HIVE FOR HUMANITY

FURNITURE RECYCLING

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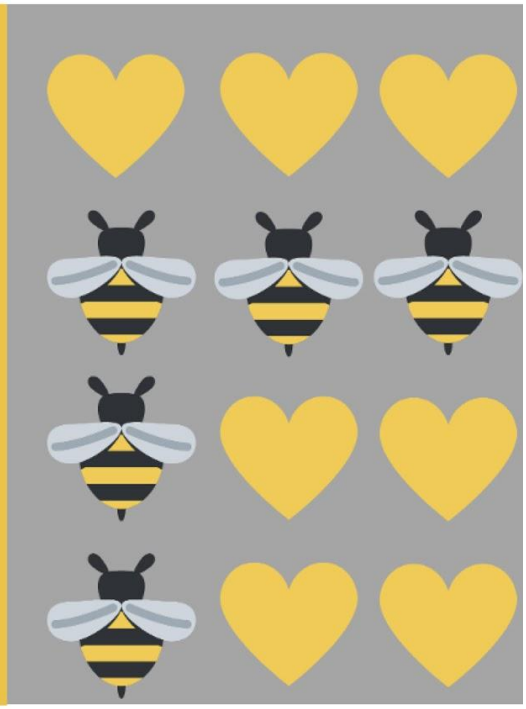
A partnership between Georgia Tech Student Housing and Habitat for Humanity

- Facilitate furniture Re-Use
- Reduce Waste
- Reduce Emissions from Furniture Manufacturing and Transportation
- Market the Re-Store to GT Students



PREVENT

120,000

LBS OF CO_2 ANNUALLY

PREPARED FOR: HABITAT FOR HUMANITY

PREPARED BY: HIVE FOR HUMANITY AT GEORGIA TECH

Proposal Scope

In order to reduce the emissions associated with furniture manufacturing and purchase, this proposal introduces Hive for Humanity, a joint effort between the Georgia Tech community and Habitat for Humanity. Hive for Humanity will expand on Habitat for Humanity's program that collects gently-used furniture, appliances, and other items to sell at an affordable price in the ReStores. Coordinating strategic drop-off and pick-up of used furniture during move-out periods will provide an influx of furniture to ReStores, a decrease in waste, and mitigation of carbon emissions.

This initiative is mutually beneficial, offering a two-fold benefit of increased donations and sales for ReStores while involving students with a green campus initiative. Through a recurring donation program each semester, we will scale up Habitat for Humanity's initiative, expand reach, and increase sales while contributing to the global effort to reduce carbon emissions. We plan on utilizing volunteers from Habitat for Humanity to assist students by transporting furniture from the Georgia Tech campus. With marketing geared towards students and involvement made accessible for all, this program will bridge the gap between the Atlanta community and what can often seem like the Georgia Tech "bubble", paving the way for future volunteering involvement with Habitat for Humanity. We have designed marketing and social media deliverables to promote and encourage involvement with Hive for Humanity in the Georgia Tech student body (see Appendix, figure 7).

This proposal for the recycling of furniture is the product of an academic and social initiative formed at Georgia Tech, dubbed the "Carbon Reduction Challenge". The nationally recognized Carbon Reduction Challenge is an opportunity for students to learn how to build a business case for sustainability and work with an organization to create a sophisticated project that will reduce carbon emissions. Students of various backgrounds are split into teams to produce unique proposals such as Hive for Humanity.

The furniture industry requires significant carbon inputs and takes a large environmental toll; therefore, our team has chosen to pursue the cutback of furniture production. Facilitating re-use and recycling is an often overlooked yet effective method for carbon reduction. As students at a public university, furniture waste is visible at the end of every academic term, as students often discard unwanted furniture when moving out. According to the Environmental Protection Agency, over 12 million tons of furniture are discarded each year in the United States (Cummins, 2020). There are embodied carbon costs to manufacture each and every pound of these discarded materials (Hammond & Norman, 2011). Embodied carbon refers to the manufacturing and transportation of the furniture.

