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Building A Comprehensive Tree Index

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Arbor Day Foundation Project

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Executive Summary

The Arbor Day Foundation's Tree City USA and the Tree Campus Higher Education programs create benefits for cities and colleges all over America by following the standards set forth in the application to the programs. The Arbor Day Foundation can use the insights received from this application to capitalize on this data and create value for the partner organizations.

Our recommendations to create value for the Arbor Day Foundation are:

- Create a uniform Arbor Day Foundation Tree Index to apply to college campuses in Tree Campus Higher Education
- Expand the use of the Arbor Day Foundation Tree Index to cities in the Tree City USA program to make a comprehensive sustainability score.

For Tree Campus Higher Education, we are recommending that Arbor Day hires a full-time database architect/consultant to create a database of application data, as well as a model for the standard Tree Index. The Tree Index will be based off of data collected from the Tree Campus applications, and will be used to create a ranking system of the different Universities, playing into the competitive spirits and rivalries surrounding college campuses. Our vision for the index is to create a platform where schools can publicly display their tree-friendly contributions to both their students but also members of the community. The goal is not only to draw awareness on social media and in school news releases, but to begin developing long-term mutually beneficial insights from the data the applications provide.

It is intuitive to apply this index to Arbor Day's Tree City USA after working with Tree Campus Higher Education. Being able to promote positive environmental impacts could potentially be very attractive to cities across the country. An Arbor Day stamp of approval, especially when coupled with partner programs that measure environmental impacts such as air and water quality would catch the attention of many eco-conscious cities. However, this recommendation is secondary due to limitations that would likely be present for certain cities, such as budget shortages.

Large milestones that must be accomplished include the hiring of a Database Administrator, a person who is skilled in research and analytics to devise the specifications of the index and what variables need to be measured. This could include expanding the Certification Survey to ask more questions about the quality and quantities of trees on campuses. After this milestone, roughly three months would be required to construct the official index, perform the initial analysis for each participating school as well as developing recognition materials for each participant.

There are two major milestones that must be accomplished in order to fulfill the Tree City USA requirement. First, Arbor Day must secure partnerships with relevant organizations that can measure things like air and water quality. We estimate that this will take at least six months to a year to accomplish, longer if the number of partner organizations increases. The second milestone is to have enough cities subscribe to this experimental partnership for it to be financially viable. Depending on the amount of early adopters, this step could also take anywhere between six months to a year at a minimum.

Supporting Analysis

Based on our research, we believe that there will be great demand for a qualified Arbor Day Foundation Tree Index ranking credential for campuses throughout the United States.

As campuses try to gain and increase their customer base (students), they have to make certain appeals to this specified demographic. As the modern college student population shifts from Millenial to Gen Z, we see an increased desire by students to keep their environment protected and healthy for future generations. Various magazine sources (see Exhibit 1) have run surveys on Gen Z compared to other generations based on their care and impact on their environment, ecosystem, and climate change. Although statistical numbers vary, all the surveys that we researched said Gen Z was more adamant in maintaining the upkeep of a healthy environment compared to other generations.

Our analysis concludes that *modern college students care about green ecosystems and supporting a healthy environment for future generations more than other generations*.

Colleges and universities care about their students, the revenue they provide, and the growth they provide for their campus. We believe that there will be increased competition between campuses to have the highest index rating they can to attract and appeal to current and incoming students. (see Exhibit 2) This Arbor Day Foundation Rating Index is the mediation between that demand we see in Gen Z students and the competition it provides for these campuses. The ending result leads to more efficient and effective tree ecosystems on campuses and an increase in brand recognition, revenue, and overall business function for Arbor Day Foundation.

The best way to gain ground and build a footprint for this ranking system is primarily through the universities themselves. It is a mutual relationship; the more the university promotes themselves via a tree ranking index, the more the tree index gains credibility and awareness itself. It may take some time to truly gain a credible index, but there is a great potential for growth within a variety of university systems.

