



Cities of Lebanon from "Planning to Congestion Towards a "flexible mobility culture

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Abstract

This paper examines the change in planning pattern In Lebanon, which relies on vehicles as a semi-single mode of transport, and directing it towards re-shaping the city and introducing concepts of "smooth or flexible" mobility in its schemes; the concept of a "compact city" with an infrastructure based on a flexible mobility culture. Taking into consideration environmental, economical and health risks of the existing model, the paper focuses on the four foundations of the concepts of "city based on culture flexible mobility," and provides a SWOT analysis to encourage for a shift in the planning methodology.

Keywords: Vehicles - Integrated City - Road Network - The System Is Full - Cities - Performance – Impact



مدن لبنان من "التخطيط إلى الزحمة" نحو "ثقافة التنقل المرن"

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مستخلص

تتناول هذه الورقة، البحث في تغيير ثقافة التخطيط في لبنان، الذي يعتمد على المركبات كوسيلة تنقل شبه وحيدة، وتوجيهه نحو إعادة صياغة المدينة وإدخال مفاهيم التنقل "السلس أو المرن" في مخططاته؛ والإنطلاق أكثر إلى مفهوم "المدينة المدمجة" ذات البنية التحتية الملائمة. إنطلاقاً من لحظ المخاطر البيئية والإقتصادية والصحية للنموذج القائم حالياً، تركز الورقة على الأسس الأربعة لمفاهيم "مدينة قائمة على ثقافة التنقل المرن"، وتقدم تحليلاً رباعياً في تحليل أهمية الدفع نحو عملية التحول في منهجية التخطيط.

كلمات مفتاحية: المركبات، مدينة مدمجة، شبكة الطرق، النظام الممتلىء، تجارب مدن، الأداء، الأثر.



Introduction:

Lebanon is suffering a great knowledge gap with urban planners, especially in the process of dealing with traffic congestion known by its large cities, especially the coastal ones, where 88% of the total population live¹.

As the existing plans tend to expand the entrances of cities and increase the number of bridges inside and outside the city, believing that this is the solution of the problem of transport and mobility, as evidence that the two recent bridges (2019) at Jal El Deeb, did not fulfill the desired expectations according to the investigations that took place after the inauguration¹.

Estimates of the Council for Development and Reconstruction show that 500 thousand cars enter Beirut alone every day and this number is expected to increase, noting that the number of cars in Lebanon is 1.8 million, increasing by a high rate of 40 thousand cars per year according to the information of the international statistics².

The main question of this search: Is there an alternative way to deal with the Congestion? Can we use the experiences of developed countries in our case? What are the effects of these plans at the social, economic and environmental scales in the long range? What are their benefits, requirements and risks, opportunities, strengths and weaknesses?

Any plan that does not include in its objectives the acquisition of economic flexibility and sustainability may not achieve success, because the city stretching has become a reality that leads to non-scientific practices and uncharted approach to the prevailing planning.

According to contemporary solutions, vehicles are no longer the only tool for people's movement. They are becoming the main source of environmental pollution, as well as life and nature threats. It is highly recommended to set possible solutions to minimize its harm on humans and nature. Moreover, there is a frightening proportion of the Lebanese population (85%) that



depend on the private car as the only vehicle for their movements.¹

In this context, this research aims to provide a model that motivates our city to be more flexible in transportation and to add adequate suggestions to the plans of the economists and ecologists.

Studies based on the theory of "catalytic demand"² have shown that traditionally - as in Lebanon - as traffic becomes more crowded, planners and local authorities are resorting to quick short term alternatives , neglecting its negative effects and long term consequences, including the development of new routes and secure bridges, as a way to solve the problem of traffic, but the results were shocking: the traffic increases and the safety decreases, accompanied by a crucial dependence on the vehicles in the mobility process. This approach proved to be a failure so we find that the journeys are increasing unexpectedly and the mobility options increase too. The traffic theory of Denius Gaissis analyzed this phenomenon (Gazis, 2002)³, also Litman and Geoff Spek based on it to explain the principle of "catalytic demand" under the term "overcrowded congestion system" as an explanation for increasing numbers of vehicles in the traditional planning process "(Figure 1)

Newsweek newspaper⁴, published a study in 2009 explaining the importance of changing the pattern which produces this existing system:

"Today planners are recognizing that building more roads will make traffic worse," adding "The researches evaluate 60 cases of reduction of roads and found that when the roads closed, the drivers took steps to avoid the area ..., and economically, road closures raise the expected cost of the trip, reducing demand".

