Buffelsdraai Landfill Site Community Reforestation Project

Community, Climate and Biodiversity Standard Project Design Document

Prepared for:
The eThekwini Municipality
and
The Wildlands Conservation Trust

Prepared by:

The Cirrus Group
A Climate Change and Natural Resources Practice

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RATIONALE

The Wildlands Conservation Trust (WCT) is implementing a reforestation project located in the buffer zone of the Buffelsdraai landfill site on behalf of eThekwini Municipality. The Trust has requested the Cirrus Group to compile a Project Design Document (PDD) for submission to the Climate, Community and Biodiversity Alliance (CCBA). The CCBA Standard is the leading means of auditing the socio-economic and biodiversity aspects of land use based climate change mitigation activities. The document follows the latest version of the CCBA PDD (www.climate-standards.org).

PROJECT OVERVIEW

The Buffelsdraai Landfill Site Community Reforestation Project was initiated by the eThekwini Municipality and is aimed at offsetting a portion of the Greenhouse Gas emissions generated by hosting the FIFA 2010 World Cup™ in Durban.

As large portion of the 809 hectare (ha) Buffelsdraai Landfill Site buffer zone is currently under sugarcane cultivation, it was decided to halt farming and rehabilitate the sugarcane lands to their original forested state. This additional management intervention would increase the biodiversity of the site and lead to a net reduction in atmospheric GHG through the sequestration of carbon in biomass and soils. Furthermore, this will contribute towards achieving the objective of establishing a “Conservancy” over the active landfill site and its surrounding buffer zone, in accordance with the approved Terms of Reference for the Buffelsdraai Landfill Site.

The Municipality approached the Wildlands Conservation Trust to implement the reforestation project through the Trust’s well-established Indigenous Trees For Life Programme (ITFL) that is currently running in several parts of the province. The ITFL programme assists unemployed people known as “tree-preneurs”, to start small indigenous tree nurseries. The trees are then traded for goods at Tree Stores established by the Trust. In turn the Trust uses the trees to green neighbourhoods, or in this case, to rehabilitate degraded ecosystems. More than 600 people from surrounding impoverished communities have already participated in the ITFL programme and improved their living conditions in the process. Since inception in November 2008, the project has created a total of 247 jobs (21 full time, 6 part time, 220 temporary) for members of the surrounding communities. At regular intervals, mass planting drives are held, during which up to 60 members from the local communities are employed to assist with planting the trees out at the project site.

More than 500 ha of sugarcane lands are being planted in a phased approach with 61 locally occurring indigenous tree species. The intention is to establish a functioning, diverse, indigenous woodland that would sequester atmospheric carbon over time and enhance the ecosystem functioning of the landfill site buffer zone. The rehabilitation of the site is anticipated to contribute to the Municipality’s climate change protection program by preventing soil erosion and managing water flow and sedimentation.
GENERAL SECTION

G1. Original Conditions in the project area

G1.1 – General Information: The location of the project and basic physical parameters
The Buffelsdraai Landfill Site Community Reforestation Project is located approximately 25km north of Durban, in the province of KwaZulu-Natal, South Africa (Fig. 1). The project area of 520.6 ha is located in the buffer zone of the eThekwini Municipality owned Buffelsdraai landfill site. The site is located in an area used historically for sugarcane production with peri-urban communities occurring to the west, south and east.

Figure 1. A map indicating the location of the project site within the eThekwini Municipal Area boundary.
The annual rainfall in Verulam (the nearest town, located 5km east of the project site) is approximately 766mm per year with most of the rainfall occurring during the summer months. The highest monthly rainfall occurs in February where average monthly rainfall is approximately 108mm (Fig. 2). Average daily temperatures range from 22.2°C in the winter months to 27.4°C in February.

![Average rainfall (mm)](image1)
![Average midday temperature (°C)](image2)

Figure 2. Charts summarizing rainfall and temperature for the project area.

Geology in the study area is dominated by Dwyka Tillite deposited in a glacial environment by retreating ice sheets about 300 million years ago (Fig. 3). As Gondwana moved north towards the equator, thick clay and silt beds were laid down in a large sea that occupied the Karoo basin. These sediments now form shales of the Pietermaritzburg Formation that occupy the eastern sections of the study area. The shales are easily weathered and often present slope stability problems (http://www.geology.ukzn.ac.za/GEM/kzngeol/kzngeol.htm).

![Geological map of the project area](image3)

Figure 3. The basic geology of the project area.
The soils of the project area are highly variable, ranging from deep, well drained red Hutton soil forms to shallow, poorly drained Glenrosa soil forms (Water Research Commission, 1995). The topography of the site is also highly variable with a large stream, the Black Mhlasini, flowing through the northern section of the site and the White Mhlasini River flowing along the southern boundary. Between these rivers, the elevation of the site ranges from 200m up to 325m AMSL along the ridge lines.

G1.2 – General Information: The types and conditions of vegetation within the project area
The vegetation is broadly described as belonging to the KwaZulu-Natal Coastal Belt (Mucina and Rutherford, 2006). This vegetation type is highly transformed and fragmented in South Africa, with very little of the vegetation type under formal protection. It was therefore classified as Endangered in the recent vegetation map of South Africa (Mucina and Rutherford, 2006). Slightly finer-scale mapping has been undertaken by Ezemvelo KZN Wildlife, the provincial biodiversity authority in KwaZulu-Natal, that sub-divides the vegetation types into sub-types (Fig. 4). This analysis broadly classifies the project area as KwaZulu-Natal Coastal Belt Grassland (Fig. 4, Ezemvelo KZN Wildlife, 2010). KwaZulu-Natal Coastal Belt Grassland is a broad description for a vegetation type that is a mosaic of grassland, woodland and forest (Rob Scott-Shaw pers. comm.).

The vegetation within the project area varies considerably. Whereas the area that will be reforested has previously been used for the production of sugarcane, forest patches do occur along some south-facing slopes while remnants of riparian forest occur along many of the drainage lines. Some areas of indigenous woodland and grassland remain, but are highly restricted in their distribution (Fig. 4).

More than half of the 809 ha landfill buffer zone consists of areas used for the cultivation of sugarcane fields (47% actively used, 9% fallow) (Table 1). While the riparian vegetation is intact, the remaining woodland, forest and thicket patches are considered to be in poor condition (Table 1).

Many of the untransformed patches of vegetation have high levels of invasive alien plant infestation. Whereas these areas are outside of boundary of project area that is being reforested, they do fall within the greater buffer zone of the landfill site. A detailed description of the vegetation surrounding the sugar cane fields can be found in Macfarlane et al. (2011).

Only areas that have been under sugarcane cultivation will be reforested and strictly speaking the vegetation of the project area is therefore “cultivated land”. In addition, 63.9 ha of fallow sugarcane fields will be reforested. Some of the land has been infested by invasive alien plants and transitional weeds that are to be removed prior to reforestation. Under South African Law, land owners are legally obliged to remove such invasive alien plants irrespectively. The removal is therefore currently being undertaken by the eThekwini Municipality as the owner of the land concerned.

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1 Rob Scott-Shaw, Ezemvelo KZN Wildlife, P.O. Box 13053, Cascades, 3202, Pietermaritzburg, South Africa
Figure 4. A vegetation map of the buffer zone of the Buffelsdraai landfill site. Reforestation activities are concentrated on areas previously used for the cultivation of sugarcane.

Table 1. Summary of the extent of vegetation types in the Buffelsdraai landfill site buffer zone prior to rehabilitation activities (copied from Macfarlane et al. 2011, Appendix A). Only sugarcane, transitional weed and fallow lands will be reforested.

<table>
<thead>
<tr>
<th>Vegetation Type</th>
<th>Area (Ha)</th>
<th>Area (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sugarcane</td>
<td>377.1</td>
<td>46.6%</td>
</tr>
<tr>
<td>Woodland</td>
<td>95.7</td>
<td>11.8%</td>
</tr>
<tr>
<td>Riparian Forest</td>
<td>72.2</td>
<td>8.9%</td>
</tr>
<tr>
<td>Transitional Weed</td>
<td>67.2</td>
<td>8.3%</td>
</tr>
<tr>
<td>Fallow lands</td>
<td>76.3</td>
<td>9.4%</td>
</tr>
<tr>
<td>Thicket</td>
<td>63.4</td>
<td>7.8%</td>
</tr>
<tr>
<td>Indigenous Forest (non riparian)</td>
<td>33.6</td>
<td>4.2%</td>
</tr>
<tr>
<td>Grassland</td>
<td>3.5</td>
<td>0.4%</td>
</tr>
<tr>
<td>Maintained area</td>
<td>6.1</td>
<td>0.8%</td>
</tr>
<tr>
<td>Rural Settlement</td>
<td>10.6</td>
<td>1.3%</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>2.7</td>
<td>0.3%</td>
</tr>
<tr>
<td>Bareland</td>
<td>0.7</td>
<td>0.1%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>809.1</strong></td>
<td><strong>100.00%</strong></td>
</tr>
</tbody>
</table>
G1.3 – General Information: The boundaries of the project area and the project zone

The project area consists of the active and fallow sugar cane fields and the transitional weed areas within the Buffelsdraai landfill site buffer zone (Fig. 4). The land is owned by the eThekwini Municipality and management responsibility rests with Durban Solid Waste (a department of the eThekwini Municipality). The landfill site is approximately 116ha in size and the buffer zone 809ha. The project area is 520.6ha of the 809ha landfill buffer.

The project area is located between the towns of Verulam and Inanda, some 35km from the Durban city centre (Fig. 1). The landfill was constructed in 2006 to accommodate increasing quantities of waste produced from the northern suburbs of Durban, the new King Shaka Airport and the Dube Tradeport.

A large portion of the buffer zone has been leased to Tongaat-Hulett (a large commercial agricultural multi-national company), for the production of sugar cane and it is this portion of the buffer zone that will be reforested.

The greater project zone includes the urban and peri-urban residential areas of Buffelsdraai and Osindisweni (Fig 5). Residents from these three communities are participating in the tree growing projects and are employed for the re-planting and maintenance of the site. There are a small number of treepreneurs in the Ndwedwe settlement as well.

G1.4 – Climate information: current carbon stocks within the project area

An overview of the current land-use and associated carbon stocks in the project area

As described in Section G1.2, the greater Buffelsdraai Landfill Site buffer zone project area consists of a mosaic of different land use- and vegetation types. The only part of the greater project area that will be directly affected by the reforestation activity are those areas that are currently under sugarcane cultivation. The reforestation program will not directly affect the remaining area consisting of indigenous Riparian Forest, Thicket, Non-Riparian Forest, Grasslands and Infrastructure, and there is little reason to assume that the carbon stocks within these areas will change due to the implementation of the project (clarity on potential leakage is contained in Section CL 2.1). The assessment of current carbon stocks and changes in carbon stocks due to the project activity, therefore only consider changes in carbon pools in the area that is currently under sugarcane cultivation.

Considering sugarcane land

- Sugarcane lands are planted, burnt, harvested and cleared on an annual basis (SASRI 2010, pers comm. David Armstrong and Rennie Reddy, Tongaat Hulett).
- Although carbon accumulates and is temporarily stored in the biomass of sugarcane during the growing season, the aboveground component is released back into the atmosphere as the cane is burnt, harvested and processed each year.

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2 The area of the Buffelsdraai landfill site and its buffer zone was previously owned by Tongaat Hulett prior to purchase by the eThekwini Municipality to establish the landfill site.
Concerning the belowground component, studies on the affect of sugarcane farming on the size of the soil organic carbon pool indicate that there is negligible long-term sequestration of carbon in soils (Galdos et al. 2009). Long-term empirical studies over 61 years undertaken at the Mount Edgecombe sugar industry research unit located near the Buffelsdraai Landfill site (<5km), clearly indicate that the production of sugarcane with- or without- mineral fertilizer leads to a slight decrease in soil organic carbon over time (Galdos et al. 2009).

Under a baseline scenario there would therefore be no increase in either aboveground-, belowground- or soil organic carbon stocks over time.

A small portion of the sugarcane fields that have been left fallow over the past two years at the request of eThekwini Municipality in anticipation of the reforestation program (Table 1). Although transitional weeds are currently gradually infesting this fallow land, under a business-as-usual baseline scenario, the fallow fields would have been used for the production of the sugarcane. It is reasonable to assume that the total 520,6ha of sugarcane, transitional weed and fallow lands listed in Table 1 (G1.1) would remain sugarcane land in a ‘without-project’ scenario.

Considering each carbon pool in the project area

To estimate the current carbon stocks within the project area, the Intergovernmental Panel on Climate Change’s 2006 Guidelines for National GHG Inventories for Agriculture, Forestry and Other Land Use were used (IPCC 2006 GL for AFOLU) as well as calculations based on peer-reviewed literature.

The carbon pools that are located within the project site (the area currently under sugarcane cultivation), which are to be considered in the calculation of the change in atmospheric GHG concentrations due to the project activity include:

- **Aboveground woody biomass pool**
  The reforestation activity will lead to a significant increase in the size of aboveground woody biomass carbon pool. This pool will be monitored and reported on at 5-year intervals over the duration of the reforestation activity. A monitoring methodology will be submitted within six months.

- **Belowground woody root biomass pool**
  The belowground woody root biomass carbon pool will increase due through the reforestation activity. The size of the woody root biomass pool will be estimated using a root:shoot ratio of 0.28 (IPCC 2006, Chapter 4, Table 4.4).

- **Perennial cropland biomass pool – sugarcane** (‘perennial cropland’ – IPCC 2006)
  Sugarcane is a perennial, non-woody grass species. In accordance with the IPCC 2006 guidelines, the average size of this pool should be included when calculating the average change in biomass carbon stocks due to the shift in land-use from cropland to forest. Whereas the size of this pool is included in this initial calculation, it will not be monitored in the future after the start of the project activity. The IPCC 2006 Guidelines do not differentiate between above- and belowground biomass carbon pools in cropland and therefore these two pools are jointly considered here.

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Note that only the aboveground woody tree biomass pool will be monitored over the course of the project. A monitoring plan will be submitted within six months.

Carbon pools excluded from monitoring and the GHG emission reduction calculations:

- **Soil organic carbon**
  The production of sugarcane has a negligible effect on soil organic carbon stocks over time (Galdos et al. 2009). Although the reforestation activity is likely to lead to an increase in soil carbon stocks, it is viewed as too expensive to monitor relative to associated carbon revenues due to the size- and heterogeneity of area considered.

- **Herbaceous layer**
  Although some form of herbaceous layer will establish under the forest canopy and sequestrate atmospheric carbon dioxide during the reforestation process, the size of pool is likely to remain relatively small and will not warrant the cost of monitoring, reporting and verification.

- **Deadwood**
  In a similar manner to the herbaceous carbon pool, although some deadwood would accumulate during the reforestation process, the size of pool is likely to remain relatively small and not warrant the cost of monitoring, reporting and verification.

- **Litter layer**
  In a similar manner to the herbaceous and deadwood carbon pools, although a litter layer would accumulate during the reforestation process, the size of pool is likely to remain relatively small and not warrant the cost of monitoring, reporting and verification.

The current carbon stocks in each carbon pool in the project area

The project area is currently being used for the production of sugarcane and would therefore be classified as ‘cropland’ according to the IPCC 2006 guidelines. As sugarcane is a perennial grass species, in terms of its consideration according to the guidance provided in Section 5.2.1.1 of the IPCC 2006 Guidelines for AFOLU, we consider it a non-woody ‘perennial crop’ as the entire aboveground component is annually harvested in mid-June; rather than a ‘perennial woody crop’ such as coffee, fruit or nut orchards, where only a small fraction of the plant is harvested and the woody biomass component of the plant remains on site from year to year. Whereas there is a temporary increase in the size of the aboveground carbon pool during the growing season, the carbon sequestered in the pool is released back into the atmosphere at the end of the growing season through burning, harvesting, processing and clearing processes.

The default Tier 1 IPCC 2006 biomass carbon stock value for perennial cropland located in dry, tropical areas is 1.8 tC.ha^{-1} (the project site would be classified as a dry, tropical area as the mean annual precipitation is less than 1000mm, Figure 3A.5.2 IPCC 2006, also see IPCC 2006, Table 5.9 below).
As only 80% of the 520ha is farmed each year (416 ha), the biomass carbon stock for the project area can be estimated as:

\[ 416 \text{ ha} \times 1.8 \text{ tC.ha}^{-1} = 748.8 \text{ tC} \]

or

\[ 1.44 \text{ tC.ha}^{-1} \text{ across the full 520ha} \]

In addition to the default IPCC 2006 biomass carbon stock value estimation, a further calculation was made based on local input data and peer-reviewed publications. The calculation is based on the assumptions listed in the table below.

