



**TETRA TECH**  
International Development



Tetra Tech International Development

# MAD-01 Dry Waste Collecting Boats for the Coastal Towns of Madagascar

## Mini Fiche

July 2022



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# 1. Introduction

## Project summary information

|                                       |   |
|---------------------------------------|---|
| <b>Name of the project</b>            | Dry Waste Collecting Boats for the Coastal Towns of Madagascar  |
| <b>Location</b>                       | Madagascar  |
| <b>Promoter</b>                       | Cluster: Committee de coordination intersectionnelle sur l'economie bleue<br>Under aegis of Directeur Général de l'Economie Bleue<br>Ministère de la Pêche et de l'Economie Bleue (MPE) |
| <b>Sectors concerned</b>              | Solid waste management, maritime waste, circular economy.   |
| <b>Main components of the project</b> | Introduction/improvement of waste collection, closing of illegal dumpsites,<br>Support and promotion of recycling and composting.   |
| <b>Estimated budget</b>               | EUR 55 million  |
| <b>Current population</b>             | 24 million inhabitants (the entire country's population).<br>This project focuses on 2.8 million urban citizens in 13 coastal provinces.  |
| <b>Contact persons</b>                | Ministère de la Pêche et de l'Economie Bleue (MPEB)   |

Figure 1: Project location



## 2. Key Institutions and Planning Framework

|  |   |
|--|---|
| Key Institutions                                     | <p>Government Agencies responsible for guidance on waste legislation are :</p> <ol style="list-style-type: none"> <li>1) Ministry of Fishery and Blue Economy</li> <li>2) Ministry of Water Energy and Hydrocarbons (MWEH) <a href="http://www.mineau.gov.mg/">http://www.mineau.gov.mg/</a></li> <li>3) Ministry of State in charge of Presidential Projects of Spatial Planning and equipment (MSPPSPE) (Technical supervision) <a href="http://www.mepate.gov.mg">http://www.mepate.gov.mg</a></li> <li>4) The Ministry of Environment and Sustainable Development (<a href="http://www.medd.gouv.cd">www.medd.gouv.cd</a>)</li> </ol>   |
| Planning framework (key policies, strategies, plans) | <ul style="list-style-type: none"> <li>• Charte de l'environnement Malagasy, Loi 2015-003 ;</li> <li>• Law No. 99-021 of 19/08/1999 on the Management and Control of Industrial Pollution Policy;</li> <li>• Law No. 88-022 of 20 January 1999 Basel Convention on the Control of Transboundary Movements of hazardous wastes and their disposal;</li> <li>• Decree N ° 2012-753 of 07/08/12 prohibiting the import of waste under the Basel Convention until the installation of appropriate treatment centers;</li> <li>• Decree No. 2012-754 of 07/08/12 laying down the management procedure for end-of-life products, sources of waste and hazardous waste harmful to the environment as part of the implementation of the Basel Convention;</li> <li>• Decree N ° 2012-900 of 23/01/13 prohibiting the importation, distribution, sale, use and reduction of some pesticide active ingredients in agriculture and chemicals in the industrial sector in the context of the application of the Rotterdam Convention and the Stockholm;</li> <li>• Decree N ° 2006-680 of 12/09/2006 adopting the National Policy of Waste Management of Care and Safety of Injections Guidance for MSW management.</li> </ul> <p>Only a few projects with small capacities have been implemented or are ongoing in reducing/preventing plastic pollution and segregation of waste as follows:</p> <ul style="list-style-type: none"> <li>• (<a href="http://www.malio.mg">www.malio.mg</a>) in Toliara (dormant) ;</li> <li>• Société de Production d'Articles Hygiéniques (S.P.A.H) S.A. (<a href="http://www.spah-madagascar.com">www.spah-madagascar.com</a>);</li> <li>• SMTP Plastics: LDPE Pipes, tanks;</li> <li>• SACOPLAST Plastics : LDPE, HDPE, PP Bags, sachets ;</li> <li>• VITAPLAST Plastics : LDPE, HDPE, PP Sachets, buckets ;</li> <li>• Impact Madagascar ;</li> <li>• Association TAFITA in the city of Ambohimambola produce 12 tons/per year of compost;</li> <li>• FAKOFIA in the city of Fianarantsoa produces 1800 tonnes/per year of compost;</li> <li>• M'IHARISOA Plastics : PET Self-locking pavers;</li> <li>• MADACOMPOST Society in the cities of Mahajanga and Toliara produces self-locking pavers and more than 1500-2000 Tonnes/per year of compost;</li> <li>• Climate and Clean Air Coalition Municipal Solid Waste Initiative <a href="http://waste.ccacoalition.org">http://waste.ccacoalition.org</a> (limited to Antananarivo).</li> </ul> |
| Capabilities   | <p>Due to the geographic and demographic situation, the focus of Solid Waste Management (SWM) is clearly on the capital Antananarivo. Little is known about the SWM capabilities of the coastal towns with no information currently available. In the town of Toliara the Non-Government Organisation (NGO) <a href="http://www.malio.mg">www.malio.mg</a> was successfully carrying out a solid waste collection project, but this was not completed due to permit issues.</p>   |