¹ ESCWA (2012), Environmental Economic Leadership of Vehicles, Practical Solution to Reduce Fuel Consumption and Environmental Pollution in Lebanon, Economic Committee Social and Cultural Rights of Western Asia (ESCWA), pp. 1-96.
<http://www.iptgroup.com.lb/Library/Assets/Escwa%20booklet%20to%20upload-122828.pdf>

A pattern Planning Model in traffic processing

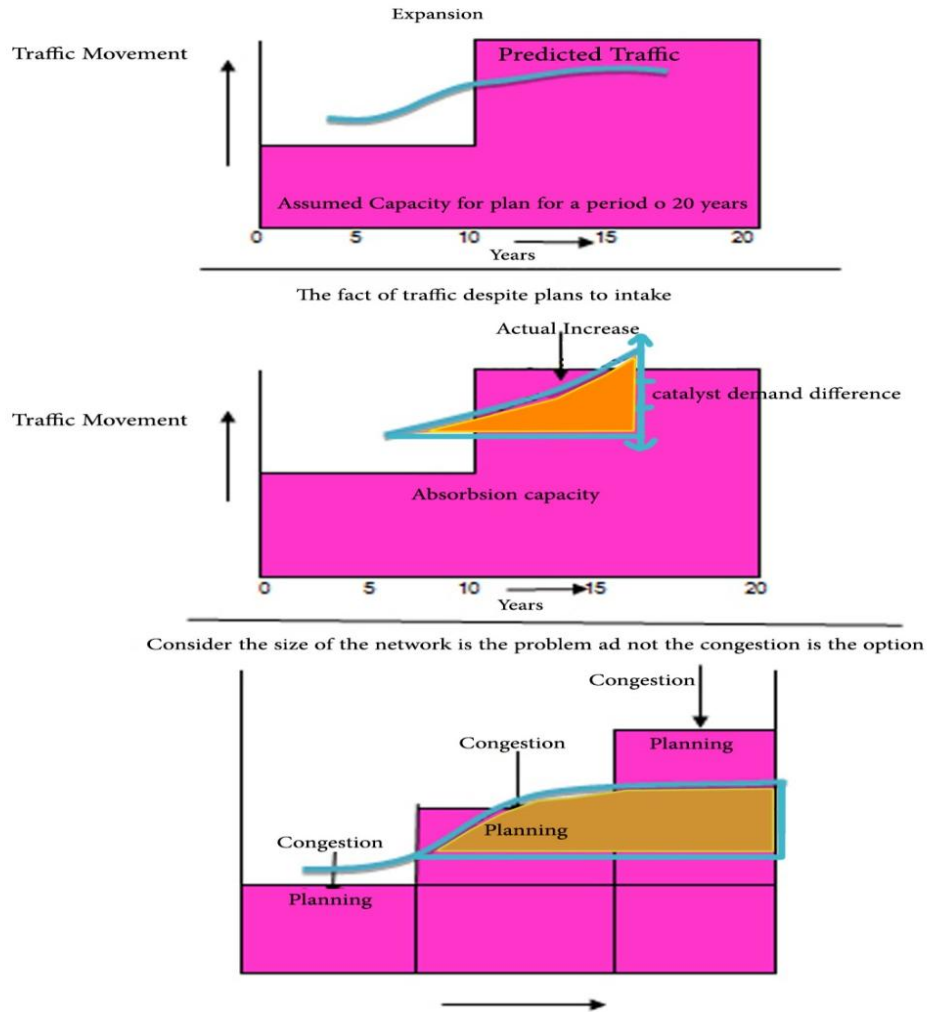


Figure 1:A pattern planning model in traffic (congestion) processing Jeff Speck to explain the principle of "catalytic demand" and called it "the system of overgrowth full" starting from the theory of catalytic demand of Todd Litman

In the same context, many international networks are being established to measure the city's ability to secure the happiness of its inhabitants through mobility ways in their city, including the network "Walk Score", which



brings together three thousand cities racing among them to become in the forefront and its standard is:

We believe that the organized neighborhoods, improved mobility and proximity to places admired by the population are a key to a happier, healthier and more sustainable lifestyle¹.

