

Title:	<b>Examining King Abdullah Financial District (KAJD)</b>
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Subjects:	Sustainability/Green/Energy Urban Design
Keywords:	Energy Master Planning Microclimate Sustainability Sustainability Certification Urban Planning
Publication Date:	2014
Original Publication:	CTBUH 2014 Shanghai Conference Proceedings
Paper Type:	1. Book chapter/Part chapter 2. Journal paper 3. <b>Conference proceeding</b> 4. Unpublished conference paper 5. Magazine article 6. Unpublished

# Examining King Abdullah Financial District (KAFD)

## 阿卜杜拉国王金融区之分析研究



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他在过去赢得许多设计竞赛,并负责随后的建筑设计项目。除了Henning Larsen Architects, Claude也曾任职于其他国际闻名的建筑设计公司。他设计的建筑荣获多项大奖,印证了他在建筑设计方面的独特才华。

### Abstract

The quality of space between buildings has become increasingly determinative in the success of any new urban district. This paper explores the viability in creating a sustainable high density urban quarter in a desert environment, and in particular, the possibility of creating an animated public realm in the climatic and social context of the Kingdom of Saudi Arabia.

The King Abdullah Financial District (KAFD) is one of the world's largest building developments currently seeking sustainability accreditation with more than 1.6 million square meters of gross site area. The development comprises 40 towers and 10 cultural and leisure premises and provides approximately 3 million square meters of space of various uses.

This paper will address the three areas that are focused in the design of KAFD with the aim of creating a quality urban environment in the context of Saudi Arabia, namely: genius loci, microclimate, and pedestrian mobility.

**Keywords: Masterplan, Urban, Sustainability, Microclimate, Riyadh, Energy**

### 摘要

一个新的城区成功与否,往往取决于建筑物之间的空间素质,而这个因素在最近亦变得越来越重要。本论文旨在探讨在沙漠地区进行具有可持续性的高密度城区规划的可行性,特别是在沙特阿拉伯的气候及社会文化环境下,如何创造生气勃勃的公共领域。

阿卜杜拉国王金融区(King Abdullah Financial District, 下称KAFFD)是现今世上最大的建设项目之一,建筑面积超过160万平方米,并争取在可持续性方面得到认证。项目包括40座高楼以及10座文化及康乐建筑,为该区域提供约300万平方米各种用途的空间。

本论文将讲解KAFFD设计规划的三个方面,分别为场所精神(genius loci)、小气候(microclimate)和行人流动性(pedestrian mobility)。设计规划以这三个方面作为重点,并针对沙特阿拉伯的独有文化,打造出高质市区环境。

**关键词: 整体规划、城区、可持续性、小气候、利雅德、能源**

### Background

The Kingdom of Saudi Arabia has embarked on a journey of economic, social and political reforms ever since King Abdullah's accession to the throne. As part of the effort in implementing these reforms the Kingdom has invested heavily in numerous mega projects throughout the country to modernize its infrastructure. Coupling with various socio-political reforms that are being implemented in the Kingdom, these mega projects are envisaged to function as a vehicle to facilitate the delivery of these reforms. The flagship King Abdullah Financial District is one of such mega projects created throughout the Kingdom.

Situated on the periphery of downtown Riyadh, The King Abdullah Financial Center occupies a site area of 1.6 million square meters. The multi-phased development accommodates a total gross floor area of 3 million plus square meters, comprising of approximately 2,000,000 m<sup>2</sup> of offices and business area; 600,000 m<sup>2</sup> of

### 背景信息

自国王阿卜杜拉登基以来,沙特阿拉伯致力在经济、社会及政治各方面实施一系列的改革。作为改革政策中的一部分,王国对当地多个巨型项目作出大量投资,以实现基础设施现代化。配合其他各种社会及政治方面的改革,这些巨型项目被普遍视为促进实现改革成果的渠道,而KAFFD就是沙特阿拉伯王国的众多巨型项目的其中之一。

KAFFD位于首都利雅德市区的外围,占地面积160万平方米。这个多阶段发展项目的总建筑面积超过300万平方米,当中约200万平方米为办公室及商业用途,60万平方米为住宅用途,15万平方米为酒店用途,5万平方米为展览及会议厅,7万平方米为政府及社区建筑,而余下的15万平方米则预留为其他有吸引力的项目。目前,进驻KAFFD的机构包括沙特资本市场管理局(Saudi Capital Market Authority)、桑巴银行(Samba Bank)、沙特证券交易所(Tadawul)、一家大型金融学院以及其他重要的金融

residential; 150,000 m<sup>2</sup> of hotel and hospitality; 50,000 m<sup>2</sup> of exhibition and conference halls; 70,000 of government and community buildings; and 150,000 m<sup>2</sup> of attraction programs. Current major tenants include the headquarter for the Saudi Capital Market Authority, Samba Bank, the Saudi Stock Exchange (Tadawul), a major financial academy, and other key financial institutions. The tallest building in KAFD will be 385 meters in height which crowns the landmark Financial Plaza located in the heart of the financial district.

