

# Global Changes & Society Project Proposal

*SUST 6000 Midterm – Spring 2020*

**Title Page:**

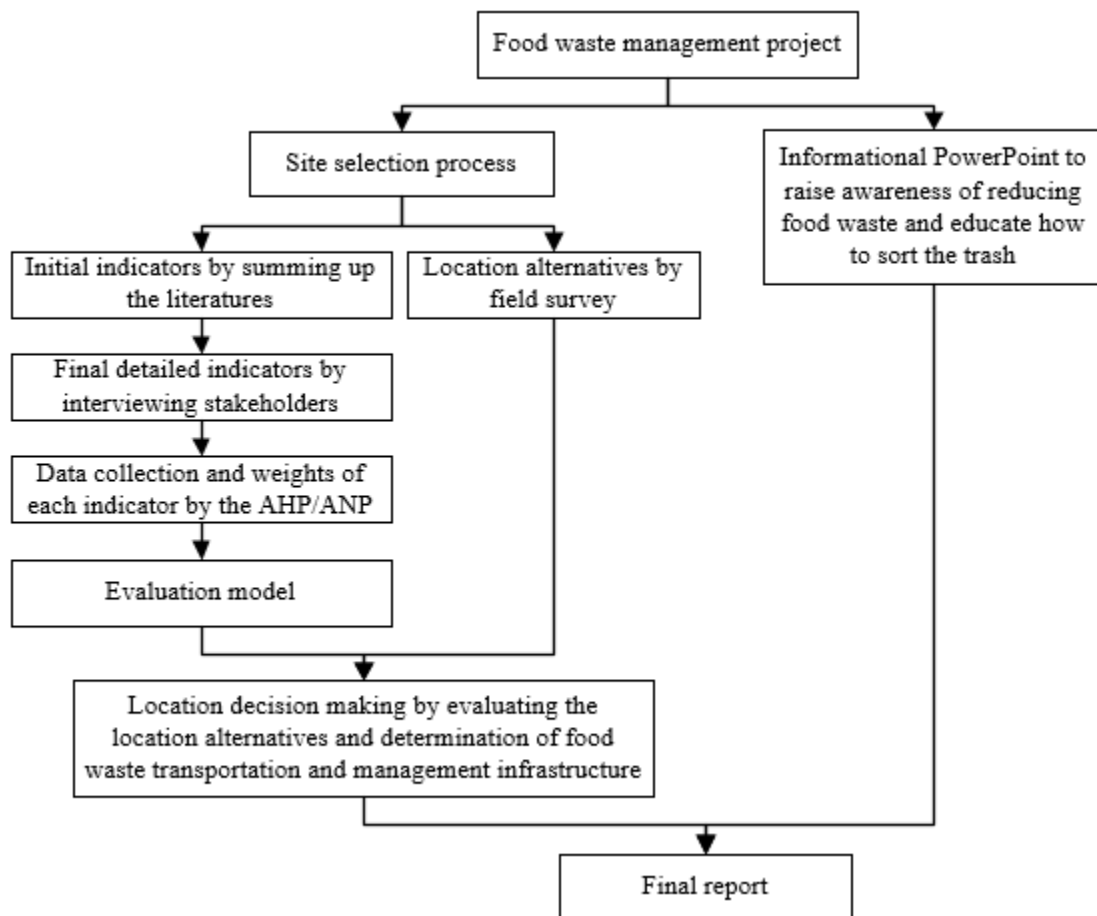
<i>Title</i>	<i>Design of an alternative food waste infrastructure at Alta, LCC</i>
<i>Group Members</i>	<i>Kripa Thapa, Ning Xiong, Dani Zebelean</i>
<i>Main Research Theme (air quality, environmental equity, food systems, etc...)</i>	<i>Climate Change</i>
<i>Secondary Research themes (the co-benefits from this project)</i>	<i>Food Waste, Greenhouse Gases (GHGs)</i>
<i>Project Problem: Include a short summary of 3-4 lines explaining the project problem.</i>	<i>GHGs are recognized as the indicator and tracker for climate change and climate impact. In an effort to reduce the overall GHG emissions from the ski area of Alta, UT, we will be evaluating possible alternatives to handle food waste</i>

**CONTENT:**

- I. Project Scope*
- II. Background and Rationale*
- III. Objectives and Expected Results*
- IV. Management and Implementation*
- V. Monitoring and Evaluation*
- VI. Budget and Financial Plan*
- VII. Project Deliverables*
- VIII. Supplemental Information: Project Data, Charts, and Infographics*

