Nuevas Esperanzas Carbon Assessment Report

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1 Introduction

As part of Nuevas Esperanzas' efforts to acknowledge and reduce the environmental impact of their activities, David Wilson (a volunteer with Nuevas Esperanzas) was asked to calculate the carbon footprint of the organisation. This was agreed at a meeting on 27th December 2010.

This report sets out the findings of the investigation into the carbon impacts of various aspects of Nuevas Esperanzas operations, including emissions related to:

- Office use: electricity consumption, air conditioning, water
- Vehicle use and freight delivery
- Business flights
- Supply chain: major items used in construction e.g. cement and iron/steel

1.1 Background Information

1.2 Table 1 Summary information

Date of audit	Jan - Feb 2011
Total floor area	98.59sq/m
Number of employees	13
Information provided	Electricity data, water data, vehicle mileage and accounts for supply chain information
Areas covered in audit	Office area, vehicles, supply chain and flights

Nuevas Esperanzas Carbon Footprint

1.3 Summary

Using the information provided by Nuevas Esperanzas, the organisations baseline carbon footprint has been calculated to be **50.39 tonnes of CO_2(e)** between January 2010 and December 2010. Calculations were made using a variety of sources including the UK Department for Environment, Farming and Rural Affair's *2010 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting.* See appendix for full list of sources.

The carbon footprint does not include emissions arising from waste or staff commuting as information is unavailable. Every effort should be made to account for as many types of emissions sources as possible in the organisation's future carbon footprints.

Table 2 below provides a summary of the emissions by source. Figures 1 – 3 provide a more detailed breakdown of the carbon emissions by source. For further details on each emission source see the attached spreadsheet, *Nuevas Esperanzas carbon footprint data.*

1.4 Obeservations

The following observations can be made from the summary table:

1. Supply chain emissions represent the largest portion of Nuevas Esperanzas' impact at over 58%
2. Collectively, emissions from vehicle use represent almost 20% of total emissions
3. Use of the Land Cruiser alone represents over 10% of total emissions
4. Only 7% of the total emissions are associated with the office use almost 5% of which is from electricity consumption
5. Almost 15% of total carbon emissions come from 1 return flight to the UK for 4 people.

