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MERGING EDUCATION AND INDUSTRY FOR LEADING A CREATIVE URBAN RECOGNITION IN MIDDLE EASTERN DEVELOPING COUNTRIES

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Abstract

Despite the drifts towards globalization, regions and cities are emerging as the main arenas for international competitiveness. Cities are turning out to be as communities of knowledge, innovation, and creativity, yet becoming more complex, dynamic, diverse, and intangible. In this context, new strategies and approaches must be considered. Proposing a science park bridges the gap between education, research and industries. It could develop a creative urban regeneration processes, educational development and economic growth. Initiating the project with a sustainable approach will increase knowledge and develop innovated solutions in common areas as water management, alternative forms of energy, oil and gas extraction, industrial advancement, and sustainable urban development. The paper is going to discuss the feasibility of applying a science park in Lebanon as a case study for Middle Eastern developing countries. Applying these strategies on slum areas will improve the urban fabric and enhance the infrastructure of the neighborhood. Ten International case studies that augmented their regions around the world are analyzed to achieve the most efficient science park program that fits the local context. Furthermore, the adopted strategy could be applied in any developing country with similar contexts.

Keywords

Creative urban regeneration, Lebanon economic growth, educational development, Science Park

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ABSTRACT

Despite the drifts towards globalization, regions and cities are emerging as the main arenas for international competitiveness. Cities are turning out to be as communities of knowledge, innovation, and creativity, yet becoming more complex, dynamic, diverse, and intangible. In this context, new strategies and approaches must be considered.

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1. INTRODUCTION

Before Lebanon became the fostering land for international conflicts in the mid-1970s, its location on the Mediterranean Sea made it a strong connection between Europe and Asia, main gate of transportation, and trades for many civilizations that resided in this country, resulting with a strong economical basis, from the trading that once happened and powered by tourism, agriculture, commerce, and banking, because of its financial power and diversity in its prime days, Lebanon was compared to Switzerland (*Moubayed, 2007*), and its capital Beirut attracted so many tourists that it was known for Paris of the Middle East (*Parc de Recerca Biomèdica de Barcelona, 2010*). Since world war one and onwards Lebanon was the land for conflicts which started slowing its development (*Johnson, 2006*). The 1975–1990 civil war heavily damaged Lebanon's economic infrastructure, cut national output by half, and all but ended Lebanon's position as a West Asian entrepôt and banking heart (*Canadian International Development Agency, 2009*). At the end of the

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war, there were massive efforts to reinforce the economy and rebuild national infrastructure, it didn't succeed since it collided with nation problems by citizen's diverse religion, and different political perspectives.

1.1 Background on Lebanon's Major Problems

Some projects started to move Lebanon forward; Beirut downtown is an example of the major development that was trying to revive the economy and tourism of Lebanon, but some projects couldn't be executed due to internal conflicts and political segregations. On the other hand the war left behind a lot of ruins which was hard to fix, one of these was the destruction of houses and the increase of the number of refugees this led to slums and underdeveloped neighborhoods with poor infrastructure, which is the slums formed today. Although the Lebanese industry has succeeded in maintaining some stability and overcame many of these disasters, nowadays, it still faces numerous difficulties to progress and push Lebanon's economy forward. Lebanese researchers made an amazing discovery that will boost Lebanon's economy back again, which is oil and gas, but as for the extraction Lebanon doesn't have the knowledge, experience nor the equipment to directly benefit from these resources, international companies were positioned for this task. The following part is going to discuss briefly the slums, industry, and oil and gas production, in Lebanon.

1.1.1 Slums In Lebanon

Slums began as squatter settlements during the period of the civil war (1975-1990) (Stinson, 2006), developments occurred in extensions of early squatter settlements such as Raml and Ouzai that grew considerably during the first years of the civil war, and many other slums developed randomly in separate region across Lebanon. These slums are considered as a major pressure on the urban development in general, with high crime percentage and poor infrastructure. In addition a 1992 survey conducted on living conditions stresses the low wages and poor levels of building structure and materials. 26% of the structures are built of tin and other non-permanent materials, and around 30% of the structures, houses or apartments were in poor conditions (BTUTP, 1992). The survey also revealed that many economic activities had developed in some of these zones, which now combine activities of substantial economic value like commercial and artisanal 53% of the population under 25 years of age and are unemployed with no education. Affordable housing and well-structured infrastructure is stressful on the government's budget with the poor economic level Lebanon is facing. In addition there is a limited possibility for expansion, the government proposed to move the housing from Beirut to Tripoli, Zahle, Saida, Nabatieh and Tyre. With the restoration of Beirut-Tripoli rail service (BTUTP, 1984).