**I. PROJECT ABSTRACT/SCOPE**

Food waste generates about 8% of humankind’s annual Greenhouse Gas (GHG) emissions, which is the main contributor to climate change [1]. Therefore, Alta proposed the Food Waste Management Pilot Program version 1.0 to divert food waste from the Salt Lake landfill to the Wasatch Resource Recovery food digester. The food digester puts food through a composting process which turns into clean biogas. This process has greatly reduced GHG emissions for the ski area of Alta. However, the program encountered some problems during the implementation process. This project aims to propose version 2.0 by solving the operational problems to ensure the sustainability of the food waste program. Based on these encountered problems, the primary focus of this project is to identify alternative locations and pathways to set up receptacles for food waste collection that are convenient for restaurant employees and the pickup trucks and also have enough space for large receptacles. Firstly, this project will establish evaluation indicators to help decide best locations and pathways through literature review and interview with stakeholders. Second, we will identify preliminary alternative locations and pathways through survey and GIS. Additionally, data for established indicators in each alternative location/pathway will be collected. After that, a model will be established to identify the best locations and pathways. Lastly, a results analysis will be conducted to find the best food waste option for version 2.0. In this site selection process, food waste transportation and management infrastructure (i.e., suitable receptacles) will also be considered and selected. Plus, an informational PowerPoint will be prepared to raise awareness of reducing food waste and educate customers and restaurant employees to sort the trash. The procedures of this project can be seen in figure 1.



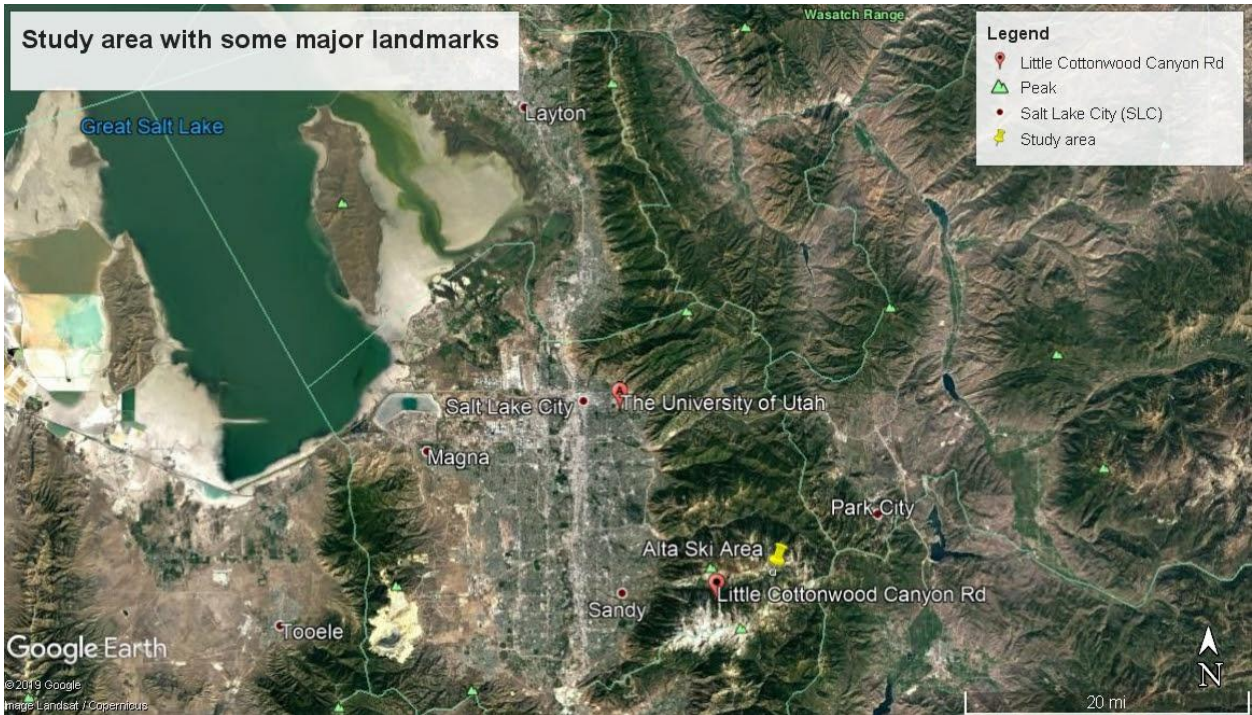
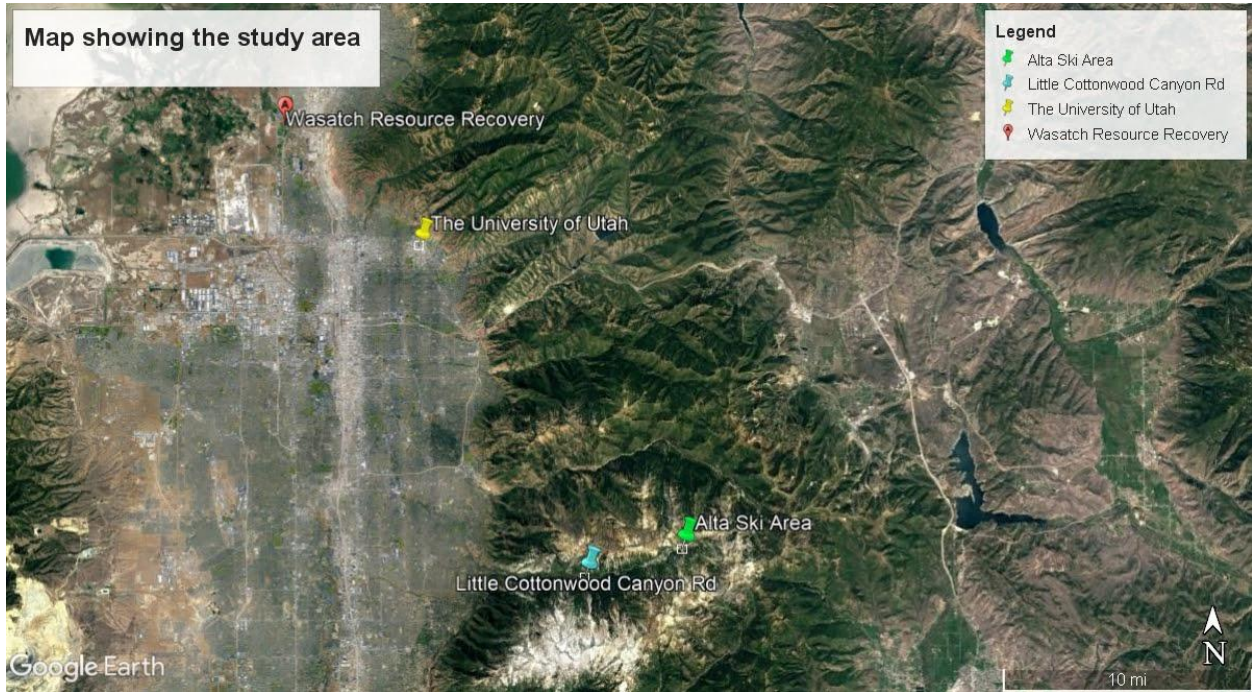
**Figure 1.** Procedures of the project