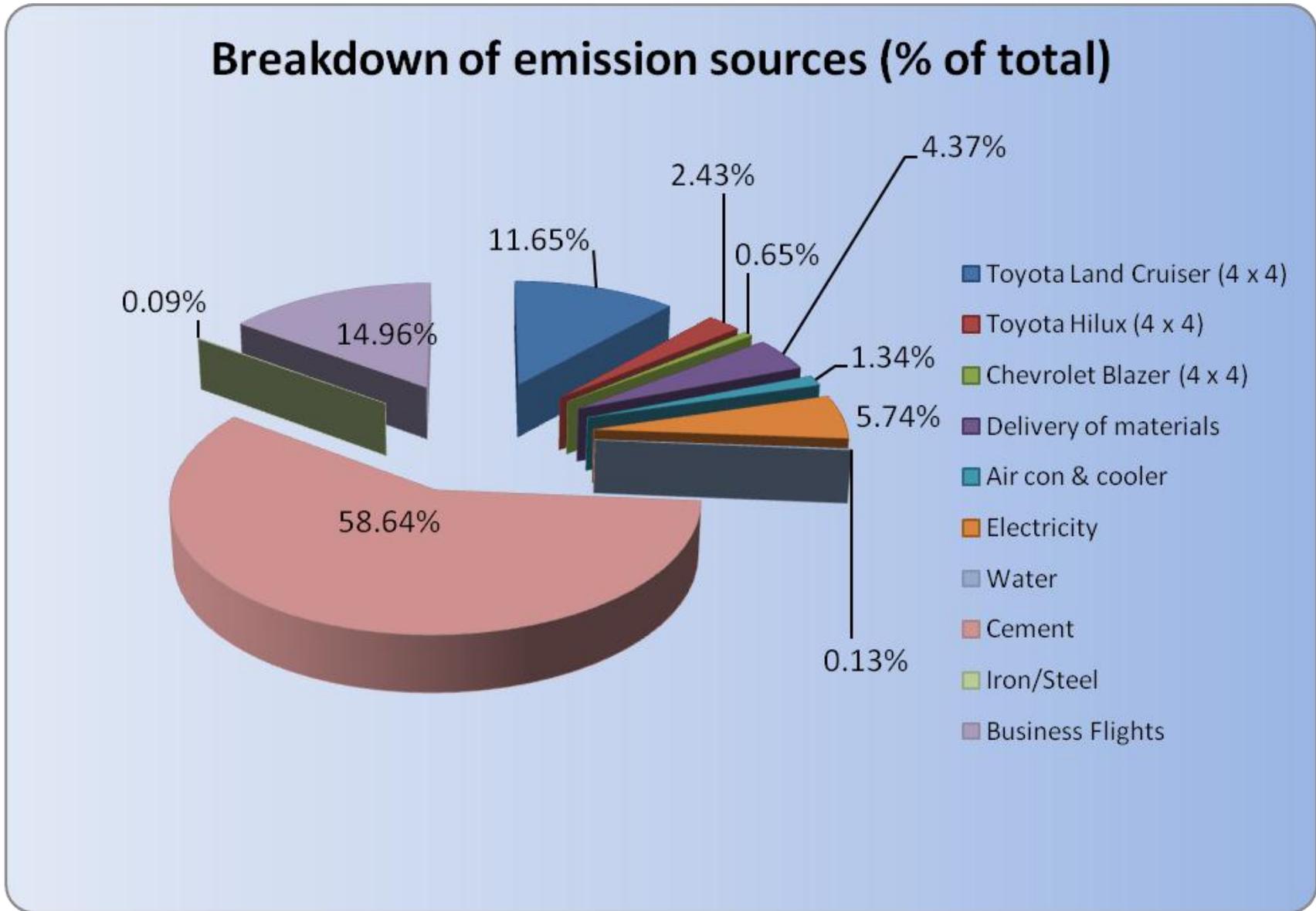**Notes:** All emissions are in units of CO_2(e) and therefore include emissions of nitrogen oxide (N_2O) and methane (CH_4).

1.5 Table 2 Carbon footprint summary

GHG emissions data for year 1		Start: Jan -10
		End: Dec-10
Scope	**Source**	**Tonnes of CO2e**
		Year 1 (baseline)
1	Total vehicle use	9.63
1	Air conditioning and refrigerant leakage	0.67
2	Electricity use	2.89
Standard practice total gross emissions		**13.19**
3	Water	0.06
3	Flights	7.54
3	Supply chain	29.6
Best practice total gross emissions		**50.39**
Carbon Offsets		0
Total annual net emissions (optional)		**50.39**
Intensity ratio emissions per staff member (tn/co2 e/employee)		**3.8**

Emission Source breakdown	kg/Co2 (e)	% of total
Land Cruiser	5872	11.65
Hilux	1225	2.43
Blazer	327	0.65
Delivery (El Ojoche)	2201	4.37
Air con & cooler	673	1.34
Electricity	2893	5.74
Water	66	0.13
Cement	29555	58.64
Iron/Steel	45.74	0.09
Business Flights	7540	14.96
Total	50397.74	100.00

1.6 Figure 1: Carbon footprint by emission source

Breakdown of emission sources (% of total)

- Toyota Land Cruiser (4 x 4) — 11.65%
- Toyota Hilux (4 x 4) — 2.43%
- Chevrolet Blazer (4 x 4) — 0.65%
- Delivery of materials — 4.37%
- Air con & cooler — 1.34%
- Electricity — 5.74%
- Water — 0.13%
- Cement — 58.64%
- Iron/Steel — 0.09%
- Business Flights — 14.96%

1.7 Figure 2: Carbon footprint by source, excluding cement

Breakdown of emission sources excluding cement (% of total)

