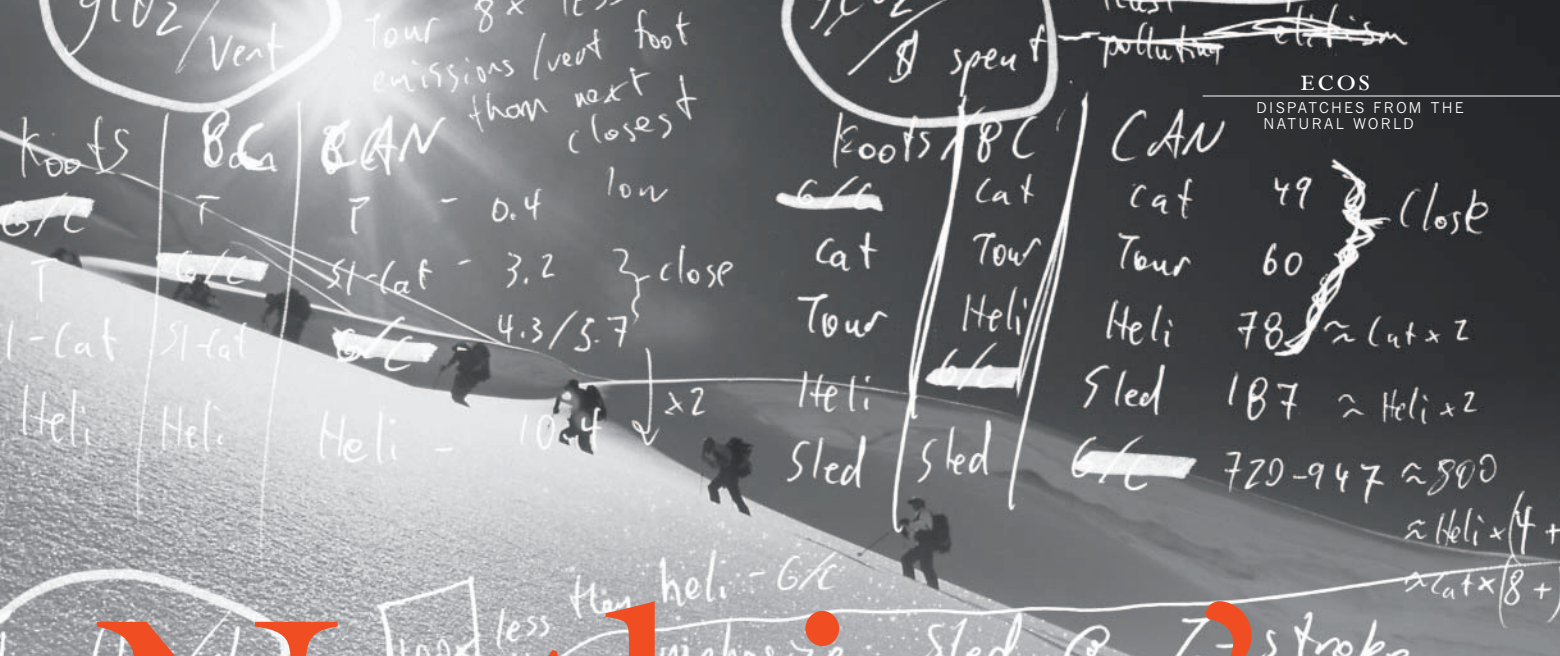


Nothing's Free

Half scientist half ski bum, Tom Chalmers takes a few well-calculated turns down the slippery slope of Kootenay mountain transport and its associated carbon emissions

By Thomas Chalmers

"GOODBYE, SLED. GOODBYE, TRUCK," was my self-satisfied thinking, signing for the keys to a little 1.5-litre station wagon. "Goodbye, gnarly carbon footprint." I mean, hey, the car is so good on gas the government was kicking me a fat purchase rebate. "Hello, thousand bucks."

