DILI SOLID WASTE MANAGEMENT PROJECT (DSWMP)

TIBAR DUMPSITE REHABILITATION AND UPGRAADING PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

VOLUME I - DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS)

March 2021

Chapters 7 to 17 (Inclusive)
Revision 0
First Draft for Regulator Review
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Dili Health Centre Delegations
Tibar Health Centre Delegations

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<td>ADB</td>
<td>Asia Development Bank</td>
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<td>ADI</td>
<td>Area of Direct Impact</td>
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<td>ANLA</td>
<td>National Agency for Environmental Licensing</td>
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<td>AOI</td>
<td>Area of Influence</td>
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<td>National Centre CHEGA!</td>
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<td>PM$_{10}$</td>
<td>Particulate Matter with a diameter ≤ 10 micron</td>
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Chapter 7 - Climate Change

7.1 - Description of the Historic Weather Observations and Trends

Chapter 6.2 already presents historical climate data in Dili, Railako and Fasenda (Liquiça).

7.1.1 Temperature

The Timor-Leste National Adaptation Programme of Action (NAPA) to Climate Change (GoTL, 2010) says that Intergovernmental Panel on Climate Change (IPCC) analysis shows that in the Timor-Leste region, temperature from 1901 -2005 has increased 0.5 – 0.8°C over the century, while data for 1979-2005 suggests a lower decadal increase of 0.1-0.3°C with a mild acceleration over the later decades (see Figure 7-1).

7.1.2 Rainfall

Analysis of total rainfall in Timor-Leste indicates a reduction in mean annual rainfall from 1961-1990 as compared to the 1931-1960 period, the decrease being mostly felt in the December-February rain period (Kaimuddin 2002, cited in Lasco and Boer, 2006). This analysis is further supported by other studies reviewed by Chang (et al., 2004) indicating that since 1976 there has been a tendency for the El Niño - La Niña normal alternation to be dominated by El Niño events that have a known negative correlation with Indonesia monsoon rainfall (see Figure 7-2).

7.2 - Future Projections of Climate Change

7.2.1 Temperature

Projections for all emissions scenarios indicate that the annual average air temperature and sea-surface temperature will increase in the future in Timor-Leste (see Table 7-1). By 2030, under a very high emissions scenario, this increase in temperature is projected to be in the range of 0.5–1.1°C. Later in the century, the range of the projected temperature increase under the different scenarios broadens, for a maximum of 4.2°C. (Pacific-Australia Climate Change Science and Adaptation Planning Program - National Directorate of Meteorology and Geophysics, 2015).

| Table 7-1 Projected changes in the annual average surface air temperature for Timor-Leste |
|---------------------------------------------|-------------|-------------|-------------|-------------|
|                | 2030 (°C)  | 2050 (°C)  | 2070 (°C)  | 2090 (°C)  |
| Very low emissions scenario              | 0.4–0.8     | 0.5–1.1     | 0.4–1.1     | 0.4–1.2     |
| Low emissions scenario                  | 0.4–1.0     | 0.8–1.5     | 0.9–1.8     | 1.1–2.1     |
| Medium emissions scenario               | 0.4–1.0     | 0.7–1.5     | 1.1–1.8     | 1.5–2.6     |
| Very high emissions scenario            | 0.5–1.1     | 1.0–2.0     | 1.7–3.1     | 4.0–4.2     |

Source: Pacific-Australia Climate Change Science and Adaptation Planning Program, 2015.
Another study carried out by Pacific Climate Change is possible to see all de scenarios for mean annual temperature (see Figure 7-1).

RCP (Representative Concentration Pathway) 2.6 Scenario (strongly declining emissions), shows an insignificant evolution of the average annual surface temperature, being below 1°C compared to the end of the last century (relative to 1980-1999).

On the opposite side, RCP 8.5 Scenario (rising emissions), shows a very significant increase in the average annual surface temperature, around 3°C compared to the end of the last century (relative to 1980-1999).

**Figure 7-1 Historical and simulated mean annual air temperature in Timor-Leste**

Source: Pacific Climate Change (www.pacificclimatefutures.net)

### 7.2.2 Rainfall

In the future, there is uncertainty around rainfall projections as model results are not consistent. Projections generally suggest that long-term rainfall over Timor-Leste will remain similar to the current climate. Wet and dry years will still occur in response to natural variability. Rainfall associated with the West Pacific Monsoon is projected to generally increase. Little change is projected in the frequency of droughts throughout this century (Pacific-Australia Climate Change Science and Adaptation Planning Program - National Directorate of Meteorology and Geophysics, 2015).

Pacific Climate Change study shows all the scenarios for mean annual precipitation (see Figure 7-2).

In both scenarios (RCP 2.6 and RCP 8.5), it appears that the average annual precipitation will not undergo significant changes, as indicated above.

Both studies reveal an uncertainty regarding the amount of precipitation. However, projections show extreme rainfall days are likely to occur more often.
7.2.3 Sea level

Pacific Climate Change study shows historical (since 1950) and future climate for annual mean sea-surface temperature (SST). The three scenarios (high, medium and low emissions) reveal an increase in temperature between 1.5°C and 2.5°C for the Timor Sea (see Figure 7-4).

The same study reveals that the sea level rise may vary between 10 and 80 cm in 2100 (see Figure 7-3).

Figure 7-3 Observed and projected relative sea level change near Timor-Leste

Source: Pacific Climate Change (www.pacificclimatefutures.net)
According to the Timor-Leste NAPA to Climate Change, sea level rise figures for Timor-Leste are expected to be close to the global averages, with a variation of only minus 0-1 cm when reviewing 17 global climate models (O’Farrell, 2008). However, it should be taken into consideration that Timor-Leste is estimated to have an annual uplift of 1 cm given tectonic activity (Bird and Ongkosongo 1980, quoted in Monk et al., 1997). CSIRO (2010) and Hunter (2010) refer to IPCC global projections with the following scenario for sea level rise - relative to 1990 data:

- 3.2 to 10 cm by 2020;
- 8.9 – 27.8 cm by 2050;
- 18-79 cm by 2095.

In Steffen’s assessment (Steffen, 2009) the possibility that sea level rise is larger than the 0.5 – 1.0 m range by 2100, relative to 1990 values, cannot be ruled out, for though there is considerable uncertainty surrounding
estimates of future sea level rise, nearly all of the uncertainties indicate that corrections could be for higher rather than lower estimates.

According to the Pacific-Australia Climate Change Science and Adaptation Planning Program (National Directorate of Meteorology and Geophysics, 2015), sea level is expected to continue to rise in Timor-Leste (Table 7-2). By 2030, under a very high emissions scenario, this rise in sea level is projected to be in the range of 9–18 cm. The sea-level rise combined with natural year-to-year changes will accentuate the impact of storm surges and coastal flooding. As there is still much to learn, particularly how large ice sheets such as Antarctica and Greenland contribute to sea-level rise, scientists warn larger rises than currently predicted could be possible.

### Table 7-2 Projected changes in the annual average sea level rise for Timor-Leste

<table>
<thead>
<tr>
<th>Emissions Scenario</th>
<th>2030 (cm)</th>
<th>2050 (cm)</th>
<th>2070 (cm)</th>
<th>2000 (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very low emissions scenario</td>
<td>9–17</td>
<td>15–30</td>
<td>21–45</td>
<td>26–59</td>
</tr>
<tr>
<td>Medium emissions scenario</td>
<td>8–17</td>
<td>15–30</td>
<td>23–47</td>
<td>33–68</td>
</tr>
<tr>
<td>Very high emissions scenario</td>
<td>9–18</td>
<td>18–34</td>
<td>30–58</td>
<td>43–88</td>
</tr>
</tbody>
</table>

Source: Pacific-Australia Climate Change Science and Adaptation Planning Program, 2015.

Under all four emissions scenarios the acidity level of sea waters in the Timor-Leste region will continue to increase over the 21st century, with the greatest change under the very high emissions scenario. The impact of increased acidification on the health of reef ecosystems is likely to be compounded by other stressors including coral bleaching, storm damage and fishing pressure.

### 7.3 - Implications for the Proposed Project, or Environment as a Result of these Trends and Projections

To verify the implications of climate change for the project, it is necessary to verify the expected impacts in each sector of activity in Timor-Leste.

Timor-Leste NAPA to Climate Change presents a vulnerabilities study for the following sectors:

- Agroforestry, Agriculture and Livestock;
- Water Availability, Accessibility and Quality;
- Terrestrial, Freshwater and Marine Ecosystems and Biodiversity;
- Human Health;
- Human Settlement and Infrastructure;
- Disaster Management.

The landfill project is part of the infrastructure sector. Timor-Leste’s infrastructure is still at an early stage of development. However, taking into account the potential for changes in terms of increased air temperature, in rainfall patterns and intensity, and in frequency and strength of storm activity, stakeholders expressed concern that climate change poses further obstacles to the development of the nation’s infrastructure.
Table 7-3 shows the climatic phenomena and the expected impacts for this sector (that can be related to the Tibar landfill project).

Table 7-3 Climate phenomena in infrastructure sector and associated impacts

<table>
<thead>
<tr>
<th>Phenomena and events of climatic nature</th>
<th>Climate change impacts</th>
</tr>
</thead>
</table>
| Increased temperatures and dry conditions | • Increased damage to infrastructure during extreme heat events (including damage caused by wildfires).  
• Impacts on building materials through heat related stresses.  
• Increased electricity consumption and demand for energy for cooling and refrigeration. |
| Increased storm activity and changes in rainfall pattern and intensity | • Rivers, water quality and downstream habitats endangered by more landslides and flooding.  
• Landslides damaging infrastructures and blocking access.  
• Damage to and difficulties in accessing flooded infrastructures and other key strategic installations.  
• Increased damage to and destruction of bridges, roads, roadsides, culverts, drainage structures and river embankments. |
| Rise in sea level rise and storm surges | No expected impacts. |

7.4 - Necessary Adaptation Measures Required to Mitigate the Impacts Any Potential Impacts to the Proposed Project or the Environment

Timor-Leste’s NAPA to Climate Change proceeded with the identification process of key adaptation needs. Table 7-4 presents the main adaptation measures that are identified by NAPA for this type of project.

Most of the adaptation measures are institutional, and the project already has adaptation measures within the project infrastructure (improvement of the rainwater drainage system, reduction of the risk of erosion in the landfill area and vegetation barrier to minimize erosion risks). Therefore, the project itself does not have a high vulnerability to climate change.
### Table 7-4 Climate change adaptation measures to mitigate the impacts to the Landfill

<table>
<thead>
<tr>
<th>Phenomena and events of climatic nature</th>
<th>Climate change impact</th>
<th>Impact in the Project</th>
<th>Potential adaptation measures (NAPA)</th>
<th>Measures (TDRUP)</th>
<th>Estimated cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased temperatures and dry conditions</td>
<td>Increased damage to infrastructure during extreme heat events (including damage caused by wildfires).</td>
<td>Impacts on infrastructure materials</td>
<td>1 - Review existing laws, regulations and standards to enhance Climate Change (CC)-resilient infrastructure.</td>
<td>Institutional</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Impacts on building materials through heat related stresses.</td>
<td>Impacts on infrastructure costs (maintenance)</td>
<td>2 - Pass new legislation to strengthen and guarantee national regulations on quality of materials, building codes and practices and law enforcement.</td>
<td>Institutional</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Increased electricity consumption and demand for energy for cooling and refrigeration.</td>
<td>Impacts on water availability</td>
<td>3 - Research on environmentally friendly building materials, standard for cement asphalt and metal.</td>
<td>Institutional</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Increased cost of urban water supplies and increase cost of water for construction.</td>
<td></td>
<td>4 - Data collection and confirmation on current incidence of fires with a focus on preventing future fires</td>
<td>Institutional</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5 - Improvement of water collection, storage and distribution infrastructure.</td>
<td>Construction of stormwater retention ponds to store water (to be used in compost plant operations and to assist in increasing waste compaction and expediting waste decomposition)</td>
<td>To be included in Project Cost Bid</td>
</tr>
<tr>
<td>Increased storm activity and changes in rainfall pattern and intensity</td>
<td>Rivers, water quality and downstream habitats endangered by more landslides and flooding. Landslides damaging infrastructures and blocking access.</td>
<td>Impacts on infrastructures Impact on access</td>
<td>1 - Reduce the impact of storms and flooding by reforestation in coastal and mountain areas. Focus on mobilizing communities.</td>
<td>Replantation of the Reserve area hillsides</td>
<td>$36,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 - Physical infrastructure - civil engineering and vegetation methods - to prevent landslides in hill sites, roads, and riverbanks.</td>
<td>Improvement of the new rainwater drainage system, considering the projections of changes in the local annual precipitation regime</td>
<td>To be included in Project Cost Bid</td>
</tr>
<tr>
<td>Phenomena and events of climatic nature</td>
<td>Climate change impact</td>
<td>Impact in the Project</td>
<td>Potential adaptation measures (NAPA)</td>
<td>Measures (TDRUP)</td>
<td>Estimated cost</td>
</tr>
<tr>
<td>----------------------------------------</td>
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<td>-------------------------------------</td>
<td>-----------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Damage to and difficulties in accessing flooded infrastructures and other key strategic installations. Increased damage to and destruction of bridges, roads, roadsides, culverts, drainage structures and river embankments.</td>
<td>3 - Establish early warning systems in areas identified as vulnerable to risks of disasters such as floods and storms.</td>
<td></td>
<td></td>
<td>Institutional</td>
<td>-</td>
</tr>
</tbody>
</table>
Chapter 8 - Alternatives

This Chapter sets out the alternatives for the management of MSW generated within Dili. The analysis of alternatives assesses the feasibility, and the environmental and social impacts, of different strategic and technology alternatives. The analysis has considered the environmental and social advantages and disadvantages of the available project alternatives and provides an overall recommendation on the best practicable option.

Options considered and assessed are:

- Location of the project;
- Do Nothing (status quo);
- Policy alternatives; and
- Alternative technological approaches to waste management and site development.

8.1 - The Choice of Tibar site

The existing disposal site at Tibar was considered a suitable location for ongoing landfill development (GHD, 2015) due to the following reasons:

a) The are no sensitive neighbours in close proximity to the site such as major schools, kindergartens or extensive residential areas;

b) The site is well located with respect to the current centroid of population and also the expected future growth centroid;

c) The site is flood free;

d) Storm water can be readily managed with appropriate diversion drains;

e) Site slopes are suitable for landfill development. It is not too flat that it requires extensive excavation to achieve suitable grades on landfill leachate pipes nor is it too steep resulting in stability concerns;

f) The local soils are easily workable and contain a mix of clayey silts as well as small gravel; and

g) The soil matrix of the surrounding hills are also readily excavatable to depth and could be developed in future as a major extension to the current landfill which is restricted presently just to the valley floor.

In terms of social benefits, the scavenging community is already present on site and the Government Investment Strategy (GovTL, 2016) includes requirements to guarantee the welfare and livelihood improvement throughout the rehabilitation of the dump site, in partnership with the DBO contractor.

The location is a brownfield site which already has a considerable quantity of MSW in place, estimated currently to be of the order of 346,700 m³ as of the end of September 2020. With the proposed rehabilitation (Chapter 4), the site will have sufficient capacity for at least ten (10) more years of operation, maximizing the utilization of the infrastructure installed at the site and avoiding the impact of procuring and developing a new site elsewhere.

The Project Proponent had, in 2018, expressed a desire to develop a new site for waste disposal within their own territorial limits and had suggested that a site be developed on the east side of Dili, in the Metinaro Sub-District.
However, no specific site had been identified and it is understood that the Ministry of State Administration did not endorse this proposal. Accordingly, this idea has not progressed any further.

Any new site would, of necessity, be a greenfield site with no existing development and would likely involve more difficult and potentially longer access, given the existing mountain range between the city and any alternate location, resulting in higher costs for waste transport.

In addition, the environmental impacts of developing an entirely new greenfield site, as opposed to rehabilitating an existing brownfield site, are considered to be highly significant.

If the Tibar site was to be abandoned in favour of developing a new site, then the following considerations are also pertinent:

- Tibar dump site would need investment to close it securely and to prevent the site remaining as an environmental liability into the future;
- Closure of the dump site at Tibar would impact the livelihood of the waste pickers at the site (refer to Chapter 6.12) and remove their source of income. Waste pickers would not likely relocate to an alternate site on the other side of Dili;
- Development of a greenfield site, as against redevelopment of a brownfield site, would have substantially more potential negative environmental impacts with regard to land use, air quality, geology, topography, water resources, ecology and to communities in the vicinity of the alternate site; and
- Redevelopment of Tibar dump site into an engineered sanitary landfill would have significant positive environmental benefits, by mitigating the current negative impacts of waste deposition at the site and reducing the flood risk to local communities downstream of the site.

Given the above considerations the more beneficial approach, with higher net positive environmental impact and lower financial and economic impact, is the rehabilitation of the existing dump site at Tibar.

8.2 - “Zero” Alternative or Do Nothing

The overall objective of the TDRUP is to improve the environmental and public health conditions in Tibar Suco and, via other components of the DSWMP, in the Díli city area. Accordingly, it is expected, by definition, that the environmental and social benefits of rehabilitating the dump site will be highly positive and will outweigh any negative impacts that might arise from continued use of the Tibar site for waste disposal.

Tibar dump site, however, is currently categorized, operated and managed as an open dump, with little control over the ensuing impacts of waste deposition on the surrounding area. Disposal of MSW has a detrimental effect on public health and the environment of the surrounding area, not only to air and the potential for pollution of surface water and groundwater, but also with respect to the associated problems of insects, vermin and animal pests. For this reason, rehabilitation of the site is highly recommended to improve both the environmental quality and the level of public health of the nearby communities as well as the general public health, safety and environmental amenity of Dili.

The ‘Do Nothing’ approach requires the provision of disposal capacity for at least the next ten (10) years. In the context of the present site, this is achievable but only if burning of waste is allowed to continue in order to attain a significant volume reduction in the waste mass following discharge from the trucks. Without burning, given the low level of compaction currently achieved, the deposited waste would occupy a significantly greater volume (at
least double) than that projected for the sanitary landfill (refer to Table 4.4, Chapter 4.3.3.2). Achieving this volume is not feasible without expanding the area occupied by waste onto the surrounding hillsides, encroaching into the Reserved Area and increasing the footprint of the waste disposal area (refer to Chapter 8.4.2 below).

The ‘Do Nothing’ approach would see the continued use of the site for the disposal of MSW. Current disposal practices would continue unabated, with waste deposited over an extensive area (12 ha.), with waste set on fire releasing large plumes of potentially toxic and unsightly smoke every day, with unrestricted access to the site by waste pickers and grazing animals, with no vermin or pest control, and with continued flood risk to residential communities downstream of the disposal site. In addition, the transport of waste by small, low-capacity trucks (6-8 m$^3$ per trip) would continue and the frequency of such truck movements would increase as the waste generated and collected increased over time. Over the last five (5) years alone the number of waste collection trucks and private delivery vehicles has risen from 130 per day to 170 per day (an increase of approximately 30%), resulting in increased vehicle exhaust emissions and noise impacts to the community along the access road leading to the disposal site.

A secure landfill site is a necessity for the disposal of residual waste that are not treated or cannot be processed economically by any other form of treatment. In all waste management systems anywhere in the world, a sanitary or engineered landfill is a fundamental requirement to cater for the disposal of any residual waste materials.

The rehabilitation of the existing dump site, together with modernization of the waste collection system (as described briefly in Chapter 4), has been determined strategically as the best practicable option that can provide an improvement in the solid waste management system in the short-term and, at the same time, meet the longer-term needs and solid waste management objectives for managing Dili’s solid waste.

All negative environmental and social impacts of the project identified and discussed in Chapter 9 are site-specific and can be readily managed/minimized through implementing the proposed mitigation measures incorporated into the project design. Comparing, at a strategic level, the positive environmental benefits of rehabilitating the dump site to the potential negative impacts of the continued use of the site for waste disposal, it is readily concluded that the ‘do nothing’ alternative is neither feasible nor sustainable from environmental and social perspectives, given that the project impacts will be controlled as recommended in this ESIA and provide significant positive environmental benefits.

### 8.3 - Policy and Management Alternatives

#### 8.3.1 Introduction

The population of Dili has grown rapidly over the past decades and is currently estimated, based on 2015 census data and projected growth rates assumed by the Department of Statistics, at 345,620 (2020).

This situation, together with the city’s ever-growing population, has resulted in significant pressure on the availability of urban spaces for development, whilst forcing residential development into environmentally sensitive areas and areas with a high risk of natural disasters, such as on the hillsides, riverbanks and places where most of them are of difficult access to public services.

It has also led to a significant increase in the waste mass generated by city dwellers, re-inforcing the urgent need for the Government to employ an appropriate and sustainable urban solid waste management system, both for waste collection and for waste disposal. As noted in Chapter 6.9 the existing system is inefficient, inflexible and
not designed to respond to the challenges posed by management of increasing quantities of urban solid waste in the city, particularly during the rainy season where most of the drainage channels are clogged with plastic bags and bottles, contributing to frequent flooding in many areas of the city.

The Technical Assistance undertaken by GHD in 2015 (ADB TA-8750 TIM: Preparing the Urban Services Improvement Sector Project) provided a comprehensive strategic review of potential policy options for waste management in Dili. The conclusions and principal recommendations of the TA were discussed and endorsed by the Government of Timor-Leste and were embodied in the SWM Strategy for Dili issued in 2016 (Government Resolution No. 32/16 dated 5th October 2016) (Appendix 8.1). Aspects of this Government Resolution have been developed further during preparation of the DSWMP.

8.3.2 Waste Management Hierarchy

The widely accepted hierarchy for managing municipal solid waste is illustrated on Figure 8-1.

As per the waste management hierarchy landfilling is regarded as the least favoured option for waste management. However, as recognised in the Government Resolution No. 32/16, the most appropriate method of final disposal in developing countries is nearly always landfills.

A brief discussion of the various approaches is presented below in the context of managing waste in Dili.

8.3.3 Waste Reduction

Strategies, policies and initiatives to reduce waste generation in the first instance are highly desirable but do not eliminate the need for managing waste that is generated. The aim of waste reduction is to eliminate the generation of unnecessary waste (for example, packaging waste, the target of the Zero Plastics Policy) or, as a minimum, to substitute materials in the product chain that are more readily recyclable or can be re-used (for
example, substitute paper packaging/re-usable/multi-use bags in place of difficult to recycle single use plastic bags and plastic wrappings). Such initiatives require high level intervention typically at government level to influence and regulate social behaviour. Initiatives are most successful where coupled with financial incentives or disincentives, such as introducing a surcharge on the use of materials that are targeted for reduction.

Waste reduction strategies need to be well planned and the economic, financial, logistical and social impacts need to be evaluated thoroughly prior to embarking upon such approaches. Imposition of waste reduction strategies requires a well-established waste management system in which the benefits of such strategies can be readily assessed and documented. This is not the situation that currently applies in Dili.

Since waste reduction strategies do not eliminate all waste, there is still the requirement to manage any waste that is produced; hence, this is not a short-term solution that is viable for Dili, although such an approach should be incorporated into long-term planning as far as practicable.

8.3.4 Recycling as a Formal System

Materials recovery, both at household level and at the dump site at Tibar, is practised in Dili, but at a comparatively low level. Whilst materials recovery, and subsequent recycling of recovered materials, are relatively high in the waste management hierarchy they are not widespread in the city. Notwithstanding the obvious socio-economic and environmental benefits that accrue form materials recovery and recycling, these activities are low-key in Dili for a number of reasons, including:

- Lack of commercial viability has resulted in the downstream re-processing and recycling industries failing to develop a significant presence locally;
- Lack of market in Dili and Timor-Leste for recycled and re-processed materials – the market is too small to generate any substantial investment in re-processing facilities;
- In the past recovered materials were exported to re-processors, for example, in Indonesia and China. With changes in government policy, particularly in China, the opportunities for exporting recovered materials has reduced significantly and the requirements to supply only clean segregated waste has increased significantly;
- The export of materials that may be suitable for recycling is subject to significant demand and market price fluctuations internationally and, therefore, cannot be relied upon solely as a sustained long-term solution to address the problem of ever-growing waste quantities in Dili;
- The lack of source segregation in Dili means that most waste is collected mixed and is often contaminated rendering it unsuitable for subsequent re-use or re-processing without extensive pre-treatment, the cost of which is prohibitive;
- The volume of waste generated in the city is relatively low (in commercial terms), with a total daily solid waste load delivered to the dumpsite estimated at approximately 150 tons. The main materials currently recovered from the dump site are various metals and, occasionally, single use plastic bottles as and when the demand exists locally; and
- The composition of waste entering the dump site appears to be dominated by organic waste, with only small percentages of potentially recyclable materials, such as metals, glass and plastic (refer to Table 6-50).
While there appears to be some scope to expand current efforts at materials recovery (for example, recovery of clean cardboard from institutional and commercial premises), this is limited by the lack of segregation of waste at source and by the low content of recyclable materials in the waste stream.

Efforts to encourage source-segregation in the UNDP pilot project in Motael, as described in Chapter 6.9, were not successful in part because of reluctance on the part of the community to participate in the scheme and because significant education was required to begin to moderate and influence social behaviour regarding waste management. Despite intensive efforts at local community level, the expected change in social behaviour did not materialise.

One local company, Caltech, has attempted to initiate projects for recycling plastic bottles into garden pavers, for using crushed glass in construction projects, exporting ferrous and non-ferrous metals for re-purposing into new products and for collecting cardboard and office paper for export to be converted into pulp to be re-purposed into new products. In this latter venture, Asia Foundation has recently supported an ongoing small pilot project to encourage the separation and collection of paper from offices throughout Dili.

The current market in Dili is considered to be too small to sustain recycling and re-processing efforts at anything other than local, small-scale initiatives. Accordingly, any increase in materials recovery must depend on strengthening links for the export of recovered materials, for which the cost of transportation is critical. The basic need for successful recycling in Timor-Leste would appear to depend largely upon shipping agents (currently paying for empty container return to major ports) striking a deal to benefit both parties (transporters and exporters). This form of discounting is widespread in the Pacific for developing nations. To be sustainable, exporting recyclables needs to be profitable.

8.3.5 Biological Treatment

Biological treatment is a form of recycling, wherein organic waste (green waste, food waste, cardboard and paper) is converted, either aerobically or anaerobically, into a humus-like product that can promoted and re-used as a soil conditioner, to improve the structure, water retention capacity and fertility of existing soils. If anaerobic digestion is undertaken, then biogas may also be generated in sufficient quantities to be used as a fuel.

As noted above, and in Chapter 6.9.1.4, a significant portion of the waste stream is recorded as being organic. Accordingly, biological treatment of a proportion of the waste delivered to Tibar has been incorporated into the project design.

Plants and facilities developed for processing of organic wastes have often failed because of lack of control on the quality of the incoming materials to be processed. There is a widespread belief that contaminants can be removed post-processing. However, this is true only to a certain extent. If the final product is to be certified for use as a horticultural product, with appropriate product certification, the final product must meet strict quality criteria, both in terms of chemical composition, but also with respect to physical contaminants – in essence it must be free of contaminants, such as plastic, glass and heavy metals, whilst attaining a suitable C:N ratio.

This is best achieved by processing only clean, source segregated, green and food waste, rather than attempting to process the organic fraction recovered from screening of mixed MSW. The project design is based on biological treatment of source-segregated clean green waste.
8.3.6 Thermal Treatment

Waste-to energy (WtE) for power generation or other purposes has found wide acceptance in countries where space is at a premium and landfills are extremely difficult to locate and maintain. This constraint is not applicable currently for Tibar.

There are several potential alternative thermal technologies ranging from incineration (mass burn or fluidised bed), with or without power generation, through to pyrolysis, gasification and plasma arc processes.

Incineration can, depending upon waste composition (which typically exhibits seasonal variation), handle unsorted MSW as well as wastes from which materials have already been separated. An issue of significance for the operation of incineration plants is the calorific value of the input waste. Mass-burn grate incinerators tend to be designed for operation using material of a reasonably well-known calorific value. If the calorific value increases or decreases significantly, the input of waste to the plant has to be reduced or increased to reflect the change. With fluctuations in the composition of wastes, the efficiency of the combustion process may change, altering the associated emissions. Where wastes reach very high calorific values, or where they are very wet, either changes in composition (separation at front-end, or mixing) may be required, or desirable. In extreme cases, the process itself may find the composition of waste difficult to cope with. This is generally less of a problem for fluidised bed incinerators.

Most mixed municipal wastes can be handled by incinerators as long as the constraints in respect of composition and calorific value are respected. Larger fractions may pose problems and may be inappropriate if they compromise the completeness of the combustion process.

One of the principal constraints on the use of incinerators is public opposition. In some countries, local communities simply do not want to live near these plants owing to perceived problems of dis-amenity, and the emissions of NOx, SOx, HCl, particulates, heavy metals and dioxins associated with the plant. The first five of these are known to have effects upon human health.

Major technical issues with pyrolysis include: heat transfer to the waste material; precise process control to achieve the desired mix and yield of products; and product separation and collection, especially of bio-oil, which needs to be condensed. Process energy is self-propagating. Pyrolysis tends not to be an efficient energy conversion technology since much of the fuel produced is consumed within the operation.

Gasification is widely considered as an energy efficient technique for reducing the volume of solid waste and for recovering energy. Useable energy of some 500 to 600 kWh per ton of waste is generated by gasification.

Gasification technologies have been operated for over a century for coal producing "town gas" and have long been promoted as being a viable, cleaner alternative to incineration for residual municipal wastes. Gasification is more widely used and more developed than pyrolysis for several reasons. First, a highly efficient process produces a single gaseous product. Second, gasification does not have the heat transfer problems associated with pyrolysis. However, plants are known to have closed down due to waste variability and material handling problems. Newer processes have been developed in order to overcome these problems through extensive pre-processing of the feedstock waste.
During the course of the previous Technical Assistance an agreement was developed by the GoTL with a Korean company to provide a plasma gasification plant at Tibar and to take all of Dili’s waste and process it at very high temperatures, while also generating some electricity.

The key points of this proposal were:

- Indicative CAPEX investment of $150 million;
- Production of electrical power from syngas derived from gasification of selected waste, such as organics, waste oil, plastics, cardboard and paper;
- Feasibility based on current very high costs of power in Timor-Leste of about $0.40 per Kilowatt hour;
- 50 year lease (control of Tibar site);
- Residues and waste not suitable for processing to be disposed at Tibar; and
- Full access to Government waste collections from Dili for the life of the plant (secure access to waste inputs).

The developer claimed the ability to supply electricity for 1,800 homes from 100 t/d waste throughput, or about 2MW generation capacity. The operation of such plants would require specialist expertise and maintenance, not readily available in Timor-Leste.

The developer signed a contract in October 2014 with the Minister of Environment, Industry and Commerce after securing the finances required. An official project opening was held in mid-2015 at the Tibar site.

Despite signing the contract in 2014 no progress has been made to date. Municipal waste streams have a relatively high moisture content, have a variable composition and include large amounts of inorganic materials i.e. poorly sorted construction waste, metals, and glass, that result in increased slag production and decreased syngas production, rendering the process unfeasible for dealing with most mixed waste, as in Timor-Leste. Unsurprisingly, due to the lack of progress, the Government withdrew from the contract permanently in 2019.

Of the thermal treatment processes noted above, mass burn incineration is most suited to the thermal treatment of mixed MSW. However, by comparison with other forms of treatment or disposal, incineration is expensive and often requires financial incentives to make the process attractive financially (for example, tax on disposal of waste to landfill of more than $100/ton in Japan and the UK).

Dili’s waste, based on the reported waste composition (Chapter 6.9.1.4) is anticipated to have a relatively low net calorific value as a consequence of the high organic content and low content of plastics, at a level that is considered likely to be marginal for treatment by mass burn incineration without the use of supplementary fuel. Pre-treatment of the waste would improve the net calorific value but would also increase the cost of using the technology.

For small capacity plants, such as might be required for Dili (of the order of 150-200 tons per day), the CAPEX and OPEX cost per tonne increase substantially making WtE uneconomic.

### 8.3.7 Landfilling

Despite being the least favoured option in the waste management hierarchy, landfilling is the most prevalent form of waste disposal. All SWM systems require landfill as a basic component, even if it is the disposal method of last resort.
A number of solid waste disposal technologies have been considered for Dili in recent years. However, as recognised in the Government Resolution No. 32/16, the most appropriate method of final disposal in developing countries is nearly always landfills on cost considerations. To minimize their environmental impact, landfills must be carefully sited, correctly designed and well operated. This is the basis underpinning the project design and is reflected in the Concept Design of the project.

8.3.8 Discussion and Conclusions

It should be noted that three of the four options discussed above, that is, materials recovery, biological treatment and thermal treatment, are suitable for dealing only with certain components of the overall waste stream. The degree to which they can reduce the total waste stream requiring final disposal depends upon the waste composition.

For Dili, the high level of organics in the stream makes biological treatment (composting) an attractive option. Nonetheless, none of the options discussed above provides a complete solution; all have residual fractions of the waste stream remaining to be disposed by landfill. Incineration, for example, produces an ash residue, some of which is the result of cleaning the combustion gases (fly ash) and has high concentrations of heavy metals. This ash must be disposed to an approved hazardous waste landfill. A summary of the types of waste materials which remain typically after materials recovery, biological treatment and thermal treatment is provided on Table 8-1.

Table 8-1 Residual Waste from Alternative Technologies

<table>
<thead>
<tr>
<th>Process</th>
<th>Residual Waste</th>
<th>Typical % Residue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials Recovery</td>
<td>• fraction of the waste stream for which recovery is not feasible (e.g. small pieces of broken glass, soiled plastics, organics etc.); &lt;br&gt;• recoverable materials which are contaminated or heavily soiled; and &lt;br&gt;• unusable recoverable materials and recoverable materials with no economic market.</td>
<td>Mixed MSW &lt;br&gt;Mixed Recyclable MRF 5-10% +</td>
</tr>
<tr>
<td>Biological Treatment</td>
<td>• non-compostable (inorganic) fraction of the waste stream; and &lt;br&gt;• compostable materials which are contaminated or heavily soiled, for example with glass or plastic fragments</td>
<td>Compost 5-20% &lt;br&gt;Anaerobic digestion 5-15%</td>
</tr>
<tr>
<td>Thermal Treatment</td>
<td>• non-combustible fraction of the waste stream, for example building rubble; &lt;br&gt;• bulky wastes which cannot be handled by the thermal plant; and &lt;br&gt;• incinerator ash (fly ash and bottom ash/slag).</td>
<td>Incineration 20-30% &lt;br&gt;Pyrolysis 5-10% &lt;br&gt;Gasification 5-10%</td>
</tr>
</tbody>
</table>

The conclusion to be drawn from Table 8-1 is that landfill is an essential and basic component of any system for managing MSW.

Modern, integrated MSW management strategies often incorporate several of the above technical options into an overall scheme. For example, materials recovery and composting are undertaken where economical. Reject material may be incinerated to recover energy and reduce its volume/moisture content and, finally, the non-incinerable wastes and incinerator ash are landfilled.
In all cases, a universal requirement is the provision of landfill, to provide final disposal of some fractions of the waste stream and unavoidable residues from the materials recovery, biological and thermal treatment processes. The provision of a sanitary landfill does not preclude the subsequent application of other treatment technologies; it does, however, satisfy the basic common requirement to provide the capacity to dispose of any remaining residual waste.

8.4 - Alternative Project-related Technical Options

8.4.1 Introduction

Key features of the Concept Design are summarized in Chapter 4.3.3 and are illustrated on the Concept Design drawings in Appendix 4-3.

There are alternative ways of engineering the Tibar site for certain key aspects of site development and operation. These are discussed briefly below with respect to the following:

- Footprint of the Waste Disposal Area;
- Cell development;
- Containment engineering;
- Leachate management;
- Landfill gas management; and
- Composting (biological treatment).

8.4.2 Footprint of the Waste Disposal Area

The Concept Design is based on re-developing the landfill within the limits of the existing footprint of the Waste Disposal Area; that is, there is no expansion of the area already occupied by deposited waste. Within this footprint it is feasible to achieve a minimum landfill disposal capacity equivalent to ten (10) year’s projected waste arisings, by adopting the following principal measures:

- Limited excavation of the base of the landfill, primarily to remove potentially contaminated soil;
- Compaction of the waste using a dedicated landfill compactor to achieve compacted densities in excess of 0.7 t/m$^3$;
- Recirculation of leachate to facilitate waste decomposition which results in volume reduction; and
- Adopting a steep restoration profile, initially at 1.00V:2.75H (20°, grade 36.36%) which, after settlement, will be 1.0V:3.0H (18.4°, grade 33.33%) or less.

An alternative approach would be to expand the waste disposal area by extending the site to the east towards the head of the valley and/or by extending onto the surrounding hillsides (north and south). This would allow the final restoration profile to be slightly less steep (for example, 1.00V:4.00H (14°, grade 25%) before settlement; 1.0V:4.5H (12.5°, grade 22.2%) after settlement); however, it would result in an expansion of the footprint of the landfill, by at least 6 ha. (50% expansion of the footprint) into undeveloped forested areas.

Depending upon the extent of any expansion of the landfill footprint on the hillside, this could, potentially, allow the flatter lower portion of the site to be redeveloped for alternative uses (for example, a waste sorting plant). However, the loss of the lower portion of the site, which accounts for approximately 50% of the gross void...
capacity of the landfill, would require a significant expansion onto the hillsides, by at least 10 ha in order to provide the required void capacity.

Any expansion of the landfill footprint would have significant negative environmental impacts regarding land use and the ecology of the Reserved Area. For this reason, expansion was not deemed to be desirable, a decision endorsed by the Project Proponent.

8.4.3 Cell Development

The Concept Design has been prepared on the basis that cell development will commence in the lower flatter portion of the site and progress eastwards, up-valley. The reasons for this are as follows:

- The waste in this area was deposited many years ago, during Indonesian times, and has degraded significantly over time. The central and eastern portions of the existing site are used currently for waste deposition;
- Waste in the west portion of the site is not on fire, whilst that in the centre and east of the site is usually on fire;
- Given the prevailing wind direction at the site from the north-west, the result of topographic forcing of the wind up-valley as noted in Chapter 6.2.6, development of the western part of the site would be upwind;
- The waste thickness survey (March 2019) indicated that the waste in the west of the site has an average thickness of 1.66 m, whilst in eastern portion of the site, the waste thickness is substantially greater, averaging around 3.86 m (Table 4-6) as of March 2019; and
- Given that the existing waste is to be re-located temporarily to facilitate the development of the engineered cells, it follows that the volume of waste to be transferred, and which requires to be double-handled, is least in the west of the site and would be greater in the east of the site for a comparable area.

The only issue with developing the western part of the site is with respect to management of stormwater from the waste mass, since the current outlet for stormwater is on the western limit of the landfill. The provision of temporary embankments, sumps and recirculation of water back to the waste mass can address this, together with the early installation of the stormwater measures on the sides of the roads to prevent run-on of water from the surrounding hillsides.

The alternative approach is to develop the cells from east to west (that is, from the proposed area of cell 3 back towards cell 1). This alternative is not preferred since the footprint of cell 3 is considerably smaller than cell 1, whilst the waste thickness is substantially greater. The working area is not considered to be sufficient for managing cell construction efficiently. In addition, the volume of waste to be removed, and which requires to be double-handled, is greater than anticipated for cell 1 (64,500 m³ in cell 3 as opposed to 43,250 m³ in 50% of cell 1, refer to Table 4-6). Since waste continues to be deposited in the area of cell 3 currently, the volume requiring temporary re-location would likely be in excess of 90,000-100,000 m³, more than double that requiring temporary location in cell 1.

Any potential negative impacts of waste transfer (dust, odour, litter blow) would be greater by developing cell 3 first than developing the first half of cell 1, particularly so since the waste in cell 3 is relatively fresh compared to being degraded in cell 1.
In consideration of the above, it is deemed that re-development in the western part of the site first, and progressive development of cells to the east, has the least environmental impact on the surrounding area.

8.4.4 Containment Engineering

The Concept Design is premised on the temporary removal of the existing waste from the area of the cells in order to permit the grading of the site (for leachate drainage) prior to the installation of the basal containment engineering system. Once the cell is formed, then existing waste would be deposited back to the cell, thereby encapsulating it. In the process, any contaminated soil at the base of the waste would be excavated and also placed into the cell once formed. This process ensures the highest level of protection to the environment by isolating any potential contaminants from contact with the surrounding environment within a lined engineered cell and by capturing any by-products produced during waste decomposition and treating these before any treated by-product is released back into the environment.

An alternative approach, as contemplated in the GHD Feasibility Study (2015) would be to leave any existing waste in situ and to develop cells on top of the existing waste once it had been graded and compacted. The basal lining system would be installed on top of compacted waste under this approach.

This approach would be considered viable if all of the waste were totally degraded and had been rendered inert; however, given continuing waste deposition at the site, particularly in the central and eastern portion of the site, the only area where this approach might be feasible is in the western lower portion of the site.

In addition, since the composition of waste that entered the landfill has not been recorded, the potential contaminants in the waste mass are unknown and cannot be quantified. It is known, for example, that clinical waste, and other special wastes, including waste oils and lubricants, have been disposed on occasions within the waste mass, although where and in what quantity is unrecorded.

Accordingly, the only safe approach is to remove and isolate the existing waste, as proposed in the Concept Design, a decision endorsed by the Project Proponent.

8.4.5 Leachate Management

Leachate management proposed in the Concept Design comprises the collection of leachate from the base of the engineered cells, its extraction via a collection sump, its transfer to a holding pond and, thereafter, recirculation back to the waste mass. This approach relies on the excess absorptive capacity of the waste to hold the leachate and then to bind the contaminants into the waste mass. Calculations show that this is a viable approach.

An alternative approach is to install a purpose-built leachate treatment plant to treat all extracted leachate to a standard that would allow the treated effluent to be discharged back to surface water. This is a more expensive option, both from the perspective of capital investment and also ongoing operational costs. It is also an approach that can be instigated at any time should the recirculation of leachate advocated in the Concept Design not prove to be as effective as anticipated. Therefore, this approach is not considered to be warranted at the outset of the project.

Leachate recirculation is favoured because of the need to add moisture to the waste mass to achieve adequate compaction and for use in composting (refer to Chapter 8.4.7 below). The moisture (make-up water) required could be abstracted from groundwater resources, involving both high pumping costs and a potential impact on
the availability of groundwater to residential communities downstream of the site. Alternatively, it might be sourced from the supernatant effluent discharged from the adjacent WWTP.