Projected Carbon Mitigation

To determine the projected carbon savings of Hive for Humanity, we researched the average carbon emissions associated with common furniture items. Our research indicates the emissions of the manufacturing of commonly-discarded furniture items yields an average of 47 kilograms of carbon emissions (kgCO2e) per furniture item. For perspective, this equates to approximately 5.3 gallons of petrol burning (Energy Live News, 2019).

To determine an estimate of interest from Georgia Tech students to guide our projected carbon mitigation, we have conducted a survey to gauge interest in this initiative. In spite of limitations associated with the COVID-19 pandemic, we were able to collect results from a diverse sample of 46 students. Survey questions encompassed interest in donating furniture, potential items for donation, and interest in shopping for furniture at the ReStore. A more detailed description of these questions can be found in the Appendix, figures 1-6.

We used our survey results to estimate and scale the projected carbon mitigation for the entire student body during a move-out period. Based on the survey results of potential furniture donations, we expect a reduction of 1,800 pounds of CO2e from the sample of 46 students alone. However, this sample size was relatively small and likely overestimated the percentage of students willing to donate. This assumption is based on acquiescence bias, the tendency for participants to overcommit their agreement in surveys (Winter, 2004). Also, our survey may have appealed to students who were already interested in this type of initiative, which may have created a sampling bias. Survey results can be found in the Appendix, table 1. Adjusting to this assumption, we quartered the expected donation rate, implying that 14% of the Georgia Tech Housing population (1,185 out of 8,465 students) would donate furniture, given volunteers are provided to facilitate the process. Using the average of 47 kgCO2e for manufacturing a single furniture item, the expected mitigation totals an estimated 122,800 pounds of CO2e. This value is approximately three times larger than the average carbon footprint of an American in a given year (McLean, 2017).

In addition to the savings associated with the manufacturing of the items donated, there are additional benefits of this initiative, including student cost savings and transportation carbon savings. We are assuming that each student who participates in Hive for Humanity will be donating one item of furniture, and logistically, these will be items that are easier to transport, such as futons, chairs, small tables, microwaves, and mini-fridges. Cost savings result from decreased storage costs and furniture disposal. Transportation emissions of furniture from foreign manufacturers are mitigated in addition to the 122,800 pounds previously calculated.

Factors Governing Feasibility of Implementation

Co-benefits

Although the primary objective of this initiative will be mutually rewarding for Habitat for Humanity and Georgia Tech students, a number of co-benefits exist that further enhance the utility of this program. Additional benefits include starting a line of communication between students and Habitat for Humanity, which opens opportunities for internships and volunteer projects, as well as exposing students to a unique way of reducing carbon emissions. Furthermore, Hive for Humanity promotes equity through encouraging student involvement, instilling an appreciation for sustainability, and enhancing education. As students discuss Hive for Humanity with their social networks, it will springboard into a larger-scale initiative for you at Habitat for Humanity to pursue.

Anticipated Obstacles

Despite the positive intentions of Hive for Humanity, this initiative is not immune to potential challenges, which could include lack of publicity and/or furniture donations. Additionally, it may be difficult to encourage Georgia Tech students to purchase furniture from the ReStore, as they could be disinclined to travel to the location, or simply may not want to purchase used furniture. To mitigate potential issues, our team will work closely with Georgia Tech Housing in addition to other on-campus entities to ensure that students are aware of this initiative and its benefits. Marketing deliverables will emphasize to students that the benefits of purchasing used furniture at the ReStore far outweigh the potential costs.

Status and Next Steps

Currently, we plan to implement the Hive for Humanity furniture drive at the end of the Fall 2020 academic term, when students are vacating their residences. During this move-out period, we plan to have four furniture drop-off locations, two on Georgia Tech's east campus and two on the west campus. We will disseminate communications to students regarding logistics of drop-off locations and time slots to align with the Habitat for Humanity volunteer schedule.

Following the pilot implementation of Hive for Humanity during the move-out period of the Fall 2020 semester, we will assess the success of the program and determine how to improve upon it in the following semester. Elements to be assessed will include the amount and types of items donated, the number of trucks and volunteers necessary, and the days and times when the most items are donated. Furthermore, we will consider whether there might be discrepancies in these

results between fall and spring terms. Ultimately, we hope to determine the feasibility of scaling up this initiative to more nearby apartment complexes and neighboring universities.