"Hello, new lightweight ski touring set-up."

Mindfully returning to a more wholesome mountain lifestyle left my newly low-emission ass feeling nigh on smug. After all, how much greenhouse gas can one person produce when they are out skinning for turns, schussing snowflakes and giggling through pow-choked cakeholes? Not freakin' much, I bet.

Thus began my personal quest to discover the carbon footprint of ski bumming.

The goal of this story and its accompanying graphs is to examine the environmental impacts of getting to a hilltop solely for the purpose of riding down. This study compares the power, carbon, and financial costs of touring, snowcat, cable lift, snowmobile and helicopter transportation to said hilltop. Set against the backdrop of a burgeoning movement towards more environmentally sustainable living in the age of peak oil, a discussion of the relative power consumption and greenhouse gas emissions of daily living is also needed to establish a societal baseline.

Study Beta

I calculated everything in this study per person, taking into account 14 shredders per snowcat, eight passengers per gondola, four per chairlift, one per sled and five per A-Star B2 helicopter. Some driving may or may not be required to engage in these activities, so it is omitted from consideration. Breathing (i.e. normal downhill skiing respiration) emits carbon dioxide, and heavy breathing (i.e. intense aerobic exertion) emits more, so ski touring emissions represent the difference between the two. You'll note a $10 per day cost of touring that reflect the extra calories needed to feed that purist monkey.

Lift-skiing emissions are calculated based on the type of electricity produced to run them. Sledding emissions are for a two-stroke machine. Newer, and hopefully increasingly popular, four-stroke snowmobiles emit way less abjectly toxic horror, 95 per cent less CO_2, and are considerably more fuel-efficient and quiet. Heli- and cat-skiing costs and calculations are for single-day trips only, which is at the cheap end of the luxury mechanized skiing spectrum. The numbers for snowcat emissions were hard to find, so it was calculated from information for a heavy-duty diesel pickup truck of similar horsepower.

For comparison and discussion, I broke down the shredding costs for each method of getting to the top of a hill into dimensions

Photo: Ryan Creary

that seem most important to the discerning shredder. This is how the calculations were made, and you may want to refer to this when checking out the graphs:

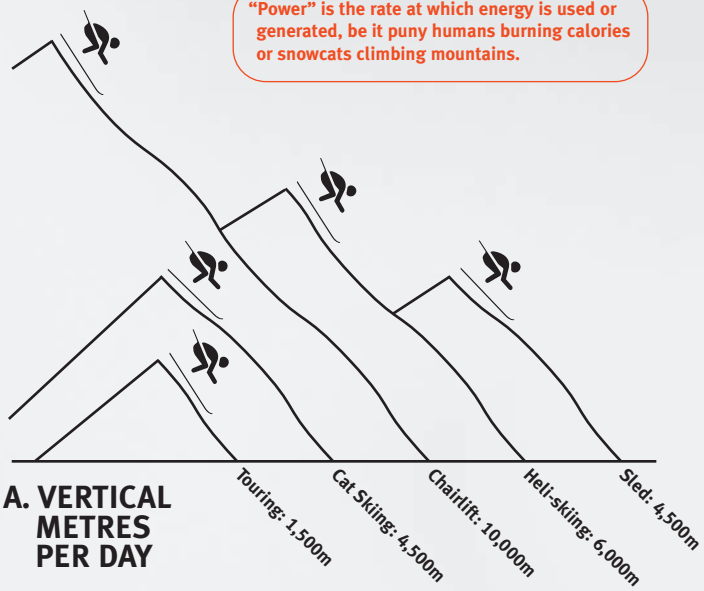
A. **Vertical Metres of Fun Per Day:** This is an estimate, from my experiences in the snow/avalanche industry, of what an average rider or guided group will do on a reasonably good day of riding.
B. **Dollars Per Day:** This is a reasonable average cost for a given activity.
C. **Dollars Per Vertical Metre:** This is what you pay for each unit of stellar pleasure. C = B / A.
D. **Greenhouse Gas Emissions Per Vertical Metre:** This is how much CO_2 is produced to get each unit of stellar pleasure.
E. **Greenhouse Gas Emissions Per Dollar Spent:** This is how bad each dollar spent is for the environment. E = D / C.
F. **Total Greenhouse Gas Emissions Per Day:** This is how much CO_2 is produced for each person who does one day of a given activity. F = D × A. For speculative fun, this is the number I can compare to the amount of CO_2 produced by commuting to work in an office for a day, to test whether skiing or working is a more sustainable lifestyle decision.