Something that many campuses have put an increased focus into lately is the mental health of their students. According to Nance Roy, chief clinical officer of the Jed Foundation and professor at the Yale School of Medicine Department of Psychiatry, within the last year three out of five college students experienced overwhelming anxiety. Two out of five were too depressed to function. Students are always looking for new ways to cope with stress and anxiety and Tree Campus can help to alleviate many of these stressors for a low cost.

As for getting buy in from the universities in regard to mental health, a key decision maker, university executives have been increasingly concerned about mental health. More than 80 percent of top university executives say that mental health is more of a priority on campus than it was three years ago, according to a report in 2019 by the American Council on Education. As we know, the challenges of the pandemic are quite real for those struggling with mental health, so the focus on mental health should only have increased from the time of this article's publication.

While Arbor Day has great resources showing the benefits of trees, having an outside source's data in addition to yours can add validity to your value proposition by showing an industry consensus on the topic. The Arbor Day Foundation should utilize more of these studies to create

infographics for their campuswide marketing materials. Take for example the study done by the Barcelona Institute for Global Health, that found a protective association, in other words a correlation, between the amount and access to green space and anxiety and depression.

A recent study published in January of 2020 focused on the effects of nature and green spaces and how much time needed to be spent to have the positive benefits. "The 14 studies examined in this review revealed that as little as 10–20 min and up to 50 min of sitting or walking in a diverse array of natural settings has significant and positive impacts on key psychological and physiological markers" (Meredith). While it seems to be a general consensus that being outside and active improves mental health, quoting the dozens of studies worldwide creates more credibility needed to get campuses to truly buy in.

While the three ideas above all provide excellent insights about the current state of mental health and green solutions, when tied together they provide a clear value proposition for Tree Campus Higher Education. Universities will be provided with a concrete number to track their progress, given additional handouts/information to share with students, as well as helping out their students stress and mental health. There is a problem with mental health that is clearly getting worse over time, the university executives understand this problem is increasing and are willing to take steps to fix it, and Arbor day can provide an index to measure their progress. As we have acknowledged, Universities have finite resources and this is a relatively inexpensive solution in addition to all they are currently doing.

None of this means anything if the Arbor Day Foundation tree index ranking credential has no credibility. This will be heavily dependent upon an increase in public awareness and branding that we hope to see as time progresses.

In addition to applying the Arbor Day Foundation Tree Index ranking credential to college campuses, it would also be applicable to cities in Tree City USA in a program called Sustainable Cities. It involved applying this rating to cities/communities across the country and also the addition of other nonprofit organizations and their own index system to create a certification.

This can be compared to the LEED certification implemented by the U.S. Green Building Council that has high popularity in the corporate world today. Starting in 1998, LEED Building Certification has grown to over 79,000 projects in 162 countries. They have had multiple versions of LEED, currently on version three. They have four different levels of certification and applying something similar to this would allow a wide variety of cities to be able to participate depending on their level of environmental impact. Although to see the contrast in the two, the LEED certification focuses on buildings and their sustainability, and the Sustainable Cities certification would be implemented in cities.

When looking for nonprofit organizations for this certification, it was important to find partners that had similar goals and passion as Arbor Day Farms. The first possible partner found was the Water Quality Association. They have a membership system that allows companies to join and benefits include education, events, news, and a network of industry leaders. The WQA has a professional certification system that could also apply to cities and would be a great organization to add to the certification program.

Another nonprofit that is passionate about their work and would partner great with Arbor Day Farms and the Water Quality Association is the American Lung Association. The ALA is very passionate when it comes to the quality of the air and they have an annual State of the Air report that they publish. As they are already doing the analysis of air quality in cities this would be an easy addition to create a three sided certification system with trees, water, and air.

A trifecta of trees, water, and air would create a certification that would provide value to any city in the USA. The process of applying this Tree Index to campuses first and branching out to cities is due to the flexibility that a college has to designate funds to plant and maintain trees. In places where there is less flexibility to increase spending on sustainability measures, we could see more frustration and less adoption of the ranking system. Sustainable Cities might suffer from this issue.