### 3. Assessment of the current situation and needs

All following figures originate from various sources of different Ministries:

In Madagascar, the predicted year 2025 average amount of solid waste per capita in urban areas is estimated to be 1.1 kg/day. Approximately 18% of the waste is collected and 97% of this is deposited in dumpsites/landfills. Thus, currently only 3% of the collected waste is re-used/recycled.

It is estimated that over 80% of the municipal waste in coastal towns is not collected and is washed to the ocean.

Considering a ratio of 10% plastic in domestic waste and a coastal urban population of about 2.8 million people, annually an amount of 112 000 tonnes of plastic could be prevented from entering the ocean.

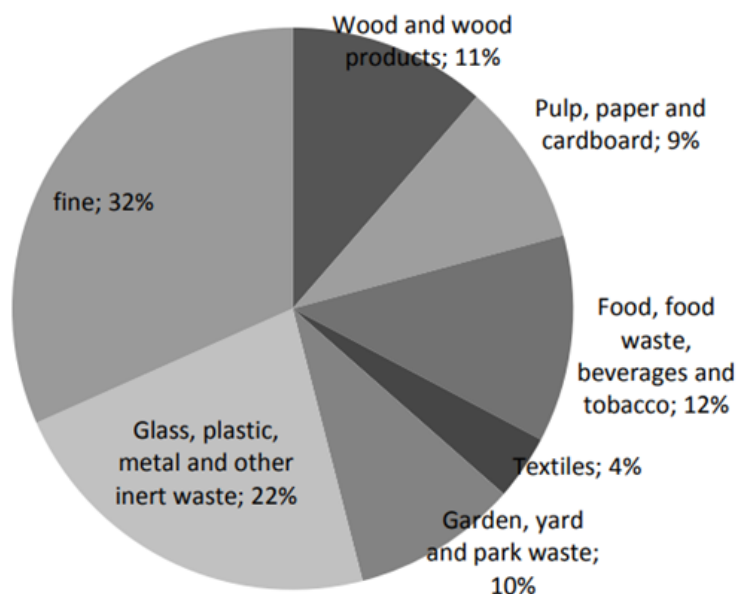
It is estimated that around 12% of the solid waste are dumped indiscriminately onto wastelands, bare lands and waterbodies.

97% of municipal and commercial waste is landfilled – mostly in informal dumpsites- and the recycling rate is very low.

The collection and transportation of domestic waste is well organized only in the capital Antananarivo. The Autonomous Maintenance Service of the City of Antananarivo (SAMVA) under the Ministry of Environment is responsible for the operation of the only legal landfill site in Madagascar.

The latest solid waste composition in Figure 2 shows that 54% domestic waste is biodegradable which creates high potential for recovery through composting.

**Figure 2: Domestic waste composition (Solid Waste characterisation by IRD France, 2010)**



## 4. Scope of the project and type of investment measures to be implemented

### 4.1 Project objectives

The proposed project focuses on the urban population of the 13 regions bordering the ocean. Thus about 2.8 million people shall be served, from which 1.4 million live on each coast side: east & west. (see Table 1). Secondary cities have not been taken into consideration in prior phases. These regions must cover long distances over poor roads to the capital, where recycling infrastructure is existing- but do have operational harbour structures. Therefore, a collection boat is proposed in the west- and in the east-coast, serving the harbour towns, collect the dry waste only and transport it to the two bigger ports of Toamasina and most probable Mahajanga, where the dry waste shall be further processed and recycled.