Leachate extracted from the cells can replace the need to abstract groundwater, whilst at the same time avoiding the cost of treatment and the requirement to discharge treated effluent to surface water. Leachate recirculation, allied with use of effluent from the WWTP, is considered to have the most beneficial environmental impacts, providing adequate odour control is included in landfill operations.

8.4.6 Landfill Gas Management

The Concept Design has undertaken preliminary calculations of potential landfill gas generation and has determined that active capture and extraction of landfill gas is required, followed by flaring. The calculated gas volumes, based on the assumptions used in the gas generation model, exceed those which can be handled by passive venting of gas alone (one alternative). However, it is recognised there are many uncertainties on the quantum of gas generated and the quality of that gas at this stage in project planning.

The approach adopted in the Concept Design is a conservative approach in that it will be necessary to install landfill gas capture and flaring capacity, as a minimum in the first few years of the project, as the site is converted from an open dump (no gas capture) into an engineered sanitary landfill (encapsulated waste mass gives rise to the need for landfill gas management).

As waste deposition proceeds, and the volume of placed waste increases, then the quantity of gas generated will also increase and a larger proportion of this will be captured once the first cell is capped. The landfill gas plant specified in the Concept Design can be adapted to attach one or more gas engines for electricity generation as and when the volume of gas evolved and captured warrants this.

At this stage, whether this requirement materialises, is not known. If it does, the intention should be to procure gas engines and generate electricity from the captured gas. However, this is far from certain; hence, the Concept Design specifies only flaring at this time. Uncertainties arise from the quantity and composition of the waste inputs (waste tonnages are low), dependent in the main on the success of waste diversion, particularly the success of the compost plant in diverting and processing green (organic) waste, the decomposition of which is the major source of landfill gas generation.

The volume of gas evolved will be monitored as waste deposition proceeds and a decision made whether to go to the next stage (electricity generation) based on both (1) the monitoring results (volume and quality) and (2) a predictive landfill gas model calibrated to the on-site results and projected future waste inputs. This stage would not be reached until at least year 5 or 6 in the landfill operations contract and possibly much later depending on waste inputs and waste diversion.

Gas from the anaerobic digestion of septage at the adjacent WWTP could be captured and conveyed to the landfill gas plant. This is currently vented, untreated, to the atmosphere. The possibility exists, therefore, that methane (CH₄), a potent greenhouse gas, generated at the WWTP could be captured and transferred to the proposed landfill gas plant - either for flaring (which in itself will reduce emissions of greenhouse gases) or to supplement gas volumes to increase the viability of electricity generation.
8.4.7 Composting

As noted in Chapter 8.3.5 above, biological treatment of organic waste offers significant potential for reducing waste volumes requiring final disposal. This is based on the indication that green waste and other organic (food) waste forms a significant component of the waste stream entering Tibar dump site, of the order of 45%-50% as reported by GHD in 2015 and in the survey conducted on behalf of the Project Proponent in October 2018 (Chapter 6.9.1.4).

Based on these observations, the Concept Design includes provision for the composting of green waste adjacent to the re-developed landfill. The Contractor operating the landfill facility is required to process 70% of the incoming clean (that is, non-contaminated) green waste delivered by DMA. Based on 30% of the waste stream being green waste (GHD, 2015), then the compost plant is intended to divert approximately 21% of the incoming waste away from disposal in the landfill (not accounting for rejects from the composting process).

Incoming green waste will be shredded and screened to remove any contaminants. The composting process is proposed to be open windrows to process the shredded green waste aerobically (cf. anaerobically in the landfill) and, therefore, will produce only CO₂, O and water vapour, none of which will be captured.

The adoption of composting has a number of positive benefits, assuming the plant is successful:

- Diversion of waste away from final disposal, of the order of 20%, which will extend the lifespan of the landfill since void space will not be consumed by the green waste treated at the compost plant;
- Reduction in the quantity and strength of landfill leachate, since decomposition of organic waste is the primary contributor to leachate formation;
- Reduction in the quantity of landfill gas evolved, since decomposition of organic waste is the primary contributor to landfill gas formation;
- Production of a product that can be applied, as a soil conditioner and growth medium, to landfill restoration and in the Reserved Area to improve soil quality; and
- Production of a product that can be applied, as a soil conditioner, to parks and public spaces in Dili.

There are different alternative options for the processing of organic waste but two main types are prevalent: windrows (as advocated in the Concept Design) and in-vessel. Of the two, windrows are the simplest to control and operate and the most flexible in terms of inputs. This method is suitable for green waste (yard waste, trees, shrubs, grass clippings etc.) and also for food waste, providing adequate green waste is present for structural support.

In-vessel composting provides greater control over the composting process and is more readily suited to the processing of food waste. It provides adequate odour control but temperature control, required to kill pathogens, is more difficult to maintain. The ‘failed’ compost plant at Tibar (since removed) was of the in-vessel type (refer to Chapter 6.9.1.8).

Anaerobic digestion is an alternative process for biological treatment of organic waste. It is in widespread use in Europe and North America, primarily for the handling and treatment of food residues. It is a batch process, and not readily suited for dealing with green waste.

On balance, and considering all alternatives, open windrows are deemed to be the best approach for the processing of green wastes at Tibar.
Chapter 9 - Impact Assessment and Mitigation Measures

9.1 - Introduction

This chapter describes the methodology adopted for the assessment of impacts beginning with the first stages of key issue identification through the identification of potential impacts, magnitude and the determination of significance.

The assessment of the impacts of a project is not the result of the comparison between the current environmental and social situation and its predictable evolution with project, but the result of the comparison between the foreseeable future environmental and social situations with the project and in its absence.

The foreseeable future environmental and social situation in the absence of the project is often designated as "Zero Alternative" (no action alternative).

In order to identify and assess all impacts, the characteristics of each environmental and social factor will be examined, followed by the identification of impact hotspots.

Given the project is to be implemented under a Design-Build-Operate (DBO) contract and the detailed design phase will be carried out by the selected DBO Contractor, the assessed impacts are based on the concept design prepared for the purpose of this EIA.

The assessment and prediction of impacts will be undertaken based on a description of their effects and a qualitative characterization based, essentially, on the parameters presented in Table 9-1.

<table>
<thead>
<tr>
<th>Evaluative Nature/Sense</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incidence</td>
<td>Direct</td>
<td>Indirect</td>
</tr>
<tr>
<td><strong>Time Scale</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temporary</td>
<td>Permanent</td>
<td></td>
</tr>
<tr>
<td>(short term)</td>
<td>(long term)</td>
<td></td>
</tr>
<tr>
<td>Periodic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(medium term)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Probability or Degree of Certainty</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certain</td>
<td>Probable</td>
<td></td>
</tr>
<tr>
<td>Probable</td>
<td>Improbable/unlikely</td>
<td></td>
</tr>
<tr>
<td><strong>Spatial Dimension</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td>Regional</td>
<td></td>
</tr>
<tr>
<td>Regional</td>
<td>National</td>
<td></td>
</tr>
<tr>
<td><strong>Reversibility</strong></td>
<td>Reversible</td>
<td></td>
</tr>
<tr>
<td>Reversible</td>
<td>Irreversible</td>
<td></td>
</tr>
<tr>
<td><strong>Magnitude/Intensity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>Small</td>
<td></td>
</tr>
<tr>
<td><strong>Significance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>(Non-significant)</td>
<td>(Significant)</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>(Very significant)</td>
<td></td>
</tr>
</tbody>
</table>

Each parameter is described as follows:

- The **nature** of an impact depends on the effects of the action on the environmental quality (positive - has a beneficial impact; negative - devalues or harms).
- The **incidence** of an impact is direct when it is generated by the actions of the project itself and indirect when it is generated by the influence of the project.
- Regarding the **time scale** of an impact, this aims at defining if it merely arises over a given period of time (temporary), if it is occasionally evident over construction phase or lifespan of the project (periodic), or if it is evident over the entire lifespan of the project (permanent).
- The **probability** or degree of certainty of the occurrence of the impacts is established from the knowledge of the characteristics of each action and each environmental factor.
- The **spatial dimension** reports the extent of impact, namely the geographic area, population or other affected stakeholders.
- The **reversibility** of an impact is related to the consequences it produces over time. In other words, this is determined according to the respective effects enduring over time or ending when the cause thereof ceases. Environmental impacts are reversible when the current state of the environmental descriptor (or its normal operation) can be recovered, or irreversible, when the current state of the environmental descriptor (or its normal operation) cannot be recovered.
- The **magnitude** of an impact is determined according to the degree of aggressiveness of each action and the sensitivity of the environmental factors affected. An impact is deemed, by way of example, to be of high magnitude, where it results in the disruption of an environmental factor that profoundly alters its current state.
- The **significance** of the impact consists of the social or ecological importance that this impact represents, which is a more subjective variable since it depends on the sensitivity of the assessor. Certain impacts, in some environmental factors, may be of no or irrelevant significance, which are defined as impacts where the analysis does not merit any relevance. The assessment of the significance is influenced by the other descriptors of the impact.

To minimize the environmental impacts identified, alternative solutions will be proposed in the project (in environmental, architectural, economic and social terms) if technically and economically feasible. The impacts will be assessed considering foreseeable operation without the realization of the project (zero alternative).

In order to comply with Ministerial Diploma 46/2017, 2 August, the physical and environmental (climate, topography, geology, water resources, air, soil and noise), ecological, economic cultural and social components will be analysed.

Social impact assessment is presented in its own chapter, Chapter 10.

To standardize the impact assessment, the following table shows the main activities to be carried out in the different phases of the landfill.

<table>
<thead>
<tr>
<th>Table 9-2 Main project activities potentially causing impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project Activity</strong></td>
</tr>
<tr>
<td>Project Design / Pre-Construction</td>
</tr>
<tr>
<td>Contract execution - Improvements in the Project Design, EMP based on final Detailed Engineering Designs</td>
</tr>
<tr>
<td>Site Investigations</td>
</tr>
<tr>
<td>Support to affected people (waste pickers) by the GoTL (such as guidance to existing Government support)</td>
</tr>
<tr>
<td>Jobs creation related to the contract execution</td>
</tr>
<tr>
<td>Project Activity</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Expectations and fears raised by the project</td>
</tr>
<tr>
<td><strong>Construction</strong></td>
</tr>
<tr>
<td>Contractor’s camp &amp; laydown areas</td>
</tr>
<tr>
<td>Clearing of vegetation</td>
</tr>
<tr>
<td>Soil excavation (formation of cells, other infrastructures)</td>
</tr>
<tr>
<td>Filling and compacting soil (cells, access roads and embankments)</td>
</tr>
<tr>
<td>Installation of surface water (stormwater) and leachate drainage systems</td>
</tr>
<tr>
<td>Circulation of vehicles and machinery on construction areas and access roads</td>
</tr>
<tr>
<td>Reduction of vector disease spreading by impeding animals scavenging in the Landfill</td>
</tr>
<tr>
<td>Job creation and procurement opportunities for goods and services related to construction</td>
</tr>
<tr>
<td>Construction sites and presence of workers</td>
</tr>
<tr>
<td>Temporary land use</td>
</tr>
<tr>
<td>Demobilization process</td>
</tr>
<tr>
<td><strong>Operation</strong></td>
</tr>
<tr>
<td>Transfer of existing waste</td>
</tr>
<tr>
<td>GHG emissions (methane, carbon dioxide and VOCs)</td>
</tr>
<tr>
<td>Elimination of waste burning</td>
</tr>
<tr>
<td>Operation and circulation of new vehicles and machines</td>
</tr>
<tr>
<td>Landfill secondary operation activities (washrooms, fuel tank and depot areas, including wash bays)</td>
</tr>
<tr>
<td>Production of contaminated water (leachate)</td>
</tr>
<tr>
<td>Conduct of surface water for the new drainage system</td>
</tr>
<tr>
<td>Waste management improvement</td>
</tr>
<tr>
<td>Operation of cells (earth movements / earthworks)</td>
</tr>
<tr>
<td>Reforestation in the reserve area</td>
</tr>
<tr>
<td>Jobs creation related to the operation</td>
</tr>
<tr>
<td><strong>Decommissioning</strong></td>
</tr>
<tr>
<td>Landfill closure and post-closure</td>
</tr>
<tr>
<td>GHG emissions (methane, carbon dioxide and VOCs)</td>
</tr>
</tbody>
</table>
9.2 - Climate and Implications in the Climate Change

9.2.1 Methodology

Climate is not an essential factor for impact assessment, but rather provides baseline data for other factors such as air quality, water resources and climate change.

Thus, during the pre-construction, construction, operation and decommissioning phases, no positive or negative impacts on the climate caused by the project are expected.

Regarding the implications for climate change, only in the operation and decommissioning phases will occur impacts related to the emission of greenhouse gases (GHG).

9.2.2 Operation Phase

Once waste is deposited in a landfill it begins to degrade and decompose through a variety of processes. In most landfills, particularly landfills receiving MSW, the dominant process is methanogenesis, whereby anaerobic bacteria decompose organic waste to produce biogas, which consists predominantly of methane (40-60%) and carbon dioxide (most of the rest). Gas generation occurs over a long period of time, usually reaching a maximum after about 15-20 years, before declining slowly thereafter.

Potential GHG emissions from the TDRUP have been calculated using the Commonwealth of Australia 2014 National Greenhouse and Energy Reporting (NGER) solid waste emissions calculator Version 1.91.

Inputs included an assumed legacy landfill size of 400,000 tons in 2010, and the latest Dili population and waste generation projections. The calculator used the climatic and waste characteristics of Darwin, NT, which approximates that of Dili. With no recycling, the emissions calculated for the landfill are shown in Table 9-3.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total emissions (CO₂-e) (t)</th>
<th>Legacy emissions (CO₂-e) (t)</th>
<th>Non-legacy emissions (CO₂-e) (t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021</td>
<td>36,111</td>
<td>7,671</td>
<td>0</td>
</tr>
<tr>
<td>2022</td>
<td>38,827</td>
<td>6,809</td>
<td>32,018</td>
</tr>
<tr>
<td>2023</td>
<td>41,252</td>
<td>6,103</td>
<td>35,149</td>
</tr>
<tr>
<td>2024</td>
<td>43,953</td>
<td>5,514</td>
<td>38,439</td>
</tr>
<tr>
<td>2025</td>
<td>46,549</td>
<td>5,013</td>
<td>41,536</td>
</tr>
<tr>
<td>2026</td>
<td>49,396</td>
<td>4,582</td>
<td>44,814</td>
</tr>
<tr>
<td>2027</td>
<td>52,435</td>
<td>4,205</td>
<td>48,230</td>
</tr>
<tr>
<td>2028</td>
<td>55,310</td>
<td>3,872</td>
<td>51,438</td>
</tr>
<tr>
<td>2029</td>
<td>58,391</td>
<td>3,575</td>
<td>54,816</td>
</tr>
<tr>
<td>2030</td>
<td>61,630</td>
<td>3,308</td>
<td>58,322</td>
</tr>
</tbody>
</table>

Note: CO₂ equivalent includes methane emissions at the landfill.

As is possible to see, at the commencement of operation in 2022, the GHG emissions for the landfill will be 38,827 tons CO₂e/year, rising to 46,549 tons CO₂e/year in 2025 and 61,630 tons CO₂e /year in 2030 (59% increase).
These emissions can be mitigated through the maximisation of recycling. With maximum recycling, the amount of waste entering the landfill is significantly reduced, and the GHG emissions are similarly reduced. This is shown in Table 9-4.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total emissions (CO₂-e) (t)</th>
<th>Legacy emissions (CO₂-e) (t)</th>
<th>Non-legacy emissions (CO₂-e) (t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021</td>
<td>31,199</td>
<td>7,671</td>
<td>0</td>
</tr>
<tr>
<td>2022</td>
<td>32,641</td>
<td>6,809</td>
<td>25,832</td>
</tr>
<tr>
<td>2023</td>
<td>33,927</td>
<td>6,103</td>
<td>27,824</td>
</tr>
<tr>
<td>2024</td>
<td>35,579</td>
<td>5,514</td>
<td>30,065</td>
</tr>
<tr>
<td>2025</td>
<td>37,190</td>
<td>5,013</td>
<td>32,176</td>
</tr>
<tr>
<td>2026</td>
<td>38,936</td>
<td>4,582</td>
<td>34,354</td>
</tr>
<tr>
<td>2027</td>
<td>40,945</td>
<td>4,205</td>
<td>36,740</td>
</tr>
<tr>
<td>2028</td>
<td>42,681</td>
<td>3,872</td>
<td>38,809</td>
</tr>
<tr>
<td>2029</td>
<td>44,699</td>
<td>3,575</td>
<td>41,124</td>
</tr>
<tr>
<td>2030</td>
<td>46,770</td>
<td>3,308</td>
<td>43,462</td>
</tr>
</tbody>
</table>

At the commencement of Landfill operation in 2022, the GHG emissions with recycling are unchanged because of the strong contribution from the legacy landfill. However, by 2025 the emissions are only 37,190 tons/year, and 46,770 tons/year in 2030 (18% and 24% lower respectively).

It should be noted that the project provides for the collection and combustion of gas (mainly methane) in a central gas treatment plant.

Initial gas collection rate is assumed to be around 40% during ongoing waste deposition, rising to approximately 60% after the landfill has reached full capacity and the cells covered and capped. It is anticipated that gas capture and flaring will be required for up to three decades after waste filling is ended.

The important climate change risks likely to impact on the solid waste project for Dili are temperature rise, rainfall and sea level rise. Based on the scenarios we can expect further warming over Timor Leste up to 1.1°C by 2030 under all RCP scenarios. By 2090 a warming of 2.5 to 4.2°C is projected for RCP8.5 while a warming of 0.5 to 1.2°C is projected for RCP2.6 (see section 7).

The result of increased temperature will be increased humidity and consequently increased extreme rainfall events (higher risk of flood) and increased evapotranspiration leading to some lower recharge of aquifers. The higher rainfall intensities could lead to higher turbidity of surface water and increased risk of landslides in the catchments.

Changes to rainfall are far less certain than temperature and the consensus of models is little change in annual rainfall. Inter-annual variability in annual and seasonal rainfall associated with the ENSO (El Niño–Southern Oscillation) is evident in the historical data record. There is no agreement on how the ENSO will change under Climate Change. However, projections show extreme rainfall days are likely to occur more often. With an increase in the frequency and intensity of rainfall events there will logically be a potential for increase in flooding with attendant risk of damage to infrastructure.
The frequency and duration of droughts are expected to decrease slightly under RCP8.5 and stay the same under all other scenarios. There is only low confidence in this prediction as it is predicated on mean rainfall change, which is expected to change only slightly.

The landfill will be protected from increased direct stormwater runoff by over-sized interception drains around the landfill site, leading to an armoured confluence basin with water velocity reduction devices and concrete channels to the drainage system.

Storm-caused landslides on the slopes above the landfill will be prevented by the maintenance and expansion of existing vegetation cover. The operating team will prevent any clearing of vegetation, removal of soil or disturbance to the stabilized surface through fencing and security. A program of tree planting in currently denuded areas will be included in the mitigation measures for the landfill (and is expected to be developed in the project design).

9.2.3 Decommissioning Phase

In the decommissioning phase, the impacts are similar to those identified for the operation phase. GHG emissions will remain for 30 years after the landfill closure process (legacy emissions).

The central gas treatment plant will continue to collect and combust gas during this period.

9.3 - Topography

9.3.1 Methodology

Considering the type of project and the planned activities, the impacts on topography occur during construction and operational phase as a result of earthmoving (soil excavations, filling and compacting) and reforestation.

At the end of the operation, the closing process has consequences for the decommissioning phase.

Regarding the negative impacts, it is generally considered to be significant when:

- Areas with special geomorphological interest are affected;
- Changes in natural morphology are generated as a result of the removal of the geological substrate in excavations and slopes heights up to 10 m.

9.3.2 Pre-Construction Phase

During the pre-construction, no positive or negative impacts on the topography caused by the project are expected.

9.3.3 Construction Phase

Some interventions provided for in the TDRUP project may contribute to the modification of the topographic characteristics, so its evaluation is justified.
Change in terrain morphology (excavations)

Soil excavation to the construction of cells and other infrastructures will be responsible for change the local morphology of the terrain.

The areas where this change will be most perceived are the cells in the Waste Disposal Area, especially in cell 3 where the difference between the current topography and the cell base grading profile reaches 6 m high.

Also, during the construction of the two internal roads and other secondary infrastructures, the excavations will cause changes in the current topography, although never reaching the heights of the embankments planned for the cells.

In summary, areas of special geomorphological interest will not be affected and the heights foreseen for landfills do not exceed 10 m.

9.3.4 Operation Phase

Change in terrain morphology / land forming

The impact on the initial morphology is much bigger as the process of filling cells with waste occurs. The maximum thickness of waste under the proposed restoration profile is approximately 44 m above the current ground surface in the central part of the western half of the Waste Disposal Area, whilst the average filled depth of waste is determined to be 18.2 m (see example on Figure 9-1).

The restoration profile adopted, after settlement, is 1.0V:3.0H (18.4°, grade 33.33%). This is a typical profile for modern sanitary landfills, adopted to maximize the available void space on the smallest landfill footprint.

The impacts on this aspect was rated as ‘Medium’ and subject to integration measures in the local landscape.

Reforestation in the Reserve Area (decrease landslide risk)

The project intends to carry out reforestation activities in the Reserve Area hillsides for ecological and safety reasons, namely for the reduction of erosion and risk of landslides, improving the visual amenity of the Landfill.

The impact is considered positive for the topography and should be extended to the entire Waste Disposal Area at the end of the operation phase (adoption of a landscape management plan).
9.3.5 Decommissioning Phase

The impacts on topography identified in the final phase of the operation remains in the decommissioning phase. As mentioned in the section of the operation phase, the profile adopted, after settlement, is 1.0V:3.0H (18.4º, grade 33.33%) and typical profile for modern sanitary landfills.

The total gross void space between the base of the landfill, as illustrated on Drawing No. TS04 in Volume 3, and the proposed restoration profile (Drawing No. TS05 in Volume 3) is 1,886,726 m³.

The Landfill closure and post-closure will have specific measures for the earth/waste conditioning (See Chapter 14 of the EMP - Closure and Decommissioning Plan).

9.4 - Geology

9.4.1 Methodology

In the analysis of the impacts likely to be caused in geology, quantitative methods were used based on the elements of the project related to the estimated areas and volumes for its implementation.

The expected impacts for the construction, operation and decommissioning phases were considered separately. In assessing the impacts was considered the general methodology presented in Chapter 9.1.

9.4.2 Pre-construction

During the pre-construction, no positive or negative impacts on the geology caused by the project are expected.

9.4.3 Construction

The main impacts on geology occur essentially in the construction phase. The interventions provided for in the TDRUP project will contribute to the modification of the geological characteristics, so its evaluation is justified.

Potential impacts that may alter the geological environment are related to the following activities:

- Excavations for construction of the project components (mainly the formation of cells, but also roads, structure foundations, surface water system and compost plant);
- Operation and deactivation of the new cells.

Regarding the significance of negative impacts, it is generally considered to be significant when the impact caused by a given action in areas with geological interest (areas with mineral resources) or when indirectly affecting mineral resource exploration.

Soil excavations (geological substrate decrease - soil loss)

Regarding the destruction of the geological substrate, the total excavations will originate a high volume of geological material (see Table 9-5).
Table 9-5 Quantities of soil excavation

<table>
<thead>
<tr>
<th>Project items</th>
<th>Contaminated soil (m³)</th>
<th>Clean soil (m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cells</td>
<td>19,255</td>
<td>49,145</td>
</tr>
<tr>
<td>Roads (primary access, maintenance and depot sites)</td>
<td>-</td>
<td>21,631</td>
</tr>
<tr>
<td>Surface water system</td>
<td>-</td>
<td>1,650</td>
</tr>
<tr>
<td>Compost plant</td>
<td>-</td>
<td>3,800</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>19,255</strong></td>
<td><strong>76,226</strong></td>
</tr>
</tbody>
</table>

In total, 95,481 m³ of soil will be excavated, of which 19,255 m³ are possibly contaminated soils which will have to be treated differently (see chapter 9.9 - Waste and Wastewater Management).

Despite this situation and regarding mineral resources, the areas where these excavations will take place will not affect any concession or exploration area of mineral resources. Even the small quarry, which is currently closed (without operating license), will not be directly affected.

On the other hand, uncontaminated soil will be used in the landfill for earthworks during the construction and operation phases. Thus, no material will be sent off-site for disposal, reducing the need for excavation elsewhere to provide fill materials for the landfill.

Therefore, the allocation of any relevant geological resource is not foreseen.

It should be noted that it will be necessary to import off-site gravel for the leachate collection system, for the landfill gas wells and for the roads. Approximately 31,495 m³ of gravel will be required, of which approximately 30,000 m³ is required for Cells 1, 2 and 3.

Increase the erosion risk

During construction it is possible that soil exposure resulting from the absence of vegetation may temporarily increase the risk of soil erosion, in particular during events of intense precipitation.

The 3 slopes identified in chapter 6.4 (see Figure 6.20) are the most worrying situations and result from the combination of these factors. Although they are not directly affected by the project's activities, it is necessary to be signalled so that the situation does not get even worse.

The adoption of appropriate measures to contain landslides will be sufficient to mitigate this potential impact.

9.4.4 Operation

During the operation are not expected negative impacts on the geology caused by TDRUP. It might need to excavate borrow pits if insufficient material on site for use in daily and intermediate cover. However, it is not foreseen to be an issue since the plan is to use old degraded waste as cover materials.

Decrease the erosion risk

During the operation the stormwater drainage system will be designed for extreme precipitation events, reducing the risk of increased erosion caused by water runoff, in particular landslides.

This positive impact will occur not only within the landfill area, but also in the downstream area that currently experiences flooding and landslide events.
The reserve area serves not only to protect the landfill but also for reforestation. This measure will also be responsible for the reduction of events that result in soil erosion and landslides. Impacts related to soil contamination will be analysed in the soils and waste management chapters.

9.4.5 Decommissioning Phase

During the landfill closure process, the rehabilitation and reforestation of the entire area is planned. These measures will be responsible for maintaining a relatively low risk of erosion and the situation is not expected to return to what is currently observed.

9.5 - Water Resources (Surface, Ground, Coastal and Marine)

9.5.1 Pre-construction Phase

During the pre-construction, no positive or negative impacts on the water resources caused by the project are expected.

9.5.2 Construction Phase

In the construction phase, the project actions that generate the greatest impacts are:

- Installation and operation of the construction site(s) and vehicles;
- Deforestation and land clearing;
- Earth moving (including earthworks);
- Implementation of the stormwater system;
- Implementation of the leachate system (water treatment).

Deforestation and land clearing - Increased surface runoff and decreased infiltration processes

In most areas to be intervened (including construction sites), work begins with clearing of vegetation and deforestation.

As a result of these actions, increases in surface runoff and at the same time a decrease in water infiltration processes is expected due to the removal of soil and vegetation cover, which helps to promote surface retention processes.

The most likely locations for these impacts are the natural areas (away from the city centres) with low density and high slopes. In the TDRUP area (ADI), these impacts can occur especially near the small water lines.

Within the intervention area there are no relevant water lines, and special care should be taken to not affect directly the three slopes already identified in the previous chapter.

As regards of the aquifer (coastal alluvium) recharging, the main recharge takes place through the rivers, outside the ADI. The planned excavations will not intercept any of the waters that are nowadays seeping down into the aquifer located beneath.
Increased concentration of suspended solids and pollutants in watercourses – decrease of water quality

Earthworks that will occur generally in the Landfill area generate particulate matter which, dragged by runoff, causes total suspended solids (TSS) concentration to increase in the receiving watercourses, aquifers and, ultimately, the sea.

In addition to the TSS, pollutants such as heavy metals (cadmium, lead), copper and zinc, hydrocarbons and oils that are produced on construction sites will also be dragged into the water (surface and groundwater).

Regarding the local aquifer, the introduction of pollutants into recharge areas will not be likely to significantly change its quality since during extreme rainfall events runoff prevails.

By adopting mitigation measures, the use of groundwater for human consumption will not be affected.

Increased water consumption and wastewater production at contractor’s camp by workers

Both actions (increased water consumption and increased wastewater production) cause impacts in the local supply and drainage systems that are sized to meet the anticipated needs.

It should be mentioned only the need to connect the construction site facilities to these two systems or to present autonomous and self-contained systems instead.

Regarding the vehicle washing and fuel / oil storage location, a proper oil tank and vehicle pit for maintenance should be set up temporally to prevent any water contamination from oil leakage in the contractor’s camp.

9.5.3 Operation Phase

Increased surface runoff and decreased infiltration processes

The surfaces that will remain impermeable are not relevant in a landfill project. In addition to this, the reforestation of the upstream reserve area and the start of operation of the stormwater drainage system causes the flow to increase almost nothing (it is possible peak flows events and for that, the project has foreseen retention pods to intercept some of the flows to reduce the peakiness).

For this reason, it is considered to be a negligible impact.

Stormwater system - Flood risk reduction in downstream areas

The construction of a new stormwater drainage system is an essential component of the project, not only for the landfill itself, but also for the entire area that is downstream, namely infrastructure (roads), residential areas and commercial / industrial areas.

The objective is to capture the stormwater that falls throughout the landfill basin and lead it correctly to the nearest river (Maucau River).

This system avoids not only the floods and erosion impacts in TDRUP’s ADI, but also in the areas existing downstream of the system, since currently the stormwater flows uncontrolled to Tibar Bay.

Leachate system and impact in the quality of the water resources (surface and groundwater)

Leachate contains highly polluting substances which, if not contained, could seep into any underlying groundwater or adjacent surface water and render such water unfit for consumption or unsafe and toxic for aquatic life.
The leachate system present in the future landfill will have the purpose of collecting this leachate and re-circulated to the Landfill. If it needs to be treated prior to discharging off-site then a small, purpose-built batch plant will be installed (the existing WWTP is not designed, nor is it capable, to treat leachate).

This is an extremely positive impact (leachate collection and the installation of the lining system), as it avoids contamination of both surface water and mainly groundwater.

The main beneficiaries of this treatment system will be the users of the wells and boreholes present near the TDRUP, which use groundwater for human consumption (contamination risk will decrease).

Contamination from depot areas

The Depot Area will serve as the parking lot for the trucks, including washrooms for workers and vehicle wash areas. These activities will be responsible for the generation of wastewater for which the project has two different measures:

- Septic tank for washrooms installations;
- Wash bays with oil-water separator and sediment trap for vehicle wash areas.

The impact that remains for water quality is residual.

9.5.4 Decommissioning Phase

Remaining leachate after closure, evaporation in collection ponds

During the decommissioning phase, leachate will continue to accumulate since water will seep into the landfill through the cover system (it will be captured and re-circulated). Only portion may be evaporated via the leachate pond.

The problem could arise if leachate is not well managed and allowed to build up – leading to break-out through the sides of the landfill or increased hydraulic head on the base of the landfill increasing the potential for seepage into the underlying aquifer. However, it is not expected to occur since specified composite lining system underlain by clay-rich soils.

Therefore, it is unlikely to occur a negative impact on surface and groundwater quality.

9.6 - Air

9.6.1 Methodology

The air quality impact assessment was assessed taking into consideration the activities planned for the different phases of the project.

The assessment was carried out in a qualitative way, considering the occupation characteristics of the surrounding area of the project and the typical air quality levels associated with the planned activities.

9.6.2 Pre-Construction Phase

During the pre-construction, no positive or negative impacts on the air quality caused by the project are expected.
9.6.3 Construction Phase

In the construction phase, the project activities that generate the greatest impacts are:

- Contractor’s camp & laydown areas;
- Soil excavation (formation of cells, other infrastructures) and stockpiling;
- Circulation of vehicles and machinery on construction areas and access roads.

At the landfill, these activities identified above has the potential to cause fugitive dust in dry weather – especially under windy conditions. At an average wind speed of 2.3 m/s TSP from the construction sites will be 8.90 mg/m$^3$ 50 m downwind and 1.65 mg/m$^3$ 100 m downwind. Only at 150 m downwind will dust levels meet the WHO standard two-day average level of 0.3 mg/m$^3$.

The location of sensitive receptors potentially more exposed to air pollutants arising from the landfill during the construction phase is shown in Table 9-6 (see also Figure 9-2).

<table>
<thead>
<tr>
<th>Type</th>
<th>Location</th>
<th>Distance to Tibar Landfill</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Houses</td>
<td>8°34'35.38&quot;S 125°29'47.22&quot;E</td>
<td>10 m west to the Operational Support Area</td>
</tr>
<tr>
<td>2 Houses</td>
<td>8°34'39.69&quot;S 125°29'47.99&quot;E</td>
<td>25 m south to the Operational Support Area and internal road</td>
</tr>
<tr>
<td>Several Houses</td>
<td>8°34'44.35&quot;S 125°29'46.11&quot;E</td>
<td>140 m southwest to the Operational Support Area and internal road</td>
</tr>
<tr>
<td>10 Houses</td>
<td>8°34'29.24&quot;S 125°29'45.28&quot;E</td>
<td>150 m northwest to the Operational Support Area</td>
</tr>
<tr>
<td>10 Houses</td>
<td>8°34'35.50&quot;S 125°29'44.23&quot;E</td>
<td>100 m west to the Operational Support Area</td>
</tr>
</tbody>
</table>

The nearest house to the landfill site is only 10 m from the site boundary, so dust impact on sensitive receivers during construction may cause problems during a limited time (during the construction of the operational support area in dry weather).

Vehicles carrying soil, sand, or other fine materials onto or away from the construction sites will be covered

9.6.4 Operation Phase

Methane and carbon dioxide emissions and odors

During the operation phase, gas will be generated from the biochemical degradation within the landfill. The main components are methane (40-60%) and carbon dioxide (most of the rest).

Potential GHG emissions from the TDRUP have been calculated using the Commonwealth of Australia 2014 National Greenhouse and Energy Reporting (NGER) solid waste emissions calculator Version 1.91 (see Table 9-3 and Table 9-4).
If the concentration of methane builds up to surface concentrations in the range 5-15%, there is a danger of ignition. So landfill generated methane concentration in the air within the landfill's area should not exceed 5%, specifically below 2 m height above landfill work surface, the concentration of methane should not exceed 0.1%.

The project provides for the collection and combustion of gas (mainly methane) in a central gas treatment plant. Initial gas collection rate is assumed to be around 40% during ongoing waste deposition, rising to approximately 60% after the landfill has reached full capacity and the cells covered and capped. It is anticipated that gas capture and flaring will be required for up to three decades after waste filling is ended.

Additionally, the project also considered the following measures:

- Application of daily cover materials to the compacted waste at the end of each day's operation, for odor control;
- Regular spraying of the landfill area and operational support area for control of insects, vermin and odor.

Therefore, the project already includes mitigation measures so that any change in air quality is not foreseen, including, it is expected that the perception of bad odors (typical in this type of project) from the population will drop significantly, mainly after the cell 1 (the closest one to the sensitive receptors) of the landfill is closed.

**Emissions from vehicles and machines for the collection, transport and disposal of waste**

The project foresees the acquisition of several vehicles that will replace the existing ones, namely new trucks (compactor trucks) for the collection and transportation of waste to the landfill. These new vehicles have larger capacity for transporting waste (traffic volume will decrease from the current 100 vehicles per day to around half) and more environmentally friendly (responsible for lower emission of pollutants into the atmosphere - CO₂, CO, NO₂, SO₂ and VOCs).

This change will lead to an improvement in the quality of the air in the sensitive receivers located next to the access to the landfill, especially those that are less than 20 m from the roads.

As mentioned in chapter 6.6.4, was requested to ANLA a waiver for Air Quality Testing which confirmed that "the proponent can submit the draft of EIS and EMP using secondary data to back up the air quality data while waiting for the air quality test because this is an ongoing process and the proponent have commitment to conduct the air quality test before the construction commences."

With this new information, the assessment of impacts on air quality must be completed, based on what is written in this report. The EIS and EMP will be updated following the pre-construction baseline monitoring.

**9.6.5 Decommissioning Phase**

In the decommissioning phase, the impacts are similar to those identified for the operation phase. GHG emissions will remain for 30 years after the landfill closure process (legacy emissions).

The central gas treatment plant will continue to collect and combust gas during this period.

Therefore, no changes in air quality are foreseen at the sensitive receivers closest to the landfill.
9.7 - Soil

9.7.1 Methodology

In this chapter only aspects related to the soil that is not considered contaminated and therefore considered waste will be analysed. Only issues related to the soil and its capacity for use if not evaluated

9.7.2 Pre-construction Phase

During the pre-construction, no positive or negative impacts on the soil caused by the project are expected.

9.7.3 Construction Phase

Soil lost (contamination)

The interventions provided for in the TDRUP project may contribute to the modification of the soil characteristics, so its evaluation is justified.

Considering the type of project and the planned activities (contractor's camp & laydown areas, circulation of vehicles and machinery on construction areas), the impacts on soil occur mainly in the construction phase as a result of handling of hazardous substances for construction of the project components (oils, hydrocarbons, and other building materials containing heavy metals).

Regarding the significance of negative impacts, it is generally considered to be significant when the impact caused by accidental spills of hazardous substances to the soil.

The potential impact from oil spills and other hazardous substances spills as a result of the works are considered to be possible. Despite this scenario, it is not expected to affect large areas, being easily minimised.

9.7.4 Operation Phase

As mentioned in Chapter 6.7 (Environmental Description), the sampling campaigns revealed that the top-soil in the intervention area consists essentially of a mixture of soils with residues (waste thickness recorded in March 2019 varied between 0.35 m and 5.30 m). Thus, its capacity for use is non-existent, with no negative impacts on the soil expected with the construction of the new landfill.

Issues related to the transfer of the existing waste in the dump (including contaminated soil) is an aspect to be developed in the waste management chapter (Chapter 9.9 - Waste and Wastewater Management).

Soil lost (contamination)

The main impacts are related to the risk of eventual contamination of the soils that surround the construction area (Waste Disposal Area).

Notwithstanding that and in view of the continuing use of the site for waste disposal, the project proposed to remove and isolate any potential source of contamination in order to protect underlying soil as part of the re-development of the disposal area.

Allied to this is also foreseen the installation of the leachate collection system, which reduces the risk of rupture of the three impermeable cells.
With the implementation of these protection systems and an adequate monitoring plan, the risk of negative impacts on soils is greatly reduced.

9.7.5 Decommissioning Phase

During the decommissioning, no positive or negative impacts on the soil caused by the project are expected (besides the contamination risk that comes from the operation phase). Contaminated soil is an aspect that will be addressed as waste to be integrated into the waste management chapter.

9.8 Noise

9.8.1 Methodology

In this chapter, the evaluation of the acoustic conditions resulting from the activities planned for the construction, exploration and decommissioning phases was carried out.

The prediction of the acoustic impacts resulting from the operation of a noisy activity is made by comparing the sound levels predictably perceived in the “Zero Alternative” (Residual Noise) with the sound levels predictably perceived, both in the construction phase and in the exploration phase (Noise Environment).

The impact assessment was carried out considering the occupation characteristics in the surrounding area of the project and the typical sound levels resulting from the planned activities.

The location of sensitive receptors points potentially more exposed to noise arising from the landfill during the construction and operation phases is shown below (Figure 9-2 and Table 9-7).

![Figure 9-2 Location of the sensitive receptors and noise measurement points](image)
9.8.2 Pre-Construction Phase

During the pre-construction, no positive or significant negative impacts are expected on any environmental noise aspects caused by the project.

9.8.3 Construction Phase

The work to be carried out at this stage involves various operations, some of which are naturally noisy, such as the use of pneumatic hammers and excavation work, thus allowing for the possibility of negative impacts, particularly in the vicinity of the work site, access roads and construction site.

In addition to the type of actions to be undertaken during the construction phase, it should be noted that there are some time-limited operations and others that will cover most of the construction period.

In addition to the above, consideration should be given to a post-construction phase, which encompasses all work inherent in the removal of the yards, the collection of materials and the restoration of the initial situation.

The sound levels generated and perceived during the construction activities will depend on several factors not yet known (characteristics, quantity, location and operating regimes of the equipment to be used, site location, etc.) and is therefore not feasible. at this stage make a quantified prediction of the resulting sound levels.

However, Table 9-8 shows the average values of the perceived sound levels at various distances from equipment normally used in civil construction activities.

<table>
<thead>
<tr>
<th>Table 9-7 Sensitive receptors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td>3 Houses</td>
</tr>
<tr>
<td>2 Houses</td>
</tr>
<tr>
<td>Several Houses</td>
</tr>
<tr>
<td>10 Houses</td>
</tr>
<tr>
<td>10 Houses</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 9-8 Typical LAeq sound levels at various distances from construction equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Equipment</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Excavators</td>
</tr>
<tr>
<td>Trucks</td>
</tr>
<tr>
<td>Concrete plants</td>
</tr>
</tbody>
</table>
### Equipment L\text{Aeq} sound levels [\text{dB(A)}]

<table>
<thead>
<tr>
<th>Equipment</th>
<th>15 m</th>
<th>30 m</th>
<th>60 m</th>
<th>120 m</th>
<th>250 m</th>
<th>500 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cranes (fixed and mobile)</td>
<td>75</td>
<td>71</td>
<td>65</td>
<td>57</td>
<td>&lt; 48</td>
<td>&lt; 42</td>
</tr>
<tr>
<td>Generators</td>
<td>77</td>
<td>73</td>
<td>67</td>
<td>59</td>
<td>&lt; 50</td>
<td>&lt; 44</td>
</tr>
<tr>
<td>Compressors</td>
<td>80</td>
<td>76</td>
<td>70</td>
<td>62</td>
<td>&lt; 53</td>
<td>&lt; 47</td>
</tr>
</tbody>
</table>

The WHO Guidelines do not indicate limits for areas where works exist as they only refer to industrial / commercial areas where the maximum limit is 70 dB (A), so it is assumed that this type of activity can be carried out during daytime.

However, the noise pollution may be increased during site preparation and construction activities from the following environmental aspects:

- Installation and operation of construction site
- Soil excavation and earthworks for project construction (formation of cells 1, 2 and 3, compost plant and other infrastructures)
- Execution of surface water and leachate drainage systems
- Construction of access roads (access road to depot sites, access road 1 and 2)
- Demolition of existing structures
- Circulation of vehicles and machinery on construction areas and access roads.