## ***II. BACKGROUND & RATIONALE***

### *LOCATION | Alta, UT*

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Our project for the Global Change and Sustainability course at the University of Utah will be based at the Alta ski area of Little Cottonwood Canyon (LCC) (Figure 1). We will focus on revamping the food waste project started in the ski season of 2018-2019. We will begin by assessing infrastructure upgrades to make the program more feasible from an operations perspective. If the pilot project version 2.0 is successful, the project can expand to accommodate the residents from the town of Alta and the Snowbird ski and summer resort. Additionally, if the project proves successful the model can be pitched to other ski areas and resorts in the greater Salt Lake area and beyond Utah.



**Figure 2.** Project location of Alta, UT

## BACKGROUND |

- **Green House Gases (GHGs) caused by human activities are the key contributor to climate change [2], and food waste generates about 8% of humankind’s annual GHG emissions [1].**

Climate Change has brought a series of serious challenges to human survival and people need to start paying attention. Many aspects affect climate change, however there needs to be a quantifiable approach. The United States Environmental Protection Agency (EPA) utilizes GHGs as a climate change indicator since GHGs trap heat in the atmosphere causing temperatures to rise [3]. Among these GHG emissions, the GHG emissions caused by food waste are one of the main contributors. According to the Food and Agriculture Organization of the United Nations, a third of the food we produce is either lost or wasted, including \$ 700 billion of environmental costs and \$900 billion of social costs, contributing 8% of humankind’s GHG emissions [1]. GHGs are produced from food waste being sent to landfills through biological activity in the landfill that breaks down food waste. The main GHG produced is methane [1], most of which is not captured to produce energy

- **Ski areas in the US are actively taking measures to reduce GHG emissions with sustainable food waste management being an important measure.**

National Ski Areas Association (NSAA) has 49 partnering ski areas participating, four of which are in Utah: Alta, Deer Valley, Solitude, and Snowbird. The NSAA asks each of the resorts to complete a GHG budget with three scopes: Direct Emissions (vehicles and buildings); Indirect Emissions (purchased electricity); Other Emissions (waste Disposal, skier travel, or business travel). In the annual GHG budgets, 14 ski areas are involved in food waste management [4]. Their current approaches are summarized in Table 1. From the 2019 report issued by the NSAA, Alta’s goal is to reduce 20% of their 5,779 MTCO<sub>2</sub>e emissions in the 2020-2021 season [4].

