

Hong Kong Academy Ecological Footprint Assessment 2010

Conducted by Grade 7 and Grade 8 Students

Introduction: The goal of this unit was to determine the following:

- the annual amount of **diesel fuel** consumed by school buses
- the annual amount of **coal burned** in order to generate **electricity**
- the volume of **water** used by the entire school
- the mass of **lunch waste** generated by the MS/HS
- the amount of A4 & A3 **copy paper** used by the entire school

What follows below is a summary of our findings. Students will outline *what we did, what we found, and what we can do* to use resources more efficiently, reduce our CO₂ emissions, and save the school money.

Each 7th grade student was put into a group and given the task of investigating the school's use of one of the resources listed above. Two groups investigated each type of resource in order to improve accuracy. Grade 8 students independently investigated school electrical usage. They graciously shared their data, findings and suggestions.

Our Data: The data used was collected from several sources. Water bills, electrical bills, and copy paper invoices were obtained from Anna Wong our business operations manager. Debby Chan, our data services coordinator, helped us work with Castle Brothers to gather relevant bus information (fuel type, kilometers traveled, fuel efficiency). Lunch waste data was gathered directly by a group of 7th grade students on May 11, 2010.

Below is a summary of all the research, but before examining the detailed results, here is our estimated total carbon emissions from electricity, fuel consumption, and copy paper usage:

578,000 kilograms of CO₂

That is the mass of 76 adult elephants

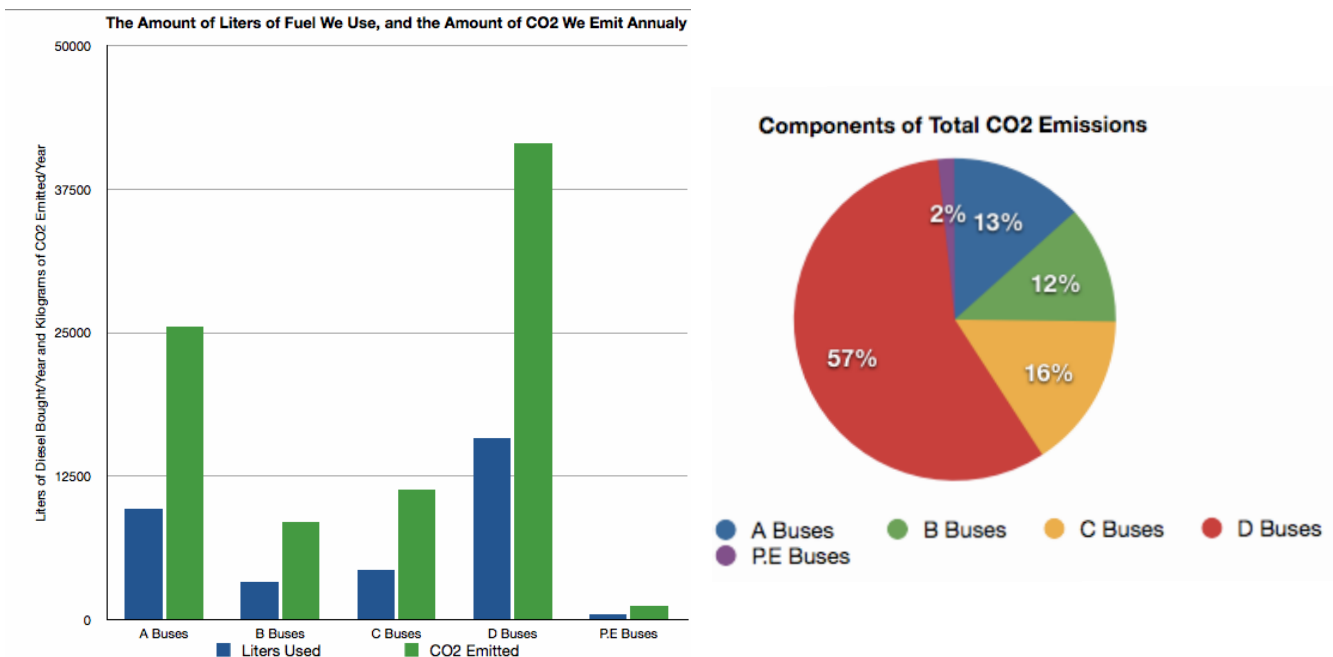
Approximately 3400 trees need to be planted to offset our CO₂ emissions for the 2009 - 2010 school year alone.