## Energy and Economy

Oil rich Saudi Arabia is the world's largest exporter of oil and is currently the second largest oil producing country in the world, slightly behind The Russia Federation. For decades, the image of Saudi Arabia as the land of "black gold" has been firmly ingrained in the collective consciousness. It is little known that the Kingdom is facing a potential energy crisis. According to Chatham House, a world-leading independent think-tank, Saudi Arabia's place in the world oil market is threatened by unrestrained domestic fuel consumption. In a report by Chatham House that draws on findings of a year-long project on energy consumption and conservation in Saudi Arabia, it is found that the Kingdom currently consumes over one-quarter of its total oil production at an increase at 7% per year. It concludes that the current trajectory of domestic oil consumption in the Kingdom is unsustainable and domestic demand could potentially outstrip the Kingdom's oil supply, rendering Saudi Arabia a net oil importer by 2038 (Lahn and Stevens 2011). Understandably, this is a more or less exaggerated projection based on various assumptions. However, as the country's oil revenue constitutes over 80% of government spending (Lahn and Stevens 2011), any form of optimization on fuel consumption deserves to be studied. According to the International Energy Agency, buildings represent 32% of total final energy consumption and around 40% in terms of primary energy consumption (IEA, 2013). Any efficiency on energy consumption achieved in the built environment will have a positive impact on the overall economy. Here, KAFD plays a significant role in spearheading this effort.

High on King Abdullah's reform agenda is the creation of an economy that is not dependent on the export of oil. The oil sector creates far from enough jobs to sustain the working population. With more than 13 million Saudis (half of the population of the country) under 20, the King is trying to create more than a million new jobs and four million homes within two decades (Ouroussoff, N. 2010). KAFD, along with several economic cities created in various parts of the Kingdom, are some of the Kingdom's initiatives to create economic hubs to diversify the economy beyond the hydrocarbon sector.

## A Catalyst for Change

In line with the spirit of some of the high-profile mega projects initiated by the Kingdom's ruler, the flagship King Abdullah Financial District is a physical manifestation of the King's vision of a more open and tolerant Saudi Arabia. It is envisaged that KAFD will be an international district with a global outlook to facilitate the creation of a non-oil-dependent economy run by a new generation of both male and female professionals who can function and excel in the global marketplace. To this end, the first task at hand is to redefine the prevailing perception of the public realm in Saudi Arabia. Today public spaces where people of different sexes and social status can mingle are very few; public buildings have separate entrances for men and women; restaurants have separate dining areas; and men and women avoid riding elevators together. To those who are familiar with the socio-political landscape in Saudi Arabia, it could be seen as a breakthrough that the design guidelines of KAFD do not mention anything about separation of the sexes.

机关。KAFD最高的大楼为385米，是金融区中的地标——金融广场 (Financial Plaza) 建筑群的最高峰和核心。

## 能源与经济

沙特阿拉伯的石油资源丰富，是世界上最大的石油出口国，石油产量仅仅落后于俄罗斯，排世界第二。在过去数十年，沙特阿拉伯的“世界油库”形象已经深深地铭刻在众人的脑海里，可是很多人却不知道这个中东王国正面临潜在的能源危机。根据世界知名的独立智库Chatham House报告，沙特阿拉伯在世界原油市场的地位正被本地无约束的内需消费所动摇。报告分析沙特阿拉伯一年内的能源消费及节能效率，发现消费的能源占当地总原油产量超过四分之一，而消费量更每年上升7%。报告总结说，沙特阿拉伯当地的原油消费趋势并不具持续性，国家必须面对国内能源需求超越总石油产量的潜在风险。沙特阿拉伯可能在2038年会变成石油净进口国 (Lahn and Stevens, 2011)。当然，这预测以多个假设为基础，有被夸大的可能性，但如果考虑到沙特阿拉伯的原油出口利润占80%的政府开支 (Lahn and Stevens, 2011)，任何模式的油耗优化则变得有考究的必要。根据国际能源机构的数据，建筑物的能源消耗量占最终能源消费的32%，或约40%的一次能源消费 (IEA, 2013)。在建筑设计方面提升能源效能，将为整体经济带来正面影响，而KAFD的规划亦将扮演重要角色，推动当地能源消费高效化。