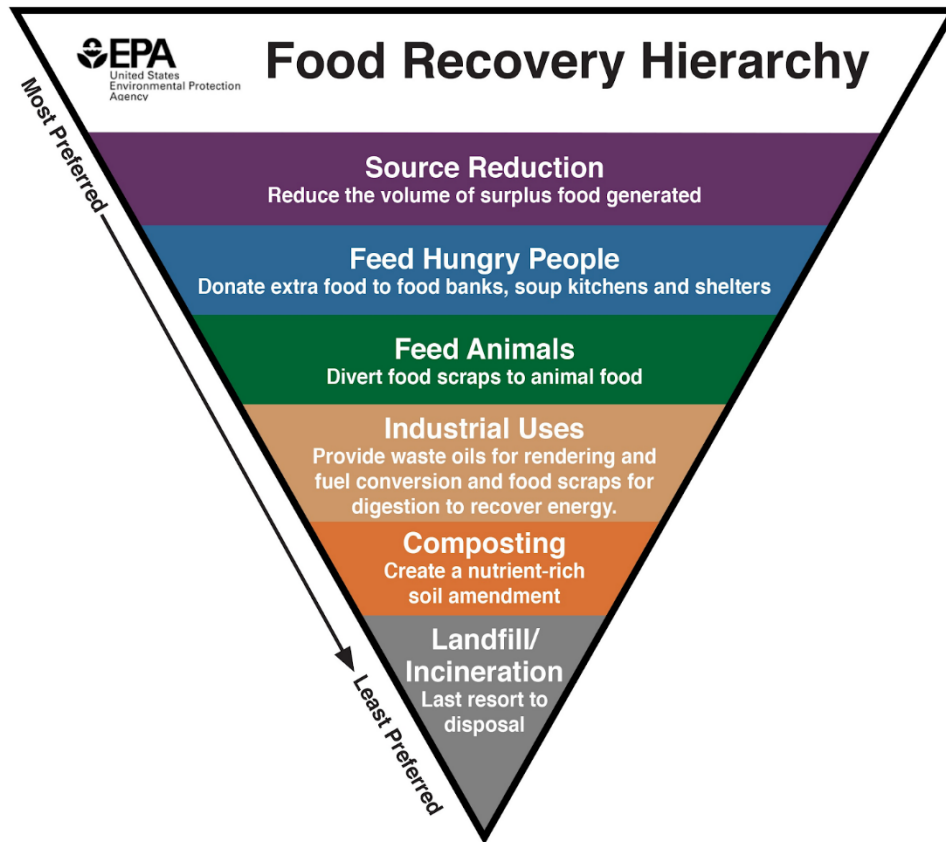
**Table 1.** Food waste management in ski areas

Ski areas	Measures
Alta	Food Waste Version 1.0
Arapahoe	Composting, recycling plastic wrappers through terracycle
Bridger Bowl	Diverted waste oil to bioreactors
Deer Valley	Partner with Wild Harvest Farms in Peoa, UT to handle composting (>10,000 lbs of food per month). No more plastic straws. Use reusable foodware in all but one lodge
Eldora	Composting (almost a 25% waste diversion)
Grand Targhee	Terracycle and increased recycling, no one-time use bags, paper free HR
Mt. Bachelor	Recycling fry oil with SeQuential, eliminated single use food items
Snowbird	No more plastic straws, battery recycling, water bottle refill stations, glass recycling
Sugarbush	Compost over 40 tons of food scraps
Tremblant	Composting managed by the ski resort

- **Environmental Protection Agency (EPA) proposed Food Recovery Hierarchy (FRH) (Figure 2) to help achieve sustainable management of waste food, and the “Industrial Use” and “Composting” strategies prioritize the “Landfill” strategy according to FRH [5].**

The FRH prioritizes actions organizations can take to prevent and divert wasted food. Each tier of the FRH focuses on different management strategies for your wasted food. The top level of the hierarchy (Source

Reduction) is the best way to prevent and divert wasted food because they create the most benefits for the environment, society and the economy [5]. The bottom layer of the hierarchy (Landfill) is the least recommended way to deal with food waste since GHG emissions produced inside of the landfill. Other strategies are better than “Landfill” strategy since these strategies can reuse waste food.



