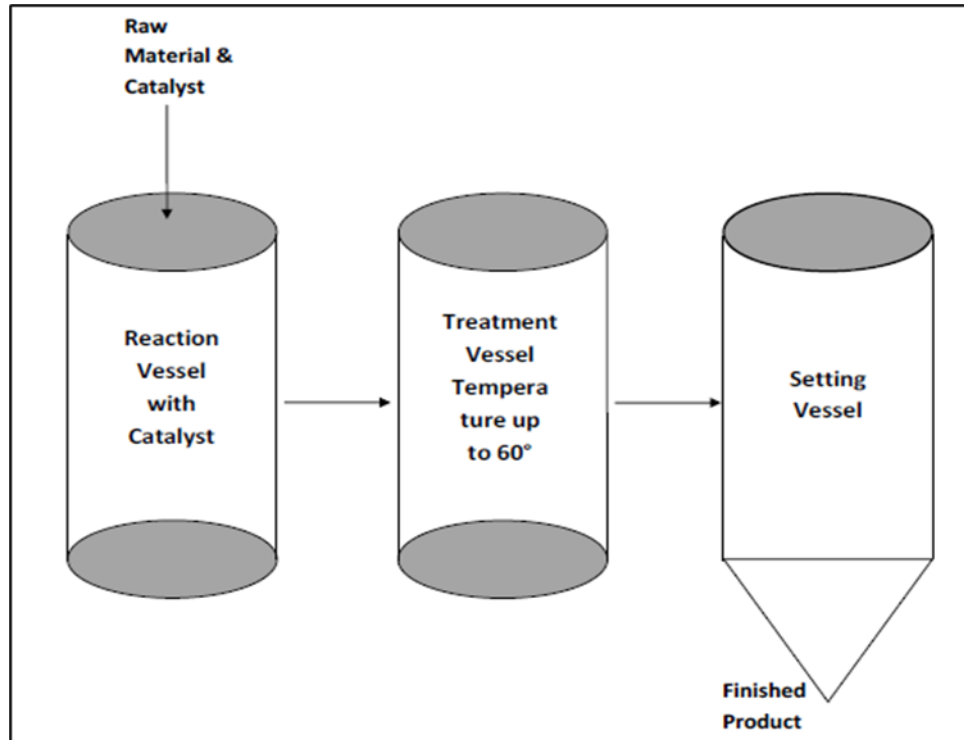


Fig. 1: Bio- Diesel manufacturing process

List of the equipment used in the technology:

- Reaction vessel
- Treatment Vessel
- Setting vessel

Steps involved in manufacturing of Bio-Diesel are:

1. **Preparation:** Cleaning / heating bio-lipid or vegetable oil. If cleaning/heating is not done, more quantity of soap will be produced with the biodiesel, the conversion index from vegetable oil to Bio-Diesel will be smaller and will result more than triglycerides.
2. **Titration:** Optional pH for Bio-Diesel is 7 (neutral), same as that of distilled water (and most tap water). Some vegetable oil has a high level of free fatty acids which require an acid Esterification (to obtain) a pH lower than 3 before alkaline Transesterification.
3. **Mixing:** Proper ratio of Methanol and catalyst (potassium hydroxide) should be mixed to produce potassium methoxide.
4. **Combination:** The reaction temperature between potassium methoxide and Bio-lipid should be 60 ° - 70 ° C.
5. **Separation:**
 - Glycerol is removed from Bio-Diesel by gravity separation

- Traces of methanol is removed from Bio-Diesel by heating

The operational life of the Bio- Diesel project activity is 25 years based upon the standard operational and maintenance practices followed at site.

The capacity of the plant is 500 KLD and there will be no further addition to the capacity with the plant efficiency of 80%.

The project boundary is India and no services are provided by the systems and equipment outside the project boundary.

The project activity is a greenfield project activity and no any facility was operating prior to the implementation of the project.

1.12 Project Location

Project Location	F-86 to F-90, RIICO Industrial Area, Swaroopgunj. Dist: Sirohi, Rajasthan – 307 023
Geo-Coordinate	24.64° N, 72.92° E



Fig.2: Map of Rajasthan showing Sirohi District

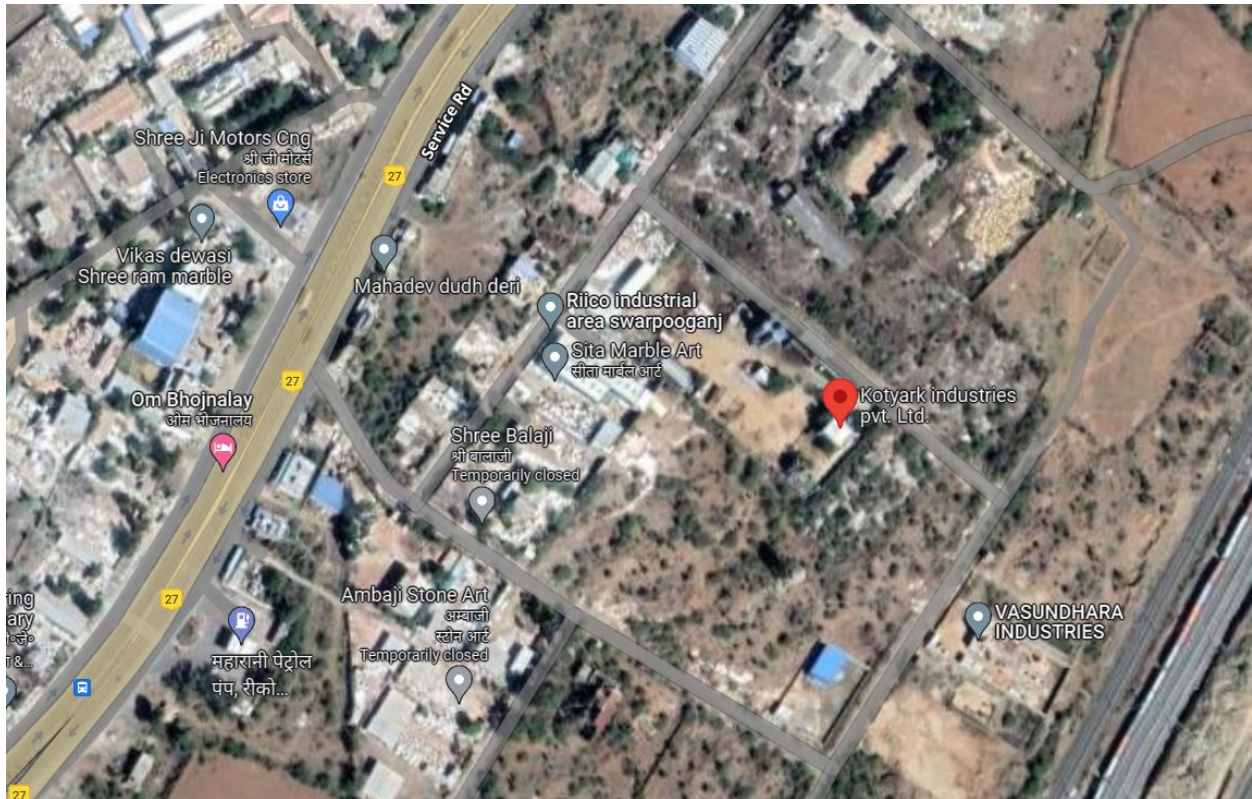


Fig.3: Project Location at RIICO Industrial Area, Swaroopganj, Dist.: Sirohi, Rajasthan

1.13 Conditions Prior to Project Initiation

The Scenario existing prior to the start of the implementation of the project activity is the fuel demand from vehicles and stationary applications using diesel within the project boundary which is now being satisfied by the project by replacing petrodiesel to biodiesel.

Prior to the project, the waste oil/fat generated every day in the local area were used to be discharged into the municipal sewage system without recovery. The baseline scenario is the same as the scenario existing prior to the start of the project. Please refer to Section 3.4 (Baseline Scenario) for further details.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

Legislation concerned for this current project activity there is no mandate law and enforcement mentioned as per the state level and country level. This project is voluntary initiatives by the Project Proponent.

The relevant national laws and regulations:

- National Policy on Biofuels³

Moreover, the Project have Factory License for setting up of the project from the State Government of Rajasthan and Explosive License for storage of Methanol from the Directorate of Explosive, Government of India.

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The Project is not registered under any other GHG programs and neither has participated in any other GHG programs.

1.15.2 Projects Rejected by Other GHG Programs

The Project is not rejected by other GHG programs.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

Net GHG emission reductions or removals generated by the Project will not be used for compliance with an emissions trading program or to meet binding limits on GHG emissions in any Emission Trading program or other binding limits.

1.16.2 Other Forms of Environmental Credit

The Project has no intent to generate any other form of GHG-related environmental credit for GHG emission reductions or removals claimed under the VCS Program.

1.16.3 Supply Chain (Scope 3) Emissions

This section is not applicable, the section effective from 1 July 2023.

1.17 Sustainable Development Contributions

1.17.1 Sustainable Development Contributions Activity Description


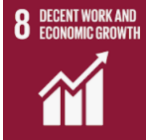
Biodiesel Project by Kotyark Industries Limited (hereafter referred to as “the Project”) is located at F-86 to F-90, RIICO Industrial Area, Swaroopgunj. Dist: Sirohi, Rajasthan – 307023 India. The project transforms the waste oil/fat into useful energy resources and thus preserve limited fossil fuel resources. The project is producing biodiesel by chemical reactions of transesterification and esterification technology with capacity of 500 KL per day from the waste oils.

³ <https://mopng.gov.in/en/page/11>

The project is contributing in sustainable development by reduction of CO₂ emissions due to implementation of project activity and generates employment to the local stakeholders. Through Project activity economic development has been achieved in the project location by creating opportunities of employment during the project lifetime.

Project owner monitors the carbon emission with help of the record of biodiesel generated and emission factor of the diesel.

Quantity of employment will be monitored through employment record maintained at the site.

	<ul style="list-style-type: none"> • Along with CO₂ reductions, the project will contribute to the sustainable development by reducing other pollutants such as NO_x and CO due to fossil fuel combustion.
	<ul style="list-style-type: none"> • Promoting the local economic development and improving the level of people's life by providing potential job opportunities to residents.

1.17.2 Sustainable Development Contributions Activity Monitoring

Table 1: Sustainable Development Contributions

The project is producing biodiesel by chemical reactions of transesterification and esterification technology with capacity of 500 KL per day from the waste oils. Since commissioning of the project, it has avoided 57,874 tonnes of greenhouse gas emissions in the atmosphere. So, the project will contribute to the sustainable development and it is fulfilling SDG 13.

The project is promoting local economic development and improving the level of people's life by proving potential job opportunities to the residents and it has employed 15 number of people since commissioning and in this it is fulfilling SDG 8.5.

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	13.0	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase	The project has avoided emission of 57,874 tCO ₂ e in the atmosphere.	Since commissioning to the project has avoided emission of 57,874 tCO ₂ e in the atmosphere.
2)	8.5	SDG Indicator 8.5.1 Average hourly earnings of female and male employees, by occupation, age and persons with disabilities.	Implemented activities to increase	15 number of people employed	The project has Employed 15 peoples since commissioning.

This is the first monitoring period and to substantiate both the SDGs, the record of biodiesel generated during the monitoring period and employment record are available with the project proponent.

1.18 Additional Information Relevant to the Project

Leakage Management

In accordance with the methodologies and tools applied to the project, no leakage effects are accounted for project activity.

Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the project description.

Further Information

There are no information or incidents that is bearing on the eligibility of the project, the net GHG emission reductions or removals, or the quantification of the project's net GHG emission reductions or removals.

2 SAFEGUARDS

2.1 No Net Harm

There was no harm identified from the project and hence no mitigations measures are applicable. The project activity involves the installation of Biodiesel production plant using feed stocks waste oil/fats which is producing biodiesel thereby replacing the Petro diesel. Use of Biodiesel reduces the GHG/Environmental impact occurred in the baseline.

Further, the implementation of the project has improved local-socio economic development through creating career opportunities hence there will be no net harm for socio-economic impacts.

Therefore, there will be no harm identified from the project activity.

2.2 Local Stakeholder Consultation

The project activity is implemented by Kotyark Industries Ltd. (hereafter referred as "project proponent") & installed the biodiesel production plant located at Swaroopganj, Rajasthan, India. Prior to the implementation of the plant, a local stakeholder meeting had been conducted in the site and the local stakeholders were informed and invited for the meeting through invitation letters to attend the stakeholders meeting.

The details of meeting are:

Venue: Balaji Bhavan, Nitoda Rd, Swaroopganj.

Date of meeting: 01- Aug- 2020

Time: 11 AM

The agenda for the meeting was:

- Introduction of the project.
- Describe clean development mechanism (CDM) and Verra Standard covering various social, environmental, technological and economic impact.
- Benefits from the Bio diesel project.
- Activities covered under CSR spending of company.
- To resolve/ clarify queries/comment or grievance received from the local stakeholders.
- Feedback/Questions from Stakeholders.
- Later, a minute of meetings has been prepared for documenting the outcomes of the local stakeholder consultation.

PP has explained how such projects help in mitigating impacts due to Global Warming. He briefly explained the gist of VCS standards prerequisites and sustainability projects in the country. Further, he explained the impacts of these projects which lead to providing clean energy, increase in employment opportunities both long term and short term, increased income and thereby leading to improvement in living standard of the people.⁴

According to the feedback during the meeting, all the stakeholders support the proposed project activity and think that the proposed project has provided environmental and safety measures. Therefore, this project activity is perceived as an environmentally friendly project, which can improve the quality of life of the surrounding community. The proposed project activity is expected to deliver multiple benefits in respect of sustainable development including environmental, social and economic benefits.

Mechanism for on-going communication with local stakeholders - Besides, PP has placed a grievance register in the communication room of the company gate. Those who want to put any comment/complain can write in the register and the same if found genuine will be addressed immediately. During current monitoring period, no comments from local or nearby stakeholders were received.

2.3 Environmental Impact

The project activity is bio diesel plant, which is free from any kind of anthropogenic emission. Project activity is not having any negative environmental impacts,

The project has certificate of Rajasthan state pollution control board and as per the guidelines on Environmental Impact Assessment have been published by Ministry of Environment, Forests and

⁴ The Minutes of Local Stakeholder meeting along with List of Attendees and other supporting's has been submitted to the VVB.

Climate Change (MoEFCC), Government of India (GOI) under Environmental Impact Assessment notification 14-Sept-06. Further amendments to the notification have been done on 14-July-2018. As per notification:

“The following projects or activities shall require prior environmental clearance from the concerned regulatory authority, which shall herein after referred to be as the Central Government in the Ministry of Environment and Forests for matters falling under Category ‘A’ in the Schedule and at Category ‘B’ in the said schedule, before any construction work, or preparation of land by the project management except for securing the land, is started on the project or activity:

As the Bio diesel projects are not listed in any of the categories in the Schedule, the project is considered environmentally safe and as per regulations in Host Party-India no EIA is required.

2.4 Public Comments

The project was listed at the VCS website from 05-July- 2022 to 04-August-2022 and no any relevant comments were received during the commenting period.⁵

2.5 AFOLU-Specific Safeguards

Not Applicable to the project activity.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Methodology

CDM Methodology ACM0017: Production of biofuel --- Version 4.0⁶

Any tools and other methodologies to which the selected methodology (ies) refer:

- CDM Tool 1: “Tool for the demonstration and assessment of additionality”: Version 07.0.0⁷.
- CDM Tool 15 “Tool for Upstream leakage emissions associated with fossil fuel use”: Version 02.0⁸.
- CDM Tool 24: “Common practice”: Version 03.1.⁹

⁵ web link of VERRA website: <https://registry.verra.org/app/projectDetail/VCS/3095>

⁶ <https://cdm.unfccc.int/UserManagement/FileStorage/W9FPD1N04ULQHTCBMOIY2ASZ3V8E7R>

⁷ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf>

⁸ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-15-v2.0.pdf>

⁹ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-24-v1.pdf>

- CDM Tool 25: “Apportioning emissions from production processes between main product and co and by-product”: Version 03.0.¹⁰
- CDM Tool 27: “Investment analysis” Version 12.0¹¹

3.2 Applicability of Methodology

Applicability for ACM0017 (Version 4.0): Production of biofuel

<p>1. The methodology is applicable to project activities that reduce emissions through the production, of blended biofuels to be used in existing stationary installations and/or in vehicles.</p>	<p>The biodiesel is supplied to consumers who use biodiesel for fuel combustion in existing stationary installations and vehicles in local transport sector. Hence Applicable.</p>
<p>2. The biofuel is produced from one or a combination of the following feedstock:</p> <p>(a) Waste oil/fat.</p> <p>(b) Seeds or crops that are cultivated in dedicated plantations.</p> <p>(c) Biomass residues (e.g., agricultural residues, wood residues, organic wastes).</p>	<p>The biodiesel is produced from the Waste oil/fat. Hence Applicable.</p>
<p>3. To avoid double counting of emission reductions, the methodology ensures that the CERs can only be issued to the producer of the biofuel. The project proponent shall demonstrate that double counting of emission reductions will not occur e.g., via a contractual agreement with the end-user(s), feedstock producer or other stakeholder involved in the supply chain</p>	<p>Kotyark Industries is the original manufacture / producer for the biodiesel. And the VCUs can only be claimed by the producer. The project proponent has the No double counting declaration certificate from the buyers mentioning that the VCUs will only be issued to the producer of biodiesel.</p>

¹⁰ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-25-v1.pdf>

¹¹ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-27-v12.pdf>

<p>4. The conditions apply to the methodology:</p> <p>a) Feedstock inputs:</p> <p>(i) For all biofuels: if the biofuel in the project plant is only partly produced from the sources specified in paragraph 4 above, any volumes of biofuel that are also produced in the project plant but from other feedstock sources, are not included in the quantity of biofuel for which emission reductions are claimed.</p> <p>(ii) For biodiesel: the alcohol used for esterification is methanol from fossil origin. Volumes of biodiesel produced with alcohols other than methanol (for example, ethanol) are not included in the quantity of biodiesel for which emission reductions are claimed.</p> <p>b) Dedicated plantations:</p> <p>(i) If the biofuel is produced from seeds or crops that are cultivated in dedicated plantations, the project activity shall comply with the provisions.</p> <p>(c) Biofuel plant and products:</p> <p>(i) The fossil fuels, the biofuels and the blended biofuels comply with national regulations (if existent) or with suitable international standards.</p> <p>(ii) The project activity involves construction and operation of a biofuel production plant.</p> <p>(iii) Any by-product (e.g., glycerol) is not disposed of or left to decay. It should be either incinerated or used as raw material for industrial consumption or sold.</p> <p>(iv) If biomass or biofuel is used at the project plant(s) (processing, production or blending plant) as fuel (e.g., for heat or electricity generation), then at least 95% of the biomass or biofuels used in these plants should be either biomass residues from the dedicated plantations established under the project activity or biofuel generated in the project plant. The amount of</p>	<p>a) Feedstock inputs:</p> <p>(i) The project only uses waste oil/fat for biodiesel production, no biomass or biofuels involved.</p> <p>(ii) For biodiesel: the alcohol used for esterification is methanol from fossil origin. No other Alcohols other than methanol are used to produce biodiesel also In India 98-99 % methanol is only produced from fossil origin¹² .Hence applicable</p> <p>b) Dedicated plantations:</p> <p>Not Applicable, as project only uses waste oil/fat for biodiesel production, no biomass involved.</p> <p>c) Biofuel plant and products:</p> <p>i. PP regularly monitor the biofuel as per the national regulations¹³ and is complying with it.</p> <p>ii. The project activity involves construction and operation of a biofuel production plant and the unit is located at Rajasthan, India.</p> <p>iii. The by product (glycerol) is completely sold and PP has maintained the record for the same.</p> <p>iv. Biofuel (Biodiesel) generated in the project plant has been used for heating in the plant and the amount of biofuel used is not included in the quantity of biofuel for which emission reductions are claimed also PP has maintained the record for the same.</p>
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¹² [Survey Report Production of Methanol.pdf \(dst.gov.in\)](http://Survey Report Production of Methanol.pdf (dst.gov.in))

¹³ https://mopng.gov.in/files/uploads/NATIONAL_POLICY_ON_BIOFUELS-2018.pdf

<p>biofuel used should not be included in the quantity of biofuel for which emission reductions are claimed.</p> <p>(d) Consumption of biofuel:</p> <p>(i) The (blended) biofuel is used by consumers within the host country in existing stationary installations (e.g., captive generators) and/or in vehicles.</p> <p>(ii) In case of vehicles, the target consumer group (e.g., captive fleet of vehicles, gas stations, bulk consumers) and distribution system of the biofuel shall be identified and described in the CDM-PDD.</p> <p>(iii) If the (blended) biofuels are consumed in stationary facilities, the consumer, and the producer of the (blended) biofuel are bound by a contract that allows the producer to monitor the consumption of (blended) biofuel and that states that the consumer shall not claim CERs resulting from its consumption.</p> <p>(iv) If the (blended) biofuels are sold to an identified consumer group within the host party, the buyer, and the producer of the (blended) biofuel are bound by a contract that allows the producer to monitor the sale of (blended) biofuel and that states that the consumer shall not claim CERs resulting from its consumption.</p> <p>(v) If the biofuel is blended but neither used in stationary facilities nor sold to an identified consumer group, the blender and the producer of the biofuel are bound by a contract that allows the producer to monitor the blending of biofuel to ensure that blending proportions and amounts are monitored and meet all regulatory requirements, and that states that no CERs resulting from its consumption will be claimed.</p> <p>(vi) In any case where the host party exports beyond the national boundary (blended) biofuels of the same type(s) as the biofuel(s) produced in the project plant, the consumption of the produced (blended) biofuel shall be monitored to ensure that no double counting</p>	<p>(d) Consumption of biofuel</p> <p>i. The biofuel is used by consumers within the host country (India) only.</p> <p>ii. The biodiesel produced will be supplied to bulk consumers who are using the same for vehicles and stationary applications.</p> <p>iii. Consumers are bound by contracts that allow monitoring of the consumption of blended biodiesel and a signed declaration which state that the consumer shall not claim VCS VERs resulting from its consumption.</p> <p>iv. The contracts are already signed before seeking registration under VCS, for such the consumers has provided d a signed declaration which states that the consumer will not claim VERs resulting from its consumption .Further, the future contracts will include clause which will allow PP to monitor the consumption of biodiesel and consumer will not claim VERs resulting from its consumption.</p> <p>v. For stationary uses no blending is done and the biodiesel is only sold to identified group of consumers.</p> <p>vi. The biofuel produced in the project activity is only used in the host country. Hence not Applicable.</p>
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<p>occurs. The consumer and the producer of the (blended) biofuel shall be bound by a contract that allows the producer to monitor the consumption of (blended) biofuel and that states that the consumer shall not claim CERs resulting from its consumption.</p> <p>(vii) In case of stationary installations, biofuels with any blending fraction between 0 and 100% can be used. In case of vehicles, the blending proportion must be appropriate to ensure that the technical performance characteristics of the blended biofuels do not differ significantly from those of fossil fuels;</p> <p>(viii) For biodiesel, the condition in 6.d.vii above is assumed to be met if the blending proportion is up to 20% by volume (B20). If the project participants use a blending proportion of more than 20%, they shall demonstrate in the CDM-PDD that the technical performance characteristics of the blended biodiesel do not differ significantly from those of Petro diesel and comply with all local regulations.</p> <p>(ix) Only biofuel consumed in excess of mandatory regulations is eligible for the purpose of the project activity.</p>	<p>vii. The producer of the Biodiesel is not involved in blending. At next stage, it is blended by OMCs (oil manufacturing companies) by 7%. In case of vehicles, the blending proportion is as per the national regulations to ensure that the technical performance characteristics of the blended biofuels do not differ significantly from those of fossil fuels;</p> <p>viii. The producer of the Biodiesel is not involved in blending. At next stage it is blended by OMCs (oil manufacturing companies) by 7%.</p> <p>ix. There are no mandatory regulations for biodiesel consumption. Hence, this project activity is completely voluntary.</p>
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Applicability for CDM tool: 1 (Version 07.0.0): “Tool for the demonstration and assessment of additionality”.