An average of 45 tons of sugarcane is produced per hectare per year. Each ton of burnt and cropped sugarcane, yields 740kg of liquid (sugarcane juice) and 260kg of moist bagasse (or 130kg of dry bagasse, Gupta and Demirbas 2010, Table 2 below). As dry bagasse is 42.26% carbon, the carbon stock per hectare at the end of the growing season is:

\[ 45 \text{ tons Cane.ha}^{-1}.yr^{-1} \times 0.13 \text{ (dry bagasse fraction)} \times 0.4226 \text{ (carbon content)} = 2.47 \text{ tC.ha}^{-1} \]

However, this is the size of the carbon pool at the end of the growing season, not the average size of the biomass carbon stock through the year. According to the IPCC 2006 guidelines, the average size of the carbon pool over time should be calculated including the net effect of burning and harvesting. For calculation purposes, if sugarcane is assumed to start growing shortly after harvest and have a linear rate of growth through the year, it can be assumed that the average size of the biomass carbon pool over the period of a year is approximately half of the carbon stock at the end of the growing season. Hence, the average size of the biomass carbon pool for considered sugarcane fields would be:

\[ 2.47 \text{ tC.ha}^{-1} \times 0.5 = 1.23 \text{ tC.ha}^{-1} \]

Again, as only 80% of the 520ha is farmed each year (416 ha), the biomass carbon stock for the project area can be estimated as:

\[ 416 \text{ ha} \times 1.23 \text{ tC.ha}^{-1} = 511.7 \text{ tC} \]

or

\[ 0.98 \text{ tC.ha}^{-1} \text{ across the full 520ha} \]
This calculation however, only includes the aboveground or ‘shoot’ part of the plant. If one assumes that 18% of plant biomass is located in the roots of sugarcane (Smith et al. 2005\(^5\)), the total (root + shoot) biomass carbon stock in the project area is estimated to be:

\[
0.98 + 0.21 \text{ (root component)} = 1.19 \text{ tC.ha}^{-1}
\]

As this estimated carbon stock value is based on more site-specific data and conversion ratios compared to the IPCC 2006 guideline figures, it shall be used in the carbon stock changes calculation below in Section G2.3.

**Table 2:** Input data and conversion ratios used to calculate the average biomass carbon pool currently present in the project area.

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
<th>Metric</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total area under sugarcane</td>
<td>520</td>
<td>ha</td>
<td>eThekwini Municipality</td>
</tr>
<tr>
<td>Area farmed each year</td>
<td>80</td>
<td>%</td>
<td>eThekwini Municipality</td>
</tr>
<tr>
<td>Area left out of production each year</td>
<td>10</td>
<td>%</td>
<td>eThekwini Municipality</td>
</tr>
<tr>
<td>Area replanted each year</td>
<td>10</td>
<td>%</td>
<td>eThekwini Municipality</td>
</tr>
<tr>
<td>Actual area farmed each year</td>
<td>416</td>
<td>ha</td>
<td>eThekwini Municipality</td>
</tr>
<tr>
<td>Average production of cropped sugarcane</td>
<td>45</td>
<td>t/ha.yr</td>
<td>Tongaat Hulett</td>
</tr>
<tr>
<td>Dry bagasse fraction per cropped ton of cane</td>
<td>0.13</td>
<td>kg/t</td>
<td>Gupta and Demirbas 2010*</td>
</tr>
<tr>
<td>Carbon content of dry bagasse</td>
<td>42.26</td>
<td>%</td>
<td>de Figueriredo et al 2010**</td>
</tr>
<tr>
<td>Root : shoot ratio</td>
<td>0.21</td>
<td>%</td>
<td>Smith et al. 2005***</td>
</tr>
</tbody>
</table>


Figure 5. A map indicating the project area and the project zone of the Buffelsdraai Landfill Site Community Reforestation Project.

G1.5 – Community Information: A description of communities located in the project zone
The Buffelsdraai Landfill Site Community Reforestation Project is located within eThekwini Municipality, in the province of KwaZulu-Natal, which contains eleven district municipalities as shown in Fig. 5.
Population estimates for 2010 indicate that KwaZulu-Natal (KZN) is home to 21% of the country’s total population of over 49.9 million. It is the second most productive province in terms of economic output but there are severe inequalities in income distribution: 54.3% of its population live below the national poverty line\(^6\) which is slightly higher than the country’s average of almost 50%. The unemployment rate for KZN is 22.7%, which is roughly in line with the national average of 24% (Pauw, 2005). The economic situation is aggravated by the HIV and AIDS pandemic. Recent estimates indicate that 26.4% of KZN’s working-age population is HIV-positive, compared to 15.9 percent in the rest of the country (Matthews et al. 2008).

\(^6\) Various absolute and relative poverty lines are used in South Africa. This assessment has considered Elsenburg’s absolute poverty line and adjusted to 2010 current prices. The resulting absolute poverty line for 2010 is R 8 845 income per person per annum. Elsenburg: A profile of KwaZulu-Natal: Demographics, poverty, inequality and unemployment, 2005 pg. 8.

eThekwini is a municipality of great contrasts with regards to demography, geography and economy. The Buffelsdraai Landfill Site Community Reforestation Project is active in one ward (ward 59) of the eThekwini Municipal Area, and specifically two communities within this ward, namely; Buffelsdraai and Osindisweni.

Despite being one of the smallest municipalities in terms of spatial area, eThekwini houses almost one third of the province’s total population. Durban is its main urban centre and one of the five major cities in South Africa in terms of contribution to the overall GDP. The wealth concentrated in...
the city of Durban explains the fact that overall, the municipality has the lowest municipal poverty rate in KZN, with only 25% of its population living below the national poverty line (as compared to the provincial average of 54%). Population figures and demographic spread is summarised in Table 3.

Table 3. Population figures and demographic spread for the eThekwini Municipality and KwaZulu-Natal 2010.

<table>
<thead>
<tr>
<th></th>
<th>Black</th>
<th>Coloured</th>
<th>Asian</th>
<th>White</th>
<th>Total</th>
<th>% of KZN population</th>
</tr>
</thead>
<tbody>
<tr>
<td>eThekwini</td>
<td>1 760 335</td>
<td>139 716</td>
<td>667 777</td>
<td>358 822</td>
<td>2 926 650</td>
<td>32.6%</td>
</tr>
<tr>
<td>Total KZN</td>
<td>7 457 345</td>
<td>177 113</td>
<td>809 052</td>
<td>547 596</td>
<td>8 991 109</td>
<td></td>
</tr>
<tr>
<td>Percentage of race group per total KZN population</td>
<td>82.9%</td>
<td>2%</td>
<td>9%</td>
<td>6.1%</td>
<td>32.6%</td>
<td></td>
</tr>
</tbody>
</table>

Whilst the Black population is dominant, in line with overall provincial trends, every demographic group is well represented within the municipality.

This diversity however, is not equally spread across the municipality, a great majority of Asian and White populations are concentrated around the urban centre of Durban. The conventional urban/rural divide is thus also a racial divide within the province.

Another important fact to note is that there is virtually no poverty among the White population whilst 64.4% of the Black population within the province lives below the national poverty line.

The average per capita income of the people of KwaZulu-Natal (R10, 824) does not compare badly to the average per capita income of South Africa (R12, 411), however, the income distribution in KwaZulu-Natal is a lot less equal (Figure 5). In eThekwini, this is particularly the case because the city of Durban has a much higher per capita income compared to that of the outlying areas such as Buffelsdraai. So even though the municipality as a whole has a lower overall poverty rate than other areas, specific areas such as Buffelsdraai, still experience high rates of unemployment and poverty (Pauw, 2005).
Figure 5. Difference in poverty rates among rural and urban populations within KwaZulu-Natal (Pauw, 2005).

As can be seen from the graph, poverty is much more prevalent in rural areas (Fig. 5). The communities involved in and benefitting from the Buffelsdraai Landfill Site Community Reforestation Project are located in peri-urban areas (in between urban and rural areas) with large African populations. The research presented above directly points to the existence of high levels of poverty within the project communities.

The property within which the project area lies is owned by the project proponent, the eThekwini Municipality, and no indigenous peoples or communities are present within the project area.

With regard to governance structures, KwaZulu-Natal is one of the provinces in South Africa where traditional leadership is most influential. Traditional leadership structures are a recognised constituency in the Constitution. They have a specific mandate with respect to communal land ownership and management and therefore have an important role to play in most initiatives involving land use in peri-urban and rural areas where communal land ownership is most prevalent. In the context of the project communities, the role of traditional leadership is considered through ongoing consultation with local government and community representatives.

Table 3 shows a summary of key demographic figures for the communities of the project zone. As previously stated, the eThekwini Municipal Area as a whole has a lower overall poverty rate as compared with other areas in the province; however, specific areas such as the project communities, still experience high rates of unemployment and poverty (Table 3).

Buffelsdraai and Osindisweni are peri-urban areas (in between urban and rural areas and lie on the outskirts of Durban. The research shows the existence of substantial levels of poverty within the project communities.
Table 3. Demographics of the Buffelsdraai Community Tree planting project zone communities namely Buffelsdraai and Osindisweni (copied from Appendix B).

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Buffelsdraai</th>
<th>Osindisweni</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Population</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3,123</td>
<td>2,365</td>
</tr>
<tr>
<td>Black</td>
<td>2,933 (91%)</td>
<td>2,293 (97%)</td>
</tr>
<tr>
<td>Coloured</td>
<td>15 (0.6%)</td>
<td>9 (0.2%)</td>
</tr>
<tr>
<td>Indian</td>
<td>257 (8%)</td>
<td>46 (2%)</td>
</tr>
<tr>
<td>White</td>
<td>8 (0.3%)</td>
<td>17 (0.8%)</td>
</tr>
<tr>
<td>Female</td>
<td>1,639 (51%)</td>
<td>1,380 (58%)</td>
</tr>
<tr>
<td>Male</td>
<td>1,574 (49%)</td>
<td>988 (42%)</td>
</tr>
<tr>
<td>Disabled</td>
<td>161 (5%)</td>
<td>168 (7%)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-14 years</td>
<td>601 (19%)</td>
<td>531 (22%)</td>
</tr>
<tr>
<td>15-34 years</td>
<td>1,338 (42%)</td>
<td>1,039 (44%)</td>
</tr>
<tr>
<td>35-64 years</td>
<td>817 (25%)</td>
<td>466 (20%)</td>
</tr>
<tr>
<td>&gt; 65 years</td>
<td>106 (3%)</td>
<td>114 (5%)</td>
</tr>
<tr>
<td><strong>Employment Status (15 to 65 years):</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>868 (27%)</td>
<td>368 (16%)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>477 (15%)</td>
<td>476 (20%)</td>
</tr>
<tr>
<td>Not economically active</td>
<td>815 (25%)</td>
<td>673 (28%)</td>
</tr>
<tr>
<td><strong>Literacy Rate (&gt; Grade 7):</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1,178 (37%)</td>
<td>1,324 (56%)</td>
</tr>
<tr>
<td><strong>Dependency Ratio:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4:1</td>
<td>6:1</td>
</tr>
<tr>
<td><strong>Household income per household per annum:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No income</td>
<td>257 (27%)</td>
<td>94 (24%)</td>
</tr>
<tr>
<td>R1 – R4 800</td>
<td>113 (12%)</td>
<td>21 (5%)</td>
</tr>
<tr>
<td>R4 801 – R9 600</td>
<td>189 (20%)</td>
<td>72 (18%)</td>
</tr>
<tr>
<td>R9 601 – R19 200</td>
<td>217 (23%)</td>
<td>80 (20%)</td>
</tr>
<tr>
<td>R19 201 – R38 400</td>
<td>119 (12%)</td>
<td>64 (16%)</td>
</tr>
<tr>
<td>R38 401</td>
<td>61 (6%)</td>
<td>55 (14%)</td>
</tr>
</tbody>
</table>

Source: www.durban.gov/durban/wardCatalog/index_html

Figure 6. Informal settlements in eThekweni peri-urban area (Source: South African Cities Network 2010)
Despite eThekweni Municipality overall having lower poverty levels compared to other areas in the province, the communities in the project zone are at the lower end of the scale with high levels of unemployment and poverty (Figure 5). Living conditions experienced by the project communities can be illustrated by looking at the availability of basic services; out of a total of 6,309 households, over 10% of them do not have access to refuse disposal and almost 20% of those do not have access to running water within their dwelling. Lack of public service delivery is more prominent in specific areas, like Buffelsdraai, where a total of 64% of households have refuse disposal and as little as 17% of households have water within their dwelling. This also speaks to the predominance of informal and traditional dwellings in this particular community. Informal shelters, often as small as 6m² and made of tin (Figure 6), are a common feature of the South African urban landscape: one out of three people who live in an urban environment, does not have formal shelter. In terms of public infrastructure, Buffelsdraai also scores behind if compared with its population size. This community has only 1 school, while Osindisweni has 2 schools and 1 community hall.

According to municipal statistics there are: 953 households in Buffelsdraai, 42% of which are formal dwellings; and 396 households in Osindisweni, 75% of which are formal dwellings, the rest of the dwellings are traditional or informal.

The area in which the project communities are based is a striking example of polarisation of living standards based on location and population group. Even though the three communities this study focuses on are situated in one of the productive and economic hubs in the province, they are still characterised by low income profiles, exclusion from productive economic activity and high dependency ratios. Interventions such as the Buffelsdraai Landfill Site Community Reforestation Project and the Wildlands Conservation Trust tree-preneur programme are important in helping to alleviate some of the effects that poverty has on communities such as these.

G1.6 – Current land use and customary and legal property rights

The property is owned by the project proponent, the eThekweni Municipality (see Appendix C, attachment A). A portion of the property is still leased to the previous owner, Tongaat Hulett, to continue with their sugarcane operations. Farming is however being phased out as the reforestation project is rolled out and will come to an end when the lease expires (see Appendix C, attachments B and C, for the notice period).

Buffelsdraai and Osindisweni are rural townships and land-use can be described as residential. There are no land claims on the property or unresolved property disputes within the project area. Although South Africa is in the process of implementing a land reform process there are no land redistribution issues within the project area. Moreover, the area has been settled for a long time.

Land within Buffelsdraai is privately owned, as is a portion of Osindisweni. The north eastern portion of Osindisweni is on communal land.

7 www.durban.gov.durban/wardCatalog/index_html
G1.7 – Biodiversity Information: A description of current biodiversity within the project zone

Eco-Pulse Environmental Consultants undertook a comprehensive study of the biodiversity within the buffer zone of the Buffelsdraai landfill site (Appendix A). The woodlands within the buffer zone typically have a canopy height of between 8-12m, ranging from sparse woodlands to dense thicket. A total of 54 indigenous tree species were recorded within the buffer zone (Appendix A). In the various forest and woodland types Xylotheca kraussiana, Syzigium cordatum and Combretum molle have the highest importance values. The project area, specifically sugar cane lands, have no indigenous tree species present.

Approximately 4.8% of the untransformed areas in the buffer zone have high levels of invasive alien plant infestation, which if not controlled, is considered a significant threat to the biodiversity of the project area (Appendix A). Almost 25% of the total buffer zone is considered to have high levels of invasive alien plant infestation by species such as Chromalena odorata, Lantana camara, Eucalyptus spp., Arundo donax, Melia azedarach, Mango spp., Psidium guajava, Solanum mauritanium and Ricinus communis.

Nine bird species were encountered in the sugarcane lands compared to 80 species in surrounding forests and woodlands. The nine species were mostly grassland species that are capable of adjusting to sugarcane and fallow fields (Appendix A). Both the sugarcane and surrounding habitats have few rodent species (five in total). This is not unusual for the broader coastal habitat type.

Ten amphibian species occur on the site. Most are wide ranging, common species that were found close to the riparian zones or small wetlands. Wahlberg’s Snake-eyed Skink (Afroblepharus wahlbergii) occurs in the sugar cane, but is a wide-ranging species that will most likely also be found in other habitats on the site. Only two other reptile species were recorded in the existing woodlands, namely Southern Vine Snake (Thelotornis capensis) and the Variable Skink (Trachylepis varia).

In a similar manner to other taxa, sugarcane and fallow lands had few invertebrate species present. Only one millipede species is unique to sugarcane while the remaining species are also found in other habitats within the project area. In contrast, the existing woodland and forest habitats have high numbers of millipedes and molluscs, with up to 20 species recorded in the south facing forests (Appendix A).

G1.8 – Biodiversity Information: Areas of High Conservation Value

Appendix A provides a detailed description of areas of high conservation value within the project zone which is summarised in Table 4. A Minset map (Fig. 8) was obtained from Ezemvelo KZN Wildlife (the provincial conservation body mandated with the protection of the province’s biodiversity) that indicated that large parts of the project zone have a mandatory conservation status. In addition, the previous conservation plan for the region listed the project area as irreplaceable in its entirety, although the classification could potentially be erroneous or at a too coarse scale as it is categorised as North Coast Grassland. KwaZulu-Natal Coastal Forest (Endangered) and Eastern Scarp Forests: Southern Coastal Scarp Forest (Vulnerable) patches occur within the project zone.
Figure 7. Minset map indicating areas requiring protection (Ezemvelo KZN Wildlife Systematic Conservation Plan, 2010).

Data from the Ezemvelo KZN Wildlife database furthermore lists 11 vertebrate, one bird and 10 plant species as well as 5 vegetation types of high conservation value that could possibly occur in the project zone, which emphasises the importance of rehabilitating the area (Table 4). Several of the species are also listed under the National Environmental Management: Biodiversity Act (no. 10 of 2004) (NEMBA) and are endemic to the province (Table 4). Reforestation of the area will thus provide new suitable habitat for a host of endemic rare species in a region where much of the indigenous forest vegetation has been transformed.