Estimated Annual Diesel Usage for Morning, Afternoon, and PE Buses

What we did

From a variety of credible sources, we gathered our information, collected our raw data, performed several calculations, processed our final numbers, represented the most influential in graphs, analyzed them, and drew the following conclusions.

What we found



- The total amount of CO₂ we emit in a school year is 88,013.94 kilograms - the mass of 18 adult elephants
- We would need to plant around, 1,242 trees every year in order to offset the CO₂ we add to the atmosphere. That's 13 American football fields planted with trees

What we can do

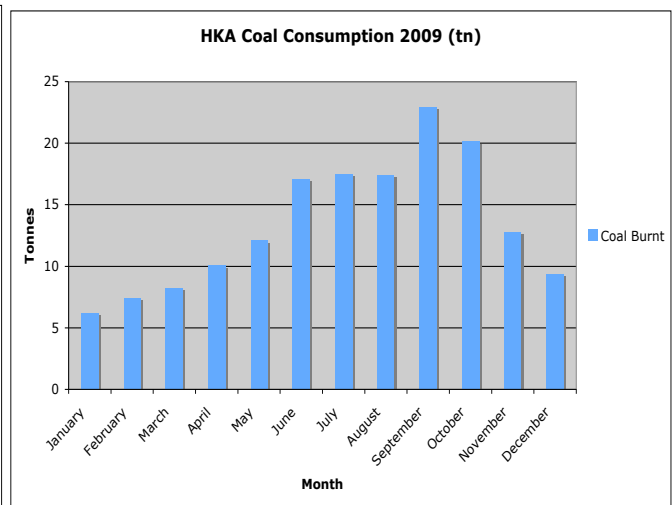
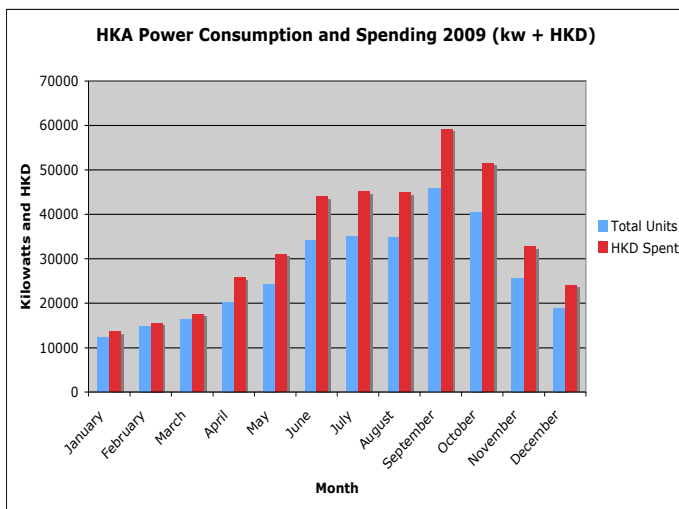
- We could explore combining 11:30 and 12:30 bus passengers. Doing so would cut our total annual CO₂ emissions by 12% and save \$30,000 in fuel cost
- We can optimize the amount of people per bus. For example, one passenger rides bus C5. That bus alone emits 897 kg of CO₂ annually.
- We could encourage Castle Brothers to switch to a cleaner fuel like LPG (liquified petroleum gas) because it is easily accessible, and although it emits more CO₂, it does not emit highly pollutant particles like diesel does, and therefore has cleaner emissions.

Electricity Usage for the Entire School (2009)

What we did

We were given the electrical bills, analyzed them, then converted the data into the graphs below. In addition, we researched possible energy saving technologies and practices. Our findings were then put into a letter addressed to Dr. Andy that informed him of what's happening now and what we can do to reduce carbon emissions in the future.

What we found



- air conditioning, lights and heaters account for **92%** of annual electrical use
- we consume **165,000 kg** of coal per year.
- 165,000 kg of completely burned coal will produce **472,000 kg of CO₂**. That is approximately the mass of **63** adult elephants

What we can do

- Use alternative heating and cooling systems like cross-ventilation and heat pumps
- Use natural lighting whenever possible
- Convert to LED lighting
- Implement energy saving practices (turn off lights, air conditioner when not in room)