Synopsis of Results And Recommendations

We will use the Arbor Day Tree Index Report as a way to measure and rank campuses based upon the quality of their urban forestry and sustainability standards. This index will be used for recognition of sustainability practices for each campus based on the information that the Arbor Day Foundation collects from their Tree Campus USA application.

Calculation

Our basic idea behind the calculation of the index is relatively simple. We want to encourage the nurturing of current tree systems, encourage growth and planting of new trees, and discourage any unnecessary removal of trees. We are in no means professional data analysts, so our formulation is simply speculation for this report. We wish for our index to factor variables such as Tree Spending per Student, Net Growth in Trees, and the Planted/Removed Ratio as a beginning point for the calculation. The formulas to calculate these variables is listed in the appendix as Exhibit 1. These metrics show dedication to a goal of sustainability on a year to year basis, which would be perfect for our annual Index.

We also want to recognize campuses who achieve their individual goals, but accounting for this aspect in the index would be quite difficult. For example, how do we measure progress on the goals, especially if they are not as measurable as planting a certain number of trees? Since this is nearly impossible to benchmark, we would exclude this from our index calculation. Instead, an additional section that recognizes outstanding work should be included in the release, showcasing the best activities and conservation efforts around the Tree Campus USA program. This could include significant improvement in a specific metric, a number of successful community events, or the achievement of a multi-year school-specific goal.

Channels

We want to present these index numbers for the universities and colleges to utilize in their marketing materials to boost awareness and engagement to the Tree Campus USA program. The annual Index report will be released on the Arbor Day website to garner website traffic from university groups and the public. Here, we can serve banner ads and additional marketing messages to gather revenue from these visitors. This opportunity has the potential to drive

revenue to the Foundation and build brand awareness for the Tree Campus program with the right messaging in place.

Timing of the Release

Our initial idea for the timing of the release of the Annual Index numbers is in late summer or early fall, around August or September. This timetable allows for the hiring and training of the full-time data analyst, as well as the development of the Index Model. Releasing at this time will also create buzz around campuses as they are returning to fall classes. Campuses would be in-session and ready to break-down their score and create goals to achieve a higher score on the index. We could see an increase in Arbor-related activities in the fall in addition to the regular activities around Arbor Day.

The fall release may run into some issues, however. Finalized school budgets must be completed before the late summer, so the release might not affect immediate change at the universities. A spring release might work better to garnish immediate and measurable results at the campuses.

Secondary Recommendation

Our secondary recommendation is to take this concept of an index for Tree Campus and apply it to the Tree City USA program. This would provide cities with a certification by Arbor Day based on planting and maintaining trees. Cities and towns can compete with one another as they work to build a more sustainable municipality. Ideally, this would not be the only index focused on sustainability standards. Partnering with other organizations who perform air and water quality standards could see the creation of a Sustainability Index.

There are obvious challenges that this secondary recommendation presents. First, the partnerships with the organizations mentioned above are not certain to happen. These relationships also take a significant amount of time to foster, which is a cost that should be considered. Another limitation that exists is with the cities themselves. As was mentioned earlier, budget shortages could prevent certain cities from competing with other cities, and this may pose an objection. For example, Omaha has significantly more resources dedicated to their community trees than Nemaha, Nebraska. Grouping comparable cities in a report would help to better identify competitive cities.

This secondary recommendation would require the work of at least one employee to reach out to potential partners as well as communicate with potential city subscribers. This would likely not require full-time work. Rather, this could be an ideal job for a full-time employee that may have some extra time on their hands. This would require investment in this particular employee to ensure they have the resources they need to accomplish the goal. Time is another important investment that should be considered. We estimate that the time it would take to secure the partnerships will take at least six months to a year to accomplish, longer if the number of partner organizations increases. In terms of having enough cities subscribe for the product to be financially viable, depending on the amount of early adopters, this step could also take anywhere between six months to a year at a minimum.