Incidentally, the estimate of "office" greenhouse gas emissions is for my own typical day of work, characterized by 80 kilometres of commuting (Nelson to Castlegar) and eight hours in a 60 square-foot office, staring at a computer and wishing I was slaying pow-pow.

The total results of this little study provide insight for personal choice regarding an appropriate means of recreational uphill conveyance and touch on the perceived lifestyle dichotomy between ski bumming in the mountains and racing rats in the city.

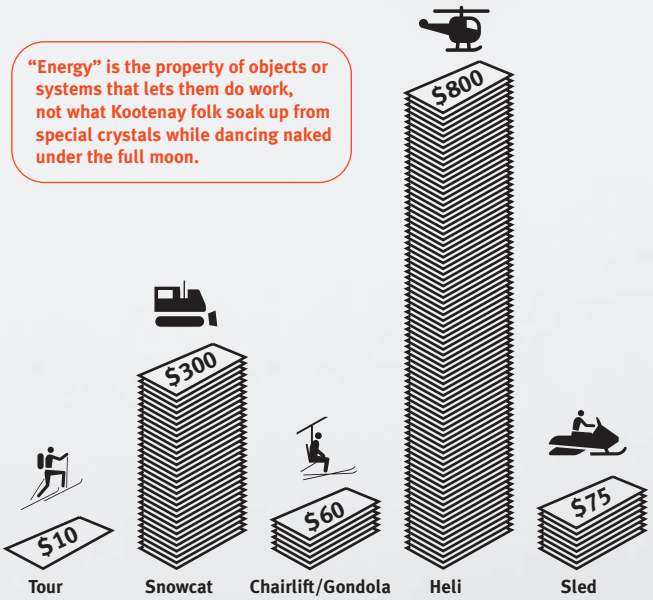
(continued on page 40)

"Power" is the rate at which energy is used or generated, be it puny humans burning calories or snowcats climbing mountains.

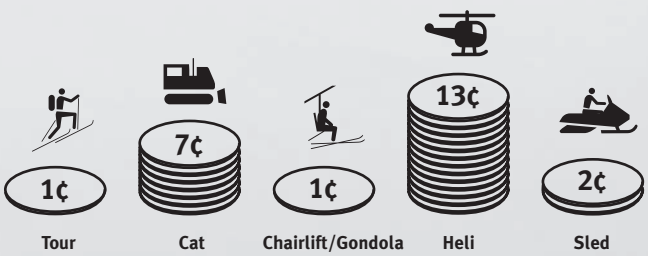


A. VERTICAL METRES PER DAY

"Energy" is the property of objects or systems that lets them do work, not what Kootenay folk soak up from special crystals while dancing naked under the full moon.