Applicability	Justification
<p>The use of the “Tool for the demonstration and assessment of additionality” is not mandatory for project participants when proposing new methodologies. Project participants may propose alternative methods to demonstrate additionality for consideration by the Executive Board. They may also submit revisions to approved methodologies using the additionality tool.</p>	<p>The PP has not applied to the new or revisions to approved methodologies.</p>

<p>Once the additionally tool is included in an approved methodology, its application by project participants using this methodology is mandatory.</p>	<p>PP is using the Approved large scale methodology. Hence the additionality is calculated on the basis of CDM tool: 1: “Tool for the demonstration and assessment of additionality.</p>
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Applicability for CDM tool: 15 (Version 02.0): “Tool for Upstream leakage emissions associated with fossil fuel use”.

Applicability	Justification
<p>The tool is applicable to calculate leakage upstream emissions associated with fossil fuel use in either or both the baseline scenario and project activity.</p>	<p>Leakage upstream emissions associated with fossil fuel has been considered in the scenario.</p>
<p>Upstream emissions associated with fossil fuel use are:</p> <ul style="list-style-type: none"> (a) Fugitive emissions of CH₄ and CO₂, including venting, flaring and physical leakage from equipment; (b) CO₂ emissions from combustion of fossil fuels; (c) CO₂ emissions associated with consumption of electricity. 	<p>Leakage upstream emissions associated with CO₂ emissions from combustion of fossil fuels;</p>
<p>Other greenhouse gas (GHG) emissions sources, such as those associated with the construction of equipment are relatively small and therefore not considered.</p>	<p>No other greenhouse gas (GHG) emissions sources have been considered.</p>
<p>The tool has two options to determine these emissions:</p> <p>Option (A) provides simple default emission factors for different types of fossil fuels and</p> <p>Option (B) calculates emission factors based on emissions for each upstream emissions stage.</p> <p>Option (B) requires identifying the relevant upstream emissions stages and the corresponding emission factor for each stage, which may be a default value or calculated, such as according to the 2006 IPCC Tier 2 or 3 methodology.</p>	<p>Emission factor has been calculated based on each upstream emissions stage.</p> <p>Option (B) the relevant upstream emissions stages have been identified as per the tool</p>
<p>This tool is applicable to the following types of fossil fuels, which can be categorized to be either based on natural gas, oil or coal:</p> <p>(a) Natural gas:</p> <ul style="list-style-type: none"> (i) Natural gas; 	<p>Emission factor has been consider based on oil Light fuel oil (diesel);</p>

<ul style="list-style-type: none"> (ii) Natural gas liquids (mixtures of primarily pentanes and heavier hydrocarbon); (iii) Propane, butane, and other types of liquefied petroleum gas (LPG); (iv) Liquefied natural gas (LNG); (v) Compressed natural gas (CNG); (b) Oil: (i) Light fuel oil (diesel); (ii) Heavy fuel oil (bunker or marine type); (iii) Gasoline; (iv) Kerosene (household and aviation); (v) Propane, butane, and other types of liquefied petroleum gas (LPG); (c) Coal: (i) Coal; (ii) Lignite. 	
<p>Methodologies which refer to this tool should state:</p> <ul style="list-style-type: none"> (a) The fossil fuel type(s), as listed above, for which upstream emissions should be determined. For the situation that the fossil fuel is defined at the project level, instead of in the methodology, and does not exactly match a type listed above, then the closest approximation shall be selected in terms of the fuel characteristics (e.g. natural gas, oil or coal based fuel) and fossil fuel lifecycle stages (see Table 1 in the appendix); (b) Procedures to determine the amount of each fossil fuel type(s) used in the baseline or project situation on a net calorific value (NCV); (c) Whether there is a possibility that leakage upstream emissions values are less than 0, such as for project activities in which a fossil fuel in the baseline situation is displaced with a renewable fuel in the project situation. Otherwise, if negative values are calculated using this tool, then they are assumed to equal 0. In any case, net leakage should always be considered as zero when net leakage effects are negative. 	<ul style="list-style-type: none"> (a) Emission factor has been consider based on oil Light fuel oil (diesel); (b) The amount of fuel has been considering form baseline because the fossil fuel has been replaced by biofuel. (c) Leakage emissions values are less than 0 then it is assumed to equal 0.

Applicability for CDM tool: 24 (Version 03.1): “Common practice”.

Applicability	Justification
<p>This methodological tool is applicable to project activities that apply the methodological tool “Tool for the demonstration and assessment of additionality”, the methodological tool “Combined tool to identify the baseline scenario and demonstrate additionality”, or baseline and monitoring methodologies that use the common practice test for the demonstration of additionality.</p>	<p>To prove additionality Tool for the demonstration and assessment of additionality has been used along with common practice test for the demonstration of additionality.</p>
<p>In case the applied approved baseline and monitoring methodology defines approaches for the conduction of the common practice test that are different from those described in this methodological tool, the requirements contained in the methodology shall prevail.</p>	<p>Common practice test done based on methodology of tool 24 (version 03.1).</p>

Applicability for CDM tool: 25 (Version 03.0): “Apportioning emissions from production processes between main product and co and by-product”.

Applicability	Justification
<p>The Executive Board has restricted the applicability of this document to the approved methodologies ACM0017 and AM0089 until further revisions are done by the Methodologies Panel.</p>	<p>PP has been using approved methodology ACM0017 version 4.0 (Production of biofuel).</p>
<p>This methodological tool is applicable to project activities that apply any version of the approved methodologies AM0089 and ACM0017. Reference to the “Guidelines on apportioning emissions from production processes between main product and co- and by-products” (if any) in the project design document of registered project activities shall be read as “Methodological tool: Apportioning emissions from production processes between main product and co- and by-products”.</p>	<p>PP has been using approved methodology ACM0017 version 4.0 (Production of biofuel). Biodiesel is main product and glycerin is by-product.</p>

Applicability for CDM tool: 27 (Version 03.0): “Investment analysis”.

Applicability	Justification
<p>This methodological tool is applicable to project activities that apply the methodological tool “Tool for the demonstration and assessment of additionality”, the methodological tool “Combined tool to identify the baseline scenario and demonstrate additionality”, the</p>	<p>This is an applicable condition because Tool for the demonstration and assessment of additionality”, the methodological tool “Combined tool to identify the baseline scenario and</p>

<p>guidelines “Non-binding best practice examples to demonstrate additionality for SSC project activities”, or baseline and monitoring methodologies that use the investment analysis for the demonstration of additionality and/or the identification of the baseline scenario.</p>	<p>demonstrate additionality” has been used for investment analysis internal rate of return (IRR).</p>
<p>In case the applied approved baseline and monitoring methodology contains requirements for the investment analysis that are different from those described in this methodological tool, the requirements contained in the methodology shall prevail.</p>	<p>The investment analysis done based on methodology of tool 27 (version 03.1).</p>

3.3 Project Boundary

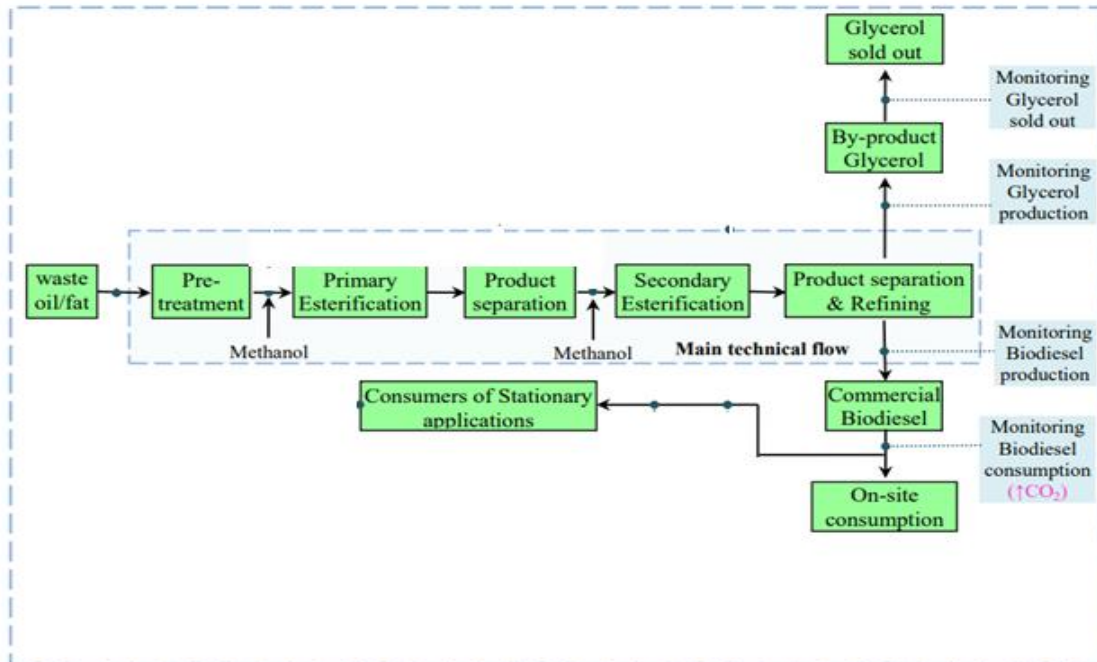


Fig.4: Project boundary

The project located at F-86 to F-90, RIICO Industrial Area, Swaroopgunj. Dist: Sirohi, Rajasthan – 307023, India and the project description has been provided in section 1.11. The boundary for the project is as follows;

Source	Gas	Included?	Justification/Explanation	
Baseline	Vehicles and Stationary Combustion	CO ₂	Yes	Main source of baseline emissions.
		CH ₄	No	

Source	Gas	Included?	Justification/Explanation
Installations Consuming Petro diesel	N ₂ O	No	Excluded for simplification. CH ₄ and N ₂ O emissions are assumed to be very small. No systematic difference to project activity
	Other	-	-
On-site energy consumption at biodiesel production plant and, if applicable, the oil production plant(s)	CO ₂	Yes	Significant emission source
	CH ₄	No	Excluded for simplification. CH ₄ emissions are assumed to be very small.
	N ₂ O	No	Excluded for simplification. N ₂ O emissions are assumed to be very small
	Other	-	-
Combustion of fossil fuel derived methanol in the biodiesel ester	CO ₂	Yes	Significant emission source.
	CH ₄	No	Excluded for simplification. CH ₄ emissions are assumed to be very small.
	N ₂ O	No	Excluded for simplification. N ₂ O emissions are assumed to be very small
	Other	-	-
Transportation of oil seeds, vegetable oils and or oil/fat wastes	CO ₂	Yes	Significant emission source.
	CH ₄	No	Excluded for simplification. CH ₄ emissions are assumed to be very small.
	N ₂ O	No	Excluded for simplification. N ₂ O emissions are assumed to be very small
	Other	-	-
Transportation of biodiesel to blending facility	CO ₂	Yes	Significant emission source.
	CH ₄	No	Excluded for simplification. CH ₄ emissions are assumed to be very small.
	N ₂ O	No	Excluded for simplification. N ₂ O emissions are assumed to be very small
	Other	-	-
Anaerobic Wastewater treatment in crude	CO ₂	No	Not applicable, the biodiesel is produced from waste oil/fat.
	CH ₄	No	Not applicable, the biodiesel is produced from waste oil/fat.