Due to unforeseen circumstances with the COVID-19 pandemic, the likelihood of students living on campus, the availability of volunteers, and the safety of our initiative during the pilot period may be affected. We will continue to monitor the circumstances and adjust the implementation of Hive for Humanity accordingly. If you have any questions regarding this initiative, please do not hesitate to reach out to our team. Our contact information can be found on the cover page of this proposal, and we would be happy to assist you.

Conclusion

Through a partnership between Habitat for Humanity and the Georgia Tech student body, real change is possible both in the realms of carbon reduction and resident involvement. Hive for Humanity also stresses the benefits of student engagement with an organization that is closely tied to equity for Atlanta residents. Participating in this recycling initiative will bridge the gap that can often form between Georgia Tech students and the surrounding community.

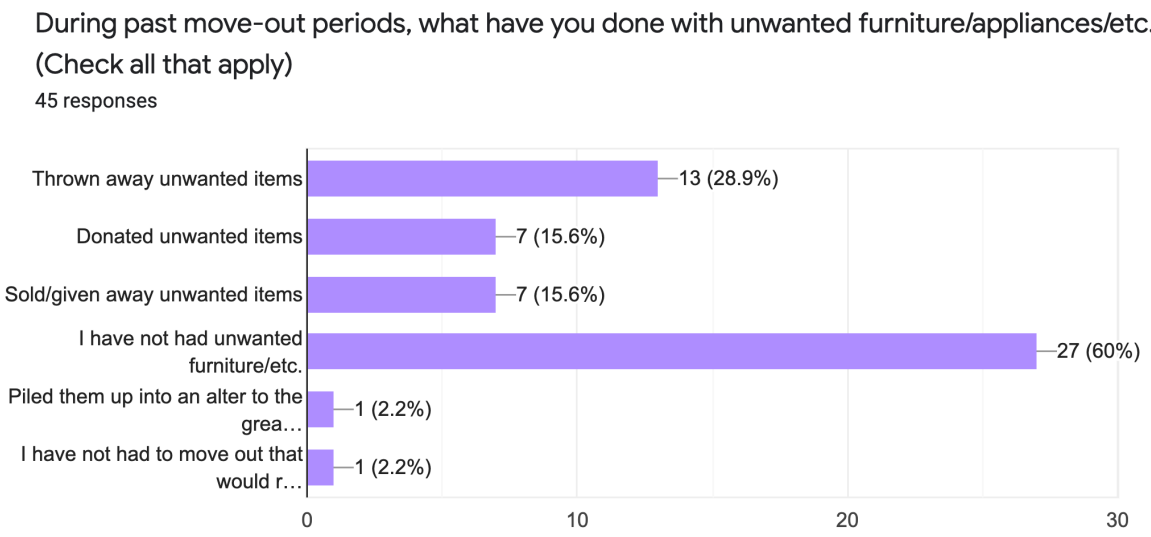
As stated in our proposal, our survey results and subsequent calculations estimate 122,800 pounds of CO2 to be mitigated through the efforts of Hive for Humanity following the 2021 academic year.

We look forward to further discussing the logistics of furniture drop-off and pick-up in the coming weeks. Given the generous contribution of Habitat for Humanity resources of labor and transit, our project will facilitate the collection and repurposing of furniture in the Atlanta area.

Possibilities do not stop with the Georgia Tech hive. Our goal is to simply scratch the surface with this initiative, eventually aiding in your efforts to continue promoting equity, decreasing carbon emissions, and boosting the sale and donation of used furniture.

Appendix

Figure 1: Furniture History*



***Latter two (2) responses read as follows:**

1) "Piled them up into an [altar] to the great god, lit the [altar] on fire, and dance around the altar with my cult"

2) "I have not had to move out that would require furniture [redistribution]."