B. DOLLARS PER DAY



C. DOLLARS PER VERTICAL METRE

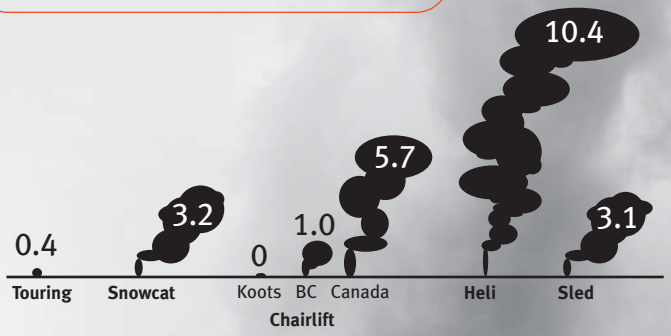
photo, far left: Mattias Fredriksson

The Units

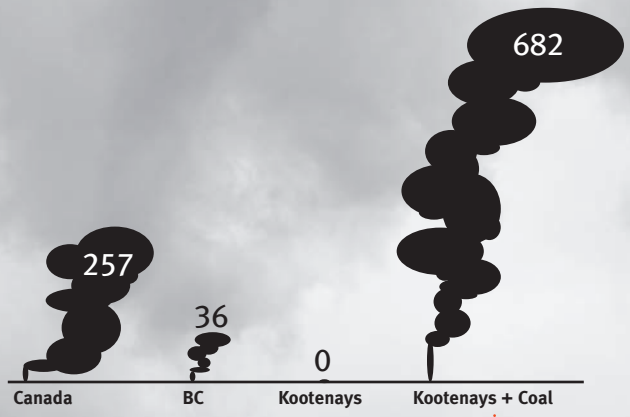
Power plants produce electric energy at a rate of joules per second, also known as a watt, in addition to carbon dioxide. Thus, a source of power can be environmentally evaluated in terms of how much CO_2 it produces per watt of power created. It's no stretch to grasp that the efficiency of any machine using power to get a rider uphill can be considered in similar terms of CO_2 emissions.

Many units of measurement are found in the hard data for greenhouse gas emissions and energy production/consumption. It took a lot of calculating and analysis to compare things on an even footing, but I checked my work real good. Henceforth, energy (from electricity, fossil fuels, people and renewable sources) is expressed as kilowatt hours (kWh), which is the amount of energy that a 1,000-watt power source produces in one hour. Greenhouse gas emissions are expressed as tonnes of carbon dioxide (tCO_2) at the big population-scale and grams (gCO_2) or kilograms ($kgCO_2$) for personal fun footprints, where 1,000 grams makes a kilogram and a million grams makes a tonne.

"Work" is not tree planting all summer to ski bum all winter, but is the transformation of power into action, such as putting a human, complete with snow-eating grin, on top of a shreddable mountain.



D. EMISSIONS PER VERTICAL METRE
(gCO_2/ vert m)

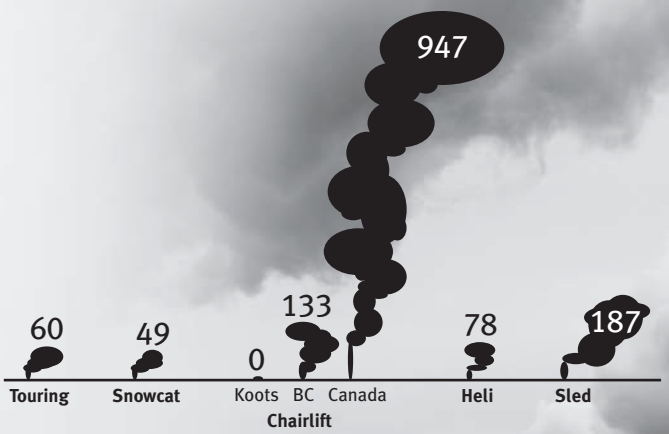


EMISSIONS FROM ELECTRICITY GENERATION
(gCO_2/ kWh)

