**Design Options**

In order to solve the problem, the team had come up with several potential solutions that each had their pros and cons. The viability of the solutions is considered based on several criteria. These are:

* **The Project Cost**

The cost must be kept relatively low, and should be more effective than simply donating the cost of the project to the community. This means that building large structures or implementing new technologies might not be very viable.

* **Simplicity of Idea**

The idea must be simple to implement. If it is too complicated, the outlook of success becomes doubtful. The idea, from the eyes of the community, must also appear to be simplistic. The community would be skeptical if they are unable to understand what the project is and how it would help, and they would be unable to become involved in it. For the locals to work on the idea and maintain it, the solution has to be kept as simple as possible.

* **Effectiveness of the Solution**

This relates to how well the solution tackles the problem that it is designed for. Effectiveness is used to evaluate if the project is a waste of resources or not.

* **Amount of Maintenance Required**

Once the project has been implemented, the people involved in the implementation are unable to remain there to continuously keep the solution working. However, maintenance is generally always necessary, and the implementation team will re-visit the site once a while. All other times, the community themselves must be able to maintain the solution. The higher the maintenance required, the less viable the project becomes. Best if no maintenance is required.

* **Community Involvement**

The community must be involved in the idea. Their exclusion would mean that the project is not for them, but is simply an act of another group treating their community poorly. The community must be able to know the project before it begins construction, must be involved in it, and must be trustful of the idea and the people who are implementing it. A more involved community would increase the success rate of the idea, and would make more benefit from the project. If the community disagrees with the idea, the project will have to be scrapped.

The options that had been discussed and short-listed to the finalisation of decision are as follows:

1. Water filters attached to community taps
2. Water storage tanks with replaceable filters attached
3. Wheelie bin portable filtration system

A fourth option to “Do Nothing” is also considered, to act as a control in the thought scenario and to compare how the solutions are better than doing nothing.

The criteria are marked up based on the following:

* **Project Cost**

This reflects on the project cost. The lower the cost, the higher the points. A weighting of 5 (out of 5) is given and the points are given out of 5. Applies to the following criteria as well.

* **Idea Simplicity**

The simplicity is measured based on the number of detachable parts, or areas requiring maintenance, the idea has. The lower the number, the higher the points. A weighting of 4 is given.

* **Idea Effectiveness**

The effectiveness is an intelligent guess given to how well the idea would work to resolve the problem it was built for. The more effective it is, the higher the points.

* **Maintenance**

The amount of maintenance required. A formula for an approximated guess can be used as given. Maintenance = frequency of maintenance X difficulty and duration of maintenance X cost of maintenance. The lower the maintenance, the higher the points.

* **Community**

The amount of community involvement. This is an approximate guess, and we assume getting the community involved in the construction of an idea as good community involvement. If the community does not agree to the idea, the project has to be scrapped. A greater community involvement would mean more points. The greater the involvement, the higher the points.

**Water Filters Attached to Community Taps**

* Water filters are made using a 3-layer system of bio-sand, gravel and pebbles, that would kill and filter out the bacteria in the water passed through it. It traps the bacteria in the bio-sand layer and causes the bacteria compete with each other until they die due to starvation, mechanical action, and lack of light. The materials involved in building a unit of this filter is simply the sand, gravel, pebbles, PVC pipes, and other household hardware materials like Perspex and plastic taps. The filter is designed to filter out the water existing in the community taps, which were pre-filtered through sandstone. Bacteria still exists in their water, and this idea aims to improve on that. Since the water to-be-filtered is clean from solids, dirt build-up in the filter would be minimal. The filter is expected to have a lifetime lifespan. This would mean that no-maintenance is required.

Pros:- Low cost, no maintenance, simple design, tested and proven solution

Neutral:- Community involvement

Cons:- No major cons

**Water Storage Tanks with Replaceable Filters Attached**

* Nepal has only half a year of water and the winter is dry. Currently, the population use water stored in large pots, and the quality of that water is uncertain. The idea of the water storage aims to improve on that condition and provide a more reliable and sustainable water supply to the community. The tanks would not fully solve their lack of water issue, but it would greatly help. The design aims to collect rainwater from the rooftops of the houses with suitable roofs, or new roofing would have to be installed. Otherwise, an alternative water collection system must be implemented, such as a rain collector. The water flows in during the wet season, and drains out for the dry season. Multiple steps of filtration are done to ensure that the water is safe for consumption. The filters are designed to be easily fitted and replaceable. Water testing kits and improved filter design, including the use of coal sand, must be used to ensure water quality. This is an alternative to underground water, which is known to be contaminated with substances such as arsenic.

Pros:- Effective solution, involves community

Cons:- Costly, requires regular maintenance, partially elaborate

**Wheelie-bin Portable Filtration System**

* A filter made in a wheelie bin. The wheelie bins are low cost containers that a reasonable durable, and more importantly, portable. By building the filters in the bins, a portable water filtration system can be made. The user can pour in dirty water from the top, and clean water gets output from the bin. The materials involved are the same as the water filters attached to the community taps. Water source may however be not as clean. This means increased maintenance, although the filter has a lifetime lifespan. Requires a fair bit of materials, and is heavy.

Pros:- Low cost, simple design, tested and proven solution

Cons:- Some maintenance required, low community involvement

**Do Nothing**

* Do nothing. This is just a control scenario, to see if the ideas are indeed helping, or simply a waste of time and resource.

Pros:- No cost, no effort

Cons:- Nothing achieved

A Decision table can then be made as follows:

|  |  |
| --- | --- |
| **Option** | **Description** |
| **1** | **Filter attached to community taps** |
| **2** | **Storage Tanks with replaceable filters attached** |
| **3** | **Wheelie bin portable filters** |
| **4** | **do nothing** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Problem | Weighting | Option1 | Option2 | Option3 | Option4 |
| Cost | 5 | 4.5 | 2 | 3 | 5 |
| Simplicity | 4 | 4 | 2 | 3 | 0 |
| Effectiveness | 5 | 4 | 5 | 4.5 | 0 |
| Maintenance | 4 | 4 | 2 | 3 | 0 |
| Community | 3 | 4 | 5 | 2 | 0 |
| TOTAL SCORE |  | 86.5 | 66 | 67.5 | 25 |

It can be seen that the winning option is Option 1, that is a filter system attached to community taps. This option has the lowest cost, and is very simple. It is reasonably effective and requires no maintenance. It is also able to involve the community, since the system is implemented for the community to share amongst themselves.