Figure 2: Donation Interest

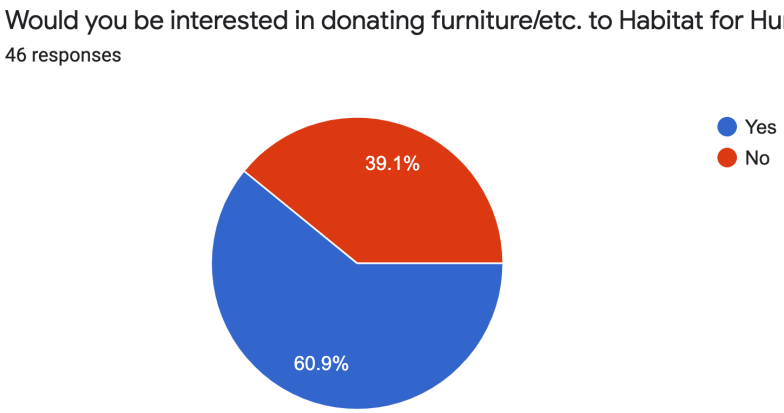
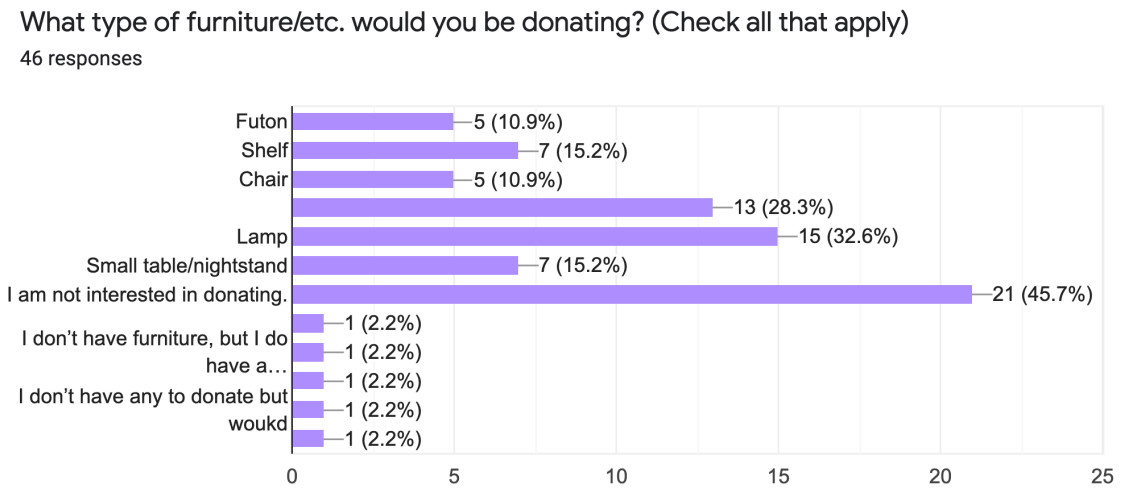


Figure 3: Potential Donation Item*



***Latter five (5) responses read as follows:**

1) "I have no furniture that I need to redistribute at this time."