Table 1 Population Estimates for the Squatter Settlements of the Southern Suburbs,

Reference: BTUTP (1984, 1992), Dar el Handassah (1993)

Area	Type of Land	1984 (BTUTP)	1990-1992
Ouzai	Public/ Private	3,537 structures (16,900 residents)	19,600 residents (DAR)
Jnah (Sultan Ibrahim, beaches)	Public	1,273 structures (7,220 residents)	15,900 residents (DAR, includes Hayy el Zahra)
Hayy el Zahra	Public	1,120 structures (5,348 residents)	
Bir Hassan Camp / Horsh el Qateel	Public/ Private	776 structures (4,505 residents)	6,000 residents (DAR)
Horsh Tabet/ Cite Sportive	Public/ Private	2,430 structures (15,492 residents)	12,775 residents (BTUTP)
Sabra area	Private	936 structures (5,868 residents)	(displaced) (BTUTP)
Raml 'ali	Public/ Private	4,028 structures (21,000 residents)	30,000 residents (Charafeddine 1991)
Amrussieh	Public	1,197 structures (7,125 residents)	7,125 residents (BTUTP)
Laylaki	Public	1,292 structures (6,698 residents)	10,000 residents (Charafeddine 1991)
Total		90,156 residents	101,400 residents

1.1.2 Industries in Lebanon

There are 13 industrial sectors in Lebanon, 86.2% of the industrial institutions operate in 10 major industrial sectors which are, Food products and beverages, Furniture and other manufactured goods, Other non-metallic mineral products, Fabricated metal products, Printed matter and recorded media, Chemicals and man-made fibers, Rubber and plastic products, Machinery and equipment, Electrical machinery and apparatus, Pulp, paper and paper products (MoI, 2007).

The location of the industries in Lebanon are mainly located in mount Lebanon Table 2 shows the mapping of the industries in Lebanon.

Table 2 Location of the Industrials in Lebanon
Reference: Ministry of Industry in Lebanon, 2007

Mohafaza	Beirut	Mount Lebanon	North Lebanon	Bekaa	South Lebanon	Nabatiyeh	Total
Nb. of establish.	239	2,010	518	744	420	102	4,033
% of total	5.9%	49.8%	12.8%	18.4%	10.4%	2.5%	100.0%
Average workers per establish.	19	25	17	18	12	12	21

Lebanon's industrial sector is one of the primary foundations of Lebanon's economic development as it is one of the main sources of wealth and employment. But it is facing three major problems which are (MoI, 2007).

- The first group of problems links up to the political instability and the effects of local and regional insecurity and conflicts. During such periods, production and commercial relations are profoundly disrupted and cause large damages to the industrial activities.
- The second group of difficulties is the informal management and fragmentation of a large number of manufacturing enterprises and especially the small and medium sized ones in isolated areas.
- A third important obstacle is the shortage of effective policies and efficient governance for supporting industrial development, and having a linkage between research sectors and the industrial sector to promote these industries (MoI, 2007).

1.1.3 Oil and Gas in Lebanon

After making the great exploration of gas and oil in Lebanon, with quantities that could astonishingly boost Lebanon's economy, Lebanon faced several problems that lingered the extraction, first no Lebanese company have the ability nor the knowledge to extract these natural resources. A bidding process was made to hire qualified European companies instead to undergo the extraction, in this process Lebanon lost a high percentage of the money it will gather from these resources by paying these international companies. Second it took 6 years of exploration and bidding (Minister of Energy & Water, 2013), nevertheless the government will be obliged to build a transportation port to the site since the oil and gas are located in the sea. In addition there is no research center to develop this work.

Table 3 Lebanon's Production Assumption of Oil and Gas
Reference: Beicip Franlab, were published by Bloomberg, 6-02-2013

	Oil	Gas
Total Reserves	Between 440 million and 675 million barrels ¹ (Average: 557.5 million barrels adopted)	Between 12 and 25 Trillion cubic feet (TCF) ² (Quantity Adopted: 20 TCF)
Production Horizon	Hydrocarbon production is distributed uniformly over 20 Years ³ (From 2020 to 2039)	
Gross Profit Margin on Offshore Drilling	60% ⁴	
Government's Share of Gross Profits	60%	
Royalty Fees ⁵	Between 5% and 12% of total oil production (Average: 8.5% adopted)	4% on gas production
Corporate Income Tax	15% (fixed tax rate assumed over the production horizon)	

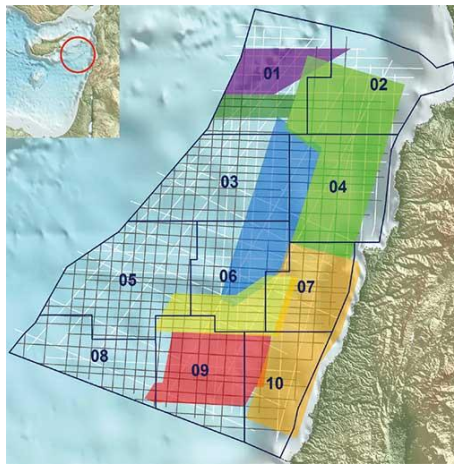


Fig. 1 shows the oil and gas Extraction Sites
Reference: Minister of Energy & Water, (2013)

1.2 Outcome of Lebanon's Problems

Slums, Industrial sector, and the extraction of oil and gas are three major factors that will enrich Lebanon's economy significantly. Since developing the slums will result in a better infrastructure and a well-planned urban development, in addition people will have improved living environment, better educational level and will have new job opportunities, so the economy will flourish and this will also attract tourists. On the other hand the industrial sector which survived the war and different conflicts, by resolving the few obstacles that are limiting its progress for example the linkage between different industries, having access to research institutes that will help in developing these industries especially the startup firms and small industries. The top rich countries in the world are rich because of gas and oil, so by developing the place to study and gain experience with how to handle this type of mission, we could develop an extraction method that won't be in need of foreign companies, this will result in better education in new domains and the income from the extraction won't be divided with foreign companies. Developing a Science park linked to the industrial sector will definitely solve the issues it is facing, nevertheless it will host the foreign companies for the oil and gas extraction to learn and gain experience from them, In addition research in the field to develop more efficient methods. And a direct port might be built also inside the science park for direct transportation. As for the slum problem having the science park on an already existing slum will have a creative urban regeneration of the site, it will offer building units with optimum infrastructure, people will also benefit from the job opportunities that will result from the science park development, nevertheless it will encourage people to visit the parks and show rooms tourism will also be affected positively, keeping in mind the education, transportation, and environmental improvement.

