

**Carbon footprint analysis and reduction plan
for
Saint Patrick's National School,
and Fingal Community Centre.

Diswellstown**



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1. Executive summary

This study has been commissioned to assess the annual CO₂ emissions from Saint Patrick's National School run by the Board of Management, Diswellstown Community Centre run by Fingal County Council, and the privately run Tigers after-school care. Diswellstown represents an innovative new model in shared resources and services between Schools and local Community Centres. The scope of the study includes emissions from the utilities, related travel, and the purchases and waste from the operations of the three organisations.

Key findings:

- The annual CO₂ emission from the School, the Community Centre, and the Tigers after-school care is 160 tonnes.
- The annual CO₂ emission per student of the school is 218 kgs.
- The National School is performing at a 'best practice' energy management level.

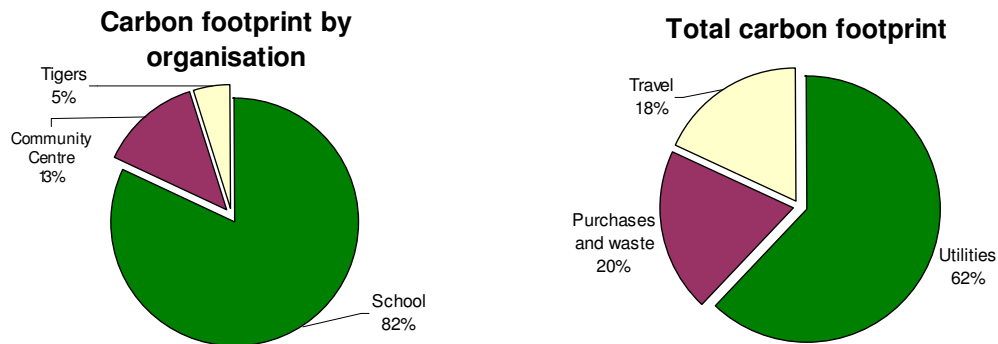


Figure 1.1

Annual emissions	tonnes of CO ₂	Annual emissions	tonnes of CO ₂
Utilities	99	School	132
Purchases and waste	32	Community Centre	21
Travel	29	Tigers	7
Total	160	Total	160

Based on a recent benchmarking analysis of 14,000 schools in the UK it can be seen that the School is in the 'best practice' category of energy management. There are however a number of cost effective opportunities to further reduce the CO₂ emissions by over 50% from the operations of the three organisations. The areas of opportunity which show the most potential are:

- Switching to a renewable electricity provider
- Developing and implementing a green procurement policy
- Developing and implementing an integrated waste management process
- Changing teachers' and pupils' commuting mode from cars to walking and cycling.

2. Introduction

This study is of a shared centre in Diswellstown, Dublin which comprises Saint Patrick's National School, Fingal County Council's Community Centre, and the Tigers after-school care, for the academic year '07/'08. The centre's management team is interested in quantifying and understanding the environmental impact of their operations on the environment. To achieve this goal they have commissioned a carbon audit to obtain a baseline against which to develop a strategy for reducing their environmental impact. The scope of this audit includes the carbon footprint associated with the utilities, purchases and waste, processes, and travel associated from the operations of the three organisations. Each of these factors is considered in a section of this report, with its associated CO₂ emissions.

Diswellstown represents an innovative new model in shared resources and services between Schools and local Community Centres. Both the School and the Community Centre have been growing quickly. The School has been playing an active role in the 'green flag' scheme with a green flag already being awarded for waste management. They have an environmental policy in place and also have a strong energy management team made up of both students and teachers. As these initiatives have been initiated through the Greener School program there is no equivalent scheme in place for the Community Centre or the after-school care.

Carbon footprinting has been successfully used to assess and communicate the environmental impacts of countries, regions, cities, organisations, lifestyles and products. It has proven to be a resonant and accessible indicator of sustainability, which is often seen to be a complex and intangible concept. Carbon footprinting considers the emissions associated with the final consumption of a product or service, no matter where in the life cycle those emissions occurred and, more importantly, where in the world they occurred. Carbon footprints are expressed as kilograms or tonnes of CO₂. See Appendix C for a more detailed explanation of the methodology used in this assessment.