- Toyota Land Cruiser (4 x 4) — 28.17%
- Toyota Hilux (4 x 4) — 5.88%
- Chevrolet Blazer (4 x 4) — 1.57%
- Delivery of materials — 10.56%
- Air con & cooler — 3.23%
- Electricity — 13.88%
- Water — 0.32%
- Iron/Steel — 0.22%
- Business Flights — 36.18%
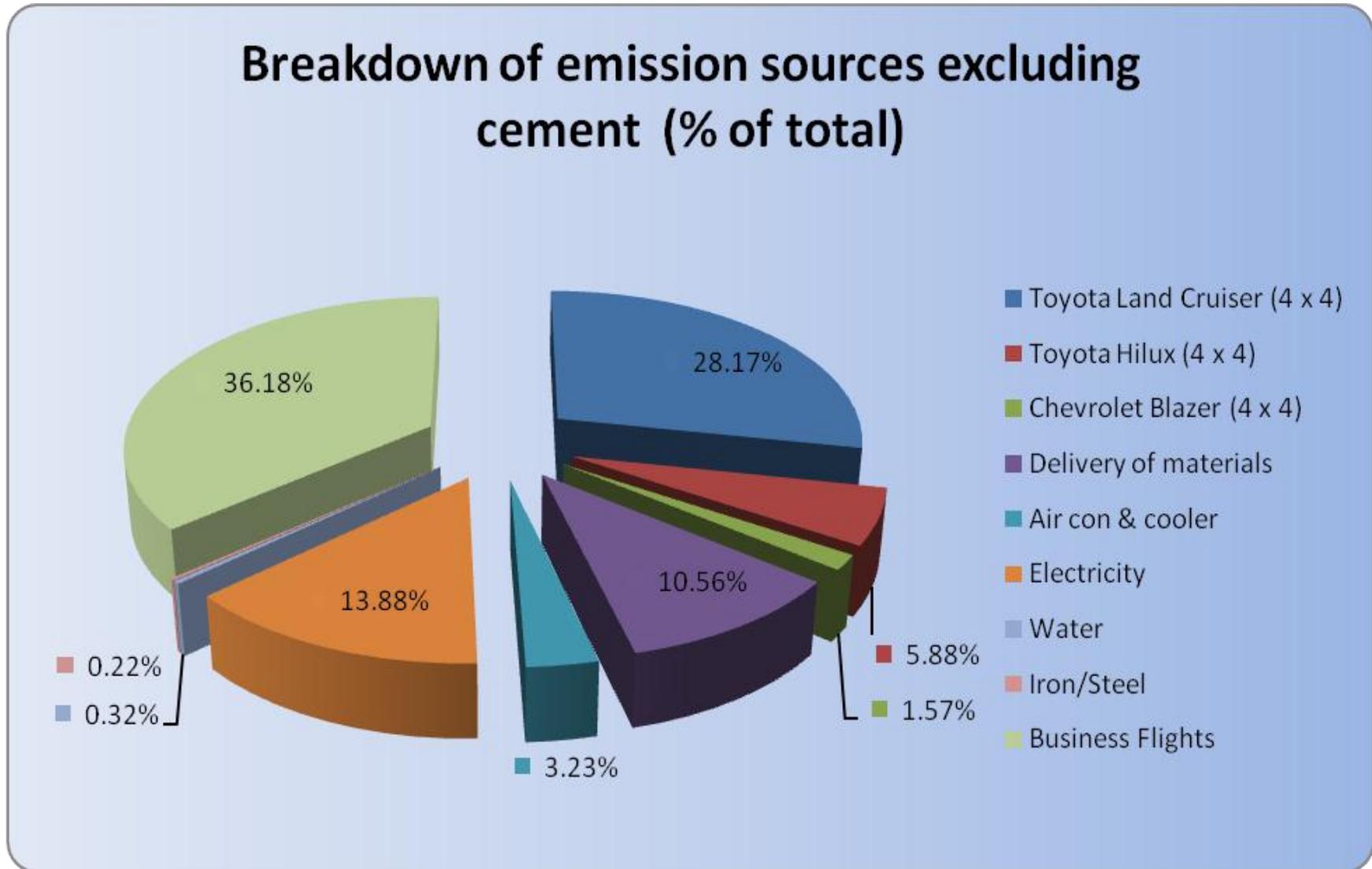
1.8 Figure 3: Carbon emissions from vehicle use