1.3 Methodology

The methodology used for this research is definition with a conceptual model, establishment of a set of dimensions of analysis, well-constructed with a system, indicators and extraction of conclusions. The empirical work was based on the collection of bibliographical elements, and direct observation, which led to the following strategies:

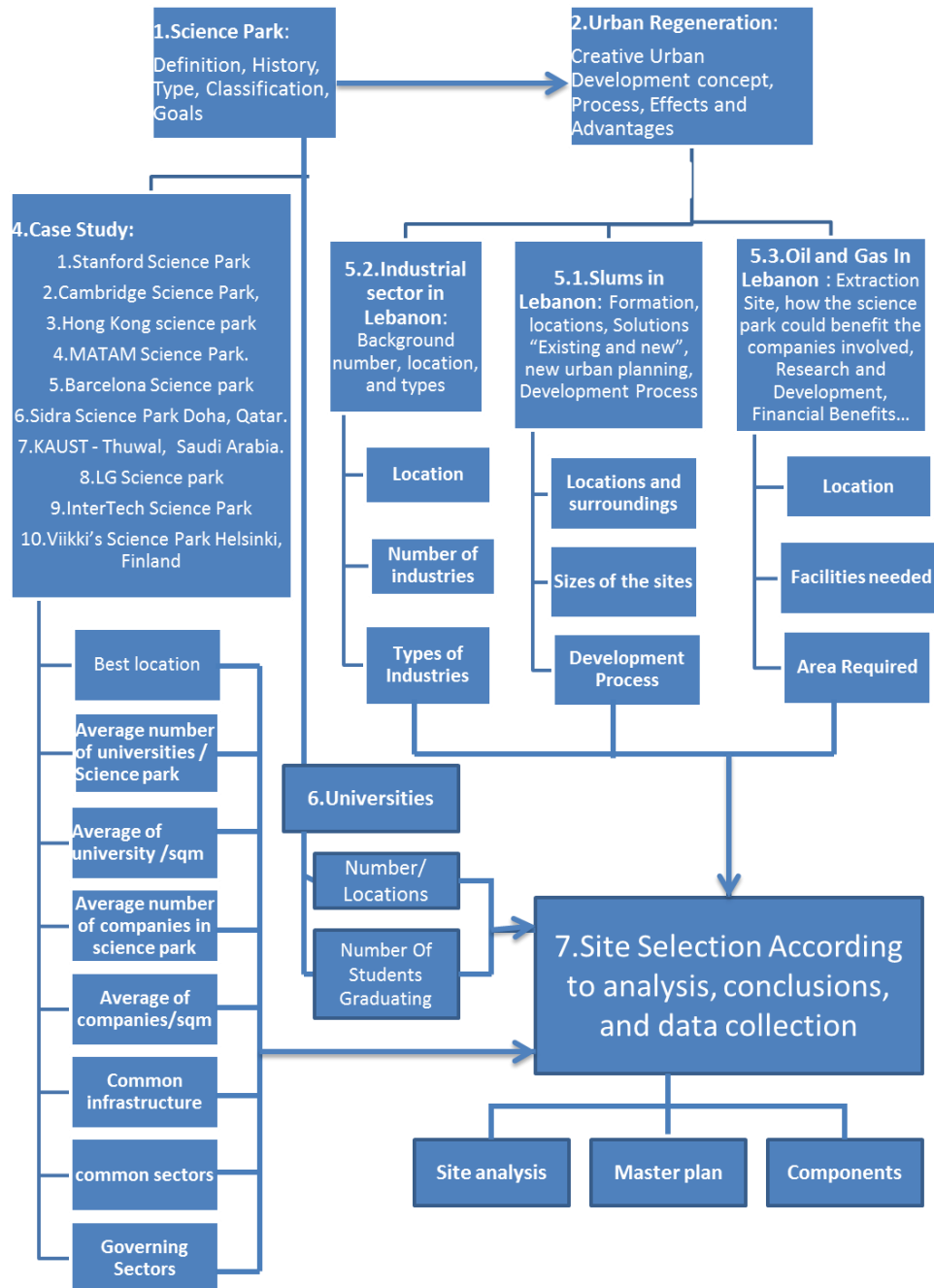


Fig. 2 Research methodology
Reference: Authors

2. SCIENCE PARKS

2.1 Defining Science parks

Since the science park is general in its typology many names had been given to it. These involve Innovation and Business Centers, Science Parks, Technology Parks, Techno-parks, Technology Centers Innovation Centers, Techno poles and Research Parks. These names give a small difference in scale, scope and services provided; the definition below covered all the distinctiveness they had. The most common definition was according to the International Association of Science Parks (IASP), defined as:

- *“A property-based initiative, which has official and operational links with universities or other higher educational institution, or major centers of research.*
- *Designed to encourage the formation and growth of knowledge-based industries or high value-added firms, normally resident on site.*
- *Has a steady management team actively engaged in fostering the transfer of technology and business skills to tenant organizations. The term STP usually denotes a focus on technology innovation and Tenant Company involved in applied science. In presenting the relevant international experience in this study”(IASP,2002)*

2.1.1 History of science parks

During the 1980s, many policymakers facing decreasing revenues and increasing unemployment looked at technology led development to pump new life into their sagging regional and national's economies (Amirahmadi, 1993). One of the methods they made to develop this high-tech strategy was to create Science and Technology Parks. This expanded the educational levels; it also added job opportunities and services to the country. Successful parks often take a few years to become economically viable.