**Figure 3.** USEPA Food Recovery Hierarchy [5]

- **Alta Food Waste Management Pilot Program version 1.0 diverted food waste from landfill to Wasatch Resource Recovery food digester where food is composted and turned into clean biogas (Industrial Use), which met the requirements of FRH to handle food waste.**

Food waste management pilot program in Alta ran for two months in the 2018-19 season. The main purpose of this pilot is to divert food waste from the landfill to Wasatch Resource Recovery food digester where food is composted and turned into clean biogas. All four kitchens of the ski area, Alf’s Restaurant, Albion Grill, Buckhorn kitchen and Watson Shelter, participated in the two-month pilot program. Two did front of house and back-of-house collection, and two did back of house collection only. Front of house food collection relies on the customers to sort their food waste at waste receptacles. Back of house food collections relies only on the employees to separate the food waste. Food was gathered in 5-gallon buckets and employees volunteered to take the food waste to North Salt Lake where the Wasatch Resource Recovery is located. The result was 3.2 tons of waste diverted from landfill (equal to 1 ton of CH<sub>4</sub> and 2 tons of CO<sub>2</sub>). This is enough energy to run an average household for 251 days [6].

- **Alta Food Waste Program version 2.0—The theme of this project**

The problems and places of improvement for version 1.0

- 1) Need better infrastructure: more permanent/functional receptacles in the restaurants; some sort of large receptacle for all food waste collection (i.e., a receptacle that a waste hauling service would pick up); Space for this large receptacle.
- 2) Logistics of getting food waste from mid-mountain restaurants to a receptacle (the snow cats are capable of hauling food waste from mid-mountain restaurants, but need to be sure and consider the logistics of hauling receptacles from mid-mountain restaurants when thinking about the receptacle design)
- 3) How to educate people without needing to staff people to separate trash.

The purpose of the project is to address the problems of the Alta Food Waste Pilot Program version 1.0 and come up with version 2.0 to continue this food waste management project which is beneficial for sustainable development of Alta.

Based on the purpose of this project, the primary focus of this project is to identify alternative locations and pathways to put up receptacles for food waste collection that are convenient from the restaurant and from the pickup truck and also have enough space for large receptacles. In this site selection process, food waste transport and management infrastructure (i.e., suitable receptacles) will be considered and built. Also, an informational PowerPoint will be prepared to raise awareness of reducing food waste and educate customers and restaurant employees to sort the trash.

### *RATIONALE |*

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To help combat climate change, we are utilizing the indicator of GHG as established by the EPA. We are investigating the feasibility and sustainability of alternative food waste management to decrease the GHG emissions produced at the Alta Ski Area. In addition to reducing Alta's GHGs we will be adding to the Wasatch Resource Recovery mission to produce more biogas. We will also be increasing the visibility of the Wasatch Resource Recovery which will help more companies and residents join their campaign to divert food waste to them. Also, by diverting food waste from the landfill, we will be increasing the lifespan of the SLC landfill. Having the landfill last longer, means residents of Salt Lake City will be able to pay less to properly dispose of their garbage.

## **III. OBJECTIVES & EXPECTED RESULTS**

### *OBJECTIVES |*

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#### *1. Immediate objectives*

The immediate objectives of this project can be divided into two categories:

- **Design a general food waste transport and management infrastructure for an efficient functioning of the trash dumping and pick-up system present in the Alta Ski Area**
- The proposed design will include the identification of locations (spots and trails) which addresses both the convenience for a hauling service collecting the food waste and the restaurant employees

responsible for dumping the waste. A robust index will be used to come up with 3-5 best alternative locations that will incorporate parameters such as:

- Elevation
  - Distance from the restaurant
  - Distance from the pickup truck (hauling service)
  - Volume of waste generated
  - Size of the receptacle
  - Number of receptacles required
  - Positional alignment of the receptacles with the restaurant and pickup service station
- **Organize an effective food waste management workshop by delivering an informative presentation that will act as a means to educate the employees of the Alta Ski Area.**
- ☐ The presentation will highlight crucial aspects of the topic through graphics and posters such as how to sort trash, minimizing one's carbon footprint at their workplace, perform a thorough food waste audit and how it ultimately contributes in aiding Alta Ski Area reduce their GHG emissions and becoming a well-decorated Green Ski Area. The main focus of this presentation is to inculcate the notions of proper operations of food waste management and its linkage to GHG and climate change, among the existing employees so that the upper management are not compelled to hire new staff to look after it. The Green Team at Alta Ski Area can use the resource materials to conduct repeated sessions in the future to further solidify their knowledge on the subject matter.

