AMERICAN UNIVERSITY OF BEIRUT

UNDERGRADUATE CAPSTONE PROJECT
IN
LANDSCAPE ARCHITECTURE

SUBMITTAL FORM

Nahr El Kalb: Reviving the Ecological Corridor

by

Deema Abdul Rahman

LDEM 242- ADVANCED DESIGN
SPRING 2017-2018
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Nahr El Kalb:
Reviving the Ecological Corridor

Dima Abdul Rahman
Landscape Capstone Project
Nahr El Kalb is a river flowing from Jeita Grotto in towards a large gorge that is of natural and historical importance. Through time the topography on site hindered transition from one side to another, therefore the civilizations that were successful in crossing it, awarded their success with Stelas carved on its mountain. Civilizations such as the Egyptian, phenacetines and roman are found in this area along many others. Alongside its historical importance derives its natural importance represented as the sanctuary for many flora and fauna as well as a transit zone for bird migration. However, with the success of crossing the gorge trails human interference that seeks expansion and further development denoted by urbanization. With that being said, Nahr el kalb faces urban stress on the forest necklace that supposed to protect the river corridor in addition to encroachment of most of the river banks that are supposed to be water filters from pollution and a reserve for flora and fauna. In this report I will introduce the site as well as analyze it and provide a design proposal for reviving the river.
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**Nahr El Kalb:**
*Reviving the Ecological Corridor*

**List of Maps**

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Phase I Introduction:

Site Location and Form
Site Images
Site’s History and Historic Elements
Understanding the context
Typology Sections
NAHR EL-KALB OVER TIME

Nahr El Kalb Landmarks
1. Amir Bashir 1700
2. Pont Ottoman 1870
3. Ottoman Empire 1870
4. Pont Francais 1880
5. Canual D'eau Francaise 1880
6. Pont Mar Abda 1883
7. Jalal al-Asar (Mountain of Monuments)
8. Windmill
9. Jesus is King
10. Ijea Grotto
Ownership by Law

The river should have all of the green buffer preserved as a connecting path for various species of flora and fauna, prevents erosion and keeps the river clean. Coastal areas should be purely sand since it is an important location for fish and marine life.

Ownership Map

- Green buffer
- River bank
- Erosion

Even though the site is considered an important ecological area, it is not treated in the proper way.

Labeling the landuse on site helps us understand how the site is occupied and if it is used properly according to its context.

The context map shows that most of the activities are found next to the river bed with minimal to no space for buffers.

Investigating the site's social activity is necessary to comprehend further why most of the site activity is located on the riverbed.

Land Use Map

- Agricultural
- Commercial
- Industrial
- Residential
- Other

According to the context map, no urban areas are found near the river, though the 10-meter buffer that exists on its banks helps to prevent erosion. However, an additional "NO Buffer" area in the eastern should have been taken into account.

Absence of River Buffer

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Phase II Site Analysis:

Understanding the Ecological aspect of the Site
Understanding Water Quantity and Quality
Understanding the Social Aspect of the Site
Accessibility and Connections
Understanding the Ecological Aspect of the site

To understand the ecological formation at Naher el kalb river certain layers like soil, geology and slope were overlayed to interpret the existing landcover and derive whether the site is used to its full ecological potential.

The evolution map helps us derive conclusions about the site. Accordingly the hatched zones are the only areas that remained the same through time. Noticeable changes are the expansion of urban areas, decrease in agricultural practices transformation of most of the scrubland to forests and finally the widening of the coastal line.

Many of these areas are not effectively protected and are being systematically destroyed by urban expansion, the building of dams and other infrastructure and road development projects. This is the case for major areas such as Nana el Kalb.

The evolution map helps us derive conclusions about the site.

Accordingly the hatched zones are the only areas that remained the same through time. Noticeable changes are the expansion of urban areas, decrease in agricultural practices transformation of most of the scrubland to forests and finally the widening of the coastal line.
The Evolution of agriculture through time

Evolution of agriculture helps us understand how the agricultural practices changed in terms of location and type. In this layer we derived that people drifted away from agricultural practices and substituted it with different activities as a source of income.