2.1.2 Types and Classification of Science Parks

There are many types of science parks. (Amirahmadi, 1993). points out that any study of the science park is confusing and difficult to define exactly what a science park is.

- Research Parks play a role in connecting industries with educational facilities that result in leading edge technologies.
- Science and Technology Parks most often is located on the campus or close to, the university.
- Technology Park, usually designed to host firms engaged in the commercial activities for renovated technologies.

The Science parks can be establishment as private-led or government-led. To start a science park multiple leaders and stakeholders must work together for example: firms, public authorities, academia, members of the investing sector, educational and research institutions. At the same time, science parks can be categorized as remote and independent parks, nearby metropolitan area, and within metropolitan area according to the relative location. In general science parks can be on any level. Science parks function as research centers including, education facilities, training, incubators, and small-scale creative and innovative industrial complex, offices, warehouse facilities, and housing units.

2.1.3 Goals of Science parks

New technologies are usually produced and commercialized by science parks by strengthening the bond among research centers, educational bodies, and technology based industries. Early stages of Science Park have usually small companies at an

early development stage pursuing growth strategy based on the incubation of new ideas. In addition the science park provides:

- Assistance in R&D with scientific research institutes and labs
- Financial consulting and cooperation in obtaining venture capital
- Professional, administrative, technical, and legal assistance
- Telecommunications and information services
- Supportive business infrastructure (Amirahmadi, 1993).

By assisting the development of hosted companies, Science Park plays an important role in the development of national economies. In addition help creating new jobs, increase knowledge, attract foreign capital, and increase national and local competitiveness. This developmental role is very important in transition economies, which will increase unemployment rate and catch-up with rapid technological developments in the international economy.

2.2 Effect of the Science Parks on Cities

Science parks in urban areas can be crucial for fostering innovation and connecting cities with the international economy. A science park can be defined as an organization whose main aim is to enhance the community where it is built by inspiring a society of creativity and competitiveness through knowledge-based facilities. Managed by experts, the science park manages and controls the exchange of knowledge and technology between R&D institutions, universities, industries and markets. By doing so, the science parks encourage companies to connect with its system. In urban environments science parks are the main element for sustainable development. This made the city to be connected and attractive in the international economy by developing industries that will lead the way. In order to achieve this purpose, sciences parks are symbolized by:

- A science park will offer the needed infrastructure and services for its tenants.
- Science parks can work with large and small companies at the same time. This allows the transmission of ideas and knowledge, which helps the new companies to grow and the large companies to innovate more.
- Skills and Knowledge are found due to the connection with universities, colleges, and professional training organizations
- Attractive environment for the highly skilled individuals
- Encourages touristic and international visits
- The society will be able to have networking, exchanges, Communications and cooperation among important individuals, businesses, governments, educational facilities and supportive of entrepreneurial activities
- Infrastructure such as transportation, telecommunications, business services, venture capital, government rules, hosted companies are usually provided as well.

2.2.1 Cities and Creative Urban Regeneration

Globalization is encouraging the expansion of knowledge, creativity and innovation. Cities are absorbing this competitiveness, due to centralization of knowledge and economy. This led the cities to behave as a community of knowledge, innovation, creativity and learning, becoming more dynamic, complex, diverse, open and intangible.

“Intelligent cities as territories with a high capacity for learning and innovation, which is built into the creativity of their population, their institutions of knowledge creation and their digital infrastructure for communication and knowledge management.” Komninos, 2006).

These cities are trying hard to attract more individuals seeking knowledge and to preserve their talents and skills, by providing more innovative institutes and

companies. This of course does not only mean building inside the city, it's also expanding its parameters. For this situation, new and advanced urban strategies and procedures must be considered, especially if it's a part of an urban regeneration. Cities are not only buildings, materials, and structures, but also people, networks and unquantifiable elements, like memories, history, emotions, experiences and cultural identities, they are places of interaction. The main idea behind creative urban regeneration approach is integration (Guerra et 2005). This implies that the coordination of public strategies in the domains of science, technology, training, education, industry, economy, immigration, transportation, and, is the essence for achieving innovative strategy. The integration between these factors and creating the innovative urban strategies in the city are called iHubs. According to Verwinjnen:

"the notion of the creative city draws our attention to the fact that beyond the traditional forms of urban renewal and urban regeneration, cities show a growing interest in creating districts imbued with a climate of innovation and creativity" (Verwijnen, 1999)

2.2.2 The 'iHub' science park initial concept

iHubs are tools of urban strategies concerned with developing creative sites in the cities. The idea behind this concept is to use technology, science and engineering to result in an urban redevelopment and regeneration. The future of the city will be based on providing the communities with education and technology by linking them with experiments, arts and communication (Modder, 2005). The idea is to have several services in the same place, such as research and development, business or entrepreneurial, education and learning, shopping and entertainment and other social services. Moreover, iHubs nurture a wide variety of interactions and mixed-use environments, integrating between physical, digital, economic, social and cultural spaces. These creative communities offer a high density of knowledge, and serious workers, who seeks a good quality of life, friendly environment, social and cultural diversity, digital and physical connections. This means that, they are the perfect place to work, live, study and play.