3. Analysis

The actual CO₂ emissions from the shared centre were analysed under three headings:

- Utilities: Includes electricity used for lighting, natural gas used for heating, water for cleaning and sanitation.
- Purchases and waste: Includes all materials purchased to operate the School, Community Centre and after-school club and their associated waste streams
- Travel: Employee, teacher and, student commuting as well as business related travel.

From figure 3.1 it can be seen that utilities make up the largest amount of emissions followed by travel and then purchases and waste. It can also be seen that the School makes up the largest contribution of carbon emissions (82%)

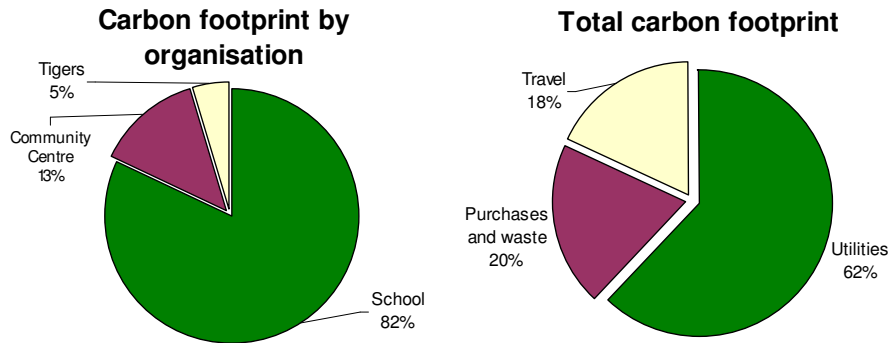


Figure 3.1

Annual emissions	tonnes of CO ₂
School	132
Community Centre	21
Tigers	7
Total	160

3.1 The School

Saint Patrick's National School has 603 students and 55 staff. It is a relatively new school which has been built to a high energy efficiency standard. It is three stories high and stands on a 1 hectare site with very limited space for any expansion. The number of pupils at the school is growing quickly from 500 in '06/'07 to 600 in '07/'08.

Key findings:

- The school based emissions are 131.5 tonnes per annum.
- The emissions from utilities making up 61% of the total are the greatest of the three categories.

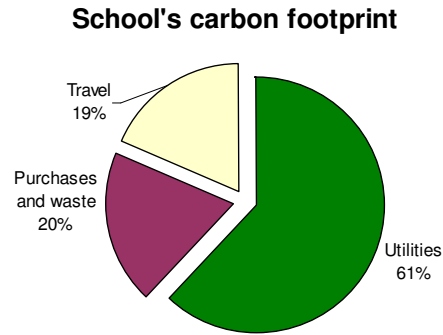


Figure 3.2

Utilities

1. Utilities		kg CO ₂
Electricity (kWh)	75,416	48,002
Gas (kWh)	146,727	30,006
Water (litres)	4,250,000	3,404
Total		81,412

Utilities make up the bulk of the emissions from the school, and electricity makes up 59% of this (figure 3.3). This estimate is based on actual meter readings from the '06/07 academic year and adding an additional 10% to forecast the consumption of the '07/'08 year. Although the school population has grown from 500 to 600+ pupils it is expected that the electricity and heating requirements will grow at a lower rate than this.

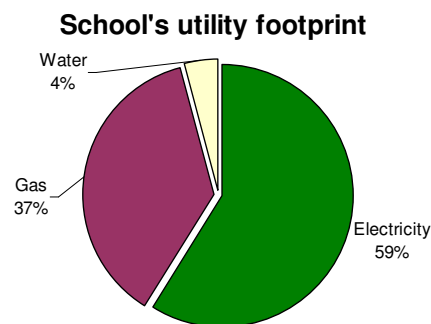


Figure 3.3

Travel

The school's travel is made up of three categories; and the daily commute for teachers, pupils and staff members, organised school trips, and business travel.

School Travel	kms	kg CO ₂
Commuting	435,624	23,862
School trips	28,800	1,526
Business travel	2,710	507
Total	467,134	25,895

Figure 3.4 shows that 92% of the emissions come from the daily commute by the teachers, pupils, and staff members. The commuting data was collected by using a five day class room survey followed by an independent validation by Carbon Decisions. The class room survey was conducted by each of the pupil's in the school and the results were tallied by the fourth class students.