The dry waste should consist of paper, cardboard, glass, plastics, marine litter and electronic waste as per Figure 2 and Table 1 with a total amount of 962 tonnes /day (as per yellow-highlighted table 1 columns). The non-recoverable residues will be deposited in small safely constructed landfills.

The wet waste with a total amount of 1 700 tonnes/day (as per the green-highlighted table 1 column) should remain on land and be processed to compost in simple composting facilities with a capacity of about 50 to 150 tonnes/day. This could be offered to local farmers in this agriculture-dominated land. It should be considered to add digestate from anaerobic digestion of faecal sludge from some of the sanitation projects/programmes.

Based on a Food and Agricultural Organisation (FAO) source with an average of 4.6 persons per household a segregation at source in about 600 000 households needs to be introduced with a comprehensive awareness campaign. As an incentive, all participating households shall be equipped with a 2-bin system (wet & dry). The current local collection and transportation system could not be regarded in depth within this Fiche as too many towns are concerned. It is trusted that existing structures and facilities will be used. Their capacity might need to increase. This shall be identified in detail during a Feasibility Study.

**Table 1: Daily Waste Generation in the urban coastal regions of Madagascar**  
(Population Source=Nat. Statistic Institute)

| Region                | population urban 2018 | annual pop. growth(%) | Pop. Urban 2023  | total daily waste generation with 1.1kg/d (ton) | pulp, paper, cardboard 9% | wood products 11% | textiles 4% | glass, plastic, metal and other inert waste 22% | Organic/ biowaste 54% |
|-----------------------|-----------------------|-----------------------|------------------|---|---------------------------|-------------------|-------------|---|-----------------------|
| <b>East Coast</b>     |                       |                       |                  |   |                           |                   |             |   |                       |
| Analanjirofo          | 181 983               | 2.63                  | 205 914          | 227   | 20                        | 25                | 9           | 50  | 122                   |
| Androy                | 86 317                | 2.6                   | 97 538           | 107   | 10                        | 12                | 4           | 24  | 58                    |
| Anosy                 | 130 600               | 2.6                   | 147 578          | 162   | 15                        | 18                | 6           | 36  | 88                    |
| Atsinanana            | 407 358               | 2.59                  | 460 111          | 506   | 46                        | 56                | 20          | 111   | 273                   |
| Atsimo-Atsinanana     | 73 213                | 3.6                   | 86 391           | 95  | 9                         | 10                | 4           | 21  | 51                    |
| Sava                  | 208 590               | 2.5                   | 234 664          | 258   | 23                        | 28                | 10          | 57  | 139                   |
| Vatovavy-Fitovinany   | 136,575               | 3.33                  | 159 315          | 175   | 16                        | 19                | 7           | 39  | 95                    |
| <b>sum East Coast</b> | <b>1 224 636</b>      |                       | <b>1 391 511</b> | <b>1 531</b>                                    | <b>138</b>                | <b>168</b>        | <b>61</b>   | <b>337</b>                                      | <b>827</b>            |
| <b>West Coast</b>     |                       |                       |                  |   |                           |                   |             |   |                       |
| Atsimo-Andrefana      | 255 000               | 3.5                   | 299 625          | 330   | 30                        | 36                | 13          | 73  | 178                   |
| Boeny                 | 333 096               | 3.52                  | 391 721          | 431   | 39                        | 47                | 17          | 95  | 233                   |
| Diana                 | 302 238               | 3.7                   | 358 152          | 394   | 35                        | 43                | 16          | 87  | 213                   |
| Melaky                | 33 600                | 3.64                  | 39 715           | 44  | 4                         | 5                 | 2           | 10  | 24                    |
| Menabe                | 112 218               | 3.5                   | 131 856          | 145   | 13                        | 16                | 6           | 32  | 78                    |
| Sofia                 | 182 041               | 3                     | 209 347          | 230   | 21                        | 25                | 9           | 51  | 124                   |
| <b>sum West Coast</b> | <b>1 218 193</b>      |                       | <b>1 430 416</b> | <b>1 574</b>                                    | <b>142</b>                | <b>173</b>        | <b>63</b>   | <b>346</b>                                      | <b>850</b>            |
| <b>total</b>          | <b>2 442 829</b>      | -                     | <b>2 821 927</b> | <b>3 104</b>                                    | <b>279</b>                | <b>341</b>        | <b>124</b>  | <b>683</b>                                      | <b>1 676</b>          |

Madagascar has 17 harbour towns from which are four are classified to be of higher importance with international lines connections (see Table 2). Their locations and distribution to the coast sides are shown in Figure 4. About 14 000 vessels were serving these harbours in year 2021 (among them 1,000 docking at the international ports of Taomasina and Ehoala (near Taolagnaro).

