

“DESERT GARDENS” VS “GARDENS IN DESERTS” – CONTRASTING APPROACHES TO ARID LANDSCAPE DESIGN

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ABSTRACT

Arid regions cover approximately 30% of the earth's land area and are home to one-fifth of its population, yet limited attention has been given to arid landscape architecture. The design experience addressing scarcity of water and extreme climatic conditions is becoming highly relevant to many other regions as they tackle decreasing freshwater supply and global warming. Arid landscape architecture provides unique solutions regarding six major facets: general character, shelter of comfort, water use, materiality, culture and maintenance. Preserving diverse landscapes' character and improving human use are potentially conflicting aims of landscape design, but in arid regions this tension is intensified since suiting the landscape to human comfort necessitates changing its identity. In this research we provide a design strategy to mediate this fundamental tension, based on studying the work of Shlomo Aronson, a leading practitioner, who introduced a personal approach to arid landscape design through his forty years of experience in the Israeli desert (Figure 1). Analyzing his oeuvre, we have developed a “spectrum of desertness” – a framework for assessing existing arid gardens and planning new ones. We differentiate between two contrasting archetypes of desert design – “garden in the desert” which is a generic green garden characterized by prodigious water use and high maintenance; versus “Desert garden” – a sustainable water-saving garden that utilizes local materials and plants and requires minimal maintenance. Between these two archetypes lies a spectrum of potential design solutions for a given site which address the six facets in varied combinations. Our framework advocates for sustainable solutions. It can either emphasize human comfort through distinction from its environment, though compact to be effective, or follow genius loci, the special atmosphere of particular place, assuming increased human tolerance to the hostile environment. Creating a modest human-made oasis is our preferred approach to mediate the aforementioned tension.

INTRODUCTION

“Arid lands”, e.g. deserts or drylands, are characterized by scarcity of water and humidity, strong winds and large temperature fluctuations on both a daily and seasonal scale (Miller 1978). They are ubiquitous across all inhabited continents and becoming more prevalent due to anthropogenic climate change and desertification (United Nations 2011).



Figure 1: Arid zones in Israel and the location of projects analyzed in this work.

Arid Landscape Architecture – Characteristics and implications

The harsh conditions in drylands pose challenges for human settlement. Historically, permanent habitation of deserts was restricted to natural oases, where gardens such as the Persian “Bagh” or Sinai’s “Bustan” were created. Modern arid gardens often reflect the settlers’ belief that technology will conceal the environmental conditions (Wescoat 1996).

The vast literature of landscape design includes only a few guidebooks written about design in arid landscape (Eckbo 1983, Miller 1978, Aronson 2008, Golany 1983). From these sources, we identified six major facets that arid landscape designs should address:

General character is how the garden is integrated into its surrounding, and the way it

maintains its “genius loci” which is often unique and powerful, with dominant geology visible through the scanty vegetation (Aronson 2008).

Creating a shelter for **human comfort** addresses both physical and psychological aspects. Physical shelter provides thermal comfort protecting users from climate extremes, glaring reflection and dusty winds (Golany 1983). Psychological considerations refers to the contrasting reactions that the desert evokes among people: some feel threatened, lonely or lost in the wide horizons, while others are fascinated by the scenery of genesis (Sagie et al. 2013).

Water deficit is the most dominant factor in the arid landscape. Scarcity, coupled with high variability in precipitation and high rates of soil erosion and salinity, lead to low primary productivity (Maliva 2012). Human existence, as well as vegetation, rely on water, which can either be found naturally (as in oases), brought from distances, desalinated or harvested locally from runoff using dams or cisterns.

Materiality refers to the physical and biological elements in the garden, including soil, vegetation and construction materials. These can be either local for sustainable integration in the environment, or imported when more durable in the harsh conditions as radiation and heat. Plants, like humans, need shelter – a niche with a humid microclimate, natural or irrigated (Lyle 1996).

Cultural aspects refer to the native human inhabitants and their traditions, and also to cultural needs of current residents, such as recreation, wellbeing, etc.

Maintenance describes the amount of human investment required to maintain the garden over time for its continued use and evolution (Young 1996). It is a fundamental component of sustainability, when considering resources such as water and energy.

