Decision Phase

Introduction

This section describes the process in which the final solution was decided on, from the list of possible solutions in the previous section. Criteria were a big part of deciding on which option would be implemented. In order to take criteria into account, the Delphi method was used to determine how each solution met the criteria.

Criteria Definition

Section II listed off the criteria that must be met while designing and building this project. In this section, the criteria will be explained in more detail**.**

Cost

The cost for this projects design and construction should be under $300. This criterion helped choose a solution that was feasible for the budget. More than $300 could be spent, with permission from the client.

Size

The size was an important constraint, as for this project must be able to fit in the space available on the barge. The WaterPod have very limited space on their barge and it is being dispersed very sparingly.

Weight

The weight of this project should be as light as possible; as for it needs to be shipped from California to the client in New York.

Transportability

Transportability goes along with weight. Since this project is being shipped, it should be able to be taken apart and made into smaller sections. This will keep shipping cost as low as possible.

Durability

This project must be durable enough to last for at least six months, with little or no maintenance. Six months will be long enough; as for it is the duration of time that the WaterPod team will be living on the barge.

Ease of Setup

How easy it is to take apart and put back together needed to be taken into consideration. The WaterPod people will have to reconstruct the project, when it arrives in New York, and it should be as easy as possible to avoid and complications.

Use of Recycled Materials

The use of recycled materials is not only good for our environment, but is also good to keep our cost down. Constructing as much of the project as possible out of recycled materials will be key to keeping in the range of the budget given.

Design and Construction Time

Less than four months of time was allowed to completely design and construct this project. Having such little time added more constraints, limiting the design and building time.

Educational Value

Many people will come onto the barge and check out the different designs being implemented. People need to be able to see all aspects of the project, so they can get an understanding of what the system does.

Energy Efficiency

The goal was to have the project use little or no energy. The WaterPod team will be producing electricity on the barge and there will not be a substantial amount of excess electricity after the essentials.

Solutions

There are 9 possible solutions that we had to be chosen from. The explanation and diagram of each of these solution possibilities was described in Section III.

These Solutions are:

- Continuous Flood and Drain
- Umbrella Aeroponic
- Tree Hydroponic
- Octagon Hydroponics
- Bucket Aeroponics
- Hexagonal Hydroponics
- Drip Hydroponic

Decision Process

A Delphi Method was incorporated to make a decision on which project would be used as a final solution. The Delphi Method is a way to weigh the criteria against each of the different solution options. The criteria were set on a scale from 1-10, ten being the most important and one being the least. The criteria's scores can be seen in Table 1 below.

Criteria	Scale (1-10)
• Cost	• 8
• Size	• 6
• Weight	• 8
• Durability	• 8
• Transportability	• 7
• Ease of set up	• 9
• Use of recycled materials	• 9
• Design and construction time	• 10
• Educational value	• 8
• Level of energy efficiency	• 6

Table 1: The criteria set by the team.

To start the process we looked over each of the alternative solutions, seeing how well each solution met the criteria. A scale from 1-10 was used to determine this for each of the criteria. After all the solutions had been weighed against the criteria, a decision was made based on the score each solution had received. The results from each of the solutions can be seen in Table 1.

		Scale out of 50(highest)						
Criteria	weight	Cont. Fld. and Dm	Umbrella Aero.	Tree hydro.	Octagon hydro.	Bucket Aeropo.	Hex Aero.	Wall H
Cost	10	35 / 350	40 / 400	20 / 200	5 / 50	42 / 420	20 / 200	40
Aesthetics	6	40 / 240	45 / 270	50 / 300	45 / 270	15 / 90	45 / 270	40
Safety	9	40 / 360	35 / 315	30 / 270	25 / 225	12 / 108	27 / 243	35
Reliability	10	35 / 350	25 / 250	15 / 150	21 / 210	45 / 450	35 / 350	36
Yield	7	30 / 210	40 / 280	26 / 182	35 / 245	40 / 280	42 / 294	32
Space utilization	7	45 / 315	48 / 336	46 / 322	36 / 252	45 / 315	38 / 266	29
Water efficiency	8	12 / 96	41 / 328	13 / 104	17 / 136	40 / 320	38 / 304	15
Electrical Efficiency	6	11 / 66	38 / 228	11 / 66	11 / 66	40 / 240	37 / 222	11
Total		1987	2407	1594	1454	2223	2149	

Table 2: The Delphi Matrix.

To come to a final decision on what the final design should be, the top three solutions were all looked at. The umbrella hydroponics, true aeroponics, and bubbleponics supertray designs scored the highest as seen above in Table 2. Instead of just choosing one of the designs, all three of them were incorporated into the final solution that was decided on.