Emission sources related only to vehicle use
(%age of total vehicle use)

- 61% — Toyota Land Cruiser (4 x 4)
- 13% — Toyota Hilux (4 x 4)
- 3% — Chevrolet Blazer (4 x 4)
- 23% — Delivery of materials
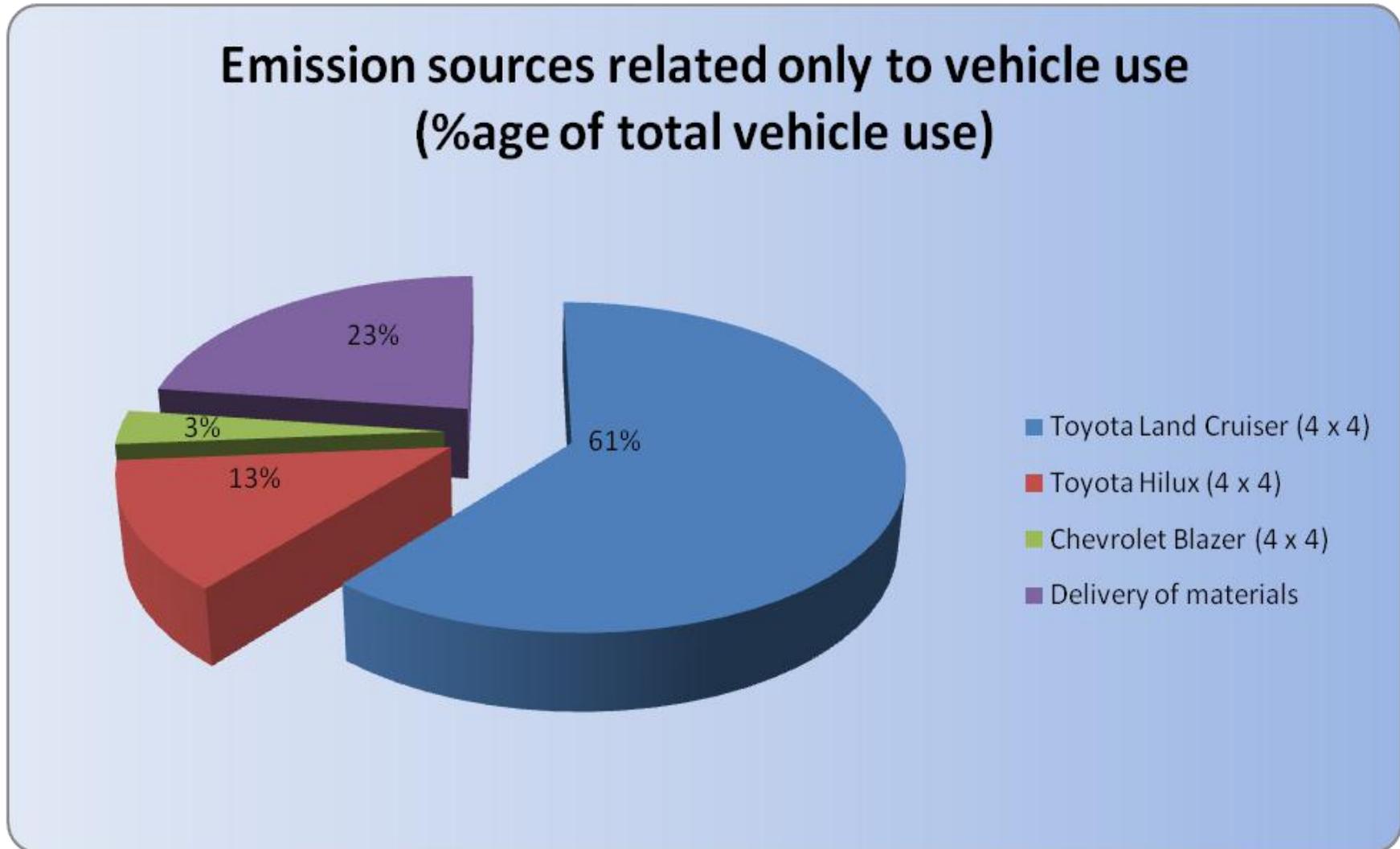
1.9 Benchmark