The independent validation was carried out by Carbon Decisions on May 22nd. It was a very wet morning which resulted in a lower number of bicycles and a higher usage of cars than is shown on the five day report. One key observation during the validation was the difficulty for cars to access the school between 8:20 and 8:40 am due to the layout of the drop off area. The high level of car congestion made it difficult and sometimes dangerous for pedestrians and cyclists to cross the road at the roundabout in front of the school. This layout should be reviewed for safety reasons, particularly on wet days.

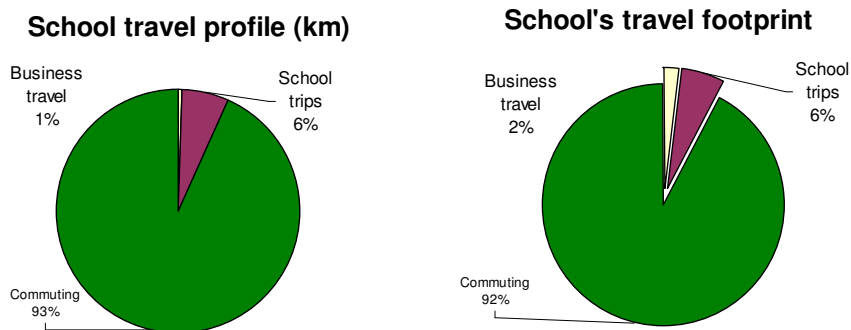


Figure 3.4

Purchases and Waste

Key findings

- Purchases and waste make up 23 tonnes of carbon emissions each year

The Procurement profile of the school is made up of a high number of low value transactions using a relatively large supply base.

Purchases	kg	kg CO ₂
Milk	9,085	5,451
Stationery and visual aids	2,101	4,202
Teacher aids	1,434	4,016
Water	620	6
IT hardware	430	6,026
Miscellaneous	400	400
Furniture	300	180
Cleaning products	164	262
Electric goods	142	1,708
Newspapers	135	216
Library	116	256
Science	111	312
Tea/coffee	62	37
Toner	2	9
Total	15,103	23,080

Figure 3.5 show the breakout of the purchasing related emissions in the different categories.

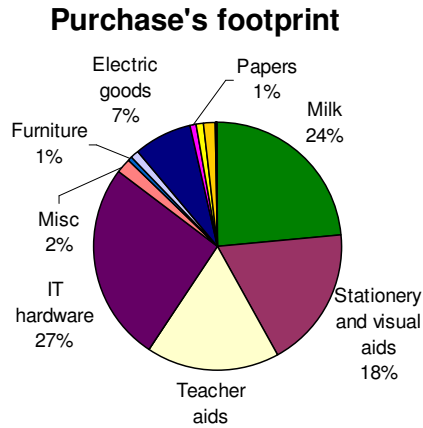


Figure 3.5

The school successfully implemented the recycling 'green flag' system last year and has segregated bins for recycling and landfill in each of the classrooms. The teachers staff room also has organic and plastic/glass segregation as well as landfill/recycling bins. The waste from the centre was weighed over a five day period before going into the bins by the facilities team to estimate the volume of waste going into each stream. Figure 3.6 shows the emissions generated by the waste stream of the school. An analysis of the waste in the landfill bin found that approximately half of the contents could have been sent to either the recycling or organic bins.

Waste: school	kg	kg CO ₂
Landfill	2110	2,007
Recycle	920	414
Plastic	100	200
Organic	100	71
total	3,230	2,691

School's waste footprint

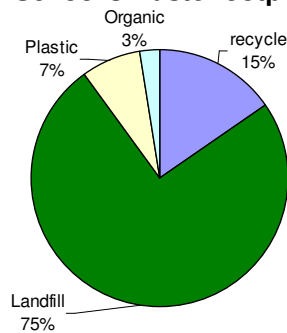


Figure 3.6

3.2 The Community Centre

The Community Centre manages the gym and a number of meeting rooms on the Diswellstown site. The building has a high utilisation by sports and social clubs and operates seven days per week. The team is made up of four staff who manage the building and its users.

