Case Study Investigation 2015
Project Review Sheet

Using This Form
This review sheet is designed for use as a collaborative work file during CSI 2015. The review sheet will house all case study content prior to submission to the LAF website. Please submit all CSI content to this document. LAF will then respond with comments on this review sheet. The review sheet is intended as a platform for dialogue related to the case study development process and will not be made public or referenced in the published case study.

As a shared document, the review sheet is intended to be used by multiple viewers, therefore it is important to track when comments are made and by whom. Please use the “comment” function to track the date/user name for all comments, or use a consistent color for comments in the document itself.

While LAF monitors the review sheets, more urgent questions or updates are better sent via email. Please contact LAF program manager Arianna Koudounas (akoudounas@lafoundation.org) about any time-sensitive issues which require an immediate reply.

Thank you for all of your work and we look forward to reviewing the findings of your research.
Project: Wadi Hanifah Comprehensive Development Plan

Final Draft: August 7

Before and After Images

Site Plan
https://www.dropbox.com/sh/o4nri8z5x89i5ri/AAATilNwqRqV-lz3kEoyh6Ha?dl=0

Landscape Performance Benefits

Environmental

- Cleaned, decontaminated, and flood-proofed 43.5 miles of river corridor to ensure that water and soil quality is suitable for human contact and non-potable uses. Removed 17.7 million cu ft of industrial and municipal waste (enough to fill a football stadium) from a total area of 3.9 square miles.
- Re-established a native riparian habitat corridor by introducing 114.9 acres of planted indigenous plant species, plus another 34.9 acres of seeded native grasses and perennials.
- Generated an additional 46.9 acres of self-renaturalized areas since 2010.
- Supports a diverse fauna, with 15 bird species, 9 fish species, 3 mollusc species, 2 amphibian species, and 3 reptile species inventoried since 2009.
- Sequesters 89,144.9 pounds of carbon annually (327,161.8 pounds in carbon dioxide equivalent).
- Reduces municipal/potable water consumption by using 92.5 million gallons per day of bioremediated urban wastewater for park amenities and irrigation.
- Reduces the average air temperature in public parks by XXX degrees relative to adjacent urban areas.

Social

- Attracts 200,000 visitors per week.
- Increased per capita open space allocation in Riyadh by XXX%.
- Re-established the social, cultural, and recreational significance of the wadi for Riyadh residents.
- Promotes environmental awareness through daily visual exposure to XXX commuters and XXX park users.

Economic

- Increased property values along the wadi ten-fold.
- Generated XXX in immediate real-estate development along the wadi
- Reduces flood-related expenditures on infrastructure maintenance and repair
- Increased local nursery production and sales of native plants by XXX
- Created ___ jobs during construction and ____ full time positions for ongoing maintenance

At a Glance Information
**Designer**
Moriyama and Teshima Planners Ltd.

**Project Type**
Stream restoration; Nature preserve; Park/Open Space; Waterfront redevelopment

**Former Land Use**
Industrial storage and disposal, aggregate extraction, water extraction, urban wastewater drainage, parking lots

**Location**
Riyadh, Saudi Arabia

**Climate Zone**
Hot desert

**Size**
1,738 square miles (4,500 square kilometres) drainage basin
74.6 miles (120 km) of riverbed
3,709 acres (1,502 hectares) of designed urban parkland

**Budget**
$1 billion

**Completion Date**
Planning: 2004
Design: 2010

**Project Assessment Area (boundaries)**
See images folder

**Overview**

The Wadi Hanifah and its tributaries form a unique 1,737 square-mile ecological basin, within which sits the Saudi capital of Riyadh. By the 1980’s urban growth had led to over-extraction of riverbed resources, industrial and raw sewage groundwater contamination, flooding liabilities, and widespread ecosystem collapse. Under the direction of the Arriyadh Development Authority, the 2001 *Wadi Hanifah Comprehensive Development Plan* established an Environmental Appraisal and Plan for the wadi basin, a Water Resources Management Plan, a Land Use Plan, and a 10-year implementation program. The environmental restoration of the wadi corridor was accompanied by the construction of the world's largest wastewater bio-remediation facility, which supplements the wadi's hydrological regime and supports downstream wetlands and agricultural uses.
The master plan also served as a catalyst for an ambitious reinvestment in Riyadh's public open spaces with nine major public parks integrated into a 31-mile long continuous river park corridor. The parks were designed to remediate some of the most derelict and contaminated sections of the river corridor and to serve as gateways to the vast network of parkland interpretive and recreational trails. To promote public accessibility while respecting local social practices the design included outdoor family privacy “rooms”, adequate parking, barbecues, and sanitary facilities. Local materials, including plant species, are employed throughout. Each park highlights a different feature of the river system, such as dams, lakes, and the wastewater bioremediation facility itself. Three of the parks provide residents opportunities to interact directly with the bioremediated water.