Source	Gas	Included?	Justification/Explanation
vegetable oil production.	N ₂ O	No	Not applicable, the biodiesel is produced from waste oil/fat.
	Other	-	-
Cultivation of land to produce oil seeds (if the feedstock is vegetable oils and / or fats from plants produced in dedicated plantations)	CO ₂	No	Not applicable, the biodiesel is produced from waste oil/fat.
	CH ₄	No	Not applicable, the biodiesel is produced from waste oil/fat.
	N ₂ O	No	Not applicable, the biodiesel is produced from waste oil/fat.
	Other	-	-

3.4 Baseline Scenario

Petroleum diesel is widely used as fuel in the transport sector in India, so the scenario existing prior to the start of the project is the equivalent fuel demand from existing stationary installations and vehicles within the project boundary satisfied by the project would have been satisfied by petroleum diesel. The waste oil/fat generated every day in the local area was used for material production of substances other than fuel. The baseline scenario is the same as the scenario existing prior to the start of the project.

According to methodology ACM0017, version 4.0 the baseline scenario of the project is demonstrated and determined through the following steps.

- **Production of fuels (P):** What would have happened at the production level in the absence of the CDM project activity?
- **Consumption (C):** Which fuel would have been consumed in the absence of the CDM project activity?
- **Material (M):** What would have happened to the material used as input for production of biodiesel in the absence of the CDM project activity?

Since in the project activity biofuel is not produced from seeds or crops from plants cultivated in dedicated plantations, Land use for plantation (L) is not taken into consideration.

For the fuel production (P),

According to latest approved version 07 of the “Tool for the demonstration and assessment of additionality” at the production level the realistic and credible alternatives can be assessed through the following steps:

Alternative P1: Continuation of current practices with no investment in biofuel production capacity;

The scenario P1 can be a possible baseline scenario, where there is no investment in the biodiesel production capacity and the fossil fuel are used for the generation of petro diesel for end usage.

Alternative P2: The project activity implemented without the CDM; and

The project faces investment barrier and described in section 3.5 hence this scenario is not applicable.

Alternative P3: Investment in any other alternative fuel replacing partially or totally the baseline fuel.

Investment in other alternative baseline fuel source is a part of baseline scenario and hence applicable.

Investment in any other alternative such as CNG, DME or LPG for end usage in the mobile transportation is not viable for the project owner. Firstly, PP has done research and development for analyzing the commercial production of biodiesel and its utilization purposes. Secondly, India is in serious shortage of natural gas resources and thus, there is no condition for development of CNG and LNG, Thirdly, domestic research on DME production technology have just started and in nascent stage and thus, alternative P3 isn't feasible. To conclude, the most plausible baseline scenario for fuel production is Alternative P1 (Continuation of current practices with no investment in biodiesel production capacity).

For the consumption of fuel (C), the most plausible baseline scenario is determined as follows:

Step 1: Identify all realistic and credible alternatives for the fuel used by end consumers.

For the intended consumer of biodiesel, the realistic and credible alternative(s) may include

Alternative C1: Continuation of petroleum diesel consumption:

Alternative C2: Consumption of biodiesel from other producers:

Alternative C3: Consumption of other single alternative fuel such as CNG or LPG etc.:

Alternative C4: Consumption of a mix of above alternative fuels:

Alternative C5: Consumption of biodiesel from the proposed project plant.

Step 2: Eliminate alternatives that are not complying with applicable laws and regulations.

All the alternatives identified comply with the local laws and regulations.

Step 3: Eliminate alternatives that face prohibitive barriers.

Alternative C1: In India, all the heavy vehicles operated by petroleum diesel therefore C1: Continuation of petroleum diesel consumption is possible case.

Alternative C2: In India, very few biodiesel manufactures are in the country at present time and manufacture of biodiesel is very less than the requirement of the biodiesel. Therefore, in absence of availability of biodiesel, the alternative C2, consumption of biodiesel from other producers is not feasible, this option faces prevailing barrier as there is a clear lack of manufactures in the region.

Alternative C3: Consumption of other single alternative such as CNG or LPG will require modification in the consumer's stationary installation and vehicles, which needs additional expense for consumers and in India all of its petro products are being imported and hence it's not practical and rather may prove costly to have CNG and PNG upgraded to be used on commercial scale, Therefore, Alternative C3 is not a realistic and credible alternative due to prevailing practice barrier.

Alternative C4: Similarly, since alternative fuels such as CNG or LPG are not credible due to prevailing practice barrier in the country, thus Alternative C4: Consumption of a mix of above alternatives fuels is not feasible either.

Alternative C5: The project isn't financially attractive without Carbon Crediting revenue due to the fact there are no other financial incentives at this stage of the developing technology from the proposed project plant isn't feasible. Thus, alternative C5: Consumption of biodiesel from the proposed project plant.

In conclusion, Alternative C1: Continuation of petroleum diesel consumption faces no prohibitive barriers and is considered to be the most plausible baseline scenario for consumption of fuel (C).

For the material (M) level, the most plausible baseline scenario is determined as follows:

Step 1: Identify all realistic and credible alternatives for the material used by the project. For the material (M) level, the realistic and credible alternative(s) may include

Alternative M1: Use of material for production of biodiesel (by the project proponent or by others);

Alternative M2: Use for material production of substances other than fuel;

Alternative M3: Incineration of material for the purpose of energy recovery;

Alternative M4: Incineration of material without energy recovery;

Alternative M5: Disposal of material in an anaerobic or aerobic manner.

Step 2: Eliminate alternatives that are not complying with applicable laws and regulations. All the alternatives identified comply with Indian laws and regulations.

Step 3: Eliminate alternatives that face prohibitive barriers. Most consumers in India do not even know about biodiesel, thus, biodiesel production from waste oil/fat is far from being a common practice in India. Thus,

Alternative M1: Use of material for production of biofuels (by the project proponent or by others) is not feasible. In the absence of the project, the waste oil/fat may be probably used to produce chemical substances, thus,

Alternative M2: Use for material production of substances other than fuel is feasible. Incineration of waste oil/fat with energy recovery is not a common practice in India, thus

Incineration of waste oil/fat is not a common practice in India thus Alternative M3 Alternative and M4 is not feasible.

No waste oil/fat is treated by anaerobic or aerobic technologies in India. Thus, Alternative M5: Disposal of material in an anaerobic or aerobic manner is not feasible.

In the absence of the project, the waste oil/fat may be probably used to produce chemical substances, like oleic acid which is prevailing practice and requires less investment thus Alternative M2: Use for material production of substances other than fuel is feasible.

Therefore, the most plausible baseline scenario for the project is: P1: Continuation of current practices with no investment in biodiesel production capacity; C1: Continuation of petroleum diesel consumption; M2: Use for material production of substances other than fuel.

3.5 Additionality

Specify the methodology or activity requirement or product requirement that establish deemed additionality for the proposed project (including the version number and the specific paragraph, if applicable).	Not Applicable
Describe how the proposed project meets the criteria for deemed additionality.	Not Applicable

Thus, the project follows section 5.3.2 of the applied methodology which requires the project proponent to determine the additionality based on “Tool for the demonstration and assessment of additionality”, Version 07.0.0. The stepwise approach to establish additionality of the project activity has been followed, details of which are provided in the following paragraphs:

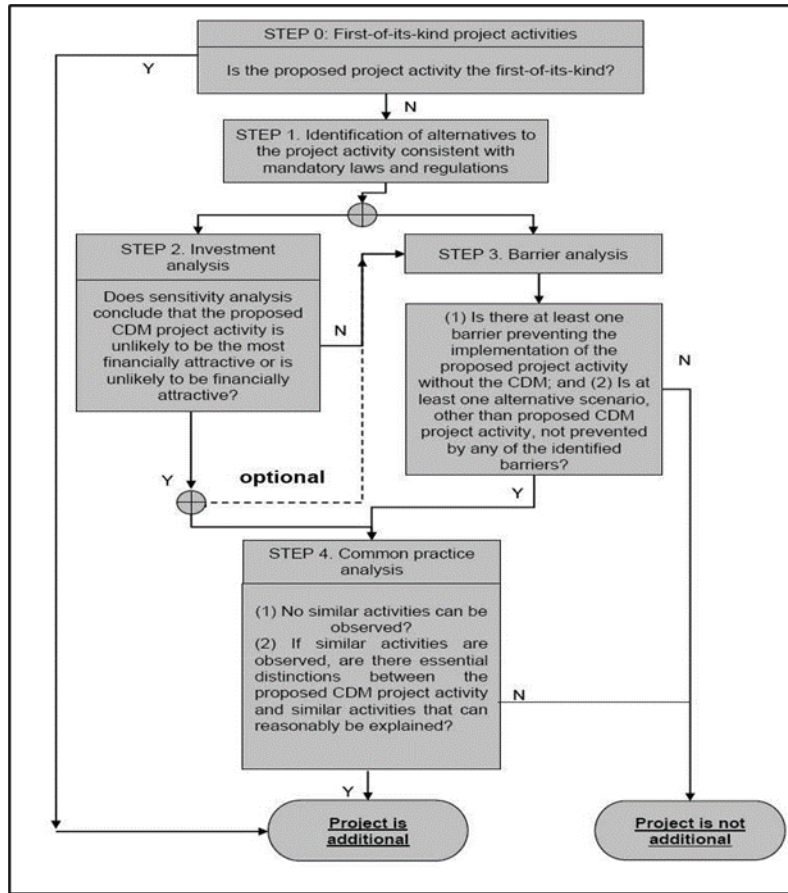


Fig.5: Flowchart of the step-wise approach of additionality

Step 0: Demonstration whether the proposed project activity is the first-of-its-kind

The proposed project activity is biodiesel production project; hence not the first of its kind. Hence, this step is not applicable.

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

As the baseline scenario is prescribed by applied methodology, hence no further analysis is carried out to identify alternatives.