In the vicinity of main roads (such as rural roads leading to the Tibar landfill) or other important sources noise where the actual sound levels recorded are already high the impacts in this phase will be negative and have low magnitude, such as measuring points MP Noise 2 and MP Noise 4 (near current delivery route).

On the other hand, in places the existing noise environment is low disturbed, away from significant sound sources, the effects of the noise generated by general construction works will be more expressive. So, in these cases, the predicted impacts during construction phase will be negative and with medium (MP Noise 2a and 1 (near operational support area)) to high magnitudes (such as MP Noise 3 (west of landfill)).

In addition, the construction phase will be of limited duration and a restricted area of influence, whereby the acoustic impacts will be negative, localized, reversible and temporary, and will cease upon completion of the work.

In this context, it is reasonable to predict that, overall, the acoustic impacts resulting from this phase may be considered low to moderately significant.

### 9.8.4 Operation Phase

In the construction phase, it should be noted that a functioning landfill currently exists on the site, and that, no significant change in its activity is expected. However, in the operation phase of the rehabilitation and upgrading of landfill, the main sources of noise consist of the operation and circulation of new machinery, such as the new green waste shredder (located west of the current wastewater treatment plant) and the circulation of waste collection trucks.
In relation to the green waste shredder, it has a sound pressure level of 72 dB(A) at about 40 m distance. Table 9-9 shows the average values of the perceived sound levels at different sensitive receptors from this equipment (Particular Noise).

<table>
<thead>
<tr>
<th>Measurement point</th>
<th>Type</th>
<th>Location</th>
<th>Distance from green waste shredder</th>
<th>LAeq sound levels [dB(A)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP Noise 1</td>
<td>3 Houses</td>
<td>8°34’35.38”S</td>
<td>245 m</td>
<td>56,3</td>
</tr>
<tr>
<td>MP Noise 2</td>
<td>2 Houses</td>
<td>125°29’47.22”E</td>
<td>325 m</td>
<td>53,8</td>
</tr>
<tr>
<td>MP Noise 2a</td>
<td>Several Houses</td>
<td>8°34’39.69”S</td>
<td>470 m</td>
<td>50,6</td>
</tr>
<tr>
<td>MP Noise 3</td>
<td>10 Houses</td>
<td>125°29’47.99”E</td>
<td>300 m</td>
<td>54,5</td>
</tr>
<tr>
<td>MP Noise 4</td>
<td>10 Houses</td>
<td>8°34’44.35”S</td>
<td>360 m</td>
<td>52,9</td>
</tr>
</tbody>
</table>

It should be noted that during the night period there should be no negative acoustic impacts since the landfill activity is not expected.

It should be noted too that the values presented above are average values in the free field, without obstacles to sound propagation. Bearing in mind that the sensitive receptors most exposed to noise from operation of this machine are MP Noise 1 and 3 and that there is a wall at the northwest limit of the landfill that acts as a barrier, the perceived values should be lower.

Regarding the trucks circulation to access the landfill, since the fleet of these vehicles will be renewed and they will have a greater capacity for collecting waste, this will result in a reduction in half of the number of trips required for transport waste. This reduction will translate in average terms to an attenuation of about 3 dB(A) compared to the current situation which represents an improvement in the noise environment in the places situated along the main access road to the landfill (MP Noise 1, MP Noise 2, MP Noise 4).

Table 9-10 the table below shows the estimated values of the sound levels of ambient noise next to the selected sensitive receivers (potentially more exposed), obtained from the logarithmic sum of the sound levels of residual noise object of characterization within the scope of this EIS (view Table 6-15), and of the sound levels particular noise from landfill equipment (Table 9-9).

<table>
<thead>
<tr>
<th>Measurement point</th>
<th>Location</th>
<th>Environmental Noise</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LAeq sound levels [dB(A)] 1, during daytime</td>
<td>Limit values 2 LAeq [dB(A)] for daytime</td>
</tr>
<tr>
<td>MP Noise 1</td>
<td>8°34’35.38”S</td>
<td>54,8</td>
</tr>
<tr>
<td>MP Noise 2</td>
<td>125°29’47.22”E</td>
<td>53,1</td>
</tr>
<tr>
<td>MP Noise 2a</td>
<td>8°34’39.69”S</td>
<td>55,7</td>
</tr>
<tr>
<td>MP Noise 3</td>
<td>125°29’47.99”E</td>
<td>55,1</td>
</tr>
<tr>
<td>MP Noise 4</td>
<td>8°34’44.35”S</td>
<td>51,3</td>
</tr>
</tbody>
</table>

1 – LAeq (Environmental Noise) = 10 x LOG10 (10 LAeq Residual Noise /10 +10 LAeq Particular Noise/10)

2 – Limit values adopted considering the characteristics of these areas (industrial with sensitive premisses – residential areas).
Considering the results presented in the table above, it is possible to verify compliance with the limits established at all measurement points during the daytime period (landfill working period).

Comparing the residual noise (“Zero Alternative”) values with the environmental noise levels it is possible to conclude that the impacts will be negative, permanent but reversible, with low magnitude in the points that are close to other important sound sources (close to roads, as is the case of the MP Noise 2, MP Noise 2a, MP Noise 4 and MP Noise 1) and with medium magnitudes in the MP Noise 3, since currently the acoustic environment is little disturbed – without important noise sources.

Therefore, it is expected that the landfill will induce changes in the local environmental noise, however, regarding the activity within the cells themselves it should be noted too that cell 1 (the closest one to the sensitive receptors) will be closed in 2027 and only cells 2 and 3, which are much more distant from the sensitive receptors (the sensitive receptor closest to cell 2 is the MP Noise 1, which is at a distance of 370 m), will remain in operation. With closure of cell 1, the acoustic impacts originated by some activities conducted for the landfill operation will be reduced.

Considering the information gaps regarding the number, location, type of machinery and their operating regimes (including the expected replacement of the current vehicle fleet with different sound emission levels), the values presented here are only an estimate and must be verified through monitoring noise campaigns for the landfill operation phase (see Chapter 10 - EMP).

9.8.5  Decommissioning Phase

During the decommissioning phase, no positive or significant negative impacts are expected on any environmental noise aspects caused by the project.

9.9 - Waste and Wastewater Management

9.9.1  Pre-construction Phase

No additional impacts – no changes to existing operations pending completion of detailed design.

9.9.2  Construction Phase

Prior to cell preparation it is necessary to re-locate the existing waste from the area of the cell to be prepared. Re-location will involve either pushing by bulldozer or excavation and trucking. Distances for relocation of waste will be small, less than 200 m. The definition and phasing of cell development has been designed to minimise the volumes of waste to be relocated. Only for the first sub-area of Cell 1 will it be necessary to double-handle waste (that is, move the same waste twice); for all other parts of the waste disposal area, the waste will be moved once and placed in its final position and compacted following the preparation of the cell.

Waste relocation will be restricted to periods of dry weather to minimise the potential for generation of muddy water and sediment in surface run-off. Where such surface run-off occurs, it will be directed to a locally developed sump and the sediment allowed to settle before the water is re-circulated back to the exposed waste.
Relocation of waste may generate dust and wind blow of light materials (including degraded plastic), in which event the active area will be sprayed with water to reduce fugitive dust emissions and portable litter fences will be placed around the area being excavated or waste being moved. In periods of high wind velocity, re-location of waste will be prohibited.

Waste that is re-located temporarily will be covered by a layer of soil to prevent wind blow. For waste re-located to a prepared cell, the material will be compacted soon after placement in the cell.

Where possible degraded waste (usually mixed in with soil) will be used as daily and intermediate cover in order to reduce the requirement to use newly excavated soil from borrow pits adjacent to the waste disposal area.

Waste materials generated during construction activities will be disposed to the existing waste disposal area and will not impact the area surrounding the landfill.

9.9.3 Operation Phase

During waste deposition, all discharged waste will be inspected to ensure that no unacceptable waste is incorporated into the waste cell. All such material identified, that cannot be disposed at the landfill, will be isolated and taken to a temporary storage area pending agreement on the method of disposal to be employed. Such unacceptable waste includes liquid waste, hazardous wastes, medical waste and animal carcasses.

All wastewater from site activities will be collected and sent to appropriate treatment. In the case of domestic wastewater this will be collected via septic tank. After settlement supernatant liquid will be pumped and recirculated to the landfill.

Washwater from vehicle cleaning will be collected after passing through an oil-water separator and sedimentation trap. This water will be re-circulated to the landfill or, once the compost plant is operating, can be used as make-up water for compost operations or in dust suppression across the landfill (active area of waste deposition, internal roads etc.).

Leachate will be collected via the leachate collection system and then re-circulated back to the landfill. This will help to speed up the process of waste stabilization. Contaminants in the wastewater will bind into the degrading waste mass over time.

9.9.4 Decommissioning Phase

Once waste disposal operations have ceased at the site, there will be no domestic wastewater generated, nor will there be washwater from vehicle and equipment cleaning.

Leachate will continue to accumulate in the landfill and, therefore, it will be necessary to continue to pump out leachate and either to evaporate this or recirculate back to the landfill, until such time as monitoring shows that the effluent is suitable for discharge back to the environment.
9.10 - Ecological

9.10.1 Methodology

The impact assessment was done based on the TOR requirements, namely a secondary data review and field visit to assess the overall fauna and flora conditions of the TDRUP Project Area of Intervention (AOI), taking into account the activities planned during the TDRUP construction and operation phases (see Section 6.10.6.3). From the baseline phase, it is clear that the current project intervention area (AOI) does not lie within any declared protected areas.

9.10.2 Pre-Construction Phase

During the pre-construction, no positive or significant negative impacts are expected on any ecological components caused by the project.

9.10.3 Construction Phase

Clearing of vegetation - Vegetation loss

There will be no direct impact on terrestrial flora as a result of the project construction. The only areas with more substantial vegetation cover are in the proposed “Triangle” area earmarked for the Composting site or in the secondary regrowth forest and the Eucalyptus Savannah on the upper reaches of the watershed.

This Triangle area includes a mix of dense areas with invasive species of shrubs i.e. *chromalaena odorata* and previously cultivated areas of fruit trees i.e. small banana grove and a number of Teak trees, which have been included in and paid out in the compensation package during the cadastral exercise to define the landfill as for Government use.

The cleared vegetation may be used as firewood in the project work site, proposed to be temporarily established in the Triangle area until the compost equipment is established.

Likewise, the secondary regrowth forest and Eucalyptus Savannah are in the higher reaches of the hillside, within the limits of the Reserve Area of the Landfill and shall be off-limits to the construction workers and the general public and will not be affected by the rehabilitation.

No sensitive or declared species were identified in any of the above-mentioned areas and thus the impact is deemed to be “Low” for clearing / disturbance.

9.10.4 Operation Phase

Fauna Control

The Landfill is currently visited by a series of domestic animals i.e. pigs, cows, goats and dogs, that feed on the organic part of the waste, with the considered health impacts when these animals are consumed for food. Given the Landfill will be fenced and access to these animals will be closed off, the accumulation of contaminants which result from feeding on the waste, and the expected decrease in the number of animals visiting the site, the impact is considered positive and significant since this will cease to take place.

The location of the project site has been reviewed against National Directorate for Protected Areas (DNAP) mapping for Tasitolu Protected Area and Important Bird Area (TL13) mapping. Although Tibar Dumpsite has
been active for more than 40 years, and does not fall into the current Protected Area boundary, the recently delineated IBA borders places the project within its south-western fringe.

Based on the site visits and baseline assessment, few species were identified at the project site, due to the landfill's current condition, thus avifauna impacts are expected to be minimal.

Nonetheless, to follow through with the requirements of Decree-Law no. 6/2020 – Biodiversity Conservation, regarding “…the need for attention to the protection of damaged ecosystems that…are adjacent to a protected area…”, a greening/reforestation plan will be implemented. Site vegetation plans will be developed at subproject site using appropriate local native species. Any existing greening areas impacted by the subproject will be replanted in the project reserve area throughout the landfill hillsides during operation and decommissioning.

Reforestation in the Reserve Area

As was referred, the project intends to carry out reforestation activities in the Reserve Area hillsides for ecological and safety reasons, namely for the reduction of erosion and risk of landslides, improving the forest ecosystem (for the purpose of adjacent IBA improvement), visual amenity of the Landfill and for Climate Change ameliorating purposes.

The impact is considered positive and significant since this activity will reduce the Carbon footprint of the project with new carbon sequestration areas within the project area.

9.10.5 Decommissioning Phase

During the decommissioning, no positive or significant negative impacts are expected on any ecological components caused by the project.

9.11 - Cultural

9.11.1 Construction Phase

The project intends to carry out its activities in the Southern Tibar hillside of the Landfill area. However, there is an active local sacred site named “Fahiduma” or ‘Tasu Oron’ located within the project Reserve Area and the ADI, on a small hill less than 100 meters Northeast of the Landfill Gate, used for ceremonial purposes within the Sau Batar traditional ceremony, which relates to corn harvesting, as well as opening of relevant events and/or projects such as the TDRUP.

Traditional ceremonies require a ceremonial opening for the TDRUP project to go-ahead. In this regard, before the construction activities start, to ward off bad omens and bring luck to the project. There is also an option that must be considered which is talking to the Lia nain of Suco Tibar to carry out a ceremony to “request” the sacred site to re-locate elsewhere in the Suco. This relocation is quite common in traditional cultures in Timor-Leste and reduced the impact of the project considerably.
9.12 - Community and Occupational Health and Safety

9.12.1 Construction phase

During the construction phase workers will be exposed to several risks of accidents due to in site due to earthwork activities, dehydration, communicable and transmittable diseases, exposure to hazardous substances, poor sanitation, poor handling and/or operation of the equipment.

DBO contractor will be required to appoint a full-time environmental health and safety managers and maintain a pool of trained engineers to ensure the effective implementation of both environmental and occupational health and safety measures at the project site.

Contractor (by the Health, Safety and Environment Officer) shall establish its Community and Occupational Health and Safety Plan to be adopted at the site following international best practices and has the responsibility to provide labor camps for migrant workers, and sufficient space for equipment, construction materials, consumables, and other supplies that will be required during construction phase. Therefore, the potential impact on community and occupational health and safety is not significant.

9.12.2 Operation phase

In the operation phase the landfill and its components poses occupation health and safety risks. To reduce the risks, contractors will be required to appoint health and safety officers for each site and to ensure regular briefing of the workforce on health and safety issues. The contractor shall establish its health and safety plans to be adopted following international best practices and the World Bank EHS guidelines on operational activities.

The machineries and plants require different chemicals and hazardous substances for operation. There is invariably a risk when such chemicals are handled. Although the landfill is located away from most Tibar residents, there is a considerable safety risk to workers and also surrounding environment in the event of any leak or spill.

Similar to impacts and measures during construction phase, DBO Contractor must implement a Community and Occupational Health and Safety Plan.

9.13 - Impacts Assessment

In general, the TDRUP project is expected to result in improved air, water and noise environment quality and community safety at the landfill site and surrounding areas, as well as the indirect impact of the changes to collection and haulage practices that will benefit the improvement of the quality of life and urban amenity to the current population in the city of Dili.

Table 9-12 presents the assessment of the impacts identified and analysed in the previous section, according to the adopted methodology, for the construction and operation phases.

In the pre-construction phase, no impact was identified.
### Table 9-11 Impact Assessment – Pre-Construction and Construction Phases

<table>
<thead>
<tr>
<th>Phase</th>
<th>Potential impacts</th>
<th>Nature</th>
<th>Incidence</th>
<th>Time scale</th>
<th>Probability</th>
<th>Spatial Dimension</th>
<th>Reversibility</th>
<th>Magnitude</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>General Contract Management</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-Construction and Design</td>
<td>Definition of a dedicated PMU Director and team to manage the TDRUP Project</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>Certain</td>
<td>Regional</td>
<td>Reversible</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>Inclusion of Final approved EIS/EMP specifications and standards in DBO contractual documents and obligation of Contractor to draft his/her EMP based on final Detailed Engineering Designs</td>
<td>Positive</td>
<td>Direct</td>
<td>Medium term</td>
<td>Certain</td>
<td>Regional</td>
<td>Reversible</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>Preparation of a Site Environmental Management and Supervision Plan</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>Certain</td>
<td>Local</td>
<td>Reversible</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Climate Change</td>
<td>Reduction of GHG emissions by reinforcing and supporting Recycling policies and programs</td>
<td>Positive</td>
<td>Indirect</td>
<td>Long term</td>
<td>Probable</td>
<td>Regional</td>
<td>Reversible</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Water Resources</td>
<td>Introduction of impermeable basal liner to collect and treat leachate</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>Certain</td>
<td>Local</td>
<td>Reversible</td>
<td>Medium / high</td>
<td>High</td>
</tr>
<tr>
<td>Air</td>
<td>Introduction of operational rules to cover waste immediately and avoid waste fire and air pollution</td>
<td>Positive</td>
<td>Direct</td>
<td>Medium term</td>
<td>Certain</td>
<td>Local</td>
<td>Reversible</td>
<td>Medium / high</td>
<td>High</td>
</tr>
<tr>
<td>Economic</td>
<td>Site choice on existing dumpsite location, as a “brownfield” project</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>Certain</td>
<td>Local</td>
<td>Irreversible</td>
<td>Medium / high</td>
<td>High</td>
</tr>
<tr>
<td>Topography</td>
<td>Change in terrain morphology (excavations)</td>
<td>Negative</td>
<td>Direct</td>
<td>Long term</td>
<td>Certain</td>
<td>Local</td>
<td>Irreversible</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>Geology</td>
<td>Soil excavations (geological substrate decrease – soil lost)</td>
<td>Negative</td>
<td>Direct</td>
<td>Long term</td>
<td>Certain</td>
<td>Local</td>
<td>Irreversible</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Increase the erosion risk</td>
<td>Negative</td>
<td>Direct</td>
<td>Short term</td>
<td>Certain</td>
<td>Local</td>
<td>Reversible</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Water Resources</td>
<td>Increased surface runoff and decreased infiltration processes</td>
<td>Negative</td>
<td>Direct</td>
<td>Short term</td>
<td>Probable</td>
<td>Local</td>
<td>Reversible</td>
<td>Small</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Increased concentration of suspended solids and pollutants in watercourses – decreased water quality (surface and groundwater)</td>
<td>Negative</td>
<td>Direct</td>
<td>Short term</td>
<td>Probable</td>
<td>Local</td>
<td>Reversible</td>
<td>Small</td>
<td>Low</td>
</tr>
<tr>
<td>Phase</td>
<td>Potential impacts</td>
<td>Nature</td>
<td>Incidence</td>
<td>Time scale</td>
<td>Probability</td>
<td>Spatial Dimension</td>
<td>Reversibility</td>
<td>Magnitude</td>
<td>Significance</td>
</tr>
<tr>
<td>-------</td>
<td>----------------------------------------------------------------------------------</td>
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<td>------------------</td>
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<td>-----------</td>
<td>--------------</td>
</tr>
<tr>
<td></td>
<td>Increased water consumption and wastewater production at construction sites by workers</td>
<td>Negative</td>
<td>Direct</td>
<td>Medium term</td>
<td>Certain</td>
<td>Local</td>
<td>Reversible</td>
<td>Small</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Decreased air quality parameters resulting from increased emissions to air (PM10 and other pollutants)</td>
<td>Negative</td>
<td>Direct</td>
<td>Short term</td>
<td>Probable</td>
<td>Regional</td>
<td>Reversible</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>Soil Lost (contamination)</td>
<td>Negative</td>
<td>Direct</td>
<td>Long term</td>
<td>Certain</td>
<td>Local</td>
<td>Irreversible</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Increase in noise levels</td>
<td>Negative</td>
<td>Direct</td>
<td>Short term</td>
<td>Certain</td>
<td>Local</td>
<td>Reversible</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>Waste relocation</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>Certain</td>
<td>Local</td>
<td>Irreversible</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Vegetation Loss at Depot Area and Composting Plant</td>
<td>Negative</td>
<td>Direct</td>
<td>Long term</td>
<td>Certain</td>
<td>Local</td>
<td>Reversible</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Impacts on local sacred site (“Fahiduma” or “Tasu Oron”)</td>
<td>Negative</td>
<td>Direct</td>
<td>Long term</td>
<td>Certain</td>
<td>Local</td>
<td>Irreversible</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Risk to health and safety in the community and workers</td>
<td>Negative</td>
<td>Direct</td>
<td>Short term</td>
<td>Probable</td>
<td>Local</td>
<td>Reversible</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>
## Table 9-12 Impact assessment – Operation and Decommissioning Phases

<table>
<thead>
<tr>
<th>Phase</th>
<th>Potential impacts</th>
<th>Nature</th>
<th>Incidence</th>
<th>Time scale</th>
<th>Probability</th>
<th>Spatial Dimension</th>
<th>Reversibility</th>
<th>Magnitude</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Climate Change</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reduction of GHG emissions (gas combustion)</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>Certain</td>
<td>Local</td>
<td>Irreversible</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td><strong>Topography</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Change in terrain morphology / Land forming</td>
<td>Negative</td>
<td>Direct</td>
<td>Long term</td>
<td>Certain</td>
<td>Local</td>
<td>Irreversible</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>Reforestation in the Reserve Area (decrease landslide risk)</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>Certain</td>
<td>Local</td>
<td>Irreversible</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td><strong>Geology</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Decrease the erosion risk</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>Certain</td>
<td>Local</td>
<td>Irreversible</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td><strong>Water Resources</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increase surface runoff and decrease infiltration process</td>
<td>Negative</td>
<td>Direct</td>
<td>Long term</td>
<td>Probable</td>
<td>Regional</td>
<td>Irreversible</td>
<td>Small</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Stormwater system - Flood risk reduction in downstream areas</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>Certain</td>
<td>Regional</td>
<td>Irreversible</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Leachate system and impact in the quality of the water resources (surface and groundwater)</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>Certain</td>
<td>Local/ Regional</td>
<td>Irreversible</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td><strong>Air</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improvement of air quality (No waste burning, less odor)</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>Certain</td>
<td>Local/ Regional</td>
<td>Irreversible</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Methane and carbon dioxide emissions</td>
<td>Negative</td>
<td>Direct</td>
<td>Long term</td>
<td>Certain</td>
<td>Local</td>
<td>Irreversible</td>
<td>Low/Medium</td>
<td>Low/Medium</td>
</tr>
<tr>
<td></td>
<td>Emissions from vehicles and machines for collection, transport and disposal of waste</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>Certain</td>
<td>Regional</td>
<td>Irreversible</td>
<td>Low/Medium</td>
<td>Low/Medium</td>
</tr>
<tr>
<td></td>
<td><strong>Soil</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soil Lost (contamination)</td>
<td>Negative</td>
<td>Direct</td>
<td>Long term</td>
<td>Probable</td>
<td>Local</td>
<td>Irreversible</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td><strong>Noise</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increased noise levels from operation of landfill</td>
<td>Negative</td>
<td>Direct</td>
<td>Medium term</td>
<td>Certain</td>
<td>Local</td>
<td>Reversible</td>
<td>Low/Medium</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Reduce noise levels from circulation of trucks</td>
<td>Positive</td>
<td>Direct</td>
<td>Medium term</td>
<td>Certain</td>
<td>Regional</td>
<td>Reversible</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td><strong>Waste and Wastewater Management</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Waste deposition</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>Certain</td>
<td>Local</td>
<td>Irreversible</td>
<td>Low/Medium</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Wastewater production</td>
<td>Negative</td>
<td>Direct</td>
<td>Long term</td>
<td>Certain</td>
<td>Local</td>
<td>Irreversible</td>
<td>Low/Medium</td>
<td>Low/Medium</td>
</tr>
<tr>
<td></td>
<td><strong>Ecological</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reforestation of the Reserve Area Hillsides</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>Certain</td>
<td>Local</td>
<td>Reversible</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Phase</td>
<td>Potential impacts</td>
<td>Nature</td>
<td>Incidence</td>
<td>Time scale</td>
<td>Probability</td>
<td>Spatial Dimension</td>
<td>Reversibility</td>
<td>Magnitude</td>
<td>Significance</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
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<td>--------------</td>
<td>-------------------</td>
<td>---------------</td>
<td>-----------</td>
<td>--------------</td>
</tr>
<tr>
<td>Decommissioning</td>
<td>Risk to health and safety in the community and workers</td>
<td>Negative</td>
<td>Direct</td>
<td>Short term</td>
<td>Probable</td>
<td>Local</td>
<td>Reversible</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Climate Change</td>
<td>Reduction of GHG emissions (gas combustion)</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>Certain</td>
<td>Local</td>
<td>Irreversible</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Topography</td>
<td>Reforestation in the Waste Disposal Area (decrease landslide risk)</td>
<td>Positive</td>
<td>Direct</td>
<td>Permanent</td>
<td>Certain</td>
<td>Local</td>
<td>Irreversible</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Geology</td>
<td>Decrease the erosion risk</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>Probable</td>
<td>Local</td>
<td>Reversible</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Water Resources</td>
<td>Remaining leachate after closure, evaporation in collection ponds</td>
<td>Negative</td>
<td>Direct</td>
<td>Long term</td>
<td>Improbable</td>
<td>Local</td>
<td>Reversible</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Air</td>
<td>Methane and carbon dioxide emissions</td>
<td>Negative</td>
<td>Direct</td>
<td>Long term</td>
<td>Certain</td>
<td>Local</td>
<td>Irreversible</td>
<td>Low/Medium</td>
<td>Low/Medium</td>
</tr>
<tr>
<td>Soil</td>
<td>Soil Lost (contamination)</td>
<td>Negative</td>
<td>Direct</td>
<td>Long term</td>
<td>Probable</td>
<td>Local</td>
<td>Irreversible</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Waste and Wastewater</td>
<td>Waste deposition</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>Certain</td>
<td>Local</td>
<td>Irreversible</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>
9.14 - Mitigation Measurements

9.14.1 Pre-construction Phase

No specific measures are recommended for this phase, other than the execution of the final approved EIS / EMP specifications and preparation of the Site Environmental Management and Supervision Plan.

The only exception is for the fuel tank area, where construction of a double skinned/bunded tank should be considered to prevent fuel leakage to the soil.

9.14.2 Construction Phase

9.14.2.1 Climate and Implications in the Climate Change

All mitigation measures are already included in the project design, namely recycling (increase in the future) and gas combustion.

9.14.2.2 Topography

Table 9-13 Mitigation measures for topography – Construction phase

<table>
<thead>
<tr>
<th>Measure ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Excavation and landfill works should be started as soon as the land is clean, avoiding repeated actions on the same areas</td>
</tr>
<tr>
<td>C2</td>
<td>To prevent ravine slopes caused by a stormwater runoff, the lining should be done early, if possible, immediately after earthmoving operations</td>
</tr>
<tr>
<td>C3</td>
<td>If temporary earth storage is required, the following areas for disposal should be avoided: Riverbeds and proximity (up to 10 m) of the riverbanks; Frequently flooded areas</td>
</tr>
</tbody>
</table>

9.14.2.3 Geology

Table 9-14 Mitigation measures for geology – Construction phase

<table>
<thead>
<tr>
<th>Measure ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C4</td>
<td>Prior to earthmoving work, pickle the topsoil and store for later use</td>
</tr>
<tr>
<td>C5</td>
<td>Reuse of excavation materials in landfill construction to reduce the need for soil from the region's quarries</td>
</tr>
<tr>
<td>C6</td>
<td>To avoid unnecessary land use, all earthmoving must be carried out in the strictly necessary areas after being properly marked.</td>
</tr>
<tr>
<td>C7</td>
<td>Soil contamination should be monitored through maintaining records of spill events</td>
</tr>
<tr>
<td>C8</td>
<td>Covering of stockpiles of materials</td>
</tr>
<tr>
<td>C9</td>
<td>Temporary grassing of stockpiles</td>
</tr>
</tbody>
</table>
### 9.14.2.4 Water Resources

#### Table 9-15 Mitigation measures for water resources – Construction phase

<table>
<thead>
<tr>
<th>Impact</th>
<th>Description</th>
<th>Impact</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C10</td>
<td>Siltation ponds to capture sediment entrained in any runoff event</td>
<td>C11</td>
<td>Do not expose soil during heavy rain events, particularly in the rainy season</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Water Resources

<table>
<thead>
<tr>
<th>Measure ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C12</td>
<td>In order to avoid soil compaction and to affect the infiltration and reload processes of aquifers, the circulation of machinery should, as far as possible, be done using existing roads (with their improvement whenever necessary)</td>
</tr>
<tr>
<td>C13</td>
<td>After construction work completed, the unpaved soils (contractor’s camp and roads) should be unturned, promoting restoration of water infiltration and reload conditions</td>
</tr>
<tr>
<td>C14</td>
<td>Ensure the cleaning of the drainage system that may have been affected by the construction works</td>
</tr>
<tr>
<td>C15</td>
<td>In the vehicle washing and fuel / oil storage location, a proper oil tank and vehicle pit for maintenance should be set up temporarily in the contractor’s camp. In the event of accidental spillage of hazardous products into soil or water, provide a response plan.</td>
</tr>
<tr>
<td>C16</td>
<td>Ensure water supply to construction sites and implement a waste water collection system</td>
</tr>
</tbody>
</table>

### 9.14.2.5 Air

#### Table 9-16 Mitigation measures for air – Construction phase

<table>
<thead>
<tr>
<th>Impact</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C17</td>
<td>All on-site vehicle and machinery traffic shall be limited to a speed of 20 km/h on unpaved roads</td>
</tr>
<tr>
<td>C18</td>
<td>All areas with vehicle and machinery traffic shall be watered or have dust palliative applied and all material transported off-site shall be sufficiently watered</td>
</tr>
<tr>
<td>C19</td>
<td>All on-site vehicle and machinery shall be should be well maintained. Engines should be regularly serviced according to manufacturer recommendations and maintained to meet statutory limits</td>
</tr>
</tbody>
</table>
9.14.2.6 Soil

Table 9-17 Mitigation measures for soil – Construction phase

<table>
<thead>
<tr>
<th>Impact</th>
<th>Soil Lost (contamination)</th>
<th>Negative, Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure ID</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>C20</td>
<td>Whenever accidental soil contamination occurs, specific procedures for the containment, collection and storage of contaminated soil must be defined on the construction site, before being deposited in the future landfill.</td>
<td></td>
</tr>
</tbody>
</table>

9.14.2.7 Noise

Table 9-18 Mitigation measures for noise – Construction phase

<table>
<thead>
<tr>
<th>Impact</th>
<th>Increase in noise levels</th>
<th>Negative, Medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure ID</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>C21</td>
<td>Prior to the commencement of the works, communication actions should be promoted to inform the local population about the works and the schedule for their completion</td>
<td></td>
</tr>
<tr>
<td>C22</td>
<td>Carefully choose the vehicles itineraries in order to minimize circulation in sensitive areas (housing, school buildings, churches)</td>
<td></td>
</tr>
<tr>
<td>C23</td>
<td>If the construction sites are situated nearby noise-sensitive areas, provide for the installation of noise barriers and/or attenuating surroundings for noisier equipment</td>
<td></td>
</tr>
<tr>
<td>C24</td>
<td>Maintain site roads in good condition to reduce noise and vibration from vehicle movements</td>
<td></td>
</tr>
<tr>
<td>C25</td>
<td>Select equipment that has low noise emission levels</td>
<td></td>
</tr>
<tr>
<td>C26</td>
<td>Ensure that the equipment present on site is in a good operational condition</td>
<td></td>
</tr>
<tr>
<td>C27</td>
<td>Periodic review of all machinery and vehicles to respect noise emission standards</td>
<td></td>
</tr>
<tr>
<td>C28</td>
<td>Limit, as much as possible, the execution of the noisier activities to daytime period and working days</td>
<td></td>
</tr>
</tbody>
</table>

Note: it was not possible to build a buffer zone since the project concerns the rehabilitation of an existing landfill.

9.14.2.8 Waste and Wastewater Management

Table 9-19 Mitigation measures for waste and wastewater management – Construction phase

<table>
<thead>
<tr>
<th>Impact</th>
<th>Waste relocation</th>
<th>Positive High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure ID</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>C29</td>
<td>The constructor must establish a waste management system in the construction</td>
<td></td>
</tr>
<tr>
<td>C30</td>
<td>The constructor must register and deliver all waste oil or other hazardous waste to established waste collection system under the Secretariat of State for Environment</td>
<td></td>
</tr>
</tbody>
</table>
9.14.2.9 Ecological

Table 9-20 Mitigation measures for ecological – Construction phase

<table>
<thead>
<tr>
<th>Impact</th>
<th>Vegetation loss at depot composting</th>
<th>Negative, Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure ID</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>C31</td>
<td>Replanting “1 for 1” (each tree felled in areas requiring reforestation for i.e. soil conservation and management in areas with erosion risk)</td>
<td></td>
</tr>
<tr>
<td>C32</td>
<td>Restrict as soon as possible the access of domestic animals to areas where activities related to the work are planned</td>
<td></td>
</tr>
</tbody>
</table>

9.14.2.10 Cultural

Table 9-21 Mitigation measures for Cultural – Construction phase

<table>
<thead>
<tr>
<th>Impact</th>
<th>Impacts on local sacred site (“Fahiduma” or “Tasu Oron”)</th>
<th>Negative, Medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure ID</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>C33</td>
<td>Before the construction starts, the new place for the replacement of the sacred site must be defined</td>
<td></td>
</tr>
</tbody>
</table>

9.14.2.11 Community and Occupational Health and Safety

The DBO Contractor shall integrate international good practices on community and occupation health and safety in its construction activities, such those included in World Bank EHS Guidelines on Waste Management Facilities. The most significant occupational health and safety impacts typically associated with workers at waste management facilities occur during the operational phase and include accidents and injuries, chemical exposure, and exposure to pathogens and vectors. Minimum requirements to the Community and Occupational Health and Safety Plan shall be the following:

Community Health and Safety

- Identify and assess the risks to, and potential impacts on, the safety of affected communities and establish preventive measures and plans to address them in a manner commensurate with the identified risks and impacts;
- Prepare a traffic management plan (DBO will inform the community and businesses of construction traffic routes);
- Inform affected communities of significant potential hazards in a culturally appropriate manner;
- Be prepared to respond to accidental and emergency situations. This preparation will include response planning document(s) that addresses the training, resources, responsibilities, communications, procedures, and other aspects required to respond effectively to emergencies associated with project hazards;
- Implement risk management strategies to protect the community from physical, chemical, or other hazards associated with sites under construction;
- Implement measure to prevent proliferation of vectors of diseases at work sites;
• Adequate dissemination of GRM (Grievance Redress Mechanism) and contractor’s observance and implementation of GRM (see EMP - Chapter 19).

Occupational Health and Safety

• Communication and Training:
  ▪ Training of all workers on occupational health and safety prior to construction works;
  ▪ Maintain records of reports and complaints concerning health & safety occurrences;
  ▪ Signages strategically installed to identify all areas at work sites, including hazard or danger areas;
  ▪ Proper labelling of equipment and containers at construction and storage sites;
  ▪ Suitable arrangements to cater for emergencies, including: first aid equipment; personnel trained to administer first aid;

• Physical Hazards:
  ▪ Use of personal protective equipment by all workers such as earplugs, safety shoes, hard hats, masks, goggles, etc. as applicable, and ensure these are used properly;
  ▪ Emergency plan and collection of all contacts in Same-city related to accident response (See EMP - Chapter 13);


9.14.3 Operation Phase

9.14.3.1 Climate and Implications in the Climate Change

All mitigation measures are already included in the project design, namely recycling (increase in the future) and gas combustion.

9.14.3.2 Topography

Table 9-22 Mitigation measures for topography – Operation phase

<table>
<thead>
<tr>
<th>Impact</th>
<th>Change in terrain morphology / Land forming</th>
<th>Negative, Medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure ID</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>O1</td>
<td>The specifications described for the cells filling process must be accomplished</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Impact</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>O2</td>
<td>Replantation of the Reserve area hillsides should be done with tree species that are: a) native or a known species in Timor-Leste; b) are not considered invasive; c) are chosen for their bioengineering, erosion and/or vegetation wall properties for dispersion control; and d) may be candidates for Carbon Credit programs that may help support operational costs of the Landfill and/or other expenses/costs</td>
</tr>
</tbody>
</table>
9.14.3.3 Geology

Table 9-23 Mitigation measures for geology – Operation phase

<table>
<thead>
<tr>
<th>Impact</th>
<th>Decrease the erosion risk</th>
<th>Positive, Medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure ID</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>O3</td>
<td>Use soil or artificial cover materials so that deposited waste is held in place. More frequent application of cover may be required during high winds or in exposed areas</td>
<td></td>
</tr>
</tbody>
</table>

9.14.3.4 Water Resources

Table 9-24 Mitigation measures for water resources – Operation phase

<table>
<thead>
<tr>
<th>Impact</th>
<th>Increase surface runoff and decrease infiltration process</th>
<th>Negative, Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure ID</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>O4</td>
<td>Inspect the landfill regularly (e.g., after storms and weekly during operation and quarterly after closure) to detect evidence of any of deterioration, malfunctions, or improper operation of run-on and run-off control systems, such as erosion of the final cover, proper functioning of wind dispersal control systems, where present; and the presence of leachate in and proper functioning of leachate collection and removal systems.</td>
<td></td>
</tr>
<tr>
<td>O5</td>
<td>Measure and record the quantity and quality of leachate generated. Changes in leachate quantity or quality not attributable to weather or other factors may indicate changes in the liner, leachate collection, or landfill cover systems</td>
<td></td>
</tr>
</tbody>
</table>

9.14.3.5 Air

Table 9-25 Mitigation measures for air – Operation phase

<table>
<thead>
<tr>
<th>Impact</th>
<th>Improvement of air quality (no waste burning, less odor)</th>
<th>Positive, High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure ID</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>O6</td>
<td>Instituting a washing program for waste collection vehicles and for company-owned waste collection and transfer containers</td>
<td></td>
</tr>
<tr>
<td>O7</td>
<td>Use extraction system to remove dust from working areas, buildings, and storage vessels, and treat as needed to control particulate emissions (e.g., bag filter)</td>
<td></td>
</tr>
<tr>
<td>O8</td>
<td>Use odor-neutralizing sprays where necessary;</td>
<td></td>
</tr>
<tr>
<td>O9</td>
<td>Use negative pressure in processing buildings and appropriate air filtration (e.g., biofilter) to remove odor</td>
<td></td>
</tr>
<tr>
<td>O10</td>
<td>Compact and cover waste promptly after discharge from the vehicle delivering the waste</td>
<td></td>
</tr>
<tr>
<td>O11</td>
<td>Restrict tipping activities during periods of adverse weather (e.g., wind toward sensitive receptors)</td>
<td></td>
</tr>
</tbody>
</table>
Aerate leachate storage areas

<table>
<thead>
<tr>
<th>Impact</th>
<th>Methane and carbon dioxide emissions</th>
<th>Positive, Low/Medium</th>
</tr>
</thead>
</table>

The specifications described for the gas collecting and burning process must be accomplished

<table>
<thead>
<tr>
<th>Impact</th>
<th>Emissions from vehicles and machines for collection, transport and disposal of waste</th>
<th>Positive, Low/Medium</th>
</tr>
</thead>
</table>

Optimize waste collection routes to minimize distance traveled and overall fuel use and emissions

Waste collection and transport vehicle operator should implement the equipment manufacturers recommended engine maintenance, along with the mechanical maintenance for the safe operation of the vehicle, including proper tire pressure

Sweep Landfill waste management areas and roads frequently and use water spray for dust control where needed

### 9.14.3.6 Soil

<table>
<thead>
<tr>
<th>Measure ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>O12</td>
<td>Aerate leachate storage areas</td>
</tr>
<tr>
<td>O13</td>
<td>The specifications described for the gas collecting and burning process must be accomplished</td>
</tr>
<tr>
<td>O14</td>
<td>Optimize waste collection routes to minimize distance traveled and overall fuel use and emissions</td>
</tr>
<tr>
<td>O15</td>
<td>Optimize waste collection routes to minimize distance traveled and overall fuel use and emissions</td>
</tr>
<tr>
<td>O16</td>
<td>Sweep Landfill waste management areas and roads frequently and use water spray for dust control where needed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Impact</th>
<th>Soil Lost (contamination)</th>
<th>Negative, Low</th>
</tr>
</thead>
</table>

### 9.14.3.7 Noise

<table>
<thead>
<tr>
<th>Measure ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>O17</td>
<td>Select equipment that has low noise emission levels and provide adequate protective equipment for landfill workers.</td>
</tr>
<tr>
<td>O18</td>
<td>Ensure that the equipment present on landfill is in a good operational condition</td>
</tr>
<tr>
<td>O19</td>
<td>Provide a periodic maintenance of all machinery to respect noise emission standards</td>
</tr>
<tr>
<td>O20</td>
<td>Limit the execution of the noisier activities to daytime period and working days</td>
</tr>
<tr>
<td>O21</td>
<td>Provide a periodic maintenance of all vehicles</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Impact</th>
<th>Increased noise levels from operation of landfill</th>
<th>Negative, Low/Medium</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Impact</th>
<th>Reduce noise levels from circulation of trucks (traffic reduction)</th>
<th>Positive, Low</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Impact</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>O21</td>
<td>Provide a periodic maintenance of all vehicles</td>
</tr>
</tbody>
</table>
9.14.3.8 Waste and Wastewater Management

Table 9-28 Mitigation measures for waste and wastewater management – Operation phase

<table>
<thead>
<tr>
<th>Impact</th>
<th>Waste deposition</th>
<th>Positive, High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure ID</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>O22</td>
<td>Encourage separation of recyclable materials at the point of generation, so that the collection points do not become sorting points for informal sector waste pickers</td>
<td></td>
</tr>
<tr>
<td>O23</td>
<td>Cover collection and transfer vehicles along the entire route of transport to avoid windblown litter</td>
<td></td>
</tr>
<tr>
<td>O24</td>
<td>Clean vehicles used for waste hauling before transportation of any goods, including compost</td>
<td></td>
</tr>
<tr>
<td>O25</td>
<td>Reject potentially hazardous materials or wastes identified, including infectious waste, and manage as a hazardous or infectious waste, as applicable</td>
<td></td>
</tr>
<tr>
<td>O26</td>
<td>Analyse suspected hazardous materials before acceptance so that they are segregated relative to compatibility and so that they can be adequately treated and disposed of</td>
<td></td>
</tr>
<tr>
<td>O27</td>
<td>Temporarily close the facility to specific or all waste or vehicle types when weather conditions are particularly adverse</td>
<td></td>
</tr>
</tbody>
</table>

Impact: Wastewater production

| Measure ID | Description |
| O28 | Provide a periodic maintenance program for all TDRUP infrastructures |

9.14.3.9 Ecological

Table 9-29 Mitigation measures for ecological – Operation phase

<table>
<thead>
<tr>
<th>Impact</th>
<th>Reforestation of the Reserve Area Hillsides</th>
<th>Positive, High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure ID</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>O29</td>
<td>Replantation of the Reserve area hillsides should be done with tree species that are: a) native or a known species in Timor-Leste; b) are not considered invasive; c) are chosen for their bioengineering, erosion and/or vegetation wall properties for dispersion control; and d) may be candidates for Carbon Credit programs that may help support operational costs of the Landfill and/or other expenses/costs.</td>
<td></td>
</tr>
<tr>
<td>O30</td>
<td>Use scaring techniques or natural predators to control scavenging birds</td>
<td></td>
</tr>
</tbody>
</table>

9.14.3.10 Community and Occupational Health and Safety

Similar to the construction phase, the DBO Contractor shall integrate international good practices on community and occupation health and safety in its operation of the Tibar Landfill, such those included in World Bank EHS Guidelines on Waste Management Facilities. The most significant occupational health and safety impacts typically associated with workers at waste management facilities occur during the operational activities and include accidents and injuries, chemical exposure, and exposure to pathogens and vectors.