Table 4 List of important biodiversity features potentially occurring in the project area and surrounding project zone. The list was obtained from the Ezemvelo KZN Wildlife database (Table from Appendix A).

<table>
<thead>
<tr>
<th>Taxa</th>
<th>Scientific Name</th>
<th>English Name</th>
<th>National IUCN listing</th>
<th>NEMBA Status</th>
<th>Endemism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bird</td>
<td>Gyps africanus</td>
<td>White-backed Vulture</td>
<td>Near Threatened</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Invertebrates</td>
<td>Centrobolus anulatus</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Endemic to KZN</td>
</tr>
<tr>
<td>Invertebrates</td>
<td>Cochlitoma semidecussata</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Endemic to KZN</td>
</tr>
<tr>
<td>Invertebrates</td>
<td>Doratagonus cristulatus</td>
<td>Cristulate black millipede</td>
<td>Least Concern</td>
<td>Endemic to KZN</td>
<td></td>
</tr>
<tr>
<td>Invertebrates</td>
<td>Doratagonus falcatus</td>
<td>-</td>
<td>Least Concern</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Invertebrates</td>
<td>Doratagonus natalensis</td>
<td>Natal Black Millipede</td>
<td>Vulnerable</td>
<td></td>
<td>Endemic to KZN</td>
</tr>
<tr>
<td>Invertebrates</td>
<td>Doratagonus peregrinus</td>
<td>Wandering black millipede</td>
<td>Not evaluated</td>
<td>Not evaluated</td>
<td>Endemic to KZN</td>
</tr>
<tr>
<td>Invertebrates</td>
<td>Doratagonus rubipodus</td>
<td>Ruby-legged Black Millipede</td>
<td>Endangered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Invertebrates</td>
<td>Edouardia conulus</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Invertebrates</td>
<td>Euonyma lymnaeaeformis</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Endemic to KZN
Table 5 summarises the conservation value of the landfill buffer area. No IUCN red listed species were found within the project area, but there is a chance that they might occur within the remainder of the landfill buffer (Table 4). The area in general is considered to be of critical conservation importance by the local authorities and conserving and rehabilitating it will thus make a significant contribution to the maintenance of the critically endangered North Coast Grassland vegetation type (Table 5).

<table>
<thead>
<tr>
<th>Value 1</th>
<th>Globally, regionally or nationally significant concentrations of biodiversity values</th>
<th>Criteria met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protected areas</td>
<td>No legally protected areas occur within the project area. It is however worth noting that the long-term intention is to have the area managed as a “conservancy” defined as “The voluntary co-operative environmental management of an area by its community and users”.</td>
<td>No</td>
</tr>
<tr>
<td>Threatened species</td>
<td>While a range of threatened species are predicted to occur within the project area, no species formally included on the IUCN Red List have been identified during baseline surveys undertaken on the site. Two Near Threatened bird species were recorded however. In addition, four of the mollusc species (Coclitoma semidecussata, Gulella dunkeri, Gulella natalensis and Euonyma natalensis) which are restricted to coastal forest / coastal and scarp forest habitats have had the extent of their occurrence and occupancy reduced through development and habitat degradation and they would meet the criteria for a classification of at least Vulnerable.</td>
<td>Possible</td>
</tr>
<tr>
<td>Endemic species</td>
<td>Five millipede and six mollusc species endemic to KwaZulu-Natal were recorded from the</td>
<td>Possible</td>
</tr>
</tbody>
</table>
project area. Several of these species are confined to the coastal area, or the coast and Midlands area of the province. From a bird species perspective, the Knysna Turaco and Cape White eye are endemic to South Africa, but are relatively common species. From a herpetological perspective, the Bush Squeaker and Natal Tree Frog are near –endemics to KwaZulu-Natal province. Despite this diversity of endemic species, this area is not regarded as a particularly important area for endemism.

**Significant concentration of species during part of their life cycle**

| Value 2 | Globally, regionally or nationally significant large landscape-level areas where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance | No |

The project area occurs within a highly transformed landscape. As a result, natural patterns of distribution and abundance have been significantly disrupted in the area.

**Value 3**

| Threatened or rare ecosystems | Yes |

The Department of Environmental Affairs and Tourism (DEAT) recently requested the South African National Biodiversity Institute (SANBI) to assist in the process of listing threatened or protected ecosystems. Preliminary outcomes are available (SANBI & DEAT. 2009) and classifies Durban Metropole North Coast Grassland, in which the site is located is a Critically Endangered vegetation type. This is in response to estimates that suggest that only 4% of the natural ecosystem still remains. Within this vegetation type, patches of KwaZulu-Natal Coastal Forest (Endangered) and Eastern Scarp Forests: Southern Coastal Scarp Forest (Vulnerable) also occur. A number of these forest patches occur in the project zone. Despite the presence of fragments of threatened vegetation types, it should be noted that better examples of such areas do occur outside of the project zone.

**Value 4**

| Areas that provide critical ecosystem services (e.g., hydrological services, erosion control, fire control) | No |

A number of indigenous forest patches are present within the project zone. These areas certainly help to control erosion and act as useful natural firebreaks. These services are not regarded as critical at the regional or national level however.

**Value 5**

| Areas that are fundamental for meeting the basic needs of local communities (e.g., for essential food, fuel, fodder, medicines or building materials without readily available alternatives) | No |

The site is located within a peri-urban landscape where subsistence use of natural products is still likely to be an important part of livelihood support. Areas within the project zone were previously owned by commercial farmers, who considerably restricted use of untransformed areas. Given the context and availability of alternatives for most community members, the area is not regarded as fundamental in meeting basic needs of local communities.

**Value 6**

| Areas that are critical for the traditional cultural identity of communities (e.g., areas of cultural, ecological, economic or religious significance identified in collaboration with the communities) | Unlikely |

The project area is not of critical cultural importance to any of the communities living within the project zone.

### G2. Baseline Projections

**G2.1 – The most likely land-use in the absence of the project activity**

The project area is currently a commercial sugarcane plantation and has been used as such since 1934. The eThekwini Municipality currently gains an income by renting the land to Tongaat Hulett for the cultivation of sugarcane. There is no legislation that obliges the project proponent (eThekwini Municipality) to change the current land-use to another form. Existing legislation and permits for the landfill site limits land-use practices in the project area to agricultural activities or open space based land uses. Due to the proximity of the project area to the landfill site, there is no reason to assume that the legislated permitted land use type for the project area would be changed to an alternative land-use such as a residential, retail or recreational zone.

The baseline ‘business-as-usual’ land-use scenario would therefore be the continued cultivation of the project area as per the existing lease between Tongaat Hulett and the eThekwini Municipality (Appendix C). Such sugarcane cultivation activities would result in GHG emissions generated through the preparation of the land, planting, the application of fertilizers and herbicides, pre-harvest burning, transport and machinery used in the process of delivering the cane to the mill.

**G2.2 – Additionality**
Alternative Land Use Scenarios: The project site falls within the buffer zone of a landfill site and there is clear legislation that limits land use practices within the buffer zone to agricultural activities. There is currently no legislation that obliges the eThekwini Municipality to restore the land to its original state, other than keeping it clear of invasive alien plant species.

Commercial sugarcane farming is a common and financially viable land-use practice in the area. Although the actual sugarcane crop can be considered neutral in terms of the net change in biomass carbon stocks over a year (the crop grows but is harvested and cleared each year), the farming operations do lead to the generation of GHG emissions. The baseline “business-as-usual” scenario with regard to GHG emissions, will include emissions from sugarcane planting, fertilization, pest control and harvesting. GHG emissions are also generated through the sugar milling and sugar by-product production process, but to be conservative, the scope boundary of the GHG emissions calculation has been set at the point of delivery of the sugarcane at the gate of the mill.

Investment Analysis: There is very little opportunity for the project to generate any financial benefits other than income from carbon markets. It is also financially more lucrative for eThekwini Municipality to lease out the land to Tongaat Hulett than to restore it to an indigenous forest state. Appendix C is a copy of the lease agreement between the municipality and Tongaat Hulett indicating the revenues received through the lease of the land for the cultivation of sugarcane.

Barrier Analysis: There is no need to perform barrier analysis as the project is not generating any income other than that from the carbon markets.

Common Practice Analysis: The project proponent is not aware of any indigenous reforestation project in South Africa that has been or is currently being undertaken for commercial gains other than those generated through the carbon markets. There are no indigenous forests in South Africa that are harvested on a large scale for commercial timber or other products.

G2.3 - Carbon Stock Changes

In terms of the land-use class and carbon pools considered in the calculation of carbon stock changes and GHG emissions associated with a “without project” baseline reference scenario; as described in Section G1.4, the only part of the greater project area that will be directly affected by the reforestation activity are those areas that are currently under sugarcane cultivation which is considered as ‘perennial cropland’ as per the guidance provided in Section 5.2.1.1 of the IPCC 2006 Guidelines.

Regarding the carbon pools concerned; as described in Section G1.4, the production of sugarcane does not lead to a significant change in the soil organic carbon pool or the belowground root biomass carbon pool over time (Galdos et al. 2009) and therefore they are not included in the calculation of changes in carbon stocks here.

Only changes in the aboveground woody, aboveground non-woody (sugarcane) and belowground woody carbon pools shall be considered when calculating the net effect of the project activity on atmospheric GHG concentrations. But as the size of the above- and below-ground woody carbon pools are currently zero and will only come into existence with the reforestation activity, they are
also not considered in the estimation of carbon stock changes under a baseline “without project” scenario.

Therefore, to calculate carbon stock changes and GHG emissions associated with a “without project” baseline reference scenario using Equation 2.3 of the IPCC 2006 Guidelines (copied in below); only the potential change in perennial cropland biomass carbon pool (sugarcane) is considered as well as GHG emissions generated through fire, harvesting and land preparation.

\[
\Delta C_{LU} = \Delta C_{AB} + \Delta C_{BB} + \Delta C_{DW} + \Delta C_{LI} + \Delta C_{SO} + \Delta C_{HWP}
\]

\text{Where:}

- \( \Delta C_{LU} \) = carbon stock changes for a stratum of a land-use category
- Subscripts denote the following carbon pools:
  - AB = above-ground biomass
  - BB = below-ground biomass
  - DW = deadwood
  - LI = litter
  - SO = soils
  - HWP = harvested wood products

\text{Considering the potential change in the perennial cropland biomass carbon pool}

In the absence of the proposed project, the land will remain under sugar cane cultivation. The net change in the carbon pool located in the biomass of a sugar cane crop over a year is considered to be zero, as it is burnt, harvested and the land is cleared at the end of each growing season.

As stated in Section 5.2.1.1 of IPCC 2006 Guidelines:

“\text{The change in biomass is only estimated for perennial woody crops. For annual crops, increase in biomass stocks in a single year is assumed equal to biomass losses from harvest and mortality in that same year - thus there is no net accumulation of biomass carbon stocks.}”

Fallow sugarcane fields that are currently weed infested, would be cleared prior to replanting and would thus be removed regardless of the reforestation project.

\text{Greenhouse gas emissions due to harvesting and management operations}

Sugar cane production requires a substantial amount of mechanised land preparation, portions of the cultivated area have to be re-planted annually and synthetic fertilizers are applied to the land. The harvested crop is then transported to the sugar mill. The fuel and fertiliser requirements listed below and in Table 6 were obtained from the Sugarcane Research Institute (SASRI 2010) and Tongaat Hulett (David Armstrong pers. comm.).

The sugarcane production system followed at present is as follows:

---

8 Mr David Armstrong, Tongaat Hulett, Amanzimnyama Hill Road, Tongaat, KwaZulu-Natal, P O Box 3, Tongaat 4400, South Africa
• The total area that is or recently was under sugarcane is 520.6 ha
• A minimum tillage system is followed
• 80% of the total area is harvested annually and synthetic fertilizer applied
• 10% of the total area is re-planted annually using minimum tillage, this process includes the application of herbicides and synthetic fertilizers of which herbicides on average contain 30% active ingredients and fertilizer 28%.
• 10% of the total area is left out of production
• 60% of the harvested area is burnt annually and the tops are windrowed before harvesting
• 40% of the harvested area is pre-treaded by thrash blanketing because they are too close to residential areas or the landfill-site to be burnt, this is done by hand and does not result in GHG emissions.
• The harvested crop is first transported to a haulage point 1km away from the cultivation area in a 6t vehicle.
• From the haulage point the crop is transferred to a 30t transporter and taken to the mill, which is located 24km away.
• The site produces on average 45 tons of sugarcane per hectare per year.

The calculation of the annual GHG emissions generated through the various land-preparation and harvesting activities is included in Table 6 below. The conversion ratios listed in Lal (2004), Carbon Trust (2010) and DEFRA (2010) where used to calculate GHG emissions due to each activity. These conversion ratios were chosen in preference to the IPCC 2006 ratios following comprehensive review, as they are more up to date and more applicable to South African agricultural activities. (This set of conversion ratios is used by the South African Fruit and Wine Industry Climate Change initiative: http://www.climatefruitandwine.co.za/ - which following the peer-review of the conversion ratio set in 2010, reviews the ratios annually)
Table 6. Baseline greenhouse gas emissions from the cultivation of 520.6 ha for the production of sugarcane at Buffelsdraai, KwaZulu-Natal, South Africa.

<table>
<thead>
<tr>
<th>Category</th>
<th>Activity</th>
<th>Measurement Unit</th>
<th>Consumption per unit</th>
<th>Application area/Distance</th>
<th>Total Consumption</th>
<th>Emissions Source</th>
<th>Emissions factor</th>
<th>Total tCO₂e/yr</th>
<th>Total tCO₂e 20 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fossil fuels</td>
<td>Minimum tillage fuel use replanting 10% of area annually (includes hoeing and fertilizer application)</td>
<td>l/ha</td>
<td>15 l</td>
<td>52.1 ha</td>
<td>780.9 l</td>
<td>Diesel</td>
<td>2.67 kgCO₂/l fuel</td>
<td>2.1</td>
<td>41.7</td>
</tr>
<tr>
<td>Fossil fuels</td>
<td>Total fuel consumption to transport entire crop from haulage point to mill (18741.6t crop transported in 30t loads 48km at a time)</td>
<td>km/l</td>
<td>5 l</td>
<td>29986.6 km</td>
<td>5997.3 l</td>
<td>Diesel</td>
<td>2.67 kgCO₂/l fuel</td>
<td>16.0</td>
<td>320.5</td>
</tr>
<tr>
<td>Fossil fuels</td>
<td>Total fuel consumption to transport entire crop haulage point (18741.6t crop transported in 6t loads 2km at a time)</td>
<td>km/l</td>
<td>5 l</td>
<td>6247.2 km</td>
<td>1249.4 l</td>
<td>Diesel</td>
<td>2.67 kgCO₂/l fuel</td>
<td>3.3</td>
<td>66.8</td>
</tr>
<tr>
<td>Fossil fuels</td>
<td>Ratoon management - cane burnt and tops windrowed, includes fertilizer application</td>
<td>l/ha</td>
<td>10 l</td>
<td>249.9 ha</td>
<td>2498.9 l</td>
<td>Diesel</td>
<td>2.67 kgCO₂/l fuel</td>
<td>6.7</td>
<td>133.5</td>
</tr>
<tr>
<td>Fossil fuels</td>
<td>Annual fertilizer application on area treated with thrash blanket - fuel usage</td>
<td>l/ha</td>
<td>10 l</td>
<td>166.6 ha</td>
<td>1665.9 l</td>
<td>Diesel</td>
<td>2.67 kgCO₂/l fuel</td>
<td>4.5</td>
<td>89.0</td>
</tr>
<tr>
<td>Fossil fuels</td>
<td>Manual planting – ridging only</td>
<td>l/ha</td>
<td>12 l</td>
<td>52.1 ha</td>
<td>624.7 l</td>
<td>Diesel</td>
<td>2.67 kgCO₂/l fuel</td>
<td>1.7</td>
<td>33.4</td>
</tr>
<tr>
<td>Herbicides</td>
<td>Re-planting herbicide application minimum tillage system, 10% of total area</td>
<td>l/ha</td>
<td>2.88 l</td>
<td>52.1 ha</td>
<td>149.9 l</td>
<td>Glyphosate</td>
<td>4.84 kgCO₂/kg applied</td>
<td>0.7</td>
<td>14.5</td>
</tr>
<tr>
<td>Synthetic Fertilizers</td>
<td>Harvested area synthetic fertilizer application annually (5:1:5), 80% of total area</td>
<td>t/ha</td>
<td>0.4 t</td>
<td>416.5 ha</td>
<td>166.6 t</td>
<td>N based synthetic fertilizer</td>
<td>0.72 kgCO₂/kg applied</td>
<td>0.1</td>
<td>2.4</td>
</tr>
<tr>
<td>Synthetic Fertilizers</td>
<td>Re-planted area synthetic fertilizer application annually (2:3:4), 10% of total area</td>
<td>t/ha</td>
<td>0.35 t</td>
<td>52.1 ha</td>
<td>18.2 t</td>
<td>N based synthetic fertilizer</td>
<td>0.44 kgCO₂/kg applied</td>
<td>0.0</td>
<td>0.2</td>
</tr>
<tr>
<td>Synthetic Fertilizers</td>
<td>Re-planted area synthetic fertilizer application annually (1:0:1), 10% of total area</td>
<td>t/ha</td>
<td>0.25 t</td>
<td>52.1 ha</td>
<td>13.0 t</td>
<td>N based synthetic fertilizer</td>
<td>0.77 kgCO₂/kg applied</td>
<td>0.0</td>
<td>0.2</td>
</tr>
</tbody>
</table>

| Total               | 35.1                          | 702.2            |

**Greenhouse gas emissions due to the pre-harvest burning of cane**

The pre-harvest burning of the sugarcane crop results in methane (CH$_4$) emissions (Weier 1998). Equation 2.27 listed in the IPCC 2006 guidelines and the input data listed in Table X, were used to calculate the carbon dioxide atmospheric forcing equivalent of the generated methane emissions:

![Equation 2.27](image)

Where:

- $L_{fire}$ = amount of greenhouse gas emissions from fire, tonnes of each GHG e.g., CH$_4$, N$_2$O, etc.
- $A$ = area burnt, ha
- $M_b$ = mass of fuel available for combustion, tonnes ha$^{-1}$. This includes biomass, ground litter and dead wood. When Tier 1 methods are used then litter and dead wood pools are assumed zero, except where there is a land-use change (see Section 2.3.2.2).
- $C_f$ = combustion factor, dimensionless (default values in Table 2.6)
- $G_{ef}$ = emission factor. g kg$^{-1}$ dry matter burnt (default values in Table 2.5)

Note: Where data for $M_b$ and $C_f$ are not available, a default value for the amount of fuel actually burnt (the product of $M_b$ and $C_f$) can be used (Table 2.4) under Tier 1 methodology.