**Sustainable Features**

- Continuous publicly-accessible open spaces and parklands were provided along the Wadi and into surrounding residential areas, through the introduction of 9 major parks, 5 lakes (totaling 62.0 acres in area), 4.6 miles of pedestrian promenades, and 29.1 miles of recreational trails.
- A total of 43.5 miles of river corridor were reprofiled to a more naturalistic streambed configuration with multiple pools and weirs to increase habitat value and oxygenate water. This involved 88.3 million cu ft of soil cut and fill and required the narrowing or removal of 26.6 miles of roadways and the removal of 23.0 miles of pipes and overhead utilities.
- In the Riyadh section, both the river and urban wastewater are treated through a bioremediation process that uses a food-chain approach to capture nutrients and pathogens. This water is then used as a central feature in three of the main public parks.
- A total of 1805 planting cells were installed in 35 distinct configurations adapted to micro-conditions along the riverbed. These serve as hotbeds for seed propagation and promote renaturalization between planting cells. The cells include a total of 28,021 ornamental trees (7 different species or varieties), 6,000 date palm trees, 40,166 shrubs (20 different species or varieties), and 44,719 grasses specimens (8 different species or varieties). In addition, 33.54 acres of grasses and 1.38 acre of perennials were seeded. A total of 35 native plant species were reintroduced.
- XXX check dams in wadi tributaries help reestablish desert tablelands and rangelands.
- Over 2,000 lay-by parking stalls ensure public accessibility. Parking spaces were consolidated in less ecologically sensitive areas along the length of the wadi.
- 3,100 custom-designed lighting fixtures (both for functional and feature lighting) ensure nighttime accessibility.
- 30 toilet blocks control contamination of the river corridor.
- 730 pieces of signage facilitate environmental interpretation and wayfinding.
- Local materials are used almost exclusively, including limestone blocks for structures and aggregates for recreational trails.

**Challenge/Solution**

**Challenge**
The Arriyadh Development Authority's (ADA) 1994 *Strategy for Wadi Hanifah* recognized that the wadi’s restoration would only succeed within an integrated, long-term, watershed-scale management framework. This implied that initiatives within the urbanized perimeter of Riyadh would have to be conceived and pursued in concert with other interventions in adjacent tributaries, rangelands, and agricultural areas. The 2001 *Comprehensive Development Plan* also called for a bioregional renaturalization approach based on plant species indigenous to Riyadh’s arid desert setting. But the lack of established local environmental restoration expertise and infrastructure posed significant logistical challenges. As a result, the consultant's mandate became one of capacity building and locally-appropriate technical innovation.

**Solution**

The *Comprehensive Plan* first established watershed-based water management and land use plans, which are both administered by a new Wadi Hanifah Directorate. River corridor cleaning and flood-profiling interventions in the implementation stage were complemented with the construction of check dams in the upper desert catchment areas. These initiatives are now being extended into the ten main wadi Hanifah tributaries. Following the identification of key species indigenous to Wadi Hanifah, the ADA and its contractors collected cuttings and seeds from the least damaged portions of the Wadi and began the process of growing thousands of trees, shrubs and grasses in new, purpose-built greenhouses and nurseries. These plants were installed in 35 different variations of planting cells and constructed by the thousands along the wadi bed. The cells consist of gravel-topped planting beds that become local incubators for seed propagation between cells.

**Cost Comparison (Draft)**

- Compare cost per hectare relative to typical rehabilitation projects / park projects in the same area
- Compare costs associated with flood damage remediation (annual) versus cost of construction for the project

**Lessons Learned**

- Given its complexity, geographical extent, and expected multi-decades time to completion the restoration of Wadi Hanifah benefitted from a highly centralized administrative structure managed by the Arriyadh Development Authority. Yet, even in that context the ADA and the design consultant made a strategic decision to introduce public amenities in parallel to environmental restoration activities. Interpretative and educational programs with local elementary schools were also implemented early on. This tie-in between ecological and social benefits increased public awareness and support for the project, which helped the ADA enforce new environmental policies (such as the removal of industrial polluters) and implement more ambitious initiatives such as the bio-remediation facility. As the consultant observed, “once the general public buys into the vision there is no going back”.
- The rate of deterioration for equipment finishes, such as signage and lighting fixtures, proved much more rapid than anticipated. The client wanted darker finishes to reduce dust marks but
even manufacturer finishes with a high-yield ultraviolet warranty of 5 years showed significant bleaching after only two years.

**Products List**

- Lighting fixtures
- Signage
- Furniture

**Project Team**

**Client:** Arriyadh Development Authority, Saudi Arabia  
**Landscape and Planning Consultants:** Moriyama & Teshima Planners Ltd, Canada  
**Engineering Consultant:** Buro Happold, UK  
**Wastewater Consultant:** Nelson Environmental Inc., Canada  
**Construction Firm:** Badan Agricultural and Contracting Company, Saudi Arabia

**Role of Landscape Architect**

The landscape architect served as main liaison with the client and coordinated all phases of the development plan and its first phase of implementation. Particular emphasis was given to the environmental appraisal of the watershed and to the development of the rationale supporting an integrated approach for environmental restoration, urban wastewater bio-remediation, and public space provision. Responsibilities also included the site design of all parks, parklands, and facilities, contract documentation, supervision of implementation (including overseeing the creation of a local environmental restoration infrastructure), and the development of operation and maintenance manuals.

**Case Study Prepared By**

**Research Fellow:** Jean Trottier, Assistant Professor, Department of Landscape Architecture, University of Manitoba  
**Research Assistant:** Kevin Eidick, MLA Candidate, University of Manitoba  
**Firm Liaison:** Drew Wensley, CEO, Moriyama and Teshima Planners Ltd

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**References and Resources**

Aga Khan Award for Architecture project brief and citation:  
[http://www.akdn.org/architecture/project.asp?id=2258](http://www.akdn.org/architecture/project.asp?id=2258)


**Awards / Distinctions**

- Aga Khan Award for Architecture, 2010
- International Awards for Liveable Communities (LivCom) Community Sustainability Award “Natural Projects” – Gold, 2007
- “Highly Commended” Award by the British Expertise Association, UK, 2006
- Waterfront Center (USA) Top Honor Award: Wadi Hanifah Comprehensive Development Master Plan, Riyadh, Saudi Arabia, 2003