阿卜杜拉国王的改革核心，就是打造一个不依赖原油出口的经济体系。目前，原油产业所创造的工作职位数目远远不能满足沙特阿拉伯的劳动人口。察看沙特阿拉伯的人口比例，小于20岁的超过1,300万，占全国人口的一半。因此，国王希望在20年内创造超过100万份职位以及兴建400万个住宅单位 (Ouroussoff, N. 2010)。落实的计划包括KAFD以及国内其他地区的几个新经济都会，目标是支持经济多样化发展，摆脱对石油产业的依赖。

## 改革的催化剂

就如沙特阿拉伯国王推动的其他高调巨型项目，KAFD是国王对沙特阿拉伯的未来愿景——成为开放而宽容的国度之实体呈现。KAFD将成为具环球视野的国际化金融区，负责打造独立于石油产业的经济体系，并由新一代精于环球市场的男性及女性专业人员推动发展。为此，首要工作就是改变群众对沙特阿拉伯公共领域的看法。目前，不同性别及不同社会地位人士可以聚集的地方非常小。公共建筑有不同的入口，指定给男性或女性使用。餐厅也有不同的进餐范围，而男性和女性也避免共同乘搭同一部电梯。对于熟悉沙特阿拉伯的社会政治环境的人来说，KAFD的设计规划并没有提及任何两性分隔的事宜，是当地建筑史上的一大突破。

为了培育当地新一代的专业人员，政府十分重视金融区的国际视野及开放性，同时鼓励本地人和外地员工一起共同作业。目前，对于本地人无法应付的专业职位，沙特阿拉伯必须依赖外来的专业人员前来任职。政府希望此举长远能够促进知识转移，并视其为改革的目标之一。KAFD在规划上的开放性及其自由性，加上金融区内的高尚住宅设计和生活配套，将有助吸引更多的外国专才前来工作，让KAFD成为真正的国际金融中心。

## 阿卜杜拉金融区的愿景

与最近几十年全球各地兴起的新都会相似的是，KAFD的发展是由投机与威望所推动。作为沙特阿拉伯的首都以及地区的重要经济力量，利雅德需要一个世界级的金融区来展示自己的地位和潜力。利雅德目前位于市中心的商业区在过去能够满足经济需要，但其金融代表性不足，办公室的位置也不甚集中。分析利雅德的办公室市场，就会发现甲级办公室的供应量严重不足。随着未来金融及商业就业人数将会增加，增加利雅德的高级办公室数目是



To nurture a new generation of homegrown professionals, the financial district has been given a mandate to foster global outlook and openness by promoting the mingling of Saudis and expatriates. Currently the Kingdom relies on foreign professionals to fill positions that are otherwise difficult to recruit from its own population. It is hoped that such exchanges will eventually facilitate knowledge transfer that the reform effort aims to achieve. It is anticipated that KAFD's relative openness and liberalism coupling with high quality residential apartments and lifestyle components integrated in the district will attract more foreign talents to the Kingdom's capital and make KAFD a true international financial hub in the region.

### Envisioning King Abdullah Financial District

Similar to the various new urban districts that have sprung up around the world in the last few decades, the development of KAFD is to a large extent driven by speculation and prestige. Riyadh, as the capital of the Kingdom and the key economic force in the region, requires a world class financial district to reflect its current status and future potential. The existing downtown business area in Riyadh has served the city well, but financial sector representation is limited and their offices are dispersed. It has been identified that the current office market in Riyadh suffers from a lack of supply of class A office floor space, and given the projected rise in financial and business services employment there is clearly a need to provide more high quality office space within Riyadh. Worldwide, cities with successful financial sectors provide opportunities for the relevant businesses to be located in a central community within easy reach of one another, ideally with a wide range of supporting facilities to encourage businesses to locate there. It has been recognized that it is very difficult to redesign Riyadh's existing downtown area to the required standard and with the optimal capacity to stimulate a center of excellence to develop, therefore a purpose built location is proposed.

