**A Simple Call of Action for Carbon Redemption**

**CO2Redemption.com**

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# 1 Introduction

## 1.1 Motivation

Human activity results in emissions of CO2 whether it is burning a gallon of gas in a car, or heating your home or office with electricity. These human-caused GHG emissions are the core debate on climate change on a global scale.

People are at least somewhat aware that their consumer behavior affects our environment, but most of them are unaware of how much carbon emissions they produce. In the spirit of creating more carbon footprint awareness, we propose in this paper a simple initiative towards carbon redemption.

* 1. **Problem Domain**

People continue to consume without awareness of their carbon footprint. We want to be in a position where we can provide awareness and promote social good.

**Hypothesis***:*

*If people were to donate a portion of their money invested in activities that produce CO2 to offset the CO2 they produce by planting a tree or sponsor an efficiency project, then not only we raise awareness of their carbon footprint and overconsumption, but we also provide a crowdsourcing platform for social good.*

# 2 A Simple Carbon Redemption Solution

## Case 1: Heli-Skiing in Canada

Heli-Skiing is one of Canada’s most popular sports. It consists of off-trail, downhill skiing that is accessed by a helicopter. Heli-skiing provides access to skiing in natural, albeit highly-selected environment, without the effort required for hiking into these areas. One of the most popular resorts for Heli-Skiing is the Canadian Mountain Holidays (CMH) heli-skiing resort located in Banff, Alberta.

In 2009, CMH’s footprint was 10,872 metric tonnes of CO2 [1]. This is equivalent to two space shuttle flight launches [3]. On a typical weekend at the CMH, depending on the ability of the skier, they get around 8 to 15 runs a day, with 10 runs being the normal average.

The helicopter runs non-stop for about 8 hours carrying a maximum of 9 passengers on each trip. The fuel burn rate for a Bell 212 helicopter is 380 Litres/Hour [6] which is equivalent to 100.385 Gallons/Hour. In a total of 8 hours, the total fuel consumption would be equivalent to 803.08 Gallons of jet fuel, or 3,040 Litters of jet fuel.

The total daily carbon emissions of a helicopter can be determined based on its daily jet fuel consumption, and the empirically-determined CO2 emissions per unit volume of jet fuel. Studies at Eastern Connecticut State University have shown that the CO2 emission coefficient to burn jet fuel is metric tons of CO2 per liter of jet fuel [7], the equivalent to 2.52 Kg/L. As a result, we can determine the CO2 emission cost for one passenger:

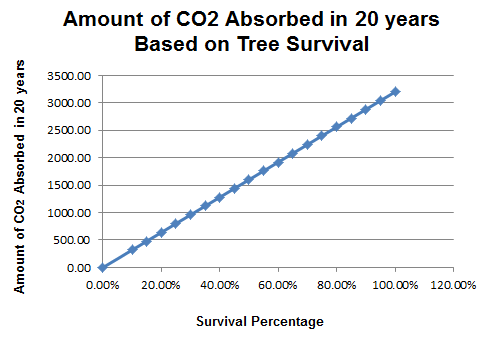
This is equivalent to a total cost of 192.1 kilograms of CO2 emissions per passenger per day. As part of our efforts to provide further social good, we calculate each passenger’s suggested “redemption donation” towards tree planting on Earth Day to make up for the carbon emission. A tree can absorb as much as 48 pounds of carbon dioxide per year [5] the equivalent to 0.0218 metric tons of carbon dioxide per year. One hectare of forested area can absorb 15.873 metric tons of carbon dioxide per year. According to a report from the U.S. Dept. of Agriculture and the Forest Service, New England has 4,816 trees per acre [9], or 1,950 trees per hectare:

This result is the number of mature trees that if added to a forest today, would in a year recover the carbon emission cost of a single day of Heli-Skiing. However, a number of inefficiencies need to be accounted for in order to achieve this end result. It is important to note that a tree must be at least 15 years old to effectively absorb the aforementioned 0.0218 metric tons of carbon dioxide per year – for a new-planted tree, the carbon offset is effectively zero. Thus, our equation must assume a certain timespan by which the incurred carbon emission have been eliminated, taking into account that trees planted will not immediately begin recovering those emissions. Additionally, the survival rate for newly planted trees, even in a managed forest, is not 100%, so an expected survival factor must be built in to offer a margin of safety in meeting carbon emission recovery goals.