Key findings:

- The annual footprint of the Community Centre is 21.5 tonnes
- Utilities make up 84% of the Community Centre's emissions.

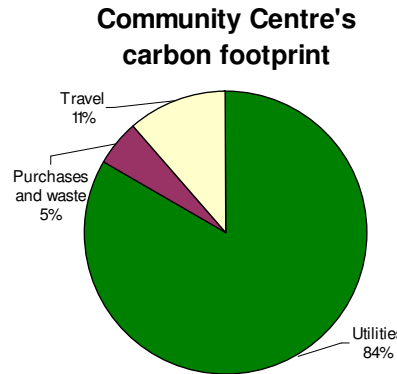


Figure 3.7

Utilities

The Community Centre uses electricity for lighting and gas for heating. Figure 3.8 shows that the emissions from electricity make up the majority 67%.

Utilities		kg CO ₂
Electricity (kWh)	18,854	12,001
Gas (kWh)	25,893	5,295
Water (litres)	750,000	601
Total		17,896

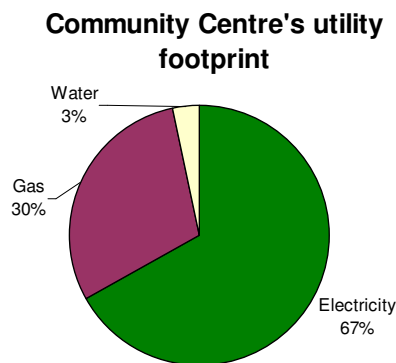


Figure 3.8

Travel

The travel is made up of commuting travel for the employees of the Community Centre only. The pupils are covered under the school, and other users are out of scope for this analysis. The team all commute to work by car and the majority live locally.

Travel	kms	kg CO ₂
Commuting	11,600	2,440

Purchases and waste

The Community Centre's purchases comprise of the office equipment required to run the office and the toilet roll for both the Community Centre and the National School.

Purchases	kg	kg CO ₂
Toilet roll	350	280
Copy paper	12.5	18.75
envelopes	5	7.6
Toner	3	16.8
Furniture	25	157.5
Defibrillator	3	54
Computer	4	56
Stationery	8	24
Total	410.5	614.65

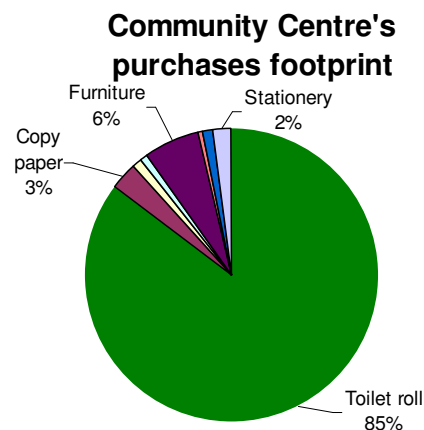


Figure 3.9

The Community Centre doesn't have separate bins for recycled and landfill waste so they don't segregate their waste. As the majority of their waste is paper based this represents a considerable opportunity for more efficient waste management.

Waste	kg	kg CO ₂
Community Centre	646	538

3.3 The Tigers after-school care

The Tigers after-school care is held at the Community Centre in Diswellstown and uses the gym and two of the classroom from 2pm until 6pm each day Monday to Friday. There are up to 45 pupils who take part in the club with 4 staff. Each day there are a number of planned activities for the pupils who each get a snack and a cooked meal before returning home at 6pm. There are no utilities as this is covered under the 'Community Centre' section.

Key finding

- The annual footprint of the after-school care is 7.4 tonnes
- Purchases and waste make up 70% of the club's emissions.

Tigers after-school care carbon footprint

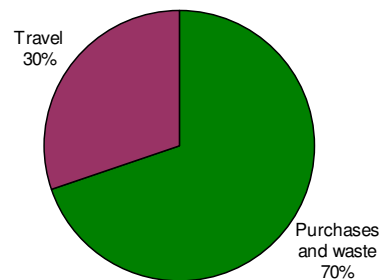


Figure 3.10

Travel

The emissions for travel related activities are made up of commuting travel for the employees of the club only (the pupils are covered under the school). The Tigers after-school care team all commute to work by car and the majority of the team live locally.