Table X: Input data and conversion ratios used to calculate the average biomass carbon pool currently present in the project area.

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
<th>Metric</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total area under sugarcane</td>
<td>520</td>
<td>ha</td>
<td>Tongaat Hulett</td>
</tr>
<tr>
<td>Area farmed each year</td>
<td>90%</td>
<td></td>
<td>Tongaat Hulett</td>
</tr>
<tr>
<td>Fraction of cultivated area burnt each year</td>
<td>60%</td>
<td></td>
<td>Tongaat Hulett</td>
</tr>
<tr>
<td>A: Area burnt each year</td>
<td>280.8</td>
<td>ha</td>
<td>Tongaat Hulett</td>
</tr>
<tr>
<td>M: Mass of fuel available for combustion</td>
<td>5.0</td>
<td>tons.DM / ha</td>
<td>SASRI 2010</td>
</tr>
<tr>
<td>C: Combustion factor</td>
<td>0.8</td>
<td>Dimensionless</td>
<td>Table 2.6, IPCC 2006</td>
</tr>
<tr>
<td>Emission factor (CH$_4$)</td>
<td>4</td>
<td>g CH$_4$/ kg</td>
<td>Delmas 1993</td>
</tr>
<tr>
<td>G: Emission factor (CO$_2$ forcing equivalent. 1 CH$_4$: 21 CO$_2$)</td>
<td>84</td>
<td>gCO$_2$/kg</td>
<td>DEFRA 2010</td>
</tr>
</tbody>
</table>

The annual tCO$_2$e emissions due to pre-harvest burning can therefore be calculated as:

$$L_{fire} = A \times M_b \times C_f \times G_{ef,CO2e} \times 10^3$$

$L_{fire} = 94.34$ tCO$_2$e.year$^{-1}$ or $1886$ tCO$_2$e over 20 years

**Annual GHG emissions generated under a baseline scenario:**

The GHG emissions associated with a “without project” baseline reference scenario can be calculated as the sum of emissions generated through harvesting, land-preparation and fire, together with the potential change in biomass carbon stocks.
As described, the change in the biomass carbon pool of perennial crops is assumed to be zero. The sum of the GHG emissions generated through harvesting, land-preparation and fire is calculated as:

Annual GHG emissions = 35.1 + 94.3 = 129.4 tCO2e

Over 20 years = 702.1 + 1886.9 = 2589 tCO2e

G2.4 – Baseline effect on communities?
The Buffelsdraai Landfill Site Community Reforestation Project is being implemented in a municipality owned buffer area between the landfill site and adjacent communities. Prior to the landfill site being established, the entire area was owned by Tongaat Hulett, a major agri-processing business in Southern Africa for the purpose of sugar cane farming. This is a predominant agricultural activity in the greater Durban area and it is performed by small scale farmers as well as major corporations.

At that stage, the land was being farmed by Tongaat Hulett directly as well as a number of small scale farmers (evaluators have been unable to establish the exact number, but indications are that it was 1 – 2 small scale farmers).
Through negotiations with eThekwini Municipality, the land was sold to the municipality for the purposes of establishing the Buffelsdraai Landfill Site. Parts of the landholding which were not required for the immediate establishment of the landfill were subsequently leased back from the municipality by Tongaat Hulett on the basis of a 5 year-long agreement. The reforestation was initiated on 45 ha of land in the project area which had not already been leased back to Tongaat Hulett. Subsequent to this, the eThekwini Municipality has terminated the leases on certain erven within the landfill buffer to allow the reforestation project to proceed (Appendix C).

While the area receives relatively low rainfall the land is of considerable value to Tongaat Hulett, and they expressed willingness to continue with this activity.

The sugar cane farming operations are managed as part of a unit of approximately 1000ha. These operations provide employment for fifteen permanent staff (at an average salary of R2 500 per month) and approximately 60 seasonal contract workers (eight-month contracts earning a minimum of R1 700 per month). Although there are no specific records, there are indications that it is common practice to hire contract staff from the local communities. It is likely that most contract staff came from Buffelsdraai and Osindisweni. The project area of 377.1ha (sugarcane farming lands) is approximately half the total farming operational unit and therefore provides employment to an effective 8 permanent staff and 30 seasonal workers.

With the cessation of the farming activity, most permanent staff would have be relocated to other plantations within the company’s operations, unlike contract staff, according to the sources consulted at Tongaat Hulett.

The negative impacts from the baseline include denial of access to the land, job losses and the loss or deterioration of ecosystem services. The sugar cane operation relies on the application of herbicides that could possibly be leaching into water sources. The application of fertilizers also leads to the eutrophication of water sources.

Furthermore, without the project the residents of Buffelsdraai and Osindisweni will not benefit from the Indigenous Trees for Life project.

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9 Mr David Armstrong, Tongaat Hulett, Amanzimnyama Hill Road, Tongaat, KwaZulu-Natal, P O Box 3, Tongaat 4400, South Africa
G2.5 –Baseline effect on biodiversity
Sugar cane lands have very low species diversity compared to adjacent indigenous vegetation. No tree species were recorded on sugar cane fields compared to 54 species in the surrounding forests and woodlands (Appendix A). Nine bird species were encountered in the sugarcane fields compared to 80 species in surrounding forests and woodlands. Both the sugarcane and surrounding habitats have few rodent species. This is not unusual for the broader coastal habitat type. Reptiles and frogs are also virtually absent from the sugarcane fields.

Furthermore the biodiversity assessment (Appendix A) concluded that “from a biodiversity perspective, it is likely that a gradual reduction in habitat condition could be anticipated in remaining untransformed areas as a result of further invasive alien plant encroachment and increased pressure from local communities to obtain food, wood and medicinal plant products from these areas. Habitat degradation and transformation would further affect connectivity between remaining natural fragments of vegetation, and reducing habitat available for threatened species.”

It is therefore likely that biodiversity values of the project area and surrounding project zone would continue to decline if the land had not been purchased by the Municipality and actions taken to actively manage and rehabilitate the area for conservation purposes.

G3. Project Design and Goals
G3.1 - Summary of the project’s major climate, community and biodiversity objectives
The objectives of the project are:

i. To restore forest habitats that are strategic from a biodiversity protection and management perspective. The Buffelsdraai landfill site buffer zone is regarded as strategic as it is one of the few large open spaces left in the northern parts of eThekwini Municipality and it is therefore appropriate to protect the area from the future spread of urban development.

ii. To assist the municipality in offsetting the climate change impact of hosting the 2010 FIFA World Cup. The reforestation of the area will lead to the long-term sequestration of atmospheric carbon in biomass and soils.

iii. To provide employment and income opportunities to impoverished communities living adjacent to the project area. The communities directly adjacent to the landfill site, namely Buffelsdraai and Osindisweni have been directly positively affected, whilst 2 other communities in the broader areas namely KwaMashu and Ndwedwe have also benefitted to a lesser extent.

iv. To restore catchment areas with the intention of improving the management of water flow and sediment flows that is important to down-stream estuaries and tourist beaches. The landfill site is located within the important uMdloti River Catchment which directly feeds the uMdloti estuary and has the potential to affect tourist beaches.
G3.2 – Description of project activities

The Wildlands Conservation Trust’s (WCT) Indigenous Trees for Life programme is based on three main activities and a similar *modus operandi* is being followed with the Buffelsdraai Landfill Site Community Reforestation Project. Each step is described below:

a) **The establishment of a network of Tree-preneurs**

The foundation of the programme is the establishment of a network of Tree-preneurs. The typical profile of a Tree-preneur is an unemployed person or orphan that has the self drive and commitment to generate a livelihood if given a chance. Over 2000 Tree-preneurs have been established in 4 years based in the townships of Durban and Richards Bay townships as well as the rural communities of Zululand. The establishment of Tree-preneurs has been supported by Engen, Tongaat Hulett Developments, UNILEVER, Richards Bay Minerals, BHP Billiton, Richards Bay Coal Terminal, Old Mutual Foundation, Bonitas, Rand Merchant Bank, Foschini, Mr Price Foundation, Mercedes SA, Lufthansa, The Witness, Ilembe and Investec.

This first activity allows the most disadvantaged and impoverished members of the community to benefit from the programme.

b) **The establishment of a market for the trees propagated by the Tree-preneurs**

The establishment of a viable and sustainable market for the trees propagated by Tree-preneurs is a crucial issue. The key incentive currently motivating the Tree-preneurs is that the WCT undertakes to purchase all the trees propagated by the Tree-preneurs for between R 5 and R 10 or seedling trays from community members that do not have a lot of space. To achieve this, the Trust’s programme team, led by Charmaine Veldman, are actively establishing markets for the trees produced by the Tree-preneurs.

This activity strives to ensure that sustainable demand exists for trees and that the Tree-preneurs will receive long-term financial benefits from the programme.

c) **Establishment of GREEN TEAMS that use the Trees propagated by the Tree-preneurs to green the Programme’s communities**

The greening of our rural and peri-urban communities is a vision that the WCT has been pursuing for a number of years. A significant proportion of the trees propagated by the Tree-preneurs are being planted in the same communities by teams of previously unemployed youth. The Trust currently has seven Green teams operating in Waterloo, eSikhawini, Dube, Mbonambi, Sokhulu, Khula and Buffelsdraai. Collectively these teams plant over 6000 trees per month.
The implementation procedure for the Buffelsdraai Landfill Site Community Reforestation Project is as follows:

a) Baselines and data collection

*Historical data collection and seed location*

To ensure that each site is rehabilitated appropriately in terms of vegetation type and species composition, an initial historical analysis of the vegetation type found at the site is undertaken. This is done through a study of aerial photography, GIS data and other historical data. The tree species used in the restoration of the area are sourced from nearby existing forests no more than 50 km from the proposed site. The seeds used in this particular project are sourced from existing seed banks at the Buffelsdraai landfill site and propagated through the Indigenous Trees for Life programme in the Buffelsdraai and Osindisweni communities.

*Ground Survey*

This step of the process involves a brief field visit to the site to assess the current vegetation and levels of invasive alien plant infestation that already exist at the site.

*Community Workshops*

A series of strategically designed workshops provide an overview of the project, promote participation of neighbouring communities, and ensure transparency. The workshops are use various community development and environmental education tools. The initial workshop is of an introductory nature and workshops thereafter are used as a means of reporting progress and issues to the respective entities that are involved in the project.

The Wildlands team have also consulted the Ward Councillor, Mr. Dlamini and community leadership structures of the Buffelsdraai and Osindisweni communities to secure their support for the project. Contact with the community has been brokered by the eThekwini Municipality Rural Area Co-ordinator responsible for that area, Mondli Mthembu.

*GPS mapping of sites*

Once a site has been agreed upon, boundaries of that site are then mapped. This information is used to calculate the amount of carbon sequestered on site as well as other operational and logistical purposes.

*Current Carbon Stock Assessment*

A field survey is undertaken to determine current carbon stocks using biomass plots and soil samples.

b) Planting

Planting then occurs using the local indigenous species (trees that had their seeds collected within 50 km of the site). Generally trees are planted at 2-3 m intervals (average density of 1300 trees/ha) and the species planted are based on the species composition of neighbouring forests or woodlands.
c) Biomass Assessments
Carbon stock assessments will be performed once every five years to assess the amount of carbon that has accumulated at the Buffelsdraai Landfill site in the various carbon pools namely:

- Soil organic carbon
- Herbaceous stratum
- Above ground woody biomass carbon
- Below ground woody biomass carbon using IPCC tables

Allometric equations will be used to estimate above- and below-ground biomass (Chave et al. 1997). A detailed operation procedure for baseline and ongoing carbon assessments can be found in Knowles (2009).

d) Tree Planting
The WCT works with Richard Winn and PRUNIT to collect seed from the forest on the Buffelsdraai property and surrounding areas. PRUNIT has a nursery on the site and the first 6000 trees were sourced from the nursery to speed up the replanting process and replaced at a later stage by the ITFL programme. 270 ha was immediately available for replanting of which 82.1 ha (106 484 trees) was planted by June 2010 (Appendix D). The planting is mainly done by two planting teams from Buffelsdraai and Osindisweni, but the Trust also uses mass planting drives where public volunteers assist in planting trees. The volunteer option has occurred on two occasions: by participants of the Comrades Marathon and members of the South African Scouts Association. PRUNIT prepares the planting sites and manages the planting and hole digging teams on behalf of the Trust.
Figure 8. Map showing the boundaries of the Buffelsdraai Landfill Site Community Reforestation Project, project area and project zone.

G3.4 - Define the project lifetime and GHG accounting period
Reforestation started in November 2008 and the accounting period is therefore from 2008-2028. The reforested area will be maintained beyond this date as a nature reserve. Table 7 outlines the planting schedule. The re-planting of indigenous trees is scheduled to be complete by July 2015. After the initial restoration activities have been completed a biodiversity stewardship process will be initiated resulting in the formal proclamation of the area as a nature reserve by the end of 2017.

G3.5 - Natural and human-induced risks to climate, community and biodiversity benefits
There are limited human induced risks to the project. The project is being implemented on public land by the eThekwini Municipality that is mandated to maintain the greater Buffelsdraai Landfill site for at least 50 years. The project is therefore included in long-term Municipal and State planning
and therefore there is little reason to assume the area would be rezoned or changed to a residential, commercial or industrial area.

The WCT and associated implementing partners have an excellent track record. The ITFL programme has proved itself successful in several parts of KZN. The ITFL programme creates direct benefits to the poorest members of the surrounding communities of the reforestation project and thus instils a sense of pride and ownership of the project. The project has the approval of local traditional leaders.

The risk of people illegally harvesting the trees or clearing it for agriculture is limited by the fact that it is being implemented on publicly owned land to which access is limited for health and safety reasons. The direct benefits that local community members are reaping from the project will further reduce the chances of illegal activities jeopardising the project.

There is a small risk of fire during the early phase of reforestation where a significant grass fuel-load may exist. However, fire rarely occurs in the coastal forest systems of KwaZulu-Natal which are generally too moist to burn. In the early phase sites, there have been two fires that breached the firebreaks but these did not cause any significant damage to the establishing trees before they were brought under control (Appendix D). Indigenous African woodlands are generally well adapted to fire and are rarely destroyed.

There is a fire management plan in place on the property run by trained staff and it includes the burning of fire breaks. In addition, well equipped and trained fire fighting teams are on standby during the fire season.

Displacement of the newly established forest by invasive alien plants is a clear risk as there is already a substantial invasive alien plant infestation within the existing woodlands in the buffer zone (Appendix A). The Municipality is therefore clearing the property of invasive alien plant species. South African law requires property owners to clear their land of alien invasive species and therefore the eThekwini Municipality will be held accountable by provincial and national authorities if this is not done.

Because only indigenous trees are used for replanting the risk of pestilence is low.

Adverse weather conditions, such as seasonal drought, may temporarily slow down the growth of new trees, but the planting programme is structured in such a way to ensure planting occurs during optimum growth conditions and the survival rate of trees to date has been exceptionally high (Appendix D).

G3.6 - Measures to ensure the maintenance or enhancement of the high conservation value attributes identified in G1

The Buffelsdraai buffer zone has lost much its biodiversity due to sugarcane farming and invasive alien plant infestation. The reforestation project will reverse this trend by actively replanting sugarcane fields with indigenous trees and the removal of invasive alien vegetation.
Removal of invasive alien plants is a priority at the project site and an ongoing process that is part of the management plan. As the indigenous vegetation recovers the rate of re-infestation will decrease, but a removal programme will have to be maintained indefinitely.