Henning Larsen Architects, a global Danish practice with strong Scandinavian roots was tasked to deliver the design of the KAFD masterplan in 2006. The immediate challenge of designing the masterplan for the district is how to efficiently accommodate the enormous floor area required and the associated infrastructure without resorting to the Doxiadis Plan of Riyadh, a "supergrid" that was introduced to Riyadh by the acclaimed Greek architect and town planner Constantinos A. Doxiadis in the 1960s; and how to address the eye level experience of a large scale commercial development. To this end, Henning Larsen Architects drew inspirations from the traditional urban form that was prevalent in the region before the discovery of oil, at the same time extending the Scandinavian sensitivity in place making to shape and animate a people centered public realm between the buildings (see Figure 1).

### Genius Loci

Approximately 35% of the masterplan area has been reserved for pedestrian only public space in the form sunken outdoor thoroughfares and passages. Seemingly carved into the ground, these outdoor spaces are framed by closely clustered buildings of various height; and consequently made more pronounced as a landscape expression that is reminiscent of a special geographical feature found in the region known as a wadi (see Figure 2).

Wadi is the Arabic term referring to a dry riverbed found in the desert environment. A wadi is formed by flowing water resulted from infrequent heavy rainfall, which is a characteristic of the desert

有确实的需要。在全球各地，拥有一流金融区的城市都能够把企业汇聚在同一地点，让企业之间的联系更紧密，同时为这些企业提供一系列配套措施，鼓励更多企业前来设置办公室。有关当局发现，要重新设计利雅德现时的市中心来满足金融区的发展需求是一件十分困难的事，所以建议另觅位置来打造新的国际金融中心。



Figure 1. KAFD design phase visualization vs current construction. (Rendering source: Henning Larsen Architects, Photo source unknown)

图1. KAFD设计阶段效果图与施工场景对比 (效果图来源: Henning Larsen 建筑事务所; 照片来源未知)



Figure 2. KAFD masterplan with the green area indicating The Wadi and the red line indicating monorail.

图2. KAFD总平面中绿色区域代表干谷，红线代表单轨铁道

environment. When such event occurs, a wadi is then transformed into an intermittent river that provides a sudden burst of life to the dormant vegetation nearby. Like an oasis, a wadi is a source of life. The Wadi of KAFD is the urban artery of the district that links the five quarters of the district together. The Wadi is a sunken urban passage 6m below grade that is densely covered with lush palm trees, layered vegetation and water features defined between a variety of shops, cafes, restaurants, leisure destinations as well as the main institutional and cultural organs of the district. The urban “wadi” of KAFD owes its inspiration and its actual datum and locality to the existing wadi that is found on the site of KAFD. Besides its spiritual function as an urban artery, incidentally the urban “wadi” also fulfills the physical function of its predecessor as a rain water relief course (see Figure 3).

The Wadi of KAFD is envisaged to be a pedestrian orientated outdoor public space that sustains an animated urban life during the day as well as in the evening (see Figure 4). The extreme desert climate of Riyadh poses a significant obstacle in creating a sustainable outdoor urban environment. High temperatures in summer limit people’s willingness to walk and to be outdoor. The design solution of the masterplan exploits a significant feature of traditional desert townscapes in the Gulf region before the discovery of oil, that the buildings tended to be closely clustered together and separated only by narrow shaded alleyways. This feature allowed buildings to offer each other mutual shading. Although building clustering may also have been the result of providing maximum density possible within a fortified perimeter. This traditional planning model provides an ideal narrative for the design of KAFD which has to accommodate a very large amount of floor area within the confine of its site boundary that is defined by vehicular ring roads in the shape of a leaf.

The success of the design for the masterplan will depend heavily on the orchestration of the clustering of building masses and in particular the way they meet the ground. To this end, masterplan regulations and specific design guidelines for each and every building parcels play an extremely important role as a control mechanism to ensure that the final result adheres to the original design vision. Whilst The Wadi constitutes the main human experience of the masterplan, the roofscape also contributes to the overall human experience of the district. A distinct feature of KAFD is that roofs within the district must not contain visible technical installations. All plants and installations on the roof must be integrated into the building envelope regardless of the heights of the buildings in order to accentuate the architectural statement of a highly orchestrated built form. The roofscape will be highly visible from the tallest buildings in the masterplan. Located to the east of The Wadi, this cluster of office towers positioned around the iconic Financial Plaza form the financial heart of the district (see Figure 5). These towers serve as a beacon of the district that provides a sense of orientation on The Wadi as well as projecting an unmistakable presence of KAFD in the global financial landscape.