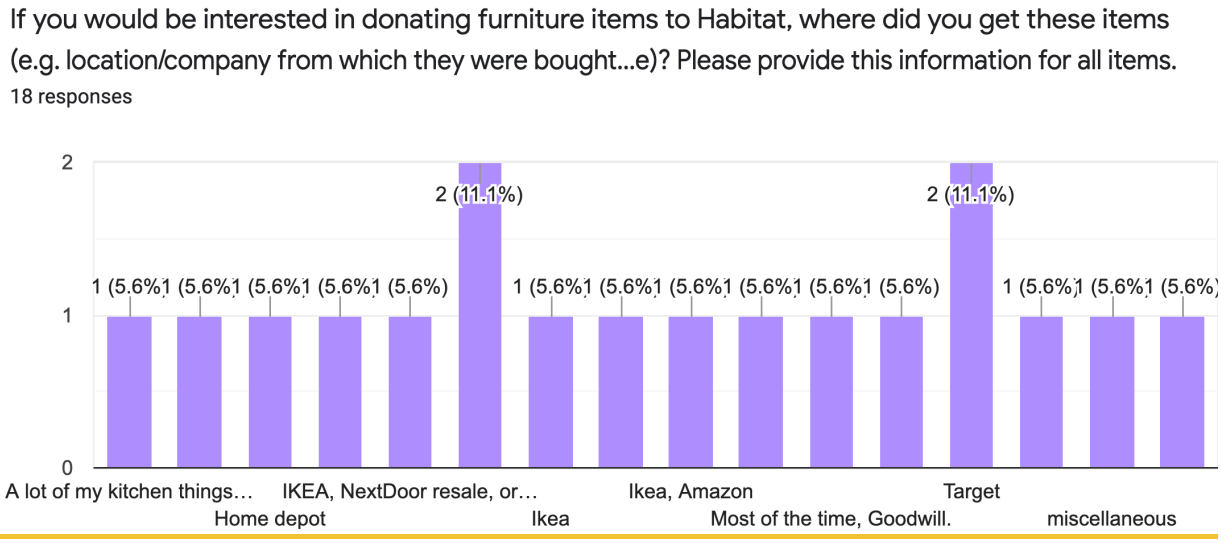
2) "I don't have furniture, but I do have a bunch of clothes."

3) "I don't have too much to donate, but I do have a variety of smaller things like clothes, office supplies, kitchen things (pots/pans/plates/cups) that I would hate to throw away."

4) "I don't have any to donate but [would]'

5) "Cooking supplies"

Figure 4: Location of Furniture Origin*



***Responses read as follows:**

1) "A lot of my kitchen things are from [T]arget and [I]kea."

2) "store"

3) "Home [D]epot"

4) "I don't have any furniture to donate because I burned all of it to the great god with my cult"

5) "IKEA, next door resale, or my home"

6) "Ikea"

7) "Ikea or [T]arget"

8) "Home Depot, Lowes any location"

9) "Ikea, Amazon"

10) "Walmart"

11) "Most of the time, Goodwill."

12) [*Question left blank*]

13) "Target"

14) "Lamp – [I]kea, small table – [I]kea"

15) "miscellaneous"

16) "N/A (home)"