Assessment Criteria:
- Good soil
- Well-maintained terraces
- Properly arrangement of agricultural grids

Location 1 & 2: Carry crops on flat land and green houses

Location 3: Most of the agriculture is on terraces

Location 4: Most of the agriculture is on terraces

River Bed Typologies:
- Citrus
- Persia americana
- Arundo donax
- Myrtle berries
Understanding Water Quantity and Quality

Understanding the water quantity and quality helps us create a better understanding about Nahr El Kalb’s Condition

Aqueduct

Nahr El Kalb is known as the main source of water for Beirut and Jounieh and that is due to the fact that the river flows from water tables Jeita and also is fed from Faraya and Sannine water table.

Therefore, the site has two major aqueducts that separates clean water from the river water.

The river’s water is separated into two:
- The actual river bed with minimum water
- The water that is straight from the grove’s water table

The bridge was built for the sole purpose of transferring water to the other side which takes to Beirut.

Nahr El Kalb is the main water resource for Beirut and Jounieh. Accordingly we have two Aqueducts that deliver the water
Water Quantity

Studying the site in different seasons and knowing that an aqueduct spread through the site helped us understand better the quantity of water delivered by Nahr El Kalb river and categories the river. According to research I was able to evaluate the river intensity in different seasons.

During winter: Peak January
Maximum of 250000m³/s per day
(Water Supply within Beirut-Mount Lebanon)

During Summer: Peak August
In some areas can be dry
(Water Supply within Beirut-Mount Lebanon)
Water Quality
The following diagram investigates the different types of pollution on site. It includes direct and indirect: direct being dumping straight to the river, indirect is through urban areas expanding over the water table.

Map of polluting elements on site

Other disturbances that are happening on site

- Disturbances such as erosion is due to building of roads and the expansion area without studying the location
- Erosion of river bed due to extensive urbanization flow
- Disturbances on forests slopes
Understanding the Social Activity On Site

To better understand the social activity on site we investigated all the social places found on site, we looked at their location in proximity with the river, the type of activity if it is indoor or outdoor (formal or in formal) and the intensity in which each place has interns of social concentration.

According to the above maps we derive that most of the social spaces on site are formal social spaces, indoors, not accessible to everyone and the house the highest social activity.

The only outdoor space that was occupied was the coast with few fishermen and a family swimming.
Accessibility and Connections

After understanding the site’s social spaces, I looked at the site’s accessibility to further understand how people could access the site, not only from Beirut but also from surrounding villages. Accordingly, I categorized the different types of roads that are on site to see if it is human friendly.

Road typologies

- Main Road
- Internal roads towards the river
- Secondary Road
- Bridges
Phase III Conclusion:

Constrains Map
Opportunities Map
Constrains Map:

**Marine Life in Danger**
Most polluted site due to the accumulation of water pollution built from top of the river.
Urban expansion on coastal lands

**Uncontrolled Urban Expansion**
Urban Stress on the green corridor defined as eco-habitat home
Urban Expansion infiltrates the green corridor

**Uncontrolled Urban Expansion**
No Master plan for the site

**Uncontrolled Urban Expansion**
Resorts and factories built on river bed that causes pollution

**Formal Spaces as Social spaces inaccessible for everyone**

**Difficult accessibility**
One main road that is unsafe.
Few hidden roads to the other side.

**Erosion due to building of roads on steep slopes that have low to no vegetation cover.**

**Low water pollution**
Phase IV Design:

Design Boundary
Concept & Strategy
Master Plan
Zoomin: River Garden
  Concept Map
  Zoomin Map
  Estuary
  RestGard
  AquaGard
Trail Sections
NAHR EL KALB: Reviving The Riparian Corridor
Deriving a Concept and Site Boundary

Site Boundary: Represented by flatlands

Typologizing the site

Characterizing the site longitudinal and transverse
Strategy
A plan of reclamation

Strategy 1: Reclaiming the riparian Buffer
Reclaiming the natural buffer allows for a healthy river system and a smooth transition for the fauna from the forest necklace towards the river.

This is accomplished by removing all concrete platform that are on river buffer.

Strategy 2: Adopting abandoned spaces
Abandoned Spaces developed unique natural habitat after the time it took to heal.
The natural transforming accompanied by human intervention will allow the formation of recreational hubs for people to occupy & enjoy.
The pocket spaces will hold unique characteristic either natural, cultural or historical that will narrate a story through an experience.

Strategy 3&4: A trail system to connect history & Nature
System of trails are designed to allow for a continuous experience through natural and historical sites that could be for education, enjoyment or mobility.

