

The Carbon Reduction Transportation Initiative at Northern Arizona University

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Executive Summary

As a well-known destination point, Flagstaff has attracted environmentally minded students, professional athletes, and tourists due to its high elevation, pine forests and easy access to outdoor recreation. Despite this beautiful town's eco-tourism based market, Flagstaff still struggled to manage its traffic congestion while its public transportation system failed to capture sustained interest or ridership.

To say that NAU had a significant impact on the environmental and economic health of the Flagstaff community was an understatement. As the largest employer in Flagstaff, NAU was found to employ nearly 1 out of every 3 people within the Flagstaff city limits. During the school year, roughly 17,000 full time students occupy housing both on and off campus. Research has shown that college students are one of the most likely demographics to fully embrace public transportation.

The Carbon Reduction Transportation Initiative (CRTI) at Northern Arizona University (NAU) was created to improve both recruitment and retention efforts while significantly lowering NAU's carbon footprint. Through a collective subsidization between NAU, and the City of Flagstaff, the CRTI would be able to provide all NAU students and staff free access to public transportation. This initiative would also help to reduce the amount of traffic congestion in Flagstaff's downtown business district and free up valuable parking spaces both on and off campus. In addition, Flagstaff's public bus system, the Northern Arizona Intergovernmental Public Transportation Authority (NAIPTA) would become eligible to apply for larger grants with the anticipated increase in ridership. This would then allow NAIPTA to increase both the number and the frequency of bus stops which would benefit the entire Flagstaff community.

The Carbon Reduction Transportation Initiative at Northern Arizona University

The following report will examine the Northern Arizona University (NAU) Carbon Reduction Transportation Initiative (CRTI) and its developmental process. Using this report, readers should be able to discover pathways to sustainable improvement within their own organization and implement similar programs. For the purposes of this paper, sustainability will refer to the environmental, social, and financial well-being of an organization, and its ability to maintain the same level of performance over time. Keep in mind that it is important to keep a broad definition when considering one's own enterprise. Often opportunities to implement sustainable practices in your own organization are not found in the most obvious places. While targeting easy to implement goals such as switching to LED lightbulbs can save money and energy, these short-term gains often lead to more creative ideas to promote internal sustainability and efficiency.

Sustainability in Higher Education

In 2004 the United Nations Decade of Education for Sustainable Development sought to 'mobilize the educational resources of the world to help create a more sustainable world' (UNESCO, 2019). Higher educational institutions such as NAU have been slower than anticipated to adopt this mandate. As have many organizations, NAU grew organically over the course of several decades, and policies came into existence to suit the immediate needs of the university rather than long-term objectives. As a result, inefficient procedures became deeply embedded and seen as difficult, if not impossible, to change.

In order to reduce NAU's overall carbon footprint, the CRTI focused on refining the University's existing operational transportation systems and benefits to reduce the number of

staff and students who drove single occupancy vehicles (SOV) to campus. With little money to support sustainability goals, this project became focused on improving an existing financial commitment's efficiency rather than seeking additional funding from the university.

Project Vision and Desired Outcomes

In 2010, NAU set out a goal to reach carbon neutrality by 2020. Unfortunately, the University was unable to reach its initial goal and acknowledged the setback during the Climate Action Forum that took place in October 2019. While this gathering brought to light many opinions and proposed solutions, the solution outlined here was centered on the University's need to sustain itself both environmentally and financially.

Initial conversations with campus sustainability advocates revealed that high carbon consumption on the NAU campus was found to be reinforced by existing course scheduling procedures. Approximately 68% of the classes that NAU offered took place on Tuesday and Thursday between 10:00 A.M. and 2:00 P.M., which created an artificial gridlock on nearby streets and campus parking lots. Expensive to purchase and difficult to find, parking on the campus was limited. Despite the \$465 price tag for an annual parking pass, NAU students and staff continued to bring their single occupancy vehicles to campus for the purpose of convenience and lack of affordable alternatives.