Travel	kms	kg CO ₂
Commuting	10,304	2,226

Purchases and waste

The Tigers after-school care purchases comprise of the equipment required to run the after school centre and the food that team provides as a daily snack and evening meal to each of the 45 pupils.

3.3 Tigers after school care	kg	kg CO ₂
Food	4140	2484
Furniture	60	378
laptops	5	70
Playstation	4	56
Total	4209	2988

Figure 3.11 shows the breakout of the carbon emissions from purchasing by category.

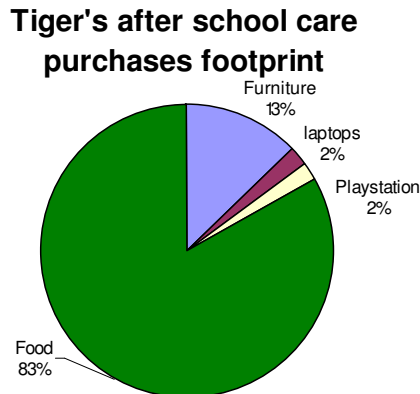


Figure 3.11

The Tigers do not have separate bins for recycled and landfill waste so they don't segregate their waste. As the majority of their waste is either organic or paper this represents a considerable opportunity for more efficient waste management.

Waste	kg	kg CO ₂
Tiger's after-school care	2,584	2,153

3.4 Summary

In summary the total CO₂ emissions of the School, Community Centre, and Tigers after-school care are 160 tonnes per annum.

Annual emissions	tonnes of CO ₂	Annual emissions	tonnes of CO ₂
Utilities	99	School	132
Purchases and waste	32	Community Centre	23
Travel	29	Tigers after school care	6
Total	160	Total	160

4. Opportunities for reduction

The opportunities for reduction are prioritised based on the:

- percentage reduction of the school's emissions
- ease of implementation

Utilities:**Energy Supply**

Opportunity: Switching to renewable electricity supply such as Airtricity would immediately reduce the centre's CO₂ annual emissions by 60 tonnes. An additional benefit would be to increase and encourage development in the local market for renewable energy.

Action: Switch electricity suppliers to a renewable electricity generator

Sign on to the Airtricity website (www.airtricity.ie) to switch accounts (requires the latest meter reading and the ESB account number).

The centre should also consider alternative heating technologies such as micro Combined Heat and Power (CHP) or solar panels. This could both supply the centre with hot water as well as electricity and potentially save 50-60 tonnes of emissions per annum. There is currently grant funding available for feasibility studies from Sustainable Energy Ireland.

Energy efficiency:

Opportunity: The centre uses gas for space and water. Reducing the temperature of the centre by just one degree will reduce the heating and gas requirement by 10%. A 10% decrease will save approximately 3.5 tonnes of emissions each year.

Action: Reduce the temperature of the school by one degree during the months where heating is required.

Purchases and Waste

Opportunity: The centre's purchase profile is highly fragmented made up of a high number of small purchases made by a large number of people. Consolidating the purchasing and implementing a green procurement policy offers the opportunity for both economic and environmental savings of approximately 10%

Action: Discuss with existing stationery suppliers whether they will supply environmentally friendly stationery and paper at competitive prices if the purchasing spend is consolidated with them. Nice Day provides such a service (as an alternative supplier) and by moving to a higher volume negotiation with a single supplier potential higher costs should be offset against the higher discount received.

Implement an integrated waste management plan

Opportunity: The weight of the waste sent to landfill is 2.3 times that of the waste sent for recycling. An analysis of the landfill showed that half of landfill waste could be sent to recycling if streamed correctly saving 1.2 tonnes of emissions.

Action: Each of the three organisations that shares the waste bins has a different waste management policy. The energy team that is in place in the school should be extended to include the Community Centre and the Tigers club. Recycling and landfill bins should be installed in the Community Centre and the Tigers club and a regular audit of the landfill bin should be held to ensure that proper waste streaming is being implemented.

