



A dark blue background with several 3D-rendered geometric shapes. In the upper left, there is a sphere and a cube. In the lower left, there is a large torus (donut shape).

Things to Fix for Final Draft:

~more images and graphs, less words, and make calculations more concise.

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Overview

Proposal

- Optional, every-day, work-from-home opportunities for employees (5+ days.)
 - Utilization of Carbon Reduction Visual Studio Extension by developers.
- Ideally targeting all Microsoft employees (~144,000 people.)
- Will continue forever unless mandated otherwise (∞ years.)



Savings

CARBON

- Average Employee:
 - Daily:
 - Carbon: 12,3417 lbs. of CO₂ per day
 - Yearly:
 - Carbon: 3,086 pounds of CO₂ per year
- All Employees / Company:
 - Daily:
 - Carbon: 1,771,655 lbs. of CO₂ per day
 - Yearly:
 - Carbon: 442,913,725 lbs. of CO₂ per year

COST

- Average Employee:
 - Daily:
 - Cost: 1.764 dollars per day
 - Yearly:
 - Cost: 441 dollars per year
- All Employees / Company:
 - Daily:
 - Cost: 348,308 dollars per day
 - Yearly:
 - Cost: 87,077,000 dollars per year



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Background and Motivation

Organization and Sustainability



- Championing efforts such as becoming carbon neutral by 2012, carbon negative by 2030, and total carbon removal by 2050
- Sustainability team
- Green IT developers

Carbon Reduction Project

- Work-From-Home plus Visual Studio Carbon Reduction Extension
- The reduction of a daily commute reduces carbon emissions, saves money, and allows for increased time to care for oneself.
- Carbon reduction software that developers can use to reduce their carbon footprint within the company.
- Work-from-home policies would extend to all 144,000 Microsoft employees.





Savings

Calculations

- *Note that when it says “for Company” it translates to all 144,000 employees.
-
- Average Roundtrip Distance Per Worker: **16.42 miles saved per day**
- Average Commute Time Per Worker: **45.59 minutes saved per day**
- Average Roundtrip Distance for Company: **2,364,480 miles saved per day**
- Average Commute Time for Company: **6,564,960 minutes saved per day**
-
- Pre-COVID Number of Working Days: **~250 days out of the year**
-
- Average Roundtrip Distance Per Worker:
 - $16.42 \text{ miles} \times 250 \text{ days} = 4,105 \text{ miles saved per year}$
- Average Commute Time Per Worker:
 - $45.59 \text{ minutes} \times 250 \text{ days} = 11,390 \text{ minutes saved per year}$
- Average Roundtrip Distance for Company:
 - $2,364,480 \text{ miles} \times 250 \text{ days} = 591,120,000 \text{ miles saved per year}$
- Average Commute Time for Company:
 - $6,564,960 \text{ minutes} \times 250 \text{ days} = 1,641,240,000 \text{ minutes saved per year}$



Calculations

- Average Miles Per Gallon of Worker: **26.24 miles per gallon**
-
- Average Number of Gallons Saved Per Worker: **0.63 gallons per day**
- Average Number of Gallons Saved for Company: **90,110 gallons per day**
- Average Number of Gallons Saved Per Worker: **158 gallons per year**
- Average Number of Gallons Saved for Company: **22,527,500 gallons per year**
-
- *Note that the 19.59 lbs. of CO₂/gallon reference was found on EPA site.
-
- CO2 Saved Per Worker Per Day:
 - $0.63 \text{ gallons} \times 19.59 \text{ lbs. of CO}_2/\text{gallon} = 12.3417 \text{ lbs. of CO}_2 \text{ per day}$
- Cost Saved Per Worker Per Day:
 - $0.63 \text{ gallons} \times 2.80 \text{ dollars/gallon} = 1.764 \text{ dollars per day}$
- CO2 Saved Per Worker Per Year:
 - $0.63 \text{ gallons} \times 19.59 \text{ lbs. of CO}_2/\text{gallon} \times 250 \text{ days} = 3,086 \text{ pounds of CO}_2 \text{ per year}$
- Cost Saved Per Worker Per Year:
 - $0.63 \text{ gallons} \times 2.80 \text{ dollars/gallon} \times 250 \text{ days} = 441 \text{ dollars per year}$
-
- CO2 Saved for All Workers Per Day:
 - $90,110 \text{ gallons} \times 19.59 \text{ lbs. of CO}_2/\text{gallon} = 1,765,255 \text{ lbs. of CO}_2 \text{ per day}$
- Cost Saved for All Workers Per Day:
 - $90,110 \text{ gallons} \times 2.80 \text{ dollars/gallon} = 252,308 \text{ dollars per day}$
- CO2 Saved for All Workers Per Year:
 - $90,110 \text{ gallons} \times 19.59 \text{ lbs. of CO}_2/\text{gallon} \times 250 \text{ days} = 441,313,725 \text{ lbs. of CO}_2 \text{ per year}$
- Cost Saved for All Workers Per Year:
 - $90,110 \text{ gallons} \times 2.80 \text{ dollars/gallon} \times 250 \text{ days} = 63,077,000 \text{ dollars per year}$