2.3 Applying iHub Concept in Lebanon

Applying the concept of the iHubs in Lebanon will definitely promote the industrial sector, educational level, economy, urban fabric, electric supply, water supply, job opportunities, and create a suitable environment that will host and benefit oil and gas extraction companies. Furthermore the Science Park will generate the only place where people can learn, work, and play at the same time, and attract people from the city and even tourists (Modder, 2005). Science and Technology Parks could make Lebanon a place of innovation, R&D, and attract foreign interest. It is clear that the Science Park is the most precious resource for that Lebanon could invest in and promote to allow and ensure its progress. The government must understand the city's obligations, concerns, and needs, so that it will be able to define the right strategies that will lead to a profitable and successful partnership.

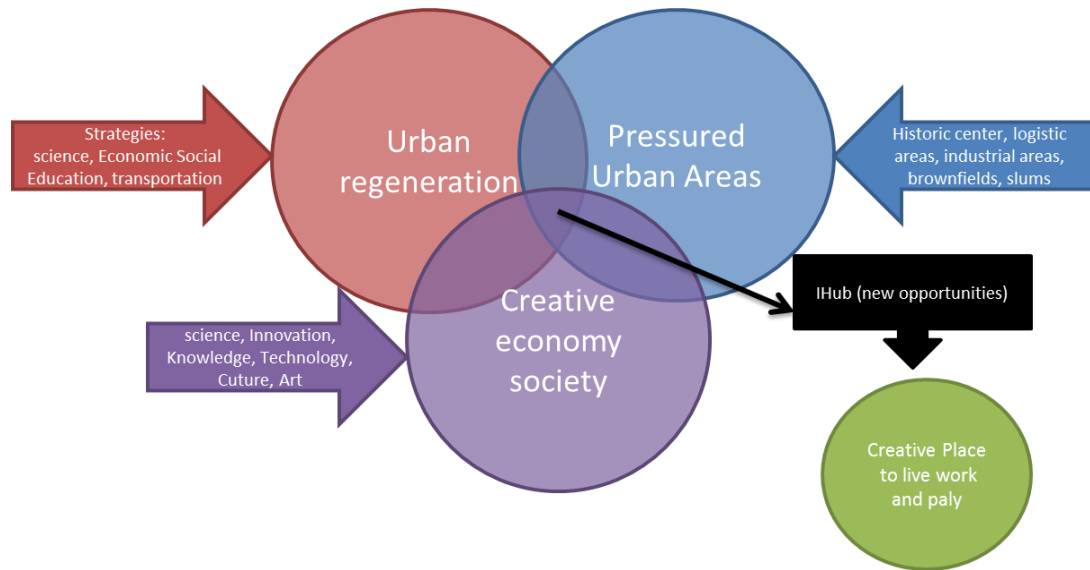


Fig. 3 IHub Concept in Urban Regeneration,
Reference: Authors

3. STRUCTURING THE SCIENCE PARK COMPONENTS

As mentioned above the science park is very broad domain, encompassing different functions, and providing a lot of services and infrastructure to nurture enrolled tenants and improve the countries resources. To narrow down the needed components, services and area needed for developing a science park in Lebanon several case studies will be analyzed, that will help acquire a general picture of the science park. Afterwards these general findings will be compared to what is found in Lebanon from industries, educational facilities, and infrastructure that the science park could be developed upon, in addition to the best location the science park could be established.

3.1 Case Study Criteria

According to the high number of Science parks around the world, a selection from top science park was made to come up with 10 case studies which were created from an excellent awareness of their importance to the regions. Each study case will be analyzed using the

- | | | |
|----------------|-------------------------------|--------------------------------|
| • Location | • Governing Body | • Infrastructure |
| • Year Founded | • Number of Universities | • Research Funds and Financing |
| • Focus | • Number of universities /sqm | • Measures Of success |
| • Size | • Number of Companies/ sqm | • Setbacks |
| • Composition | | |

Table 4: comparing Case Studies, Reference: Authors analysis

Composition	Size	Focus	Year Founded	Location	
95 Companies, Research& Services	3,160,000 m ²	Electronics Biotechnology Computer Hardware	1951	Palo Alto, USA	Stanford Research park
66 companies and research	145,000 m ²	telecommunication Electronics biotechnology	1970	Cambri dge, Englan d	Cambridge science park
113 company& research	330,000 m ²	Telecommunication Electronics Biotechnology	2001	Hong Kong, China	Hong Kong science park
13companies &research	240,000 m ²	Telecommunication Electronics Biotechnology	1970	Haifa, Israel	MATAM
encompassing a marine sanctuary and research facility. residential area	36,000,000m ²	Biological and Environmental Science Engineering, Computer, Electrical, Mathematical Science catalysis, clean combustion, geometric modeling & visualization, membranes, agriculture, alternative energy, & water desalination	2009	Thuwal, Saudi Arabia	King Abdullah University for Science & Technology(KAUST)
28 companies laboratory, manufacturing and office space, bioscience businesses, life science, pharmaceutical, digital media, and venture capital industries	404,208m ²	Biomedicine and Biotechnology, Environmental and Energy Sciences, Information and Communication Technologies, Advanced anufacturing Technologies	1998	Shreveport, Louisiana	InterTech Science Park
university's experimental. residential industrial companies farming area and parks, sector enterprises	2,000,000m ²	Biotechnology, agricultural sciences, bioscience, Veterinary Medicine, and Neuroscience	1990-2015,	Viiikki,helsinki Finland	Viiikki's Science Park