Financial Implications

We were told that the financial goal of Arbor Day was to hire another team member. We believe this recommendation would require this and would be able to sustain it in the long term. To start off we should address the necessity of hiring a new associate full-time. The new full-time associate would need to perfect our formula above for how to calculate each campus's tree index. They should be familiar with statistics and data analytics. This person must also be able to relay their ideas and rationale to members who may not be as familiar with their statistical methods. The skillsets of an actuarial consultant come to mind when thinking of what this person's resume should look like. This expertise will help make the tree index as accurate as possible so that it can hold true weight to Tree Campus' subscribers. We need to be sure that we are fairly ranking our members to make them all truly want to improve.

We believe hiring a full-time associate is the best option to achieve this outcome for a few reasons. A full-time associate would be able to better align themselves with Arbor Day's vision. As a nonprofit, it is very important that associates understand and agree with Arbor Days' mission because that is their purpose as an organization. Having an employee who cares will not only help further Arbor Day's vision, but it will also improve their individual work. Employees who enjoy the work they do are much more likely to work harder and put more effort into their work. The new full-time associate will familiarize themselves with Tree Campus's business. This holistic deep understanding will allow them to best tune the model to accurately rate the different colleges. The index cannot be purely numbers based because trees are not purely numbers based. Trees need a better understanding and for that, we believe a full-time dedicated associate is the best solution.

This associate will not have their work stop after simply building the index. The associate's secondary role will be to work as a liaison between Arbor Day and the members of the Tree Index. Therefore, the new team member will need to be selectively hired to fill this role as well. As the person who built the Tree Index and the database associated with it, the new associate will understand every number that goes into the calculations. This will be very important for schools that want to dig deep into their score and find ways to improve. The new architect will be able to chat with these schools about where their score can be improved as well as the best ways to go about that. This adds a lot of benefit to our subscribers because they not only get a rating for their status, they also now have a contact for how to improve in the future.

The financial benefits to this solution come from our $100/year subscription model for these member schools. This cost was vetted with the College of Business Student Advisory Board to see if it was reasonable to expect schools to be willing to pay. While overseeing a budget allocated for around 5000 students, the College of Business SAB saw no issues with implementing this. To put this cost into perspective, the current average size of enrollment for member schools of Tree Campus is 11,000. This makes the average cost per student less than a penny. For all the benefits mentioned earlier, this is great value and more than affordable for these schools to participate.

To see success for this project, we expect membership to grow among already associated conferences. NCAA conferences are always interacting outside of just the sports they compete in. As of right now, only 29 power five schools are included in Tree Campus, but we believe that

as rapport amongst their conference peers grows this can be a great opportunity for growth of the Tree Index. Getting the additional 37 power five schools involved will not be difficult when they want to compete for the highest score in their conference. This can easily be expanded to other division one conferences as well as lower divisions. Currently, many students are unaware of their school's association with Tree Campus. However, once they are able to compare to other schools in their conference or around the country, this awareness will drastically increase.

Arbor Day can also seek out partnerships to gain additional revenue from this recommendation. There are hundreds of 'Best College' lists out there. Many of these lists use a wide range of metrics to rank these schools, often ones the schools like to use themselves. With the conference traction of the Tree Index, these sites would be happy to add the Tree Index as a new metric for which to rank schools. Some websites such as 'niche.com' would greatly benefit from this kind of ranking as it is something they are lacking sustainability metrics in their expansive list. Some of these partnerships could result in some additional income for Arbor Day and this recommendation.

The financial costs of this project come down to the cost of the new associate. Arbor Day would require a database architect to construct a database and compile data from Tree Campus applications. This database architect will require salary, benefits, and a permanent workplace. Altogether, this will cost Arbor Day between $66k and $70k per year. Being built from the ground up, this cost can also be seen as an investment in the intellectual property of this new architect because whatever they create can stay with Arbor Day for a long time to come.