### Microclimate

Riyadh is situated in the middle of the Saudi Arabian desert and it is extremely challenging to create a passively controlled outdoor microclimate that is comfortable for urban life. The massing and geometric articulation of the masterplan has a significant impact on the comfort level experienced in the spaces between buildings. Comprising of mainly mid-rise and high-rise buildings, they are strategically placed to optimize the distance between buildings in order to provide optimal shading for The Wadi as well as for each other (see Figure 6). The relatively short distances between the buildings also help reduce the impact of the occasional sandstorms. The site is

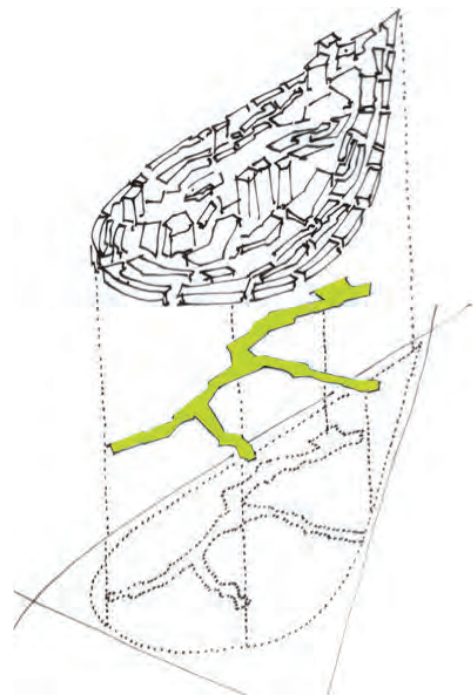


Figure 3. KAFD initial concept sketch.  
图3. KAFD最初方案草图



Figure 4. The Wadi: A public space shaped and protected by tall buildings. (source : Henning Larsen Architects)  
图4. 干谷: 由高层建筑组团塑造及围护的公共空间 (来源: Henning Larsen 建筑事务所)

2006年，Henning Larsen Architects——一家拥有悠久北欧传统的丹麦设计公司获委托负责KAFD的整体规划。整体规划最大的挑战是如何有效善用有限的空间，容纳庞大的建筑面积及其相关设施，同时避免重复Doxiadis的利雅德规划。Constantinos A. Doxiadis是一位著名的希腊建筑师和城市规划师，他曾经在上世纪60年代为利雅德进行城市规划，并采用“超级方块 (supergrid)”——把市区以方块形式切割和规划。我们面对的另一难题是确保这大型的商业发展项目在观感上同样具备美感。为此，Henning Larsen Architects从当地发现石油前的传统市区模式取得灵感，并为规划设计注入斯堪的纳维亚的感性，让建筑物之间的公共空间体现以人为本的精神 (见图一)。





Figure 5. Financial Plaza. (source: Henning Larsen Architects)  
图5. 金融广场 (来源: Henning Larsen 建筑事务所)

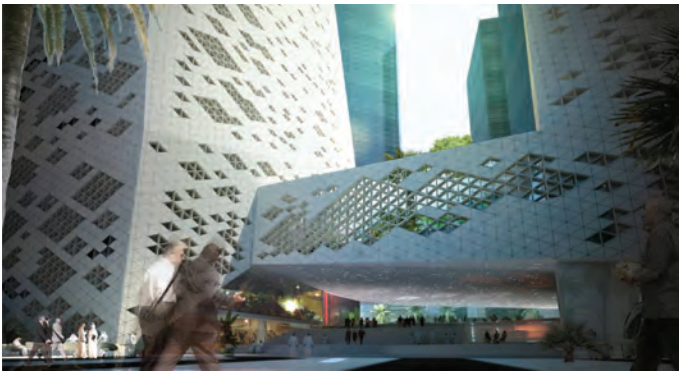


Figure 6. Crystal Towers: Linking The Wadi to the Financial Plaza. (source: Henning Larsen Architects)  
图6. 水晶塔: 联接干谷与金融广场 (来源: Henning Larsen 建筑事务所)

subject to prevailing strong winds from north and moderate winds from southeast. The hierarchical orchestration of building heights and proportions enables manipulation of these prevailing winds for optimal diversion over and around the development to mitigate potential discomfort experienced at the pedestrian level; as well as for optimal channeling to create highly desired breeze through The Wadi (see Figure 7). The provision of masterplan guidelines for the selection of façade materials facilitates the control of daylight experienced between as well as within the buildings (see Figure 8). Strategic incorporation of still and moving water features and misting systems; as well as vegetation for shading and windbreaks to mitigate the adverse effects of air-born sand, further enhances the microclimate experienced on The Wadi. The combined effort from these passive measures has the effect of reducing the outdoor temperature on The Wadi by up to 6-8 degrees Celsius.