Step 2: Investment Analysis

As per para 29 of “Tool for the demonstration and assessment of additionality” v7.0.0, it is determined that the proposed project activity is not an economically or financially feasible option. To conduct the investment analysis, Methodological tool: Investment analysis, version 10.0 (EB 105 annex 06) has been referred.

Sub-step 2a: Determine appropriate analysis method

As per “Tool for the demonstration and assessment of additionality” (version 07.0.0), for financial analysis of the project, the following three options are available:

Option I: Simple Cost Analysis

Option II: Investment Comparison Analysis

Option III: Benchmark Analysis

The project will generate revenues from sale of biodiesel and glycerine; therefore, Option I is not applicable. Option II also does not apply since there is no comparable investment alternative available to the project participant in line with para 32 of the Methodological tool: “Tool for the demonstration and assessment of additionality” (version 07.0.0). The most appropriate financial analysis method is therefore option III: the benchmark analysis,

Sub-step 2b: Option III. Apply benchmark analysis

The suitable financial indicator needs to be selected considering the project type and decision-making context. For this project activity as explained in above section 3.4 that the most plausible baseline scenario for the project activity is the continuation of the current practice i.e., PP has choice to invest or not to invest in Bio-Diesel project. The guidance available at the time of decision making was Guidance 19 of “Guidance on the Assessment of Investment Analysis”, Version 09, which states that. The benchmark approach is therefore suited to circumstances where the baseline does not require investment or is outside the direct control of the project developer, i.e., cases where the choice of the developer is to invest or not to invest.” Also, as per the latest available “Investment Analysis Tool” Version 12 para 7 and 9 considers IRR (Internal Rate of Return) as one of the financial indicators designed to calculate the return on the cost of investment and as per the applicable methodology most plausible baseline scenario for the project activity is the continuation of the current practice hence the benchmark analysis is considered appropriate in context of the project activity. Hence, PP has chosen the benchmark analysis and considered IRR as the suitable indicator in context of the Bio-Diesel project.

Default Value Benchmark:

The Required return on equity (benchmark) was computed in the following manner:

$$\text{Nominal Benchmark} = \{(1+\text{Real Benchmark}) * (1+\text{Inflation rate})\}-1$$

Where:

(a) Default value for Real Benchmark is the default value of expected return on equity in real terms for Energy Industries (Group 1) in India as provided in the Appendix.

(b) Inflation Rate forecast for India as per IMF website.

Benchmark estimation

Default Value as per Investment Analysis Tool	10.79%
Long Term Target Inflation forecast for India	4.00%
Benchmark	15.22%

Sub-step 2C: Equity IRR

The equity IRR for (Bio-Methanation Plant) has been computed based on the following input assumptions:

Details of the project		Source
State where the project is situated	Rajasthan	As per DPR
Plant Capacity in KL	1,50,000	As per DPR
Output Biodiesel	84%	As per DPR
Output Glycerine	16%	As per DPR
Date of Commissioning	31-Mar-21	As per DPR
No of working days	300	As per DPR
Life of the plant (Yrs.)	20	As per DPR
Production & Revenue		
Annual Capacity Utilization Factor	80.00%	As per DPR
Selling Price Biodiesel (Rs/KL)	52,000	As per DPR
Selling Price Glycerine (Rs/KL)	35,000	As per DPR
Annual Price Rise 3rd year onwards	10%	As per DPR
Direct & Indirect cost		
Purchase Cost per KL production (INR Mn.)	0.0433	As per DPR
Process Cost per KL production (INR Mn.)	0.0055	As per DPR
Other Direct Cost (INR Mn.)	20.00	As per DPR
Other Indirect Cost (INR Mn.)	68.00	As per DPR
Raw Material 3rd year onwards	10%	As per DPR
Process Cost 3rd year onwards	5%	As per DPR
Other Cost 3rd year onwards	10%	As per DPR
Financial parameters		
TOTAL COST (INR Mn.)	72.539	As per DPR
Equity Investment (INR Mn.)	47.539	As per DPR
Loan Amount (INR Mn.)	25.00	As per DPR
Term loan		
Margin (%)	65.54%	As per DPR
Loan Amount (INR Mn.)	25.00	As per DPR
Interest rate (%)	11.00%	As per DPR
Loan Tenure (Qtr.)	32	As per DPR
Moratorium Period (Qtr.)	4	As per DPR

Repayment Period (Qtr.)	28	Calculated Value
Repayment instalments value (INR Mn.)	0.8929	Calculated Value
1st instalment from (Qtr. end)	31-Mar-22	Considered from the next Quarter End
Working Capital		
Raw Material Holding Period (in Days)	30	As per DPR
Utilities Holding Period (in Days)	15	As per DPR
Employee Cost Holding Period (in Days)	30	As per DPR
Debtors Collection Period (in Days)	15	As per DPR
Interest on Working Capital Debt	11.25%	As per DPR
Book Depreciation (SLM Method)		
Land Cost (INR Mn.)	13.297	As per DPR
Working Capital Margin (INR Mn.)	25.00	As per DPR
Gross Depreciable Value (INR Mn.)	34.242	Calculated Value
Salvage Value (%)	5.00%	Assumption
Salvage value (INR Mn.)	1.712	Calculated Value
Net Depreciable Value (INR Mn.)	32.529	Calculated Value
Residual Value (INR Mn.)	15.009	Calculated Value
IT Depreciation (SLM Method)		
Depreciation on Building & Site Works	3.17%	As per DPR
Depreciation on Plant & Machinery	4.75%	As per DPR
Depreciation on Other Assets	9.50%	As per DPR
Income Tax		
Financial Year	FY 2021-22	
Income tax rate (%)	25.00%	Tax rates applicable to a domestic company
MAT (%)	18.50%	
Surcharge (%)	12.00%	Tax rates applicable to a domestic company
Education cess (%)	4.00%	
Final Tax rates		
Income tax rate (%)	29.12%	Calculated Value
MAT (%)	21.55%	Calculated Value

Based on above the equity IRR works out to:

Equity IRR	Benchmark
6.85%	15.22%

Sub-step 2d: Sensitivity analysis:

To show the robustness of the financial analysis, a sensitivity analysis is carried out on key factors that may impact the performance of the project activity. As per Guidance 27 & 28 of EB 105, Annex 06, “the sensitivity analysis of the project parameters which may substantially influence” only those parameters that constitute more than 20% of either total project costs or total project

revenues are subjected to reasonable variation. The critical parameters thus identified for determination of financial viability of project are as follows:

- 1) Capacity Utilization
- 2) Raw Material
- 3) Project cost
- 4) Selling price (Bio-Diesel)
- 5) Selling price (Glycerine)

According to para 28 of Annex 06 EB 105, 'As a general point of departure variations in the sensitivity analysis should at least cover a range of +10% and -10%, unless this is not deemed appropriate in the context of the specific project circumstances”.

Variation %	-10%	Normal	10%
Capacity Utilization	6.25%	6.33%	7.34%
Raw Material	50.31%	6.33%	0.00%
Project Cost	6.84%	6.33%	6.23%
Selling Price (Bio Diesel)	0.00%	6.33%	45.12%
Selling Price (Glycerin)	3.44%	6.33%	10.38%

Even in the best scenarios through decreasing the Investment cost, the project is not able to overcome the investment barrier and would require carbon benefits for its successful operations. From the above discussion of barrier analysis, it can be concluded that the project is additional in terms of investment and organization capacity to bring the project into implementation.

Step -3: Barrier analysis

Barrier analysis has not been used.

Step 4: Common practice analysis

For the concerned project activity, common Practice Analysis has been carried out. The project is developed with biodiesel production of 440 TPD. Thus, common practice analysis has been carried out for large scale project activity. The project activity is located in state of Rajasthan in India; hence, Rajasthan state is considered as Geographical area for the project activity. Stepwise approach for common practice analysis has been carried out as per Methodological tool 24 “Common Practice”, version 03.1 ¹⁴:

Step (1): Calculate applicable capacity or output range as +/- 50% of the total design capacity or output of the proposed project activity.

¹⁴ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-24-v1.pdf>

Range	Capacity (TPD)
50%	660.00
Capacity of the proposed project activity	440.00
-50%	220.00

Step (2): Identify similar projects (both CDM and non-CDM) which fulfil all the following conditions:

- The projects are located in the applicable geographical area:
- The projects apply same measure as the proposed project activity:
- The projects use the Same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity.
- The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g., clinker) as the proposed project plant.
- The capacity or output of the projects is within the applicable capacity range for the chosen projects.
- The projects started commercial operation before the PDMR is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity.

Particulars	No. of projects
N_{biodiesel}	3
Total no. of similar projects	3

Step (3): within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number, **N_{all}**.

Particulars	No. of projects
N_{all}	3

Step (4): within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number **N_{diff}**.

Particulars	No. of projects
N_{diff} =	0

Step (5): calculate factor $F = 1 - \frac{N_{diff}}{N_{all}}$ representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology

used in the proposed project activity that deliver the same output or capacity as the proposed project activity.

$F =$	$1 - N_{diff} / N_{all}$
$F =$	1
$N_{all} - N_{diff}$	3

The project is "common practice" if both the following conditions are satisfied:

- a) $F > 0.2$
- b) $N_{all} - N_{diff} > 3$

Hence, project activity is not a common practice.

3.6 Methodology Deviations

There is no methodology deviation.

4 IMPLEMENTATION STATUS

4.1 Implementation Status of the Project Activity

The Biodiesel plant had been successfully commissioned by Kotyark Industries Limited at F-86 to F-90, RIICO Industrial Area, Swaroopgunj. Dist: Sirohi, Rajasthan – 307023 India. The commissioning date is 15-September-2020.

The plant is in operation continuously since commissioning and there is no major breakdown/shut down of project from commissioning date. Events or situations which may impact the applicability of the methodology have not occurred during the monitoring period.

5 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

From the **ACM0017: Production of biofuel – Version 4.0 Paragraph 38**, states that Baseline emissions from displaced fossil fuel are determined as follows:

$$BE_y = BF_y \times NCV_{BF,y} \times EF_{CO2,FF} \tag{Eq. (1)}$$

With,

$$BF_y = \left[\min \left\{ (P_{BF,y} - P_{BF,on-site,y}); \left(\sum_i f_{PJ,i,y} \times C_{BF,i,y} \right) \right\} - P_{BF,other,y} \right] \times \left[\frac{\sum_i C_{BF,i,y} \times \left(\frac{f_{PJ,i,y} - f_{reg,y}}{f_{PJ,i,y}} \right)}{\sum_i C_{BF,i,y}} \right] \quad \text{Eq. (2)}$$

Where:

BE_y = Baseline emissions during the year y (tCO₂)

BF_y = Quantity of biofuel eligible for crediting in year y (t)

$NCV_{BF,y}$ = Net calorific value of biofuel produced in year y (GJ/t)

$EF_{CO2,FF}$ = Carbon dioxide emissions factor for displaced fossil fuel (tCO₂/GJ)

$P_{BF,y}$ = Quantity of biofuel produced in the project plant in year y (t)

$P_{BF,on-site,y}$ = Quantity of biofuel consumed at the project plant(s) (biofuel production and/or feedstock processing) in year y (t)

$P_{DBF,other,y}$ = Quantity of biofuel that is either produced with alcohols other than methanol from fossil origin or produced using feedstock or waste oil(s)/fat(s) other than those eligible under this methodology according to the applicability conditions in year y (t)

$C_{BF,i,y}$ = Quantity of biofuel type i consumed/sold/blended in year y (t)

$f_{PJ,i,y}$ = Fraction of biofuel in the blended biofuel type i in year y (ratio)

$f_{reg,y}$ = Fraction of biofuel in the blended biofuel which is required by mandatory regulations of the host country in year y (ratio)

i = Blended biofuel type (e.g., B5, B10, B20, B50 etc.); there is blending of 7% in the Biodiesel by OMCs.