We now determine how much should a passenger donate to Earth Day for tree planting or tree maintenance. The cost of planting a pine tree, in 2014, is approximately $90 per acre for the contractor and the seedlings [8]. Hence, giving an approximately cost of 0.225 cents per pine tree. In our Heli-Skiing example, each skier should donate a total of **$5.85 dollars per day of skiing on Earth Day to plant 26 trees.**

Assume that X% of trees survive…. And so total Carbon absorbed over 20 years is Y….. so I donate Z dollars per day of heliskiing so in 20 years allk the cartbon will have been absorbed….

The following figure shows the total CO2 absorbed over 20 years based on survival percentage of the 26 trees



**Figure 1.** Total amount of CO2 absorbed in metric tons based on the survival rate of 26 trees

To offset 0.1921 metric tons of CO2 released per person heli-skiing per day, considering that a single tree absorbs a total of 123.19 metric tons of CO2 in 20 years [10] is :

Which costs

## Case 2: Average Car CO2 Emission

A liter of gas produces about 2.35 kilograms of carbon dioxide [4], the equivalent to metric tons of CO2 per liter. Over 20,000 kilometers (the distance an average American will drive in a year) a 50 KPL (Kilometers per Liter) car will produce 5.1 metric tons of carbon dioxide.

Using the number of trees per acre in New England, the number of trees a driver needs to plant and grow fully to offset his car’s annual carbon dioxide emission is:

**The cost of planting 115 trees is estimated to be $25.87 dollars per vehicle,** hence every driver should be donating that amount each year on Earth Day to compensate for their vehicle CO2 emissions.

# 3 Discussion

**Companies are starting to consider CO2 offset projects, but not users**

Heli-Skiing company, Majestic Heli Ski Alaska, has recently become the first Heli-Skiing company to seriously become carbon neutral. According to a recent blog post from the company, they have partnered up with Energy Native, a non-profit institution, to build projects to offset their CO2 emissions. They estimate that they will offset approximately 56,000 lbs of CO2 produced by the company’s helicopters and operations [2].

This is a great move put forward by the company to partner up with a non-profit and address the carbon offset problem. However, very few Heli-Skiing users are concerned in reducing their CO2 emissions. We propose a simple tool to engage with the end user by informing and encouraging them to give a donation to offset the amount of CO2 they emitted. We want to propose a non-profit system, completely transparent about overhead costs, that will invest in projects that will benefit communities and promote social good.

We propose to build a mobile app, *CO2Sin*, with the following features:

* Easy and directly donation to Earth Day based on their CO2 emissions to redeem themselves from their sins
* Calculate carbon foot-print for users and let them make their own decision about if and how they wish to off-set those emissions
* A catalogue to correlate the estimated amount of CO2 the user is releasing based on salary, so that you can do a yearly donation to sponsor a tree (planting or employing someone to take care of the tree) [Alex]
* Integrate as a plug-in or add-on to current travel/activity/experience booking software/apps/websites.  Go to book heli-skiing and right as you are about to pay, ask the user to consider offsetting their carbon emissions (and show them their expected emissions with comparison the emissions of everyday activities) by including a donation to a set of or a specific CO2 recovery programs/etc. [Nick]
* Allows entering assumptions, including cost of land to plant the trees. [Alex]

# 4 Conclusion

By purchasing carbon offsets, you help sponsor a project that helps offset greenhouse gases from being emitted for each ton that you have caused. We proposed a simple solution, to build a mobile phone, which raises awareness of carbon footprint and overconsumption, and sponsors tree planting and other efficiency projects for Earth Day to redeem people from their sins

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