### Pedestrian Mobility

Riyadh has one of the highest car dependencies of any city in the world, even for relatively short distances. This could probably be explained by the fact that the city's public transport infrastructure is severely underdeveloped. Although it is widely recognized that the inhabitants' preference for traveling in air-conditioned cars and traveling in privacy contributes to such dependency. Cultural norms also play a significant role in opting for private vehicles. KAFD challenges the status quo.

### 地方特色

在整体规划中, 约35%的空间是预留给公共行人专用的下沉式户外通道。这些户外空间被高度不一的建筑群包围着, 看起来就像稍微下沉似的。这种景观的表达让人想起当地的一个独特地理特色——干谷 (wadi) (见图二)。

干谷, 或阿拉伯语的wadi, 是形容沙漠环境中的干旱河床。干谷是由不定期的大雨所导致的流动水所形成的, 这情况在沙漠环境中并不罕见。大雨后, 干谷往往会化身成为断断续续的河道, 瞬间为附近蛰伏中的植物带来生气。跟绿洲一样, 干谷是生命的泉源。KAFD的干谷就是该区的都市动脉, 连接该区的五个小区。这干谷是一条下沉式的市区通道, 比地面低6米。干谷的“茂密棕榈树”、“植物”和“水源”就是各式各样的商店、咖啡馆、餐厅、休闲景点以及区内的主要机构及文化机关。KAFD都市干谷的灵感来自该区发展前原有的真正干谷, 肯定了干谷通道设计这个概念。除了作为都市脉络, 都市干谷其实与真正的干谷一样, 在下大雨的时候可以疏导雨水 (见图三)。

KAFD的干谷将成为以行人为主的户外公共空间, 在白天和晚上为都市生活带来朝气 (见图四)。利雅德的极端沙漠气候对建立具持续性的户外都市环境是一个极大的障碍。夏天的高温令人们都不愿意到室外去。因此, 整体规划的设计参考了发现石油前, 波斯湾地区的传统沙漠城镇。这些城镇的建筑物都是紧紧建在一起, 并由狭窄, 受遮盖的小巷分隔。这特色让建筑物之间可以提供互相遮荫的作用。虽然这种传统密集式建筑方式也可能是城墙区内密度最大化的结果, 但也为KAFD的规划设计提供珍贵的参考作用, 因为KAFD也是受周边叶形行车环线所限, 在规定范围里必须容纳大量建筑空间。



Figure 7. KAFD masterplan clustering profile. (source: Henning Larsen Architects)  
图7. KAFD 建筑组团总览 (来源: Henning Larsen 建筑事务所)



Figure 8. Crystal Towers: Façade designed in response to KAFD design guidelines. (source: Henning Larsen Architects)  
图8. 水晶塔: 根据KAFD设计指南设计的表皮 (来源: Henning Larsen 建筑事务所)



The Wadi of KAFD is a pedestrian orientated public domain that links the cultural and institutional landmarks within the district. The Wadi celebrates exchanges and encounters; and it promotes leisurely strolling as well as walking as a means of getting around. Pedestrian mobility is a key driver in the design of KAFD. The success of the masterplan upon completion of the development will be judged upon with pedestrian mobility as a main indicator.

Another key feature of KAFD is the network of “Skywalk” that links all buildings in the district at the first level above ground (see Figure 9). The Skywalk is a semi-public elevated bridge system that makes it possible to walk from one end of the district to the other whilst remaining fully indoor. The system consists of 96 independently air-conditioned bridges with lengths varying from 20-73 meters, amounting to a total distance of 3.8 km excluding the distances within the buildings being connected (see Figure 10). Whilst The Wadi is a place, the Skywalk is seen as a transient space that facilitates speedy pedestrian movement between buildings (see Figure 11). It guarantees absolute pedestrian mobility even in the event of flood or severe sandstorm. This circulation strategy is to a large extent inspired by the successful Plus15 network of elevated walkways ubiquitous in the Canadian city of Calgary. Where as Plus15 is heated, Skywalk is cooled. Both scenarios inevitably consume additional energy, but this burden is offset by relieving the use of cars.