Funds &	Infrastructure	Companies/sqm	Universities /sqm	Universities No	Governing Body
660\$ million	3 Airports High internet connectivity	32,631 m ²	775,000 m ²	4	University of Stanford
Several Sponso rs	High Internet connectivity secured site other services	2,197 m ²	72,500 m ²	2	Cambridge Consultants
180\$mill ion	High Internet connectivity secured site other services	2,920m ²	55,000m ²	6	Private companies
Governm ental Assistan ce	High Internet connectivity secured site other services	1,935m ²	80,000m ²	3	SHATAM
\$20 billion	supercomputer and other laboratory facilities through the 10 gigabits per second (Gbps) Saudi Arabian Advanced Research and Education Network (SAREN)Residential neighborhoods	36,000,000m ²	36,000,000m ²	1	king abdullah university of science and technology
\$123 million	industrial city and health facility	2,143m ²	344,208 m ²	1	Biomedical Research Foundation of Northwest Louisiana
49\$ million	Public transport connections, residential area with common infra structure, high speed internet	3,225m ²	285,714m ²	7	Government, City of Helsinki, University of Helsinki, Lahti Science and Business Park and industrial organisations

Measures Of success	Setbacks
Premiere STP in the World	Cost of living
Premiere STP in Europe	
premiere stp in Asia	
Premiere STP in the Middle East	T Professional Left To the SA. Business Angels as Intel and IBM are leaving
world's largest LEED Platinum campus, 2010 Top Ten Green Projects, 2011 AIA/ALA Library Building Award	Geographical separation. Limited local interprise
recognized by the Southern Growth Policies Board with their Innovator of the Year Award in Innovation and Technology	have 2 separated lands
the science park is responsible for national and international food production and supervision	very low population

3.2 Analysis of the case studies output

The following table shows the averages of universities and companies in the Science Park and the area required for each, in addition it's a collection of the common infrastructure that will guide my decision making and fields that the Science Park might contain. Furthermore the governing sectors that usually manage the science park hand in hand with universities.

Table 5: Case Studies output
Reference: Authors

Average number of universities / Science park	4	246,800m²
Average of universities/sqm	61,700m²	
Average number of companies in science park	39	125,463
Average of companies/sqm	3,217m²	
Common infrastructure	internet connectivity, connection to hospitals and universities, inter relation with industrial sectors and companies, residential area and other services	
common sectors	Telecommunication, Electronics, Biotechnology, Biomedicine, Renewable energy, and Agriculture	
Governing Sectors	Government, universities, Industrial sectors	

4. SITE SELECTION

To acquire the best site several factors must be considered, first of all as mentioned before the science park have a very strong impact on the city and its urban regeneration, hence it shouldn't be in isolation or far away from the city. Second the site should be surrounded by the infrastructure that was achieved from the case studies in (table 4, 5). Third the site should be a focal point in the city to connect must of its regions, in addition to the easy accessibility that the site must have. Fourth the site should have a huge area; moreover it should be capable of any future extension. Finally to have the major impact and to reach the ultimate regeneration concept the science park should be developed in an underdeveloped region slum.

4.1 Ouzai Meets the Needs of the Science park

Taking Ouzai as an example of a slum, it's one of the most crowded areas in Lebanon figure(5), in addition Ouzai embraces a lot of trades, crafting, manufacturing in it, over 1,000 shops were located around the main artery. Nevertheless a major road linking south Lebanon to the city passes by it figure(5). The illegality of the residential units and the repelling neighborhood infrastructure is talked about in many local papers (Bakri, 2006). Large scale projects and projects concerning airport extension that was planned to remove out 30 to 40 % of Ouzai in 1980's, sports stadium construction, highway enlargement planned in 1970's to become 70m wide, In addition The government assigned Elissar to make the project of the sea side in 1990's, the project was to develop touristic and residential neighborhoods along the currently squatted beaches. It also includes new strategies for upgrading infrastructure and services (Clerc, 2002). These project, still are not executed, and stopped by the dense neighborhoods that have large population groups, since they will demolish around 800 units (Charafeddine, 1985). On the other hand the science park will play a different role than what is already planned to be done.



Fig. 4 Ouzai Zones and Components,
Reference: Google earth, Authors analysis

4.2 Constraints

Since the major part of the site selected lies on the sea and it is adjacent to the airport several constraints should be taken into consideration, part of which are natural and the other are legal constraints.

4.2.1 Natural constraints

4.2.1.1 Geology

The site is located on a site classified as a very shallow soil on a rocky land (lithic leptosols) with limited to non-steep (Ilaiwi, 1985), (Schiffner, 1962). It's Also considered as a Non-terracing agricultural area (Darwish, 1999).

4.2.1.2 Topography

The topography of the earth is simple it's a leveled site with no slope.

4.2.1.3 Climate

The climate for this land is very similar to that of all of coastal regions in Lebanon and that of the Middle East area in total, stating that it's cold in the winter and hot in the summer, with a little above average in precipitation.