Minimum requirements to the Community and Occupational Health and Safety Plan shall be the following:

- **Accidents and Injuries**: Physical hazards encountered at waste management facilities are similar to those at other large industrial projects. Solid waste workers are particularly prone to accidents involving trucks and other moving equipment, so traffic management systems and traffic controllers are
recommended. Accidents include fires, explosions, being caught in processing equipment, and being run over by mobile equipment. Other injuries occur from heavy lifting, contact with sharps, chemical burns, and infectious agents. Smoke, dusts, and bioaerosols can lead to injuries to eyes, ears, and respiratory systems. In addition to other standard measures adopted in most industrial facility operations, appropriate procedures following international best practices are recommended to prevent, minimize, and control accidents and injuries at the Landfill and associated facilities;

- **Chemical Exposure**: Chemical hazards encountered at waste management facilities are like those at other large industrial facilities, such as toxic and asphyxiating gases, and are addressed in the General EHS Guidelines. The municipal solid waste (MSW) often contains hazardous chemicals, such as heavy metals from discarded batteries, lighting fixtures, paints, and inks. Appropriate procedures following international best practices are recommended to prevent, minimize, and control chemical exposure at the Landfill and its associated facilities;

- **Pathogens and Vectors**: Workers can be exposed to pathogens contained in manure and animal excreta found in MSW from the disposal of sludge, carcasses, diapers, and yard trimmings containing domestic animal waste. Uncontrolled dumping of MSW attracts rats, flies, and other insects that can transmit diseases. Processing of MSW can also generate bioaerosols, suspensions of particles in the air consisting partially or wholly of microorganisms, such as bacteria, viruses, molds, and fungi. These microorganisms can remain suspended in the air for long periods of time, retaining viability or infectivity. Specific measures must recommended to prevent, minimize, and control pathogens and vectors at the Landfill;


- **Community**: Visitors and trespassers at the Landfill may be subject to many of the hazards described for site workers. In particular, waste pickers, looking for recyclable materials and food scraps for animal feeding, often work informally at waste transfer and disposal sites, especially MSW facilities, typically living adjacent to the site. Waste pickers may be encounter numerous risks, including contact with human fecal matter, paper that may have become saturated with toxic materials, bottles with chemical residues, metal containers with residue pesticides and solvents, needles and bandages (containing pathogenic organisms) from hospitals, and batteries containing heavy metals. Recommended measures to prevent, minimize, and control physical, chemical, and biological hazards to the community around the Landfill site include:
  - Restrict access to waste management facilities by implementing security procedures (Former and future waste pickers included).

### 9.14.4 Decommissioning Phase

#### 9.14.4.1 Climate and Implications in the Climate Change

All mitigation measures are already included in the project design, namely recycling (increase in the future) and gas combustion.
9.14.4.2  Topography

Table 9-30 Mitigation measures for topography – Decommissioning phase

<table>
<thead>
<tr>
<th>Impact</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>Reforestation to be done with tree species that are: a) native or a known species in Timor-Leste; b) are not considered invasive; c) are chosen for their bioengineering, erosion and/or vegetation wall properties for dispersion control; and d) may be candidates for Carbon Credit programs that may help support operational costs of the Landfill and/or other expenses/costs.</td>
</tr>
</tbody>
</table>

9.14.4.3  Geology

Table 9-31 Mitigation measures for geology – Decommissioning phase

<table>
<thead>
<tr>
<th>Impact</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D2</td>
<td>Provide a periodic maintenance program for all TDRUP infrastructures</td>
</tr>
</tbody>
</table>

9.14.4.4  Water Resources

Table 9-32 Mitigation measures for water resources – Decommissioning phase

<table>
<thead>
<tr>
<th>Impact</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D2</td>
<td>Provide a periodic maintenance program for all TDRUP infrastructures</td>
</tr>
</tbody>
</table>

9.14.4.5  Air

Table 9-33 Mitigation measures for air – Decommissioning phase

<table>
<thead>
<tr>
<th>Impact</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D2</td>
<td>Provide a periodic maintenance program for all TDRUP infrastructures</td>
</tr>
</tbody>
</table>

9.14.4.6  Soil

Table 9-34 Mitigation measures for soil – Decommissioning phase

<table>
<thead>
<tr>
<th>Impact</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D2</td>
<td>Provide a periodic maintenance program for all TDRUP infrastructures</td>
</tr>
</tbody>
</table>
### 9.14.4.7 Waste and Wastewater Management

#### Table 9-35 Mitigation measures for waste and wastewater management – Decommissioning phase

<table>
<thead>
<tr>
<th>Impact</th>
<th>Waste deposition</th>
<th>Positive, High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure ID</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>D3</td>
<td>Development of a closure plan which specifies the necessary environmental objectives and controls (including technical specifications), future landuse (as defined in consultation with local communities and government agencies), closure schedule, financial resources, and monitoring arrangements</td>
<td></td>
</tr>
<tr>
<td>D4</td>
<td>Evaluation, selection, and application of closure methods consistent with post-closure use and which should include the placement of a final cover to prevent further impacts to human health and the environment</td>
<td></td>
</tr>
<tr>
<td>D5</td>
<td>Application of final cover components that are consistent with post closure use and local climatic conditions. The final cover should provide long term environmental protection by preventing direct or indirect contact of living organisms with the waste materials and their constituents; minimize infiltration of precipitation into the waste and the subsequent generation of leachate; control landfill gas migration; and minimize long term maintenance needs</td>
<td></td>
</tr>
</tbody>
</table>

### 9.15 - Residual Impacts

The definition of residual impact states that it is an impact to which, even by applying measures, it cannot be fully mitigated.

Therefore, this section identifies the negative impacts that remain in the project area, even after applying the measures that are identified in chapter 9.13.

#### Table 9-36 Residual impacts – Construction phase

<table>
<thead>
<tr>
<th>Impact</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topography</td>
<td>Change in terrain morphology (excavations)</td>
</tr>
<tr>
<td>Geology</td>
<td>Geological substrate decrease (soil loss)</td>
</tr>
<tr>
<td></td>
<td>Increase erosion risk</td>
</tr>
<tr>
<td>Water Resources</td>
<td>Increased surface runoff and decreased infiltration processes</td>
</tr>
<tr>
<td></td>
<td>Increased concentration of suspended solids and pollutants in watercourses – decreased of water quality (surface and groundwater)</td>
</tr>
<tr>
<td></td>
<td>Increased water consumption and wastewater production at construction sites by workers</td>
</tr>
<tr>
<td>Air</td>
<td>Decreased air quality parameters resulting from increased emissions to air (PM10 and other pollutants)</td>
</tr>
<tr>
<td>Soil</td>
<td>Soil Lost (contamination)</td>
</tr>
</tbody>
</table>
### Noise
Increase in noise levels (human health)  
**Table 9-37 Residual impacts – Operation phase**

<table>
<thead>
<tr>
<th>Topography</th>
<th>Change in terrain morphology / Land forming</th>
<th>Negative; Irreversible; Low magnitude and significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Resources</td>
<td>Increase surface runoff and decrease infiltration process</td>
<td>Negative; Low magnitude and significance</td>
</tr>
<tr>
<td>Air</td>
<td>Methane and carbon dioxide emissions</td>
<td>Negative; Irreversible (long-term); Low magnitude and significance</td>
</tr>
<tr>
<td>Soil</td>
<td>Soil Lost (contamination)</td>
<td>Negative; irreversible; low magnitude and significance</td>
</tr>
<tr>
<td>Noise</td>
<td>Increased noise levels from operation of landfill</td>
<td>Negative, Reversible; Low magnitude and significance</td>
</tr>
<tr>
<td>Waste and wastewater management</td>
<td>Wastewater production</td>
<td>Negative; Irreversible; Low magnitude and significance</td>
</tr>
</tbody>
</table>

### Water Resources
Increase surface runoff and decrease infiltration process  

<table>
<thead>
<tr>
<th>Water Resources</th>
<th>Remaining leachate after closure, evaporation in collection ponds</th>
<th>Insignificant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>Methane and carbon dioxide emissions</td>
<td>Negative; Irreversible; Low magnitude and significance</td>
</tr>
<tr>
<td>Soil</td>
<td>Soil Lost (contamination)</td>
<td>Negative; irreversible; low magnitude and significance</td>
</tr>
</tbody>
</table>
**Chapter 10 - Social Impact Assessment**

**10.1 - Methodology**

TDRUP is a project of public utility, crucial to ensure an adequate waste deposition and management, and for solving or mitigate the actual environmental problems caused by the dumpsite and the impacts on surrounding communities.

However, and as with any project with intervention in populated territories, particularly in urban areas, its implementation will imply negative impacts on people and their livelihoods, namely waste pickers and their families, and on the economic activities related to reception and reselling of the recyclables collected in the dumpsite. On the other hand, it will also have positive impacts on the quality of life and safety of people and families and will open some opportunities that may benefit local populations.

The overall social impact assessment methodological strategy is guided by a sustainability perspective through which it seeks to verify how the project contributes or can contribute to the social sustainability of its area of intervention and influence. Well-being, dignity, equity, justice, participation, empowerment, social cohesion, and social vitality are the main social sustainability criteria that guide the assessment of impacts.

The defence of human rights and the designs expressed in the Sustainable Development Goals (SDGs) - 2030 underlies the general criteria for assigning importance/significance to impacts.

Ensuring the sustainability of the livelihoods of the communities and families affected by the project, particularly the most vulnerable, are the specific criteria for assessing impacts, defining measures to mitigate negative impacts or enhance the positive ones, and the social management of impacts in general.

Thus, what is at stake in the evaluation process is to ensure that the negative impacts of project implementation are avoided, adequately minimized and/or supported, and that the positive impacts are enhanced in order to ensure, on the one hand, the success and adequate implementation of a project of public interest and, on the other hand, ensure that the affected populations will be in a situation that is at least equal or, hopefully, better than that they had before the project implementation.

Regarding the specificities of social impacts, the assessment considers the relevant Timor-Leste legislation and follows the guidance expressed in the Asian Development Bank (ADB) and the World Bank (WP) safeguards and best practices in assessing social impacts from a social and environmental sustainability perspective.

The impact assessment carried out in this section follows the general methodology defined for the EIS as a whole and explained in Chapter 9.1.

In sum, the analysis and evaluation of impacts follow the structure presented in the following Table.
## Table 10-1 Summary of the Impact Assessment Framework

<table>
<thead>
<tr>
<th>Project Phases</th>
<th>Evaluation scales</th>
<th>Focus of the analysis</th>
<th>Families and communities</th>
</tr>
</thead>
</table>
| Project phase and phase prior to the start of construction operations        | ADI<sup>1</sup> and AII<sup>2</sup> (in the immediate vicinity of DIA and in resettlement areas) | - Effects of the anticipation of project impacts by potentially affected people, with potential generation of uncertainty, concern and distress regarding the negative effects or, more or less, realistic expectations and hopes regarding the positive effects.  
- Attitudes of affected populations towards the project.  
- Effects on people and families.  
- Establishment of support and economic resettlement measures for waste pickers.  
- Negotiation and establishment of compensation for affection of private owned land by drainage system. |                         |
| Construction                                                                  | ADI and AII (local, municipal, scale) | - Job creation; creation of opportunities for waste pickers, local purchases of goods and services for the work; effects on the income of the population.  
- Nuisance, risks and impacts on the health and well-being of workers and local people, resulting from construction activities and the circulation of light and heavy vehicles.  
- Presence of workers from outside the communities.  
- Temporary affectation of roads and traffic, access to housing, commerce, services and equipment.  
- Impacts resulting from the demobilization of labour hired for the work.  
- Affectation of land and private owned property. |                         |
| Operation                                                                     | ADI and AII (in the immediate vicinity of ADI) and Dili City | - Effects of project implementation on the configuration and functioning of the Tibar landfill.  
- Job creation.  
- Safety and risk of accidents.  
- Nuisance and potential impact on the health and well-being of people and populations. |                         |
| Decommissioning                                                              | ADI and AII (local, municipal, scale) | - Job creation; creation of opportunities for local purchases of goods and services for the work; effects on the income of the population.  
- Nuisance, risks and impacts on the health and well-being of workers and local people, resulting from construction activities and the circulation of light and heavy vehicles.  
- Presence of workers from outside the communities.  
- Affectation of traffic.  
- Impacts resulting from the demobilization of labour hired for the work.  
- Impacts on the work force employed in the landfill. |                         |

<sup>1</sup> Area of Direct Impacts  
<sup>2</sup> Area of Indirect Impacts
10.2 - Pre-Construction Phase

To the social analysis impacts, it is considered that the prior phase does not include the operations of installation of construction sites and preparation of the work. These actions are analysed below as part of the construction phase.

Social impacts do not start with the construction phase, but rather now when the parties potentially affected or interested by a given project become aware of its existence, either through public news, or following consultations with entities, public consultation processes of the Terms of Reference of the EIA, meetings with entities and local authorities, activity of technical teams and interviewers on the ground, and other situations.

Depending on the scenarios drawn up by potentially affected or interested people and groups, fears are immediately created regarding possible negative impacts, and/or expectations regarding possible positive impacts and benefits.

Due to the uncertainties resulting from the lack of information about the project and/or the interaction between potentially affected and interested parties, both fears and expectations may be exaggerated or not correspond at all to the reality resulting from the project.

Situations of uncertainty can create concern and distress and can even lead to attitudes and actions of contestation aid conflict. In certain situations, such as the Dili Drainage Project, the pre-construction phase can be maintained for a long time, so the uncertainty situation of people and families is prolonged excessively, causing greater anxiety and dissatisfaction, and hindering the planning of their lives.

Finally, waste picker’s situation must be resolved before the beginning of construction phase since waste picking activity will be not allowed. So, project’s impact on waste picking activity also happens during the phase prior to construction phase.

10.2.1 Impacts on local communities

10.2.1.1 Expectations and fears raised by the project

As referred in the baseline section, a questionnaire was applied to a sample of 35 households in the surrounding area of the Tibar dumpsite and/or along the road that leads to the dumpsite. The questionnaire was applied to one person in each household.

Next tables present more information about respondents, namely, profession and the kind of diseases that were suffered by respondents, and by their household family, during the previous year.

Range of professions is very large, but it is relevant to note that 5 of the respondents are waste pickers.

<table>
<thead>
<tr>
<th>Respondents profession</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste picker</td>
<td>5</td>
<td>14.29</td>
</tr>
<tr>
<td>Civil servant</td>
<td>4</td>
<td>11.43</td>
</tr>
<tr>
<td>Company worker</td>
<td>3</td>
<td>8.57</td>
</tr>
<tr>
<td>Unemployed</td>
<td>3</td>
<td>8.57</td>
</tr>
</tbody>
</table>
The kind of health problems that respondents had and that occurred in their household families is very similar and is also very similar to the kind of health problems reported by Tibar waste pickers, according to the results obtained with the application of the questionnaire that was dedicated to them, except for the frequency of wounds/cuts/infections which low among community respondents and high between waste pickers.

Considering the total diseases reported, some of the respondents had more than one kind of diseases.

<table>
<thead>
<tr>
<th>Respondents profession</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor</td>
<td>2</td>
<td>5.71</td>
</tr>
<tr>
<td>Farmer</td>
<td>2</td>
<td>5.71</td>
</tr>
<tr>
<td>Trader</td>
<td>2</td>
<td>5.71</td>
</tr>
<tr>
<td>Security</td>
<td>2</td>
<td>5.71</td>
</tr>
<tr>
<td>Seasonal worker</td>
<td>2</td>
<td>5.71</td>
</tr>
<tr>
<td>Housewife</td>
<td>2</td>
<td>5.71</td>
</tr>
<tr>
<td>Driver</td>
<td>1</td>
<td>2.86</td>
</tr>
<tr>
<td>Fisherman</td>
<td>1</td>
<td>2.86</td>
</tr>
<tr>
<td>Fish seller</td>
<td>1</td>
<td>2.86</td>
</tr>
<tr>
<td>Cooker</td>
<td>1</td>
<td>2.86</td>
</tr>
<tr>
<td>No answer (NA)</td>
<td>4</td>
<td>11.43</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>35</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Table 10-3 Health problems respondents had during last year

<table>
<thead>
<tr>
<th>Kind of health problems respondents had during last year</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sore throat</td>
<td>13</td>
<td>37.14</td>
</tr>
<tr>
<td>Respiratory</td>
<td>11</td>
<td>31.43</td>
</tr>
<tr>
<td>Eye irritation</td>
<td>10</td>
<td>28.57</td>
</tr>
<tr>
<td>Back pain / muscular pains</td>
<td>10</td>
<td>28.57</td>
</tr>
<tr>
<td>Skin diseases</td>
<td>6</td>
<td>17.14</td>
</tr>
<tr>
<td>Wounds / cuts / infections</td>
<td>2</td>
<td>5.71</td>
</tr>
<tr>
<td>Headache</td>
<td>1</td>
<td>2.86</td>
</tr>
</tbody>
</table>

Table 10-4 Health problems respondents’ families had during last year

<table>
<thead>
<tr>
<th>Kind of health problems respondents’ families had during last year</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory</td>
<td>14</td>
<td>40.00</td>
</tr>
<tr>
<td>Eye irritation</td>
<td>13</td>
<td>37.14</td>
</tr>
<tr>
<td>Sore throat</td>
<td>11</td>
<td>31.43</td>
</tr>
<tr>
<td>Back pain / muscular pains</td>
<td>8</td>
<td>22.86</td>
</tr>
<tr>
<td>Skin diseases</td>
<td>6</td>
<td>17.14</td>
</tr>
<tr>
<td>Wounds / cuts / infections</td>
<td>2</td>
<td>5.71</td>
</tr>
</tbody>
</table>
It was asked to the respondents if they expected their community to be benefited or harmed with the implementation of TDRUP. Results obtained (see next table) show that the majority expects benefits, and no one expects negative impacts. However, a significant minority did not answer to the question.

<table>
<thead>
<tr>
<th>Respondents' expectations about the project</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project will benefit the community</td>
<td>21</td>
<td>60.0</td>
</tr>
<tr>
<td>Project will harm the community</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>NA</td>
<td>14</td>
<td>40.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>35</td>
<td>100.0</td>
</tr>
</tbody>
</table>

It was asked to those who answered they expected benefits, what kind of benefits they expected. Table, below, shows the results obtained. Some respondents referred more than one benefit.

Job creation was the benefit referred by a bigger proportion of respondents (34,3%). The block of environmental benefits (pollution, smoke, bad odors, environmental impacts) was referred by 42,9% of the respondents. For 23,9% of the respondents, project’s implementation will prevent diseases. One of the respondents referred that child labor will decrease.

<table>
<thead>
<tr>
<th>Kind of projects' benefits expected by the respondents</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>To have a job / to create jobs</td>
<td>12</td>
<td>34.29</td>
</tr>
<tr>
<td>Prevent diseases</td>
<td>8</td>
<td>22.86</td>
</tr>
<tr>
<td>Decrease pollution</td>
<td>8</td>
<td>22.86</td>
</tr>
<tr>
<td>Decrease smoke</td>
<td>5</td>
<td>14.29</td>
</tr>
<tr>
<td>There will be no bad odours</td>
<td>1</td>
<td>2.86</td>
</tr>
<tr>
<td>Child labour will decrease</td>
<td>1</td>
<td>2.86</td>
</tr>
<tr>
<td>Reduce environmental impacts</td>
<td>1</td>
<td>2.86</td>
</tr>
</tbody>
</table>

Overall results let us to conclude that respondents are not aware of potential negative impacts or did not want to express negative expectations.

On the positive side, the environmental quality and the job creation are especially important issues that TDRUP must deal with, to correspond to the expectations. Communities must be clearly informed about what it is technically expected the TDRUP to achieve on these matters. As was already reported before and will repeated in the next point of this report, public information about the project is low and this gap must be bridged.

### 10.2.1.2 Attitudes towards the project

It was asked to the respondents if Tibar dumpsite needed to be rehabilitated. Table 10-7 shows that the necessity of Tibar dumpsite to be rehabilitated is almost unanimously referred.
Table 10-7 Respondent’s opinion on the necessity of Tibar dumpsite rehabilitation

<table>
<thead>
<tr>
<th>Does Tibar dumpsite need to be rehabilitated?</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>34</td>
<td>97.1</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>NA</td>
<td>1</td>
<td>2.9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>35</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Table 10-8 shows the reasons given by the respondents to justify the necessity of Tibar dumpsite rehabilitation. Many respondents gave more than one reason. Lack of conditions, health reasons and environmental reasons are the main justifications given by the respondents.

Table 10-8 Reason given by respondents for Tibar dumpsite rehabilitation

<table>
<thead>
<tr>
<th>Respondents’ reasons for the necessity of dumpsite’s rehabilitation</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tibar dumpsite needs to be cleaned and have conditions / does not have conditions</td>
<td>24</td>
<td>68.57</td>
</tr>
<tr>
<td>For health reasons / people live nearby</td>
<td>21</td>
<td>60.00</td>
</tr>
<tr>
<td>For environmental reasons (environment, smoke, floods, waste spreading, drainage, fauna)</td>
<td>10</td>
<td>28.57</td>
</tr>
<tr>
<td>Because of mosquitos and insects</td>
<td>4</td>
<td>11.43</td>
</tr>
<tr>
<td>Because has negative impacts on children</td>
<td>2</td>
<td>5.71</td>
</tr>
<tr>
<td>Because respondent wants the project to be implemented</td>
<td>1</td>
<td>2.86</td>
</tr>
<tr>
<td>To reduce the number of waste pickers</td>
<td>1</td>
<td>2.86</td>
</tr>
</tbody>
</table>

It was asked to the respondents if they were aware of TDRUP. Table 10-9 shows that the majority did not have any information about the project. This issue was already commented before.

Table 10-9 Respondent’s awareness of TDRUP

<table>
<thead>
<tr>
<th>Respondent’s awareness of TDRUP</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>12</td>
<td>34.29</td>
</tr>
<tr>
<td>No</td>
<td>18</td>
<td>51.43</td>
</tr>
<tr>
<td>NA</td>
<td>5</td>
<td>14.29</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>35</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Finally, it was asked to the respondents if they agree with TDRUP implementation. Table 10-10 shows that the 30 respondents (85.7%) said ‘yes’ and only 2 (5.7%) said ‘no’. These results show a broad support to the project, at the time of respondents’ interview.

Reasons given for ‘no’ relate to the need of more information about the project. Reasons given to the ‘yes’ are mainly related to expectations that the dumpsite conditions will be better and that communities will benefit from the project.
### Table 10-10 Do respondents agree with TDRUP implementation?

<table>
<thead>
<tr>
<th>Do respondents agree with TDRUP implementation?</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>30</td>
<td>85.7</td>
</tr>
<tr>
<td>No</td>
<td>2</td>
<td>5.7</td>
</tr>
<tr>
<td>NA</td>
<td>3</td>
<td>8.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>35</td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

**If yes, why do they agree?**

- Dumpsite conditions will get better: 16 (53.33%)
- It will benefit the communities: 12 (40.00%)
- Reduces impact on environment and on public health: 3 (10.00%)
- Because wants to thank the Government for creating better conditions: 2 (6.67%)
- Because it is necessary do end pollution: 2 (6.67%)
- Improves drainage: 1 (3.33%)
- To avoid open access to the dumpsite: 1 (3.33%)
- It responds to communities’ concerns: 1 (3.33%)
- There will be no more mosquitos and other insects: 1 (3.33%)
- Because project will be organized by international technicians: 1 (3.33%)

**If no, why do they do not agree?**

- Because more information about the project is needed: 2 (100.00%)

As referred, the results obtained show a broad support to the project, at the time of respondents’ interview. It should however be remembered that these were only the opinions of a small sample of respondents that live near the dumpsite, that is, those who suffer more with the impacts resulting from the present conditions of the dumpsite.

On the other hand, it is also important to recall that all the 12 institutional stakeholders that were interviewed also agree with the necessity of Tibar dumpsite rehabilitation. These where the Head of Liquiçá Municipality, the Head of Bazartete Administrative Post, the Chefe de Suco of Tibar, the Chefes de Aldeia of Libaulelo, Fatunia, Turleu and Mau-soi, the representants of 3 health facilities and of 2 religious organizations who give support to vulnerable people including waste pickers.

It is also important to remember that the majority of waste pickers also expressed the opinion that Tiber dumpsite needs to be rehabilitated, and some of them said to agree with the project, as will be referred in more detail in the next section. The fears that waste pickers expressed were not related with the dumpsite rehabilitation, in itself, but with the perspective of losing their income source, if they are not allowed to go on waste picking or were not given an alternative income source.

### 10.2.2 Impact on Tibar dumpsite waste pickers

The project of rehabilitation and improvement of Tibar dumpsite will not allow the continuity of waste picking. This is the most significant negative social impact of TDRUP, considering the number of people involved in this activity, which is estimated to be around 100 people, and the negative effects that may have in their families, totalling around 700 people.
As was referred in the baseline section of this report, waste pickers are affected by several vulnerability factors, such as poverty, gender, age, health, low capabilities, and lack of alternative jobs.

The impact on waste pickers can be considered an economic resettlement case, following World Bank's Environmental and Social Framework (WB, 2017) and Asian Development Bank's Safeguard Policy Statement (ADB, 2009).

This section will deal with the following issues:

- Waste pickers as vulnerable people.
- WB and ADB social standards applicable to the impacts on waste pickers.
- Timor-Leste relevant legislation.
- Waste pickers as a case of involuntary economic resettlement.
- Tibar dumpsite waste pickers attitudes of towards TDRUP.
- Identification and assessment of impacts on waste pickers.
- Negotiation processes and establishment of support and other resettlement mitigation measures.

### 10.2.2.1 Waste pickers as vulnerable people

Informal waste picking is a reality involving many million people all over the world, mainly in the big cities. Waste pickers are often comprised of the socially vulnerable groups, including low-income families, women, children, and migrant workers (WB, 2013, 2018; ILO, 2019).

As described in the baseline section of this report, Tibar dumpsite waste pickers are affected by several vulnerability factors, such as poverty, gender (86% women), poor education, health problems, low capabilities, and lack of alternative jobs. It was also referred the presence of children and elderly, while in low number.

To reduce poverty, inequality, and vulnerability, is one of the main purposes of ADB's Policies and Strategy (ADB, 2008, 2018). Poverty and gender issues are main drivers for the incorporation of social dimensions into ADB operations, and central concerns of projects’ Environmental and Social Assessment (ADB, 2009, 2010, 2013). To assess impacts on vulnerable people is also a central concern of World Bank’s Environmental and Social Framework (WB, 2017).

The rights of vulnerable groups are expressed in the Constitution of the Democratic Republic of East Timor: Article 17, Equality between women and men; Article 18, Protection of Children; Article 19, Support for young people; Article 20, Protection for the elderly; Article 21, Support for citizens with disabilities; Article 50, Right to work; Article 58, Right to housing.

The protection and support to vulnerable groups is also clearly stated in Timor-Leste’s Roadmap for the Implementation of the Sustainable Development Goals, approved by Government Resolution no. 45/2017.

Ministerial Diploma no. 46/2017 - Regulation on detailed requirements for screening, definition of scope and terms of reference, Environmental Impact Statements and Environmental Management Plans for Environmental Assessment, states (Annex IV, section 10, d) v) the necessity to assess the risks and impacts of projects on vulnerable groups and underlying vulnerability factors that contribute to their vulnerability in order to prepare risk management plans to address these concerns during projects’ design, implementation and evaluation.
This overall context points clearly to the social sustainability obligation of dealing with waste pickers situation as vulnerable people, to support them for project’s impacts and to ensure that they will be in a better situation with the implementation of TDRUP.

10.2.2.2 Tibar dumpsite waste pickers: the case for economic involuntary resettlement

ADB’s Safeguard Requirements 2: Involuntary Resettlement (ADB, 2009, Appendix 2) refers that “The involuntary resettlement requirements apply to full or partial, permanent or temporary physical displacement (relocation, loss of residential land, or loss of shelter) and economic displacement (loss of land, assets, access to assets, income sources, or means of livelihoods) resulting from (i) involuntary acquisition of land, or (ii) involuntary restrictions on land use or on access to legally designated parks and protected areas. Resettlement is considered involuntary when displaced individuals or communities do not have the right to refuse land acquisition that results in displacement.”

World Bank’s ESS5 – Land Acquisition, Restrictions on Land Use and Involuntary Resettlement “Recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons” and “may cause physical displacement (relocation, loss of residential land or loss of shelter), economic displacement (loss of land, assets or access to assets, leading to loss of income sources or other means of livelihood), or both. The term ‘involuntary resettlement’ refers to these impacts. Resettlement is considered involuntary when affected persons or communities do not have the right to refuse land acquisition or restrictions on land use that result in displacement.” (WB, 2017, p.52).

ESS5 also refers that “‘Restrictions on land use’ refers to limitations or prohibitions on the use of agricultural, residential, commercial or other land that are directly introduced and put into effect as part of the project” and also include “restrictions on land use within utility easements or safety zones”.

ADB’s Safeguards Requirements 2 recognize that those “who have neither formal legal rights nor recognized or recognizable claims to such land” are also eligible to compensation, assistance, and benefits for displaced persons, and WB’s ESS5 recognizes eligibility to those “who have no recognizable legal right or claim to the land or assets they occupy or use”.

Tibar dumpsite exists for decades. Most part of waste pickers (64,4%) work on dumpsite for more than 5 years and 44% work for more than 10 years. A very significant majority of the respondents (82%) work on waste picking 7 days a week, and almost 7% work 6 days a week, almost 74% work more than 6 hours a day, and almost 18% work more than 8 hours. All the waste pickers interviewed referred that they only worked at Tibar dumpsite, being for almost all of them the only source of income. Waste pickers are responsible for a daily removable of more than 1 ton of recyclable waste, performing a function with social and environmental utility.

Waste picking in Tibar dumpsite is a consolidated activity. For the big majority of waste pickers this is not an occasional activity or even a complementary one. It is a structured way of life.

Considering all these aspects one can conclude that TDRUP prohibition of waste picking during and after rehabilitation is a case of involuntary economic resettlement for restrictions on land use and access to resources and assets, leading to loss of income sources of people that suffer from multiple vulnerabilities and are mostly women.

Eligibility of waste pickers to involuntary resettlement support and assistance has been the case for several projects funded by ADB, WB, EBRD, and other agencies, such as, among others, the Uzbekistan Solid Waste Management Improvement Project (ADB, 2009), the Kharkiv Municipal Waste Management Sub-Project, Ukraine
ADB's SPS on Involuntary Resettlement (IR) states that ADB-supported projects that are likely to have significant involuntary resettlement impacts are classified as Category A projects, and a resettlement plan and a social impact assessment are required. Concerning involuntary economic resettlement, the IR impacts are considered significant if 200 or more persons lose 10% or more of their productive assets (income generation).

As referred, around 100 waste pickers will lose their income as a result of TDRUP implementation. According to the results obtained from waste pickers survey, it was estimated that the average monthly income resulting from waste picking activity was nearly 90 USD, and that the waste pickers’ family global average monthly income (including waste pickers income) was around 343 USD.

Considering survey results, waste pickers average family size is 7 persons, then, around 700 people will be affected by TDRUP impacts on waste picking activity.

Around 100 waste pickers will lose almost all their income. This lost represents 26.3% of family’s monthly income and will potentially affect 700 persons. One can then conclude that TDRUP is Category A project.

Other aspects reinforce this conclusion. Waste pickers suffer from several vulnerability factors: they are among the poorest, 86% of them are women, and at least 16% of these women are household heads.

### 10.2.2.3 Waste pickers opinions and attitudes towards the project

The attitudes towards the project are considered in a dual dimension. On the one hand, they can condition the project, and, in this way, they are part of the situation existing before the beginning of its implementation and are analysed as part of the baseline.

On the other hand, however, the attitudes already constitute an impact of the project in that they are only formed on the basis of the existence of project intentions or actions and the generally partial knowledge of the people affected or interested in the project. Thus, the attitudes of waste pickers are analysed both as baseline conditions and as indicators of potential behaviours, and as impacts of the project.

As referred in baseline section, it was asked to the waste pickers if, in their opinion, the Tibar dumpsite needed to be rehabilitated and improved. The majority (56%) said ‘yes’ and only 2 respondents said no. However, a significant part (41%) did not answer to this question.

The reasons given for the ‘yes’ are interesting and reveal that most waste pickers are aware of some Tibar dumpsite problems. Main reasons are environmental (smoke, dust, floods) and surrounding community’s life quality. To have a decent job is another reason.

One of the reasons given to the ‘no’ relates with the belief that the rehabilitation implies that the access to the landfill will be forbidden.

<table>
<thead>
<tr>
<th>Does the dumpsite need to be rehabilitated and improved?</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>41</td>
<td>56.16</td>
</tr>
<tr>
<td>No</td>
<td>2</td>
<td>2.74</td>
</tr>
<tr>
<td>NA</td>
<td>30</td>
<td>41.10</td>
</tr>
<tr>
<td>Total</td>
<td>73</td>
<td>100.00</td>
</tr>
</tbody>
</table>
Does the dumpsite need to be rehabilitated and improved?

<table>
<thead>
<tr>
<th>If yes, why?</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>To improve community’s life quality</td>
<td>13</td>
<td>17.81</td>
</tr>
<tr>
<td>Smoke / Waste burning</td>
<td>13</td>
<td>17.81</td>
</tr>
<tr>
<td>For environmental reasons</td>
<td>9</td>
<td>12.33</td>
</tr>
<tr>
<td>To have a decent job</td>
<td>7</td>
<td>9.59</td>
</tr>
<tr>
<td>Because it is the Government’s obligation</td>
<td>6</td>
<td>8.22</td>
</tr>
<tr>
<td>Dust</td>
<td>2</td>
<td>2.74</td>
</tr>
<tr>
<td>Floods</td>
<td>1</td>
<td>1.37</td>
</tr>
</tbody>
</table>

If no, why?

<table>
<thead>
<tr>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrance forbidden</td>
<td>1</td>
</tr>
<tr>
<td>Depends on the Government</td>
<td>1</td>
</tr>
</tbody>
</table>

It was asked to the waste pickers if they were aware of TDRUP project. The majority (60%) said ‘no’. The lack of information about the project was also confirmed by other stakeholders that were interviewed, as referred in other sections of this report.

To the respondents that were aware of the TDRUP it was asked if they agree with the project. The most part (13) did not answer, 9 said ‘yes’ and 3 said ‘no’.

Table 10-12 Waste pickers awareness of TDRUP

<table>
<thead>
<tr>
<th>Are waste pickers aware of TDRUP?</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>25</td>
<td>34.25</td>
</tr>
<tr>
<td>No</td>
<td>44</td>
<td>60.27</td>
</tr>
<tr>
<td>NA</td>
<td>4</td>
<td>5.48</td>
</tr>
<tr>
<td>Total</td>
<td>73</td>
<td>100.00</td>
</tr>
</tbody>
</table>

If yes, do respondents agree with the Project?

<table>
<thead>
<tr>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>9</td>
</tr>
<tr>
<td>No</td>
<td>3</td>
</tr>
<tr>
<td>NA</td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
</tr>
</tbody>
</table>

One of the main objectives of the survey was to grasp waste pickers’ attitudes towards the possibility of TDRUP did not allow waste picking activity in the Tibar dumpsite. The answers obtained (see 6.62) can be summarized as follows:

- 25 respondents (34.3%) will demand a job as compensation, from Government or others.
- 23 respondents (31.5%) will not accept that situation and/or will demonstrate and protest.
- 9 respondents (12.3%) will demand compensation in money.
- 5 respondents (6.8%) seem to have softer attitudes, referring that they will look for another job, open their own business or will follow Government’s instructions.
- 11 respondents (15.1%) did not answer.
The answers obtained are sufficiently clear and are representative of the significance of the potential social impacts, as reflected on respondents' attitudes.

### Table 10-13 Waste pickers attitude towards the possibility of TDRUP not to allow the continuity of waste piking activity

<table>
<thead>
<tr>
<th>If TDRUP does not allow waste picking on Tibar dumpsite, what will pickers do?</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand employment from the Government</td>
<td>18</td>
<td>24.66</td>
</tr>
<tr>
<td>Demonstration and protest</td>
<td>12</td>
<td>16.44</td>
</tr>
<tr>
<td>Not to accept, is a source of income</td>
<td>11</td>
<td>15.07</td>
</tr>
<tr>
<td>Demand compensation in money</td>
<td>9</td>
<td>12.33</td>
</tr>
<tr>
<td>Demand another job, as compensation</td>
<td>7</td>
<td>9.59</td>
</tr>
<tr>
<td>To look for another job</td>
<td>3</td>
<td>4.11</td>
</tr>
<tr>
<td>Open own business</td>
<td>1</td>
<td>1.37</td>
</tr>
<tr>
<td>Follow Government’s instructions</td>
<td>1</td>
<td>1.37</td>
</tr>
<tr>
<td>NA</td>
<td>11</td>
<td>15.07</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>73</td>
<td>100.00</td>
</tr>
</tbody>
</table>

10.2.2.4 Assessment of TDRUP potential impacts on waste pickers

To close the poor conditions resulting from an uncontrolled dumpsite, will have important effects on waste pickers health. However, this effects only can, effectively, become an improvement on waste pickers life if they do not lose their source of income.

Waste pickers surely do not like to work on such unhealthy and unsafe conditions. If they do so it is because they need to do it.

Most waste pickers are among the poorest, most waste pickers are women, most waste pickers work on Tibar dumpsite for a long time, for most waste pickers their activity is a structured way of life, and most waste pickers do not have any other income source than waste picking on Tibar dumpsite. To impede them of earning their living, would be a very significant negative social impact.

Besides, waste pickers have a relevant social and environmental function while allowing the recycling of more than 1 ton a waste a day.

So, TDRUP impacts on waste pickers are negative, permanent, certain, direct and indirect, reversible, with high magnitude and high significance. Impacts cannot be avoided unless TDRUP is not implemented, which is not at stake. Thus, impacts must be mitigated.

TDRUP is a public project, so the social responsibility relevance is higher. If TDRUP implementation does not allow waste picking activities to go on, during and after rehabilitation, then, TDRUP must assure alternative income sources to the waste pickers that have been working in the Tibar dumpsite.

On this basis, considering ADB (2009, 2012) and WB (2017) orientations in the case of economic involuntary resettlement, TDRUP could follow some orientations on this matter such as:
• Waste pickers income should be assured, at minimum, to the level of income that they get from waste picking, or, most desirably, and as vulnerable poor people, an improved level.

• Draft a stakeholder engagement plan to ensure an adequate communication and a thorough waste picker consultation, informed negotiations, and grievance mechanisms availability and functioning information.

• Waste pickers should be called, jointly by Government authorities responsible for the project, and the Dili and Liquiçá municipalities, to a public meeting to inform and discuss about TDRUP project and alternatives for the waste pickers activity.

• Authorities responsible for TDRUP should convocate Tibar dumpsite waste pickers to register for being eligible for support. A cut-off date must be established, and all waste pickers must be informed that, after that date, eligibility for support will not be considered.

• Waste pickers should be treated with fairness and in an equitable way.

• However, the most vulnerable, among the vulnerable, as the poorest, the elderly, the disabled, women heads of family and other with deeper vulnerability, should be considered with more attention and be eligible to more support.

• An economic resettlement plan in the form of a Livelihoods Restauration Plan (LRP) should be drafted and implemented by the project owner before the construction phase, including eligibility criteria, waste pickers’ rights, support measures, monitoring programming and actions, and complaint and response mechanisms.

• In the framework of LRP elaboration, a Gender Action Plan (GAP) should be drafted, considering the very high proportion of women waste pickers in Tibar dumpsite.

• Waste picking activity on Tibar dumpsite must only be forbidden after the support measures to registered waste pickers are active and functioning.

• Support for the elderly should include an allowance for the elderly people.

• Support measures must not be imposed but be negotiated with each one of the waste pickers, considering their opinions and options, and having in account their preferences.

• Children’s waste picking activities must be immediately forbidden, and support should be considered to guarantee continuation and/or conclusion of basic education.

• Waste pickers should be clearly informed of the requirements and the qualifications necessary to the jobs that were offered to them, as a mitigation measure.

• The following measures are suggestions for possible discussion with waste pickers and can be complemented or substituted by other ones. What is important is that the waste pickers income be restored or, desirably, improved, and that the mitigation measures be active before waste picking is forbidden in Tibar dumpsite. Some suggested measures (several measures can be cumulative):
  
  o Direct waste pickers with 60 years old or more to the existing Timor-Leste Social Security System with at least a national minimum wage basis;
  
  o Provide opportunity of professional training and capacitation.
o Provide the opportunity for young waste pickers to continue their studies.

o Provide waste pickers with the jobs created during TDRUP construction phase.

o If feasible, implement recycling activities, in Tiber Landfill, within the scope of TDRUP, and offer waste pickers jobs in recycling activities, in safe and hygienic conditions.

o Alternative to job giving, promote waste pickers organization in recycling cooperatives and give management support.

o Give the waste pickers the opportunity to work for Dili municipality or Liquiçá municipality waste collecting services, gardening activities or other services (integrated into the Job Placement Program).

o Set protocols with private and public companies operating in Tibar suco, to give jobs to waste pickers, as well as with ONGs and other civil society organizations.

o Set protocols with international and national partners to support training activities.