## 2. Long-term objectives

Similarly, the long-term objectives of this project are also divided into two categories:

- **Attain the successful operation of the food waste management infrastructure in coalition with other ski areas and residence of the Little Cottonwood Canyon (LCC) area.**
- ☐ The design of food waste management infrastructure for the Alta Ski Area is a model project which has a potential to be scaled up given its successful operation over a period of time. The model can then be adopted by other ski areas in an effort towards becoming a fully-fledged Green Ski Industry. The ski areas, then will have the option to form partnerships among each other and share the same hauling service which will prove to have a significant economic feasibility.
- **Adopt a sustainable approach by increasing the longevity of the landfill space hence help Alta Ski Area achieve their GHG reduction requirements in a timely manner.**
- ☐ The development of this model will have far reaching effects in terms of combating climate change on a significant level. By averting the waste from the landfill in North Salt Lake, Alta Ski Area will also uphold its green choices by supporting Wasatch Resource Recovery's biogas production. This will help Alta Ski Area in being recognized as an environmentally friendly organization and will



attract numerous funding agencies and partners for further boosting the economy of the business in the long run.

### **BENEFICIARIES |**

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The direct and indirect beneficiaries of this project are:

- **Alta Ski Area**

- ☐ The project will help the study area accomplish their GHG reduction requirement goals that were set previously. The appropriation of the food waste management model will endorse it as a Green Ski Area that will further see an uptick in the customer engagement and also attract funding agencies and sponsors who promote sustainability practices.

- **Stakeholders**

- ☐ The successful operation of the project will also encourage other ski resorts to adopt this infrastructure and lead to some beneficial partnership among them. In addition, this will maintain a sound relationship with the stakeholders who have made investments in the facility.

- **Wasatch Resource Recovery (WRR)**

- ☐ Looking at the bigger picture, by supplying the food waste, the ski area will help Wasatch Resource Recovery (WRR) in their plan to increase the production of biogas. The WRR will gain the much-needed recognition for their campaign from the employees, recreational users and the residence of the Little Cottonwood Canyon.

- **Residents of Salt Lake City**

- ☐ The residents of Salt Lake City will be able to pay less for the proper disposal of their garbage for longer if there is an increase in the life span of the landfill space at North Salt Lake.

### **EXPECTED RESULTS |**

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*Explain what is expected and the quantifiable/qualitative results at the end of the project implementation (ie: end of the semester). Describe the impact for the stakeholders and other beneficiaries.*

- To build a model to establish an efficient food waste management system which reduces GHGs emission in the ski area. The model will provide various alternatives with a set of advantages and disadvantages of each of those and recommend the best one with the help of an index.
- To produce a consulting report with supporting data from the field work and a detailed analysis of the observations and measurements that serves as a basic foundation for the Alta Ski Area to operate an effective food waste management system. The project is also expected to raise a wave of urgency

among the other ski areas to endorse green ideas approaches in the path to combat climate change at a local level.

*Consider and explain the unintended results or consequences from this project. Describe the impact for the stakeholders and other beneficiaries.*

- Given the limited amount of time for the project, the project might not be able to incorporate all the factors that may lead to a full-fledged food waste infrastructure. The model will leave room for modifications and improvement according to the needs of the facility. Additionally, the time period might also pose as a restriction to carry out seasonal surveys of the study area (For example: more robust operation required during the busy ski seasons and a flexible operation during the off season) which might slightly hamper the recommendations of the alternatives.

#### **IV. MANAGEMENT & IMPLEMENTATION**

##### *PROJECT GOVERNANCE*

**Table 2. Roles and responsibilities of each team member**

SN	Group members	Roles and Responsibilities
1.	Dani Zebelean	<ul style="list-style-type: none"> <li>● Deliver presentations and maintain correspondence with the concerned authorities</li> <li>● Provide an engineering perspective towards the project</li> <li>● Share local knowledge and ideas about the study area</li> <li>● Data collection and analysis</li> <li>● Proofread the written documents and report before the final submission</li> </ul>
2.	Ning Xiong	<ul style="list-style-type: none"> <li>● Developing a food waste management index with relevant indicators for the project</li> <li>● Data collection and analysis</li> <li>● Statistical interpretation of the data</li> <li>● Provide input from a geographical point of view for the project</li> <li>● Compilation and formatting of the proposal and reports</li> </ul>
3.	Kripa Thapa	<ul style="list-style-type: none"> <li>● Arrange group meetings every week</li> <li>● Prepare and document each of the regular meeting minutes</li> <li>● Conduct literature review and identify research work, news articles that is pertinent to the project</li> <li>● Pitch ideas and approaches towards the project from an environmental standpoint</li> <li>● Creating maps, charts and necessary illustrations for the report</li> </ul>