The Kootenay Coal Equation

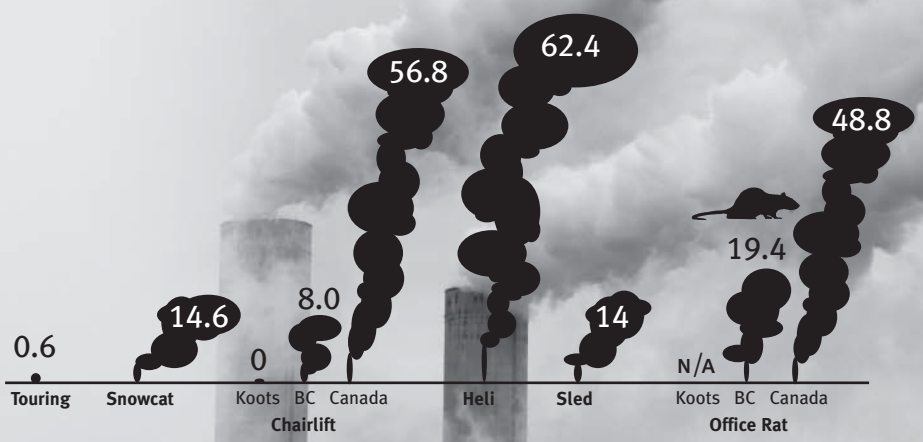
It's worth considering that the Kootenays also export a whack of coal, totalling 20% of that shipped by sea worldwide. According to the US Department of Energy, "Coal-fired electricity … comprise(s) nearly 80% of the total CO_2 emissions produced by the generation of electricity in the United States … coal-fired plants having the highest output rate of CO_2 per kWh." Actually, I figure that it works out to almost 1000gCO_2 (or one tonne)/kWh, nearly 30 times BC's generation levels and four times the Canadian average.

Though Kootenay coal is most suitable for making steel, it is still burned to release energy and that burning produces emissions to the tune of around 54 million tCO_2/yr, equating to about 7% of the emissions produced by all of Canada. That makes the Kootenay carbon balance tilt to a much grittier slant, especially considering that our reserves yet to be mined could produce emissions equivalent to over 20 years worth of Canada's total current CO_2 production.



E. EMISSIONS PER DOLLAR
(gCO_2/ $)

In my typical day of work, the car commute constitutes 75% of the day's carbon footprint. If I rode my bike instead, which is 200 times more fuel efficient than the average passenger vehicle*, I could reduce that "Office Rat" footprint by 400%. That's nuts. For the same day in the rest of Canada, the car would be 30% of the footprint, and switching to a bike would equate to a 30% total reduction in Office Rat scurrying. Also highly significant.



F. EMISSIONS PER DAY
($kgCO_2$/ day)

Power Production by Region

As a nation, Canada produces 740 million tonnes of CO_2 (tCO_2) a year, or about 20 tonnes per person. We generate 991 billion kilowatt hours of juice a year from power plants—devices like windmills, natural gas, water turbines, coal, solar panels and nuclear reactors—which account for about one-third of our total greenhouse gas emissions. Combining these two statistics means as Canadians we produce 257 gCO_2/kWh per person per year.

In comparison, BC manages to weigh in at only 36 gCO_2/kWh made or one-seventh the national average. Why the big difference? BC uses predominantly hydroelectric power, mixing in some fossil fuel generation. In terms of the carbon footprint of power generation, hydro yields large volumes of very "clean" power, though there are significant greenhouse gas emissions resulting from constructing steel and concrete dam infrastructure, in addition to the contentious environmental cost of permanently lost habitat and arable land. That, however, is a whole other story.

The Kootenays, with only 0.4% of Canada's population, uses hydro exclusively to crank out almost 2% of our nation's power. The low local's deal of about $0.06/kWh results in an effective carbon footprint of almost 0 gCO_2/kWh—almost nothing.

Research and Sources

When dealing with a hot topic like climate change, it's important to go beyond the usual media bunk to find objective data. Without an axe to grind, Googling up a story like this needs to avoid leftistrant.com, corporategreenwash.ca or ijustmadeitup.au. Largely unimpeachable sources like Natural Resource Canada's Office of Energy Efficiency and the US Department of Energy and Environmental Protection Agency are crucial. Corporate information, like that from BC Hydro, Fortis BC, Elk Valley Coal and Elk Valley Sustainability, is limited to raw and publicly available numbers. Less formal sources are used for some information but have been corroborated and diligently checked for outlandishness.