Bond and Steiner defined a Transportation Demand Management (TDM) system as a package term for a variety of strategies that promote a more efficient use of transportation resources (2006). According to Shannon et al., the large number of trips generated by universities will, if not addressed, continue to produce significant health and environmental impacts (2006). Further inquiry revealed that each year, as part of its TDM strategy, NAU's Parking Services contributed ~65K to make an unlimited bus pass available to all full time NAU employees. Although the passes were an extremely valuable benefit, analysis showed that of the total number of passes purchased, roughly 20% of the passes accounted for the majority of the annual usage each year since 2015. Many employees cited meetings and busy family schedules as preventing them from consistently utilizing the option.

Although employees were not able to fully embrace Flagstaff's public transportation, research showed that NAU students were more than willing to ride the bus. According to NAIPTA, the Mountain Line Route 10 was their most heavily traveled bus route due to a 2012

Service Agreement between NAU, NAIPTA and the City of Flagstaff. This agreement allowed NAU students to ride to and from campus fare-free. Not surprisingly ridership shot up dramatically that year and the subsequent 8 years.

Implementing an all access subsidized bus pass on other university campuses has also been found to be extremely popular with students, which is further illustrated in the following (see Figure 1).

Figure 1

-Bruin GO is one of the smartest things UCLA has done in years. With this program, I feel UCLA is finally showing it cares for students.

-I am a first-year graduate student and I do not have the words to adequately describe how wonderful it is to have

Student comments concerning UCLA's implementation of an All Access Pass for students and staff.

Research, project feasibility & scope.

The goal of the CRTI was to improve lives of students, staff and community while providing balance to the whole University: 'We strive to create a clean and sustainable campus that champions a healthy work life balance for both students and staff in order to drive student success and academic excellence both at NAU and beyond'. Although the task of carbon neutrality appeared insurmountable at first glance, a global viewpoint showed that a few systemic changes could alleviate many of the issues.

When reviewing scholarly articles related to this project, reference pages proved to be an invaluable resource as they often led to more relevant and useful sources of information.

Although many articles contained information related to the subject of subsidized public transport, the abstracts were reviewed and measured against the purpose of the project, and the similarities of the organization. If the article supported findings but brought no new information to the table, it was not included.

Although it was ultimately decided that this project would focus on the reduction of carbon emissions through the promotion of an all access public transportation pass the Initiative went through several iterations. Early on, a Park and Ride model was investigated, but found to have too high of a startup cost to be of interest to the University. Additionally it was thought to incorporate the class schedule changes into the first phase of this project, but after serious consideration it was decided that this would need to be a separate project due to the complexity of the schedules and the time that it would take to implement correctly.

It became necessary to take a step back each month and evaluate if the project was fully feasible in light of new information and recommendations. In this project, it made more sense to break it up into more manageable pieces. If implemented poorly, the change to the class scheduling system could have created backlash against the whole project. Ultimately it was decided to recommend the creation of a Carbon Coalition at a later date to further analyze NAU's course schedule and recommend adjustments in order to further improve space utilization, control traffic surges, and maximize student performance on the NAU campus in the future.

Miller found that unlimited access programs increased ridership in the first year almost 50% at the University of Florida and 200% at the University of Colorado at Boulder (2001). According to Brown et al. when UCLA implemented its all access pass program, SOV driving fell by 20%. (Brown, Hess, & Shoup, 2003).

Further research suggested that subsidized bus programs freed up valuable space to support research and education rather than parking lots and garages. For example, at the University of California Los Angeles (UCLA), it was found that to build a single parking space in a garage cost them approximately \$31,500.00. That number then became their baseline of what the university would consider spending in support of shifting staff and students to public transportation. (Brown, Hess, & Shoup, 2003).