To serve the north-south coast length of about 2 000 km, each collecting boat would need an approx. shipping time of 67 hours considering a cruising speed of 30 km/h. If one adds about three-hour loading time in eight harbours, the loading interval would be about four days, which is sufficient for the collection of dry waste. Thus, each of the collecting boat would need a loading capacity of 480 tonnes/day\*4d=about 2 000 tonnes.

This transportation logistics should be under the aegis of the Agence Portuaire Maritime et Fluviale (APMF).

| PORTS        | PIN | PIR | PGA | PCG |
|--------------|-----|-----|-----|-----|
| Antalaha     | •   |     |     | •   |
| Antsiranana  | •   |     |     |     |
| Ehoala       | •   |     |     | •   |
| Mahajanga    | •   |     |     |     |
| Maintirano   |     | •   |     |     |
| Manakara     |     | •   |     |     |
| Mananjary    |     | •   |     |     |
| Maroantsetra |     | •   |     |     |
| Morombe      |     | •   |     |     |
| Morondava    |     | •   |     |     |
| Nosy Be      | •   |     |     |     |
| Saint Louis  |     | •   |     |     |
| Sainte Marie |     | •   |     |     |
| Taolagnaro   |     | •   |     |     |
| Toamasina    | •   |     | •   |     |
| Toliara      | •   |     |     |     |
| Vohémar      | •   |     |     | •   |

**Note** : column heading acronyms shown below.

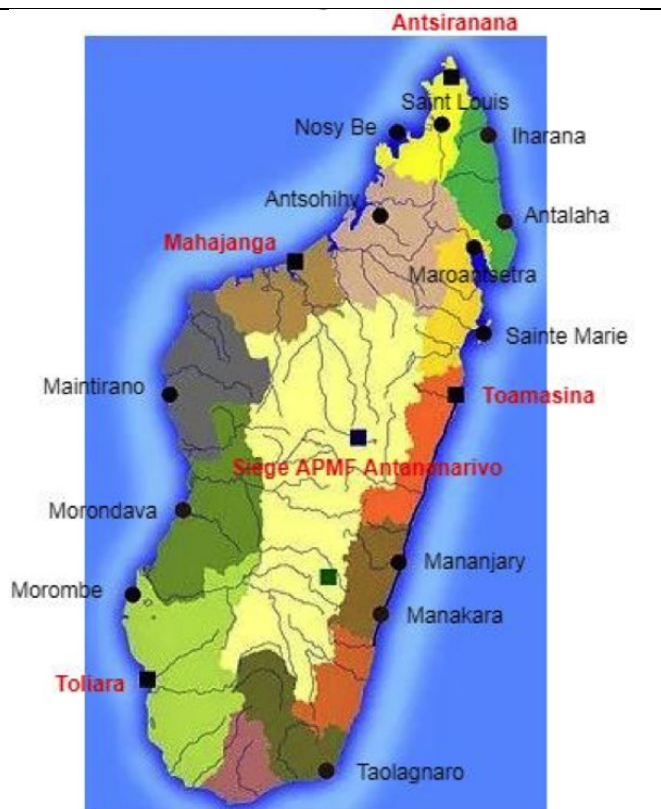
PIN= Port of National Interest

PIR= Port of regional interest

PGA= Port with autonomous status

PCG= Port with global concession

**Table 2: List of classified Ports in Madagascar**



**Figure 3: Ports Location**



## 4.2 Proposed investments

The following investments are proposed in the framework of COPIP. The referring costs are approximate estimates and shall need to be verified within a feasibility study.