It is also the aim of the eThekwini Municipality to register the project site as a conservancy and later as a formal nature reserve that will give it stronger legal protection and ensure long-term funding for the maintenance of the site in its indigenous state.

In accordance with the National Environmental Management: Protected Areas Act (Act No. 57 of 2003), the guidelines for the proclamation of protected areas in KwaZulu-Natal will be followed to formally protect the project area as a nature reserve. This process is expected to take two years after the initial restoration is complete. This process will be jointly funded by the eThekwini Municipality and Ezemvelo KZN Wildlife as the local and provincial government bodies with the mandate to protect areas of biodiversity conservation value.

A fire management programme is also in place and consists of a system of firebreaks that are maintained annually and a fire fighting team that is on standby throughout the fire season.

G3.7 - Measures that will be taken to maintain and enhance the climate, community and biodiversity benefits through and beyond the project lifetime

As stated above, the area is considered an important part of the eThekwini Municipality’s biodiversity conservation strategy where the intention is to register the entire buffer zone as a formal nature reserve that will ensure the climate and biodiversity benefits continue beyond the lifetime of the project.

Although the ITFL programme will come to an end once the reforestation program has been completed, the long-term maintenance of the site including the management of fire and invasive alien plant species, will continue to provide employment opportunities to neighbouring communities.

G3.8 – Community and other stakeholder involvement, engagement and consultation process

Engagement with the communities of Buffelsdraai and Osindisweni started in July 2008 (Appendix D). The ITFL programme and associated reforestation project was initially first presented to the ward committee and then in September 2008 a meeting was held with local residents at the council offices introducing the project to about 90 people. Follow up meetings were held at the Buffelsdraai clinic and 70 tree-preneuer starter packs consisting of seeds, seed trays and potting soil, were handed out. Joining the programme is voluntary and open to any local residents. By May 2010 a total of 199 tree-preneurs were registered with 163 already trading goods at tree stores.

After the good reception of the project by Councillor Dlamini, and receiving assistance from him to advertise positions for the Planting Team, it was hoped that recruitment would continue in a similar fashion.

In March 2009 the digging of 20 000 holes was put out on tender for one team from Buffelsdraai and one digging team from Osindisweni as the teams already in place were not managing to dig enough
holes. Mr Mabaso (Ward Committee member responsible for Osindisweni) and Zanele Dlamini (Ward Secretary responsible for Buffelsdraai) then selected 10 residents from each community and sent them to the project site for the temporary hole-digging work, which took place for the first time in May 2009. Community leaders also selected the 62 temporary workers needed to plant the trees for the Comrades 2009 event. Thereafter, Wildlands decided to rather use the local facilitators in Buffelsdraai and Osindisweni to select tree-preneurs to do temporary work on site, as it was felt that any temporary jobs or project benefits should firstly be offered to tree-preneurs who had already committed time and energy into the project. Therefore all temporary work that followed (for example nursery transplanting and the 50 workers needed for the Comrades 2010 planting event) was done by registered tree-preneurs, this approach will be used for the remainder of the reforestation activities.

In order to obtain better buy-in and support from the local ward Councillor and Committee, a site visit was arranged for them on 28 October 2010 to see the reforestation progress and to attend a Tree Store that at Buffelsdraai. Unfortunately on the day the Councillor did not attend, but three Ward Committee members attended and indicated that they enjoyed the experience and would report back to the Councillor.

The communication process with local council members is on going and they are still invited to all management meetings.

G3.9 – Publicizing of the CCBA public comment period to communities and other stakeholders

The CCBA application process will be advertised in the municipal newspaper and notices will be placed at community centres within Buffelsdraai and Osindisweni. Copies of this document will be made available to local stakeholders and community members at the local civic centres within Verulam and kwaMashu. Ward committee members and the WCT community facilitators will be the recipients of comments from community members these will reported to the CCBA via the project manager.

G3.10 – Conflict and grievance resolution process

The Buffelsdraai Landfill Site Community Reforestation Project is taking place on public land set aside as a health and safety buffer for the Buffelsdraai landfill site, and therefore no one has been displaced through the implementation of the project. The property has been in private possession for some years having been used for the cultivation of sugarcane prior to its purchase by the eThekwini Municipality as part of the Buffelsdraai landfill site. The project area has not been used by local residents for the planting of crops or harvesting of non-timber forest products. A project steering committee was established and met on a monthly basis for the first 6 months. This committee was comprised of representatives from the local community and representatives from the following organisations:

- Durban Solid Waste (a department of eThekwini Municipality)
- Department of Water Affairs
- eThekwini Water Services
- Ward 59 Council office
- Wildlife and Environment Society of South Africa
- Department of Environmental Affairs, Agriculture and Rural Development
After the project had been successfully initiated and was running smoothly it was considered unnecessary to have a separate steering committee as the same organisations and the community are represented on the monitoring committee for the landfill site. The Buffelsdraai Landfill Site Community Reforestation Project is a standing item on the agenda of this committee and is a suitable platform to engage with stakeholders. Local residents are represented by the local councillor. No objections from local residents have been received to date.

There are legal contracts in place between all the implementing partners that allows for conflict resolution (See Appendix C and E).

Any employment grievances are covered by the Basic Conditions of Employment Act which is strictly enforced in South Africa by the Department of Labour and adherence to the labour laws are a condition of the contract between the eThekwini Municipality and the Wildlands Conservation Trust (Appendix E).

**G3.11 – Project financial sustainability**

The eThekwini Municipality has identified the Buffelsdraai Landfill Site Community Reforestation Project and subsequent registration of the landfill site buffer zone as a nature conservancy as a long term objective and will continue to source and provide funding to fulfil this objective. For details on recent expenditure and funding please see Appendix D and Appendix C which is an official document from the municipality stating the long term commitment of the project proponent to the project.

**G4. Management Capacity and Best Practices**

**G4.1 – Project proponent**

The project proponent is the eThekwini Municipality. The role of the Municipality and other parties involved in the Buffelsdraai Landfill Site Community Reforestation Project are as follows:

- The eThekwini Municipality is the owner of the land and provides funding for the reforestation project (Appendix C).
- The Wildlands Conservation Trust has been appointed by the eThekwini Municipality to implement the Buffelsdraai Landfill Site Community Reforestation Project through its Indigenous Trees For Life Programme (Appendix E).
- PRUNIT has been employed by the eThekwini Municipality to prepare the project site for planting and maintain the biodiversity benefits by clearing invasive alien plants (Appendix C).

The project organogram in Figure 9 describes how the management structure of the project fits together.
G4.2 - Technical skills of the project team

- Mr Andrew Whitley is a strategic manager at WCT responsible for ecological restoration. He has a BSc in Agriculture and has a broad range of experience in natural resource management. He is responsible for the overall management of project implementation.
- Mr Richard Winn of PRUNIT is an ecological restoration specialist with a wealth of experience in successfully rehabilitating areas and in the propagation and establishment of indigenous plants.
He is contracted into the team to provide technical input into the restoration activities and species selection and to manage the preparation and maintenance of planting areas.

- Ms Nondumiso Khumalo is the project manager responsible for the roll-out of the planting and maintenance at the project site. She has successfully implemented the first two years of reforestation activities.
- Ms Ningi Gcabsache is the local manager of the Indigenous Trees for Life Programme and is responsible for ensuring sufficient trees are produced by local community members and support the development of the tree-preneurs and community based facilitators.
- Dr Roelie Kloppers is a director at WCT responsible for the implementation of the various initiatives. He has extensive experience in and knowledge of community development, community conservation, conservation development and project management. He will provide high level support to the project implementation and provide support for the development of a nature reserve and provide input into the development of economic activities associated with the nature reserve.

A team of eight local community members have been recruited to plant and care for trees. They have been trained in plant propagation and care, invasive alien plant control and fire protection (Appendix D).

**Carbon stock measurement and monitoring:**

Tony Knowles and Leon-Jacques Theron of the Cirrus Group provided technical advice on the measurement and monitoring of carbon stocks.

Tony Knowles is Director of the Cirrus Group and has seven years of experience in the development land use based climate change mitigation and adaptation activities. Further to his doctoral work on risk and feasibility aspects of REDD activities, Tony has provided advisory services to a broad-scope of public, NGO and private entities on initiatives ranging from the development of REDD projects in South Africa, the DRC, Zambia, Malawi and Mozambique, to the development of a climate change strategy for the South African Fruit and Wine Industry.

Particular experience and publications pertaining to the monitoring of terrestrial carbon stocks and GHG emission accounting include:

- Developing a community based forest carbon monitoring methodology including the training of local field teams for the Disney Tayna-Kisimba REDD project located in the eastern DRC
- The development of a carbon stock and land-use monitoring methodology for the Peace Park Foundation’s climate change initiative located in south-western Zambia.
- IPACC: REDD capacity building for indigenous people in Africa. Tony was contracted to provide a lecture series in South Africa and Kenya introducing attendants to the science of climate change, climate change policy, and the development of forest carbon monitoring programs.
- The development of an online GHG emission calculator for the South African Fruit and Wine Industry. The calculator provides a user-friendly mechanism for commercial farmers, packhouse operators and exporters to quantify and report GHG emissions generated through their operations – submitted to DFPT and the Commark Trust – funding provided by DFID (www.climatefruitandwine.co.za).
Mr. Leon-Jacques Theron is an ecologist at the Cirrus Group with several years experience in carbon stock assessments. He holds an MSc degree in Zoology. He has developed and undertaken carbon stock assessments for climate change mitigation ventures in South Africa, Zambia and the Democratic Republic of the Congo. He is an expert in the training of local residents in carbon stock monitoring. He was a panel member at the Kyoto Think Global act Local closing conference at COP15 in Copenhagen. The specific aim of the six year programme was to study the effectiveness of community based forest monitoring and if it meets the criteria of land use sector climate change mitigation ventures.

G4.3 Orientation and training for the project’s employees and relevant people from the communities

The Wildlands Conservation Trust has provided relevant training to all staff employed by the project as listed in Table 6 below. The training is not only directly related to the tree planting, but also first-aid skills to ensure workers are prepared for emergencies as well as how to apply for tenders which will allow staff to further their careers beyond the project.

Table 6. List of project relevant training provided to Buffelsdraai Landfill Site Reforestation Project staff and stakeholders.

<table>
<thead>
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<th>Training</th>
<th>Date</th>
<th>Training provider</th>
<th>Attendees</th>
<th>Topics covered</th>
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<td>Course Title</td>
<td>Date/Time</td>
<td>Location/Partner</td>
<td>Description</td>
<td>Accreditation</td>
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</tr>
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<td>------------------------------------------------</td>
<td>--------------------</td>
<td>-----------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------------</td>
<td></td>
</tr>
<tr>
<td>4. Introduction to Tendering</td>
<td></td>
<td>Pietermaritzburg Chamber of Business</td>
<td>Managers (incl. Paul Makhanya and Nondumiso Khumalo) How to tender for a project, understanding tender documents, costing.</td>
<td>Informal, Non-accredited</td>
<td></td>
</tr>
<tr>
<td>7. Basic Business Skills training</td>
<td>13 April 2011</td>
<td>Internal Wildlands training by Ncamisile Hlatshwayo</td>
<td>Supergrower tree-preneurs from Buffelsdraai, Ndwedwe &amp; Osindiswini (14 participants) Wants &amp; needs, the business idea, characteristics of an entrepreneur, feasibility studies, business plans, pricing and profit, marketing.</td>
<td>Informal.</td>
<td></td>
</tr>
</tbody>
</table>

**G4.4 – Employment Equity**

The Wildlands Conservation Trust and all employers in South Africa are required to abide by the Employment Equity Act (no. 55 of 1998) of which the purpose is to ensure equal opportunities for all and the implementation of affirmative action policies to address past inequities. To fill the positions of the tree planting teams, the objective was to employ people from Buffelsdraai and Osindisweni. With the assistance of Councillor Dlamini, posters were put up on 4 September 2008 in strategic positions in Buffelsdraai and Osindisweni, inviting applicants. Two separate posts were originally advertised for planting crew and for nursery staff. However after further consideration, it was decided to merge these positions into one so as to give the staff experience in more than one area, and lend more day to day variety to their work. Unfortunately there were few applications from Osindisweni residents compared to Buffelsdraai residents.
Six candidates were selected for the positions, namely two women and four men:
1. Thandazile Khuwzayo – Buffelsdraai resident
2. Dan Mkhize – Buffelsdraai resident
3. Clifford S’fiso Mthembu – Buffelsdraai resident
4. Simphiwe Mkhize - Buffelsdraai resident
5. Christian Madlala – Osindisweni resident
6. Lungile Sibiya – Osindisweni resident

All of the Planting Team members were previously unemployed, and two of the team are regarded as youths (< 25yrs). They began work on 13 October 2008.

In January 2009, an additional three people were recruited, namely Sipho Ndlela, Nokwathemba Zulu and Nonhlanhla Khumalo, to ensure reaching the planting targets. This increased the size of the planting team to nine members. However, In May 2009, one of the planting team members (Lungile Sibiya) left the planting team to change roles and became a full-time Tree-preneur facilitator in Osindisweni. The planting team then remained at eight members until the end of June 2010, and consisted of five men and three women. In July 2010 when the contracts of the planting team ended, the contracts of six people were renewed, and two people’s contracts were not renewed, based on performance. It also became apparent at this stage that six people were sufficient to do the planting work on site, when assisted by temporary labour for hole digging and mass planting activities.

Nine community facilitators were employed by WCT to establish and manage the local tree-preneur initiative. These facilitators were identified through community structures and selected by WCT, they are all women and are residents of the communities in which they work. Their responsibilities include: recruiting tree-preneurs; visits to tree-preneur homesteads to monitor and encourage tree propagation; helping tree-preneurs with tree species identification and seed collection; assistance with tree collections and Tree Store trading days.

The approximately 600 tree-preneurs participate in the ITFL programme on a voluntary basis and are therefore not impacted on by employment equity issues.

G4.5 - Relevant laws and regulations covering worker’s rights in South Africa
South Africa has strict labour laws. The most relevant laws to the project are listed below.

- Labour Relations Act 66 of 1995
- Basic Conditions of Employment Act 75 of 1997 (updated)
- Employment Equity Act 55 of 1998
- Skills Development Act 97 of 1998 (updated) and SAQA
- Occupational Health and Safety Act
- Unemployment Insurance Fund Act
- Pensions Fund Act
- Medical Schemes Act and Regulations
The Wildlands Conservation Trust staff all have contracts that makes their rights and the relevant laws clear to them. Furthermore the eThekwini Municipality strictly enforces health and safety regulations on it’s property and no workers are allowed to be on the site without the necessary safety equipment. Adhering to the relevant labour laws is also a condition in the contract between eThekwini Municipality and WCT (Appendix E).

G4.6 - Situations and occupations that pose a substantial risk to worker safety
As above, all workers are provided with the necessary training and safety equipment to ensure that they do not face any unnecessary dangers in the work place. The work that they perform is of a low risk and there is little chance of injury. The most dangerous activities will be the clearing of vegetation using brush cutters and the burning of fire breaks. These activities are undertaken with the necessary training and safety equipment.

G4.7 – The Financial Health of the Wildlands Conservation Trust and eThekwini Municipality
Both the Trust and the Municipality are in good financial standing and are audited every year. The project is included in annual Municipal budgets, which will ensure long-term funding by the State. Financial statements have been made available to the auditors.

- National Environmental Management Act 107 (NEMA) of 1998
- Environment Conservation Act 73 of 1989

G5. Legal Status and Property Rights
G5.1 – Relevant national and local laws
In addition to the relevant labour laws listed in Section G4.5, the following local laws are applicable to the project:

- National Environmental Management: Biodiversity Act 10 of 2004
- National Forest Act 84 of 1998
- National Environmental Management: Air Quality Act 39 of 2004
- Conservation of Agricultural Resources Act 43 of 1983

Overarching international and national obligations:

- Convention on Biological Diversity.
- Local Agenda 21
- The Ramsar Convention
- The United Nations Framework Convention on Climate Change (UNFCCC)
• Constitution of the Republic of South Africa, 1996
• The National Biodiversity Framework, 2007
• South Africa’s National Framework for Sustainable Development, 2008
• The National Spatial Development Perspective, 2003

The project will contribute to the sustainable development agenda embodied in the National Environmental Management Act by enhancing biodiversity and creating employment. It fulfils the criteria of the Conservation of Agricultural Resources Act by clearing the site of declared weeds and invasive alien plant species.

G5.2 – Project approval from appropriate authorities
Please see Appendix C which is a letter of approval from the eThekwini Municipality.

G5.3 – Possible encroachment on private property.
The reforestation project will only take place on the property of the project proponent, the eThekwini Municipality and will not encroach on land owned by other entities.

G5.4 – Possible involuntary relocation of people
The Buffelsdraai landfill site and surrounding buffer zone has been in private ownership and under sugarcane cultivation since at least 1934. The previous owner, Tongaat Hulett sold the property to the Municipality out of their own free will. There has thus been no relocation of people or forced removals of people.

G5.5 – Illegal Activities that could affect the project’s climate, community or biodiversity Impacts
Although arson or illegal harvesting of medicinal plants could plausibly affect the benefits of the project, the probability of either occurring is low. In addition, there is a fire management and prevention plan in place for the site. Although there have been two accidental fires, they caused little damage to the trees of the project. Arson is therefore not assumed to be a serious risk.