	General Character	Human Comfort	Water use & source	Materiality & plants	Cultural aspects	Maintenance
						
Limans	Many small-scale gardens, determined by natural water availability	Thermal comfort in summers, sometimes too cold in winters	Retains runoff water from drainage basin	Local soil; non-native trees	Reminiscent of Nabatean traditions	Very extensive maintenance, sustainable, resilient, adapted to local conditions
Eilat south promenade	Restores natural character with some green additions	Some thermal comfort	Minimal use of desalinated water	Both local and imported materials. Xerophytic plants	Addresses social-recreational needs	Limited maintenance, sustainable, resilient. Uses drip irrigation
Sapir Park	Richly green and verdant, resembles the nearby natural marsh and spring	Thermal comfort year-round	Local saline groundwater for lake, stream and waterfall	Both local and imported materials and plants. Irrigated	Appreciation of natural resources, a manmade oasis, recreational park	Medium maintenance, sustainable, independent local water source, uses drip irrigation
B.G.University central plaza	An abstract interpretation	Thermal comfort year-round	Medium use of water for modest stream	Both local and imported materials and plants. Irrigated	Respects local heritage and common landscapes	Medium, constant maintenance. Requires few resources. Sustainable

Table 1: Considerations of the six facets in the case studies

In arid regions, there is an inherent tension between the two first facets: restoring the genius loci and providing a thermal comfort shelter, since suiting the landscape to human comfort means changing its identity. Our research aims to explore **how landscape architecture can mediate the tension between maintaining genius loci and providing thermal comfort.**

METHOD

We chose four well documented projects of landscape architect Shlomo Aronson’s desert oeuvre, varying in scale and surroundings, where this tension was mediated. We scrutinized the considerations of the “six facets of arid landscape design” in these projects, and analyzed their suitability to arid lands.

ARONSON’S CASE STUDIES CONSIDERING THE “SIX FACETS”

Shlomo Aronson, a leading practitioner, has been working during the past forty years in arid Israeli towns and countryside. He was inspired by traditional gardens such as the “Bagh” and the “bustan” (Aronson 2008), but he applied his own interpretation to the national mission of populating the desert, considering its genius loci, and providing thermal comfort. We examined four of his desert projects (Aronson 1998, Aronson 1977, Aronson 2015) to explore the way he mediated the aforementioned tension:

“Limans” (“port” in Greek) are small groves planted in a small area with embankments within a dry stream bed (“wadi”), creating a shady summer refuge for travelers and shepherds (Figure 1). Limans collect runoff from a basin 20 times larger than their own 0.1-0.5 hectare

Facet	Desert garden		Garden in the desert
General character Genius-loci, Integration in surroundings 	Preserving genius loci – local spirit. Gently integrated, respectful, emphasizing and interacting with the environment 	βà	A green verdant environment. Not relating to desert genius loci. Sharp contrast to the surroundings, reflecting humans ability to dominate and alter nature 
Shelter for Human Comfort in arid conditions physical comfort & psychological concerns 	Minimal or no shelter, may provide some shade and protection. No thermal comfort. Attractive in summers at sunrise and sunset, and midday winters. Restores its natural identity 	βà	Provides a green refuge on a large scale, which might limit its effective temperature reduction. Improves thermal comfort in some areas, with non-effective parts between them. Satisfies the yearning many people have for green 
Water source and use 	Limited water, if any, from local sources (natural or recycled) 	βà	Prodigious water use, transported from a distance or desalinated 
Materiality and Planting type, Irrigation 	Stone, rocks, local earth. Other materials durable to heat and radiation such as concrete and metal. No vegetation or only local-native adapted to arid climate 	βà	Diversity of materials. Planting of cultivated plants, flowers, lawns etc. Intensive irrigation 
Cultural Aspects 	Respects traditions and cultural heritage 	βà	Addresses social-recreational needs 
Maintenance 	Sustainable, resilient. Minimal maintenance, if any 	βà	Requires significant resource input (water, energy and care). Intensive maintenance 

Table 2: How the two archetypes of arid landscape design consider “the six facets”.

area, thereby sustaining a relatively humid habitat (Shachak et al. 1998). Inspired by Nabatean settlement during Roman times, it has been applied since the 1960s by the Keren Kayemeth L’Israel (the country’s quasi-national forest service). Almost 500 limans were planted, introducing small focal interventions along desert roads.

South-beach promenade is an example of arid design in an urban setting. It is located in Eilat, a tourist city on the Red Sea, where a former granite quarry was turned into an attractive walking and recreational area along a narrow one-kilometer strip. Located between mountains and sea, it reflects the natural landscape using granite groundcover and sculptural elements, and includes wooden structures for shade.