It is required from the cities today to restructure their streets and prepare their inhabitants for flexible means of mobility. This paper suggests that the trend towards a new style based on the promotion of "cities of smooth mobility" is the way to be followed.

We refer to the term "cities of smooth or flexible mobility"; those cities which possess the factors and structure making possible to walk or ride a bike in the city, requiring the existence of safe corridors, lanes, sidewalks including all the conditions and standards as exclusive rights for pedestrians and bicycle riders, which make the population, especially those who live and work inside the city, more courageous to subdue the vehicle and thus reduce its numbers within the city.

For defining more this subject, the research relies on a methodology that takes into account some simulations of the main experiments, rather than studying the economic, health and environmental aspects, and identifying the practical requirements to have cities of "smooth mobility" preferred to provide SWOT analysis to explain this transformation.

There are many cities in Europe and America striving to achieve the goal of transformation, in which they adopt a different pattern and exchange experiences among themselves for the most effective solutions in order to elevate their cities ranking towards the most secure and economical smooth mobility ever. This investment begins from building new roads and bridges

towards building an infrastructure for cycle and pedestrian paths that are becoming an ideal choice mobility within standards² of the cities: Extent

¹ www.walkscore.com/cities-and-neighborhoods/ (12)

² Litman, T. A. (2017). *Economic value of walkability* Victoria Transport Policy Institute

of replacement and conversion of huge rickshaw places sidewalks, to bike and hiking trails. Therefore, when the smooth mobility is ever created, this will become a pioneering culture, which will double the number of its users at the expense of vehicles, as seen strongly in New York (painting trails in green) although the per capita income there is much higher than ours, and some cities have resorted to canceling pre-paid meter positions - Parkmeter - for bicycle trails as in Chicago bike trails made by Ram Emanuel (Figure 2).

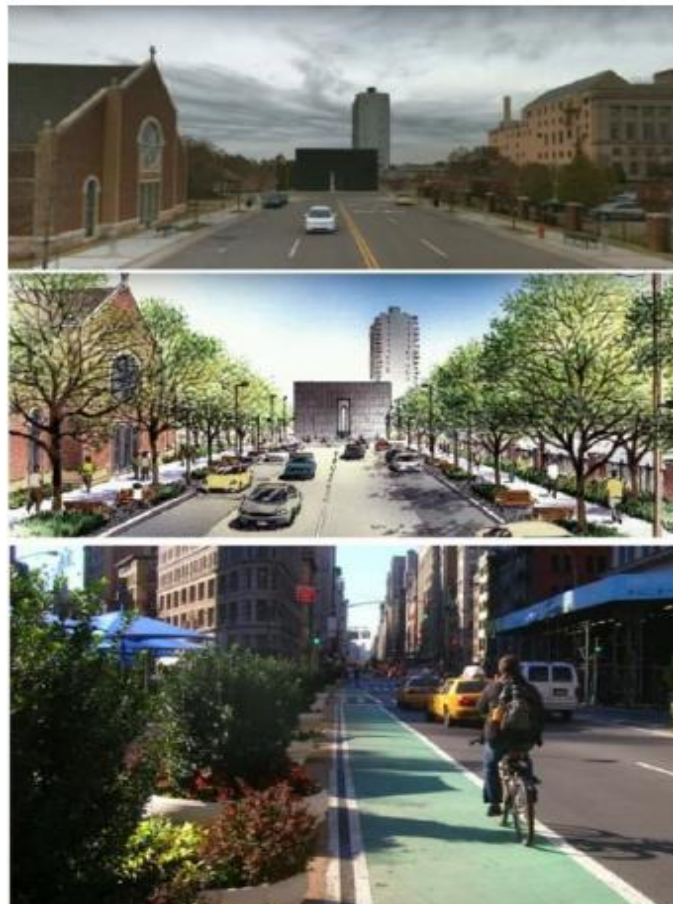


Figure 2: Top Street Restructuring in Chicago (Jeff Speck), below the screening bicycle trails in New York (Andres Duany)