Nuevas Esperanzas' energy efficiency performance has been benchmarked against the Chartered Institute of Building Services Engineers (CIBSE) typical and good practice benchmarks for a standard air conditioned office.
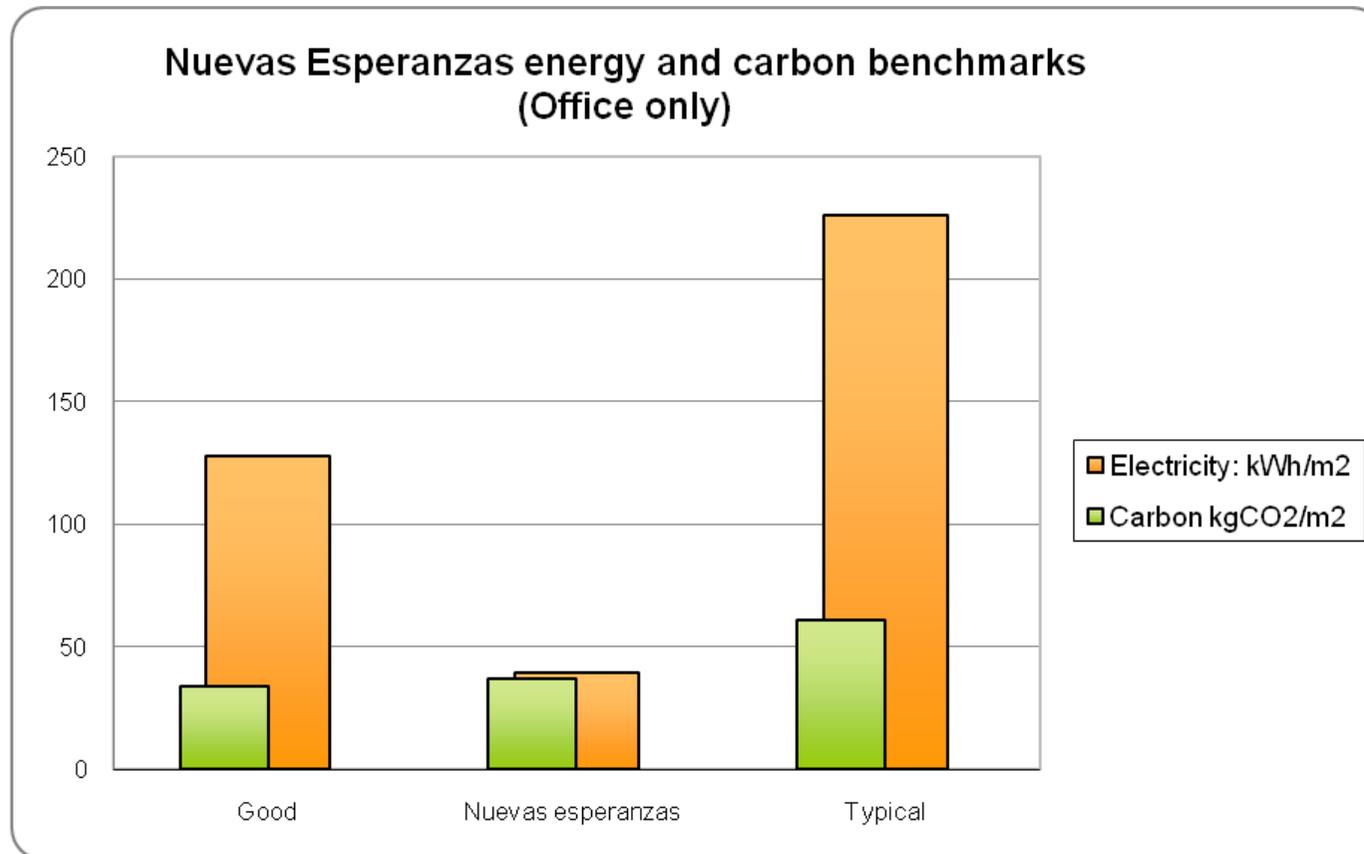