Figure 5: Location for Pick-Up

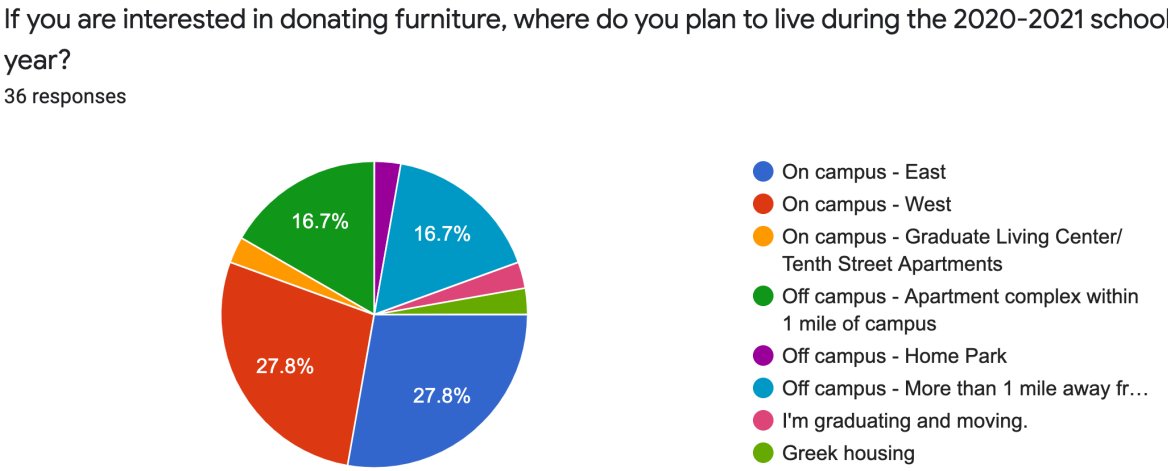


Figure 6: Potential Future Buyers

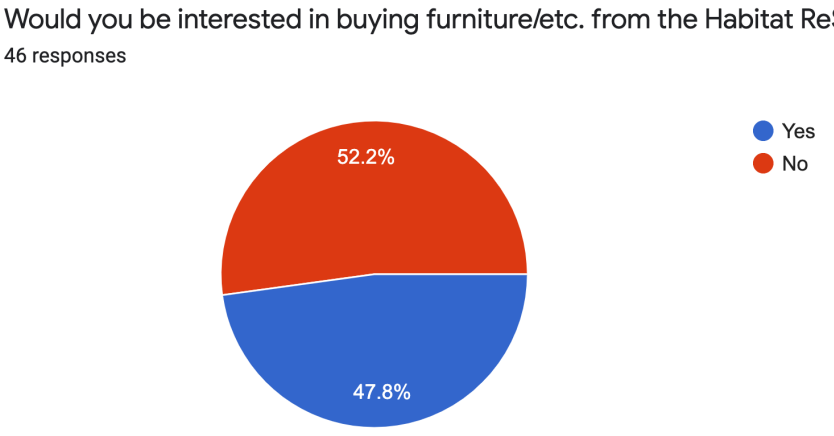


Figure 7: Campus Marketing Examples

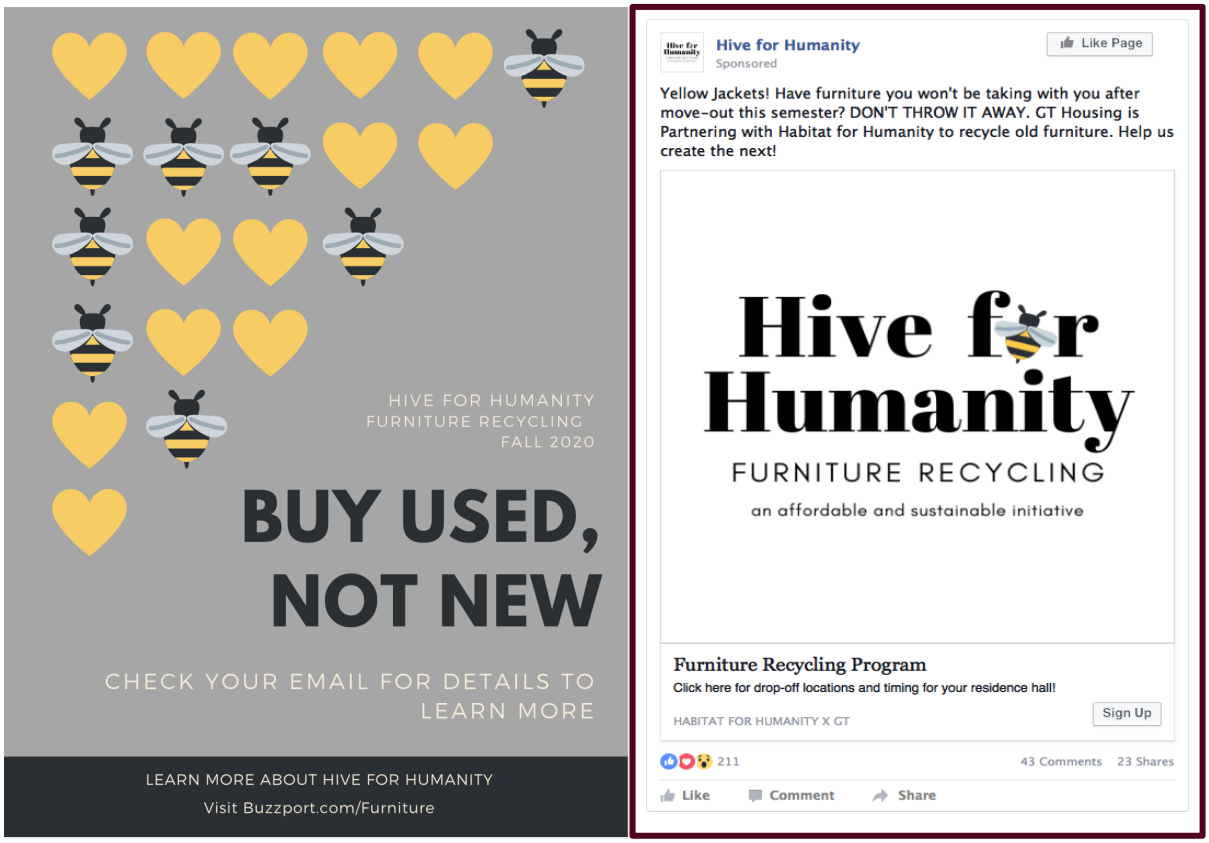


Table 1: Survey Results for Donations with Manufacturing Emission Estimates from Calculadora CO2