4.2.1.4 Flora and fauna

Ouzai is not a sensitive land (not a prime farmland, not parkland, not within a flood hazard not a habitat for endangered species Figure (5)). One small park is found near al zahra hospital and the golf club about 30% of the Ouzai. Mainly birds like the blue jay and sparrows are found including pigeons, it's also known as a strong fishing location



Fig. 5 Arial View of the site shows
No park land, No farmland, and no species and habitats
Reference: Joelle Haddad, Dec. 2014. Website: www.touristtube.com

4.2.2 Human constraints

4.2.2.1 Cultural

The war left Ouzai with people from different cultures and backgrounds, there are Syrian and Palestinians refugees with people from the south of Lebanon as well, and most of the people living there are divided between fishermen and craftsmen making furniture and other simple crafts. With most of the people having no education at all and some didn't finish their education.

4.2.2.2 Social

Ouzai residents are divided into 2 religious sectors, and 3 political zones many conflicts occurred during the past years.

4.2.2.3 Economically

People living in Ouzai are very poor, most of them can barely have their daily supply, although some have shops and sell crafts, fish, and other products they are also considered as poor economically since they sell with cheap value. On the north of the Ouzai's parameters lies a very luxurious neighborhood, people that live there are from very high economical level.

4.2.2.4 Political

This slum is cut into 3 political areas, each area has its own political thinking that keeps them away from each other, but however there is a

mediator area which is located in the center of the slum that is inhabited by foreign workers. Each political area have its own gathering area, mosque, and political building.

4.2.2.5 Legal constraints

Since the site is located adjacent to the airport, it is divided into 3 building height zones figure (6). First zone next to Jnah can build 4 story building, the second zone in the middle of Ouzai the maximum number of floors is 2, and at the parameter of the airport only one floor is permitted. Other than the height constraints the government might give a permit if there is something that didn't match the building regulations.

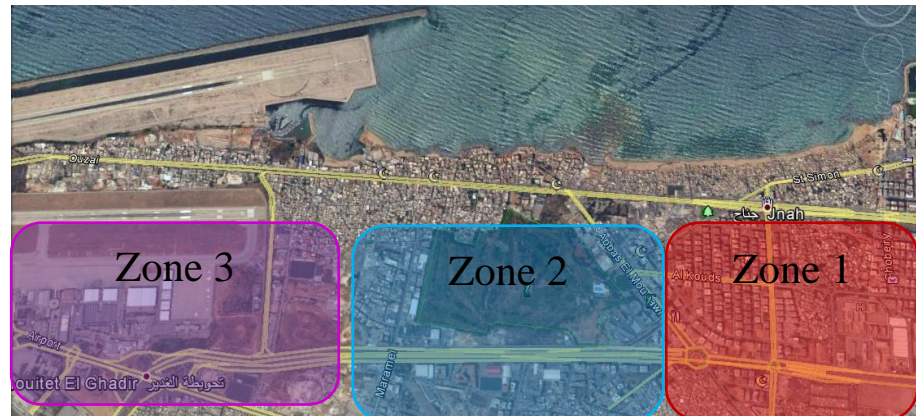


Figure 6: Building Height Zones
Reference: Google earth own editing

4.2.3 Geometry

The site layout has no specific geometric pattern figure (6). The highway cuts the land in a straight line for 5km, and the costal side takes the natural shape. The airport runway defines the southern parameter of the land. In addition to the upper highway that also cut the land in along straight line. The buildings have no defined geometry and with a deteriorated structure and façade figure (7,8).



Figure 7, 8: Building quality in Ouzai
Reference: Soubra, Lynn, The muted screams of Ouzai, World Press, Dec. 2012
https://lynnsoubra.wordpress.com/2012/12/16/the-muted-screams-of-ouzai/4005668468_65f3b1c469_b/

4.3 Ouzai Surroundings

Although Ouzai is known for its commercial and local manufacturing field, it also hosts several industrial firms, like furniture, wood and steel, on the parameters of this neighborhood a district called Choueifat known as the industrial zone, embraces most of the industrial sector found in Lebanon. Other than industry, Ouzai sits on the main road that connects the city to the south which gives it the unique location. Ouzai lies on the parameters of the airport which is restricting the airport from expanding. In addition educational facilities, medical facilities

and universities are very close tables (6, 7). Oil and Gas extraction site lies 3 km in the sea away from the site.

Distance from Industrial Zones	
Choueifat	1.5 km
Mekalles	5 km
Borj Hamoud	6 km
Out Side Beirut & Mount Lebanon	
Tripoly	70 km
Saida	32 km
Zahle	40 km
Tyre	60 km

Table 6: Distances from Industrial zones to Ouzai,
Reference: Authors

Distance from Universities	
LU	3.5 km
LIU	1 km
BAU	0.9 km/18km
USJ	2.5 km
AUB	3.5 km
USEK	18 km
NDU	14 km
LAU	1.5 km

Table 7: Distances from Main Universities to Ouzai,
Reference: Authors

4.4 Ouzai as a Science Park Development Site

As the main peoples concern, the science park will not demolish any home it will replace the neighborhood with a better one, in addition it will help people living there to find employment, nevertheless it will promote the manufacturing and the crafting that already exist there. Needless to say the infrastructure of this neighborhood will flourish. So by giving the slum residents a good orientation about the science park and its vision of the future site they will be helping to develop the project and not stand in its way. As for the surroundings the science park has most of infrastructure needed to develop. In addition there is a lot of hard workers with talents that could be assisted later on to work for the science park.