4 Historic Monuments
3 Trail Path
2 Recreational spots
1 Reclaimed areas
NAHR EL KALB: Reviving The Riparian Corridor
Conceptualizing and Typologizing

The general design Typologies three main areas - Program

Conceptual diagram of Accessibility & Vegetation Typologies

Pedestrian Connection

Bird Migration

Vehicular Connection

Concept Map

The River Garden
Out of the river
Experience
In to the river
Experience
NAHR EL KALB: Reviving The Riparian Corridor
Master Plan

Nahr el kalb, a majestic gorge with river flow, represents an important location for many historical successes. However, faces many problems that are mostly related to human encroachment and pollution. Thus, the design will aim to improve the ecological system represented by the riparian corridor and the forest necklace to sustain the flora and fauna’s flow and wellbeing. This improvement will allow the sustainable integration of human activity which in turn will reinforce the engagement between the people and the history of the site and also provide an outdoor entertainment spaces in a much-needed location.

River Garden
Consists of three main areas
- Aquagarden that contains water activity
- RiverGard a unique seating space viewing Nahr el Kalb bridge
- A Wetland

Out of the river experience

Agriculture of citruses

Old Town

Oak Forest

Agriculture of olives

Jeita
NAHR EL KALB: Reviving The Riparian Corridor
River Garden: Concept

Conceptual diagram - Accessibility

- Important historic monuments
- Water activity spot
- Garden's Resting spot
- Viewing Point
- Fishing spot
- Highway
- Vehicular Road
- Pedestrian Road
- Aquaduct Path
Planting Strategy

- **Trees and high shrubs** - for protection and visual block
- **Grasses and low shrubs**
- **Low shrubs** - allow visual connection and act as protective buffer
- **Grasses that allow people to access water**
- **Colorful plants as eye catchers for people passing by**

Plants that are used above are not limited to the order category but are also used in different areas.
NAHR EL KALB: Reviving The Riparian Corridor
River Garden: The Estuary
NAHR EL KALB: Reviving The Riparian Corridor
River Garden: The Estuary
NAHR EL KALB: Reviving The Riparian Corridor
River Garden: The RestGarden
NAHR EL KALB: Reviving The Riparian Corridor
River Garden: The AquaGarden

- Historical Bridge
- Two way Road
- Platform for view
- Channelized Water
- Low grass
- Sidewalk
- Trees and high vegetation

Section of water garden
Scale: 1:500

Aqueduct Trail
Viewing Platform
Water Play area
Diverged sidewalk into the grass
Medium Height plants
Trees used to buffer the road
Two way Road

Scale: 1:500
NAHR EL KALB: Reviving The Riparian Corridor
River Garden: The AquaGarden
NAHR EL KALB: Reviving The Riparian Corridor
Trail Sections

Trails Sections

River Bank

Staging/Scrub

Existing Vegetation Conditions currently used as dog walking area

Existing vegetation may be able to be preserved and reinterpreted

Stabilization of river banks to allow visual connection

Sidewalk

Two way road

Shelter

Grapevines

Sycamores

Pine

Cherry Tree

Bulrush

Grazing

Low Planes to allow visual connection

Shelter

Grapevines

Sycamores

Pine

Cherry Tree

Bulrush

Grazing

Low Planes to allow visual connection

Shelter

Grapevines

Sycamores

Pine

Cherry Tree

Bulrush

Grazing

Low Planes to allow visual connection

Shelter

Grapevines

Sycamores

Pine

Cherry Tree

Bulrush

Grazing

Low Planes to allow visual connection

Shelter

Grapevines

Sycamores

Pine

Cherry Tree

Bulrush

Grazing

Low Planes to allow visual connection
NAHR EL KALB: Reviving The Riparian Corridor
Trail Sections

Section IV-D: A rocky Path

Section IV-A: The Oak Forest

Section IV-B: In between Oaks & Olives

Section IV OVERALL

Signage on the path is used to indicate the trail path.

Signage on the path is used to indicate the distance to the next point.

Signage on the trail is used to indicate the direction to the next point.

Plant species:
- Quercus cerris
- Ficus carica
- Olea europaea
- Phillyrea angustifolia
- Olea europaea
- Phillyrea angustifolia
- Quercus cerris
- Ficus carica
- Olea europaea

法律责任声明：本文件中的内容主要是景观设计，包括地形图、植物配置和路径标识。具体路径方向和距离标识等方面的信息可以通过仔细阅读和理解来获取。
NAHR EL KALB: Reviving The Riparian Corridor Trail Sections

Section IV OVERALL

Section IV-C: Close to the river experience

Section IV-E: A river walk next to agricultural fields
Bibliography

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