5.2 Project Emissions

Project activity emissions are calculated as follows:

$$PE_y = PE_{Biomass,y} + AF_{1,y} \times PE_{MeOH} \quad \text{Eq. (3)}$$

Where:

PE_y = Project emissions in year y (tCO₂)

$PE_{Biomass,y}$ = Project emissions associated with the biomass and biomass residues in year y (tCO₂)

$PE_{MeOH,y}$ = Project emissions from fossil carbon in the biodiesel due to esterification with methanol of fossil origin in year y (tCO₂)

$AF_{1,y}$ = Allocation factor for the production of biofuel in year y (fraction)

1. Project emissions associated with the biomass and biomass residues ($PE_{Biomass,y}$)

No biomass is being used in the project so $PE_{Biomass,y}$ is not applicable.

2. Project emissions from fossil carbon in the biodiesel due to the use of methanol from fossil origin in the esterification process ($PE_{MeOH,y}$)

Under the current applicability of the methodology, methanol of fossil origin is used for the esterification of waste oil/fats. In the esterification process, the carbon from the methanol remains in the esters. Thus, a fraction of the carbon in the biodiesel is of fossil origin and need to be accounted as project emissions. These emissions are estimated as follows:

$$PE_{MeOH,y} = MC_{MeOH,y} \times EF_{C,MeOH} \times \frac{44}{12}$$

Eq.(4)

Where:

$PE_{MeOH,y}$ = Project emissions from fossil carbon in the biodiesel due to esterification with methanol of fossil origin in year y (tCO₂)

$MC_{MeOH,y}$ = Quantity of methanol consumed in the biodiesel plant, including spills and evaporations in year y (tonnes)

$EF_{C,MeOH}$ = Carbon emissions factor of methanol, based on molecular weight (tC/tMeOH)

44/12 = Molecular weight ratio to convert t of carbon into t of CO₂ (tCO₂/tC)

5.3 Leakage

This methodology estimates the following sources of leakage:

- Emissions associated with the production of the methanol used for esterification;
- If the biodiesel is produced from waste oil/fat, displacement of existing uses of waste oil/fat that may result in increased demand for fossil fuels elsewhere;
- Positive leakage associated with the avoided production and transportation of petro diesel.

Please note that the leakage emissions shall not be less than zero. In cases where, in year y, LE_y is less than zero, consider it as zero. The leakage emissions are calculated as follows:

$$LE_y = LE_{MeOH,y} + LE_{BR,y} - LE_{FF,y}$$

Eq. (5)

Where: LE_y = Leakage emissions in year y (tCO₂)

$LE_{MeOH,y}$ = Leakage emissions associated with production of methanol used in biodiesel production in year y (tCO₂)

$LE_{BR,y}$ = Leakage emissions from displacement of existing uses of waste oil/fat or biomass residues in year y (tCO₂)

$LE_{FF,y}$ = Leakage related to the avoided production of fossil fuel in year y (tCO₂)

1. Leakage emissions from displacement of existing uses of waste oil/fat or biomass residues.

Leakage emissions from the diversion of existing applications of waste oil/fat and/or biomass residues are estimated in accordance with the methodological tool: “Project and leakage emissions from biomass”.

But there are no existing applications of waste oil/fat so (LE_{BR}) is negligible.

$$LE_{BR}=0$$

2. Leakage emissions associated with production of methanol/chemicals used in biofuel production.

Leakage effects due to the upstream emissions for the methanol production may be disregarded if the leakage due to the avoided production of fossil fuel (including production of crude oil and refining of crude oil) is also disregarded. Otherwise, the leakage emissions due to the production of methanol used in the esterification process shall be calculated as follows:

$$LE_{MeOH,y} = MC_{MeOH,y} \times EF_{MeOH,PC}$$

Eq. (6)

Where:

$LE_{MeOH,y}$ = Leakage emissions associated with production of methanol used in biodiesel production in year y (tCO₂)

$MC_{MeOH,y}$ = Quantity of methanol consumed in the biodiesel plant, including spills and evaporation on-site in year y (t MeOH)

$EF_{MeOH,PC}$ = Pre-combustion (i.e. upstream) emissions factor for methanol production (tCO₂/t MeOH)

There are no Leakage emissions from displacement of existing uses of waste oil/fat or biomass residues so $LE_{BR,y}$ is not applicable.

3. Leakage related to the avoided production of fossil fuel

The substitution of fossil fuels by biofuel reduces indirect (“upstream”) emissions associated with the production of fossil fuels ($LE_{FF,y}$) and is treated as negative leakage¹⁵ and can be calculated based on the default emission factors included in the methodological tool “Upstream leakage emissions associated with fossil fuel use”, as follows:

$$LE_{FF,y} = BF_y \times \sum_x \sum_i \sum_j NCV_{BF,y} \times EF_{i,j,x,y}$$

Eq. (7)

Where:

¹⁵ Emission reduction from reducing international bunker fuel consumption is not eligible under CDM as per EB 25 report, paragraph 58.

$LE_{FF,y}$ = Leakage related to the avoided production of fossil fuel in year y (tCO₂)

BF_y = Quantity of biofuel eligible for crediting in year y (t)

$NCV_{BF,y}$ = Net calorific value of biofuel produced in year y (GJ/t)

$EF_{i,j,x,y}$ = Emission factor for upstream emissions stage i associated with consumption of fossil fuel type x from fossil fuel origin j applicable to year y (t CO₂e/TJ)

Emission reduction

The emission reductions achieved by the project activity shall be calculated as the difference between the baseline emissions and the sum of the project emissions and leakage.

$$ER_y = BE_y - \text{MAX}(PE_y + LE_y, 0) \quad \text{Equation (1)}$$

Where:

ER_y = Emission reductions in the year y (t CO₂e)

BE_y = Baseline emissions during the year y (t CO₂)

PE_y = Project emissions in year y (t CO₂e)

LE_y = Leakage emissions in year y (t CO₂e)

5.4 Estimated Net GHG Emission Reductions and Removals

Baseline emissions:

$$BE_y = BF_y \times NCV_{BF,y} \times EF_{CO_2, FF}$$

With,

$$BF_y = \left[\min \left\{ (P_{BF,y} - P_{BF,on-site,y}); \left(\sum_i f_{PJ,i,y} \times C_{BF,i,y} \right) \right\} - P_{BF,other,y} \right] \times \left[\frac{\sum_i C_{BF,i,y} \times \left(\frac{f_{PJ,i,y} - f_{reg,y}}{f_{PJ,i,y}} \right)}{\sum_i C_{BF,i,y}} \right]$$

Production Per day (KL/D)	500
Production Per day (TPD)	440
CUF	80%
No of working days in a month	25
Production Per Year (T) $PB_{F,y}$	105,600

Quantity of biofuel produced in the project plant in year y $PB_{F,y} = 105,600$ T

Quantity of biofuel consumed at the project plant $PB_{F,on-site,y} = 3,168$ T

Fraction of biofuel in the blended biofuel type B100 in year y $f_{PJ,B100,y} = 100\%$

Quantity of biofuel type B100 consumed/sold/blended in year $CB_{F,100,y} = 105,600$ T

Quantity of biofuel that is either produced with alcohols other than methanol from fossil origin or produced using feedstock or waste oil(s)/fat(s) other than those eligible under this methodology according to the applicability conditions $PB_{F,other,y} = 0$ T (because no biofuel is produced with alcohols other than methanol).

Fraction of biodiesel in the blended biodiesel which is required by mandatory regulations of the host country in year y (ratio) = 7%

Net calorific value of biofuel produced $NCV_{BD,y} = 38.4$ GJ / t (From Lab test).

Carbon dioxide emissions factor for displaced fossil fuel (tCO₂/GJ) $EF_{CO_2,FF} = 0.0741$.

Quantity of biofuel eligible for crediting in year y (t) $BF_y = 95,262.76$ T

$BE_y = 95,262.76 * 38.4 * 0.0741$.

$BE_y = 271,061$ tCO₂e (Round down value)

Project emissions:

$$PE_y = PE_{Biomass,y} + AF_{1,y} \times PE_{MeOH}$$

Allocation factor for the production of biofuel in year y $AF_{1,y} = 1$

1. Project emissions associated with the biomass and biomass residues ($PE_{Biomass,y}$)

No biomass is being used in the project so $PE_{Biomass,y}$ is not applicable.

$$PE_{Biomass,y} = 0$$

2. Project emissions from fossil carbon in the biodiesel due to the use of methanol from fossil origin in the esterification process ($PE_{MeOH,y}$)

$$PE_{MeOH,y} = MC_{MeOH,y} \times EF_{C,MeOH} \times \frac{44}{12}$$

Quantity of methanol consumed in the biodiesel plant, including spills and evaporations on-site in year y (tMeOH) $MC_{MeOH,y} = 15,600$ T

Carbon emissions factor of methanol, based on molecular weight $EF_{C,MeOH} = 0.375$

Project emissions from fossil carbon in the biodiesel due to esterification with methanol of fossil origin $PE_{MeOH,y} = 21,450$.

$PE_y = 0 + 21,450 * 1$

$PE_y = 21,450$ tCO₂e (Round up value)

Leakage emissions:

$$LE_y = LE_{MeOH,y} + LE_{BR,y} - LE_{FF,y}$$

$$LE_{MeOH,y} = MC_{MeOH,y} \times EF_{MeOH,PC}$$

Quantity of methanol consumed in the biodiesel plant, including spills and evaporation on-site

$$MC_{MeOH,y} = 15,600 \text{ T}$$

Pre-combustion (i.e. upstream) emissions factor for methanol production $EF_{MeOH,PC} = 1.95$

Leakage emissions associated with production of methanol used in biodiesel production $LE_{MeOH,y} = 15,600 * 1.95$

$$LE_{MeOH,y} = 30,420 \text{ tCO}_2$$

There are no Leakage emissions from displacement of existing uses of waste oil/fat or biomass residues so $LE_{BR,y}$ is not applicable. $LE_{BR,y} = 0$

$$LE_{FF,y} = BF_y \times \sum_x \sum_i \sum_j NCV_{BF,y} \times EF_{i,j,x,y}$$

Quantity of biofuel eligible for crediting $BF_y = 95,262.76 \text{ T}$

Net calorific value of biofuel produced $NCV_{BF,y} = 38.40 \text{ GJ/t}$

Emission factor for upstream emissions stage i associated with consumption of fossil fuel type x from fossil fuel origin j applicable $EF_{i,j,x,y} = 5.244 \text{ tCO}_2\text{e/TJ}$

Leakage related to the avoided production of fossil fuel $LE_{FF,y} = 19,182.82 \text{ tCO}_2\text{e}$

$$LE_y = 30,420 + 0 - 19,182.82$$

$$LE_y = 11,238 \text{ tCO}_2\text{e (Round up value)}$$

According to the methodology ACM0017, version 4.0 para 49, if leakage emissions are less than zero, consider it as zero.