At that point it was decided that the best course of action would be to pursue the adoption of a University wide all access pay-per-ride pass by utilizing the 65K investment from Parking Services and seeking additional support from the City of Flagstaff. It was believed that this solution would provide the best benefit for both the University and the greater Flagstaff community. The first step in this solution was to gain the support of Parking Services to explore different pass pricing options and consider incorporating students into the pass benefit program.

Audience and stakeholders.

After the overall vision and scope of the project was decided on, and the feasibility of the project was verified, the next step was to learn more about the project stakeholders. These were the people who would be able to authorize the project, support the project, or would otherwise be affected by the project in some significant way. Once identified, their individual motivations and concerns were analyzed to help anticipate concerns that could have potentially derailed the project.

In 2006, a study done at the University of Western Australia in Perth showed similar demographics to NAU. Close to the central business district and located in a low-density city that was largely car dependent, Perth also relied on bus service as its primary mode of public transportation. It was found that their students were more likely to utilize public transportation

with an all access pass because of the cost savings. Staff and Faculty indicated that they would be motivated to use public transportation for health benefits. (Shannon et al. 2006). This study proved useful when considering ways to encourage and motivate the implementation of a similar program at NAU.

The CRTI was found to rely on three key internal stakeholders: NAU Administration, NAU students, and NAU staff/ faculty. Each group encompassed a different set of motivating factors and each group required a different set of fulfilled expectations. The project had one additional external stakeholder, which was the City of Flagstaff. This report will not cover this stakeholder in depth as plans to approach the city would not be made until after buy-in was gained from internal stakeholders.

NAU's Upper Administration was identified as the primary set of stakeholders that would ultimately decide to give this project a green light. This set of stakeholders included the University President, the Vice President of Operations and the Director of Parking Services. Motivated by cost savings & efficiency as well as student retention and recruitment, it was important to bring financial savings and/or enrollment growth and retention to the table. In most organizations, upper level management has certain guiding metrics set out by their board in the form of a Vision Statement, a Mission Statement and several strategies to support both. The intended purpose of these tools was to drive the organization in an agreed upon direction. Historically bonuses have been tied to these metrics, and therefore it was necessary to become familiar with NAU's guiding principles.

For the purpose of this project, University goal number 5, Objective 2 (Promoting Stewardship to Reduce the Impact of the University through environmentally sustainable practices) and Goal number 5 Objective 1 (Increase the financial stability and strength of the

University) clearly aligned with the implementation of an all access pass program (NAU 2019). These goals, as approved by the Arizona State Board of Regents were tied directly to the university president's annual bonus and thus the CRTI program could help her meet these strategies.

The second set of stakeholders that were analyzed for this project were NAU students. This group represented the stakeholder majority in this project. Although they had little power to authorize the project, they offered valuable opinions that helped to influence upper administration's decision. Cost was a major selling point for students when it came time to consider their endorsement. In the UWA study, researchers found that students were most likely to use public transport if subsidized by the University. (Shannon et al, 2006). These influencers would be able to put weight behind the CRTI by lending it popularity. It was important to communicate with this group often when gathering support and building excitement around the project.

NAU Staff and Faculty made up the final stakeholder segment. Work done by Shannon et al. revealed that this group of stakeholders were more concerned about the location and frequency of stops when considering the use of University subsidized public transportation. They were also more likely than students to be motivated by the health benefits from walking to and from stops (2006). Knowing this, the university would have to consider some long-term service upgrade costs if they wanted to encourage this last group to take better advantage of the all access pass. The scope of this project was unable to guarantee the required upgrades, so communication was limited to the benefit that this program would provide to their students, and the peripheral health benefits that came from utilizing public transportation.

SWOT analysis.

To fully prepare for the CRTI project implementation, an analysis of the Strengths, Weaknesses, Opportunities and Threats (SWOT) was done to identify any hurdles or launch pads to success. In this analysis, Strengths and Weaknesses were considered to be internal to the project idea or organization. Opportunities and Threats were considered to be external.