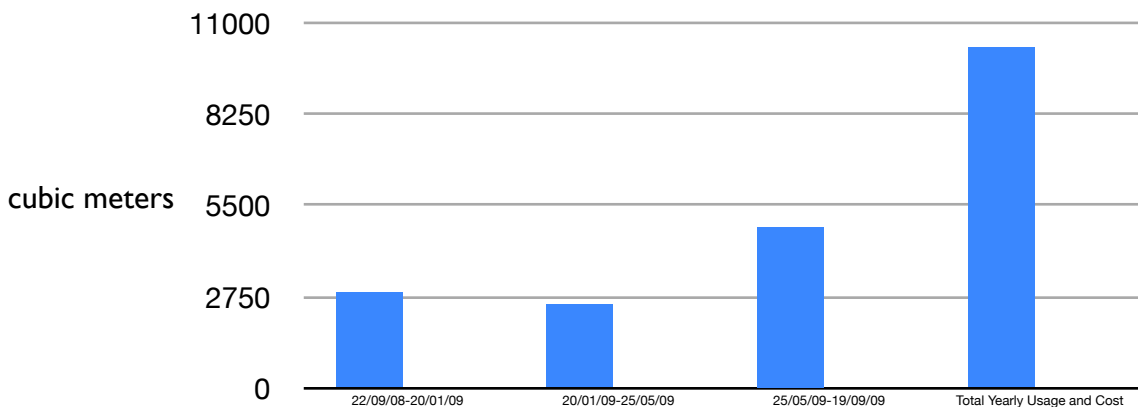
Water Usage for the Entire School (tap and sewage water)

What we did

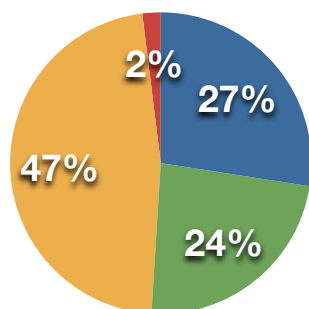
Throughout this process, our group used a variety of different sources to accomplish the three different steps needed to get us the information that we were required to find. These three steps were planning, collecting data, and analyzing our data. Without completing these tasks, we would not have been able to get any reliable information. In order to calculate the volume of lost water, we spent one afternoon measuring the flow rate of all the leaking faucets and hoses we could find around the entire school and then calculated what those losses would be for an entire school year.

What we found

Cubic Meters of Water Used by Bill Date Range and Annual Total



% of Water Used by Bill Date Range and % Wasted Annually



- Water Used (September-January)
- Water Used (January-May)
- Water Used (May-September)
- Water Wasted (All Year)

- In one year HKA used **10,268,000 liters** of water and spent **\$46,442**
- 10 million liters of water can fill up about **36,764** average sized bath tubs and **four** olympic sized swimming pools
- Every year, we waste about **122,000 liters** of the 10 million liters of water we pay for as a result of leaking taps and hoses
- 122,000 liters of water can fill up about **448** average sized bath tubs

What we can do

- Turn off the taps when you are not using them.
- Turn off the taps properly. Most of the leaking taps were just taps that had not been turned off properly.
- Fix any permanently leaking taps and hoses. Our group noticed that a lot of water is being wasted by not only leaking taps, but especially hoses: enough to fill up approximately 224 average sized bath tubs.
- Install water efficient toilets and urinals in at Kennedy Town. Urinals in the MS/HS currently flush automatically whether or not they have been used.

What we did

Waste Generated During Middle School & High School Lunches

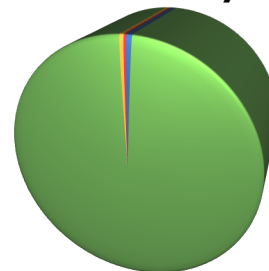
On Tuesday, May 11th, we collected, sorted, and measured the mass of all the plastic, aluminum, food, and paper waste generated by students and teachers in the MS/HS. On that day there were 116 MS & HS students, 27 teachers, and 37 5th grade students for a total of 180. The 5th grade students were in the gym because of the exhibition. We included them in our data because they will be part of the MS/HS next year.

What we found

- Food waste made up **98.5%** of the total mass collected on that day.
- MS/HS lunches generate around **1000 kg** of waste per year. That's about the mass of 55 pig

● plastic ● food ● paper ● aluminum

Type of Waste By Mass



What we can do

- Adjust the portion size so that less food is wasted
- Reuse and recycle the aluminum and plastic containers
- Use less juice boxes by bringing drinks in reusable containers or have the school purchase juice dispensers and use cups or water bottles
- Build worm farms to create usable fertilizers