The goodwill that, especially the tree-preneur programme has generated amongst local residents, has instilled a sense of ownership of the project amongst the people of Buffelsdraai and Osindisweni and it is believed that illegal removal of trees will not be a problem in the future. Access to the site is also restricted, further mitigating this potential risk.

G5.6 Title to carbon rights
The eThekwini Municipality is the legal owner of the property and therefore is also the owner of the trees and associated biomass carbon stocks on the land (see Appendix C).
**CLIMATE SECTION**

**CL1. Net Positive Climate Impacts**

**CL1.1 - Net Change in Biomass Carbon Stocks**

A stock-difference method therefore was used to calculate the net change in biomass carbon stocks due to the implementation of the project activity (based on Equation 2.5 of the IPCC 2006 Guidelines for AFOLU).

![Equation 2.5]

**Carbon stock change in a given pool as an annual average difference between estimates at two points in time (stock-difference method)**

\[
\Delta C = \frac{(C_{t_2} - C_{t_1})}{(t_2 - t_1)}
\]

Where:
- \(\Delta C\) = annual carbon stock change in the pool, tonnes C yr\(^{-1}\)
- \(C_{t_1}\) = carbon stock in the pool at time \(t_1\), tonnes C
- \(C_{t_2}\) = carbon stock in the pool at time \(t_2\), tonnes C

Regarding each of the carbon pools in the project area as described in Section G1.4, the pools included in the calculation of the net change in biomass carbon stocks due to the project activity are the:
- Aboveground woody pool
- Belowground woody pool
- Perennial cropland biomass pool

The carbon pools not included in the calculation are the:
- Herbaceous pool
- Litter pool
- Soil organic carbon

The change in each of the carbon pools included in the calculation is described further below:

- **Consideration of the perennial cropland biomass pool**

As calculated in Section G1.4, the average annual carbon stock in the perennial cropland biomass pool is 1.19 tC.ha\(^{-1}\) across the full 520ha. To ensure a conservative estimation, it is assumed that the entire pool is released into the atmosphere due to the reforestation activity.

Therefore: \(\Delta C_{\text{cropland}} = -1.19\) tC.ha\(^{-1}\) or **-618.8 tC** across the project site

- **Consideration of the aboveground and belowground woody carbon pool**

The change in carbon stocks due to the project activity is essentially the increase in the forest biomass carbon pool as it increases in size following planting and rehabilitation. The project will be implemented in phases (Table 7). The initial plan was to plant a 100ha of sugarcane land with indigenous trees per year, but in the first 18 months only 82.1 ha was planted (Appendix D). The
planting has occurred at a density of approximately 1300 trees/ha. The choice of planting density was based on a survey of adjacent forests as well as experience in the restoration of similar forests in the region. Over time, ecological processes, such as natural thinning (tree mortality) as well as natural recruitment are expected to occur.

Glenday (2007) did an inventory of biomass carbon stocks of the forests of the greater eThekwini municipal area. Based on this field data, Knowles (unpublished data) modelled carbon accumulation rates using Century Ecosystem Program for the various vegetation types sampled by Glenday (2007) and the model results compared favourably to the actual carbon stocks measured in the inventory (Figure 10 and 11 below). Appendix F contains a copy of the Glenday (2007) report including a description of the field survey method and allometric equations used to calculate forest carbon stocks.

![Figure 10](image.png) An example of the results of a typical Century Ecosystem Program simulation run. The model is run for 2000 years to reach an ‘equilibrium’ intact state (a), b is the period in which the carbon stocks are reduced to a ‘degraded state’ through harvesting of wood and cultivation of the cleared land. From point c, the system is allowed to recover (section d). Figure 11 contains a graph illustrating the simulated recovery period for dry valley woodland.
The results of a Century Ecosystem Program simulation run illustrating the change in above-ground carbon stocks in dry valley woodland during a recovery period following cultivation.

Glenday (2007) determined the rehabilitation and reforestation potential of various sites within the municipality as part of the inventory and concluded that project site had the potential to return to Dry Valley Thicket/Broadleaf Woodland, although a small portion might have the potential to return to Coastal Scarp Forest which has a significantly higher mean carbon density (Glenday 2007).

**Estimated biomass carbon stocks for Dry Valley Thicket**
- Mean Above Ground Biomass = 29.0 ± 6.4 tC.ha\(^{-1}\) (Glenday 2007)
- Mean Below Ground Biomass = 9.2 ± 1.9 tC.ha\(^{-1}\) (note 95% CI calculated from SE assuming a normal distribution (Zar 1996)
- Mean Annual Carbon Accumulation rate (above and below ground) for the first 20 years = 1.4 tC/ha.yr

Table 7 below contains the calculation of the mass of carbon sequestered in woody biomass over the 20-year lifespan of the project activity. The carbon accumulation or sequestration rate is not constant over 20 years. For the sake of simplicity, a constant, linear rate has been calculated over the 20 years.

**Table 7.** The increase in the woody biomass carbon pool following the phased planting of the Buffelsdraai Project Site, KwaZulu-Natal, South Africa.

<table>
<thead>
<tr>
<th>Year</th>
<th>Cumulative area planted (ha)</th>
<th>Carbon sequestration rate (tC/ha)</th>
<th>Carbon sequestration rate per year (tCO(_2)e/year)</th>
<th>Accumulated carbon sequestered to date (tCO(_2)e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>1.1</td>
<td>1.4</td>
<td>5.6</td>
<td>5.6</td>
</tr>
<tr>
<td>2009</td>
<td>44.1</td>
<td>1.4</td>
<td>226.4</td>
<td>232.0</td>
</tr>
<tr>
<td>2010</td>
<td>82.1</td>
<td>1.4</td>
<td>421.4</td>
<td>653.5</td>
</tr>
<tr>
<td>2011</td>
<td>182.1</td>
<td>1.4</td>
<td>934.8</td>
<td>1588.3</td>
</tr>
</tbody>
</table>
Applying the stock-difference method as per Equation 2.5 of the IPCC 2006 Guidelines:

\[ \Delta C_{\text{woody pool over 20 years}} = 42214 \text{ tCO}_2\text{e} \text{ or } 11512.9 \text{ tC across the project site} \]

- **Calculating the Net Change in Biomass Carbon Stocks**

In summary, over the lifetime of the project activity, across the 520ha project site:

\[ \Delta C_{\text{cropland}} = -618.8 \text{ tC} \]

\[ \Delta C_{\text{woody pool over 20 years}} = 11512.9 \text{ tC} \]

Therefore:

\[ \text{Net } \Delta C = 11512.9 \text{ tC} - 618.8 \text{ tC} \]

\[ \text{Net } \Delta C = 10894.10 \text{ tC or } 39945.03 \text{ tCO}_2\text{e} \]

**CL1.2 – Net Change in Non-CO\textsubscript{2} GHG Emissions**

The carbon stock changes associated with the shift from sugarcane cropland to a reforested state are described and calculated in Sections G1.4 and CL1.1.

The net change in non-CO\textsubscript{2} GHG emissions is due to the halt of pre-harvest fires as well as required land-preparation prior to planting. The GHG emissions from these sources are described and calculated in Section G2.3. In summary:

GHG emissions from land-preparation = 35.1 tCO\textsubscript{2}e.year\textsuperscript{-1} or 702 tCO\textsubscript{2}e over 20 years

GHG emission from pre-harvest fires = 94.3 tCO\textsubscript{2}e.year\textsuperscript{-1} or 1886 tCO\textsubscript{2}e over 20 years

Therefore:
Annual GHG emissions = 35.1 + 94.3 = 129.4 tCO2e
or
Over 20 years = 702.1 + 1886.9 = 2589 tCO2e

CL1.3 - Other non CO2 Emissions from Project Activities
As described in Section G1.4, a small portion of the sugarcane fields that have been left fallow over the past two years at the request of eThekwini Municipality in anticipation of the reforestation program. Although transitional weeds are currently gradually infesting this fallow land, in a ‘without-project’ scenario, it would have been used for the production of the sugarcane. It is reasonable to assume that the total 520,6ha of sugarcane, transitional weed and fallow lands would remain sugarcane land and be cleared before planting under a baseline-scenario.

The only additional GHG emissions generated through the project will be from the planting of trees during the phased planting. One diesel light utility vehicle will be used to transport seedlings to the project site. Approximately 300 seedlings can be transported at a time and the nursery is situated 5km from the project site and the emissions produced will thus be:

\[(\alpha \div \beta) \times \delta \div \epsilon \times \epsilon \div 1000\]

Where:
\[\alpha = \text{Total number of seedlings planted} = 675220\]
\[\beta = \text{Total number of trees transported per haul from nursery} = 300\]
\[\delta = \text{Total distance to and from nursery in kilometres} = 10\]
\[\epsilon = \text{Diesel fuel consumption per kilometre} = 8\]
\[\epsilon = \text{emissions factor of diesel in kgCO2/litre fuel (IPCC 2006)} = 2.67\]
It is divided by 1000 to convert kilograms to tons.

\[= ((675220/300 \times 10)/8) \times 2.67)/1000\]

Over 20 years = 7.5 tCO2e

CL1.4 – Net Climate Impact
The net climate change impact is calculated in the Table X below. Reference is made to the sub-sections of the Project Design Document where each component was calculated.

The total net reduction in atmospheric GHG concentrations due to the project activity over the 20 year project period is conservatively estimated to be 42,526 tCO2e.

Table X: Calculation of the net climate impact due to the reforestation activity at the Buffelsdraai Landfill site

<table>
<thead>
<tr>
<th>Carbon pool or GHG emission source</th>
<th>Section where calculated</th>
<th>Per year (tCO2e)</th>
<th>Over 20 year project period (tCO2e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes in C pools or GHG emissions associated with the ‘without project’ scenario</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Perennial cropland C biomass pool (1,19tC.ha$^{-1}$) & G 1.4 & -113 & -2269 \\
GHG emissions from pre-harvest fire & G 2.3 & 94 & 1886 \\
GHG emissions from land preparation & G 2.3 & 35 & 702 \\

Changes in C pools or GHG emissions associated with the additional reforestation activity

| Change in above- and belowground woody C pools | CL 1.1 | 2111 | 42214 |
| GHG emission generated through planting operations | CL 1.3 | -0.4 | -7.5 |
| **TOTAL** | **2126** | **42526** |

**CL1.5 – Avoid Double Counting**

The emission reduction units (ERUs) generated through the implementation of the project activity are to be used to partially offset the GHG emissions generated by eThekwini Municipality during the course of hosting certain matches of the 2010 FIFA World Cup in Durban. This shall be clearly stated on the websites of both the Municipality and the Wildlands Conservation Trust.

The project shall be communicated to the national climate change office for inclusion in South Africa’s next National Communication to the UNFCCC as a project-scale land-use based emission reduction activity.

**CL2. Offsite Climate Impacts**

**CL2.1 - Types of Leakage**

- The shift of the baseline activity
  Tongaat Hulett is a large agricultural company with approximately 25000 hectares of cropland under sugar cane. The total area under sugarcane varies from year to year as land is purchased, sold and or leased. The baseline area under sugar is less than 2% of the cultivated area and there are no specific plans to shift the baseline sugar cane activity elsewhere. Since land under cane changes year to year it is not possible to state that anyone particular area has or has not been replaced by another cultivated area. However the overall area under sugar cane in South Africa has declined slightly over the last 10 years (Department of Agriculture, Forestry and Fisheries 2011 and SASA 2012) as land has been converted into other landuses (particularly urban development), this indicates that there is no more land available and the baseline activity cannot shift elsewhere.

- Fuel Wood Harvesting
  There is the potential that neighbouring communities may harvest fuel wood from the project site. It is however, envisaged that the risk of such leakage occurring is low because in essence the establishment of the project stems directly from the tree planting initiative of local communities. The community reaped substantial benefits from the broader tree planting initiative and have also been the subjected to a project sensitisation and awareness programme.
- The risk of fire to project activity

The coastal forests of KwaZulu-Natal are typically too moist year round to allow for the occurrence of fire. Fire may occur in grassland areas or forests that have been invaded by exotic Eucalypt species but in general the coastal forests of South Africa’s eastern coastline is seen as ‘fire-free vegetation’ (Bond 1997). In addition, the project site is relatively small in size and a rigorous fire prevention programme will be in place until the forest is established and through the duration of the project’s lifespan. Fire is therefore not seen as a clear threat to the outcome of the project over a period of 20 years.

Furthermore, the landowner is committed to the project and has the capacity to manage and police the reforested project area and thus prevent potential leakage.

**CL2.2 – Mitigation of Leakage**

The risk of leakage is considered low and we do not therefore see the need for an intensive leakage mitigation programme other than controlling access and implementing a basic fire control programme in the early stages of the project activity.

**CL2.3 – Unmitigated Negative Offsite Climate Impacts**

It is not envisaged that the project will produce any negative offsite climate impacts.

**CL2.4 – Unmitigated Negative Non CO₂ Climate Impacts**

The project is unlikely to lead to additional or negative non-CO₂ climate impacts offsite

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**CL3. Climate Impact Monitoring**

**CL3.1 – Carbon Pools to be monitored**

A monitoring methodology will be submitted within 12 months, which will include:

- Monitoring of the aboveground woody carbon pool
- Monitoring of GHG emissions generated through reforestation and management operations (the use of liquid fuels)

As described in Section G1.4, only the aboveground woody carbon pool will be monitored using the forest inventory methods described by Glenday (2007, Appendix F). The herbaceous, litter and soil organic carbon pools shall not be monitored due to the cost of estimating the size of each carbon pool.

Concerning monitoring leakage, as described, no leakage is expected due to the project activity. The production of sugar cane shall not be diverted elsewhere and the reforestation of sugarcane land is unlikely to lead to deforestation elsewhere or lead to GHG emissions in addition to those generated through reforestation and management operations.

**CL3.2 – Commitment to Monitoring Plan**

The project developer is committed to develop a detailed monitoring plan within 12 months of validation against the Standards and to make the plan available for peer review. The monitoring will be undertaken by local residents, which has been shown to be a cost-efficient yet scientifically robust means of estimating changes in biomass carbon stocks while providing additional direct employment benefits to neighbouring communities (Knowles et al. 2010). Members of the local
community will be trained to undertake the monitoring, further enhancing the community benefits of the project.

The monitoring plan and the results of monitoring will be made available to communities and stakeholders through the following means:

- Published on the internet accessible via the Wildlands website
- Printed copies of documents will be made available at the project office
- The plan and results will be presented at the monitoring committee for the landfill site

COMMUNITY SECTION

CM1. Net Positive Community Impacts

CM1.1 – Net positive impacts on communities

The community benefits derived from the project were investigated by GreaterCapital. A detailed report can be found in Appendix B. The benefits created by the project can be divided into two components, firstly, jobs created by the actual reforestation project (summarised in Table 8) and secondly, the social upliftment created by the treepreneur programme that has been established within eThekwini to supply trees for reforestation. Treepreneurs do not receive cash payments, but rather trade their trees at Tree Stores for a variety of goods. The social impact assessment carried out by GreaterCapital (Appendix B) included the overall tree-preneur programme within the eThekwini Municipal Area. This includes the kwaMashu community which falls outside the project zone. Treepreneurs from kwaMashu supply trees to the Buffelsdraai reforestation project but also to other projects within eThekwini. While kwaMashu treepreneurs have benefited from the Buffelsdraai projects this benefit is limited and will come to an end in 2013 when their trees will be supplied to other eThekwini projects. The Buffelsdraai and Osindisweni communities will be involved in the project for the long term and therefore are included within the project zone.

Table 8. Job creation statistics for the Buffelsdraai Landfill Site Community Reforestation Project (note this does not include Tree-preneurs) (Appendix B).

<table>
<thead>
<tr>
<th>Category</th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
<th>Position</th>
<th>Origin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-time</td>
<td>8</td>
<td>13</td>
<td>21</td>
<td>planting teams and facilitators</td>
<td>Osindisweni, Buffelsdraai, kwaMashu and Ndwedwe</td>
</tr>
<tr>
<td>Part-time</td>
<td>6</td>
<td>0</td>
<td>6</td>
<td>fire watch and biodiversity enhancement teams</td>
<td>Osindisweni and Buffelsdraai</td>
</tr>
<tr>
<td>Temporary labour</td>
<td>134</td>
<td>86</td>
<td>220</td>
<td>seasonal tree planting and hole digging teams</td>
<td>Osindisweni and Buffelsdraai</td>
</tr>
<tr>
<td>Total</td>
<td>148</td>
<td>99</td>
<td>247</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All of the planting team members were previously unemployed and two of the team are regarded as youth (< 25yrs). Their salaries are calculated according to the minimum wage in the construction industry in the Buffelsdraai community (hourly rate) including annual inflationary increases. The average level of pay over the two years of the project is R2 700 per month. This salary range is equivalent to the salaries paid out to permanent staff working on sugar cane farming activities. Permanent facilitators receive an average salary of R1800 a month.
Temporary labour was employed to assist in the nursery with transplanting seedlings, when there was a back-log of transplanting. Normally this activity lasted an average of 9 days at various stages during the project’s inception. Temporary labour wages were paid through arrangements with a local wholesale supermarket in Verulam; wages were paid at the shop (common mechanism to pay out pensions in South Africa), on the condition that they spent part of their wage at the shop. This worked out at an average of R990 per person.