Strengths (Characteristics that gave this project an advantage over SOV usage):

- The implementation of a sustainable TDM System reinforced the concept of a living laboratory, allowing students to learn from both theory and practice (see Figure 2).

Figure 2

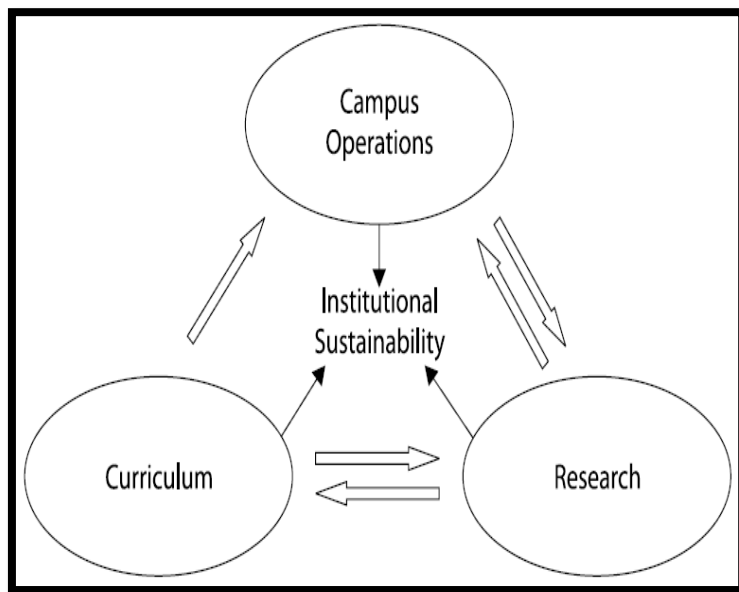


Illustration showing the way sustainability can create an interconnected relationship between students, operations and research on a college campus.

- Reduction of capital expenditure on transportation infrastructure (Bond & Steiner, 2006).

- In 2001, passengers occupied only 27% of available seats on busses nationwide (Bond & Steiner, 2006). To increase ridership, NAIPTA supported a reduced cost all access pass for each student and employee at the University. The CRTI increased NAIPTA ridership numbers and reduced congestion and parking issues on and near the NAU campus.
- Public transportation was able to be used for in town field trips and cultural events instead of using course fees to pay for fleet rental vehicles.
- The university was interested in maximizing their existing 65K investment and supported this initiative as it requires no initial additional funding support.

Weaknesses (Project characteristics that put the project at a disadvantage):

- Perceived time and distance still made some students and staff prefer to drive their personal vehicles instead of using the all access pass program (Shannon et al. 2006). This concern was best mitigated by communicating realistic travel time estimates between major destinations prior to and during the initial roll out of the All Access Pass program. Targeted emails allowed project managers to communicate the true time investment to encourage participation.
- Although the university organizational structure in general allows more people to have input, this can make consensus among stakeholders difficult to obtain (Velasquez et al. 2005). This weakness required frequent presentations to key stakeholder groups such as the Service Professionals Advisory Council, the Classified Staff Advising Council, the Faculty Senate and the Student Body Government to address concerns and communicate the advantages of the CRTI.

Opportunities (Elements or circumstances in the environment that this project used to its advantage):

- University employees are prone to health risks affiliated with sedentary behavior such as high blood pressure and high body mass index (Alkhatib, 2014). The Perth study showed the importance of health as a popular staff/ faculty consideration when adopting public transportation. This project used this knowledge as a lever when communicating with this set of stakeholders.
- NAU, like most universities was very concerned with the physical and mental wellbeing of its students. Adolescent depression, suicide and lower GPA's was shown to be reduced

with moderate to high levels of exercise such as walking or running (Field et al, 2001). Utilizing the all access pass encouraged NAU students to walk more and drive less. This created a win-win situation for NAU. In short, public transportation encouraged more active movement than driving a SOV.