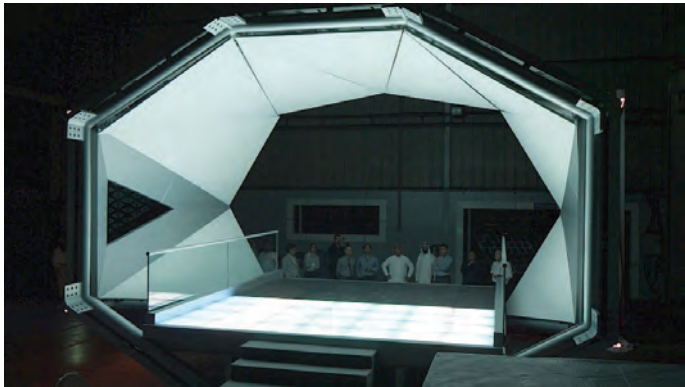


Figure 9. Skywalk prototype (source: Standard Vision)  
图9. 空中步道原型片断(来源: 标准视角)



Figure 10. Skywalk directory in KAFD. (source: Henning Larsen Architects)  
图10. KAFD空中步道指南(来源: Henning Larsen 建筑事务所)

整体规划的成功与否，将取决于密集建筑群如何互相协调，特别是建筑物的落地位置和方式。因此，整体规划的守则和每一栋建筑物的具体设计方针就显得非常重要，加上设立调控机制，确保建筑成果与原设计相符。都市干谷虽是整体规划中人类经验 (human experience) 的主要构成部分，但楼面景观亦同样重要。KAFD的其中一个特色就是区内的屋顶并不可以安置任何可以见到的技术设备。所有屋顶的装置和设备都必须移到大厦里，以强调建筑群的高度协调性。从整体规划中最高的大楼往下看，整个地区的屋顶景观就可以一览无遗。在都市干谷的东边，金融广场周边的办公大楼建筑群是整个区域的金融核心(见图五)。这些大楼将会成为整个金融区的灯塔，让人们在都市干谷中容易辨别方向之余，也凸显KAFD在环球金融世界的地位。

小气候

利雅德位于沙特阿拉伯沙漠的中央，因此要在这地方创造适合都市生活，受调控的户外小气候并不是一件容易的事。整体规划就这方面的考虑及量度将决定建筑物之间的空间舒适程度。区域中的建筑物主要是中高层建筑，我们必须策略性地确定不同建筑物的位置，让建筑物之间拥有最合适的距离，为都市干谷及旁边的建筑物提供遮荫(见图六)。建筑物之间的较短距离也有助减少沙尘暴带来的影响。风向方面，建筑选址会吹较强的北风，也会吹中等强度的东南风。大楼在高度和大小上的层次协调可以为这些风力做出最佳分流，让怡人清爽的微风通过都市干谷(见图七)，减轻行人路上因天气所造成的不适感。整体规划指引所规定的大厦外墙用料也可以有效控制阳光对大厦之间及大厦内部的影响(见图八)。策略性放置静水及流水水景、喷雾系统、遮荫植物以及针对沙尘暴的风障，都能提升都市干谷的小气候条件。采取这些被动措施将可以为都市干谷的室外温度降低6至8度。

行人流动性

利雅德的汽车依赖比率是全世界数一数二的高，即使是短距离路程，当地人也会选择开车。这也许可以归因于利雅德的公共交通配套严重不足，另外当地居民喜欢坐空调车，并希望在行程中保持隐私也是导致汽车依赖率高企的原因。当地的文化规范也令居民偏向选择使用私家车，而KAFD将致力改变这现状。



Figure 11. Skywalk construction. (source:Henning Larsen Architects)  
图11. 空中步道施工(来源: Henning Larsen 建筑事务所)

To further enable pedestrian mobility and to reduce the reliance on cars, KAFD is equipped with a monorail infrastructure with a capacity of 600 passengers per train. The primary purpose of the monorail system is to move people from the vastly distributed subterranean parking facilities to a station nearest to the intended location. The station is in turn serviced by one or more skyways as well as The Wadi that lead the pedestrian to the final destination (see Figure 12). The integration of monorail, skyway and The Wadi provides a pedestrian infrastructure that makes walking realistic within the vast extent of KAFD. Such integrated pedestrian mobility should eradicate the need for vehicular travel within the district.