Sapir Park in the Arava utilizes local saline groundwater, designed to flow from a waterfall to a narrow stream running into a lake. Created on marshland, it is sharply distinguished from its surroundings by color, cooler microclimate, and the sound of water providing a comfortable park for recreation all year round.

Ben Gurion University central plaza in Beer Sheva is an urban space that introduces abstract nature to the predominately concrete campus. It features a desert stream with circulated water, a familiar and meaningful local landscape for students from different cultures. Well-defined lawns and vegetated areas with trees, along with shading structures above paths and resting areas, create a cool, popular place.

ANALYSIS: A PROPOSED SPECTRUM OF “GARDEN DESERTNESS”

Analyzing each facet as applied in the case studies, we found that they show various levels of “**desertness**” (adaptability to the arid environment); while some emphasize the natural identity, others focus on providing a shelter from the harsh conditions. This led us to develop a conceptual model: “The spectrum of adaptation to arid lands” (Figure 2), which

differentiates between two contrasting approaches to desert design: “**desert gardens**” versus “**gardens in the desert**” and proposes a gradient between them.

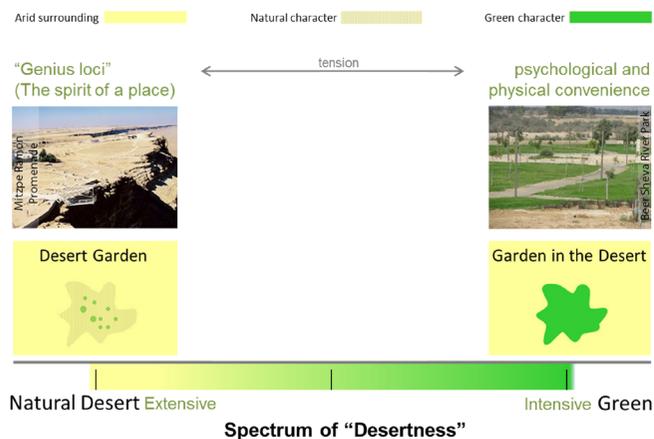


Figure 2: Spectrum of adaptation to arid lands

“**Gardens in the desert**” are generic green gardens characterized by intensive planting, prodigious water use and high maintenance in order to supply shelter and to facilitate physical and psychological comfort. This is a common design form, perhaps preferred by desert residents, for whom it may represent vitality. In contrast, “**Desert gardens**” follow the site’s spirit and natural desert character, emphasizing sustainable water-saving methods that use local materials and plants, requiring minimal maintenance.

We suggest that each archetype can address the six facets at their extremes, which have both advantages and disadvantages (see table 2): “Garden in the desert” addresses psychological yearning for green, but is not sustainable and is not effective in achieving physical comfort when spread over large areas. Alternatively, the “desert garden” design can restore genius loci, but does not offer shelter from the harsh climate. In practice, each facet can be addressed along

a spectrum of design possibilities to find the optimal solution for the site, as indicated in the case studies.

To evaluate each case study’s adaptability to the arid environment (see figure 3) we assessed the considerations of each facet in the projects (table 1) according to the facet’s level of “desertness” (table 2). Thus we could locate them along the spectrum between the two archetypal gardens, moving from “desert garden” and “garden in the desert” (Figure 4).