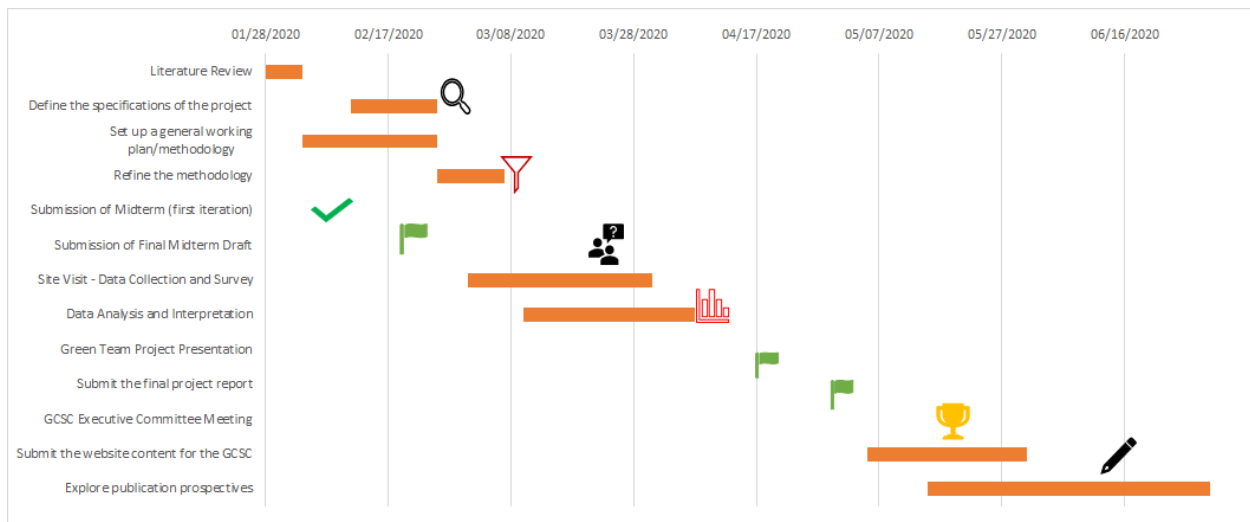
*Describe the coordination and communication mechanism(s) between team members to ensure completion of this project.*

In addition to the regular weekly meetings, the project members will be maintaining communication with each other via emails, text messages and canvas. In case of an emergency, we have also decided to respond via phone calls. Each meeting is divided into two halves. The first half involves a short brainstorming session and pitching ideas from different journals or articles review on the topic to each other. The second half is mainly about navigating the workflow and discussing any difficulties faced by the other team members. The meeting minutes for each of those meetings have been documented in an organized manner on a Google Drive for everyone to peruse. Furthermore, the division of tasks among the project members have been recorded digitally to track the progress at the end of the semester. Each project member has been appointed a responsibility which includes leading the major three aspects of the project (design, analysis and discussion). This has been set up specifically to bolster the skills of each project member in an impartial manner.

*Describe any known skillset “gaps” within the team and what strengths, talents, and/or expertise are needed from fellow classmates, faculty, or stakeholders to help complete this project.*

As two out of the three project members are international students who just came to the US in August 2019, there seems to be a lack of knowledge about the study area. Having only visited Alta once, it is a bit difficult to pitch ideas that are significantly coherent on all grounds. Being a small group, the project members would definitely appreciate some guidance from a professional who has expertise on food waste management and understands the study area at a local level.

**DURATION & TIMELINE** | implementation steps



**Figure 3.** Gantt Chart showing the project timeline

## V. MONITORING & EVALUATION

### RISKS and ASSUMPTIONS

**Table 3.** Main risks and corresponding mitigating measures

SN	Main Risks	Mitigating measures
1.	Stakeholders unwilling to cooperate with this project	<ul style="list-style-type: none"> <li>Carry a project introduction letter. The project introduction letter explains the main content of the project and its significance to stakeholders</li> </ul>
2.	Project overdue (The original plan cannot be implemented due to uncontrollable factors, such as bad weather and illness)	<ul style="list-style-type: none"> <li>Increase plan flexibility, and each plan has plan B</li> </ul>

### MONITORING AND SUSTAINABILITY

- Key Indicators for measuring progress
  - Completion of indicator establishment
  - Completion of selection of preliminary potential locations/pathways
  - Completion of data collection
  - Completion of model building
  - Completion of determination of food waste transportation and management infrastructure
  - Completion of information PowerPoint
  - Completion of report

- Sustainability mechanisms

☒ Communication mechanism (Stakeholders meeting)

First meeting: meeting is to understand the willingness of stakeholders to implement this project. if they are willing to implement this project, what do they want to get? what problems, questions, and suggestions do they have for the implementation of this project? In the way, stakeholders' requests will be understood and project implementation will be guaranteed by responding to these requests of stakeholders.