10.2.3 Negotiation and establishment of compensation for affectation of private owned land by drainage system

The TDRUP will construct a suitable stormwater management system to manage the discharge of stormwater from the site given that there is currently no proper and functioning stormwater management system downstream of the project site.

There are some potential alignments for the construction of a stormwater management system to facilitate the drainage of stormwater from the project site. Details of the options are summarized on Table 10-14.

<table>
<thead>
<tr>
<th>Option</th>
<th>Distance along Public Highway (m)</th>
<th>Distance through Third Party Land (m)</th>
<th>Total Distance (m)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>710</td>
<td>80</td>
<td>790</td>
<td>Along current access road, then uses existing drainage line to the river</td>
</tr>
<tr>
<td>2</td>
<td>626</td>
<td>50</td>
<td>676</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>652</td>
<td>47</td>
<td>699</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>481</td>
<td>136</td>
<td>617</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>362</td>
<td>177</td>
<td>539</td>
<td>Shortest length but longest path through third party land (except for Option 7)</td>
</tr>
<tr>
<td>6</td>
<td>712</td>
<td>78</td>
<td>790</td>
<td>Along current access road and then across main road to the river</td>
</tr>
<tr>
<td>7</td>
<td>0</td>
<td>810</td>
<td>810</td>
<td>Entirely through private land</td>
</tr>
</tbody>
</table>
The drainage system would comprise, subject to detailed design, dual pipes, of the order of 1.2 m in diameter, buried under ground, each pipe providing a capacity of 1.13 m³/second at a flow rate of 1 m per second.

Considering the above described, there is a high probability that the drainage construction system may affect private owned land.

It is not possible to assess the impacts since the drainage system options have not yet been selected, and there is not any quantification of the possible areas that will be affected either temporarily or permanently.

In the project detailed phase, impacts must be assessed, negotiations must be conducted, and affected landowners must be adequately compensated.

On a preliminary analysis, main potential impacts can be either temporary or permanent, as follows.

Temporary impacts on private owned land may result from construction activities like access opening, machines operation, vehicles circulation, construction materials deposition, workers circulation, and other activities necessary to infrastructure installation. Option 7 has much higher extension and potentially more impacts. Landowners must be contacted in advance and no intervention can be done on private owned land without their agreement, unless that is determined within legal expropriation processes. Compensation for temporary impacts must be negotiated.

Permanent impacts may result mainly from permanent land occupation by new drainage infrastructures. Compensation for permanent impacts must be negotiated with landowners in order to reach an agreement. It is not expected that economic displacement will occur.

10.3 - Construction Phase

Following the construction planning it is expected that the construction phase will last for around three years, beginning in 2021.

This section analyses the impacts that are mainly of a temporary nature. Some of these impacts, due to their limited duration, are potentially of less importance. However, negative impacts should be properly considered and managed to ensure that they are reversible, avoiding permanent consequences.

It is also important to remember that this type of impact will affect people and families who will remain in the surroundings of the area affected by the construction operations.

Temporary impacts also include positive impacts, notably on job creation and local procurement of goods and services for construction activities. In this case, the main concern in managing the impacts is to increase, as much as possible, the positive effects for the populations affected by the project.

The following impact dimensions will be analysed:

- Job creation
- Creation of opportunities for local acquisition of goods and services for the work
- Construction sites and the presence of workers from outside the city of Dili or even from abroad
- Environmental nuisances and risks to the health and safety of the population
- Risks to the health and safety of workers
- Temporary affectation of roads and circulation, and access to housing, commerce, and equipment.
- Impacts resulting from the demobilization of hired labour.
• Impacts on land and private owned property.

The impacts are analysed and assessed, and measures are defined to mitigate negative impacts and enhance positive impacts. These measures are then systematised elsewhere in this study.

### 10.3.1 Job creation

The various construction operations are potentially job generators due to the need to hire labour, in addition to that which the construction companies already have in their staff.

Thus, the estimated amount of labour for the construction phase may reach an annual volume of several dozens of direct workers, with variation over the construction period.

As mentioned in the baseline section situation, the volume of underemployment and unemployment are very high in the city of Dili. So, project will have a positive impact.

From a perspective of sustainability and social responsibility, an as a way of mitigating negative impacts, the tender documents for the construction work should establish the obligation for construction companies to hire, as first priority, Tibar dumpsite waste pickers, and, as second priority, to hire local labour in Tibar suco area, and, as far as necessary and possible, to promote training and qualification initiatives in order to maximise the volume of labour that can be hired in the families, villages and Suco affected by the project.

Another concern to be taken into account is the application, as far as possible, of the principle of equity, i.e. the hiring of labour in the various villages affected by the project and not just at one point or another.

Similarly, opportunities must be provided for the employment of women, which unemployment rate is much higher than that of men and are most part of waste pickers.

The promoter and the construction companies must articulate with the Suco chief and the Aldeia Chiefs, in order to plan the hiring of labour, with the concern of benefiting with employment those who need it most and the most vulnerable.

### 10.3.1.1 Impact Assessment

Considering the estimates of several dozen direct jobs, and even taking into account that a large part of the necessary workforce is already part of the workforce of construction companies, the impact will be positive, of high probability, direct, temporary, reversible, of medium magnitude and medium significance. These positive effects can and should be enhanced.

### 10.3.1.2 Maximization measures

To maximise the positive effects, the following measures are proposed:

• Where and when feasible, the use of manual labour should be preferred to the use of machinery to create more employment.

• Carry out, whenever possible, the hiring of local labour, following the following priorities: i) waste pickers; ii) affected families; iii) affected villages; iv) affected Suco; v) Liquiçá municipality; vi) other locations outside Liquiçá municipality.

• The hiring of local workers should be planned and implemented in articulation between the construction companies, the promoter, the Suco chief and the Aldeia chiefs.
• A communication plan should be implemented in good time, in liaison with the local authorities, with a precise indication of the number of jobs made available and the necessary requirements to fill them.
• When hiring, give priority to the most deprived and vulnerable people.
• Not discriminate against women, who should receive a salary equivalent to that of men performing the same functions.
• In the performance of equivalent functions, locally hired workers should not receive a lower salary than workers integrated into the staff of construction companies.
• Not resort to child labour.
• Assign fair wages and respect working hours. Overtime work, when performed at the request of construction companies, must be remunerated.
• Companies responsible for the construction works should promote the implementation of vocational training initiatives to increase the skills of as many locally hired workers as possible.

10.3.2 Creation of procurement opportunities for goods and services on the local market

In the construction phase, the construction period will cause an increase in direct demand from construction companies for goods and services in the Project's area of influence, especially for construction works (construction materials, fuel, tools and equipment), non-durable consumer goods (food, medicines, personal hygiene products, among others) and services (subcontracting, transportation, lodging, surveillance, among others).

The city of Dili is expected to polarize a significant part of this demand, due to the greater development and diversification of its economy and the location of the works. However, this effect should be maximised in the project's area of intervention, particularly in affected families and villages, to the extent that some of these goods and services can be provided locally. It would be a way not only to compensate for the negative impacts, but also to contribute to the improvement of the well-being of families.

10.3.2.1 Impact assessment

In general, the impact will be positive, high probability, direct, temporary, reversible, medium magnitude and medium significance. These positive effects can and should be enhanced.

10.3.2.2 Maximization measures

To maximise the positive effects, the following measures are proposed:
• Wherever possible, procure goods and services in the local market, following the following priorities: i) affected households; ii) affected villages; iii) affected Suco; iv) Liquiçá municipality; v) other locations outside Liquiçá municipality.
• There should be articulation between the construction companies, the promoter, the municipality of Liquiçá, the Suco chiefs and the Aldeia chiefs, in order to identify the potential of the local market for the acquisition of goods and services for the work.
10.3.3 Construction sites and presence of workers

Although it is predictable and desirable that a significant part of the workforce needed to carry out the works will be employed in local communities, there will always be a proportion of the workers who will come from other locations, namely those who already work for the companies that will be involved in the construction works.

Workers from outside Dili could be accommodated at the social construction sites. The presence of these workers from other locations can have adverse impacts on local communities.

The potential impacts generated include:

- Risk of social conflicts: Conflicts may arise between local communities and outside workers due to cultural differences or socially unacceptable or conflictual behaviour.
- Increased risk of illicit behaviour and crime: The influx of workers and service providers into local communities can increase the rate of crime and/or a perception of insecurity on the part of members of those communities. Such unlawful behaviour or crimes may include theft, physical assault, substance abuse and prostitution.
- Increased demand for and pressure on social and local health services: the presence of outside workers can generate additional demand for public services, medical services, and social services.
- Increased risk of dissemination of communicable diseases and increased burden on local health services: the influx of external labour can bring communicable diseases into the project area, including sexually transmitted diseases. This may place an additional burden on local health services.
- Gender-based violence: Separation from the family and its usual social environment can induce inappropriate and criminal behaviour by outside workers, such as sexual harassment of women and girls, exploitative sexual relations, and illicit sexual relations with minors in local communities.

10.3.3.1 Impact assessment

The correct assessment of the impacts listed above is difficult because their significance will depend on the management capacity of the different parties involved in the work, in particular the Project Owner and the Contractor(s), which cannot be assessed at this date.

However, considering that the vast majority of the workforce will be made up of workers already resident in Liquiçá or Dili municipalities, and that, therefore, the external workforce will correspond to a minority, the potential significance of these impacts is expected to be medium to low.

In general, the impact will be negative, of medium probability, direct and indirect, temporary, reversible, of medium to low magnitude and significance.

10.3.3.2 Mitigation measures

In order to mitigate the negative effects, the following measures are proposed:

- Establish a standard Code of Conduct for all construction workers, describing their rights and obligations. This Code should be disclosed and explained to employees during their recruitment and subscribed by all when signing their employment contracts. Non-compliance with this code should be associated with wage penalties and, in serious situations, with the dismissal of offenders.
- Carry out awareness-raising activities among construction workers in relation to:
o Inappropriate behaviour and the promotion of good relations with local communities;
  o Risk behaviour for health and preventive care to prevent the transmission of infectious diseases. In the case of sexually transmitted diseases, it is recommended that condoms be made available to workers.

- Define and implement an effective Complaints Mechanism that is accessible to communities and enables early identification of problems and their mitigation. The procedure for using this mechanism should be explained to the communities.

10.3.4 Environmental nuisances and risks to the health and safety of the population

The circulation of heavy goods vehicles and construction machinery will pose an increased risk of accidents for the inhabitants (particularly children) of the villages affected by the construction of the project, including not only the communities located near the area of intervention, but also those along the routes used by the traffic generated by the works.

In addition to the risks they pose to the physical integrity of persons, the circulation and operation of vehicles and machinery will cause the emission of air pollutants, including dust and pollutants emitted by the combustion of diesel engines, which will affect the air quality of the area of intervention, causing discomfort to the sensitive receptors present.

Several construction activities will present a high risk to the health and safety of the people, including unaccompanied children, who circulate daily in the area of intervention and influence of the project. In this context, the following activities stand out as potential risk factors: handling of hazardous materials, fuels, flammable materials, toxic substances; operation of machinery and equipment; demolition of constructions; excavations.

Present COVID-19 pandemic crisis raises specific risks to the population, that must be addressed. The approval of several vaccines by health authorities and the implementation of vaccination campaigns may result in pandemic control, but it is not possible to predict with certainty how the pandemic will evolve till the beginning of TDRUP construction phase.

In case the pandemic is still active, health protocols determined by Timor-Leste Government must go on being implemented and World Health Organization recommendations and measures to prevent transmission of COVID-19 must go on being applied, such as frequent hand-washing or disinfection with alcohol based hand sanitizer, respiratory hygiene such as covering coughs, physical distancing of at least 1 metre or more according to the national recommendations, wearing of masks where distancing is not possible, regular environmental cleaning and disinfection, and limiting unnecessary travel.

10.3.4.1 Impact assessment

In general, the impact will be negative, high probability, direct, temporary, reversible, medium magnitude and medium to high significance.

10.3.4.2 Mitigation measures

In order to mitigate the negative effects, the following measures are proposed:
• Select the most suitable routes for the circulation of vehicles and machines assigned to the work site, minimizing the passage near sensitive receptors.

• When crossing urban areas, the circulation should be done at low speed and with the necessary care.

• Train all site workers, in particular vehicle drivers and machine operators, on specific precautions to be taken to minimise the risk of accidents to the population (special attention should be paid to children).

• Properly signal all areas allocated to construction work, including construction sites, work fronts, material storage areas, and accesses, and delimit, interdict/condition circulation to people outside the construction site.

• If it is necessary to restrict or prohibit the movement in areas regularly used by the population, it is necessary to identify alternative safe routes for the movement of people. It is recommended that the identification of these routes be carried out with the support of the village chiefs.

• Ensure that the paths or accesses in the surroundings of the intervention area are not obstructed or in poor condition, enabling their normal use by the resident populations and other users.

• Provide information to the affected communities on the timetable for the execution of the main construction works and areas subject to interdiction or conditioning.

• Define and implement an Emergency Response Plan that includes the necessary measures to deal with potential emergencies in a coordinated and expeditious manner, to prevent them from adversely affecting the health and safety of communities, and to mitigate and compensate for any impacts that may occur.

• Implement the measures already mentioned to mitigate the emission of atmospheric pollutants resulting from the circulation and operation of vehicles and machines assigned to the worksite.

• Establish a standard Code of Conduct for all construction workers, describing their rights and obligations. This Code should be disclosed and explained to employees during their recruitment and subscribed by all when signing their employment contracts. Non-compliance with this code should be associated with wage penalties and, in serious situations, with the dismissal of offenders.

• Carry out awareness-raising actions among workers regarding risk behaviours and preventive care to prevent the transmission of infectious diseases.

• Require appropriate conduct from security personnel who may be employed to carry out asset-surveillance services during construction works. It is essential that clear instructions are given to security personnel about their work objectives and permitted actions. The level of detail in the instructions will depend on the scope of the permitted actions (especially where security personnel are authorised to use force) and the number of employees. These instructions should be communicated as conditions of employment and reinforced through periodic professional training. These professionals should also subscribe to the standard Code of Conduct to be applied to all construction workers.

• Define and implement a Complaints/Reclamation Resolution Mechanism that ensures the collection of complaints from potential victims of activities associated with the works and the effective response thereto.

10.3.5 Risks to the health and safety of workers

The construction works will involve various activities with risks to the health and safety of workers, of which the following are highlighted as being of high risk:

• Transport, handling and storage of machinery, equipment, and construction tools;
• Transport, handling and storage of hazardous materials, fuels, flammable materials, toxic substances;
• Operation of machines and equipment;
• Transport of people;
• Excavations;
• Work in an unhealthy environment (waste, waste combustion, smoke);
• Dealing with dangerous waste;
• Work at high temperatures;
• Works with electrical risks.

The risks resulting from these activities range significantly from minor injuries to loss of life. The significance of these risks will depend to a large extent on the implementation of appropriate management measures and on workers’ compliance with them.

Considering that a significant part of the workforce to be hired is local and that most of these workers, despite being aware of the risks identified above, are not in the habit of adopting adequate protection measures, namely the use of Personal Protective Equipment (PPE), some accidents are expected to occur during the course of the works.

Present COVID-19 pandemic crisis raises specific risks to workers and the population in general, that must be addressed. The approval of several vaccines by health authorities and the implementation of vaccination campaigns may result in pandemic control, but it is not possible to predict with certainty how the pandemic will evolve till the beginning of TDRUP construction phase.

In case the pandemic is still active, health protocols determined by Timor-Leste Government must go on being implemented and WHO recommendations and measures to prevent transmission of COVID-19 must go on being applied, such as frequent hand-washing or disinfection with alcohol based hand sanitizer, respiratory hygiene such as covering coughs, physical distancing of at least 1 metre or more according to the national recommendations, wearing of masks where distancing is not possible, regular environmental cleaning and disinfection, and limiting unnecessary travel.

Clear policies and messages, training, and education for staff and managers to increase awareness of COVID-19 are essential. The management of people with COVID-19 or their contacts is also critical, like requiring workers who are unwell or who develop symptoms to stay at home, self-isolate and contact medical professional or the local COVID-19 information line for advice on testing and referral.

10.3.5.1 Impact assessment

In general, the impact will be negative, high probability, direct, temporary, reversible, medium magnitude and medium to high significance.

10.3.5.2 Mitigation measures

To mitigate the negative effects, the following measures are proposed:

• Prepare and implement a Worker Health and Safety Management Plan for the construction phase, which complies with the requirements of the Timorese legislation (in particular the provisions of the Labour Code on Safety, Hygiene and Health at Work (Decree-Law no. 4/2012, articles 34 to 37).
• This Plan will have to be approved by the Project Owner.
The Construction Company will be responsible for the implementation of the Plan and internal supervision of its compliance (in particular, with subcontracted companies).

The Promotor will be responsible for the external oversight of compliance with the Plan, including identification of non-compliance and the respective corrective measures.

The Plan shall include the following components:
- Manual of Procedures, detailing the specific procedures to be adopted to perform the main health and safety management tasks, including activation forms, registration systems, documentation procedures, communication flow and other aspects.
- Responsibilities, describing the responsibilities of the employees involved in the implementation of the Plan.
- Health and Safety Training Programme, presenting the content, frequency and application context of each health and safety training module.
- Occupational Health Management, describing how workers' health will be monitored (in particular with regard to communicable diseases and diseases caused by vectors) and medical assistance, as well as emergency response.
- Safe working procedures focused on high-risk project activities.

Ensure that both the Construction Company and the Project Owner have properly qualified employees in Occupational Health and Safety.

Before starting work, workers should be trained in:
- a) the potential risks associated with their activities;
- b) safety measures;
- c) first aid.

Ensure that all workers have PPE and make permanent use of it during their stay on site.

In case of accidents or incidents with the workers, the Construction Company must inform the Project Owner immediately after the occurrence of the same.

10.3.6 Impacts on roads, circulations, and local accesses

Within the construction phase it is expected that the rehabilitation and improvement of the road that leads to the landfill will be done.

There is, also, the possibility that the drainage system to be constructed to drain rainwater to downstream area of the landfill, will be constructed along the road that leads to the landfill, for an extension of, at maximum, 712 m.

Both kind of interventions will therefore condition road traffic, pedestrian traffic and may condition the access to public spaces, housing and other buildings, causing impacts on mobility and accessibility.

10.3.6.1 Impact assessment

Overall, the impact will be negative, with high probability, direct, temporary and reversible, of medium magnitude and significance.

10.3.6.2 Mitigation measures

To mitigate the negative effects, the following measures are proposed:
- Temporarily cut off roads and accesses shall be subject to an alternative access and circulation plan.
- Access to housing, social facilities and other buildings shall be provided at all times.
• Efficient site planning must be ensured to guarantee that interferences, cuts and conditionings last as little as possible.
• The works, the impacts on access and circulation, and circulation alternatives should be advertised in advance, with the collaboration of the Suco chiefs and Aldeia chiefs.
• Mechanisms for receiving and responding to complaints from users, residents, and the general public should be put in place.
• The planning and construction phase should be monitored with the involvement of the Suco chiefs and Aldeia chiefs, within their respective jurisdictions.

10.3.7 Impacts resulting from the demobilization of hired labour

As previously analysed, it is expected that the execution of the works of the TDRUP will have positive impacts for the local communities, considering not only the possibility of local acquisition of goods and services, but above all, the employment generated and the concomitant increase in disposable income of people and families, especially the neediest.

The construction period of 3 years is long enough for the job opportunities generated to become a regular source of income, albeit not continuous, for the beneficiary families, and an improvement in their quality of life.

With the end of the construction phase, this source of income ends, putting people back in more precarious situations. The cessation of this significant positive impact on a highly vulnerable socio-economic environment ends up being a very significant negative impact.

This impact will not be felt by hired waste pickers, since, in their case, alternative jobs or compensation must be provided after the end of construction phase.

10.3.7.1 Impact assessment

In general, the impact will be negative, certain, direct, permanent, irreversible, of medium magnitude and medium to high significance.

10.3.7.2 Mitigation measures

In order to mitigate the negative effects, the following measures are proposed:

• Provide people hired for construction work with clear and objective information on the duration of the work and the jobs created, so that they can, in an informed manner, plan and manage their lives.
• During construction, carry out professional training activities for the workers involved in the work in order to train them to perform the tasks for which they were hired and, simultaneously, increase their employability after the end of their contract for this work.
• Maintain close and continuous cooperation with Suco chiefs and Aldeia chiefs to clarify and manage opportunities for employment and local procurement of goods and services. This cooperation should extend to the identification and implementation of improvements that can be made in communities in terms of water supply, sanitation, health and other social investments, the implementation of which is considered feasible in the context of this project.
• Consider and maximise the hiring of people for activities associated with the operating phase.
10.3.8 Impacts on land and private owned property

As referred before, the TDRUP will construct a suitable stormwater management system to manage the discharge of stormwater from the site given that there is currently no proper and functioning stormwater management system downstream of the project site.

Potential alignments for the construction of a stormwater management system to facilitate the drainage of stormwater from the project site may affect private owned land.

It is not possible to assess the impacts since the drainage system options have not yet been selected. In the project detailed phase, impacts must be assessed.

On a preliminary analysis, main potential impacts can be as follows.

As already referred for the pre-construction phase, the construction phase will cause temporary impacts on land uses, necessary to the opening access to area, movement of people, vehicles and machines, excavations, and burial of the drainage pipes. Option 7 has much higher extension and potentially more impacts.

These operations should be conducted in order to affect land uses to the minimum. The impacts that may occur in this phase and that have not been included in owners’ compensation, should be object of a complementary compensation.

Landowners must be contacted in advance and no intervention can be done on private owned land without their agreement unless that is determined within legal expropriation processes. Compensation for temporary impacts must be negotiated.

Permanent impacts may result mainly from permanent land occupation by new drainage infrastructures. Compensation for permanent impacts must be negotiated with landowners in order to reach an agreement. It is not expected that economic displacement will occur.

10.4 - Operation Phase

This section analyses the impacts of the operation phase of the rehabilitated landfill. Main impacts are of positive nature, corresponding to rehabilitation objectives. Some negative impacts, mainly nuisances, may continue to be felt by surrounding populations, but in a mitigated way.

Nuisances and safety issues resulting from waste truck circulation are more difficult to mitigate.

The following impact dimensions will be analysed:

- Effects of rehabilitation on waste management, air quality, odours, waste spreading, mosquitos and other pests, drainage
- Jobs creation
- Compost producing plant
- Nuisances resulting from landfill operation
- Nuisances resulting and safety risks resulting from waste truck circulation to and from the landfill.

10.4.1 Effects of rehabilitation

Rehabilitation will improve in a very significant way the waste management, mitigating or avoiding the negative impacts that result from the present uncontrolled situation. Landfill will be surrounded by a fence impeding the
access to animals and unauthorized people. Waste burning will be extinct, eliminating smoke emissions. Waste will be compacted and daily covered, reducing bad odors and waste spreading. Landfill will have a drainage system including rainfall drainage, contributing to a better drainage, and avoiding or mitigating flooding on the downstream area. Conditions that facilitate the reproduction of mosquitos and other pests will decrease. Methane produced by the landfill will be burned. There will be noise prevention and reduction by using mufflers, silencers, noise fencing and screens and through regular preventative maintenance of operating equipment. Internal landfill roads will be improved reducing dust emissions.

All these aspects will contribute to a significant improvement of the environmental quality in the surrounding area, social areas quality of life, and public health conditions.

10.4.1.1 Impact Assessment

The impact will be positive, certain, direct, permanent, reversible, of high magnitude and high significance.

10.4.2 Job creation

Operation phase will create new jobs to waste management activities, compost producing, security and other necessary functions. Some of jobs will need qualifications. Data about the number of jobs to be created is not available.

10.4.2.1 Impact assessment

The impact will be positive, of high probability, direct, permanent, reversible, of medium to low magnitude and significance.

10.4.2.2 Maximization measures

To maximise the positive effects, the following measures are proposed:

- Carry out, whenever possible, the hiring of local labour, following the following priorities: i) waste pickers; ii) affected families; iii) affected villages; iv) affected Suco; v) Liquiçã municipality; vi) other locations outside Liquiçã municipality.
- The hiring of local workers should be planned and implemented in articulation between the construction companies, the project owner, the Suco chief and the Aldeia chiefs.
- A communication plan should be implemented in good time, in liaison with the local authorities, with a precise indication of the number of jobs made available and the necessary requirements to fill them.
- When hiring, give priority to the most deprived and vulnerable people.
- Not discriminate against women, who should receive a salary equivalent to that of men performing the same functions.
- Not resort to child labour.
- Assign fair wages and respect working hours. Overtime work, when performed at the request of construction companies, must be remunerated.
10.4.3 Compost plant

A compost plant will be developed to produce organic compost from vegetable waste. The compost produced can be sold as a fertilizer for agricultural activity.

10.4.3.1 Impact Assessment

The impact will be positive, certain, direct, permanent, reversible, of medium magnitude and significance.

10.4.4 Environmental nuisances resulting from landfill operation

Although the rehabilitation will contribute to a significant improvement of the environmental quality in the surrounding area, social areas quality of life, and public health conditions, as said before, landfill operation will go on having some effects and producing some nuisances, mainly on the areas nearest to the landfill.

Circulation of trucks on landfill interior roads, operation of machines for waste management will produce some dust emission, pollutants emissions and noise impacts. Other activities may also produce some noise emissions.

Bad odors will decrease significantly but will not be completely eliminated, as well as mosquitos, rodents and other pests.

10.4.4.1 Impact assessment

The impact will be negative, with high probability, direct and indirect, permanent but not continuous, reversible, with medium magnitude and significance.

10.4.4.2 Mitigation measures

To mitigate the negative effects, the following measures are proposed:

- Implement the measures already mentioned to mitigate the emission of atmospheric pollutants resulting from the circulation and operation of vehicles and machines assigned to the landfill.
- Implement and, if necessary, increase noise prevention measures and reduction by using mufflers, silencers, noise fencing and screens and through regular preventative maintenance of operating equipment.
- Define and implement a Complaints/Reclamation Resolution Mechanism that ensures the collection of complaints from the public.

10.4.5 Environmental nuisances and risks resulting from waste trucks circulation

The circulation of the waste vehicles to and from the landfill will probably increase and will pose an increased risk of accidents for the inhabitants (particularly children) of the areas along the routes used by the waste traffic.

In addition to the risks they pose to the physical integrity of persons, the circulation of vehicles will cause the emission of air pollutants, including dust and pollutants emitted by the combustion of diesel engines, which will affect the air quality of the area of intervention, causing discomfort to the sensitive receptors present.
10.4.5.1 Impact assessment

The impact will be negative, with high probability, direct and indirect, permanent but not continuous, reversible, with medium to high magnitude and medium to high significance.

10.4.5.2 Mitigation measures

To mitigate the negative effects, the following measures are proposed:

- When crossing urban areas, the circulation should be done at low speed and with the necessary care.
- Train all site workers, in particular vehicle drivers, on specific precautions to be taken to minimise the risk of accidents to the population (special attention should be paid to children).
- Define and implement an Emergency Response Plan that includes the necessary measures to deal with potential emergencies in a coordinated and expeditious manner, to prevent them from adversely affecting the health and safety of communities, and to mitigate and compensate for any impacts that may occur.
- Implement the measures already mentioned to mitigate the emission of atmospheric pollutants resulting from the circulation and operation of vehicles and machines assigned to the landfill.
- Define and implement a Complaints/Reclamation Resolution Mechanism that ensures the collection of complaints from potential victims of activities associated with the trucks’ circulation and the effective response thereto.

10.5 - Decommissioning Phase

A detailed assessment of the social impacts resulting from the decommissioning phase is not feasible because is not possible to anticipate the concrete social and urban situation in a future time when the landfill will be decommissioned.

However, if one considers that the social and urban situation remains similar to the current one, or aligned with the trends of the present one, most impacts of decommissioning are similar to the impacts of the construction phase, with regard to the effects of the activities to be carried out on the ground, the movement of machinery and vehicles, temporary job creation, etc., being applicable the same type of measures defined for the construction phase, as assessed in section 10.3.

Decommissioning phase will have, however, specific impacts, such as:

- Nuisances resulting from landfill activity will cease;
- Nuisances and safety issues resulting from waste truck circulation will also cease;
- Landfill area can be rehabilitated and used as a public park or leisure area;
- Landfill employment will be over.

Only the last impact is negative and must have mitigation measures. These measures consist on avoiding unemployment and maintain jobs by transferring workers to other similar facilities or assign them to other functions.
10.6 - Residual impacts

The notion of residual impact and the possibility of its determination, in the context of ex-ante assessments, raises several difficulties. For ex-ante social assessment, due to the specificities of social impacts, these difficulties become, to a large extent, unavoidable, not allowing the application of this notion in most situations.

Starting with general difficulties, it should be noted, from the outset, that the notion of residual impact is not applicable to positive impacts, either because of the nature of this type of impact or because a positive impact can be, by definition, continuously potentiated.

As for negative impacts, the predictability of residual impacts faces a double difficulty. On the one hand, the difficulty that results from the uncertainty of forecasting impacts, and the possibility of the occurrence of unforeseen or even unforeseeable impacts. On the other hand, the one that results from the difficulty in predicting the effectiveness of the proposed mitigation measures and, above all, the efficiency of their effective application.

In addition to these general difficulties, social assessment faces particular difficulties or impediments. Indeed, the complexity of social factors does not allow the effect of mitigating measures to be taken for granted, since their application constitutes itself a social process that, as such, can have variable results and even generate new impacts.

As for the immaterial and cultural impacts, it is even more problematic to try to reference which are the residual impacts, since the impacts themselves are difficult to determine and of significance very variable.

Ex-ante assessments have a preventive and precautionary character. So, the determining moment to verify and ensure the most effective mitigation of negative impacts, or the maximum potentiation of positive impacts, is that of monitoring and management of impacts during the construction and operation phases. It is through this monitoring and management ongoing assessment that it is possible to effectively determine, in each case, the significance of impacts, the effectiveness of mitigation measures and, in the case of negative effects, the residual impacts. Another moment where the assessment of residual impacts is possible is, of course, at the final ex-post evaluation.

So, in the context of ex-ante assessment, and from the point of view of social sustainability, more relevant than the notion of residual impacts and the search for its determination, is the notion of involvement and negotiation with the affected persons, and the implementation of negotiation processes guided by principles of sustainability, such as precaution, justice, equity and dignity. It is from the result of these processes that the degree of mitigation of negative impacts and the potentiation of positive impacts depend.

In short, when dealing with social impacts, to state, in the framework of ex-ante assessment, which will be the residual impacts, it is not possible or even methodologically adequate. In ex-ante social assessment, it is only possible to state about the impacts that are, or were, avoided. As for the impacts that cannot be avoided, it is expected that the proposed mitigation measures will reduce negative impacts significance to not significant or nil.

This is valid for the measures indicated in the previous sections of this report which are expected to avoid or reduce negative impacts significance to not significant.

However, these desired outcomes cannot be taken for granted or guaranteed before mitigation processes have been effectively developed and mitigation measures implemented. To do so, it would be misleading, and, above all, it could be a serious risk for the affected people.
This is clearly the case of the main negative social impacts of TDRUP, that is, the impacts on waste pickers activity. Multiple solutions and different or complementary mitigation measures can be implemented, according with negotiations with affected persons. The mitigation process will last for 3 years (at least). Only through and during monitoring, and at the end of this process one can state which are the residual impacts to all, and each one, of the affected persons.
Chapter 11 - Economic Assessment

11.1 - Costs and Benefits of the Environmental Impacts

At this stage, it was not possible to present a cost-benefit analysis of positive and negative environmental and social impacts.

The most significant positive impact will be the rehabilitation and closure of the Tibar dump that improves sanitation conditions and reduces health risks, while the most significant negative impact will be the need for resettlement of about 100 waste pickers, the RAP/LRP under the responsibility of PMU will present this analysis.

There is however a positive impact on the local economy which is the public investment for this project. In total, the expected investment is US$ 27,124,582.71 (see Table 11-1).

Table 11-1 Total public investment

<table>
<thead>
<tr>
<th>Item</th>
<th>Estimated Approximate Cost (USD$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Initial Investment (Design and Construction)</td>
<td>$ 9,762,397.41</td>
</tr>
<tr>
<td>Waste Collection (2021-2030)</td>
<td>$ 11,844,350.02</td>
</tr>
<tr>
<td>Landfill Operation (2021-2030)</td>
<td>$ 5,517,835.28</td>
</tr>
<tr>
<td><strong>Total Costs</strong></td>
<td><strong>$ 27,124,582.71</strong></td>
</tr>
</tbody>
</table>

11.2 - Costs, Benefits and effectiveness of mitigation measures

Table 11-2 provides a forecast of the total costs of implementing mitigation measures.

Outside this forecast are costs related to the construction contract (which are defined by the contractor) and costs for the resettlement process (waste pickers).

Table 11-2 Costs of the compensation measures and monitoring

<table>
<thead>
<tr>
<th>Activity</th>
<th>Total ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design Stage</strong></td>
<td></td>
</tr>
<tr>
<td>a. Baseline Reviews (Pre-construction) for environment and social</td>
<td>$36,000</td>
</tr>
<tr>
<td>b. RAP (Resettlement Action Plan) implementation for waste pickers(1)</td>
<td>N/A(1)</td>
</tr>
<tr>
<td>c. Annual compensation for 100(2) waste pickers (economic involuntary resettlement)</td>
<td>$138,000(3)</td>
</tr>
<tr>
<td><strong>Construction Stage</strong></td>
<td></td>
</tr>
<tr>
<td>a. Environmental Monitoring</td>
<td>$75,000</td>
</tr>
<tr>
<td>b. Tree Planting in Reserve Area (Sector 1 – 12 ha)</td>
<td>$12,000</td>
</tr>
<tr>
<td>c. Social Monitoring (waste pickers and community)</td>
<td>N/A(1)</td>
</tr>
<tr>
<td><strong>Operation Stage</strong></td>
<td></td>
</tr>
<tr>
<td>a. Environmental Monitoring</td>
<td>$50,500</td>
</tr>
<tr>
<td>b. Flare Quality Control</td>
<td>$9,000</td>
</tr>
<tr>
<td>c. Tree Planting in Reserve Area (Sector 2 – 12 ha)</td>
<td>$12,000</td>
</tr>
<tr>
<td>d. Social Monitoring (waste pickers and community)</td>
<td>$TBC(5)</td>
</tr>
<tr>
<td><strong>Decommissioning Stage</strong></td>
<td></td>
</tr>
<tr>
<td>a. Environmental Monitoring</td>
<td>$75,000</td>
</tr>
<tr>
<td>b. Flare Control</td>
<td>$9,000</td>
</tr>
<tr>
<td>c. Tree Planting in Reserve Area (Sector 3 – 8 ha)</td>
<td>$12,000</td>
</tr>
</tbody>
</table>

(1) Activity pertains to technical support from PMS to PMU for RAP/LRP design and implementation, based on guidance from Social assessment in this EIS. See EMP Section 6 – Institutional Roles
(2) The EIS has registered 74 Waste pickers during the social baseline phase and the Chefe de Suco Tibar estimates approximately 100 Waste pickers.

(3) Annual value based on minimum wage in Timor-Leste (USD115.00/month) for 10 years duration of project. Shall derive from DMA Annual budget. (still requires review with DMA on proposed solutions and/or alternatives)

(4) Requires review with DMA on responsibilities and technical support to DMA after PMS support closure.

While it is a substantial value, the benefits of these measures are related to the reduction of the negative effects that the population will be subjected to during the construction period, namely their welfare and quality of life.

Proper implementation of the EMP will provide effective implementation of the resources allocated to the implementation of mitigation measures.

11.3 - Discussion on Impacts that have not been expressed in monetary terms

As mentioned above (section 11.1), at this stage it was not possible to make an assessment costs for environmental and social impacts.

The main cause is the complexity of the project and its timeframe, which extends over 10 years (2021 to 2030) and makes this measurement extremely difficult.
Chapter 12 - Summary of EMP

12.1 - Introduction

This chapter provides a summary of the environmental management plan (EMP) to address the potential adverse environmental and social impacts throughout the project development.

The complete EMP is presented in a separate volume, as required by the environmental licensing law and Ministerial Diploma no 47/2017.

The EMP is an essential tool for ensuring that mitigation of the negative impacts and enhancement of the positive impacts is carried out effectively throughout the time life of the TDRUP Project. This document must be improved over time in parallel with the development of the project.

The EMP addresses the environmental impacts that have been classified in the EIS as significant (medium) or above (very significant or high) and attributes mitigation measures to apply during the different phases, as well as the monitoring standards required to keep up-to-date their scale and progress and addresses the responsibilities of each entity within the project management and review structure, regarding the specific roles for the EMP operation.