Please remember that I've done my best to paint a truthful picture of skiing and snowboarding's state of affairs, and I like my head where it is. If the results shock or piss you off, I encourage you to do some cool-headed fact-checking to your own satisfaction. If this story makes you question your personal riding habits, then consider the means by which you can offset that winter fix: ride a bike to work all summer, buy carbon credits online, quit mowing the lawn with a two-stroke gas mower, etc. Creating a lower-carbon lifestyle is replete with options.

Lastly, my city-folk smack talk comes from the best of intentions, to open those smog and skyscraper-obfuscated horizons to the good life that lies beyond. It all comes down to personal choice. I just happen to like being a ski bum.

The media loves to chuck around buzz words, but exactly what does "carbon footprint" have to do with "greenhouse gas"? A carbon footprint is often referred to as the measure of the impact human activities have on the environment in terms of the amount of greenhouse gases produced, measured in units of carbon dioxide. Atmospheric "greenhouse gases" which include clean ol' water vapour, comprise one of the key mechanisms of the Earth's climate. Greenhouse gas produced by humans is 72 per cent carbon dioxide (CO_2), 18 per cent methane, and 9 per cent nitrous oxide. What? Nitrous oxide!? Laughing gas is messing up the planet? That sucks.

Anyway, the consensus opinion of the Intergovernmental Panel on Climate Change (IPCC), a body of the best and brightest climatologists on the planet, is that human greenhouse gas emissions are presently forcing an unnatural warming of the Earth's atmosphere, with potentially disastrous future effects.

As a whole, humanity's largest single contribution to greenhouse gas, all 21.3 per cent of it, comes from power production. Major sources of an individual's greenhouse gas emissions include home heating and cooling, electricity consumption and transportation—including, but not limited to, hilltop transportation.

This makes an important point on ski bumming: Cable lifts run on electricity, but the environmental impact of lift skiing varies wildly, depending on the means used to produce that electricity. Such that getting on a chair in the Kootenays has a much smaller carbon footprint than doing the same thing just about anywhere else. In fact, BC as a whole ain't that bad. Check out the graphs on the previous page for more detailed information about power production by region.

Results: Drum Roll, Please

In answer to the philosophical keel of this story, when all is said and done, dear reader, can you harm the environment less by shredding than going to work? For those of us who live in BC, the answer is a reasonable "yes," especially for touring and lift skiing. Cats, sleds, and office rats come in neck and neck, certainly within the margins of error for my calculations, but I am erring on the side of fun. That "yes" also comes under the implicit assumption that none of us dirt-bagging mountain peeps are swooping around in helicopters, gnawing on caviar, and thrashing out powder 8s. After all, when you live in the snow, you don't need to spend 800 smackers a day to chase it. Ski bums are clean bums after all.

The implications of electricity cleanliness are also quite interesting, as riding a lift goes from the lowest-emission fun in the Kootenays to second best in BC as a whole, but using the chairlift is close to par with taking a helicopter for the rest of Canada.

Personally, the dramatic differences between self- and machine-powered fun speak volumes to me. Even if—in the worst case for my chops as a researcher—the numbers are off by 50 per cent from actual values, it is abundantly clear that ski touring is the cheapest overall option and the most environmentally sound, producing about 25 times less total greenhouse gas than cat skiing or sledding, 80 times less than riding a lift, and 100 times less than using a helicopter. Touring and lift riding both produce similar amounts of vertical bang for the buck, though people use much less power to do so on their own.

Gee whiz, I guess that means all of those long forgotten years spent chasing things down to eat have made us humans naturally efficient and clean self-powered travellers after all—in deep snow, no less. Even if jobs and money have supplanted survival with leisure, depending on your degree of snow addiction, two feet and a heartbeat remain *the* best way to have good, clean, wholesome fun in the mountains. ❐

Photo: Adam Clark