Furniture Item	Survey Count for Donation	Manufacturing Carbon Emissions (kgCO2e)
Futon	5	87.62
Shelves	7	18.14
Chair	5	24.70
Kitchen Appliances	13	3.54
Small Table	7	12.58
Total	**37**	**822.66**

Equation 1: Calculating Survey Emissions

$$5 * 87.62 + 7 * 18.14 + 5 * 24.7 + 13 * 3.54 + 7 * 12.58 = 822.66\ kgCO2e$$
$$\approx 1800\ lbs\ of\ CO2e$$

Equation 2: Calculating Estimate of Carbon Mitigation

$$GT\ Population\ Donation\ \%\ Estimate: 14\%$$

$$Total\ GT\ Housing\ Population: 8465$$

$$Researched\ Average\ of\ kgCO2e\ of\ furniture\ items: 47\ kgCO2e$$

If 14% of GT Housing students donate one item each…

$$14\% * 8465 = 1185.1\ items\ of\ furniture$$

$$\mathbf{1185.1 * 47\ kgCO2e \approx 55{,}700\ kgCO2e \approx 122{,}800\ lbs\ of\ CO2e}$$

Equation 3: Calculating Transportation Emissions from Luxembourg to Atlanta with Manufacturing

Half of respondents would be interested in buying from the ReStore. Applying this percentage to our calculation for CO2e associated with transportation, we can expect a minimum of 2,000 lbs of CO2e savings. As a result, we expect that we could reduce a total of at least 124,800 lbs of CO2e when considering the entire Georgia Tech Housing population, although much higher carbon savings are likely.

$$1.84\ tonnes\ of\ CO2e \approx 4{,}050\ lbs\ of\ CO2e$$

$$48.7\% * 4050\ lbs\ of\ CO2e \approx 2{,}000\ lbs\ of\ CO2e$$

$$Transportation\ e + Manufacturing\ e = 2{,}000\ lbs\ of\ CO2e + 122{,}800\ lbs\ of\ CO2e$$
$$= 124{,}800\ lbs\ of\ CO2e$$

References

Could the real enemy of climate change turn out to be furniture? (2019, September 9). Retrieved from https://www.energylivenews.com/2019/09/09/could-the-real-enemy-of-climate-change-turn-out-to-be-furniture/

Cummins, E. (2020, January 14). Fast Furniture Is an Environmental Fiasco. Retrieved from https://newrepublic.com/article/156208/fast-furniture-environmental-fiasco

Emissions Calculator. (n.d.). Retrieved from https://www.cargolux.com/Our-Expertise/e-services/Emissions-Calculator

Flight Carbon Footprint Calculator. (n.d.) Retrieved from https://calculator.carbonfootprint.com/calculator.aspx?lang=en-GB&tab=3

Hammond, G. P., & Norman, J. B. (2011, July 20). Decomposition analysis of energy-related carbon emissions from UK manufacturing. Retrieved from https://www.sciencedirect.com/science/article/abs/pii/S036054421100421X

McLean, R. (2017, June 2). How much CO2 does the average person create each year?. Retrieved from https://carbonpositivelife.com/much-co2-average-person-create-year/

WHY THE BUILDING SECTOR? (n.d.). Retrieved from https://architecture2030.org/buildings_problem_why/

Winter, J. (2004, March 15). Response bias in survey−based measures of household consumption. Retrieved from https://pdfs.semanticscholar.org/df24/64f2434e3c4bdcfb97fe8424d3ca3101a969.pdf