*Table 3: Investments proposed for COPIP financing*

| Ref.<br>Number | Investment  |
|----------------|---|
| 1              | Awareness building campaign on segregation of waste at source/separate collection in 17 harbour towns.  |
| 2              | Furnish about 600 000 households with a 2 bin system ( the bins to be made local, either from organic or recycled plastic material)   |
| 3              | Establish referring storage and ship transfer facilities for the dry waste in 15 harbour towns. These to include collection points for maritime litter from fishing boats and ships (PP nets, PE ropes, PVC/Polystyrene fish&ice containers, etc) |
| 4              | small scale composting facilities   |
| 5              | Small scale landfills for non recoverable refuse  |
| 6              | Purchase or lease collecting boats and equip them with referring facilities   |
| 7              | Equip the 2 boats with pyrolysis plants to operate with own generated Diesel from PtF plants  |
| 8              | Establish 2 MRF's at the harbours of Toamasina and most probable Mahajanga. Here the dry waste shall be further processed.  |
| 9              | Install PV plant on the roof of the MRF's to operate the machinery  |
| 10             | Equip each MRF with a PtF Container to produce Diesel/Oil from non-recyclable plastics  |
| 11             | Incentives for local recyclers  |
| 12             | Long term technical assistance  |
|                | <b>Sum</b>  |

Total Cost – Euro 55 million

## 5. Contribution to the Objectives of the Clean Oceans Initiative

- Increased waste collection and sorting.
- Increased recycling rate for plastic waste.
- Introduction, promotion and support of the circular economy.
- Reduction of CO<sub>2</sub>e emissions due to reduced transportation costs.

Creation of skilled jobs in waste recovery.

## 6. Approach to project funding

### 6.1 Current funding

Unfortunately, no data sets were available from the Government of Madagascar on the projects being funded. The situation outside the capital Antananarivo is complex since there are many regions/provinces.

### 6.2 Potential for revenue generation and project sustainability

The potential for revenue generation arises from:

- Sales of compost/fertilizer;
- Where applicable: Discharge fees from faecal sludge;
- Sales of paper/cardboards to the local tissue paper factory Société de Production d'Articles Hygiéniques (S.P.A.H) S.A. ([www.spah-madagascar.com](http://www.spah-madagascar.com));
- Sales of washed and sorted Plastics to dealers, so far not recycled in Madagascar itself;
- Sales of scrap metal;
- Sales of crushed glasses to the construction industry (sand substitute);
- Use of electricity from the PV plant situated on the MRF roof;
- Sales of Diesel from the PtF plants;
- Household tariffs, (unfortunately only limited feasible);
- Commercial & institutional tariffs, if feasible.

If the above combined revenues prove insufficient to cover costs the financial analysis would prioritize a preliminary assessment of the national (and local) governments financial capacities in the context of intergovernmental revenue transfers including any loans and grants subsumed in these. However, since it is probable that local governments will depend significantly on transfers from the national government any loans for the investments would then be subject to a creditworthiness analysis based on the national governments balance sheet conducted post FS stage. This would be initiated by the EIB. Grants covering investment costs and possibly even O&M costs may be considered (by the EU and others) but it would seem unwise to support these in the absence of adequate commitments from national and local authorities to improve cost recovery and to ensure that assets are managed in the most cost-effective way. In this context an alternative approach might be considered to leverage the potential competitive advantages of the private sector in PPP mode as a means of reducing costs and possibly mobilizing finance from them which would be amortized by the public sector through annuity payments.

## 6.3 Potential sources of funding

The following components could be outsourced to private operators/investors with some possible incentives as indicated in Investment No. 8:

- Investment 4: The decentralized composting plants. With incentives, a clearly defined marketing strategy and know-how transfers these plants should be possible to run successfully on private basis. Biogas producing components might be added;
- Investment 5: It might be less costly to rent/lease the referring boats. These costs would be included in the operating budget;
- Investments 6 & 9: There are leasing companies for Plastic to Fuel engines (PtF) on the market. They will be repaid from income derived from diesel sales;
- Investment 8: There are several green climate funds available, which may provide grant financing or underwrite leasing arrangements.

Potential sources of financing could include loans from the EIB and other banks and grants from the EU, AfD, bilateral donors and local and national authorities.

# 7. Key aspects to consider for the pre-feasibility study

The summary below indicates the main points of the methodology and key aspects to be followed in the pre-feasibility study to further define the project, demonstrate its feasibility, and determine the economic value of the project and justify its financing, where a positive financial rate of return is not possible, and subsidies are required.