12.2 - Pre-Construction Phase

Table 12-1 provides a general summary of the potential negative environmental impacts and their respective mitigation and monitoring measures for each of the activities during the pre-construction phase, while Table 12-2 provides the same information but for social impacts. More detailed information on the specific parameters, proposed monitoring locations and compliance requirements can be found in Chapter 10 of EMP.
### Table 12-1 Summary of Activities, potential impacts and mitigation measures during pre-construction phase – Environmental Monitoring

<table>
<thead>
<tr>
<th>Activity</th>
<th>Potential Impact</th>
<th>Aspect</th>
<th>Mitigation Plan</th>
<th>Monitoring Requirements</th>
<th>Responsible</th>
<th>Cost (usd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>Decreased of water quality (groundwater) (Monitoring community wells)</td>
<td>Water resources</td>
<td>-</td>
<td>Year 1 – Baseline (before construction) + 1x year</td>
<td>DBRO-C</td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>Decreased of water quality (groundwater) (Monitoring testing wells)</td>
<td>Water resources</td>
<td>-</td>
<td>Year 1 – 2x year</td>
<td>DBRO-C</td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>Decreased of water quality (surface)</td>
<td>Water resources</td>
<td>-</td>
<td>Year 1 – Baseline (before construction, if surface water is present + if WW occurrence)</td>
<td>DBRO-C</td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>Groundwater Elevation (Monitoring wells)</td>
<td>Water resources</td>
<td>-</td>
<td>Year 1 – Every week</td>
<td>DBRO-C</td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>Decreased air quality parameters resulting from increased emissions to air (PM10 and other pollutants)</td>
<td>Air</td>
<td>-</td>
<td>1x Before Construction (Baseline)</td>
<td>DBRO-C</td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>Increase in noise levels</td>
<td>Noise</td>
<td>-</td>
<td>1x Before Construction (Baseline)</td>
<td>DBRO-C</td>
<td></td>
</tr>
</tbody>
</table>

Total Cost: 22,000
### Table 12-2 Summary of Activities, potential impacts and mitigation measures during pre-construction phase – Social Monitoring

<table>
<thead>
<tr>
<th>Activity</th>
<th>Potential Impact</th>
<th>Mitigation Plan</th>
<th>Monitoring Requirements</th>
<th>Responsible</th>
<th>Cost (usd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relocation/ support of people (waste pickers) by the GoTL (including negotiation process)</td>
<td>Prohibition of waste picking activity during and after rehabilitation will affect 100 people (and their families, totalling around 700 people)</td>
<td>- Waste pickers income should be assured, at minimum, to the level of income that they get from waste picking, or, most desirably, and as vulnerable poor people, an improved level. Waste pickers should be called, jointly by Government authorities responsible for the project, and the Dili and Liquiçá municipalities, to a public meeting to inform and discuss about TDRUP project and alternatives for the waste pickers activity. Authorities responsible for TDRUP must convolve Tibar dumpsite waste pickers to register for being eligible for support. A cut-off date must be established, and all waste pickers must be informed that, after that date, eligibility for support will not be considered. Waste pickers should be treated with fairness and in an equitable way. An economic resettlement plan in the form of a Livelihoods Restauration Plan (LRP) should be drafted and implemented by the project owner before the construction phase, including eligibility criteria, waste pickers' rights, support measures, monitoring programming and actions, and complaint and response mechanisms. Waste picking activity on Tibar dumpsite must only be forbidden after the support measures to registered waste pickers are active and functioning. Support for the elderly waste pickers should be assured.</td>
<td>Year 1 – 1x Before construction (Baseline) Year 1 – 2x Before construction (monitoring) Year 2 to 3 – every 3 months Year 4 to 10 Every 6 months</td>
<td>PMU</td>
<td>NA</td>
</tr>
</tbody>
</table>

NA - Activity pertains to technical support from PMS to PMU for RAP/LRP design and implementation, based on guidance from Social assessment in this EIS. See EMP Section 6 – Institutional Roles
12.3 - Construction Phase

Table 12-3 provides a general summary of the potential negative environmental impacts and their respective mitigation and monitoring measures for each of the activities during the construction phase, while Table 12-4 provides the same information but for social impacts. More detailed information on the specific parameters, proposed monitoring locations and compliance requirements can be found in Chapter 10 of EMP.
<table>
<thead>
<tr>
<th>Activity</th>
<th>Potential Impact</th>
<th>Aspect</th>
<th>Mitigation Plan</th>
<th>Monitoring Requirements</th>
<th>Responsible</th>
<th>Cost (usd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circulation of vehicles and machinery and overall construction activities</td>
<td>Increased concentration of suspended solids and pollutants – decreased of water quality (groundwater) (Monitoring community wells)</td>
<td>Water resources</td>
<td>C15 In the vehicle washing and fuel / oil storage location, a proper oil tank and vehicle pit for maintenance should be set up temporally in the contractor’s camp. In the event of accidental spillage of hazardous products into soil or water, provide a response plan.</td>
<td>Year 2 to 3 – every 3 months</td>
<td>DBRO-C</td>
<td>75,000</td>
</tr>
<tr>
<td>Circulation of vehicles and machinery and overall construction activities</td>
<td>Decreased of water quality (groundwater) (Monitoring testing wells)</td>
<td>Water resources</td>
<td>C15 In the vehicle washing and fuel / oil storage location, a proper oil tank and vehicle pit for maintenance should be set up temporally in the contractor’s camp. In the event of accidental spillage of hazardous products into soil or water, provide a response plan.</td>
<td>Year 2 to 3 – every 3 months</td>
<td>DBRO-C</td>
<td>75,000</td>
</tr>
<tr>
<td>Production of contaminated water (leachate)</td>
<td>Decreased of water quality (surface)</td>
<td>Water resources</td>
<td>-</td>
<td>Year 2 to 3 – 1x Year + if WW occurrence</td>
<td>DBRO-C</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>Groundwater Elevation (Monitoring wells)</td>
<td>Water resources</td>
<td>-</td>
<td>Year 2 to 3 – Every week</td>
<td>DBRO-C</td>
<td>-</td>
</tr>
<tr>
<td>Activity</td>
<td>Potential Impact</td>
<td>Aspect</td>
<td>Mitigation Plan</td>
<td>Monitoring Requirements</td>
<td>Responsible</td>
<td>Cost (usd)</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>--------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------</td>
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<td>------------</td>
</tr>
<tr>
<td>Circulation of vehicles and machinery on construction areas and access</td>
<td>Decreased air quality parameters resulting from increased emissions to air (PM10 and other pollutants)</td>
<td>Air</td>
<td><strong>ID</strong>&lt;br&gt;C17&lt;br&gt;C18&lt;br&gt;C19&lt;br&gt;All on-site vehicle and machinery traffic shall be limited to a speed of 20 km/h on unpaved roads&lt;br&gt;All areas with vehicle and machinery traffic shall be watered or have dust palliative applied and all material transported off-site shall be sufficiently watered&lt;br&gt;All on-site vehicle and machinery shall be well maintained. Engines should be regularly serviced according to manufacturer recommendations and maintained to meet statutory limits</td>
<td>Every 6 months</td>
<td>DBRO-C</td>
<td></td>
</tr>
<tr>
<td>Circulation of vehicles and machinery on construction areas and access</td>
<td>Increase in noise levels</td>
<td>Noise</td>
<td><strong>ID</strong>&lt;br&gt;C22&lt;br&gt;C23&lt;br&gt;C24&lt;br&gt;C25&lt;br&gt;C26&lt;br&gt;C27&lt;br&gt;C28&lt;br&gt;Carefully choose the vehicles itineraries in order to minimize circulation in sensitive areas (housing, school buildings, churches)&lt;br&gt;If the construction sites are situated nearby noise-sensitive areas, provide for the installation of noise barriers and/or attenuating surroundings for noisier equipment&lt;br&gt;Maintain site roads in good condition to reduce noise and vibration from vehicle movements&lt;br&gt;Select equipment that has low noise emission levels&lt;br&gt;Ensure that the equipment present on site is in a good operational condition&lt;br&gt;Periodic review of all machinery and vehicles to respect noise emission standards&lt;br&gt;Limit, as much as possible, the execution of the noisier activities to daytime period and working days</td>
<td>Every 3 months</td>
<td>DBRO-C</td>
<td></td>
</tr>
</tbody>
</table>
### Table 12-4 Summary of Activities, potential impacts and mitigation measures during construction phase – Social Monitoring

<table>
<thead>
<tr>
<th>Activity</th>
<th>Potential Impact</th>
<th>Mitigation Plan</th>
<th>Monitoring Requirements</th>
<th>Responsible</th>
<th>Cost (usd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job creation and procurement opportunities for goods and services related to construction</td>
<td>Environmental nuisances and risks to the health and safety of population. Risks to the health and safety of workers, resulting from operation activities. Job creation. Creation of procurement opportunities for goods and services on the local market</td>
<td>Carry out, whenever possible, the hiring of local labour, following the following priorities: i) waste pickers; ii) affected families; iii) affected villages; iv) affected Suco; v) Liquiçá municipality; vi) other locations outside Liquiçá municipality. Train all site workers, in particular vehicle drivers and machine operators, on specific precautions to be taken to minimise the risk of accidents to the population (special attention should be paid to children) Define and implement an effective Complaints Mechanism that is accessible to communities and enables early identification of problems and their mitigation. The procedure for using this mechanism should be explained to the communities Wherever possible, procure goods and services in the local market, following the following priorities: i) affected households; ii) affected villages; iii) affected Suco; iv) Liquiçá municipality; v) other locations outside Liquiçá municipality. Temporarily cut off roads and accesses shall be subject to an alternative access and circulation plan. Access to housing, social facilities and other buildings shall be provided at all times</td>
<td>Design – 1x Before construction (Baseline) Year 2 to 3 – Every 3 months Year 4 to 10 – Every 6 months Year 10 – Every Year</td>
<td>DBRO-C</td>
<td>NA</td>
</tr>
</tbody>
</table>

NA - Activity pertains to technical support from PMS to PMU for RAP/LRP design and implementation, based on guidance from Social assessment in this EIS. See EMP Section 6 – Institutional Roles
12.4 - Operation Phase

Table 12-5 provides a general summary of the potential negative environmental impacts and their respective mitigation and monitoring measures for each of the activities during the operation phase, while Table 12-6 provides the same information but for social impacts. More detailed information on the specific parameters, proposed monitoring locations and compliance requirements can be found in Chapter 10 of EMP.
<table>
<thead>
<tr>
<th>Activity</th>
<th>Potential Impact</th>
<th>Aspect</th>
<th>Mitigation Plan</th>
<th>Monitoring Requirements</th>
<th>Responsible</th>
<th>Cost (usd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste management improvement</td>
<td>Leachate system and impact in the quality of the water resources (surface and groundwater)</td>
<td>Water resources</td>
<td>Measure and record the quantity and quality of leachate generated. Changes in leachate quantity or quality not attributable to weather or other factors may indicate changes in the liner, leachate collection, or landfill cover systems</td>
<td>Year 4 to 10 - every 3 months</td>
<td>DBRO-C</td>
<td>55,000</td>
</tr>
<tr>
<td>Waste management improvement</td>
<td>Leachate system (water treatment) and impact in the quality of the water resources (surface and groundwater)</td>
<td>Water resources</td>
<td>Inspect the landfill regularly (e.g., after storms and weekly during operation and quarterly after closure) to detect evidence of any of deterioration, malfunctions, or improper operation of run-on and run-off control systems, such as erosion of the final cover; proper functioning of wind dispersal control systems, where present; and the presence of leachate in and proper functioning of leachate collection and removal systems. Measure and record the quantity and quality of leachate generated. Changes in leachate quantity or quality not attributable to weather or other factors may indicate changes in the liner, leachate collection, or landfill cover systems</td>
<td>Year 4 to 10 - every 3 months</td>
<td>DBRO-C</td>
<td></td>
</tr>
<tr>
<td>Activity</td>
<td>Potential Impact</td>
<td>Aspect</td>
<td>Mitigation Plan</td>
<td>Monitoring Requirements</td>
<td>Responsible</td>
<td>Cost (usd)</td>
</tr>
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<td>------------</td>
</tr>
<tr>
<td>Production of contaminated water (leachate)</td>
<td>Leachate system (water treatment) and impact in the quality of the water resources (surface and groundwater)</td>
<td>Water resources</td>
<td>Inspect the landfill regularly (e.g., after storms and weekly during operation and quarterly after closure) to detect evidence of any of deterioration, malfunctions, or improper operation of run-on and run-off control systems, such as erosion of the final cover; proper functioning of wind dispersal control systems, where present; and the presence of leachate in and proper functioning of leachate collection and removal systems. Measure and record the quantity and quality of leachate generated. Changes in leachate quantity or quality not attributable to weather or other factors may indicate changes in the liner, leachate collection, or landfill cover systems.</td>
<td>Year 4 to 10 - 1x Year + if WW occurrence</td>
<td>DBRO-C</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>Increase surface runoff and decrease infiltration process Groundwater Elevation (Monitoring wells)</td>
<td>Water resources</td>
<td>-</td>
<td>4 to 10 – Every week</td>
<td>DBRO-C</td>
<td>-</td>
</tr>
<tr>
<td>Elimination of waste burning Operation and circulation of new vehicles and machines</td>
<td>Emissions from vehicles and machines for collection, transport and disposal of waste</td>
<td>Air</td>
<td>Optimize waste collection routes to minimize distance travelled and overall fuel use and emissions. Waste collection and transport vehicle operator should implement the equipment manufacturers recommended engine maintenance, along with the mechanical maintenance for the safe operation of the vehicle, including proper tire pressure. Sweep Landfill waste management areas and roads frequently and use water spray for dust control where needed.</td>
<td>Every year</td>
<td>DBRO-C</td>
<td>-</td>
</tr>
<tr>
<td>Activity</td>
<td>Potential Impact</td>
<td>Aspect</td>
<td>Mitigation Plan</td>
<td>Monitoring Requirements</td>
<td>Responsible</td>
<td>Cost (usd)</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>----------------------------------------------------------</td>
<td>--------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------</td>
<td>-------------</td>
<td>------------</td>
</tr>
</tbody>
</table>
| Operation and circulation of new vehicles and machines | Increased noise levels from operation of landfill      | Noise  | - Select equipment that has low noise emission levels  
- Ensure that the equipment present on landfill is in a good operational condition  
- Provide a periodic maintenance of all machinery to respect noise emission standards  
- Limit the execution of the noisier activities to daytime period and working days  
- Provide a periodic maintenance of all vehicles | Every 3 months                                        | DBRO-C       |            |
Table 12-6 Summary of Activities, potential impacts and mitigation measures during operation phase – Social Monitoring

<table>
<thead>
<tr>
<th>Activity</th>
<th>Potential Impact</th>
<th>Mitigation Plan</th>
<th>Monitoring Requirements</th>
<th>Responsible</th>
<th>Cost (usd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landfill operation</td>
<td>Environmental nuisances and risks to the health and safety of population. Risks to the health and safety of workers, resulting from operation activities. Job creation.</td>
<td>Implement the measures already mentioned to mitigate the emission of atmospheric pollutants resulting from the circulation and operation of vehicles and machines assigned to the landfill. Implement and, if necessary, increase noise prevention measures and reduction by using mufflers, silencers, noise fencing and screens and through regular preventative maintenance of operating equipment. Define and implement a Complaints/Reclamation Resolution Mechanism that ensures the collection of complaints from the public. Define and implement an Emergency Response Plan that includes the necessary measures to deal with potential emergencies in a coordinated and expeditious manner, to prevent them from adversely affecting the health and safety of communities, and to mitigate and support for any impacts that may occur.</td>
<td>Annual report, broken down by analysis every quarter</td>
<td>DBRO-C</td>
<td>TBC</td>
</tr>
</tbody>
</table>

TBC - Requires review with DMA on responsibilities and technical support to DMA after PMS support closure
12.5 - Decommissioning Phase

Table 12-7 provides a general summary of the potential negative environmental impacts and their respective mitigation and monitoring measures for each of the activities during the decommissioning phase. More detailed information on the specific parameters, proposed monitoring locations and compliance requirements can be found in Chapter 10 of EMP.
<table>
<thead>
<tr>
<th>Activity</th>
<th>Potential Impact</th>
<th>Aspect</th>
<th>Mitigation Plan</th>
<th>Monitoring Requirements</th>
<th>Responsible</th>
<th>Cost (usd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landfill closure and post-closure</td>
<td>Decreased of water quality (groundwater)</td>
<td>Water resources</td>
<td>Provide a periodic maintenance program for all TDRUP infrastructures</td>
<td>Year 10 – every 6 months</td>
<td>Landfill Manager</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Monitoring community wells)</td>
<td></td>
<td></td>
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<tr>
<td>Landfill closure and post-closure</td>
<td>Decreased of water quality (groundwater)</td>
<td>Water resources</td>
<td>Provide a periodic maintenance program for all TDRUP infrastructures</td>
<td>Year 10 – every 6 months</td>
<td>Landfill Manager</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Monitoring testing wells)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production of contaminated water (leachate)</td>
<td>Remaining leachate after closure, evaporation in</td>
<td>Water resources</td>
<td>Provide a periodic maintenance program for all TDRUP infrastructures</td>
<td>Year 10 – 1x Year + if WW occurrence</td>
<td>Landfill Manager</td>
<td>75,000</td>
</tr>
<tr>
<td></td>
<td>collection ponds</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landfill closure and post-closure</td>
<td>Increase surface runoff and decrease infiltration</td>
<td>Water resources</td>
<td></td>
<td>Year 10 – every 6 months</td>
<td>Landfill Manager</td>
<td></td>
</tr>
<tr>
<td></td>
<td>process Groundwater Elevation (Monitoring wells)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landfill closure and post-closure</td>
<td>Decreased air quality parameters resulting from</td>
<td>Air</td>
<td></td>
<td>Every year</td>
<td>Landfill Manager</td>
<td></td>
</tr>
<tr>
<td></td>
<td>increased emissions to air (PM10 and other pollutants)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landfill closure and post-closure</td>
<td>Increase in noise levels</td>
<td>Noise</td>
<td></td>
<td>Every 6 months</td>
<td>Landfill Manager</td>
<td></td>
</tr>
</tbody>
</table>
Chapter 13 - Information Disclosure and Public Consultation

13.1 - General Information

It is important to involve the public and increase their understanding and acceptance of the project by consulting them during the preparation of the EIS, such as how the project can affect their living conditions or even improved them. In this process, the current project has tried to involve the public as early as possible in order to be able to build a more trusting relationship and receive relevant recommendations.

The project is characterized by the importance and considerable weight given to its socioeconomic dimensions. The EIS/EMP were produced in a participatory manner to fully engage stakeholders groups. The study is particularly sensitive to the interests of the primarily affected vulnerable groups such as the waste pickers who will be restricted from access to their source of livelihoods and the surrounding community to the dumpsite.

The current Public Consultation process derives from the first ADB-supported IEE in 2015, a previous study carried out from January to September 2015, by the consultancy firm GHD (ADB, 2015), commissioned by the ADB (Asian Development Bank) to carry out the Technical Assistance for the Dili Urban Services Improvement Sector Project and develop an investment strategy to meet the Solid Waste Management (SWM) needs of Dili’s population over the period 2015-2030.

Despite a few constraints in policy definition and prioritisation of waste management projects for the sector, in order to give continuance to the implementation of the above-mentioned strategy, in 2018 the ADB, working in partnership with the G-RDTL, contracted Transaction Advisory Services (TAS) from the Finishing Consulting Group (FCG) in consortium with REBEL and OASIS Sustainable Projects, to assist the DMA in undertaking the necessary Due Diligence and Technical Studies for the effective implementation of the Dili Solid Waste Management Project (DSWMP). The continuation of this TA is reflected in the EIA service provided and the drafting of the current EIS/EMP, whose Public Consultation components and processes, as requested by the environmental regulator, were carried out in accordance with Draft Ministerial Diploma no. 47/2017, of 22 April 2014 - Regulation on the Public Consultation Procedures and Requirements during the Environmental Assessment Process.

This EIS/EMP process has also suffered several complications due to the current COVID-19 Emergency impositions and restrictions. In this respect, the project has tried to be as effective as possible, given these conditions and the travel restrictions it has imposed to all layers of Timorese society and socioeconomic activity, particularly importing important environmental services from abroad, for the baseline phase.

With all these difficulties and despite the proponent having requested the Environmental Authority to exempt the TDRUP project from carrying out a physical Public Consultation Meeting for the present TOR (at the request of ANLA itself at Project Document and Classification Phase), ANLA did not approve the request and requested the proponent to carry out the TOR Public Consultation AFTER the emergency situation was lifted, which unfortunately consecutively delayed the project up to 4 months after the beginning of the COVID 19 Emergency Situation in Timor-Leste.

Nevertheless, the EIA team agreed to carry out the EIS/EMP Public Consultation safely, as socially as possible and in accordance with both the COVID-19 rules advised by the Ministry of Health, in July (see Appendix 13.4), the legal requirements of DL 05/2011 and Chapter 5 of the Ministerial Diploma no. 47/2017, to guarantee that public have access to the proposal of the TOR draft.
13.2 - Methodology and Approach

The Project Team conducted public consultation and disclosure meetings for the preparation of the project and during the TOR and the Baseline Phases, with detailed fieldwork and meetings held with specific, targeted stakeholders. These involved Government Authorities, the Administrators of the Municipal Authorities of Dili and Liquiça, community leaders from Tibar Village (in Tetum “Suco”) and Hamlets (in Tetum “Aldeia”), institutional representatives from the Suco Tibar area, demonstrating that the proponent and technical team are well aware and in contact with the main interested parties regarding this project.

The Public Consultation in the TOR Phase involved a direct public meeting in the Suco Tibar Headquarters, where the TOR was presented in Powerpoint, as well as a Technical Summary in Tetum and English Languages (see Appendix 13.2), and the TOR contents explained and questions and answers were taken and given from the Stakeholders, in order to check for gaps in the EIS/EMP TOR methodology.

Additionally, to implement the approved TOR requirements, the EIS team proposed the below-mentioned activities to carry out the Public Consultation activities during the study phase for the drafting of the EIS and EMP, a plan that was approved by the Environmental Regulator under the approved TOR (see Appendix 4.2):

- Baseline phase: Within the social component, the EIA team would prepare baseline questionnaires and carry out surveys in the project area to stakeholders identified as representative, to collect information about the predicted Environmental and Social Impacts to communities, for further support in the impact assessment;
- Compulsory EIS/EMP Public Consultation would be done in accordance with the legal requirements of DL 05/2011 and Chapter 5 of the Ministerial Diploma no.47/2017, to guarantee that public have access to the proposal and can comment on the EIS and EMP draft.

13.3 - Summary of Consultation Activities Carried Out

13.3.1 2015 IEE Consultations

The ADB IEE (ADB, 2015) undertook Public Consultation during the last week of May 2015. The objective of the Public Consultation was to inform residents of the likely developments at the Tibar landfill site and solid waste collection system, and obtain information on residents’ environmental concerns.

The IEE team prepared the survey questionnaire, which described and explained the proposed project, and had a meeting with 3 groups of about 10 people that live close to the proposed project location. These people engaged in farming, employment at the landfill site and waste-pickers. A local NGO was also involved in this Public Consultation conducted in Tetum to be able to collect information regarding the concerns and opinions coming from public.

13.3.2 Previous consultations with other Authorities

The Ministry for State Administration, together with Dili Municipality (as the proponent), has been leading the implementation process of the DSWMP, both for the collection of waste and for the Tibar Dumpsite Rehabilitation, since 2015. During this process, several issues in the implementation have led to substantial contacts with Government Authorities, depending on the several issues at hand.
One important consultation has been the Dili Municipality Sanitation Services engagement with Liquiça Municipality to help implement the Tibar Landfill Management Action Plan. A multisectoral, high-level meeting took place in Liquiça on the 13th December 2018, between the President of Dili, Liquiça and Ermera, Tibar Suco and Aldeia leaders, as well as the Liquiça PNTL commander and various Dili and Liquica Departmental heads where, amongst the improvement of the landfill’s human resource, infrastructure and operational issues, the issue of the waste pickers and animal access was explained and the institutional support needs to be addressed was requested. This action plan has aligned the Municipality’s intent and the measures to address these issues and timelines for completion, in order to make sure the waste pickers’ quality of life and livelihood is maintained in accordance with the Government’s Waste Investment Strategy commitments (GovTL, 2017).

Another important consultation activity was related to the cadastre of the project area. Given that the land was not yet completely reserved for the Landfill at the time, the National Cadastre Services facilitated a meeting on the 15th January 2019 with several stakeholders to plan out the requirements for the mapping and dispute resolution of the areas related to the Tibar Landfill.

This meeting produced an Interministerial Working Group to work on and solve the cadastre issue, composed of the following persons: 1) the Secretary for the Liquiça Municipality President (Chair); 2) Director for the National Cadaster Services; 3) the Deputy Municipality President; 4) the Director for National Urban Organization; 5) PNTL Liquiça Commander; 6) Director for Liquiça Land and Property; 7) Dili Municipality Head of Department for Sanitation Services; 8) Bazartete Administrative Post Head; 9) Department for Environment – Liquiça; 10) Department for Environment – Liquiça; 11) Tibar Chefe de Suco; and 12) Tibar Chefe de Aldeia.

This joint effort has led to the land issues being resolved (see Appendix 6.8) and the definitive establishment of the reserve area for the Landfill is now underway.

13.3.3 2020 EIS/EMP consultations

13.3.3.1 Public Consultation Meeting for the TOR (29th July 2020)

The objective of the Public Consultation meeting was to provide an opportunity for the Public and relevant Stakeholders to participate and provide comments on the overall Project and the technical methodologies proposed for the first Phase of the Environmental Impact Assessment of the TDRUP Project (please see Appendix 13.1 – TOR PC Meeting Minutes, for more complete details of the PC Meeting).

a) Online Consultation: To prepare for the meeting, the proponent requested the consultant to publish the TOR Report and the TOR Non-Technical Summary (NTS) in the OASIS official website (www.oasis-sustainable.com), including a Notification of Public Consultation (in English and Tetum), so that the public and interested parties could access and prepare for the upcoming meeting (See Appendix 13.1). The Documentation online availability, the invitation to the Chefe de Suco Tibar and respective Aldeias and Meeting Announcement on ETAN daily news stream (www.etan.org) were all published on the 23rd July 2020. This Notification and the documentation were to remain available up to 7 work days after the meeting.

b) Public Meeting: The Public Consultation Meeting was held on the 29th July 2020 at the Suco Tibar Headquarters, from 8.30 am to 1 pm. The proponent distributed a Non-Technical Summary (NTS) of the TOR during the meeting (also accessible in the OASIS website) to facilitate the comprehension of the interested parties.
c) Written comments: All channels for communication from the interested parties were opened, as defined by Ministerial Diploma no. 47/2017, namely:

1. Electronic Consultation - TDRUP Consultant website: www.oasis-sustainable.com
2. TOR Paper version for consultation until the 31st July 2020:
   - ANLA facilities (headquarters of the Environmental Authority), from 08:30 in the morning until 12:00 and from 14:00 until 17:00 in the afternoon;
   - Facilities of the Dili Municipal Authority (headquarters of the Project proponent), from 08:30 in the morning until 12:00 and from 14:00 until 17:00 in the afternoon.
   - Tibar Suco Headquarters, from 08:30 in the morning until 12:00 and from 14:00 to 17:00 in the afternoon.
3. Contacts to receive Public Comments:
   - Comments written on paper:
     To: Mr. António Leolo Tasi, Acting Executive Secretary
     Autoridade Nacional para Licenciamento Ambiental (ANLA)
     Secretaria de Estado do Ambiente, Edifício Fomento, Avenida Dom Aleixo, Mandarim, Dili, Timor-Leste
   - Comments written by email:
     To: infonael2019@gmail.com, with
     c.c. to: consulta_publica@oasis-sustainable.com and emilianafsoares@municipio.gov.tl

13.3.3.2 Public Consultation during the Baseline

The questionnaires applied in the Field were catered to the realistic status of the Landfill Waste pickers and surrounding communities, all of which were done in Tétum. The objective was to collect information on the characterization of respondents, their households, habitability conditions and livelihoods, while, on the other hand, to gather respondents’ opinions and attitudes towards the project and the potential effects it may have, including the possibility of economic resettlement. In practice, the questionnaires were applied to 74 Waste Pickers and 34 Community dwellings. Taking into account an average 7 persons per HH per interviewee, this presents a total range of 749 persons surveyed and of which the most important concerns were recorded for this analysis.

In addition, the EIA team carried out surveys in the project area to stakeholders identified as representative, to collect information about the predicted Environmental and Social Impacts to communities, for further support in the impact assessment.

During the baseline interviews, taking photographs was limited to the permission of the interviewees, which had restricted the team from taking photographs. Below, a set of relevant pictures are presented (see Figure 13-1).

These were the following (see sub-chapter 6.12.7.3 – Interviews with stakeholders):

<table>
<thead>
<tr>
<th>Component and Activity</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical Waste Survey - Interviews</td>
<td>26/09 to 13/10/20</td>
</tr>
<tr>
<td>- 9 Pharmacies/Medical Centers (Dili)</td>
<td></td>
</tr>
<tr>
<td>- 1 Government Central Distribution (SAMES)</td>
<td></td>
</tr>
<tr>
<td>- 1 National Directorate Pharmacy &amp; Medication</td>
<td></td>
</tr>
<tr>
<td>- Health Delegation (Dili Municipality)</td>
<td></td>
</tr>
<tr>
<td>- 1 National Hospital (Guido Valadares)</td>
<td></td>
</tr>
<tr>
<td>- 4 Health Centres (Government) Dili Area</td>
<td></td>
</tr>
<tr>
<td>Issues with WWTP integration and Depot</td>
<td>23/09/20</td>
</tr>
<tr>
<td>- National Directorate for Basic Sanitation</td>
<td></td>
</tr>
<tr>
<td>Waste Pickers Survey</td>
<td>9 to 11/09/20</td>
</tr>
</tbody>
</table>
### Component and Activity

<table>
<thead>
<tr>
<th>Activity</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADI Community Survey</td>
<td>14 to 16/09/20</td>
</tr>
<tr>
<td>Local Authorities Survey - Interviews</td>
<td>21/09 to 08/10/20</td>
</tr>
<tr>
<td>- Liquiça Municipality Administrator</td>
<td></td>
</tr>
<tr>
<td>- Bazarote Administrative Post Administrator</td>
<td></td>
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<tr>
<td>- Chefe Suco Tibar</td>
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<td>- Chefe Aldeia Libaulelo</td>
<td></td>
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<tr>
<td>- Chefe Aldeia Fatumea</td>
<td></td>
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<tr>
<td>- Chefe Aldeia Turleu</td>
<td></td>
</tr>
<tr>
<td>- Chefe Aldeia Mausoi</td>
<td></td>
</tr>
<tr>
<td>Other Institutions - Interviews</td>
<td>21/09 to 08/10</td>
</tr>
<tr>
<td>- Health Centre Turleu (Government)</td>
<td></td>
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<tr>
<td>- Health Centre Mausoi (Government)</td>
<td></td>
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<tr>
<td>- Imaculada Coração de Maria (Religious)</td>
<td></td>
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<tr>
<td>- Irmãs Concepcionistas ao Serviço dos Pobres (Religious)</td>
<td></td>
</tr>
<tr>
<td>Culture Representatives – Interviews and Survey</td>
<td>1 to 2/10</td>
</tr>
<tr>
<td>- Interview Chefe de Suco Tibar</td>
<td></td>
</tr>
<tr>
<td>- Field Survey w/ Chefe de Suco support</td>
<td></td>
</tr>
</tbody>
</table>

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**Figure 13-1 Photographs from the Public Consultation Interviews**

![Photographs](image1.jpg)

![Photographs](image2.jpg)

![Photographs](image3.jpg)

![Photographs](image4.jpg)
13.4 - Summary of Main comments received from the public, community leaders, NGOs, local officials, other stakeholders

13.4.1 2015 IEE comments

The communities gave their opinion and suggestions for the project implementation, focusing mainly on the need for the landfill site’s rehabilitation, such as:

i. Separation of garbage;
ii. Prohibition or strict segregation of hospital/medical waste;
iii. Security and organization at the site to improve health and workers and recyclers;
iv. Leachate control and runoff control in rainy season;
v. No burning of waste at the landfill;
vi. Control of insects and vermin;
vii. Increased road-making and maintenance of access road for safety and dust control;
viii. Reduced noise from garbage trucks and
ix. Increased load security of trucks.

The current environmental assessment has followed through with the previous opinions and improvement opportunities, as well as conducted other consultations to update these concerns towards the project’s success.

The proposed redesign and rehabilitation of the landfill will be done to cover all these aspects except the issues related to road improvement and road safety. As in the IEE in 2015 (ADB, 2015), these issues need to be considered as additional supporting components. However, the current environmental assessment will include the necessary and required consultations to guarantee that the proponent addresses the social and local concerns, when the DBO contract process initiates and is operational.

13.4.2 2020 TOR Phase comments

13.4.2.1 Comments during Public Meeting

The environmental consultant carried out a powerpoint presentation in Tetun to explain the Project Concept Design, its components and the preliminary list of environmental impacts that are expected in the project, as well as the types of environmental analysis and methodology to be used in the upcoming baseline analysis.

After the presentation, in total, around 33 questions were made of which only one (1) of them was not relevant and pertinent to the TOR and did not require an answer from the proponent as it was outside the scope of the project and the TOR.
There were several repeated questions and answers and therefore, the main issues relevant to the TOR that were raised by the stakeholders were grouped as below (see Appendix 13.1 for more detailed information):

a) Current Landfill Impacts:

Issue a1: Many stakeholders are worried about ongoing environmental impacts in the landfill such as air (smoke) and water (storm water and leachate) pollution since decades ago until now and want to understand how does the Proponent intend to address them in the project. Lack of current environmental health in the area reflects the lack of Government attention given to the problem until now. They requested information on when the project would be implemented, given the urgency. Some stakeholders were disappointed and requested the Municipality to stop the fires or they would close access to the Landfill, others suggested Díli’s waste should go elsewhere.

Response: the technical improvement of the landfill to international standards i.e. leachate and gas collection and treatment and separation of rainwater, will reduce substantially the current negative impacts and improve the health of the population in the project area, in the near future. The EIS will also carry out baseline studies to assess these problems, namely: air quality, noise, soil contamination and social. The Landfill rehabilitation is planned to be done from 2021 to 2031, if no constraints appear. Given the Waste pickers are the main cause of the fires, not the Municipality, the proponent expects that this project solves this major issue and therefore requested the population not to block access so the work could be done. The location of the Tibar Landfill was decided in this location and is seen as the best solution so far since it is a “brownfield” project and reduces substantially the current and future significant environmental impacts while using the existing and limited Government budget more efficiently.

b) Affected Community

Issue b1: Stakeholders requested more participation from the affected community.

Response: Participation in this TOR PC was requested of Community Leaders and representatives, given the restraints and Government rules COVID-19. However, the baseline phase will include individual questionnaires to stakeholders and especially the waste pickers and therefore, include the affected community as requested.

c) Land Issues

Issue c1: Stakeholders stated that there were unresolved land issues, as well as surface cultivations within the Landfill area.

Response: The proponent informed that land and surface cultivations within the Landfill operational area had already been resolved and the Project area had already been attributed to the Government for the Landfill project. If there were any other related complaints these would have to be clarified with them and the Land and Property Directorate.

d) Socioeconomic Issues

Issue d1: Stakeholders requested that the project have direct socioeconomic benefits to the people in the Tibar area/region and the contractor requested to help in the development of the Tibar Suco.

Response: The proponent noted the stakeholders concerns and informed that there are various levels of commitments that need to be thought through but, at this moment, there are no commitments yet regarding how to address the benefits of the project, these will be defined after the socioeconomic review. The
proponent also stated that there are plans for additional activities in the Landfill area i.e. Recycling Project that could bring possible job replacements.

e) Various General and Technical issues

Issue e1: There is little information on the expected lifetime of the Landfill.
Response: The Landfill has been designed to accumulate un-segregated waste for a lifespan of 10 years, which may increase if activities such as i.e., recycling start to establish in Timor-Leste, as well as programs such as the Recycling Pilot Project (RPP) and the Government’s “Zero Plastic” Policy, currently being implemented in Dili and Timor-Leste.

Issue e2: There is information that needs to be added to the TOR.
Response: Given the general nature of the statement, the proponent redirected the stakeholders to the complete TOR contents (available at www.oasis-sustainable.com) and added that much more detailed information will be included in the EIS.

13.4.2.2 Written Comments Post-Public Consultation Meeting

Only one (1) written comment/opinion was received in the Project’s Public Consultation official emails (proponent, consultant or environmental regulator), after the public consultation and up to the 18 August 2020.

This question was received by the Proponent, from ANLA, on the 17 August 2020, originally sent by the National Authority for Petroleum and Minerals, as the Licensing Entity for Downstream Activities such as the Home Base Fuel Filling Station proposed for the Depot Site within the Concept Design of the TDRUP Project. This Entity requested clarification on the Fuel Tank and inclusion of the Typical Layout and Drawings into the TOR contents.

13.4.2.3 Comments during Baseline Survey

In the various interviews during the baseline survey carried out by the TDRUP EIA team, there was a variety of comments/observations made by the interviewees in response to the questions asked, as can be noted in detail in Sub-Chapter 6.12 (social study), namely in the result analysis provided in 6.12.7 – TDRUP Area of Influence (AOI). In general, three main groups participated in the consultation during the baseline, such as the local authorities relevant to Tibar, the waste pickers working in Tibar Landfill and the community surrounding the Landfill. These concerns were, in a summarised way, the following:

a) Need for Tibar Landfill Rehabilitation: there is general acceptance from all stakeholders interviewed that the rehabilitation of Tibar Landfill will have positive outcomes and therefore needs to be carried through. Even though there are two different attitudes towards the dumpsite: (i) those who want the dumpsite to be closed to avoid problems like smoke, bad odors and health problems; (ii) those who do not want the dumpsite to be closed because it would affect their income, local authorities advised they are prepared to support the rehabilitation of the project and expect that rehabilitation may solve all environmental and health impacts related to the landfill and benefit the local communities. There are a few that do not want the Landfill rehabilitation to move ahead but this ‘no’ relates to the issue that access to the landfill will be forbidden.

b) Institutional Management: Liquiçá Municipality stated they have territorial rights over the Landfill, as it is located in their Municipality, even though the landfill management is centralized in Dili. Therefore, Liquiçá Municipality must be a part of this management, because of future revenue issues and definition of municipal rights. It is necessary to have an integrated management with Liquiçá Municipality participation.
c) **Project Management:** The general expectation is that the landfill rehabilitation will reduce impacts on surrounding communities and allow a proper and controlled landfill management. However, the Project management must continue to cooperate with local authorities and any problems that may result from the project’s implementation must be solved with reason and not by force.

**d) Environmental Impacts:** In general, the main environmental impacts that the stakeholders state they are aware of are noise, air pollution (i.e. smoke from the waste burning and dust), waste spreading from collection trucks and localized floods and the impact they have on the surrounding community's quality of life. It was referred that during the raining season, lack of dumpsite drainage contributes with plastic garbage spreading in the community area and with local flooding, thus the expectation that the installation of a drainage system from landfill rehabilitation ameliorates the existing drainage problems. On the Culture segment of this EIA, Local leadership in Tibar also recommended a ritual ceremony to be carried out before the construction begins.

**e) General Health** – stakeholders are aware that the landfill, as is today, is bad for public health and has negative impacts on the surrounding communities. Comments on complaints regarding health problems and severity were stated at mainly 2 levels: 1) local community; and 2) Waste pickers in the Landfill. The Community Surrounding the Landfill points at bad odors and the smoke as being the cause of previously occurring respiratory diseases, whilst the Waste pickers reported several health problems during the year previous to the survey, mainly back pain / muscular pains, respiratory, sore throat, eye irritation and skin diseases, as well as wounds and cuts and subsequent infections.

**f) Jobs and Employment:** As with the previous item, comments on complaints regarding jobs and employment were stated mainly at 2 levels: 1) local community; and 2) Waste pickers in the Landfill.

At the 1) Local level, respondents understand that Landfill rehabilitation may bring benefits to local communities, namely employment but stated that youth in Tibar face unemployment problems, perhaps because the local youth work force doesn’t yet have the skills companies require, sometimes leading to confrontations between the youngsters themselves. Thus, there was a general recommendation that, when the construction phase starts, local communities must be involved in this phase and the project provide jobs, particularly to young people, at least in functions like security, cleaners, servers, etc, except for specialized functions like technicians and engineers.

At the 2) Waste Picker level, the major reason referred by respondents for being waste pickers are related to meeting personal and family needs, given they are currently unemployed or there is a lack of job alternatives. While a big part of the interviewees said they wanted to continue to be waste pickers, the majority answered that they would like to have another profession, a decent job, to earn money and improve their work conditions although many mentioned a preference for job opportunity in Tibar, given the distance to Dili city.

Thus, stakeholders stated that if the Landfill project opens job opportunities, there should be a priority to hire waste pickers, namely those that work in the landfill for a long time and only have that income source, or in other functions in Municipal projects i.e. waste recycling services, gardener, etc.

**g) Compensation:** respondents stated that the Government must be fair with compensations to waste pickers, because if waste picking is forbidden, there have to be clear justifications and explanations on the reasons as one cannot forbid people from the landfill without creating reasonable livelihood alternative opportunities and/or solutions.

The general opinion was that the best and most sustainable option of compensation is to provide a secure job i.e. with work on recycling services, given it was mentioned that with monetary compensation it would probably
be misspent and there would be a risk of waste picking re-incidence and protesting. Another option raised was the possibility to provide waste pickers with professional training, qualifications, and incentives so they can create self-employment.

Local authorities also advise that whatever the compensation, one must take special care because some people may want to take advantage of the opportunity and for that, it is necessary to identify the complete and current list of the true waste pickers, as there are also waste pickers from Tasi Tolu and if there is not a fair compensation for Tibar waste pickers they will blame the Tibar chefe de suco and chefes de aldeia.

### 13.4.2.4 Comments during Baseline Stakeholder Meetings

Semi-structured interviews were conducted with Head of Liquiçá Municipality, Head of Bazartete Administrative Post, Head of Village (Chefe de Suco) of Tibar, Chiefs of Neighborhood (Chefes de Aldeia) of the neighborhoods of Turleu, Libaulelo, Fathunia and Mau-Soi, representatives of two NGOs, and health personnel of 2 health posts and 1 health centre. Interviews had common themes and some specific themes, according to the social function of each kind of interviewees. Common themes are related with Tibar dumpsite actual situation and perceived impacts on surrounding communities, dumpsite rehabilitation, waste pickers situation, perceived health problems of pickers and local communities. Other themes, like urban characteristics and services, urban planning, community characteristics, cultural aspects, health profiles, where only dealt with some of the interviewees. The most relevant local leadership meetings held are listed below.

<table>
<thead>
<tr>
<th>13.4.4</th>
<th>13.4.5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Urban and population growth</strong></td>
<td>House building is significantly growing. Space for building is diminishing. Some families have moved to mountain areas or coastal areas. Population growth has been significant between 2015 and 2019 (around 71,000 to 77,000; 8.5%). Growth happens all over Liquiçá Municipality.</td>
</tr>
<tr>
<td><strong>Water and electricity supply</strong></td>
<td>Most part of households have water supply but sometimes there are difficulties in water distribution. 3 Sucos and 26 aldeias still do not have electricity supply.</td>
</tr>
<tr>
<td><strong>Waste management</strong></td>
<td>Only municipality capital has a waste collecting system. Waste is transported to Tibar dumpsite by 1 truck, twice a day.</td>
</tr>
<tr>
<td><strong>Urban planning</strong></td>
<td>There is no master plan. There is a municipality strategic plan.</td>
</tr>
<tr>
<td><strong>Tibar suco communities</strong></td>
<td>There is migration from other sucos and municipalities. This migration is growing. Main community problem is unemployment. Civil servants, company employees, farmers, fisherman and waste pickers are the main professional occupations. Young face unemployment problems. Sometimes there are confrontations between groups of youngsters.</td>
</tr>
<tr>
<td><strong>Tibar dumpsite management responsibility</strong></td>
<td>As there is not yet a law on regional and municipal management, there is no definition about management responsibility over Tibar dumpsite: Liquiçá municipality, Dili municipality or both. TDRUP is located on the territory of Liquiçá Municipality, so municipality must be informed about all the process and project's progression. Liquiçá Municipality has territorial rights, even if dumpsite management is centralized at Dili. Liquiçá Municipality must be a part, because in the future there will be revenues and it is necessary to define municipal rights. It is necessary to have an integrated management with Liquiçá Municipality participation. This is a very important issue for Liquiçá municipality.</td>
</tr>
<tr>
<td><strong>Tibar dumpsite environmental and community impacts</strong></td>
<td>The municipality has not received any complaints from population, probably because dumpsite exists since 1982, and people has perhaps adapted. Health personnel usually refers that dumpsite is bad for public health and has negative impacts on communities. Main community diseases are respiratory.</td>
</tr>
</tbody>
</table>
### 13.4.4

**Tibar dumpsite rehabilitation**

The Head of Liquíçá Municipality does not have any information about the project, besides dumpsite to be rehabilitated. Municipality expects that rehabilitation will reduce impacts on surrounding communities and allow a proper and controlled dumpsite management. Rehabilitation may bring benefits to local communities, namely employment on recycling activities.

When construction phase starts, local communities must be involved (employment), except for specialized functions like technicians and engineers.

Project should continue to cooperate with local authorities.

### 13.4.5

**Waste pickers**

If waste picking is forbidden, clear justifications and explanations must be done to waste pickers and give them conditions. One can not to forbid people without creating alternatives.

There have been some conflicts between waste pickers, but they solve the problems among them, at suco level.

One must consider two groups of pickers: those for whom waste collection is the only income source and those who do that job as an extra activity. Priority must be given to the first group.

Liquíçá Municipality has not given any social support to waste pickers.

Main waste pickers diseases are respiratory.

### 13.4.6

**Eventual finding of human remnants during dumpsite rehabilitation**

Positive identification, with DNA test, is up to legal authorities, supposedly with integrated technical teams.

If families recognize the remnants, they need to participate in the identification process. As far as interviewee knows, if human remnants are found, works must be interrupted, and competent authorities must be informed, as is the case of Police, the Commission for Human Remnants, and the National Liberation Fighters Commission.

Usually, ceremonies and rituals are realized.

### 13.4.7

**Urban and population growth**

Population growth continues every year. Presently Bazartete has 30,416 inhabitants and around 8,000 families. Growth happens all over Bazartete sucos. Population in the surrounding areas of Tibar dumpsite is also growing. There are also industrial areas and agricultural areas.

**Water supply**

Water supply is one of the main difficulties in all sucos, including Tibar. Some sucos only have problems in the dry season, but for others it is a permanent problem.

**Social equipments**

In Bazartete there are schools from the basic level till university (1 school), and a professional training centre. All sucos have health posts. Bazartete has a total of 10 health posts and 1 health centre.

**Urban planning**

There is no master plan. There is a municipality strategic plan.

### 13.4.8

**Tibar suco communities**

Population composition is a mix of local population and population with origin in other sucos and municipalities.

Mean number of persons per family is 7.

Most jobs are in private companies. Some people sell wood. Young face unemployment problems and difficulty to find job in local companies. In Tibar port most workers do not live in Tibar but in other municipalities. Perhaps local young work force has not the skills companies need. Administrative Post authorities try as much as possible that projects give jobs to local young people but that is difficult to obtain, particularly with national projects.

Main family problem is low income. Main health problems are season diseases like malaria. Most common diseases are diarrhea and fever, skin and respiratory diseases.