Figure 4: Nuevas Esperanzas energy and carbon benchmark against CIBSE recommended good and typical practice for standard air conditioned office.

1.10 Methodologies

1.10.1 Vehicle use methodology

Using Annex 6 of DEFRA's 2010 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting

A breakdown of the total number of kilometres travelled by each vehicle owned and operated by Nuevas Esperanzas during 2010 was provided. Using table 6i in annex 6, the total number of kilometres travelled was entered into the relevant vehicle class cell which produced an overall total. Additional information was provided on the number of deliveries (usually sand) for which Nuevas Esperanzas paid and these were also included using table 7d in annex 7 of the Defra guidelines.

Assumption: For the purposes of the calculation it has been assumed that the fuel mix for regular diesel is the same as DEFRA's figures which are based on EU figures.

1.10.2 Electricity consumption methodology

Using Annex 10 of DEFRA's 2010 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting

12 months electricity bills were provided and the monthly kWh figures were aggregated. Initially these figures were entered into the DEFRA spread sheet as above. The Latin America row in Table 10c was used but this is an average figure (0.24 kg/co2/kWh) for the region and used for UK based companies to take account of their overseas operations. However, research on the [International Energy Agency website](#) revealed that that the carbon emission factor (the amount of carbon released for every kWh of energy produced) was actually almost triple the average (0.74kg/co2/kWh) for Nicaragua. This probably reflects the fact that 65% of Nicaragua's energy demand is met through oil burning electricity production. Therefore this figure has been used to give a more realistic picture of the impact.

1.10.3 Air conditioning and refrigerant leakage

Using Annex 8 of DEFRA's 2010 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting

Information was taken from the air conditioning unit and the water cooler as to the coolant type and charge capacity (kg). These figures as well as the time in use are entered into table 8b. Leakage rates are standard and international which means, unlike energy or fuel use that the result is correct regardless of which country the equipment is being operated in.

1.10.4 Water Methodology

Using Annex 9 of DEFRA's 2010 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting

The total number of cubic metres of water consumed according to 12 months of water bills was entered into table 9a, Annex 9.

Assumption: The carbon emission factor for each cubic metre of water is based on UK figures. Whilst this is not accurate for Nicaragua, it gives some indication of the impact of water use on carbon emissions. Typically it is quite low. However, should information become available as to the carbon intensity of the water in Nicaragua, this figure should be updated.

1.10.5 Business flights methodology

Using Annex 6 of DEFRA's 2010 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting

Andrew and Jane Longley reported that they took a flight from Managua to London via Miami. The ticket was for 4 people in economy class. The mileage for this journey was calculated using the Continental Airlines website which gives details of journey lengths. These flights were included as they were paid for by the organisation. The calculation made in table 6L is accurate for international long haul flights.