### Technical :

- Verification of waste generation and required facility capacities (waste characterisation in the secondary cities, weighing record evaluation);
- Assessment of existing waste treatment and recovery practices, with a focus on internal recovery by households prior to waste (pre-) collection;
- Assessment of local authorities' priority needs and analysis of alternative (community) approaches;
- Opportunities to introduce separate collection to improve the performance of recovery activities;
- Marketing of recovered materials and quality criteria (esp. compost/fertilizer);
- Identifying the real cost of waste management and first cost estimate for proposed investments;
- Need for composting capacities and availability of space.

### Financial :

- Household income and expenditure surveys to facilitate an affordability study that will determine the cost recovery potential of solid waste management using existing revenue instruments as well as other potential instruments;
- Assess the funding gap in the context of project costs, affordable tariffs and other financial instruments;
- Identify any other potential economic, environmental and social benefits that could be used to justify closing the funding gap;
- Carry out a financial analysis of the project costs and revenue streams (discounted costs and revenue streams over 20 years);
- Conduct a cost-benefit analysis of potential economic, environmental and social impacts (quantifying these impacts where possible);

- Estimate the financial and economic rates of return;
- The COPIP team will assist the EIB to identify financing arrangements for the COPIP project (grant/loan/loan conditions) as directed.

**Institutional :**

- Identify technical assistance needs to determine beneficial institutional delegations and responsibilities (O&M, financial management, managerial capacity, monitoring...);
- Assessment of current institutional and operational set-up, gap analysis and need.

## 8. Environmental and social aspects

|  |   |
|--|---|
| <p>Key environmental and social aspects identified</p> | <p>Key negative impacts identified at this stage will be most likely limited to project sites and will include the risk of environmental pollution, possible impact on existing land use as well as vulnerability to climate change.</p> <p>The main benefits are expected to include, improved health and productivity of contiguous populations, reduced environmental degradation caused by plastic and other waste, reductions in greenhouse gases resulting from relevant investments, improved sustainability of land based and ocean resources etc.</p>  |
| <p>Topics to be covered in the ESIA</p>                | <p>New infrastructure will need to be considered in relation to all applicable environmental standards and guidelines, including national and those of the international financing partners (EIB).</p> <p>The assessment conducted at the prefeasibility stage will briefly describe environmental and social baseline conditions in the proposed project locations, will identify key stakes and likely impacts of the project, including both costs and benefits. The assessment should also review whether there will be impacts that require remedial actions and mitigation, identify and evaluate appropriate mitigation measures for the identified potential impacts, outline the management principles and controls that will apply to the project to address these impacts that will be further developed during the feasibility and design phase, as part of the Environmental Management Plan including an Environmental Monitoring Plan.</p> <p>It should be noted that the costs and benefits of environmental and social impacts (temporary or long term) need to be quantified as far as possible to justify investments which are unlikely to be financially viable. The environmental impacts and their resulting costs and benefits need to be clearly defined and will require the attention of environmental and social specialists as well as the economists to determine and value these to the extent feasible.</p> <p>The detailed ToR of the ESIA will be formulated during the pre-feasibility study and will cover the following topics as a minimum:</p> <ul style="list-style-type: none"> <li>• Impact of the project on the natural environment with a particular focus on terrestrial and marine biodiversity issues;</li> <li>• Impact of the project on the physical environment with a particular focus on environmental pollution;</li> <li>• Impact of the project on the climate change (mitigation and adaptation);</li> <li>• Impact of the project on the population with particular focus on national health, productivity, as well as impacts on the and local economy (job creation, circular economy, waste pickers, informal waste collectors etc.);</li> <li>• Gender dimension of proposed investments.</li> </ul> |

## 9. Recommendations

The proposed project was evaluated on the basis of the 5 ranking criteria listed below.

| Ranking criteria      | COIP ranking |
|-----------------------|--------------|
| EUD priority          | 1            |
| EIB priority          | 2            |
| Promoter priority     | 2            |
| Impact                | 2            |
| Likelihood to proceed | 1            |
| Sub total             | 8            |

Note: Priority ranking scale 1 = low ranking 2 = medium ranking 3 = high ranking

With a total score of eight (8), it is recommended that this COIP project does not proceed to the pre-feasibility stage under the current COIP programme.