Overall, Arbor Day should see an increase in revenue and growth in exposure because of our recommendation. Colleges will want to use our Tree Index to compete against one another. This will result in an increase in subscriber growth as well as an increase in retention of Arbor Day's current subscribers. The additional revenue from the subscription model will cover the cost of the new associate with some additional revenue on top once the user base expands.8

Appendix

Exhibit 1: Formulation of Variables

$$Net\ Growth\ in\ Trees\ (\%) = \frac{Amt\ of\ Trees\ Planted - Amt\ of\ Trees\ Removed}{Amt\ of\ Trees\ Planted}$$

$$Money\ Costs\ Per\ Student = \frac{Total\ Tree\ Spending}{Student\ Population}$$

$$Plant\ to\ Removed\ Ratio = \frac{Amt\ of\ Trees\ Planted}{Amt\ of\ Trees\ Removed}$$

Exhibit 2: Analysis of Big Ten Universities

University Name	Money Cost Per Student	Plant to Remove Ratio	Net Growth %
Indiana University Bloomington	$ 14.74	2.30	0.57
Michigan State University	$ 13.71	0.84	-0.19
Northwestern University	$ 6.11	2.22	0.55
Purdue University	$ 3.94	1.07	0.06
The Ohio State University	$ 4.03	5.68	0.82
The Pennsylvania State University	$ 10.00	1.50	0.33
University of Illinois at Urbana-Champaign	$ 6.84	0.33	-1.99
University of Iowa	$ 15.74	0.97	-0.03
University of Maryland	$ 8.78	2.32	0.57
University of Michigan	$ 12.53	0.35	-1.85
University of Nebraska--Lincoln	$ 30.09	2.20	0.55

Exhibit 3: Rankings of Big Ten Universities based on Exhibit 2

University Name	Rank
Indiana University Bloomington	1
University of Maryland	2
University of Nebraska--Lincoln	2
The Ohio State University	4
Northwestern University	5
The Pennsylvania State University	6
University of Iowa	6
Michigan State University	8
Purdue University	9
University of Michigan	9
University of Illinois at Urbana-Champaign	11

Exhibit 4: References of Gen Z environmental demand

"93 percent [of Gen Zs] say if a company makes a commitment, it should have the appropriate programs and policies in place to back up that commitment."

"While Generation Z feels unprecedented urgency around many pressing issues, the environment (26 percent) is the top priority that they want companies to address."

Noorulabdeen Ahmad/Unsplash. (2019, October 23). Gen z believes in its own power to make change, but that companies must lead the way. Retrieved March 22, 2021, from https://sustainablebrands.com/read/marketing-and-comms/gen-z-believes-in-its-own-power-to-make-change-but-that-companies-must-lead-the-way

"Despite all their time online, Gen Z cares more about the environment than previous generations. A 2019 Amnesty International survey of more than 10,000 Gen Zers from across the world found that climate change is their number one issue."

White, H. (2020, February 09). Why gen z cares the most about nature. Retrieved March 22, 2021, from https://thriveglobal.com/stories/why-gen-z-cares-the-most-about-nature/#:~:text=Despite%20all%20their%20time%20online,stark%20difference%20from%20other%20generations.

Exhibit 5: References of college campuses demand for green ecosystems and LEED certification

"Higher-education institutions boast 3,850 LEED (Leadership in Energy and Environmental Design) certified buildings, more than any other industry."

"[The Princeton Review] found that 63% of the 10,300 high school-age college applicants and parents surveyed said they would find information about a college's dedication to the environment useful in their college selection process. In 2009, it was 66%."

Green universities attract students. (n.d.). Retrieved March 22, 2021, from https://www.cleanlink.com/news/article/Green-Universities-Attract-Students--11989

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Jackie The mental health of our youth is such an important topic especially identifying the struggling and vulnerable. I wonder about any resources going towards protecti, et al. "The Rise of Mental Health on College Campuses: Protecting the Emotional Health of Our Nation's College Students." *Higher Education Today*, 20 Sept. 2019, www.higheredtoday.org/2018/12/17/rise-mental-health-college-campuses-protecting-emotional-health-nations-college-students/.

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