Regular meeting: meeting is to understand the difficulties encountered in the implementation of the project and understand the stakeholders' optimization suggestions for the implementation of the project. In the way, project sustainability will be guaranteed through continuous response to stakeholder's requests and continuous improvement of the project implementation process.

☒ Financial mechanism (Some options)

Funds from some private and public foundations which fund to tackle climate change.

Donation by passengers: Donation point for the implementation of the project in the Alta can be established. At the donation site, display board can be set up, and the contents of the display board include the introduction and significance of the project.

Tax on passengers: The tourists who travel to Alta can be charged taxes for the implementation of the project.

Increase in ticket prices: Alta can increase the price of ski tickets for implementing the project.

## **VI. BUDGET & FINANCIAL PLAN**

### *BUDGET |*

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The cost that we will be accounting for are surveying trips to Alta, informational materials, and additions to infrastructure. This includes trips to meet with Beth. We will put in the budget to take one trip a week to Alta after spring break and the first meeting with the Green Team. The University of Utah provides a standard reimbursement of \$0.58 per mile. According to Google Maps, from the University of Utah to the town of Alta is 24 miles. Each round trip will then cost \$27.96. We estimate that we will be driving to Alta a total of six times during the remainder of the semester. End total will be \$167.74 for the six trips. We would like to provide educational instructions at front of house receptacles. Using an 11" x 17" laminated sheet of paper at \$10.93 a page. We estimate making 30 sheets to place at receptacles for front-of-house collection. We might need more educational materials that we estimate needing a total of \$500.00. We are unsure of how much we will spend on infrastructure additions so we would like to request \$500 be set aside to put toward the upgrades.

### *FINANCING PLAN |*

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We plan to use part of the cash award from the Alta ski area to finance the project.

## **VII. PROJECT DELIVERABLES**

### *DEFINITION |*

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Our project deliverable will be a quantifiable approach to help the Alta ski area reduce their GHG emissions. The other intangible result will be supplying other ski areas the model to design their own Food Waste Program.

### *EXPECTATION |*

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- By the end of the semester have a working model for evaluating alternatives that will include:
  - Identification of important stakeholders
  - Indicators for each stakeholder
    - Define weights for each indicator
- Utilize model to find best food waste option for version 2.0
- Make an information PowerPoint to be used during staff training
- If the desired alternative is put into place for the 20-21 season, we will work with Alta to do reporting for the waste badge of NSAA.
- Use the results from the 20-21 season to pitch the food waste to other ski resorts along the Wasatch Front.

### *GCSC EXECUTATIVE MEETING & GCSC WEB CONTENT*

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*Determine who will be presenting your project results at the GCSC Executive Committee Meeting on May 4<sup>th</sup>, 2020 (11:30-1:00pm). Note: more than one person may present, but everyone is not required to present.*

Dani Zebelean

*Determine who will take the lead in preparing and submitting GCSC Website Content. One person does not need to prepare all of the content; however, one person should be responsible for submitting a final product to the GCSC website coordinator, Laurie Mecham. Note: this does not need to be complete/submitted before the end of the semester, but still needs to be submitted in a timely matter.*

Kripa Thapa

### ***Bibliography***

- [1] Food and Agriculture Organization of the United Nation, "Climate change and your food: Ten Facts," [Online]. Available: <http://www.fao.org/news/story/en/item/356770/icode/>. [Accessed February 2020].
- [2] R. K. Pachauri, M. Allen and V. Barros, "Climate Change 2014: Synthesis Report," Contribution of Working Groups I, II, III to the Fifth Assessment Report, 2014.
- [3] United States Environmental Protection Agency, "Climate Change Indicators: Climate Forcing," USEPA, Washington D.C. , 2016.
- [4] National Ski Area Association, "Sustainable Slopes 2019 Annual Report," National Ski Area Association, Lakewood, 2019.
- [5] United States Environmental Protection Agency, "Sustainable Management of Food," USEPA, Washington D.C., 2019.

[6] Alta Environmental Center, "Alta Sustainability Report 2019," Alta Environmental Center, 2019, 2019.

[7] United States Environmental Protection Agency, "Food: Too Good to Waste," USEPA, Washington, D.C., 2020.

### *Definitions & Abbreviations*

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*Include and necessary definitions or abbreviations relevant to the project and background knowledge of the project.*

Green House Gases (GHGs)

Analytic Hierarchy Process (AHP)

Analytic Network Process (ANP)

Salt Lake City (SLC)

Little Cottonwood Canyon (LCC)

National Ski Areas Association (NSAA)

Environmental Protection Agency (EPA)

Food Recovery Hierarchy (FRH)

Geographic Information Software (GIS)