1.10.6 Supply Chain methodology

The methodologies and calculations used in the DEFRA guidance use amount spent (£) as the unit to calculate carbon emissions. This is not relevant for Nicaragua and therefore another methodology was sought. In conversation with Andrew Longley, the main areas for investigation are cement, iron and steel and PVC as these are the materials most used in the organisations projects. For all these materials the first step was to calculate the amounts (by weight) used in the defined period (2010). Further research for each material revealed a carbon factor, see below:

Cement: Almost 42 tonnes of cement was used in 2010 across various projects, from data taken from Nuevas Esperanzas accounts. The units were sacks bought and each sack of cement weighs 42.5 kg. Using data produced by the Cement Sustainability Initiative (CSI) it was found that for every 1 tonne of cement produced, 706kg of carbon dioxide is released. This means that cement use represents Nuevas Esperanzas single biggest carbon impact.

Iron/Steel: Just over 1 tonne of iron and steel was used in 2010. This includes wire, mesh, nails, corrugated metal and bars. These figures were taken from the organisation's accounts which provided amounts in pounds (lbs). Information from the US Environment Protection Agency (EPA) suggests that 40 kg of carbon dioxide is emitted per tonne of iron or steel produced.

PVC: As data on PVC use was provided by length and number of accessories, it has proved difficult to find out the total weight of PVC used. This is required if a conversion to carbon emissions is to be made. It is anticipated that the impact would be minimal and therefore this source has been omitted. Should more information become available over time, it should be included.

2 Recommendations

2.1 Environmental management improvement recommendations

No.	Name	Benefits	Implementation options	Costs	Priority
1	Check tyre inflation levels in vehicles before use.	This can save up to 250kg of co2 per vehicle per year.	Check tyre pressures weekly or daily if possible.	n/a	1
2	Reduce vehicle idle time	Reduces fuel consumption. Saves money and emissions.	Engage staff to ensure vehicles are turned off when not in use.	n/a	2
3	Reduce delivery distances where possible	Reduced emissions	If possible, identify a local source of materials.	Low	5
4	Continue to regularly maintain vehicles	Regular maintenance of vehicles can reduce annual fuel consumption and emissions by up to 10%	Continue with regular maintenance	Low	4
5	Monitor cement use	Use of cement is essential but monthly monitoring of use and ensuring that there is no wastage could help to reduce emissions.	Establish a monthly monitoring spreadsheet and ask staff to report any wastage or unused stock.	n/a	3
6	Ensure electrical equipment (fans, computers and lights) are turned off when not in use	Ensuring electrical items are turned off after use can save up to 5% of energy consumption annually.	Use signage around key items (air con, fans, lights etc) asking staff to switch off.	n/a	6
7	Offset emissions	Accounts for unavoidable emissions	Purchase carbon credits to offset some or all emissions	Med	7
8	Change to electronic timesheets	Save up to approximately 520 leaves of paper.	Set up an excel template and circulate to staff	No cost	8

3 Summary and next steps

3.1 Carbon Reduction target

Based on the recommendations provided in this report, it may be possible for Nuevas Esperanzas to save up to 1.2 tonnes of $CO_2(e)$ annually. This equates to an overall reduction of almost 2.5% if all recommendations were implemented successfully and perform as predicted.

However, in reality, some recommendations will prove to be unfeasible in practice and some may under-perform. Therefore a reduction target of 2% is recommended

2% reduction in CO_2 by 2012

In reality it is difficult for Nuevas Esperanzas to make significant carbon savings as the greatest emissions come from sources essential to their work (vehicles and supply chain). Therefore this should be viewed as an aspirational target. However, any opportunities to make savings in the future should be taken.

3.2 Action Plan

The recommendations table above could be used as a starting point for an action plan using the assigned priority levels as a guide to where the biggest impact could be made for the least effort or investment.

3.3 Sources and further reading

- DEFRA's 2010 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting
- Co2 emissions from fuel combustion. Highlights. 2010. International Energy Agency
- Energy Efficiency in Buildings. Guide F. Chartered Institute of Building Service Engineers (CIBSE). 2004
- Direct emissions from iron and steel production. Climate Leaders. EPA. 2003
- Co2 accounting and reporting standard for the cement industry. CSI. 2005

This report was compiled on 18th February 2011 and amended and finalised on 6 March 2011.