**Comparative analysis of the Tree-preneur project’s social impact since end of 2008**

The social impact of the project was assessed by establishing the change in socio-economic conditions of project beneficiaries since November 2008. Actual survey data has been compared with historical baseline data, taking into consideration the organisations’ own activity planning and monitoring records in order to deal with the question of causality. Qualitative findings elicited from the focus groups have been considered in the analysis as well.

More than 600 tree-preneurs have already registered with the ITFL programme that supplies trees to the Buffelsdraai site (Appendix D). This section provides detailed socio-economic information of the tree-preneur participants before the start of the tree growing project and up to the present moment in time. It discusses the net change recorded according a set of indicators and analyses the possible causal-link to the reforestation project. Data on current socio-economic indicators is aimed to serve as valuable baseline for the monitoring and evaluation of the project going forward.

The information contained in this section refers to household as opposed to individual tree-preneurs. 305 tree-preneurs were interviewed and spoke on behalf of their households.

**Participation in the ITFL project**

- 13% of households have not yet traded trees. This infers that 13% of households participating in the survey have started growing trees but not yet received any goods or services in exchange for trees.
- Food is the most traded good; almost every tree-preneur who has already traded has required food at a tree store at least once. These results are consistent with WCT records of value traded.
- As expected, goods traded have an impact on the whole household and not only the individual tree-preneur. The reach of the project expands beyond the direct participants in the project. Goods are also being shared to a lesser degree beyond the household boundaries, with extended family (7%) as well as church members (4%).

Figure 12 summarises the goods traded by tree-preneurs and Figure 13 the ultimate users of the traded goods.
Key findings of the socio-economic assessment follow below. For detailed information on survey techniques and more results consult Appendix B.

**Living standards: food consumption**

Due to the differences in the communities surveyed, it is possible to expect different understandings/interpretations of “being hungry” or having “sufficient food” as the question around food availability in the household was formulated on the questionnaire. Unfortunately, this assessment did not test basic definitions and the value placed on food and food availability among survey participants in the various communities and therefore the findings assume a generic, standard understanding of these terms across communities.
Respondents were asked to rate their level of food consumption / food availability in the household on a scale of “Always go hungry” to “Lots of food”. Eighty percent of respondents admitted to having insufficient food to satisfy their needs on a regular basis at the start of the project. Only 11% indicated that they had “enough food”, which describes the situation of food scarcity experienced by the treepreneurs and their families. Households obtained food from a variety of sources, mostly from the local market (44%), which is often supplied with home-grown produce, in the case of 27% of respondents.

As Figure 14 and 15 below illustrate, this picture has however changed significantly over time.

**Figure 14.** Impact of project on food consumption levels of Tree-preneurs, average of all three communities combined.

**Figure 15.** Baseline and current source of food for the three communities combined.
Currently, the number of participants that experiences irregular food supply has almost been halved to 47%, and nearly half of the sampled households now boast an adequate supply of food, with a small but noteworthy 2% having plentiful supply. This is further confirmed by the responses around the quantity and quality of food consumption: respondents have an average of 2.7 meals a day and eat meat, as a major source of protein, at least twice a week.

Although some households still source their food from the local market, tree stores have become a source of food for 30% of participants. It is interesting to note that tree store goods have replaced most of the support provided by extended families as well as some of the produce grown by treepreneurs in their gardens.

When analysing the survey responses per community, however, considerable differences come to the surface in terms of the benefit of the project. The following graphs represent the trends in food security emerging from the survey results before the implementation of the project and at present time.

![Buffelsdraai](image)

**Figure 16.** Level of food consumption for tree-preneur households in Buffelsdraai
The community where tree-preneurs indicate they have experienced the largest positive change in food security within the household is Buffelsdraai. 40% of respondents’ households went from being “hungry sometimes” at the start of the project to having “enough food” at the present time. Buffelsdraai is the community that obtained the most food of the three through the trading of trees (food calculated in value terms): 156 tree-preneurs accessed 55% of the total value of R150,872.50. 80% of Buffelsdraai project beneficiaries now have a secure supply of food.

Figure 17 shows that tree-preneurs in Osindisweni have experienced benefits to a limited extent compared to the other communities. Only 10% more respondents indicated to have “enough food” compared to the beginning of the project. This finding is validated by trading data records: tree-preneurs from Osindisweni (106) only accessed 11% of the total value of food traded.

![Figure 17. Level of food consumption for tree-preneur households in Osindisweni](image)
Between January 2009 and October 2010, school fees to the value of R31 500 (which is equal to 21% of the total value of goods traded, according to WCT records) were funded through the project. This was distributed among 27 households of which 22 came from Buffelsdraai, one from KwaMashu and four from Osindisweni. It should be noted that most of the households that requested that school fees be sponsored were from Buffelsdraai due to a facilitator that actively promotes education. This highlights the need for communication of the benefits of using the project to enhance children’s education. It is interesting to note that 8 of these treepreneurs are under the age of 18 and therefore grow trees to pay for their own school fees. One particular tree-preneur (age 11) stated that she grows trees to be able to attend a school that has better facilities than her local school. 7% of the tree-preneurs indicated that they have been able to send their children to schools with better equipment and more resources since starting participation in the ITFL Programme.

Figure 18 below represents the most common reasons for missing school, as indicated by respondents.

![Figure 18](image)

**Figure 18.** Baseline versus current reasons for missing school in tree-preneur communities.

These findings, however, must be interpreted within the context of school attendance rates: children were attending school 4.6 days a week at the beginning of the project. This rate has gone up to 4.8 days a week in the current scenario. This represents a 4% decrease in the rate of children missing school, which as Figure 19 illustrates, can be attributed to an increase in food security within the projects’ households. Even without the programme’s benefits and despite economic difficulties, parents have been prioritising their children’s education over other expenses.

Figure 19 above also shows that since the project started there has been a 20% decrease in children not attending school due to a lack of food. According to participants in the focus groups, depending on the size of the family, food purchased at a tree store sustains the household until the next tree store trading day.

Currently, the main reason indicated for children missing school is lack of school fees. Despite the introduction of the programme, this option is selected by an increased number of survey respondents to explain the reasons why children in their household are currently not going to school. This can be explained by two reasons:
- There are 129 more children within the survey sample than at the beginning of the project in November 2008; it is possible that household income has not increased proportionately to the need for school fees.
- The reach of school fees’ benefit through the programme is limited. As stated above, only 27 Treepreneurs have accessed school fees. During the focus group discussions it became apparent that Osindisweni Treepreneurs were not aware of the possibility of trading trees for school fees. One facilitator confirmed that the benefit had not been introduced in that particular community at that time.

During the focus group discussions, treepreneurs did place a great emphasis in the value of being able to pay for school fees through the programme, which presents a good opportunity for the programme to be expanded further into the each community.

Living standards: access to additional resources, electricity and water

Alternative resources, such as building materials, are also available at the tree stores. According to WCT records, it’s a small group of treepreneurs that has bought building materials, accounting 5% of the total value traded. According to the survey, 6% of treepreneurs renovated their house since the start of the project but predominantly used their own income for this purpose as well as in-kind donations.

Over 95% of survey participants having in-house electricity. According to participants in the focus groups, pre-paid electricity meters are used in all three communities, which allows for easy electricity usage control and household budgeting.

Figure 19. Baseline and Current: water access in tree-preneur communities.

Almost one third of the households sampled need to collect water from the surrounding natural water sources (Figure 19). However, when analysing these results per community, an asymmetry between the project communities becomes apparent: only 12% of households in Buffelsdraai have in-house water and get their water from communal stand-pipes.
The current conditions in water supply do not differ considerably from the pre-project conditions. It is however worth noting that although many households in Buffelsdraai and Osindisweni do not have the convenience of direct water supply to their homes, the water collected from the communal taps is adequate and of good quality.
The overall benefits of the Buffelsdraai Landfill Site Community Reforestation Project is summarised in Table 9 below.

**Table 9.** Summary of community benefits of the Buffelsdraai Landfill Site Community Reforestation Project including benefits derived from the ITFL programme.

<table>
<thead>
<tr>
<th>Livelihood Asset</th>
<th>Net effect</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Financial resource</strong></td>
<td>Job creation</td>
<td>21 full-time, permanent jobs; 6 part-time jobs; 220 short-term jobs (average 9 days); Loss in temporary jobs (approx. 30 labourers over average 8 month long periods); With the start of the reforestation activity, permanent sugar cane staff was reallocated to other operations within the company resulting in zero net loss of permanent jobs with project scenario. The reforestation project has only replaced some of the temporary jobs created by the sugar cane farming activity.</td>
</tr>
<tr>
<td><strong>Access to infrastructure resources</strong></td>
<td>Limited benefit of increased access to infrastructure resources</td>
<td>Potential causes: Lack of an integrated and complementary offer (i.e. cement, bricks and necessary tools); Long time gaps between tree stores, which are not conducive for the building process;</td>
</tr>
<tr>
<td><strong>Social resource</strong></td>
<td>Cohesion levels within the community</td>
<td>Enabled informal connections among community members and “sense of belonging”; “Sense of purpose” for the unemployed</td>
</tr>
<tr>
<td><strong>Human resource</strong></td>
<td>Access to education</td>
<td>Improved schooling for children; Additional disposable income to cover additional needs (i.e. transport) has been released; 7% of Treepreneurs indicated to have been able to send their children to a better school as a result of the programme</td>
</tr>
<tr>
<td><strong>Food security</strong></td>
<td>Adequate food supply and consumption by project participants in 2 project communities has increased by 40%; 80% of surveyed respondents in Buffelsdraai and 40% in KwaMashu indicated they now have sufficient food (from 38% and 2% respectively)</td>
<td></td>
</tr>
<tr>
<td><strong>Natural and environmental resource</strong></td>
<td>Access and appropriate use of natural resources</td>
<td>No evidence of impact from the research conducted has been recorded.</td>
</tr>
<tr>
<td><strong>Environmental awareness/education</strong></td>
<td>Increased awareness of the benefits of indigenous vegetation over invasive alien plant species; Treepreneurs are also able to identify seeds of indigenous trees</td>
<td>This knowledge could be capitalised on in other programmes such as invasive alien plant control.</td>
</tr>
</tbody>
</table>

**CM1.2 – Negative impacts on areas of High Conservation Value**
The project will not impact negatively on any areas of High Conservation Value.
CM2. Offsite Stakeholder Impacts

CM2.1 – Negative offsite stakeholder impacts

The identified potential impacts to offsite stakeholders are summarised in Table 10 below.

Table 10. Summary of potential negative off-site social and economic impacts as well as possible mitigation strategies for the Buffelsdraai Landfill Site Community Reforestation Project.

<table>
<thead>
<tr>
<th>Areas of possible negative offsite impacts</th>
<th>Mitigation measures</th>
</tr>
</thead>
</table>
| Potential for the landfill buffer zone (809 ha) to be reforested in its entirety and become a conservation reserve: limited access and use by surrounding communities. | • A management plan should be put in place, which includes community consultation and feedback mechanisms.  
• The plan should include an assessment of job creation opportunities for surrounding community members, as rangers and maintenance teams.  
• The plan should also consider alternatives for community members, especially, traditional healers, to continue accessing plants and herbs on a sustainable basis. |
| Displacement of sugar cane farming activity | • Land was paid for outright.  
• Land was not very productive due to the lack of rainfall.  
• Potential loss of permanent and/or contract jobs should be analysed in the context of the future expansion plans of the project. |
| Community discontent around the limitation for new community members to join the programme | • Community consultation and communication could be strengthened, regarding expectation management, community participation and future programme development. Ward councillors and community representatives are important stakeholders, some of them being Tree-preneurs themselves. |

CM2.2 – Mitigation of negative offsite stakeholder impacts

The measures to mitigate impacts to offsite stakeholders are summarised in Table 10 above.

CM2.3 – Negative impacts on the well-being of other stakeholder groups

The reduction in total sugar cane production is the only possible impact on other stakeholder groups, but due to the farm’s relatively small size and low productivity this reduction will be insignificant to any stakeholder.

CM3. Community Impact Monitoring

CM3.1 – Community Impact monitoring

The Community Impact Monitoring Plan seeks to ensure that the programme remains relevant, with a net positive impact on the surrounding communities. This will be achieved through the continued monitoring of the programme’s performance as well as annual evaluations of net impact. The
indicators to be monitored have been selected on the basis of the categories suggested by the Social Carbon Methodology approach. These are included in Table 11 below.

**Table 11.** Buffelsdraai Landfill Site Community Reforestation Project Monitoring and Evaluation indicators.

<table>
<thead>
<tr>
<th>Resource</th>
<th>Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial Resource</td>
<td>Indicator 1. Number of jobs created – permanent and temporary</td>
</tr>
<tr>
<td></td>
<td>Indicator 2. Increased access to infrastructure resources</td>
</tr>
<tr>
<td>Social Resource</td>
<td>Indicator 3. Conflict level within the community</td>
</tr>
<tr>
<td>Human Resource</td>
<td>Indicator 4. Increased access to education and attendance</td>
</tr>
<tr>
<td></td>
<td>Indicator 5. Enhanced food security</td>
</tr>
<tr>
<td>Biodiversity and Natural Resource</td>
<td>Indicator 6. Increase access and appropriate use of natural resources</td>
</tr>
<tr>
<td></td>
<td>Indicator 7. Increase level of environmental awareness/education</td>
</tr>
</tbody>
</table>

The monitoring will include:

1. **Collection of baseline data at registration stage**
   Baseline information will be collected at the point of registering new participants into the programme. A sample of the data entry form is included in Appendix B.

2. **Regular feedback through employee and community consultation**
   Facilitators are well-positioned to collect feedback from beneficiaries regarding specific needs which could be addressed by the trading programme and the implementation programme in general. This will assist in keeping the programme relevant and in optimizing positive impacts where possible.

3. **Regular surveys**
   Surveys to assess the impact of the programme against the established baseline will be conducted on a regular basis, using a survey tool similar to what has been recommended in Appendix B. The survey frequency will be determined by the monitoring plan.

4. **Data analysis against indicators**
   WCT uses trading records to track programme outputs. The analysis of those records together with the data collected from the two previous phases will provide a good understanding of scope of the impact of the programme across beneficiaries. The specific indicators that would be assessed include:
   - The value of food traded and number of people buying food;
   - The number of children who have been sponsored to go school in a given year;
The number of children that have moved to schools with better facilities as a result of being sponsored.

Results of the annual assessment will be shared with programme stakeholders as per the requirements of the CCBA Standard.

**CM3.2 – Assessment of impact on areas of High Conservation Values**
No areas of High Conservation Values related to community well-being have been identified (Table5)

**CM3.3 – Commitment to Monitoring Plan**
The project developer is committed to develop a detailed monitoring plan within 12 months of validation against the Standards and to make the plan available for peer review. The monitoring plan and the results of monitoring will be made available to communities and stakeholders through the following means:

- Published on the internet accessible via the Wildlands website
- Printed copies of documents will be made available at the project office
- The plan and results will be presented at the monitoring committee for the landfill site
B1. Net Positive Biodiversity Impacts

B1.1 – Estimated changes in biodiversity due to the project

The biodiversity objectives of the project are as follows:

- **Objective 1**: To successfully re-establish naturally occurring indigenous trees and plants into lands previously managed as sugarcane and croplands;
- **Objective 2**: To manage and maintain reforested areas in order to secure a long-term contribution towards conservation objectives;
- **Objective 3**: To maintain or improve the habitat condition of natural habitat fragments;
- **Objective 4**: To attain a recognized conservation status (at least a conservancy), thereby maintaining the conservation value of the area and providing opportunities for research and education on environmental matters.

These biodiversity objectives are being achieved by reforested currently active or degraded sugar cane lands that are severely impoverished from a biodiversity perspective. Only indigenous plant species, grown from seed harvested within a 50 km radius from the project area, are used in the replanting. The species composition of remaining natural woodlands on the property is also used to further guide the rehabilitation process.

At present, 61 indigenous tree species are being planted at a density of approximately 1300 trees/ha on the sugar cane and fallow lands (Table 12). To enhance the rehabilitation process, understorey species are planted with the trees. None of these species are planted are non-native or invasive.
Table 12. Indigenous tree and understorey species used in the Buffelsdraai Landfill Site Community Reforestation Project.