Figure 3: Evaluating the case studies on the spectrum according to each facet

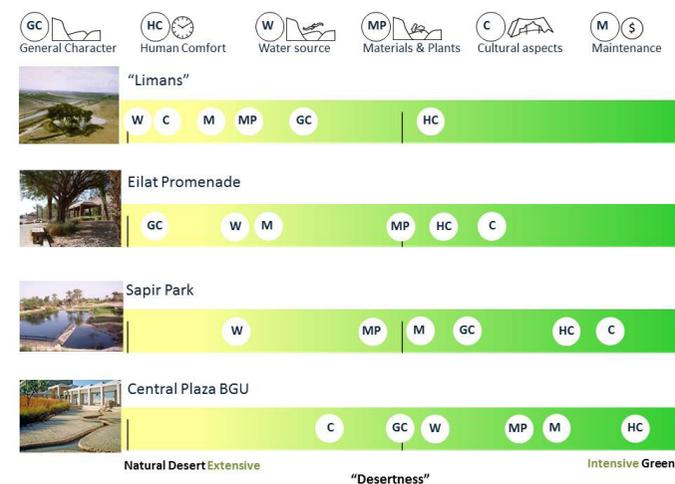


Figure 4: Relative positions of the case studies along the spectrum

DISCUSSION

Locating the case-studies on the spectrum, we suggest that Aronson’s design doesn’t fall at the extremes of the archetype’s definitions; they all span the “spectrum of desertness”, either tending toward a “garden in the desert” if human comfort is the main emphasis, or towards “desert garden” when the site has exceptional identity. Aronson attempted to mediate the tension between genius loci and human comfort and to achieve a suitable amount of both, introducing a range of “man-made oases”. Inspired by the traditional gardens of Sinai and Iran, he designed gardens that are vivid as “gardens in the desert”, but limited in size to save resources and to leave most of the surrounding area untouched. His work provides us the practical examples with which we suggest the **design strategy** below.

When conducting a new project in arid regions, we believe that identifying the desired image of the two archetypes is a good entry point towards understanding the implications of the design, whether “desert garden” (emphasizing local identity) or “garden in the desert” (providing a green shelter). To apply sustainable garden design, reduce costs and maximize benefits, adaptations may be applied in both archetypical cases. A “desert garden” requires humans to adapt psychologically and physically to achieve comfort, either by education to develop an appreciation for dry landscapes or by limiting activity hours to those of comfort, (e.g. early mornings or late afternoons). A “garden in the desert” should be compact, and thus consume fewer resources and reduce changes in the genius loci. In practice, it will become a **man-made oasis**.

In practice we find the “man-made oasis” the most useful approach to mediate this tension, since it offers an effective shelter with minimal change of the environment and a reference to traditional and sustainable solutions that were introduced historically into specific arid regions.

CONCLUSION

Our proposed strategy of the “spectrum”, based on Aronson’s approach to arid landscape design, was tested practically as a design tool to tackle multiple facets and balance between them in varied scales and arid environments. It enables us to clarify the conditions, the requirements, and the possibilities in terms that can make the design more coherent.

Simplifying the complex process of planning in reference to this spectrum, based on six clear facets, helps both researchers and practitioners to understand the essence of arid regions and hence examine the suitability of any specific design for such an environment. Broader research should examine the unique design solutions that arid landscape architecture provides to address the various constraints.

The current decade (2010-2020) was declared by the United Nation as a UNDDD – “decade for deserts and the fight against desertification”, since dryland conditions may become more prevalent with greater water deficit, climate change, desertification and growing human development into arid regions. The lesson from design strategies in arid regions could be useful to promote the UN’s purpose of the decade as “an opportunity to make critical changes to secure the long-term ability of drylands to provide value for humanity’s wellbeing” (UNITED NATIONS 2010).

The framework arising from the challenge of bridging the gap between human comfort and genius loci in a sustainable way could be applied not only to arid lands, but wherever such a gap exists, such as in degraded lands (mines, quarries, wasteland), where the landscape architect aims to restore the site’s local identity while improving its potential for human use.

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ILLUSTRATIONS AND THEIR SOURCES

Figure 1: Arid zones in Israel and the location of arid projects analyzed in this work.

http://upload.wikimedia.org/wikipedia/commons/c/c9/Satellite_image_of_Israel_in_January_2003.jpg

Cropped from original by Jacques Descloitres, MODIS Rapid Response Team, NASA/GSFC. Edited by authors.

Liman – By Dave Boimowitch, KKL archive

Figure 2: Spectrum of adaptation to arid lands

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Mitzpe Ramon Promenade –designed by Zvi Dekel, Minadd-
http://minadd.com/uploads/head_img/img_1292502928.jpg

Bagh-e-Fin, Iran – Hossein Chaychi- <http://static.panoramio.com/photos/large/43499177.jpg>

Beer Sheva River Park – Yehudit Garinkol – http://www.pikiwiki.org.il/?action=gallery&tag_id=1933#

Figure 3: Evaluating the case studies on the spectrum according to each facet

©Adi Noy Ivanir (Photos – See figure 4)

Figure 4: Relative positions of the case studies along the spectrum

Limans; South Beach Promenade, Eilat; Sapir Park; Central Plaza BGU, Beer Sheva – Shlomo Aronson Architects

* Graphic editing of the images: Adi Noy Ivanir, Yulia Langman and Rakefet Sinai.