Hence,

$$LE_y = 11,238 \text{ tCO}_2$$

Emission reductions

Emission reductions are calculated as follows:

$$ER_y = (BE_y - PE_y - LE_y) \quad \text{Eq. (8)}$$

Where:

ER_y = Emission reductions in year y (tCO₂)

BE_y = Baseline emissions in year y (tCO₂)

PE_y = Project emissions in year y (tCO₂)

LE_y = Leakage emissions in year y (tCO₂)

$$ER_y = 271,061 - 21,450 - 11,238$$

$$ER_y = 238,373 \text{ tCO}_2\text{e (Round down value)}$$

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
15-Sept-2020 to 31-Dec-2020	79,059	6,256	3,278	69,525
01-Jan-2021 to 31-Dec-2021	271,061	21,450	11,238	238,373
01-Jan-2022 to 31-Dec-2022	271,061	21,450	11,238	238,373
01-Jan-2023 to 31-Dec-2023	271,061	21,450	11,238	238,373
01-Jan-2024 to 31-Dec-2024	271,061	21,450	11,238	238,373
01-Jan-2025 to 31-Dec-2025	271,061	21,450	11,238	238,373
01-Jan-2026 to 31-Dec-2026	271,061	21,450	11,238	238,373
01-Jan-2027 to 14-Sept-2027	192,002	15,194	7,960	168,848
Total	1,897,427	150,150	78,666	1,668,611
No. of years			7	
Average	271,061	21,450	11,238	238,373

6 MONITORING

6.1 Data and Parameters Available at Validation

Data / Parameter	NCV _{FF}
Data unit	GJ/t
Description	Net calorific value of fossil fuel (diesel) displaced
Source of data	2006 IPCC Guidelines

Value applied:	43
Justification of choice of data or description of measurement methods and procedures applied	Default value has been taken from 2006 IPCC Guidelines
Purpose of Data	NA
Comments	NA

Data / Parameter	$EF_{CO_2, FF}$
Data unit	tCO ₂ /GJ
Description	Carbon dioxide emissions factor for fossil fuel displaced
Source of data	2006 IPCC Guidelines
Value applied:	0.0741
Justification of choice of data or description of measurement methods and procedures applied	Default value has been taken from 2006 IPCC Guidelines
Purpose of Data	For Baseline emission calculation
Comments	NA

Data / Parameter	$EF_{i,j,x,y}$
Data unit	tCO _{2e} /TJ
Description	Emission factor for upstream emissions stage i associated with consumption of fossil fuel type x from fossil fuel origin j applicable to year y
Source of data	Tool “Upstream leakage emissions associated with fossil fuel use”

Value applied:	5.244
Justification of choice of data or description of measurement methods and procedures applied	Tool “Upstream leakage emissions associated with fossil fuel use” has been used to get value.
Purpose of Data	For leakage emissions calculation
Comments	NA

Data / Parameter	EF_{C,MeOH}
Data unit	tC/t MeOH
Description	Carbon emission factor of methanol, based on molecular weight
Source of data	Methodology ACM0017: Production of biofuel --- Version 4.0
Value applied:	0.375
Justification of choice of data or description of measurement methods and procedures applied	In line with the ACM0017: Production of biofuel --- Version 4.0
Purpose of Data	For project emissions calculation
Comments	Not Applicable

Data / Parameter	EF_{MeOH_PC}
Data unit	tCO ₂ /t MeOH
Description	Pre combustion (i.e. upstream) emissions factor for methanol production
Source of data	Apple 1998: and 2006 IPCC Guidelines
Value applied:	1.95

Justification of choice of data or description of measurement methods and procedures applied	In line with the ACM0017: Production of biofuel -- Version 4.0
Purpose of Data	For leakage emissions calculation
Comments	Based on 30 GJ/t energy requirement and average of IPCC emissions factors for natural gas and diesel oil

6.2 Data and Parameters Monitored

Data / Parameter	$f_{PJ,i,y}$
Data unit	Ratio
Description	Fraction of biodiesel in the blended diesel from the project activity, with blending ratio i , in year y
Source of data	Records from blending operations
Description of measurement methods and procedures applied	NA
Frequency of monitoring/recording	Annually
Value applied:	100%
Monitoring equipment	NA
QA/QC procedures applied	NA
Purpose of data	Calculation of baseline emissions
Calculation method	Equation (2)
Comments	Till now there is no blending at project activity

Data / Parameter	$f_{reg,y}$
Data unit	Ratio
Description	Fraction of biodiesel in the blended biodiesel which is required by mandatory regulations of the host country in year y
Source of data	Regulations in the Host Country (National Policy on Biofuels) ¹⁶
Description of measurement methods and procedures applied	NA
Frequency of monitoring/recording	Annually
Value applied:	7%
Monitoring equipment	Records from blending operations
QA/QC procedures applied	During the process of creating the blended biodiesel at the blending station, the blending operation shall be monitored to assure adequate mixing of the products in the correct proportions.
Purpose of data	Calculation of baseline emissions
Calculation method	Equation (2)
Comments	NA

Data / Parameter	$MP_{Glyc,y}$
Data unit	t
Description	Amount of by-product glycerol produced during plant operation
Source of data	Plant Record

¹⁶ <https://mopng.gov.in/en/refining/bio-diesel#:~:text=On%2010.08.,consumers%20for%20blending%20with%20diesel.>

Description of measurement methods and procedures applied	Weighbridge to measure the weight of produced by-product
Frequency of monitoring/recording	Annually
Value applied:	15,800
Monitoring equipment	Weighbridge
QA/QC procedures applied	Weighbridge will be calibrated once in year and Measured amounts to be crosschecked against mass balance of the biofuel production unit
Purpose of data	NA
Calculation method	NA
Comments	This monitored parameter is used to meet the applicability condition “The by-product (e.g. glycerol) is not disposed of or left to decay. It should be either incinerated or used as raw material for industrial consumption or sold”

Data / Parameter	MU _{Glyc,y}
Data unit	t
Description	Amount of by-product (e.g. glycerol) incinerated or sold or used
Source of data	Plant Record
Description of measurement methods and procedures applied	Weighbridge will be calibrated once in year and to measure the weight of produced by-product
Frequency of monitoring/recording	Annually
Value applied:	15,800
Monitoring equipment	All quantity of produced glycerol must be monitored

QA/QC procedures applied	All produced by-product cross checked by sales data or internal records
Purpose of data	NA
Calculation method	NA
Comments	This monitored parameter is used to meet the applicability condition “The by-product (e.g. glycerol) is not disposed of or left to decay. It should be either incinerated or used as raw material for industrial consumption or sold”

Data / Parameter	$P_{BF,y}$
Data unit	t
Description	Quantity of biofuel produced in the project plant in year y
Source of data	on-site measurements by project participants
Description of measurement methods and procedures applied	Weighbridge will be calibrated once in year and to measure the weight of produced biofuel
Frequency of monitoring/recording	All produced biofuel must be metered every day
Value applied:	105,600
Monitoring equipment	Weighbridge
QA/QC procedures applied	<i>Cross check production and consumption data with sales records and pant records</i>
Purpose of data	Calculation of Baseline emissions
Calculation method	Equation (2)
Comments	NA

Data / Parameter	PBF _{,on-site,y}
Data unit	t
Description	Quantity of biofuel consumed at the project biofuel production plant and/or the oil production plant(s) in year y
Source of data	Metering system at fueling station
Description of measurement methods and procedures applied	Weighbridge will be calibrated once in year and weighbridge is used to record the quantity of biofuel consumed.
Frequency of monitoring/recording	All consumed biofuel must be metered every day
Value applied:	3,168
Monitoring equipment	Metering system at fueling station
QA/QC procedures applied	Cross check production and consumption data with sales records and pant records
Purpose of data	Calculation of Baseline emissions
Calculation method	Equation (2)
Comments	Not Applicable

Data / Parameter	PBF _{,other,y}
Data unit	tonnes
Description	Quantity of biofuel that is either produced with other alcohols than methanol from fossil origin or that is produced using other feedstock or waste oil(s)/fat(s) than those eligible under this methodology according to the applicability conditions
Source of data	Metering system at fueling station

Description of measurement methods and procedures applied	Measurements are undertaken using calibrated meters at production site
Frequency of monitoring/recording	Annually
Value applied:	0
Monitoring equipment	Continuous recording of filling consumers' stationary combustion installations or vehicles
QA/QC procedures applied	Cross check production and consumption data
Purpose of data	For baseline emissions calculation
Calculation method	Equation 2
Comments	NA

Data / Parameter	$CB_{F,i,y}$
Data unit	t
Description	Quantity of blended biofuel with blending ratio i , consumed by the captive user in year y
Source of data	Metering system at fueling station
Description of measurement methods and procedures applied	Use calibrated measurement equipment that is maintained regularly and checked for proper functioning
Frequency of monitoring/recording	Annually
Value applied:	105,600
Monitoring equipment	Continuous recording of filling consumers' stationary combustion installations or vehicles
QA/QC procedures applied	Cross check production and consumption data with sales records and pant records

Purpose of data	Baseline emissions
Calculation method	Equation (2)
Comments	NA

Data / Parameter	$NCV_{BF,y}$
Data unit	GJ/t
Description	Net calorific value of biofuel produced in year y
Source of data	Time to time Laboratory analysis
Description of measurement methods and procedures applied	Laboratory analysis
Frequency of monitoring/recording	Annually
Value applied:	38.4
Monitoring equipment	Laboratory report
QA/QC procedures applied	Check consistency of measurements and local / national data with default values by the IPCC. If the values differ significantly from IPCC default values range, possibly collect additional information or conduct measurements
Purpose of data	Calculation of Baseline emissions
Calculation method	Equation (1 and 7)
Comments	NA

Data / Parameter	$MC_{MeOH,y}$
Data unit	tMeOH

Description	Quantity of methanol consumed in the biofuel plant, including spills and evaporations on-site in year y
Source of data	Plant record
Description of measurement methods and procedures applied	Weighbridge will be calibrated once in a year weighbridge is used to record the quantity of methanol consumed.
Frequency of monitoring/recording	monthly
Value applied:	15,600
Monitoring equipment	Weighbridge
QA/QC procedures applied	Crosscheck against methanol purchase receipts and calculated stoichiometric requirements
Purpose of data	Calculation of <i>Project emissions</i>
Calculation method	Equation (6)
Comments	NA

Data / Parameter	$AF_{1,y}$
Data unit	Fraction
Description	Allocation factor for the production of biofuel n year y
Source of data	TOOL 25 version 03.0 “Apportioning emissions from production processes between main product and co and by-product”
Description of measurement methods and procedures applied	Calculated Using Tool “Apportioning emissions from production processes between main product and co and by-product”
Frequency of monitoring/recording	Annually
Value applied:	1

Monitoring equipment	NA
QA/QC procedures applied	NA
Purpose of data	Project emissions
Calculation method	Equation (3)
Comments	NA

6.3 Monitoring Plan

The project is constructed and operated by Kotyark Industries Limited and is designated to produce biodiesel with capacity of 500 KL per day from the feedstock to produce biodiesel, from the waste oil / fat. The distribution system starts from collection of waste oil / fat to the plant facility with the help of tankers. The waste oil / fat along with methanol & catalyst is processed during transesterification. The pure biodiesel produced is consumed in plant & for other stationary applications whereas some part of the biodiesel is blended by Oil manufacturing companies in line with the National Policy on Biofuels. The end users of the blended biodiesel include bulk consumers having transport applications.