<table>
<thead>
<tr>
<th>Pioneer tree species</th>
<th>Biodiversity input / understorey species (shrubs, bulbs &amp; grasses)</th>
<th>Climax tree species</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Acacia karroo</td>
<td>Agapanthus campanulatus</td>
<td>Albizia adianthifolia</td>
</tr>
<tr>
<td>2  Acacia robusta</td>
<td>Agapanthus praecox</td>
<td>Allophylus natalensis</td>
</tr>
<tr>
<td>3  Acacia sieberiana</td>
<td>Aloe barberiae</td>
<td>Antidesma venosum</td>
</tr>
<tr>
<td>4  Aloe arborescens</td>
<td>Aloe ferox</td>
<td>Burchellia bubalina</td>
</tr>
<tr>
<td>5  Apodytes dimidata</td>
<td>Aristida junciformis</td>
<td>Calodendrum capens</td>
</tr>
<tr>
<td>6  Brachylaena discolour</td>
<td>Asparagus falcatus</td>
<td>Carissa bispinosa</td>
</tr>
<tr>
<td>7  Bridelia micrantha</td>
<td>Asparagus densiflorus</td>
<td>Celtis africana</td>
</tr>
<tr>
<td>8  Combretum spp.</td>
<td>Asystasia gangetica</td>
<td>Cussonia spicata</td>
</tr>
<tr>
<td>9  Croton sylvaticus</td>
<td>Barleria obtusa</td>
<td>Dombeya burgessiae</td>
</tr>
<tr>
<td>10 Dalbergia obovata</td>
<td>Bauhinia tomentosa</td>
<td>Dovyalis spp.</td>
</tr>
<tr>
<td>11 Ekebergia capensis</td>
<td>Buddleja salvifolia</td>
<td>Eucleria natalensis</td>
</tr>
<tr>
<td>12 Erythrina caffra</td>
<td>Bulbine asphodeloides</td>
<td>Gardenia thunbergia</td>
</tr>
<tr>
<td>13 Ficus natalensis</td>
<td>Carissa macrocarpa</td>
<td>Indigofera frutescens</td>
</tr>
<tr>
<td>14 Ficus sur</td>
<td>Chrysanthemoides monilefera</td>
<td>Phoenix reclinata</td>
</tr>
<tr>
<td>15 Ficus thonningii</td>
<td>Crassula multica</td>
<td>Pittisporum viridiflorum</td>
</tr>
<tr>
<td>16 Grewia occidentalis</td>
<td>Crinum macowanii</td>
<td>Podocarpus ssp</td>
</tr>
<tr>
<td>17 Halleria lucida</td>
<td>Cyperus albostratus</td>
<td>Rhus ssp</td>
</tr>
<tr>
<td>18 Harpephyllum caffrum</td>
<td>Dietes grandiflora</td>
<td>Rothmannia glabosa</td>
</tr>
<tr>
<td>19 Heteropyxis natalensis</td>
<td>Draacaena aletriformis</td>
<td>Schotia brachypetala</td>
</tr>
<tr>
<td>20 Millettia grandis</td>
<td>Encephalartos natalensis</td>
<td>Scleroxyra caffra</td>
</tr>
<tr>
<td>21 Protorhus longifolia</td>
<td>Eucomis autumnalis</td>
<td>Vepris lanceolata</td>
</tr>
<tr>
<td>22 Psychotria capensis</td>
<td>Gazania rigens</td>
<td>Chaetachme aristata</td>
</tr>
<tr>
<td>23 Strelitzia nicolai</td>
<td>Hibiscus pedunculatus</td>
<td>Dombeya rotundifolia</td>
</tr>
<tr>
<td>24 Syzygium cordatum</td>
<td>Hypoxis acuminata</td>
<td>Drypetes natalensis</td>
</tr>
<tr>
<td>25 Trema orientalis</td>
<td>Kniphofia latifolia</td>
<td>Maytenus heterophylla</td>
</tr>
<tr>
<td>26 Trichilia dregeana</td>
<td>Ledebouria revoluta</td>
<td>Ochna natalitia</td>
</tr>
<tr>
<td>27 Trichilia emetica</td>
<td>Leonotis leonorus</td>
<td>Portulacaria afr</td>
</tr>
<tr>
<td>28 Ziziphus mucronata</td>
<td>Plectranthus ecklonii</td>
<td>Rauvolfia caffra</td>
</tr>
<tr>
<td>29 Ficus lutea</td>
<td>Plectranthus fruticosus</td>
<td>Rhus chirindensis</td>
</tr>
<tr>
<td>30 Ficus polita</td>
<td>Plumbago auriculata</td>
<td></td>
</tr>
<tr>
<td>31 Acacia caffra</td>
<td>Polygala fruticosa</td>
<td></td>
</tr>
<tr>
<td>32 Erythrina lysistemon</td>
<td>Tecomaria capensis</td>
<td></td>
</tr>
<tr>
<td>33 Syzygium cordatum</td>
<td>Tetradenia riparia</td>
<td></td>
</tr>
<tr>
<td>34 Tulbagha violacea</td>
<td>Tetradenia riparia</td>
<td></td>
</tr>
<tr>
<td>35 Scadoxus puniceus</td>
<td>Tetradenia riparia</td>
<td></td>
</tr>
<tr>
<td>36 Scilla natalensis</td>
<td>Tetradenia riparia</td>
<td></td>
</tr>
<tr>
<td>37 Zantedeschia aethiopica</td>
<td>Tetradenia riparia</td>
<td></td>
</tr>
</tbody>
</table>

The main biodiversity benefit of the reforestation project is the significant enhancement of severely degraded ecosystems presently found in the project area. The baseline scenario is one where no indigenous tree species occur in sugar cane lands (Appendix A). It is expected that bird, mammal, amphibian and additional plant species will colonize the reforested sites from intact neighbouring forest.
In summary, the biodiversity assessment (Appendix A) conducted by Eco-pulse summarises the benefits of the project as follows:

“Re-establishment of natural habitats within the project area is likely to have a range of broader biodiversity benefits in the surrounding project zone. Some of the anticipated positive biodiversity impacts include:

- Reduction in the invasive alien plant levels resulting in decreased risk of spread onto adjoining natural areas;
- Increased connectivity between habitats in the adjoining landscape facilitating dispersal and movement of animals in the project area and project zone;
- Increase in habitat and food availability leading to an increase in carrying capacity and animal numbers in the project zone;
- Increased filtering capacity and reduced erosion from rehabilitated areas leading to a reduction in turbidity in receiving rivers.”

The tools recommended by the CCB are international tools, the local conservation authority (Ezemvelo KZN Wildlife) has developed a sophisticated conservation planning tool which is locally relevant, the KwaZulu-Natal Terrestrial Systematic Conservation Plan. This was the primary tool used to assess biodiversity status and impacts together with the IUCN Red List and the South Africa Red Lists.

B1.2 – Negative impact on areas of High Conservation Value
No areas of high conservation value will be negatively impacted. The conservation of neighbouring areas is likely to be enhanced through increasing habitat connectivity between threatened ecosystems (Appendix pg57).

B1.3 Species used by the project
Only species indigenous to the region as listed in Table 12 are used in the reforestation project. None of these species are invasive. As stated earlier, the project proponent is obliged by law (Conservation of Agricultural Resources Act 43 of 1983) to clear alien invasive species in the project area and the remainder of the landfill site buffer zone and is actively doing so.

B1.4. The use of non-native species
The project will under no circumstances plant non-native species as part of the reforestation, the main biodiversity aim is to restore the project area to as close as possible to it’s natural state.

B1.5 The use of GMOs
Only seeds harvested from local, indigenous trees are used in the project, thus no GMOs are used at all.

B2. Offsite Biodiversity Impacts
B2.1 Negative offsite biodiversity impacts
The project is not envisaged to result in any negative offsite biodiversity impacts, see Appendix A (page 57).
B2.2 Mitigation of negative offsite biodiversity impacts
As no negative offsite biodiversity impacts are envisaged, there are no mitigation activities needed.

B2.3 Unmitigated negative offsite biodiversity impacts
There are no negative offsite biodiversity impacts envisioned, the net biodiversity impact will be positive, see Appendix A (page 57).

B3. Biodiversity Impact Monitoring
B3.1 – Biodiversity impact monitoring
The Biodiversity Monitoring Programme is outlined in Appendix A. A detailed survey of the biodiversity currently occurring in the entire buffer zone was undertaken by a team of experienced natural scientists from Eco-pulse Consulting Services in 2010/2011. A similar approach will be followed in future to assess the ongoing biodiversity impacts of the project. The tools recommended by the CCB are international tools, the local conservation authority (Ezemvelo KZN Wildlife) has developed a sophisticated conservation planning tool which is locally relevant, the KwaZulu-Natal Terrestrial Systematic Conservation Plan. This was the primary tool used to assess biodiversity status and impacts together with the IUCN Red List and the South Africa Red Lists.

B3.2 – Assessment of impact on High Conservation Values
The monitoring programme outlined in Appendix A will; identify changes in vegetation condition and plant community composition of the ecosystems identified as being of High Conservation Value, and identify the presence and absence of High Conservation Value species.

B3.3 – Commitment to Monitoring Plan
The project developer is committed to develop a detailed monitoring plan within 12 months of validation against the Standards and to make the plan available for peer review. The monitoring plan and the results of monitoring will be made available to communities and stakeholders through the following means:

- Published on the internet accessible via the Wildlands website
- Printed copies of documents will be made available at the project office
- The plan and results will be presented at the monitoring committee for the landfill site
**GOLD LEVEL SECTION**

**GL1. Climate Change Adaptation Benefits**

**GL1.1 – Identify Likely Climate Change Impacts**
Predicted future impacts of anthropogenic climate change for the Greater eThekwini municipal area include (CSIR 2006, Constable and Cartwright 2009):

- Temperature increase of 2-3 °C and 3-4°C in daily maximum and minimum temperatures
- Increase in mean annual precipitation of 10-20%
- Increase in the frequency and intensity of short duration heavy rains
- Prolonged periods with no rain
- Increase in frequency and intensity of extreme weather events such as droughts, floods and heat waves

While these impacts are unlikely to affect the outcome of the project, the Buffelsdraai project does contribute to eThekwini Municipality’s climate change adaptation strategy. The project has been identified as one initiative within Phase 4 of Durban’s Integrated Development Plan that aims to mainstream climate change concerns into city planning and development. The restoration and reforestation of the project site will lead to improved water flow and sedimentation regulation as well as increase the area of suitable indigenous habitat in which species may shift in response to changes in climate. In a region where the frequency and intensity of short duration rainfall events as well as the occurrence of floods and droughts are predicted to increase, the improved management of storm water run-off through the restoration of degraded areas is a clear, practical climate change adaptation strategy.

For further information on how the project contributes to climate change adaptation, either through water flow and sedimentation regulation or the creation of suitable habitat for the migration of species, please see:

- Green Landscaping Guideline – COP 17 Durban
- eThekwini Municipality, Integrated Development Plan, 5 Year Plan 2007-2011

**GL1.2 – Identify Risks to Project’s CCB Benefits from Climate Change**

**Biodiversity benefits**
Predicted changes in climate for the project site are unlikely to negatively affect the anticipated increase in species richness and abundance. The project activity may assist species to adapt to the effects of climate change by providing corridors and area of suitable habitat for indigenous species that may need to shift their current geographic range due to changes in climate.
**Local community livelihood benefits**

Predicted changes in climate are unlikely to negatively affect the community-benefits anticipated due to the implementation of the project activity such as employment created through implementation, management and monitoring. Employment opportunities created through project implementation, management and monitoring are not anticipated to be negatively affected by predicted climate change. Local communities do not rely on subsistence farming and we thus do not foresee that changes in climate such as increased drought, will increase the risk of the project to be deforested for agricultural purposes.

**GL1.3. Demonstrate Current or Anticipated Climate Change impacts**

Please see section GL1.4 above.

**GL1.4. Demonstrate that Project Activities will Mitigate Climate Change impacts**

As identified in section GL1.1 predicted changes in climate for the region in which the project activity is located include (CSIR 2006, Constable and Cartwright 2009):

- Temperature increase of 2-3 and 3-4°C in daily maximum and minimum temperatures
- Increase in mean annual precipitation of 10-20%
- Increase in the frequency and intensity of short duration heavy rains
- Increase in frequency and intensity extreme weather events such as droughts and floods

The impacts on communities and biodiversity are predicted to include (Eeley et al. 1999, Lawes et al. 2007, Constable and Cartwright 2009, Ziervogel and Methner 2009):

- An increase in the frequency and intensity of flooding
- Reduction in agricultural productivity leading to unemployment
- Increase in invasive species and a shift in the geographic range of important endemic species and forest types

In their conclusions Eeley et al. (1999) sum up the current understanding of the historical effect of climate change on the forests of the region succinctly:

- The evolution and persistence of the diversity of forest types in KwaZulu-Natal is a result of the complex biogeographical history and present day physical diversity of the province.
- Different forest subtypes can be distinguished by relatively few physiologically important climatic variables.
- Forest [systems have] responded to past climate change by large-scale migration.
- At different times in the past the area currently occupied by scarp forests has provided refugia, as well as a region of overlap between Afromontane and Indian Ocean coastal belt forests, elements of which these forests retain to this day. This may help to explain the current high diversity of scarp forests, and we would argue that their conservation deserves a high priority.
- Forests are likely to respond to future climate change by migration.
- Montane, mist belt, scarp and lowland forests look relatively secure into the future, provided of course that sufficient area of these forests is protected.
- The positioning of protected areas will be important for the future preservation of forest in the region. Size and topographical heterogeneity of reserves is particularly important to allow forest to respond to climate change by migration within the protected area.
The effect of climate change on a particular species is not only constrained to a potential range shift, but the existence of suitable habitat within the new range and the dispersal capability of the species and its ability to successfully populate and survive in the new range. Especially in the KwaZulu-Natal region there has been large scale transformation of suitable habitat in indigenous landscapes to exotic pastures, plantations, crops, sugarcane, mines and urban settlements. The combination of climate change together with large-scale transformation and fragmentation of suitable habitat presents negative consequences and challenges for long-term conservation of region (Eeley et al. 1999, Lawes et al. 2007).

Maintaining unique ecosystems, intact forests and corridors outside of formal conservation areas provides indigenous species with the ability to adequately respond and adapt to climate change. The restoration and long term maintenance of indigenous forests may assist in providing suitable habitat for anticipated range shifts within the proximity of the project site.

In comparison to sugarcane fields that are cleared each year, the restoration of forests and riverine vegetation provides an opportunity to regulate water flow and sediment load. As rainfall events are expected to become more episodic and extreme in region, the restoration of indigenous forests, ground cover and associated ‘sponge effect’, reduces the potential for flash floods following heavy downpours and cyclones. It also assists to maintain water flow through drought periods. As such, it assists adjacent human societies and downstream economies to adapt to climate change in a relatively cost effective manner.

The implementation and management of the project activity will lead to the creation of additional employment opportunities.

GL2. Exceptional Community Benefits

GL2.1 – Project Zone HDI
The Buffelsdraai Landfill Site Community Reforestation Project is within a Medium Human Development country (South Africa’s HDI is 0.597) and lies within the province of KwaZulu-Natal where 54.3% of its population live below the national poverty line (see section G1.5 above)

GL2.2 – Demonstration of “Most Need” Benefits
The Buffelsdraai Landfill Site Community Reforestation Project uses a highly innovative model: the buffer zone around the Buffelsdraai landfill is being reforested with locally indigenous tree seedlings, which are grown by community members. Those “tree-preneurs” can then trade the seedlings in exchange of much needed goods and services, such as food and school fees. The project is therefore actively contributing to improving the living conditions of the surrounding communities, by creating an opportunity for additional income as a result of food availability, casual employment, and improved schooling for families, who could otherwise not afford it.

According to the results of the survey conducted in the project communities (Appendix B: Social Impact Assessment), over 90% of all the project’s beneficiaries fall below South Africa’s poverty line of R8,845 per person per annum.
As stated in the section covering the general socio-economic overview; over 90% of the sample receives a maximum household income of R2501 per month or R30,012 per year. Considering the average household size of six people, the average income per person per annum stands at R5,002. This is substantially below the national poverty line of R8,845 as defined previously. This confirms that almost all of the project’s beneficiaries are below South Africa’s poverty line.

The Buffelsdraai Landfill Site Reforestation Project is therefore contributing to reducing poverty and enhancing the sustainable livelihood of some of the most vulnerable and poor groups in South African society.

GL2.3 – Barriers to benefits
Anyone within the project zone can become a “tree-preneur” and there are no barriers preventing poorer households receiving benefit from the project.

GL2.4 – Negative Impacts
The project is benefiting the poorer members of the neighbouring communities (see GL1.2) and is not expected to have negative impacts on these individuals. The possible job losses associated with the reduction of farming activities may impact poor and vulnerable households; this will be mitigated by a net increase in job opportunities. Poorer and more vulnerable households are identified by community leadership for employment.

GL1.5 – Community Impact Monitoring
The surveys developed for community impact monitoring record monthly household income which will identify poorer households and allow for a differentiated approach to the monitoring, see Appendix B: Social Impact Assessment

GL3. Exceptional Biodiversity Benefits
The project does not fulfil the criteria of this section.

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List of Appendices

Appendix A - Biodiversity assessment of the Buffelsdraai Landfill Site Reforestation Project.

Appendix B - Final report to Wildlands Conservation Trust: social assessment of the Buffelsdraai Landfill Site Community Reforestation Project.

Appendix C – Letter from eThekwini Municipality regarding project ownership, sustainability and land tenure, with attachments.

Appendix D - Buffelsdraai Landfill Site Community Reforestation Project: Phase 1 Report

Appendix E – Wildlands Conservation Trust letter of appointment to undertake Buffelsdraai Landfill Site Community Reforestation Project on behalf of eThekwini Municipality.

Appendix F – Carbon Storage and sequestration analysis for the eThekwini Environmental Services Management Plan.