**Tibar dumpsite management responsibility**

Tibar dumpsite is located on the territory of Liquíçá Municipality so, juridically, municipality should be responsible for the dumpsite. Public waste collected daily transportation to Tibar dumpsite is only done by 1 truck, but several companies transport their own waste to the dumpsite.
### 13.4.7 Tibar dumpsite environmental and community impacts

Bad odors and respiratory diseases are the main impacts felt by communities. The municipality has tried to get people to leave the surrounding areas of the dumpsite, but people continue to live there, probably because they have adapted. Sometimes trucks spread waste along the roads to Tibar dumpsite. During the raining season, lack of dumpsite drainage causes local flooding. It is important that rehabilitation solves drainage problems.

### 13.4.8 Tibar dumpsite rehabilitation

The Head of Bazartete Administrative Post has only general information about the project. Administrative Post expects that rehabilitation may solve environmental and health impacts and bring benefits to local communities, namely employment. On the negative side, main impacts are not expected, but can happen. The construction of drainage may affect community property. Drainage must be well projected in order not to affect property. If necessary and if the Government or the contractor has means to pay compensations, it can be done. Any problems that may result from project’s implementation must not be solved by force but with reason.

### Waste pickers

Most part of waste pickers do not live in Tibar suco. Their main difficulty is to supply daily needs. For them, health risks are less important than the income they can get from waste picking. Health personnel says main waste pickers health problems are respiratory diseases, diarrhea, and TBC. If waste picking is forbidden, it is positive. Our ancestors did not live from garbage. To be a waste picker is a life choice. However, this is a Government’s project, and some conditions must be given to the waste pickers, particularly by the contractor. We recommend to the contractor that is to be responsible for dumpsite management to prepare with anticipation a plan for waste pickers in order to avoid problems during implementation. The interviewee does not know how many waste pickers work on Tibar dumpsite, but they are many including children, what is not a good thing. But, to end this situation it is necessary to get job alternatives.

One should not stop waste picking in Tibar dumpsite without having solutions for pickers. One possibility is to give them professional training, qualifications, and incentives so they can create self-employment.

### Eventual finding of human remnants during dumpsite rehabilitation

If human remnants are found, competent authorities must be informed, as is the case of Police, and the National Liberation Fighters Commission. Usually, ceremonies and rituals are realized.

### Land claims

Some people resident in Tibar have made claims on land parcels of Tibar dumpsite. Although these claims have been done without documents, these situations must be solved by Ministry of Justice, Land and Property, in order not to bring problems to projects’ implementation.
### Tibar suco communities

- Population composition is a mix of local population and population with origin in other sucos and municipalities, like Dili and Ermera.
- Mean number of persons per household is less than 10, but sometimes 3 and 4 families live together.
- Most people work as civil servants, farmers, and fisherman. Some work in the quarry, coffee industry, and security.
- Young face unemployment problems.
- Suco decided that any project to be implemented in suco area must meet with suco authorities in order to avoid problems.
- Main communities’ problem is lack of water in the dry season and less food.
- In the raining season floods always happen in Libaulelo and Turleu areas, including houses near the dumpsite.

### Waste management

- There is no waste management. People burn the waste.

### Tibar dumpsite management responsibility

- The interviewee did not want to comment, besides saying that it is government's property since the Indonesian times.

### Tibar dumpsite environmental and community impacts

- In Tibar there are two different attitudes towards the dumpsite: (i) those who want the dumpsite to be closed to avoid problems like smoke, bad odors and health problems; (ii) those who do not want the dumpsite to be closed because it would affect their income.

### Tibar dumpsite rehabilitation

- Suco authorities have only general information about the project. Dumpsite needs to be rehabilitated because it is causing negative impacts for everybody that lives nearby. Suco authorities have sent several letters to municipality administration about these problems but never received a positive answer.
- Suco authorities are prepared to support the rehabilitation project and expect that rehabilitation may solve environmental and health impacts and bring benefits to local communities.
- On the negative side, main impacts are not expected.

### Waste pickers

- Interviewee estimated the number of Tibar dumpsite waste pickers to be 50-60 persons.
- Waste pickers have health problems like cough, bloody cough, respiratory problems, and TBC. Waste pickers go to public clinic to get treatment and sometimes go to Dili hospital.
- Children should not go the dumpsite because that affects their health.
- Presence on domestic animals in the dumpsite is also negative because animals eat the waste. If waste picking is forbidden, the solution for waste pickers is up to the Government. It would help if the Government could include some waste pickers to work in the project rehabilitation, or in other functions like gardener because that would help their income. Priority should be given to waste pickers to have employment. It is not recommendable to give compensation in money because they would expend the money and after they would go back protesting again.

### Eventual finding of human remnants during dumpsite rehabilitation

- We collect human remnants that we find, do a ceremony, and then give to the Government if they want to do identification tests.
- The interviewee said that in Tasi Tolu, when Pelican Paradise project was implemented, human remnants were found. Local authorities and the Lian-n’ain were called, and the Forensic Police. When remnants are identified as belonging to national liberation fighters, they are buried in heroes’ gardens.

### Local areas with cultural / spiritual value

- In Portuguese colonial time there was a sacred place in Tibar dumpsite area, but it was moved later to other local, somewhere in Tibar coastal zone. Rituals are done every year and the original spot is invoked.

<table>
<thead>
<tr>
<th>Urban and population growth</th>
<th>Population is growing. In 2008 there were 70 families and presently there are 170.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water and electricity supply</td>
<td>In the raining season there is sufficient water but in the dry season it is difficult for the community to receive water. Those who have a borehole have water but for those who use public distribution it is difficult. Some people buy water. People in Humbuti neighborhood do not have electricity supply. All households have sanitation.</td>
</tr>
</tbody>
</table>
Meeting: Fatunia Chefe de Aldeia (05/10/2020 at Suco Tibar Headquarters)

Interview themes

Social equipments
There is a school in Humbuti but it is far away. There is no health facility. There is a church and a chapel.

Meeting: Libaulelo Chefe de Aldeia (05/10/2020 at Suco Tibar Headquarters)

Interview themes

Urban and population growth
Total number of families in Libaulelo was 213, in 2019. House construction has been growing along the main road.

Water and electricity supply
Along the main road to Ermera, households are supplied by water supply system. From the road to the dumpsite area water supply exists only till 250 m. Some people have private boreholes. All the households have pre-paid electricity supply. Households basic sanitation, with bathroom and septic tank, is adequate, but there is no rain and residual water’s drainage. As the road platform is higher than surrounding areas when it rains floods happen. In 2018, due to intense rains, there was a serious flood in the surrounding area of road’s roundabout.

Social equipments
In Libaulelo there are schools, health posts, police office, government offices and professional training center, churches and convents of nuns and friars.

Tibar suco communities
Libaulelo and Fatunia are the aldeias that are closer to Tibar dumpsite. Libaulelo population has been growing. Population composition is a mix of local population and population with origin in other sucos and municipalities. Mean number of families per household is 2. Most people work as civil servants, farmers, and fisherman. Some work in the quarry, coffee industry, security, and temporarily in the rice warehouse MTCI. Young people do not face unemployment problems. It is easy to get work while not a good job. Some families do not have enough food.

Tibar dumpsite environmental and community impacts
Smoke, garbage spreading during raining season, bad odors, and pests are the main problems. Accidents with waste transportation trunks are rare but happen. They also spread garbage on the roads. The inexistence of drainage system also contributes for plastic garbage spreading in the community. It is very important that a drainage system is installed.

Tibar dumpsite rehabilitation
People know that there is a rehabilitation project. It is expected that rehabilitation will solve negative impacts of dumpsite that seriously affect public health and environmental health. The interviewee recommends that the project have good quality and good management, and give jobs, particularly to young people. Any project implemented in Tibar should employ local people, at least in functions like security, cleaners, servants, etc. One should build a wall around the dumpsite to prevent the access of people and animals.

Waste pickers
Interviewee did not know how many waste pickers Tibar work at dumpsite and said that many of them come from Tasi Tolu. Waste pickers have health problems like skin diseases, respiratory problems, and TBC. Waste pickers go to public clinic to get treatment and sometimes go to Dili hospital. Children should not go the dumpsite because that affects their health. The project must give job opportunities with priority to the waste pickers, namely to those that work in the dumpsite for a long time, and only have that income source. Compensation to waste pickers should be to give them another job. Liquiçá Municipality did not give social support to waste pickers but the nuns and Liquiçá students have given support.

Eventual finding of human remnants during dumpsite rehabilitation
The interviewee said to have heard rumors about possible existence of buried human bodies in Tibar dumpsite, but there are no proofs. If remnants are found they must be treated according to law and culture.

Local areas with cultural / spiritual value
There is a sacred place inside Tibar dumpsite area, called FAHIDUMA. This name is invoked whenever there is a ceremony or ritual such as those related with corn harvests or laying the first stone for a project in the surrounding area.

Meeting: Turleu Chefe de Aldeia (Interviewee Residence, 06/10/2020)

Interview themes

Urban and population growth
Turleu has 587 families and more than 3,000 inhabitants. In Beduku area population is growing faster.

Water and electricity supply
Some community areas have water supply along all the year, but those who live in plateau areas have difficulties to have water during dry season. All the households have electricity supply.
### 13.4.10 Meeting:

**Turleu Chefe de Aldeia (Interviewee Residence, 06/10/2020)**

#### Interview themes

**Social equipments**

In Turleu there are 6 schools, health center, a professional training center, a catholic church and a protestant church, a convent of nuns, and two cemeteries.

**Tibar suco communities**

Population composition is a mix of local population and population with origin in other sucos and municipalities, but majority is from Turleu.

- Mean persons per family is 8.
- Most people work at Tibar port, as civil servants, farmers, and fisherman. Some work in coffee industry.
- Young people main problem is lack of employment.
- Some families do not have enough food.
- Main health problems are respiratory diseases that caused 7 deaths.
- Sometimes floods happen in Turleu when the river overflows.

**Tibar dumpsite environmental and community impacts**

Accidents with waste transportation trunks happen sometimes. Trucks should moderate velocity to avoid dust emissions and garbage spreading.

Interview said to be certain that project will be implemented.

**Tibar dumpsite rehabilitation**

Interviewee said to have little information about the project. It is expected that rehabilitation will improve the situation of Tibar dumpsite and will be positive to the community.

The interviewee recommends the project to include drainage.

**Waste pickers**

Interviewee referred that more than 10 waste pickers working at Tibar dumpsite are from Turleu. Waste pickers have health problems like skin diseases, respiratory problems, and TBC. Tibar dumpsite is important to waste pickers because it is their source of income.

It is necessary to reduce the smoke. Tibar dumpsite contractor should give jobs to the waste pickers, in waste recycling, for instance. If it not possible, then the Government should give compensation in money or other king of help. To give them a job is better and sustainable.

Liquiçá Municipality did not give social support to waste pickers.

**Eventual finding of human remnants during dumpsite rehabilitation**

If human remnants are found it is necessary to do a cultural ceremony and do identification process.

The interviewee said to know the case of project’s implementation where human remnants were found. Communities are informed and, if they identify the remnants, they take them and bury in cemeteries. If remnants are not identified, legal authorities are informed to identification to be done.

**Local areas with cultural / spiritual value**

There is a sacred place near Tibar dumpsite area, called Taso oan. People do ceremonies there.

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### 13.4.13 Meeting:

**Mau-Soi Chefe de Aldeia (Suco Tibar Headquarters, 06/10/2020)**

#### Interview themes

**Urban and population growth**

Population is growing faster. In 2019 Mau-soi aldeia had 274 families and 1,382 people and in 2020 has 377 families and 1,662 people.

**Water and electricity supply**

In slope areas communities have sufficient water although supply is only done twice a week. In mountain areas like Fahiten community has a system installed by the Red Cross, with a borehole and water supply twice a week. In Beduku is the same but when the dry season goes on for a long time, water supply is more difficult. All the households have electricity supply. The households have bathrooms but in some cases with shared use.

**Social equipments**

In Mau-soi there are schools, health post, and Government’s buildings. There is a public cemetery, but some groups prefer to have their own private cemeteries.

**Tibar suco communities**

Population composition is a mix of local population and population with origin in other sucos and municipalities, but majority is from Tibar suco. Migrations continue to happen.

- There are 2 to 4 families per household. Mean persons per family is 7 but some families have more than 10 members.
- Most people work as civil servants, farmers, and fisherman. Some work in coffee industry and in the rice warehouse MTCI. Manny people earn money selling firewood.
- Young people main problem, namely for girls, is the lack of employment. In most cases after finishing the studies they stay a long time without a job and are financially dependent on parents.
- Some families do not have enough money to meet basic needs. This problem is more serious during the rainy season (January and February) because people have more difficulty to look for income sources.
- Main health problems are respiratory diseases, skin diseases and TBC. People have medical treatment in public health posts. When necessary they go to private clinics or to National Hospital in Dili.
- Public transportation is functioning well.
- There is no waste collecting system. Usually people burn the waste.
### 13.4.13 Tibar dumpsite environmental and community impacts

Main problem is the smoke that has been causing respiratory diseases. The interviewee did not know about any accidents happening inside Tibar dumpsite but referred that, years ago, his uncle died after having drunk an of out date bottle of wine he picked in Tibar dumpsite. Main problems caused by waste transportation trucks are high velocity on Tibar road where many people walk along, including students, and poor waste control. Many times, waste is spread along the road.

### 13.4.14 Tibar dumpsite rehabilitation

Interviewee said that the community knows that there is a rehabilitation project. It is expected that rehabilitation will improve the situation and the management of Tibar dumpsite and will be very positive to the community and to the environment. The interviewee recommends the project to include a wall around the dumpsite to avoid access to people and diseases dissemination. TDRUP must be implemented. There have been government commitments previously about waste management but have never been realized. It not expected that the rehabilitation project may have negative impacts on the community.

### Tibar dumpsite management

The dumpsite is located in Liquiçá municipality, but the type of management and who is responsible for it, is up to the Government to decide and one has to agree with Government’s option.

### Waste pickers

Interviewee referred that around 7 waste pickers working at Tibar dumpsite are from Mau-soi. Waste pickers have health problems like fever, skin diseases, respiratory problems and TBC. In 2018, one of the waste pickers living in Turfeu died with a skin disease. Tibar dumpsite is fundamental to waste pickers to support the family. Some waste pickers collect out of date food and resell it. Waste picking must be forbidden and for that is necessary to build a wall. Waste picker can be compensated with work on recycling services. But the Government must take care with compensations and be fair. In Tibar dumpsite there are also waste pickers from Tasi Tolu and if there is not a fair compensation for Tibar waste pickers they will blame Tibar chefe de suco and chefs de aldeia. The best compensation is to give a job. But whatever the compensation one must take care because some people may want to seize the opportunity. It is necessary to identify who are the true waste pickers.

### Eventual finding of human remnants during dumpsite rehabilitation

If human remnants are found it is necessary to call the tribute commission to the veterans and former combatants for national liberation. DNA tests must be done, and ritual ceremonies realized.

### Local areas with cultural / spiritual value

There is a sacred place inside Tibar dumpsite area, called Taso. In the old days, the ritual ceremonies were realized there but it was a long time ago. Presently the Lian-na’in only needs to invoke the place. There is another sacred site in the quarry that was closed by the Government. The site is called Fahi oron (Fahi han fatin). For TDRUP project the interviewee recommended a ritual ceremony to be realized before the construction beginning.

13.5 - How these comments were taken into account

The overall impression seems to suggest that the majority of the stakeholders support the project and manifest an effective capital of trust in the Government. However, this trust capital has to be secured and confirmed by the adoption of solutions that are acceptable to affected stakeholders, notably in terms of jobs, housing, livelihood compensation or other deemed fair and appropriate.

With the expectation that the Landfill area and current conditions are improved, the main concern expressed by the stakeholders was the wish to stop the continuous emission of smoke from the burning of waste in Tibar dumpsite, as the major cause of health problems for the waste pickers and the Fatunia and Libuulelo community in general. With the establishment of a sanitary landfill in Tibar with access restrictions to the waste, the interests of the disadvantaged community of Tibar will have to be highly considered.

These interests in general have been taken into account and reflected in EMP Chapter 8 - Description of Proposed Mitigation Measures, both for the Environmental and Social components, with particular emphasis on noise and air pollution control and the social issues regarding waste pickers and job opportunity prioritization for
waste pickers and residents of the Tibar area, during the construction and operation phases of the project, if/when duly qualified.

13.6 - Other Materials or activities i.e. press releases, notifications, etc

The TOR Public Consultation Phase of the Project has been the most significant event of the project, notified mid-July on the consultant website (www.oasis-sustainable.com) and on the East Timor and Indonesia Action Network (www.etan.org) (see Appendix 13.1 - Terms of Reference (TOR) Meeting Notes), and has received strong media attention, with a preliminary introduction from the international media outlet LUSA – Portugal (www.lusa.pt) on the 28th July 2020 (see Appendix 13.3) and specific coverage from the National TV station TVTL during the Consultation meeting on the 29th and again on the 30th July, on prime time news coverage (see link: https://m.facebook.com/story.php?story_fbid=745918162895248&id=370048750482193&sfnsn=wa&d=w&vh=e).

Figure 13-2 Selected images from the RTTL Television coverage of the TDRUP TOR Public Meeting (29th July 2020)

The TVTL coverage focussed on the objectives of the Project, the consultation meeting and the consultant's presentation and on the opinions of the impacted stakeholders and the position of the Government as the project proponent, whilst the Lusa piece focussed on linking the Public Consultation to a general explanation of the DSWMP as a whole, from the current waste condition and the rapid population expansion in Dili to the rehabilitation of the Landfill and the investment effort in an infrastructure portfolio that “...assumes evermore required urgency, given the volume of waste that it collects daily”.

13.7 - Recommendations for future consultations

While extensive consultations were done since the beginning of the project, it is important to bear in mind that after delivery of the draft EIS/EMP to the environmental regulator, a series of additional public consultation meetings will take place in accordance with the regulatory obligations of DM 46/2017 and the approved TOR
requirements (see approval in Appendix 4.2) to complete these documents with the most information possible and cover the concerns of the population with the necessary mitigation measures, where required.

The public consultation process will be carried out during the legal timeframe set in the legislation, in order to: a) gather baseline information; b) keep people informed and guarantee access to the project’s proposed EIS/EMP documentation and objectives; and c) respond to issues/comments from interested parties, as they arise. It will have the following components:

i) Collection of Comments: Besides using the legally compulsory methods to collect comments, such as making the EIS/EMP copies available in the Environmental Authority Headquarters, the office of the Dili Municipality Administration and other representative locations, the Proponent and the EIA team will continue to make available a dedicated email for this purpose (consulta_publica@oasis-sustainable.com) to receive written comments and suggestions from the public, available throughout the Public Consultation timeframe.

ii) Public Consultation meeting: the Proponent and the EIA team will organize a general meeting with the usual interested parties (broader Tibar community, Government Agencies and local representatives, NGOs, etc) to discuss the final draft of the EIS/EMP. This meeting will be announced and within the respective timeframe, the Proponent and the EIA team will make available the draft EIS/EMP proposal as mentioned in b) above.

After this process, the DMA will analyse the questions and written comments accordingly and incorporate any required mitigation measures into the final EIS/EMP, where relevant.

13.8 - Information Disclosure

Disclosure of relevant project information ensures affected/interested communities understand the risks, impacts and opportunities of the Project.

The DMA will publicly disclose the draft EIS/EMP and all related Environmental and Social Assessment documentation in accordance with Draft Ministerial Diploma no. 47/2017, of 22 April 2014 - Regulation on the Public Consultation Procedures and Requirements during the Environmental Assessment Process, for public review and comment.

These documents will be made available as per the above-mentioned regulatory requirements, both in form and appropriate locations in the Project area, prior to the 2nd Phase of the Public Consultation and further on, the final documents prior to the tendering of relevant activities. These documents (draft EIS/EMP and Non-Technical Summary [the latter in English and Tetum languages]) will be available at the following locations:

**Physical Copies:**
- Municipality of Dili Administration Headquarters (specifically with the PMU leader);
- Chefe de Suco Tibar Headquarters;
- Chefe de Aldeia Fatunia and Libaulelo; and
- ANLA headquarters

**Digital Copies:**
- Oasis Sustainable Projects website ([www.oasis-sustainable.com](http://www.oasis-sustainable.com)). Until the ANLA website is up and running, the consultant website will provide the community with the opportunity to provide comments electronically.
Newspaper and other media outlets i.e. ETAN.org, will be used to alert the community to the availability and location of the documentation and communication points/methods for the project.
Chapter 14 - Difficulties Encountered

The preparation of the EIS encountered several challenges at many levels, which were managed by the Environmental Consultant.

The COVID-19 Global Pandemic, which has been ongoing for nine (9) months under Emergency conditions, proved very trying times for work effectiveness, given the internal legal obligations to Social distancing rules and closing of the country's borders, as well as other legally imposed rules, all of which have hindered considerably the capacity of the EIS team to maintain the study within a reasonable timeframe.

This situation impacted the mobilization of the international specialists (due to the border closing), increasing the amount of work time spent in long distance communication methods i.e. video calls to enable these specialists to continue their service, with additional pressure on the local team regarding the most efficient process of data collection from relevant stakeholders.

The emergency also hindered the team's capacity to engage in meaningful data collection and meetings with relevant stakeholders, particularly in the preparation of the Terms of Reference (TOR) for the project, between the end of March 2020 and beginning of June 2020. Given Timor-Leste was under lockdown, most Government services were limited in regard to opening hours and a considerable percentage of the stakeholders to be engaged were not available for physical or phone meetings, etc., delaying the project further.

In addition, ANLA not agreeing with a project request to carry out the TOR Public Consultation by email, Internet, etc, and requesting the proponent to carry out the TOR Public Consultation meeting AFTER the emergency situation was lifted (in June 2020), added to the project delay.

There was also a substantial lag time between the approval of the TOR and the beginning of the Baseline itself, added to the additional impediment of bringing in environmental services from abroad to perform the Air, Noise and Soil baseline studies or importing the necessary equipment to perform the baseline studies.

This difficulty ties in with one of the limitations in undertaking environmental assessment in Timor-Leste at the moment; the lack of accredited environmental laboratories or services that provide sampling with equipment and methodologies to the standards in effect in Timor-Leste (WHO and, consequently, the IFC).

The only laboratory in Dili that can perform water quality analysis is the National Directorate for Water Services (DNSA) under the Ministry of Public Works and the soil samples were flown to Australia to be analysed, when the limited air flight conditions allowed, due to COVID-19 Emergency Status.

Noise sampling was carried out despite only Class 2 Sound Meters being available in the country, instead of the more accurate Class 1 Sound Meter, appropriate for environmental noise sampling, requiring that the estimation of environmental noise values during the operational phase be confirmed in the post-evaluation phase (information gaps regarding the number, location, type of machinery and their operating), namely through monitoring.

Regarding Air quality, given the equipment in-country is currently not to environmental standards, the ANLA granted a waiver i.e. continuance of the air quality sampling to any time before construction starts, in order to guarantee that air travel may resume and proper equipment and teams may be flown in to carry out the sampling process as well as guarantee that the reference air quality baseline is done before the project construction starts.
A further difficulty encountered in the baseline studies related to the social survey and impact assessment, since taking photographs during this survey was constrained by the need to seek the permission of the interviewees. In most cases permission it was not granted impacting the ability to document thoroughly the social surveys undertaken.

An additional difficulty was the amount of bureaucracy required to source relevant Government information for use in other Government projects such as this one, which has also taken a toll in the time required for the presentation of the EIS. This has added on to the weight and complexity of the project size itself and, therefore, is reflected in the time the EIS has taken to perform the analysis and present these documents in due process.

This EIS has been prepared in accordance with the template provided in Annex 4 of the Draft General Regulations (Draft 5 dated 22 April 2014).
Chapter 15 - Conclusions and Recommendations

As would be expected, a project of this nature and of this size will have significant positive impacts to Dili’s environment. The EIS has been prepared taking into account the Concept Design of the landfill rehabilitation and upgrade and the technical specifications included in the DBO bid documents, together with primary data collection in the field and secondary data from available bibliographic sources. It has also taken into account all of the relevant comments presented throughout the TOR phase and the baseline study, and each have been reflected in the relevant section of this EIS.

The EIA’s main conclusions are the following:

i) The fact that this project is a brownfield project limits the risk for an extensive increase of significant negative impacts beyond those already existing in the project area. On the contrary, the implementation of the TDRUP presents an opportunity to improve a difficult environmental and social situation without requiring significant considerations on locational factors / Land use impacts, etc as a new “greenfield” project would require. The nature of the proposed rehabilitation, and the technology proposed in the feasibility and design phases of the project, contribute to this objective since many potentially significant negative impacts are being addressed by design features and operating regimes alone, elevating the overall positive impact of the project. It is the best environmental outcome to achieve the objective that the Government has set for itself in terms of improvement of Dili as a liveable city in Asia and improvement of the Tibar Landfill situation, in the medium-term.

ii) Construction impacts exist, but these are of a temporary nature and are covered by stringent site management and procedural provisions in the EMP implementation. They are also restricted, in general and topographically, to the confines of the project site, away from potentially sensitive receptors;

iii) Regarding physical components, besides the general impacts that occur mainly in the construction phase (temporary and reversible), there are positive impacts that are important such as flood risk reduction in downstream areas, the leachate system and impact reduction in the water resources, the reduction of pollutant emissions and odors that result from burning of waste and the reforestation of the reserve area hillsides.

iv) Social Impacts of the project are highly significant, especially economic resettlement impacts pertaining to the Waste Pickers (potential conflicts, risk of erosion of social cohesion of communities and prohibition of waste picking activity).

v) Macro Policy decisions regarding Technical alternatives such as, for example, materials recovery/recycling or other additional waste management solutions influence the expected future available void volume in the Landfill, for waste deposition. Any increase in the lifetime of the Landfill beyond the currently expected 10 years is directly related to the success of implementation of such measures, if the DMA intends to promote this sector. This is particularly relevant for the definition of the decommissioning phase, whose scheduling will vary in accordance to improvement and, consequently, avoidance of deposition in the landfill, creating more available space for residual waste that is not capable of being re-used or recycled.

vi) Likewise, the Restriction of “Urban Solid Waste” only in the future Landfill will obligate reorganization of other Non-Urban waste streams, given the limited projected 10 year space for deposition in the Landfill.
• In the case of the Medical Waste Stream, the Health Sector will require improvement of their current collection and treatment, for example, GV National Hospital and regional Clinic incinerators or initiate negotiations with DMA for the design of a possible segmented cell area to deposit these wastes, duly prepared with all technical requirements.

• In the case of the Construction Sector, the PMU should engage in detailed consultations with other Government Infrastructure counterparts in the construction sector to come up with short and long-term solutions regarding the reuse and recycling of the spoils from other public construction sites.

The EIA’s main recommendations are the following:

i) The implementation of the EMP for the entire life-cycle (i.e. pre-construction, construction, operation and decommissioning) of the project is vital to achieve the appropriate environmental management standards detailed for this project.

ii) Establish a Social Resettlement/Support Unit under the PMU in Dili Municipal Administration, with the recommended Social Development Officer (SDO) as soon as possible, supported by the PMS, in order to plan and draft and implement the Resettlement/Support Action Plan (or Livelihood Restoration Plan - LRP) during the Design Phase (based on the recommended mitigation solutions under the EIS), in order to guarantee that the Landfill can move into the Construction phase while the Waste Pickers are in negotiation and agreement with the proposed support options, towards the betterment of their lives, in general;

iii) Given the nature and current condition of the project area, it is reasonable that the higher impacts refer broadly to the social aspect of the future resettlement of persons and households and the contents of this EIS will be paramount in guiding the established PMU, with PMS support, in the preparation of the Resettlement Action Plan. Under the responsibilities defined in the Timorese national laws, the scope of the consultant’s work does not include producing the resettlement action plan, but supporting the proponent in guiding him/her in areas of potential interest in terms of social impacts and possible solutions to design and carry out a RAP. Social impacts can usually be very significant and have a potential for social grievance and even political agitation, which must be taken into account, requiring very thorough and cautious management. It is important to guarantee that none of the waste pickers will be in a worse situation than that in which they are currently, especially those most vulnerable.

iv) It is also recommended that a final Waste picker registry be taken given 74 waste pickers have been identified during the social baseline and Suco Chief estimates puts the total between 90 and 100 waste pickers. A “cut-off” date must also be established so that no individual person may establish/define themselves as “waste picker” and try to revert to waste picking for the purpose of possible support. This date must be defined by the DMA, regulated and widely publicized in the media, to avoid time passing by and uncontrolled re-picking waste re-occurs.

v) Carry out the Air, Water and Noise Baseline study during the Design Phase in Q1 2021, as defined in the Bid Schedule, especially to comply with the ANLA waiver and establish an air quality baseline given it was not possible to carry one in the EIS baseline due to COVID-19 restrictions. There is a contractual requirement for the appointed landfill contractor to undertake and report comprehensive baseline environmental surveys prior to any construction activity at the site.
vi) Establish the six (6) monitoring wells to monitor groundwater quality variation during the construction, operation and decommissioning phases as indicated in the environmental monitoring plan, especially for groundwater monitoring.

vii) Replanting of the Reserve area hillsides should be done with tree species that are: a) native or a known species in Timor-Leste; b) are not considered invasive; c) are chosen for their bioengineering, erosion and/or vegetation wall properties for dispersion control; and d) may be candidates for Carbon Credit programs that may help support operational costs of the Landfill and/or other expenses/costs.
Chapter 16 - Non-Technical Summary

16.1 - Non-Technical Summary (English Version)

16.1.1 What are we proposing?

Dili Municipal Authority (DMA) is the Government entity responsible for collection, transportation and treatment of urban solid waste, management of public spaces to ensure hygiene and cleanliness, as well as cleaning and maintenance of landfills within its territorial jurisdiction. Dili Municipality Administration (DMA), on behalf of the Ministry of State Administration, intends to rehabilitate and operate the Tibar Dumpsite Rehabilitation Upgrading Project (TDRUP).

The Dili Municipality Administration is the project proponent representative and ADB, as the financier, engaged the Finnish Consulting Group Asia Pte (FCG) to provide Transaction Advisory Services (TAS) for the preparation of long-term service contracts to implement the Dili Solid Waste Management Project (DSWMP) who in turn contracted the consultants OASIS-Sustainable Projects, together with JGP Consultancy-Portugal (OASIS/JGP or the EIS team) to provide said services.

This non-technical resume is a simple and summarized way for the most relevant information contained in that environmental impact study regarding the proposed TDRUP project, to present the analysis and minimization measures. Wherever there is doubt regarding the content of the Summary, please consult the Environmental Impact Statement (EIS) and the Environmental Management Plan (EMP) for clarification.

16.1.2 Project Description and of the affected environment

The Government of Timor-Leste, through the Dili Municipal Authority (DMA), under the Ministry of State Administration (MSA), proposes the Tibar Dumpsite Rehabilitation and Upgrading Project (TDRUP).

In summary, the Government wants to invest in design, construction works and specialized equipment to rehabilitate the current waste disposal site and upgrade it to a sanitary landfill operated and managed to modern international standards.

Why? To enhance the conditions of the current Tibar open dumpsite, that has negative effects on public health and the environment of the surrounding area. Its rehabilitation is highly recommendable to improve the environmental quality and the level of public health of the surrounding population and the general public health, safety and environment amenity of Dili.

The TDRUP is part of the Dili Solid Waste Management Project (DSWMP), an Investment Strategy that the Government of Timor-Leste has developed with ADB since 2015, which is legally defined in the Government Resolution no. 32/2016 - Dili Urban Solid Waste Management Investment Strategy. The project is planned to be developed during 10 years (2021 to 2030), with a total investment estimated at close to 10 million US dollars.

The project follows the environmental laws in effect in Timor-Leste, namely DL24/2012 called the base law for environment and Decree-Law no. 5/2011, on environmental licensing, as well as the World Health Organization

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1 TA-9292 REG: Strengthening Project Preparation Capacity in Asia and the Pacific. Supporting Preparation of Infrastructure Projects with Private Sector Participation in Asia Pacific (Subproject 4) - #1 TIM: Project Preparation for Dili SWM (49407-005).
(WHO) and International Finance Corporation (IFC) standards given Timor does not have environmental technical standards yet.

The DSWMP has gone through several steps since its beginning in 2014, with the preparation of an Initial Environmental Examination (IEE) for Tibar Landfill, carried out in 2015, and now the more recent steps to guarantee the implementation of the DSWMP strategy with support from an ADB Transaction Advisory (TA) Support team, composed of the Finishing Consulting Group (FCG, REBEL and OASIS Sustainable Projects, to assist the DMA in the necessary Due Diligence and carry out the Technical Studies for the effective implementation of the DSWMP.

Now, the project is at a phase where a tender process has been opened for Contractors to bid for a Design-Build-Operate (DBO) Contract, meaning that they will improve on the current Concept Design, also based on the results of this EIA assessment and carry out the implementation and operation of the project on behalf of the Dili Municipality, for a period of 10 years.

16.1.3 Why do we need the project? Benefits of the Project...

The population of Dili has grown rapidly over the past decades, currently estimated at 345,620 people (Census 2015), which has led to a significant increase in the waste mass generated by city dwellers.

The existing waste collection system is not enough and so solid waste ends up in the beaches and drainage system, frequently leading to flooding.

Government is in the process of implementing an appropriate and sustainable urban solid waste management system for the long-term, modernizing the collection fleet and rehabilitating Tibar Dumpsite for safe depositing of urban solid waste, while waiting for recycling to establish itself and become commercially feasible in Dili.

However, today, Tibar Dumpsite is an open dump with air (waste burning) and water pollution (leachate) and health risks associated with waste pickers and insects and animal pests in the operational area.

The redesign and rehabilitation of the Tibar landfill is expected to solve these issues, resulting in improved air, water and noise environment quality and community safety at the landfill site and surrounding areas and cater for any residual waste materials that are not treated or processed.

Together with the waste collection improvement, it will also have the indirect positive impact of improving the quality of life and urban amenity of the population of the city of Dili.

16.1.4 Why an Environmental Impact Assessment of the TDRUP?

This TDRUP Project requires Government environmental licensing and approval under Timorese Law, where it has been classified as a Category A (Environmental Impact Assessment) [EIA] under Decree-Law no. 05/2011 – Environmental Licensing, because the dimension (area) of the proposed Landfill and the tonnage of waste received at the landfill (150 ton/day) surpassed the limits set in ANNEX I of the Decree-Law, specifically in item no. 1 of SECTOR VII – SANITATION SECTOR, of the above-mentioned DL (Landfills and disposals of Urban Solid Wastes, < 100 Ton / day, 1 to 100 CBM / day, 0.5 to 10 hectares).
16.1.5 What is the EIA process?

EIA is a regulatory process that is governed by Timor-Leste law. The Timorese Government set out laws for the Environmental Impact Assessment (EIA) process in 2011 through Decree-Law no. 05/2011 – Environmental Licensing, on the assessment of certain public and private projects on the environment. This has been subsequently reinforced and regulated by a series of Ministerial Diplomas that have organized and defined the contents for the EIA process documentation, Public Consultation process, etc.

The EIA follows a process with the following stages:

- **a)** **Screening** is the first stage of the EIA process where the Environmental Regulator (the National Authority for Environmental Licensing (ANLA) or the Secretary of State for Environment) decide if an EIA is required.

- **b)** Once it has been agreed that EIA is required, **Scoping** is undertaken to define what should be assessed as part of the EIA and reported in the Environmental Impact Statement (EIS). This is done in partnership between the proponent and the Environmental Regulator and results in a Terms of Reference (TOR) Document for the EIA.

- **c)** With the scope set, relevant information on the environmental baseline conditions is collected. This information is then used initially to understand the potential environmental effects and inform the design of the proposed development to minimize the potential for significant adverse impacts.

- **d)** The formal impact assessment process is then undertaken of the proposed scheme parameters to define the significant impacts of the proposed development.

- **e)** Where significant adverse impacts cannot be minimized through alterations to the design itself, mitigation or reduction measures are considered. Monitoring may also be considered to measure the actual significance of the impact during and post-construction to allow management of mitigation where appropriate.

- **f)** Once the EIA is completed, the draft EIS is submitted to the Environmental Regulator for Public Consultation, which is the phase this project is at the moment;

- **g)** After Public Consultation, the Proponent revises and finishes the EIS/EMP documents and delivers a final version of the document for decision on the environmental licensing.

This process and its outcomes are then reported in the EIS to decision makers, the Environmental Regulator, and the public. The NTS is provided to allow a wider public understanding of the project and environmental effects of the project.

The EIS is set out in a structured manner to allow easier navigation:

- Volume 1 comprises the Main Environmental Statement (EIS) and the Non-Technical Summary (NTS);
- Volume 2 comprises the Appendixes;
- Volume 3 comprises the Environmental Management Plan.

16.1.6 Who is the Project Proponent?

The proponent of the project is the Municipality of Dili, in the person of its President, Mr. Gaspar Soares, supported by Ms. Emiliana Soares, Director for the Municipal Planning Agency, which can be contacted for any queries required by interested parties, through the following contact:

- **Contact:** +670 77790002
- **Email Address:** emiliana.soares@municipio.gov.tl
- **consulta_publica@oasis-sustainable.com**
16.1.7 Who is the Assessment Team?

The Dili Municipality have requested and ADB have commissioned the environmental assessment to FCG-International and OASIS Sustainable Projects, a local Environmental Consultancy active in Timor-Leste since 2011, that has prepared the environmental application and the TOR and is providing technical inputs, environmental assessment and co-coordinating the EIA study with JGP NVIST, Consultoria Ambiental, S.A., a Portuguese consultancy company.

16.1.8 What is our project?

16.1.8.1 Where do we want to implement the Project?

The TDRUP study area is located in suco Tibar, Bazartete administrative post, Liquiça municipality, adjacent to the Tibar Bay area and approximately 14 km west of Dili centre (see Figure 16-1). It is an existing open dump used for dumping of municipal solid waste since Indonesian times and extends over a total area of approximately 12 hectares. There are no controls over access to the site and there are a large number of scavengers (waste pickers) who set fire to the waste to recover metals, which produces continuous fires and large volumes of potentially toxic fumes.

16.1.8.2 What do we want to do?

We want to re-develop the whole waste disposal area, subdivided into 4 principal areas:

1. **The Waste Disposal Area** with the construction of three sanitary landfill cells, defined engineered areas for the receipt and disposal of residual waste. The three cells cover 11.07 hectares of the present filled area. Each cell will be developed progressively and in a phased manner, whilst the construction of the support infrastructure will be completed in the first 3 years of site re-development;

2. **Reserve Area**, a buffer zone around the southern, eastern and northern margins of the landfill area. It is for the temporary lay down and storage of materials and equipment during construction (if required), and protection of the investment area during the operational phase. There will be no waste disposal in this area; and

3. **The Operational Support Area**, the remaining parts of the site on the west margin of the Waste Disposal Area and in which the required support infrastructure to upgrade the disposal facility will be developed.