## Conclusion

Large scale urban interventions, let alone a whole new urban district, requires time to mature in order to fulfill its intended objectives. Coupled with social and economical policy implementations, new urban district can exert a considerable impact on its surrounding environment, and has a potential to promote change at a societal level.

The macro political agenda embedded in KAFD has yet to manifest its influence. At a micro level, however, there are already signs of optimism. It has been reported that most of the residential apartments within KAFD have already been sold prior to their marketing. A recent visit to the construction site has reported a noticeable lower temperature in the Wadi of KAFD. It has also been reported that the envisaged controlled breeze has been channeling through the Wadi between the partially clad tall buildings, further enhancing the comfort level of the outdoor public space. An enhanced microclimate is essential in promoting pedestrian mobility in a desert setting. This will greatly reduce the dependency on vehicular travel within the district and thus reduce energy consumption. This combined effect is envisaged to encourage physical encounters and thus social interactions. The cultural significance of appropriating the Wadi as the unique identity of the public realm for such interactions will reinforce a sense of place, further enriching the quality of the public realm.

Together, the design measures introduced in the main areas of genius loci, microclimate, and pedestrian mobility will enhance the quality of the space between buildings that will be determinative in the success of the King Abdullah Financial District.

KAFD的都市干谷是以行人为主的公共空间，并把区内的文化及机构地标连接起来。都市干谷鼓励交流，并希望区内的人可以以轻松步行的方式到达目的地。行人流动性是KAFD规划设计的一大要点。在项目完成后，测量整体规划成功与否的一个重要指标就是行人流动性。

KAFD的另一主要特色就是在二楼水平连接区内所有建筑物的“行人天桥”系统(见图九)。这个行人天桥是一个半开放式的高架桥梁系统，让行人在完全置身室内的情况下从区内的一端走到另一端。系统包括96条配备冷气的高架桥，长度由20至73米不等。不计被连接大厦内的步行距离，系统总长度为3.8公里(见图十)。与都市干谷比较，行人天桥不只是一个地点，也是一个让行人穿梭于建筑物之间的流动空间(见图十一)。即使户外出现洪水或沙尘暴的状况，系统都可以确保行人流动性不受影响。行人天桥的概念很大程度上来自加拿大卡尔加里市的Plus15高架行人路，而它们的区别在于Plus15配备暖气，而行人天桥配备的是冷气。两款系统固然都会消耗额外能源，但行人天桥将能够逐渐取代区内的私家车，有助弥补系统的能源消耗量。

为了进一步提升行人流动性及减少当地居民对汽车的依赖，KAFD也设有单轨列车系统，每一部列车可载客600人。单轨列车系统主要用途是把人流从各个地下停车场运送到距离目的地最近的车站。在车站，他们可以通过都市干谷或行人天桥步行到目的地(见图十二)。单轨列车系统、行人天桥和都市干谷的互相配合，将为KAFD提供完善的步行配套，在区内步行也变得轻松，从而消除区内居民对汽车的依赖。

## 总结

大型的城市项目，特别是全新的城区，都需要时间来发展及走向成熟，才能实现其预期目标。配合社会及经济措施，这个新城区将对其周边环境有重大的影响，并有能力在社会层面上带来转变。

虽然KAFD的宏观政治愿景有待实现，但从微观层面来看，已经可以看到乐观的迹象。据报道，KAFD的大部分住宅单位在营销前都已经出售。在最近的一次工地考察中，也发现KAFD都市干谷的温度有显著降低，而虽然高楼还在建筑中，在都市干谷已经可以感受到经高楼分流而吹来的微风，使户外公共空间的舒适感有所增加。在沙漠环境中，要提升行人流动性就必须改善小气候条件，从而减少区内市民对汽车的依赖及能源消耗。此举亦能够鼓励人与人之间的交流，增强社区互动。把干谷视为交流的公共领域也带有独特的文化意义，带出场所精神，进一步提升公共领域的素质。

我们讨论了场所精神、小气候和行人流动性这三个范畴的设计措施。这些措施将有效提升建筑物之间的空间素质，为阿卜杜拉金融区奠定成功的基础。





Figure 12. One of the many monorail stations in KAHD. (source: Henning Larsen Architects)  
图12. KAHD中众多单轨车站其中之一 (来源: Henning Larsen 建筑事务所)

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