Calculations

- Success Metrics:
 - 10% reduction in carbon emissions within a codebase.
 - For example, if developers in OneDrive Consumer are using the extension, one would hope to see a 10% reduction in overall code base related carbon emissions.
 - Using Microsoft's overall carbon emissions of 16 million tons and an internal carbon fee of \$15, the carbon and cost calculations are as follows:
 - Carbon: **1,600,000 tons of carbon emissions per year**
 - Cost: **24,000,000 dollars per year**



Calculations

- Average Employee:
 - Daily:
 - Carbon: 12,341.7 lbs. of CO₂ per day
 - Cost: 1,764 dollars per day
 - Yearly:
 - Carbon: 3,086 pounds of CO₂ per year
 - Cost: 441 dollars per year
- All Employees / Company:
 - Daily:
 - Carbon: 1,771,655 lbs. of CO₂ per day
 - Cost: 348,308 dollars per day
 - Yearly:
 - Carbon: 442,913,725 lbs. of CO₂ per year
 - Cost: 87,077,000 dollars per year



Assumptions

- Assumed that every Microsoft employee worked from the office pre-COVID and that every Microsoft employee would be able to work from home post-COVID.
- Assumed that the voluntary sample of 225 OneDriveSharePoint employees (pre-survey) and 102 OneDriveSharePoint employees (focused survey) represented the entire Microsoft population.
- Rough average for average miles per gallon since not every surveyed employee knew their mpg off the top of their head.

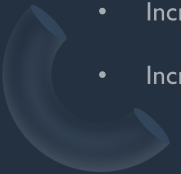


Illustrate Magnitude of Savings

- The **daily** company calculations for carbon emissions (1,771,655 pounds) offsets carbon emissions of approximately 39 individuals.
- The **yearly** company calculations for carbon emissions (442,913,725 pounds) offsets carbon emissions of approximately 9628 individuals.



Co-Benefits

- Less overall (air, noise, and light) pollution leading to better health conditions and Fewer and less intense traffic jams in employee-heavy regions.
 - Less wear and tear on vehicles.
 - More money saved from food, other expenses.
 - Increased employee productivity.
 - Less laundry to be done.
 - Comfy clothes, leading to relaxed state of mind.
 - Increased time to prioritize activities that increase mental / physical well-being.
 - Reported decreased level of stress.
 - Increased flexibility in schedule.
 - Increased time for cooking, leading to a healthier lifestyle.
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Next Steps

Issues and Solutions

ROADBLOCKS

- People find it hard to break out of routines they have kept up for years.
- Few developers will not want to utilize the software to realize and then reduce their carbon footprint.

SOLUTIONS

- Carbon reduction campaign
- Continuing incentives such as allowing employees reimbursements for buying office equipment.
- Establishing a standardized carbon metric across Microsoft.



Project Status and Future Work

- Overall Microsoft survey sent out that hinted that the company is leaning towards a work-from-home policy.
- A hybrid option is being discussed by senior executives.
- A team has already taken ownership of the carbon reduction software and intends to continue work on it.