Travel

Opportunity: The travel category offers a number of opportunities for emissions reduction:

- Changing the percentage of teachers, students, and staff member who use the car to commute to work from 31% (current) to 20% offers a potential saving of 7.4 tonnes of CO₂ emissions per annum.
- The validation survey found that the average number of children per car is 1.6. If this average can be raised to an average of 2 children per car then this would represent a saving opportunity of 4.7 tonnes of CO₂ emissions per annum.

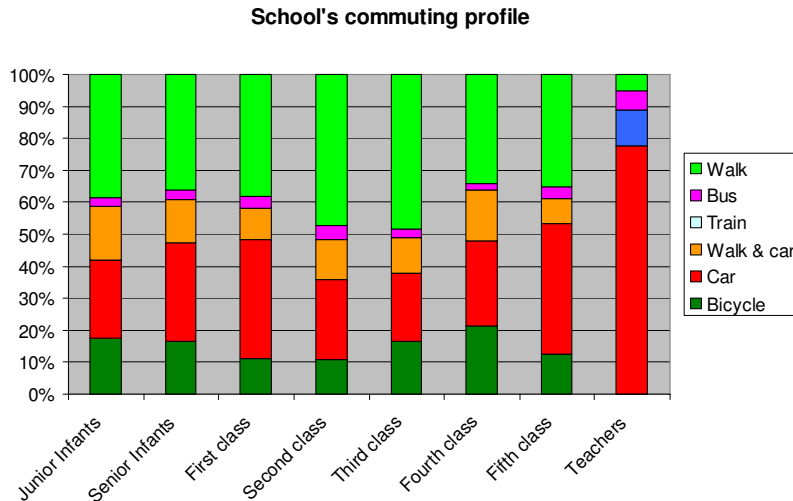


Figure 4.1

Action: Switch to lower carbon transport for commuting

Changing the commuting mode of transport from cars to cycling and walking offers an attractive source of emission savings. Graph 4.1 shows that the teachers who are an influential group have the highest usage of cars as the mode of transport. The first step should be to encourage this leading group to try more environmentally friendly modes of transport. Possible means to do this might include

- Buy a communal bicycle to be left at the school for local trips
- Leadership by example, encourage senior staff to make the change first by highlighting the benefits to them (e.g. health benefits).
- Publish testimonials of those who have changed.

The next phase would be to increase the percentage of car pooling and environmentally sound forms of pupil commuting.

- At the next Parent Teacher Association meeting promote car pooling and walking, cycling
- Explore whether it is possible to get direct access for walking and cycling to the school from the roundabout at the front of the school. This will both provide increased safety for the pupils travelling to school and reduce their environmental impact.

Total opportunities for reduction

	Annual emissions	Annual emissions with savings	% reduction
Utilities	99,309	35,776	64%
Purchases and waste	32,065	29,867	7%
Travel	29,034	17,046	41%
Total	160,408	82,688	52%

5. Carbon offsetting

'Offsetting' allows an organisation or individual to demonstrate their awareness of CO₂ emissions by supporting low-carbon projects elsewhere in the world. However, offsets should not be seen as a replacement for CO₂ reduction because;

- Offsetting alone will not create the net overall reduction in CO₂ emissions that we need to avert dangerous climate change
- Questions exist over the authenticity of some schemes
- The current market price of offsets is far lower than the real costs of CO₂ to the environment, society and the economy (as shown in the Stern Review)

Carbon Decisions believes that offsetting should be the last step after taking all possible measures to reduce emissions.

Indicative pricing

Based on an indicative price of €18 per tonne under the Voluntary Carbon Standards program the centre could expect to offset its annual emissions of 160 tonnes for approximately €2900 per annum (ex VAT).

6. Benchmarking

This section presents the relative performance of the school against similar schools. Figure 6.1 shows the carbon footprint per pupil and compares it to; the Irish average; the global average; the level at which the world might be sustainable¹.