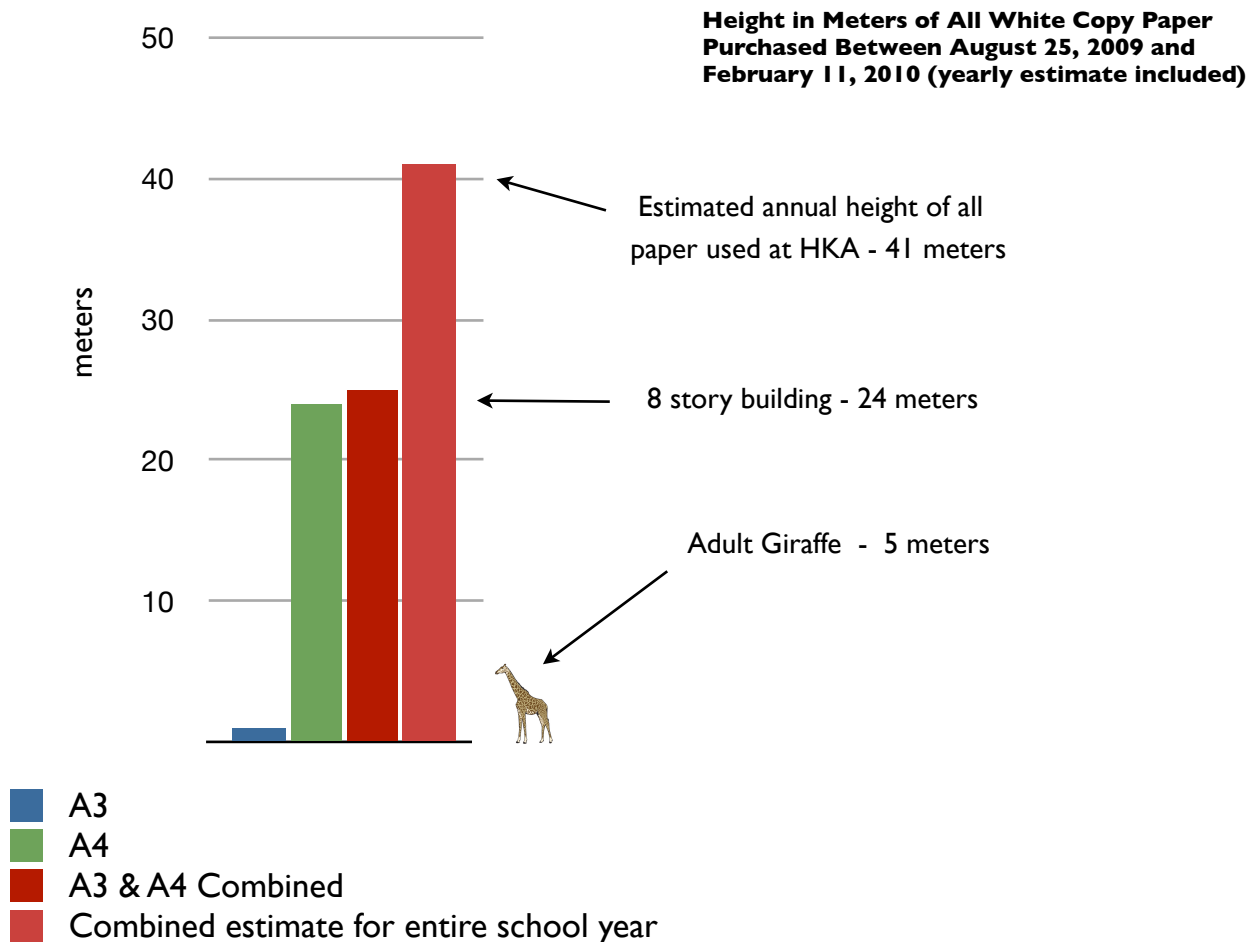
Copy Paper Usage For All of HKA

What we did

We reviewed copy paper invoices from August 25, 2009 through February 12, 2010. We looked at the total packs purchased (one pack has 500 sheets) and the total cost. With that information we were able come up with statistics like the number of sheets of paper each person at the school uses in one year.

What we found

- In total since the beginning of the school year we have spent a total of \$11,616 HK on 480 units of A4 paper at \$24.20 HK with 500 pieces of paper per unit
- If the purchasing from August - February is consistent with the purchasing from March - June, then we will purchase approximately an additional 320 units of paper. That would bring the total number of sheets to 410,000
- There are around 497 students, teachers, and support staff at HKA. In one full school year each person would use an average of 825 sheets of paper.
- The mass of all that paper totals 1,886 kg which ultimately contributes 7542 kg of CO₂ to the atmosphere. That's the weight of one adult elephant.



What we can do

- Choose carefully what we decide to print
- Give each person a monthly quota and if they go over they can no longer print
- Improve the effectiveness of our paper recycling program school-wide.
- Use electronic documents as much as possible
- Educate people so they know how much we use and how to reduce the amount we use

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