Monitoring equipment:

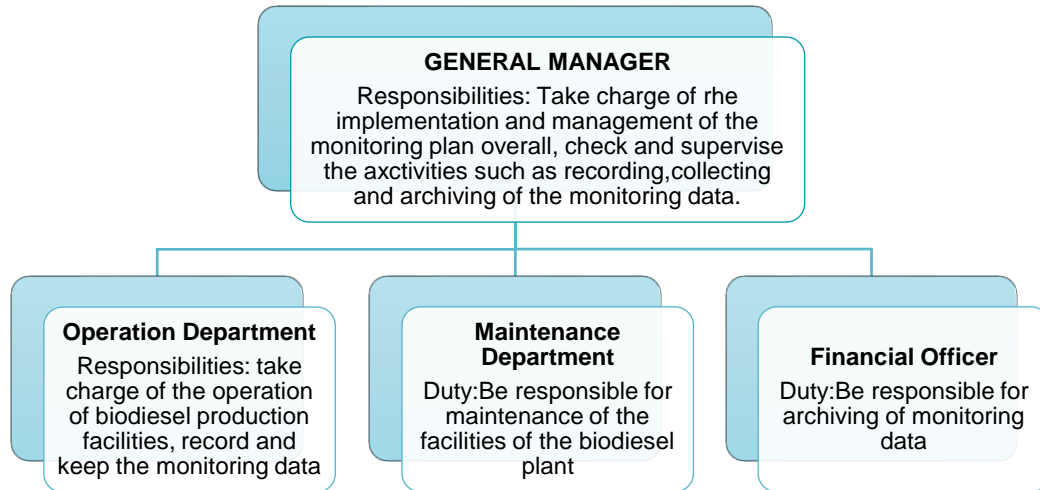
Weigh Bridge

The amount of waste oil/fat, fuel and methanol consumed for biodiesel production, the amount of biodiesel and byproduct glycerol produced and sold will be measured by weighing meter at the biodiesel plant and Weighbridge will be calibrated once in a year. All the monitored values have been crosschecked by plant records.

Monitoring management structure

In order to obtain reliable monitoring data, the project owner will establish a monitoring management structure prior to the start of the crediting period. Clear responsibilities will be assigned to all staffs involved in the project activity. A general Manager will be appointed who has the overall responsibilities for the monitoring of the project, other staffs will be responsible for the data recording, data collecting, data archiving and emission reduction calculation.

The detailed structure is as follows:



The monitoring process are as follows:

- The designated persons read the meters and record the data according to requirements described and then collect and submit the data on a monthly basis.
- The general manager is in charge of checking the accuracy and completeness of the collected data.
- The financial office is responsible of archiving the data and sale receipts.
- All the relevant data records will be kept by the project owner during the crediting period and two years after the end of crediting period.

Quality control

1. Calibration of Weigh Bridge

The calibration of Weigh Bridge will be conducted in accordance with national regulations by a qualified entity to ensure the accuracy. The Weigh Bridge will be calibrated once in years.

2. Emergency treatment

When the meter breaks down, the project owner should inform the qualified calibration organization to check, calibrate, test and treat the meter so as to recover the normal monitoring site.

3. Data management

All monitoring data and records will be archived electronically and be kept at least for 2 years after the end of crediting period.

4. Training program

The project developer will organize at least 1 training in a year regarding operational regulations, quality control (QC), data monitoring and data management regulation etc.

Methods used for measuring and recording of the parameters of the Project:

Quantity of total waste oil/fat received at site is weighed in the weighbridge and recorded in the logbook monthly.

Quantity of biofuel produced at the plant is weighbridge and recorded in the logbook monthly.

Quantity of biofuel combusted at site recorded in the logbook.

Policies:

Logbook helps you manage and document critical processes while maintaining a simple interface that ensures consistency of documentation and compliance QA/QC procedures.

Calibration helps to assure and optimize the control parameters affecting the production process, thereby enhancing the quality of this process. Calibration plays a pivotal role in the implementation and maintenance of international quality systems.

The quality assurance and quality control over the data monitored will be done by the manager as follows:

- The monitored data will be verified for the completeness and consistency.
- It will be ensured that the plant personnel receive adequate training
- It will be ensured that the equipment in the project activity undergo periodic maintenance as recommended by the manufacturer.
- It will be ensured that the monitoring instruments are calibrated as per the specified frequency.
- It will be ensured that there is an adequate storage of the data monitored. Any non-conformance will be identified and a corrective action will be taken.

Internal Audit:

Internal Audit is a department or organization within a company tasked with providing unbiased, independent reviews of systems, business organizations, and processes. The role of an internal audit department is to provide senior leaders and governing bodies of an organization with an objective source of information. An internal audit should have four general phases of activities— Planning, Fieldwork, Reporting, and Follow-up.

Material balance: Mass balance / material balance is an application of conservation of mass to the analysis of physical systems. By accounting for material entering and leaving a system, mass flows can be identified which might have been unknown, or difficult to measure without this technique. The mass balance is as follows:

Input	Out put
Waste oil 84 % Methanol 18.5 % Catalyst 0.2%	Bio-diesel 86% Glycerol 14 %

7 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

7.1 Data and Parameters Monitored

Data / Parameter	$P_{BF,y}$
Data unit	t
Description	Quantity of biofuel produced in the project plant in year y
Value applied:	23,378.486
Comments	NA

Data / Parameter	$P_{BF,on-site,y}$
Data unit	t
Description	Quantity of biofuel consumed at the project plant(s) (biofuel production and/or feedstock processing) in year y (t)
Value applied:	435.360
Comments	NA

Data / Parameter	$C_{BF i,y}$
Data unit	t
Description	Quantity of biofuel (Biodiesel) consumed /sold/blended for year y
Value applied:	22,943.126

Comments	NA
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Data / Parameter	$P_{DBF,other,y}$
Data unit	t
Description	Biofuel that is either produced with alcohols other than methanol for year y
Value applied:	0
Comments	NA

Data / Parameter	B_{Fy}
Data unit	t
Description	Quantity of biofuel eligible for crediting for year y
Value applied:	22,943.126
Comments	NA

Data / Parameter	BE_y
Data unit	t CO _{2e}
Description	Baseline emissions during the year y
Value applied:	65,283
Comments	NA

Data / Parameter	PE _{Biomass,y}
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Data unit	tCO ₂ e
Description	Project emissions associated with the biomass and biomass residues in year y
Value applied:	0
Comments	NA

Data / Parameter	MC _{MeOH}
Data unit	t
Description	Quantity of methanol consumed in the biodiesel plant, including spills and evaporations on-site in year y
Value applied:	3,718.430
Comments	NA

Data / Parameter	PE _{MeOH, y}
Data unit	t CO ₂ e
Description	Project emissions from fossil carbon in the biodiesel due to the use of methanol in year y
Value applied:	5,092.390
Comments	NA

Data / Parameter	AF ₁
Data unit	NA
Description	Allocation factor

Value applied:	0.938
Comments	NA

Data / Parameter	PE _y
Data unit	tCO ₂ e
Description	Project emissions during the year y
Value applied:	4,777
Comments	NA

Data / Parameter	LE _{MeOH,y}
Data unit	t CO ₂ e
Description	Leakage emissions by production of methanol used in biodiesel production for year y
Value applied:	7,250.939
Comments	NA

Data / Parameter	LE _{BR,y}
Data unit	tCO ₂ e
Description	Leakage emissions from displacement of existing uses of waste oil/fat for year y
Value applied:	0
Comments	NA

Data / Parameter	$LE_{FF,y}$
Data unit	t CO _{2e}
Description	Leakage related to the avoided production of fossil fuel for year y
Value applied:	4,620.048
Comments	NA

Data / Parameter	LE_y
Data unit	tCO _{2e}
Description	Leakage emissions in year y
Value applied:	2,631
Comments	According to the methodology para 49, if leakage emissions are less than zero, consider it as zero.

Data / Parameter	ER_y
Data unit	tCO _{2e}
Description	Emission reductions in year y
Value applied:	57,874
Comments	According to the methodology para 49, if leakage emissions are less than zero, consider it as zero.

7.2 Baseline Emissions

Baseline emissions

Based on equation (2) of section 5.1, the baseline emissions are calculated as follow:

$$BF_y = \left[\min \left\{ (P_{BF,y} - P_{BF,on-site,y}); \left(\sum_i f_{PJ,i,y} \times C_{BF,i,y} \right) \right\} - P_{BF,other,y} \right] \times \left(\frac{\sum_i C_{BF,i,y} \times \left(\frac{f_{PJ,i,y} - f_{reg,y}}{f_{PJ,i,y}} \right)}{\sum_i C_{BF,i,y}} \right)$$

$$BF_y = 22,943.126 \text{ tons}$$

Thus,

$$BE_y = BF_y \times NCV_{BF,y} \times EF_{CO2,FF}$$

$$BE_y = 22,943.1 \times 38.4 \times 0.0741 = 65,283 \text{ tCO}_2\text{e (Round down value)}$$

7.3 Project Emissions

Based on equation (3) in section 5.2, the baseline emissions are calculated as follow:

$$PE_y = PE_{Biomass,y} + AF_{1,y} \times PE_{MeOH}$$

$$PE_{Biomass,y} = 0$$

$$AF_{1,y} = 0.938,$$

$$PE_{MeOH} = 5,092.390$$

$$PE_y = 0 + 0.938 \times 5,092.390$$

$$PE_y = 4,777 \text{ tCO}_2\text{e (Round up value)}$$

7.4 Leakage

$$LE_y = LE_{MeOH,y} + LE_{BR,y} - LE_{FF,y}$$

$$LE_y = 7,250.939 + 0 - 4,620.048$$

$$LE_y = 2,631 \text{ tCO}_2\text{e (Round up value)}$$

7.5 Net GHG Emission Reductions and Removals

Based on equation (8) in section 5.4, the baseline emissions are calculated as follow:

$$ER_y = (BE_y - PE_y - LE_y)$$

$$ER_y = 65,283 - 4,777 - 2,631$$

$$ER_y = 57,874 \text{ tCO}_2\text{e (Round down)}$$

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
15-Sept.-2020 to 31-Dec.-2020	6,726	853	819	5,053
01-Jan.-2021 to 31-Dec.-20201	43,726	3,125	1,649	38,952
01-Jan.-2022 to 31-March-2022	14,831	799	163	13,869
Total	65,283	4,777	2,631	57,874

<u>Ex-ante emissions reductions/removals</u>	<u>Achieved emissions reductions/removals</u>	<u>Percent difference</u>	<u>Justification for the difference</u>
367,682 tCO ₂ e	57,874 tCO ₂ e	- 84.26 %	The achieved emissions reductions are less in comparison to ex ante emissions reductions during the current monitoring period due to less market demand and Indian transporters hesitate to adopt ¹⁷ it. Oil manufacturing companies purchase biodiesel from producers based on market demand & requirement.

¹⁷ <https://www.thehindubusinessline.com/economy/logistics/biodiesel-a-renewable-environment-friendly-fuel-faces-slow-adoption-in-india/article67318323.ece#:~:text=India's%20annual%20biodiesel%20consumption%20grew,140%20million%20litres%20in%202021.>

APPENDIX X: <TITLE OF APPENDIX>

Use appendices for supporting information. Delete this appendix (title and instructions) where no appendix is required.