School impacts with global comparators

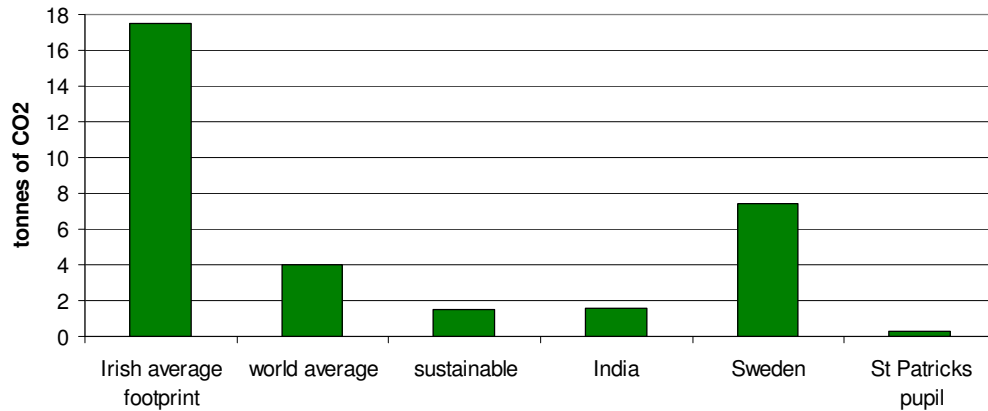


Figure 6.1

The footprint of an average pupil in the school gives rise to 0.2 tonnes of CO₂ which accounts for 1% of an average Irish CO₂ footprint. Figure 6.2 shows how the school compares to the benchmark data in the UK of 14,000 schools².

CO2 benchmark (energy)

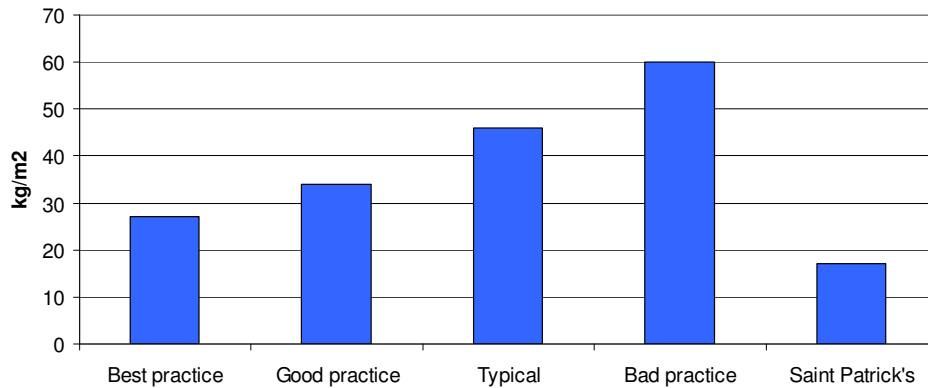


Figure 6.2

¹ Stern Review on the economics of climate change, 2006.

² Carbon Trust www.carbontrust.co.uk

7. Next steps

The management team should implement the following next steps which will reduce the total centre's emissions in a cost effective way.

1. Review the report with the management team.
2. Nominate champions or owner to take charge of the reduction plan
3. Prioritise and select actions to form the reduction plan
4. Agree timescales
5. Implement the reduction plan

8. Conclusions

The School and the Community Centre already have relatively low CO₂ emissions due to the:

- High building utilisation due to the shared building model
- High energy efficiency of the building
- Implementation of energy saving technology (e.g. PIR sensors)
- The implementation of 'greenflag' energy teams

The emissions that are attributable to non energy activities i.e. purchases and waste, travel for the three organisations show room for improvement. There are cost effective opportunities available to reduce the total emissions by an additional 50%.

The cost of carbon is expected to increase over time as new and more stringent forms of regulation are implemented. Figure 8.1 shows how the increasing cost of carbon will effect the total centre's operational costs (excludes commuting costs).

Cost of one tonne of carbon dioxide	€25	€40	€60
Annual cost to the centre	€3,275	€5,240	€7,860

figure 9.1

Looking ahead the management team of the total centre should:

- Promote the school as having 'best practice' levels of CO₂ emissions compared to the 14,000 schools from the UK benchmarking study.
- Implement the next steps from section 7 which offer cost effective emission reduction savings of 50+% of the overall emissions.
- Integrate carbon management as part of its overall management system and set 5%-10% reduction targets per annum which will keep the centre ahead of the National Strategy for emissions reduction.