Threats (Elements or circumstances that could cause trouble for the project):

- According to Velazquez, sustainability professionals cited lack of awareness, interest and involvement most frequently as a barrier to progress in higher educational institutions (2005). This threat was turned into an advantage by thoughtfully communicating with stakeholders about relevant concerns and motivations. For other leading barriers to sustainable process and procedure implementation, please refer to Figure 3 below.
- A slowing economy and less state funding sparked talk to remove support for the existing employee bus pass program and use that money for other projects. This remained an active concern for the lifespan of the project. Ultimately the deciding factor was that the CRTI was a well-informed plan that benefited the entire organization. The following Figure lists the top factors that can negatively influence sustainability projects at Higher Education Institutions (see Figure 3).

Figure 3

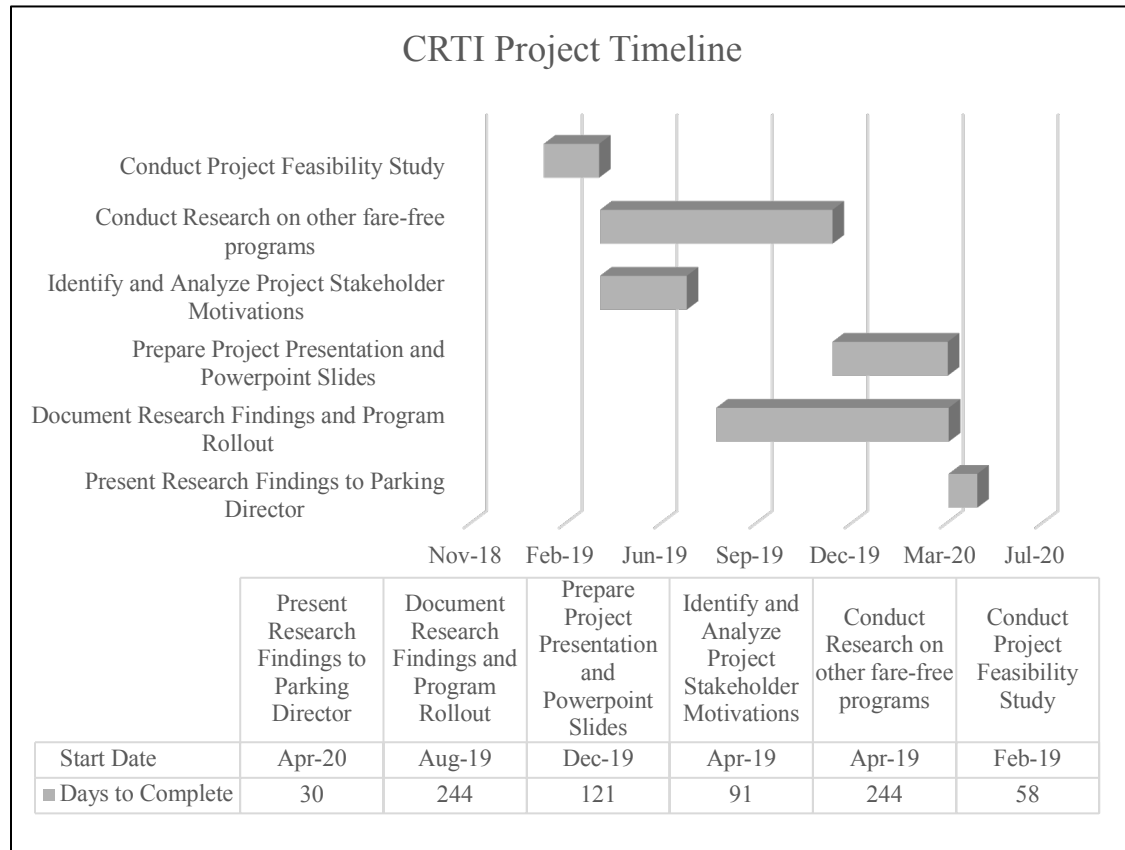


Various factors that impact effectiveness of college campus sustainability projects.

Project planning, implementation and maintenance.