16.1.8.3 When do we propose to do it?

The project will have four phases: Pre-Construction/Detailed Design is scheduled from Q1 to Q3 2021 (6 months), the bulk of construction preparatory works from Q3 2021 to Q3 2023 (3 years) and from commissioning in mid-2023, run parallel with the operational phase up to 4Q 2030 (7 years). A summary of the potential impacts during each phase are presented in Table 16-1. Of these, key impacts have been identified as either a ‘Moderate’ or ‘High’ risk, and mitigation measures have been identified for each of them (see EIS Section 9) to manage and reduce the impacts.
Figure 16-1 Location of the TDRUP Project
<table>
<thead>
<tr>
<th>Phase</th>
<th>Types components</th>
<th>Potential impacts</th>
<th>Nature</th>
<th>Incidence</th>
<th>Time scale</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre - Construction and Design</td>
<td>General Contract Management</td>
<td>Definition of a dedicated PMU Director and team to manage the TDRUP Project</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>General Contract Management</td>
<td>Inclusion of Final approved EIS/EMP specifications and standards in DBO contractual documents and obligation of Contractor to draft his/her EMP based on final Detailed Engineering Designs</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>General Contract Management</td>
<td>Preparation of a Site Environmental Management and Supervision Plan</td>
<td>Positive</td>
<td>Direct</td>
<td>Medium term</td>
<td>Medium</td>
</tr>
<tr>
<td>Economic</td>
<td>Site choice on existing dumpsite location, as a “brownfield” project</td>
<td>Site choice on existing dumpsite location, as a “brownfield” project</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>High</td>
</tr>
<tr>
<td>Water Resources</td>
<td>Introduction of impermeable basal liner to collect and treat leachate</td>
<td>Introduction of impermeable basal liner to collect and treat leachate</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>High</td>
</tr>
<tr>
<td>Air</td>
<td>Introduction of operational rules to cover waste immediately and avoid waste fire and air pollution</td>
<td>Introduction of operational rules to cover waste immediately and avoid waste fire and air pollution</td>
<td>Positive</td>
<td>Direct</td>
<td>Medium term</td>
<td>High</td>
</tr>
<tr>
<td>Climate Change</td>
<td>Reduction of GHG emissions by reinforcing and supporting Recycling policies and programs</td>
<td>Reduction of GHG emissions by reinforcing and supporting Recycling policies and programs</td>
<td>Positive</td>
<td>Indirect</td>
<td>Long term</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>Drainage design upgraded to extreme events and water velocity reduction devices and retention basins for water reuse</td>
<td>Drainage design upgraded to extreme events and water velocity reduction devices and retention basins for water reuse</td>
<td>Positive</td>
<td>Indirect</td>
<td>Long term</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>Landslide prevention and protection of Landfill infrastructure by establishing a Reserve area for protection and reforestation</td>
<td>Landslide prevention and protection of Landfill infrastructure by establishing a Reserve area for protection and reforestation</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>Medium</td>
</tr>
<tr>
<td>Social</td>
<td>Potential conflicts with populations and waste pickers and risk of social cohesion</td>
<td>Potential conflicts with populations and waste pickers and risk of social cohesion</td>
<td>Negative</td>
<td>Direct</td>
<td>Long term</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Loss or reduction of sources of livelihood (100 waste pickers)</td>
<td>Loss or reduction of sources of livelihood (100 waste pickers)</td>
<td>Negative</td>
<td>Direct</td>
<td>Long term</td>
<td>High</td>
</tr>
<tr>
<td>Construction</td>
<td>Topography and Geology</td>
<td>Change in terrain morphology / Soil Lost</td>
<td>Negative</td>
<td>Direct</td>
<td>Long term</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Geology</td>
<td>Increase the erosion risk</td>
<td>Negative</td>
<td>Direct</td>
<td>Long term</td>
<td>Medium</td>
</tr>
<tr>
<td>Phase</td>
<td>Types components</td>
<td>Potential impacts</td>
<td>Nature</td>
<td>Incidence</td>
<td>Time scale</td>
<td>Significance</td>
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</tr>
<tr>
<td>Water Resources</td>
<td>Increased concentration of suspended solids and pollutants in watercourses – decreased of water quality (surface and groundwater)</td>
<td>Negative</td>
<td>Direct</td>
<td>Short term</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increased water consumption and wastewater production at construction sites by workers</td>
<td>Negative</td>
<td>Direct</td>
<td>Medium term</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Air</td>
<td>Decreased air quality parameters resulting from increased emissions to air (PM10 and other pollutants)</td>
<td>Negative</td>
<td>Direct</td>
<td>Short term</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>Soil</td>
<td>Soil lost (contamination until leachate system is implemented)</td>
<td>Negative</td>
<td>Direct</td>
<td>Long term</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Noise</td>
<td>Increase in noise levels</td>
<td>Negative</td>
<td>Direct</td>
<td>Short term</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>Ecological</td>
<td>Vegetation Loss at Depot Composting</td>
<td>Negative</td>
<td>Direct</td>
<td>Long term</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Cultural</td>
<td>Impacts on local sacred site (&quot;Fahiduma&quot; or &quot;Tasu Oron&quot;)</td>
<td>Negative</td>
<td>Direct</td>
<td>Long term</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Social</td>
<td>Job creation and procurement of opportunities for goods and services related to construction</td>
<td>Positive</td>
<td>Direct</td>
<td>Medium term</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Health and safety in work areas</td>
<td>Negative</td>
<td>Direct</td>
<td>Medium term</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Temporary allocation of infrastructures</td>
<td>Negative</td>
<td>Direct</td>
<td>Medium term</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Demobilization of labour hired</td>
<td>Negative</td>
<td>Direct</td>
<td>Long term</td>
<td>Medium/high</td>
<td></td>
</tr>
<tr>
<td>Climate Change</td>
<td>Reduction of GHG emissions (gas combustion)</td>
<td>Positive</td>
<td>Indirect</td>
<td>Long term</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>Topography and Ecological (habitat)</td>
<td>Reforestation in the Reserve Area (decrease landslide risk)</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Geology</td>
<td>Decrease the erosion risk</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>Water Resources</td>
<td>Stormwater system - Flood risk reduction in downstream areas</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Leachate system (water treatment) and impact in the quality of the water resources (surface and groundwater)</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Air</td>
<td>Improvement of air quality (No waste burning lower emissions by vehicles and machines)</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Methane and carbon dioxide emissions</td>
<td>Negative</td>
<td>Direct</td>
<td>Medium term</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>Phase</td>
<td>Types components</td>
<td>Potential impacts</td>
<td>Nature</td>
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<td>Significance</td>
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</tr>
<tr>
<td>Noise</td>
<td>Improved noise levels from operation of landfill</td>
<td>Negative</td>
<td>Direct</td>
<td>Long term</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Waste management</td>
<td>Improvement of the waste management</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Social</td>
<td>Improvement of public health, safety and environmental amenity of Dili</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Social</td>
<td>Job creation related to landfill operation</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>Social</td>
<td>Health and safety in work areas</td>
<td>Negative</td>
<td>Direct</td>
<td>Long term</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>Social</td>
<td>Demobilization of labour hired</td>
<td>Negative</td>
<td>Direct</td>
<td>Long term</td>
<td>Medium/high</td>
<td></td>
</tr>
<tr>
<td>Climate Change</td>
<td>Air pollutant emissions (Methane GHG) from final stages of digestion</td>
<td>Positive</td>
<td>Indirect</td>
<td>Long term</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>Topography and Ecological (habitat)</td>
<td>Reforestation in the Reserve Area (decrease landslide risk)</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Geology</td>
<td>Decrease the erosion risk</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>Water Resources</td>
<td>Remaining Leachate after closure, evaporation in collection ponds</td>
<td>Negative</td>
<td>Direct</td>
<td>Medium term</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>Air</td>
<td>Methane and carbon dioxide emissions</td>
<td>Negative</td>
<td>Direct</td>
<td>Medium term</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>Waste management</td>
<td>Improvement of the waste management</td>
<td>Positive</td>
<td>Direct</td>
<td>Long term</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Social</td>
<td>Landfill employment over</td>
<td>Negative</td>
<td>Direct</td>
<td>Long term</td>
<td>High</td>
<td></td>
</tr>
</tbody>
</table>
16.1.8.4 How do we propose to do it?

16.1.8.4.1 Remediation of the Waste Disposal Area

1. **Extinguish Fires** and cool the waste;
2. **Planned rehabilitation** – will be done in order, from **Cell 1 to Cell 3**, with the following steps:
   i) **Excavate existing waste in each cell** (down to the natural soil) and Temporarily re-locate it within the Waste Disposal Area;
   ii) **Removed Natural soil** (to a depth of around 20 cm) to ensure any contaminated soil is removed. If contaminated soil is deeper than 20cm then remove all contaminated soil and replace with clean soil;
3. **Shape, grade and compact the base of the cell** to achieve the required slopes and elevations to promote drainage (from the top to the bottom and along the middle of the Waste Disposal Area); and
4. **Install a Basal Lining System** to collect the Leachate, composed of (bottom-to-top):
   i) **Compacted natural soils, enriched with bentonite cement** to reduce permeability;
   ii) Sodium-bentonite Geocomposite Clay Liner (GCL) [1 layer of bentonite clay in the middle of two layers of geotextile]; and
   iii) Primary liner of HDPE flexible geomembrane (2 mm thick)
5. **Collect and Treat the Leachate**
   i) Install a network of Feeder and Collection HDPE pipes on a layer of porous, highly permeable gravel;
   ii) Direct Leachate to be stored temporarily in a lined pond and re-circulate it back to the landfill to provide additional moisture for waste decomposition.
   iii) A small package treatment plant may be installed to improve the quality the remaining leachate effluent to comply with IFC Environmental, Health, and Safety Guidelines for Waste Management Facilities (Emissions and Effluents)
6. **Collect and Treat the produced Gas**
   Waste decomposition produces landfill gas (methane (40-60%) and carbon dioxide (most of the rest), with trace amounts of other volatile organic compounds [VOCs]) that needs to be collected and treated for Climate Change and Landfill Safety issues.
   A series of gas collection wells will be distributed throughout each cell and installed as waste deposition proceeds in the cell. The collection wells will penetrate the full depth of the waste mass and is extended vertically as the waste thickness increases and will direct the gas to a central gas treatment plant with a flare stack in which collected gases will be combusted.

16.1.8.4.2 Rehabilitate Operational Infrastructure

1. **Improve access roads** around Cells 1 to 3;
2. **Improve drainage** in the landfill area where:
   a) **Stormwater will be directed** to a first stormwater retention pond and **overflow** from this pond will be drained to a second lined stormwater pond, adjacent to the compost plant, in the Operational Support Area.
   b) The retained stormwater will be used in:
      • compost plant operations;
• circulated back to the landfill to assist in increasing waste compaction and expediting waste decomposition;
• discharged off-site near to the existing DNSB waste water treatment plant.

3. **Access control and security access to the site (security gates, fencing and security personnel)**

4. **Waste Reception with a weighbridge for waste weighing**;

5. **New administration buildings and covered parking areas**;

6. **Operational areas: storage and workshop**

7. **Composting** – Green waste will be collected separately from the other municipal waste and composted so that:
   a) more space available in the landfill;
   b) reduce leachate and gas in the landfill;
   c) produce a safe compost (end product) for Municipality parks and open spaces.

8. **Depot area** – two depot sites for the secure overnight parking of waste collection vehicles, an access road and a fully-bunded steel fuel storage tank [50,000L] and dispensing station.

### 16.1.9 How did we assess the Environmental Impacts?

#### 16.1.9.1 Collected information on the Project Site

The EIS provides an overview and detailed description of the nature of the various impacts (on physical, biological and social components) that may occur during the implementation of each component of the TDRUP project. To do that, we have collected baseline information (primary and secondary data collection and literature review) that described the conditions of the site today and compared/estimated them with possible impacts of the proposed future situation and actions from the project implementation. To have more detailed information from the field, we interviewed and discussed the project in the Tibar area, involving consultation with people who may be affected by the project and other project stakeholders, as well as having carried out a Public Consultation for the Terms of Reference (TOR) of the Project on the 29th July 2020.

The environment and Social data collection that the EIA consultants carried out in the field (Primary data) were the following:

a) **Water Resources (surface and ground):** Collected water samples at 8 points (2 surface, 5 ground and 1 drinking water).

b) **Soil:** Collected original soil samples at 9 points under the landfill waste to verify level of contamination.

c) **Noise:** Carried out noise level samples at 6 points (industrial and residential).

d) **Social Components:** Interviewed the communities affected by the project in the villages of Fatunia and Libaulelo and also Municipal, local leaders and other important stakeholders in Tibar. We also applied a census questionnaire of affected persons i.e Waste pickers and asset register, to identify persons who will be economically displaced by the Project and to determine who will be eligible for support.

e) **Cultural Components:** Field inspection by collecting the photos of the Tibar archaeological, historic and sacred sites based on local leader knowledge, as well as the Centro Nacional CHEGA (CNC) and Secretary State for Culture (SEC) data.

#### 16.1.9.2 We used that information to estimate the project impacts...

The assessment of the impacts of a project is the result of the comparison between the foreseeable future environmental and social situations with the project and in its absence (“Zero Alternative”). We have an idea on the general impacts attributed to a landfill rehabilitation project, such as the ones in Table 16-1. For this project,
in order to identify and assess all relevant impacts, the characteristics of each environmental and social factor was examined, followed by the assessment and prediction of the SIGNIFICANT impacts based on a description of their effects and a qualitative characterisation.

16.1.10 What are the project’s greatest impacts?

The project predicts that the highest negative impacts may be from the economic resettlement i.e. loss of income of an estimate 100 waste pickers and their 700 family members, as well as those impacts that come from the civil construction and operation of the landfill rehabilitation, such as noise, dust, earthworks, leachate production, traffic management, etc. However, the most important and positive impact will be the improvement of the environmental conditions in the Landfill i.e. no more smoke, which impacts daily the surrounding community of Tibar, or higher health risk activities i.e. Waste pickers, and, indirectly the improvement of the overall conditions in Dili city, regarding waste collection and cleanliness, for the benefit of its citizens.

16.1.10.1 How will we manage the significant impacts?

We have assessed the significant impacts and defined mitigation measures and put them into an Environmental Management Plan (EMP) (see Volume 3 – Environmental Management Plan), which is the document that manages the potential environmental impacts from the construction, development and decommissioning phases. The objective of the EMP is to communicate the key environmental obligations that apply to all contractors, their sub-contractors and employees while carrying out any form of construction activity as part of the TDRUP. It is to become the main obligation reference for contractors to follow during the design, construction and operation phases, and address the conditions precluded in the EMP that will be attached to the Contract Documents.

16.1.11 How can you participate in the next EIA phases?

a) During the draft EIS/EMP Public Consultation: we will have another Public Consultation Meeting to collect comments and opinions regarding the contents of this draft EIS/EMP from interested stakeholders and the public;

b) From NOW until the end of the 2nd Public Consultation: anyone who has a legitimate interest related specifically to the TOR and/or the EIS/EMP contents (when these documents are officially published) can have their opinion registered only when it is in WRITTEN FORM and sent to the following contacts:

Mr. António Lelo Taci, M.Sc, Interim Executive Secretary for ANLA
Address: Secretariat of State for Environment, Edifício Fomento, Mandarim, Dili Timor-Leste
Email: infonael2019@gmail.com / Telephone: 77115444)
with copy (c.c.) to:

Ms. Emiliana Soares, Director for Díli Municipality Urban Planning
Address: Dili Municipal Authority (AMD) – Avenida Mártires da Pátria, Vila Verde, Dili, Timor-Leste
Email: emilianafsoares@municipio.gov.tl / Telephone:
Also copy to: consulta_publica@oasis-sustainable.com
16.2 - Sumáriu Naun Tékniku (Versaun Tetum)

16.2.1 Saida mak ita propoin?

Autoridade Munisipál Díli (AMD) mak entidade Governu nian ne’ebé mak responsável ba rekolla, transportasaun no tratamentu hosi lixu sólidu urbanu, jestaun ba espasu públiku sira atu asegura ijene no aseiu, nune’e mós limpeza no manutensaan lixeira nian iha ninia jurisdisaun teritorial. Administrasaun Munisipál Díli (AMD), Díli Municipality Administration (DMA), lori Ministériu Administrasaun Estatál (MAE) nia naran, hakarak rehabilita no hala’o servisu Projeto Rehabilitasaun no Melloramentu Aterru Tibar (TDRUP) nian.

Administrasaun Munisipál Díli nu’udar reprezentante hosi proponente no ADB, nu’udar financiador, kontrata Finnish Consulting Group Asia Pte (FCG) atu fornese servisu asesoría tranzasaun (TAS)² ba preparasaun kontratu servisu tempu naruk nian hodí implementu Projeto Jestau Lixo Sólidu Díli nian (DSWMP) ne’ebé mak depoi kontrata tutan fali empreza konsultora OASIS-Sustainable Projects, hamutuk ho JGP Consultancy-Portugal (OASIS/JGP ka ekipa EIA nian) hodi fornese servisu refere.

Sumáriu Naun Tékniku ida ne’e hanesan dalan simples no badak ida ba informasaun sira ne’ebé relevante liu iha Estudu Impaktu Ambientál (EIA) konabá projetu TDRUP propostu, hodi aprezena análizes no medidas minimizasaun. Karik iha dúvida rumá konabá kouteudu hosi rezumu ida ne’e, halo favor bele konsulta dokumentu Deklarasaun Impaktu Ambientál (DIA) no Planu Jestau Ambientál (PJA) nian hodi hetan klarifikasaun.

16.2.2 Deskrisaun Projetu no Ambiente Afetadu nian

Governu Timor-Leste, liu hosi Autoridade Munisipál Díli (AMD), iha Ministériu Administrasaun Estatál (MAE) nia okos, propoin Projeto Rehabilitasaun no Melloramentu Aterru Tibar (TDRUP).

Hanesan rezumu ida, Governu hakarak investe iha design, servisu konstrusaun no ekipamentu espesializadu sira hodí rehabilita fatin soe lixu nian agora dadauk ne’ê, hadí’ak no transforma ba iha ateru sanitário ida ne’ebé mak refleta operasaun (funsionamentu) no jestau nian ida ne’ebé tür padrão internasionál modernu.

Tamba saida? Atu hadí’ak kondisaun atuál hosi lixeira Tibar, ne’ebé mak iha efeitu negativu ba iha saúde públiku no ba meu ambiente iha ninia sorisorin. Ninia rehabilitasaun rekomendávele teb-tebes atu bele hadí’ak kualidade ambiental no nivel saúde públiku hosi populasaun sira ne’ebé besik no saúde públiku jerál, seguransa no amenidade ambiental Díli nian.

TDRUP nu’udar parte hosi Projeto Jestau Lixo Sólidu Díli nian (DSWMP), Estratejia Investimentu ida ne’ebé mak Governu Timor-Leste dezenvolve liha ona hamutuk ho ADB dezde 2015, ne’ebé mak legalmente define iha Rezolusaun Governu no. 32/2016 – Estratejia Investimentu ba Jestau Lixo Sólidu Urbanu Díli nian. Tür planu, sei dezenvolve projetu ne’e durante tinan 10 (2021 to’o 2030), ho totál investimentu estimadu besik tokon 10 dolar Amerikanu.

Projeto ne’e la’o tür Lai ambiental sira ne’ebé iha efeitu hela iha Timor-Leste, liiliu DL24/2012 hanara Lei Baze ba Ambiente no DL no. 5/2011, konabá Lisensiamentu Ambiental, nune’e mós padraun sira hosi Organizausn

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² TA-9292 REG: Strengthening Project Preparation Capacity in Asia and the Pacific. Supporting Preparation of Infrastructure Projects with Private Sector Participation in Asia Pacific (Subproject 4) - #1 TIM: Project Preparation for Dili SWM (49407-005).
DSWMP – Tibar Dumpsite Rehabilitation and Upgrading Project (TDRUP)
EIA – Environmental Impact Statement (EIS)
March 2021

Saúde Mundial (WHO) no Kooperasaun Finanseira Internasionál (IFC) nian, tamba Timor-Leste sidauk iha padraun tékniku sira ambiente nian.

DSWMP atravesa faze lubuk ida ona dezde ninia inisiu kedas iha 2014, ho preparasaun Exame Ambientál Inisiál (EAI) ida ba ateru Tibar, ne’ebé realiza iha 2015, no agora ho pasu/faze resente sira, hodi garante implementasaun estratejava DSWMP nian ho apoiu hosi ekipa Asesoria Transzasona (TA) ida ADB nian, ne’ebé kompostu hosi Finishing Consulting Group (FCG, REBEL and OASIS Sustainable Projects), hodi fó asisténsia ba AMD halo Due Diligence no realiza Estudu Tékniku sira ne’ebé importante ba implementasaun efikaz DSWMP nian.

Agora, projetu ida ne’e tama iha faze ida tan, iha ne’ebé mak prosesu tenderízausaun nian mós loke tiha ona ba empreiteiru sira atu konkore ba kontratu Design-Build-Operate (DBO) nian ida, ne’ebé signifika katak, sira sei hadi’ak Dezeñu Konsetuutl atul, nomós bazeia ba rezultadu sira hosi avalisauna AIA ida ne’e nian no realiza implementasaun no operasaun hosi projetu ida ne’e, lori AMD nia fatin, ba períodu tinan 10 nian.

16.2.3 Tamba saida mak ita presiza projetu ida ne’e? Benefísiu saida de’it hosi projetu ne’e…

Iha tinan sanulu-resin ninia laran, Díli hatudu kresimentu populasionál ida ne’ebé lais tebes no agora dadauk, ho número aproximadu 345,620 (Census 2015), ne’ebé mak kontribuí ona ba iha aumentu signifikativu hosi produsaun lixu sidade ida ne’e nian.

Sistema rekolla lixu existente la sufisiente no tamba ne’e mak lixu, dala barak, namkari iha tasi-ibun no valeta sira, ne’ebé dala barak kauza inundausaun.

 Governu iha hela prosesu implementasaun hosi sistema jestau lixu sólido urbano ida, ne’ebé mak apropiadiu no sustentável ba tempu naruk, hodi moderniza frota rekolla nian no rehabilita ateru Tibar hodi sai hanesan fatin depózitu lixu sólido urbano ida seguru, ekuantu hein sistema resiklajen atu estabelse no sai komersialmente viável ba Díli.

Entretantu, agora dadauk, Ateru Tibar nu’udar “ateru-nakloke” ida ho poluiasaun ár (tamba sunu), bee (lixiviadu), risku ba saúde asosiadu ho ema sira ne’ebé hili fo’er, insetu (lalar) no moras animál nian iha ateru laran.

Esperansa hosi redezeñu no rehabilitasaun ateru Tibar nian mak, atu resolve problema hirak ne’e, ne’ebé sei rezulta ba iha kualidade ár, bee no ruidu ida ne’ebé di’ak liu, kualidade ambientál no seguransa comunidade nian iha ateru laran no área sira iha ninia sorsorin no supre materiál reziduí balun ne’ebé mak la hetan tratamentu ka prosesamentu.

Hamutuk ho melloria ba rekolla lixu nian, rehabilitasaun ateru Tibar sei iha impaktu pozitivu indiretu ida mak, hadi’ak kualidade moris no amenidade urbanu hosi populasaun sidade Díli nian.

16.2.4 Tamba saida mak presiza halo Avalisauna Impaktu Ambientál ida ba TDRUP?

Projetu TDRUP ida ne’e nesesita Governu ninia lisensiamentu ambientál no aprovasaun tuir Lei Timo-Leste nian, iha ne’ebé hetan ona klasifikasaun nu’udar categoria A (Avalisauna Impaktu Ambientál) [AIA] tuir Dekretu-Lei no. 05/2011 – lisensiamentu ambientál, tamba dimensau (area) hosi ateru propostu no tonelajen lixu ne’ebé mak tama iha ateru (150 ton/oron) ultrapasa limite nee’ebé mak estabelesa iha ANEXU I, lilii iha iten no. 1 SECTOR VII nian – SETÓR SANEAMENTU, hosi DL refere (Ateru no Depózitu Lixu Sólidu Urbanu, < 100 ton/oron, 1 to’o 100 CBM/oron, 0.5 to’o 10 ha).
16.2.5 Saida mak prosesu AIA?


AIA la’o tuir prosesu ida ho pasu sira hanesan tuirmai ne’e:

a) **Triajen** mak faze dahuluk hosí prosesu AIA iha ne’ebé Reguladór Ambientál (Autoridade Nasional na Lisensiamentu Ambientál [ANLA]) ka Sekretáriu Estadu ba Meiu Ambiente) deside karik presiza holo AIA;

b) Bainhira konkorda ona katak presiza holo AIA, Definisinau Ámbitu mós tuir kedas hodi define saida mak atu avalia nu’udar parte ida hosí AIA no relata iha Deklarasaun Impaktu Ambientál (DIA). Proponente no Reguladór Ambientál mak sei servisu hamutuk hodi halo ida ne’e no sei rezulta ba iha Dokumentu Termus Referénsia ida (TOR) ba AIA ne’e rasik;

c) Ho Definisinau Ámbitu ne’ebé prontu ona, komesa rekolla ona informasaun relevante sira konabá kondisoinсол baseline ambientál nian. Informasaun ida ne’e depois sei uza hodi komprinde uluk efeitu ambientál potensial sira no hato’o ba design konabá servisu propostu hodi minimiza potensial ba impaktu adversu signifikativu sira;

d) **Prosesu formál ba avaliaasaun impaktu** mós la’o tuir planu parâmetsri sira ne’ebé propostu hodi define impaktu signifikativu sira hosí servisu propostu;

e) Karik impaktu adversu signifikativu sira labele minimiza liu hosí altersasoinsoles ba design ne’e rasik, maka komesa **konsidera ona mitigasaun ka medidas redusuan.** Bele konsidera mós monitorizaun hodi avalia signifikánsia loloos hosí impaktu durante no depoizde konstrusaun hodi permite jestaun ba mitigasaun karik presiza;

f) Bainhira AIA kompletu ona, esbosu DIA nia mós submete ba Reguladór Ambientál hodi prepara ba **Konsulta Públika,** faze ida, iha ne’ebé projetu ida ne’e agora dadauk iha ba;

g) Depoizde Konsulta Públika, Proponente mós sei halo revizaun no kompleta dokumentu sira EIS/EMP nian no entrega versaun finál ida hosí dokumentu refere ba desizaun konabá lisensiamentu ambientál.

Prosesu ida ne’e ho ninia rezultadu sira depois sei relata iha DIA ba sira ne’ebé mak atu foti desizaun, ba Reguladór Ambientál, no ba públiku. SNT ida ne’e fornesidu atu permite koñesimentu públiku ne’ebé luan liu konabá projetu ho ninia efeitu ambientál sira.

DIA ida ne’e forma tuir ninia estrutura atu permite asesu ne’ebé fásil liu:

- Volume 1 kompostu hosí Deklarasaun Ambientál Prinsipál (EIS) no Sumáriu Naun Téknikucomprises (SNT);
- Volume 2 kompostu hosí Aneksu sira;
- Volume 3 kompostu hosí Planu Jestaun Ambientál.

16.2.6 Sé mak Proponente Projetu nian?

Proponente projetu nian mak Autoridade Munisipál Dili, ho ninia Prezidente rasik mak, Sr. Gaspar Soares, ne’ebé mak hetan apoiu hosí Sra. Emiliana Soares, Diretora Ajénsia Planeamentu Urbanu Munisipiu Dili nian, ne’ebé mak kontaktável liu hosí kontaktu sira tuirmai ne’e, karik iha kestaun ruma ne’ebé mak parte iteresada sira presiza koloka:
16.2.7 Sé mak Ekipa Avalisaun?

Ho pedidu Autoridade Munisipál Dili nian mak ADB kontrata ona ba avalisaun ambientál, FCG-International ho OASIS Sustainable Projects, Konsultoria Ambientál lokál ida, ativu iha Timor-Leste dezde 2011, ne’ebé mak prepara tiha ona aplikasaun ambientál ho ToR no ago daraak halo hela inputs tékniku, avalisaun ambientál no ko-koordena hela estudu AIA ida ne’e ho JGP NVIST, Consultoria Ambiental, S.A., empreza konsultoria Portugés ida.

16.2.8 Ita nia projetu ne’e sáda?

16.2.8.1 Ita hakarak implementa projetu ne’e iha ne’ebé?

Área estudu TDRUP nian lokalizadu iha suku Tibar, Postu Administrativu Bazartete, Munisípiu Liquiça, adjasente ba baia área Tibar, aproximadamente 14 km iha oeste hosi sentru Dili (haree Figure 16-1). Fatin ne’e nu’udar ateru-nakloke ida ne’ebé mak uza atu depozita lixu munisipál dezde tempu Indonézia nian kedas no ninia luan maizumenus 12 ha. Agora dadaak, laiha kontrolu ba asesu no eziste grupu boot (sira ne’ebé hili fo’er) ne’ebé mak sunu lixu hodi rekopera besi-aat, no ida ne’e halo ahi nunka mate iha ateru laran hodi produz ahi-suar ne’ebé maka’as no tóksiku.

16.2.8.2 Saida mak ita hakarak halo?

Ita hakarak dezenvolve fila-fali área ba depózitu lixu nian, hodi fahe ba área prinsipál 4:

5. **Área ba Depózitu Lixu nian**, ho konstrusaun sélula tulu (3) ateru sanitáriu nian, área projetadu sira defindu ba resesaun no depózitu lixu nian. Sélula tulu ne’e kobre área 11.07 ha hosi área depózitu atuál. Sei dezenvolve sélula 3 ne’e ida-idak progresivamente no pur sélula, entretantu konstrusaun infraestrutara apoii nian sei kompleta iha tinan 3 dahuluk nia laran hosi re-dezenvolvimentu ateru nian;

6. **Área Rezerva**, zona tampaun ida ne’ebé hale’u marjen sul, leste no norte hosi área ateru nian. Karik presiza, maka área ida ne’e sei uza hodi tau temporamente materiál no ekipamentu durante konstrusaun, nomós nu’udar protesaun ba iha área investimentu nian durante fase operasionál nian. Sei la iha depózitu lixu iha área ida ne’e;

7. **Área ba Apoiu Operasionál**, parte restante sira iha marjen Oeste hosi Área ba Depózitu Lixu nian, iha ne’ebé sei dezenvolve infraestrutura ba apoii, ne’ebé presiza ba melloramentu (hadi’ak) fasilidade depózitu nian;

8. **Área ba Depot**, ba estacionamentu noturnu no limpeza hosi veikulus rekolla lixu nian no instalasaun estasaun no abastesimentu kumbistolvelba operadór/empreiteiru ateru no rekolla nian.

16.2.8.3 Bainhira mak ita propoin atu halo ida ne’e?

Projetu ida ne’e sei iha faze haat (4): Pre-konstrusaun/Dezeñu Detalladu ajendadu hosi Q1 to’o Q3 2021 (fulan 6), maior parte hosi serbusu preparatóriu konstrusaun nian hosi Q3 2021 to’o Q3 2023 (tinan 3) no hosi komisionamentu iha meadus 2023, la’o paralelu ho faze operasionál nian to’o iha 4Q 2030 (tinan 7). Sumáriu ida
hosi impaktu potensiál sira durante kada faze aprezentadu iha Table 16-1. Hosi hirak ne’e, impaktu xave sira identifikadu hotu ona hanesan ‘Moderadu’ ka ‘Risiku aas’, no medidas mitigasaun nian mós identifikadu ona ba kada impaktu (haree DIA Sesaua 9) atu jere no hamenus impaktu sira ne’e.

16.2.8.4 Oinsá mak amí propoin atu halo ida ne’e?

16.2.8.4.1 Remediasaun ba Área Depózitu Lixu nian

1. Halo-mate Ahí no husik lixu arefese;
2. Planu rehabilitasaun – sei halo tuir orden, hosí sélula 1 to’o sélula 3, ho pasu sira tuirmai ne’e:
   i) Ke’-e-sai tiha lixu ezistente iha kada sélula (to’o iha solu [rai] intaktu/naturál) no Temporariamente realoka fali iha área ba depózitu lixu nian;
   ii) Ke’-e-sai tiha rai naturál (ho profundidade maizumenus to’o 20cm) atu asegura katak hasai duni rai kontaminadu. Karik mak rai kontaminadu ne’e mahar liu 20cm, maka sei hasai hotu kedas no substituti fali ho rai moos (deskontaminadu);
3. Halo moldajen, nivelamentu no kompaktasaun ba baze/rai hosí sélula atu hetan dekliwe no elevasaun ne’ebé presiza hodi promote drenajen/eskoamentu (hosi leten ba kraik no tuir área depózitu lixu nia klaran)
4. Instala Sistema Revestimentu Bazál hodi rekolla lixiviadu, kompostu hosí (hosi okos ba leten) :
   i) Rai naturál kompaktadu, enrikesidu ho simentu bentonite atu reduz permeabilidade;
   ii) Revestimentu Jeokompostu arjilozu Bentonite-Sódii (GCL) [kamada bentonite arjilozu ida iha kamada jeotéstil rua nia klaran]; no
   iii) Revestimentu Prinsipál hosí jeomembrana fleksível HDPE nian (nia mahar 2mm)
5. Halo Rekolla no Tratamento ba Lixiviadu
   i) Instala Feeder no rede tubajen HDPE ba rekolla lixiviadu iha kamada porozu ida ninia leten, fatuk britas altamente permeável;
   ii) Kanaliza Lixiviadu ba rezervatóriu/tanke revestidu ida hodi akumula temporariamente iha ne’eba, no sei resirkula fali ba ateru laran hodi fornese umidade adisional ne’ebé promote dekompozisaun lixu nian.
   iii) Bele mós instala unidade kí’il ida hodi hadi’ak kualidade hosí effluente lixiviadu nian ne’ebé resta atu nune’e bele kumpri rekezitus/normas Ambientál, Safúde no Seguransa IFC nian ba Fasilidade sira Jestaun Lixu nian (Emisoinss no Efluentes)
6. Halo Rekolla no Tratamento ba Gás produzidu

Dekompozisaun lixu nian produz gás (metano [40-60%] no dióksidu-karbonu [maioria hosí % ida ne’ebé sei faita], ho vestijius hosí kompostu orgániku volátil sira selul [VOCs]) ne’ebé mak presiza rekolla no halo tratamento tamba kestaun Mudansa Klimáítica no seguransa Ateru nian.

Posu rekolla gás nian lubuk ida mak sei distribui no instala iha sélula ida-idak ninia laran, enkuantu depozisaun lixu kontinua la’o. Posu rekolla gás nian ne’e sei penetra tama to’o iha lixu ninia okos kedas no estende verticalmente enkuantu lixu nia mahar aumenta no sei kanaliza gás rekollidu ba to’o iha unidade tratamento gás nian ida, iha ne’ebé gás rekollidu ne’e sei elimina tiha (suno).
Figure 16-2 Lokalizasaun hosi Projetu TDRUP
## Tabela 16-2 Impaktu Potensiál ambientál no Sosiál hosí projeto TDRUP

<table>
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<th>Faze</th>
<th>Tipu hosí komponente sira</th>
<th>Impaktu Potensiál sira</th>
<th>Natureza</th>
<th>Insidénsia</th>
<th>Eskala Temporál</th>
<th>Signifikánsia</th>
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<tbody>
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<td>Pre – Konstrusaun no Design</td>
<td>Jestaun Jerál Kontratu nian</td>
<td>Definisaun no formasaun hosí ekipa PMU ida ho ninia Diretór dedikadu ida atu jere projeto TDRUP</td>
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<td>Diretu</td>
<td>Tempu Naruk</td>
<td>Médiu</td>
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<tr>
<td></td>
<td>Jestaun Jerál Kontratu nian</td>
<td>Incluzaun hosí espesifikasoins no padrains finais aprovasus EIS/EMP nian ba dokumentu kontratul DBO nian no obrigaun empreiteiru nian atu halbo esbosu ba ninia PJA bazeia ba DED final (Detailed Engineering Designs)</td>
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<td>Diretu</td>
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<td></td>
<td>Jestaun Jerál Kontratu nian</td>
<td>Preparasaun hosí Planu ida ba Jestaun Ambientál Fatin nian no ba Supervizaun</td>
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<td>Ekonómiku</td>
<td>Eskollia (hill) ba fatin ezistente Ateru nian, nu’udar projetu “brownfield” ida</td>
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<td></td>
<td>Rekursu Bee nian</td>
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<td>Introdusaun regras operasionais nian atu imediatamente falun lixu (taka ho rai) no evita sunu no poluisaun ár</td>
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<td></td>
<td>Mudansa Klimátika</td>
<td>Redusaun ba emisaun GHG liu hosí haforsa no apoia politikas no programas Resiklajen</td>
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<td>Dezeñu drenajen ne’ebé preparadu ba eventus/kondisoins estremas no aparellu ba redusaun velosidade bee nian no basias retensaun ba reutilizasaun bee nian</td>
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<td>Alterasaun iha morfolochi rai nian / Soil Lost</td>
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16.2.8.4.2  Rehabilita Infraestrutura Operasionál

1. Hadi’ak estrada asesu ba sélula sira (sélula 1 to’o 3);
2. Hadi’ak drenagen iha área ateru nian, iha ne’ebé:
   a) Sei rekolla no kanaliza udan-been ba iha debun revestidu dahuluk no karik nakonu ona, sei suli falli ba debun daruak nian besik área kompostajen nian, iha área ba apoiu ooperasionál nia laran.
   b) Udan-been akumuladu sei uza ba iha:
      • operaasua unidade kompostajen nian;
      • sirkula fila-fali ba iha ateru laran hodi ajuda aumenta kompaktasuaun no aselera dekompozisaun lixu nian;
      • deskarega ba iha li’ur, ba fatin besik unidade ezistente ba tratamentu bee fo’er DNSB nian
3. Kontrolu no seguransa ba asesu ba iha ateru (portaun seguransa, lutu no pesóal seguransa nian
4. Resesaun Lixu nian, kompletu ho ponte-báskula ida atu tetu lixu;
5. Edifisiu foun ba servisu administrativu no fatin estacionamento;
6. Áreas ooperasionais: armajén no ofisina
7. Kompostajen – Sei rekolla lixu verde separadamente hosí lixu munisípi sira seluk no sei halo kompostajen atu nune’é:
   a) aumenta vida útil ateru nian;
   b) reduz lixiviadu no gás iha ateru laran;
   c) produz kompostu orgániku ida ne’ebé seguru (produtu finál) ba jardín no fatin públiku sira seluk Munisípi nian.
8. Área Depot nian – sei prepara fatin depot nian rua ba estacionamento notumu hosí veikulus rekolla lixu nian, estrada asesu nian ida no estasaun ba abastesimentu combustível nian ida ho kapasidade 50,000L.

16.2.9  Oinsá mak ami avalia Impaktu Ambientál sira?

16.2.9.1  Halibur informasaun konaba fatin projetu nian

Dokumentu DIA nian fornese rezumu no deskrisaun delladdu ida konaba natureza hosí impaktus oioin (ba komponente fiziku, biolójiku no sosial) ne’ebé mak bele akontese durante implementasaun hosí kompenente ida-idak projetu TDRUP nian. Atu halo ida ne’e, ami rekolla tiha ona informasaun baseline nian (dadus primárius no sekundárius no revizaun bibliográfika) ne’ebé descreve kondisaun atuál sira hosí área estudu nian no kompara (halo estimativa) ho impaktus posíveis hosí situasaun propostu no asoins hosí implementasaun projetu nian. Atu hetan liutan informasaun detaladu hosí terenu, ami halo entrevista no diskusaun konaba projetu ne’e iha área Tibar, involve mós konsulta ho ema sira ne’ebé dala roma bele afetadu hosí projetu ne’e no partes interesadas seluk, nune’é mós hala’o ona konsulta públika ba Termus Referénsia (TOR) projetu nian iha fulan Julu 2020.

Rekollamentu ba dadus ambientais no sosiais ne’ebé mak konsultór AIA nian halo iha terenu (dadus primárius) mak hanesan tuirma ne’e:

   a) Rekursu Bee nia (superfisiál no subteráneo): rekolla amostra bee nian hosí fatin/pontus 8 (superfisiál 2, subteráneo 5 no bee-hemu nian 1).
   b) Solu (rai): rekolla hosí lixu nia okos amostra rai orijinál nian iha fatin 9 atu verifika nivel kontaminasaun.
   c) Ruídu: halo amostrajen iha pontus hamutuk 6 (industriál no residensiál).
   d) Komponente Sosiál: halo entrevista ba comunidade sira iha Aldeia Fatunia no Libaulelo ne’ebé afetadu hosí projetu ida ne’e nune’é mós ho autoridades munisipais no lokais no partes interesadas importantes
seluk iha Tibar. Ami mós aplika kestionáriu sensus nian ba ema afetadu sira i.e. katadór lixu no rejistu ba bens (asset), atu identifika ema sira ne’ebé mak sei ekonomikamente deslokadu hosi projeto ne’e no atu determina se mak elejível ba apoiu.

e) Komponente Kulturál: Inspesaun iha terenu liu hosí recolla fotografias konaba fatin arkeolójiku, istóriku no sagradu sira Tibar nian bazeia ba Autoridade Lokál sira nia koñesimentu, nune’e mós dadus hosí Sentru Nasionál CHEGA (SNC) no Sekretáriu Estadu ba Kultura (SEK).

16.2.9.2 Ami uza informasaun hirak ne’e hodi halo estimativa ba impaktus …

Avaliasaun ba impaktus hosí projeto ida nian mak rezultadu ida hosí komparasaun entre situausaun ambientál no sosial sira ne’ebé previzível ba futuru hosí implementasaun no auzénsia projeto nian (“Zero Alternative”). Ami iha koñesimentu (hatene) konaba impaktus jenéniku ne’ebé mak kwaliker projeto rehabilitasaun ateru ida bele kauza, hanesan aprezenta iha Table 16-1. Ba projeto ida ne’e, atu bele identifika no avalia impaktu relevante sira hotu, maka ami halo ona análizes ba fatór ambientál no sosial ida-idak, tuir kedas ho avaliasaun no previzaun ba impaktu SIGNIFIKATIVU sira bazeia ba deskrisaun hosí sira ninia efeitu no ba karaterizaun kualitativa ida.

16.2.10 Projetu ninia impaktu boot liu mak saida de’it?

Projetu ne’e prevé katak impaktus negativus ne’ebé aas liu dala ruma mai hosí reasentamentu ekonómiku i.e. perda rendimentu hosí katadores besik 100 no sira ninia membru familia besik 700, nune’e mós impaktu sira ne’ebé mak mai hosí konstrusaun sivil no operausaun hosí rehabilitasaun ateru nian hanesan, ruidu, rai-raahun, teraplenajens, produsun lixiviadu, jestaun tráfegu, nst. Maske nune’e, impaktu importante no pozitivu liu mak melloramentu ba kondisaun ambientál sira iha fatin ateru nian i.e. laiha tan ahi-su’ar, ne’ebé mak fó impaktu lor-loron ba komunidade sira iha Tibar, ka atividade sira ne’ebé ho risku saúde ne’ebé aas liu i.e. katadores lixu, no indiretamente had’ak kondisoins jerais iha sidade Díli, relativamente ho rekolla lixu nian no asei/limpeza ba benefisiu hosí ninia sidadaun sira.

16.2.10.1 Oinsá mak ami sei jere impaktu signifikativu sira?

Ami avalia thia ona impaktu signifikativu sira no define mós ona medidas mitigasaun no tau hamutuk iha iha Planu Jestaun Ambientál nian ida (PJA) (haree Volume 3 – Planu Jestaun Ambientál), ne’ebé mak sai hanesan dokumentu ida ne’ebé jere impaktu ambientál potensial sira hosí faze konstrusaun, dezenvolvimuneto no enseramentu. Objetívu hosí PJA mak atu komunika obrigasaun ambientál xave sira ne’ebé mak aplika ba empreiteiru xutu-hotu, sira ninia sub-empreiteiru no funsionáriu sira enkuantu halo hela atividade konstrusaun saida de’it n’udar parte ida hosí TDRUP. Ida ne’e sei sai hanesan referénsia prinsipál obrigasaun nian ba empreiteiru sira atu tuir durante faze dezeñu, konstrusaun no operausaun, no hatan ba kondisaun sira ne’ebé mak inkluidu ba iha PJA ne’ebé sei aneeka hamutuk ho Dokumentus Kontratu nian.

16.2.11 Oinsá mak ita bele partisipa iha faze AIA sira tuirmai?

a) Durante Konsulta Públika ba esbosu DIA/PJA: ami sei realiza Konsulta Públika seluk ida tan hodi halibur komentáriu no opiniaun sira konaba konteúdu DIA/PJA nian hosí parte interesada sira nomós hosí públiku;

b) Háhú hosí AGORA to’o iha finál Konsulta Públika daruaq nian: Sé de’it mak iha interesse lejitimu espesifikamente konaba konteúdu ToR no/kka DIA/PJA nian (bainhira dokumentu hira ne’e oficialmente públikadu ona) só bele hato’o sira ninia opiniaun ho FORMA ESKRITU DE’IT no haruka ba kontakto sira tuirmai ne’e:
Sr. António Lelo Taci, M.Sc, Sekretáriu Ezekutivu Interinu hosi ANLA  
**Enderesu:** Sekretaria Estadu ba Meiu Ambiente, Edificio Fomento, Mandarim, Dili Timor-Leste  
**Email:** infonael2019@gmail.com / Telefone: 77115444  
ho kópia (c.c.) ba:  

**Sra. Emiliana Soares**, Directora Ajênsia Planeamentu Urbanu Munisípiu Díli nian  
**Enderesu:** Autoridade Munisípiu Díli (AMD) – Avenida Mártires da Pátria, Vila Verde, Díli, Timor-Leste  
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Nomós kópia ba: consulta_publica@oasis-sustainable.com
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