Appendix A: Assumptions and calculations

Utilities

Gas: Gas consumption was calculated from reviewing the '06/07 bills from Bord Gais and using a 10% uplift for the '07/'08 academic year. The allocation between the school and the community centre was determined after reviewing the internal metering system between the two organisations.

The emission factors for gas were provided by SEI³

Electricity: Electricity consumption for the '07/'08 academic year was estimated using the '06/'07 bills and adding a 10% uplift to account for the growth of the school. The allocation between the school and the community centre was based after reviewing the internal metering system between the two bodies.

The emission factors for electricity were provided by SEI⁴

Water: The water consumption was unavailable as the water meter does not appear to work. The centre's water usage is based on an estimated usage of a similarly sized services company.

Travel:

Business: The school's management team provided their estimated business travel with mode of travel and the distance of each trip.

Commuting:

School: Each class of the school carried out a questionnaire of their travel patterns for five days. These questionnaires were then tallied by fourth class. An independent validation was also carried out of the commuting pattern by CarbonDecisions.

Community Centre: the commuting pattern of the Community Centre's employees was collected by interviews with the team.

Tigers after-school care: the commuting patterns of the Tigers after school care team were collected through an interview process.

Purchases and waste

Purchases

School: The purchases of the school were collected by reviewing the school's invoices for the academic year '07/08.

Community Centre: The purchases of the Community Centre were collected by interviewing the Community Centre's management team.

Tigers after-school care: The purchases of the Tigers after-school care were collected by interviewing the Tigers team.

Waste:

The waste profile of the School, Community Centre and Tiger after-school care was collected by weighing the waste for five days. A review of the mix of the material in the landfill, recycling and organic bins was also carried out, emission factors have come from the Repak website⁵.

³ www.sei.ie

⁴ www.sei.ie

⁵ www.repak.ie, www.wasteonline.org.uk

Appendix B: Data tables

1. Utilities		
1.2 Electricity	(kWh)	kg CO ₂
School	75416	48,002
Community Centre	18,854	12,001
Total	94,270	60,003
1.2 Gas	(kWh)	kg CO ₂
School	146,727	30,006
Community Centre	25,893	5,295
Total	172,620	35,301
1.3 Water	(litres)	kg CO ₂
School	4,250,000	3,404
Community Centre	750,000	601
Total	5,000,000	4,005

2. Travel		
2.1 School	kms	kg CO ₂
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2.2 Community Centre		
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Commuting	10,304	2,226

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3.2 Community Centre	kg	kg CO ₂
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Furniture	25	157.5
Copy paper	12.5	18.75
Stationery	8	24
envelopes	5	7.6
Computer	4	56
Toner	3	16.8
Defibrillator	3	54
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3.3 Tigers after school care	kg	kg CO ₂
Food	4140	2484
Furniture	60	378
laptops	5	70
Playstation	4	56
Total	4209	2988

4. Waste	kg	kg CO ₂
School	3,230	2,691
Tigers after school care	2,584	2,153
Community centre	646	538
Total	6,460	5,383

Appendix C: What is a carbon footprint analysis?

The carbon footprint calculations in this report follow the Green House Gas Protocol⁶ and Global Footprint Network standard methodology⁷. These methodologies use a 'component' (or 'bottom-up') approach to perform carbon footprint analysis.

The methodology, wherever possible, uses full life cycle impact data to derive carbon footprint conversion factors for key activities (the 'components'). For example, to calculate the carbon footprint of a car passenger travelling one kilometre, fuel use, materials and energy for manufacture and maintenance of the vehicle, and the share of Irish roadspace appropriated by the car are accounted for. This conversion factor is then applied to the number of passenger-kilometres travelled.

A similar approach is used to derive a range of carbon footprint component values, representing the main categories of impact, before summing them to calculate a total ecological footprint. The key components used in this study are:

- Utilities
- Materials & waste
- Transport

Each of these key components is made up of smaller sub-categories. For example, 'Utilities' is sub-divided into electricity, gas, heating oil and water. Each of these sub-categories can be broken down further. Using this component approach enables the calculation of carbon footprints at any level – for a product, organisation, activity or region.

⁶ Green House Gas Protocol: <http://www.ghgprotocol.org/>

⁷ <http://www.footprintnetwork.org/>