After the SWOT analysis was completed, it was time to move forward to the Planning and Measurement phase. This step allowed the CRTI team to measure impact and provide a timeline for reporting and execution. By providing timely and accurate feedback and project progression the team was able to build confidence and credibility with upper administration. The table below is used to illustrate the total project timeline and major steps taken (see Table 1).

Table 1



According to an analysis in 2012 done by Yamine and Tanaka, there are 5 categories typically covered in HEI Assessment tools: Governance, Operation, Education, Research and Outreach. CRTI used these categories to flesh out the areas for reporting and measuring.

Governance for the CRTI was designed with the entire organization in mind. The Vision for the project was used to guide project decisions along the way to ensure that the project remained on a sustainable pathway. To ensure that the project stayed true to its intended purpose, monthly progress analysis were conducted to verify project relevance.

Operations were a critical part of this project’s success. NAU’s organizational structure placed TDM under this department’s purview. Research findings surrounding the employee bus pass program were analyzed and compiled to be shared with the Director of Parking Services to help strengthen the argument that students should be incorporated into the program. Education was a planned component of the project.

Town and Gown tensions over parking and traffic concerns have been anticipated with the creation of the CRTI Outreach plan. Presentations for city council and the Downtown Business Alliance have been created to both engage and garner support. Quarterly updates are planned to be provided to both City and DBA representatives in order to promote accountability and trust.

Lastly, plans to create the Carbon Coalition have been made in order to best decide the future funding of the all access pass and other HEI behaviors such as class scheduling, walking and bike path improvements, and an increase in parking passes to reduce SOV usage that can reduce the NAU's carbon footprint. This coalition will be created in order to represent all stakeholders fairly.

Conclusion.

By extending the bus pass program to students in addition to staff and faculty, NAU would be able to significantly reduce the number of personal vehicles being driven to campus every day. While the project has not yet been fully implemented, the Director of Parking Services has agreed to explore pay per ride pricing with Flagstaff's public bus provider NAIPTA.

When the CRTI was formed, the vision to improve lives of staff and students was kept at the forefront of all decision making. By conducting feasibility assessments and defining the scope of the project, the Initiative was able to compartmentalize progress and monitor effectiveness. Serious consideration was given to the project stakeholders to determine their primary motivations. This allowed the project representatives the necessary credibility and flexibility when seeking buy-in from various organizations and committees. Likewise, a SWOT analysis was conducted to identify the areas of the project that would need more attention than others, and helped avoid costly miss-steps.

This program was designed to be mutually beneficial to students and staff, the university, and NAIPTA, thereby making it sustainable for the future. In addressing the issue of Carbon Neutrality, NAU will enjoy improved relations with the community, and increased accountability in the eyes of its students and staff.

Winston Churchill once wrote that 'Success is not final, Failure is not fatal: It is the courage to continue that counts. If nothing else, sustainability advocates must reflect the resiliency they seek to bring to their own organization. At the time of this final report, the project had stalled out due to the social distancing restrictions put into place in order to slow the

progression of the COVID-19 virus. Although this has set the project completion timeline back for an unknown period of time, it was decided to continue on with the project once the restrictions are lifted.

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Figure 1. Student comments concerning UCLA's implementation of an All Access Pass for students and staff. Adapted from 'Fare-free public transit at universities: An evaluation' by J. Brown, D. Hess, and D. Shoup, 2003, Retrieved from <https://escholarship.org/uc/item/3rt6d1hz>.

Figure 2. Illustration showing the way sustainability can create an interconnected relationship between students, operations and research on a college campus. Adapted from 'A Whole University Approach to Sustainability', by McMillan, J. and Dyball, R. 2009, Retrieved from www.sagepublications.com.

Figure 3. Various factors that impact effectiveness of college campus sustainability projects. Adapted from 'Factors affecting effectiveness of sustainability initiatives in HEIs', by Velasquez et al, 2005, Retrieved from www.emeraldisight.com/1467.

