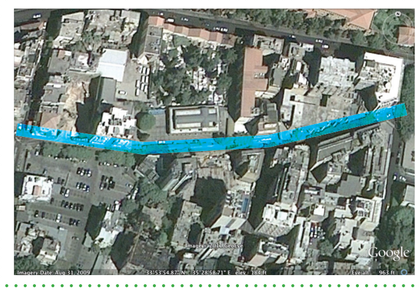
Abstract

The main focus of this project is to develop solutions to harvest rainwater in a community near AUB. This project falls under the scope of work of the AUB Neighborhood Initiative and the Center for Civic Engagement and Community Service (CCECS). The study covers socio-economic considerations and studying rainfall data to decide which rainwater harvesting system (RHS) would be best to use. The feasibility results will hopefully offer a clear way of identifying whether rainwater harvesting is possible in this area, and if it is, recommend the most economical system to use. A successful installment of such a system would provide residents of this area with an additional, cheap, and renewable water source. Once this problem is solved at an individual household level, it would help serve the community as a whole.

Area of Focus

Ras Beirut area bounded by Bliss Street, Hamra Street, Jeanne D'Arc Street, and Abdel Aziz Street but with specific focus on Makhoul Street, shown below.



INTERESTING FACTS

- Most Lebanese use the public network as a source for both potable and service water!
- The water supplied by Beirut's aquifers has become saline due to seawater infiltration.
- An underground water tank could be built then covered up with soil and plants.

WAYS TO SAVE WATER

1. Do not leave the water running recklessly.
2. Close the tap while brushing your teeth.
3. Don't take lengthy showers
4. Fill the water machine or cold water in buckets while waiting for the water to get warm.

RAIN HARVESTING AND WATER RECYCLING IN A NEIGHBORHOOD IN RAS BEIRUT

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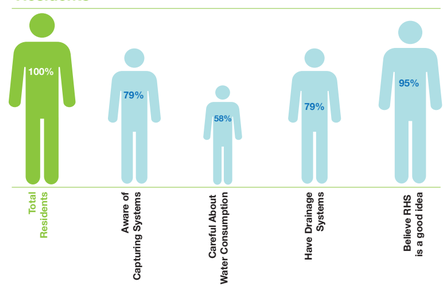
THE PROJECT COVERS FOUR MAIN AREAS

1 Feasibility

Interview Scheme:

- 19 residents and developers.
- Resident's water needs, greening concerns and willingness to incorporate RHS in their homes.
- No clear statistical relevance due to the small and deliberate sample because choosing quality over quantity was essential.

Interview Results



2 Design

General Designs Guidelines

- Harvested water = 0.55m^3/m^2 of capturing area/year (taking losses into account)
- Availability of storage space: storing water that is collected during the wet season to be used during the dry season when most shortages occur.
- Main system composed of two components:
  1. Rainwater Conveyance: need to intercept the already existing drainage system off the roof and lead the water into storage tanks after treating it adequately depending on the potential uses of the water.
  2. Rainwater Storage: constrained by the lack of available space to place tanks and the potential use of stored water.

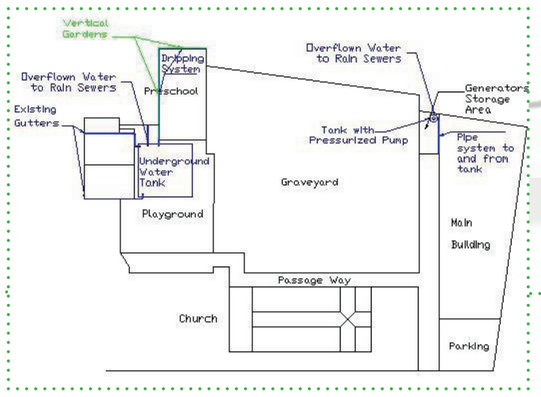
Conceptual Designs for Four Most Abundant Different Types of Buildings (in the area of study):

1. Buildings with available external spaces for storage.
2. Buildings with no available external space but with existing wells.
3. Buildings with no external spaces and no wells.
4. Private Institution Buildings.

Detailed Design for Saint Mary's Orthodox College (SMOC) on Makhoul Street

This design will be implemented and was therefore done in most detail. The SMOC RHS system consisted of two different systems:

- Main School Building System: would serve to clean the main building's grounds. It will be capturing rainwater on a per shower basis that would be used shortly after thus requiring minimal storage (4 m^3). This system only cost about $1750!
- Pre-School Building System: would cater to the irrigation needs of the school. 100 m^3 of water will be collected in the wet season and stored for irrigation purposes during the dry season. This will include an underground concrete tank that will be built under the existing playground. This system will costs about $10500.



3 Greening

Best food planting options in Beirut:

Food	Water Needs
Olive	60 L in summer, weekly
Cucumber	2-3 times per day, water for 20 minutes at each time
Tomato	Once every 2-3 days, water at an average rate of 2.4L/sqm

Greening location constraints

- Vertical Gardening.
- Ground Floor.
- Balconies *[orientation and access to sunlight issues].*
- Roof *[structural load, capacity issues].*

Vertical Gardens:

- New concept where plants grow out of the wall.
- Does not always need soil.
- Quite costly! Quoted about $720-$800 per m^2 of vertical planting.

4 Impact Assessment

Economic Impact Assessment

- The main economic benefit is based on the strong environmental benefit of harvesting rainwater since water is becoming a limited resource.
- If water is collected off all rooftops in our area of study, an approximate 24,864 m^3 of water could be collected a year. This could save people from having to buy water from private distributors.

Environmental Impact Assessment

- Conservation of water by capturing rainwater and storing it for future use.
- Greening automatically follows through using this water to make a building "environmentally friendly" by planting the roofs, balconies or facades.

Social Impact Assessment

- Most residents interviewed are generally interested in the implementation of the project but the data is not that reliable since the sample is small compared to whole block.
- An awareness program is crucial to educate people concerning the benefits of RHS and water conservation.
- Involving the municipality by changing the water charging system and introducing motives for people to build such a system could help mitigate the current social constraints.