4.5 Ouzai met the requirements of a science park

For summing up the previous mentioned characteristics of Ouzai which are:

- Ouzai was first an attraction zone to shops it hosted over 1000 shops
- Ouzai is next to the airport
- Ouzai is surrounded by 2500 industries located 3km and less from
- 5 of the top universities are located less than 5km
- Ouzai Links Beirut with Sidon and mount Lebanon
- Ouzai residents could offer good workmanship
- Close to Oil and Gas excavation Site

4.6 SWOT Analysis

The SWOT analysis will identify the strengths and weaknesses, of the Ouzai as a location for the science park, including the external opportunities and threats that might also affect the Science Park to be build there shown in Table8.

Table 8: Ouzai SWOT analysis
Reference: Authors

	Helpful to achieve the objective	Harmful to achieve the objective
Internal Origin attributes of the organization	<ul style="list-style-type: none"> -Water front generation -Market Strength -Strong infrastructure -Airport Development -Preferential policies and improving legal environment (on tax/ on import and export) -Knowledge-intensive zone -Vast domestic market 	<ul style="list-style-type: none"> -Relatively less-developed infrastructure -Lack of high-quality personnel in some fields -Lack of global advanced technology -Scarcity of venture capital
External Origin attributes of the organization	<ul style="list-style-type: none"> -Technological leapfrogging -Job Creation -Reforming education and "reverse brain drain" -Foreign venture capital -Environmental protection -Urban regeneration -Investment incentives 	<ul style="list-style-type: none"> -Lack of governmental attention -new housing for existing people -incorporation of industries -Relatively weak Infrastructure compared to other countries -Competing for high-tech talents -Technology predicament

5. CONCLUSION

Building the first science park in Lebanon will be an important step forward; it will help Lebanon in many different areas including educational, industrial, agricultural and urban wise. This will boost Lebanon's economy and develop international relations between Lebanon and foreign countries. Nevertheless investors will be eyeing Lebanon for making future projects, in addition it will blossom tourism. By having the science park located in Ouzai it will not only remove the slum but it will regenerate the site in a way that all connections to the south will get easier, connection between industrial and educational facilities will exist. Lebanon won't have brain drain problems, it will help reducing unemployment and people traveling to find jobs, and hopefully it will reduce political problems. Figure (11) illustrates the outcome of the science park in Lebanon.

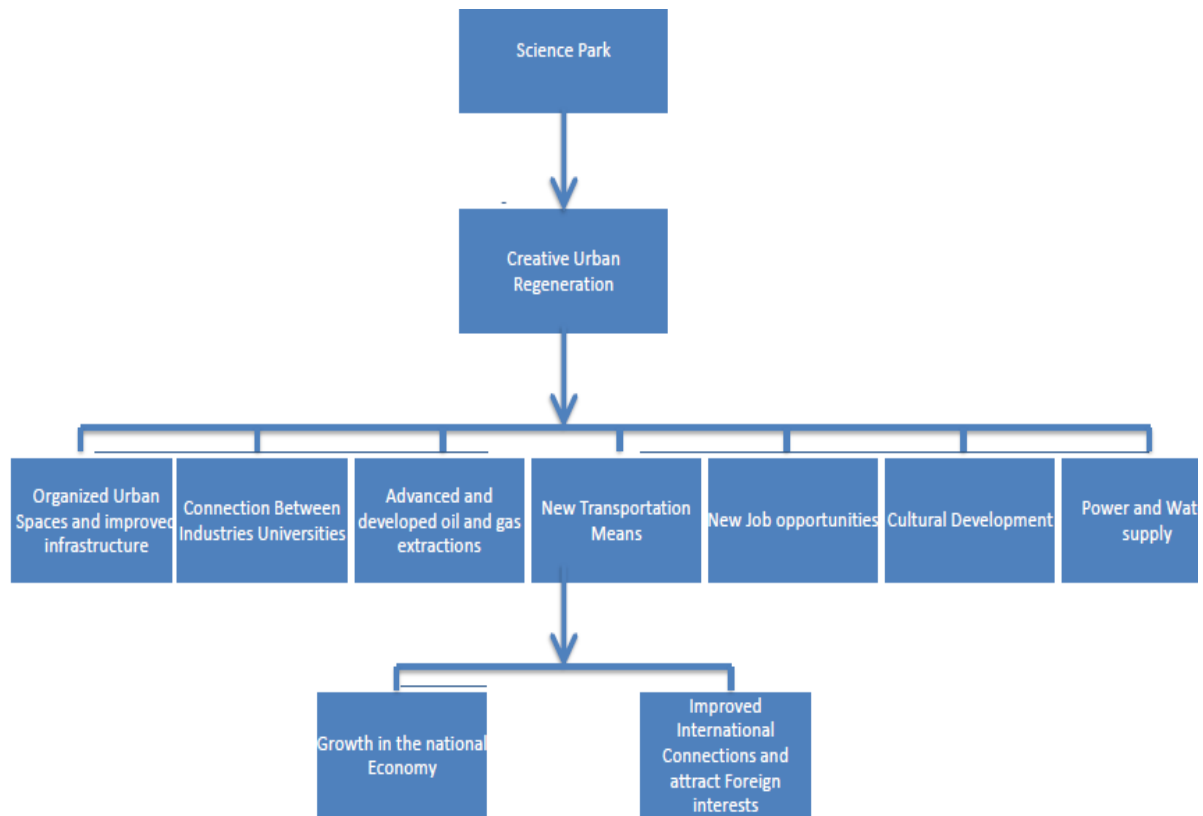


Fig. 9 Development Process of Science Park in Lebanon,
Reference: Authors

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