2. Economic, environmental, and health aspects:



Lebanese people spend about \$2 billions (Gas- maintenance- insurance-licensing) on their mobility way; despite the number of bridges and roads has doubled, the importance of the car has increased as a major tool to move between work centers and housing without attention to time and money wasted. More planners are going to expand roads and double bridges, and because of this, Beirut's entrances are packed with cars at peak times, also it is important to consider the high prices of the apartments inside the city, and the scarcity of land that is good for construction has pushed the population to move to the suburbs, which have grown largely in response to housing demand. On the other hand, a helpful phenomenon has been remedied by the city of Portland in Oregon in the 70s, where important decisions have been taken to confront such troubles by setting limits on their urban growth instead of expanding the road network, existing roads are reconstructed to maintain health strategy and environmental sustainability through investment in walking and cycling infrastructure. This policy led to make it a strong culture of the population and instead of spending 20% of their money on the mobility way, they spend this value to live within the city and raise their level of life¹.

2.1 Environmental and healthy aspects:

Active environmentalists like Ed Glaeser (1992)², who says:

"We are a devastating human race, if you are a lover of nature, do not harm it. The integration into the city is better than expansion to the suburbs can be dispensed "

The most integrated and density cities are the ones that do the best, and here appears a cultural principle that requires to be carefull in our thinking, by having "a different culture in the way of life" (example in how to heat and refine water including dual drainage system, recyclable building materials, air conditioning and cooling system). But the "mobility plan" cannot be applied in an "immovable" city which does not have a public network above and under the

¹ Speck, J. (2013). Walkable city: How downtown can save America, one step at a time. Macmillan (14).

² Glaeser, E. L., Kallal, H. D., Scheinkman, J. A., & Shleifer, A. (1992). Growth in cities. *Journal of political economy*, 100(6), 1126-1152.

ground. According to Spec¹, the change of street lamps in the city to solar lights does not equate to saving a week in a city with a transition structure and healthy transport. This issue has a direct relevance to health, economy, education and housing.

As noted above, the increasing number of vehicles per year (Figure 3), accompanying with elevated fuel consumption and high environmental pollution, far exceeds global ex², resulting in an increase expense in the health and transportation bills which is negatively reflected on the national economy. In the absence of vision of National Public Transport, the figures show that government plans spending on building a public transport system was comparatively small with the figures that were spent on road construction.

A simple comparison between the years 1970, 1999³ and 2012⁴ showed that the public transportation system in Lebanon has declined significantly, in favor of citizens' use of vehicles, while smooth mobility (Walking / bicycle), which is very popular in developed cities, is completely absent from any actions in Lebanon and Beirut in particular. (Figure 4 and Table 1).

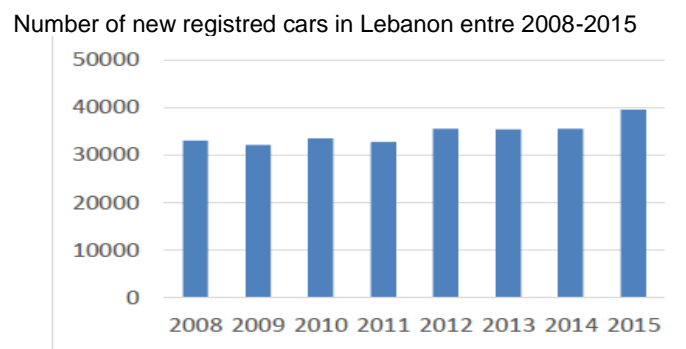


Figure 3: Chart of the growing number of cars in Lebanon according to the Association of Automobile Importers in Lebanon (Made by the author/ ESCWA)

¹ Jeff speck, 2014, The general theory of walkability, TEDx seminar, 23may.

² Environmental Economic Leadership for Vehicles, Practical Solution to Reduce Fuel Consumption and Environmental Pollution in Lebanon, Economic and Social Commission for Western Asia 2012 (pp. 1 - 96)
Link: <http://www.iptgroup.com.lb/Library/Assets/122828.pdf> (12)

³ Sandra Rishani Richani, (1999) *Get me out of this Traffic Jam*, Beirut the fantastic,
<http://spatiallyjustenvironmentsbeirut.blogspot.com/2011/10/get-me-out-of-this-traffic-jam.html>

⁴ 15 ESCWA (2013), Practical solution to reduce fuel consumption and environmental pollution in Lebanon, United Nations, Economic and Social Commission for Western Asia, New York
Link: <http://www.iptgroup.com.lb/Library/Assets/Escwa%20booklet%20to%20upload-122828.pdf>

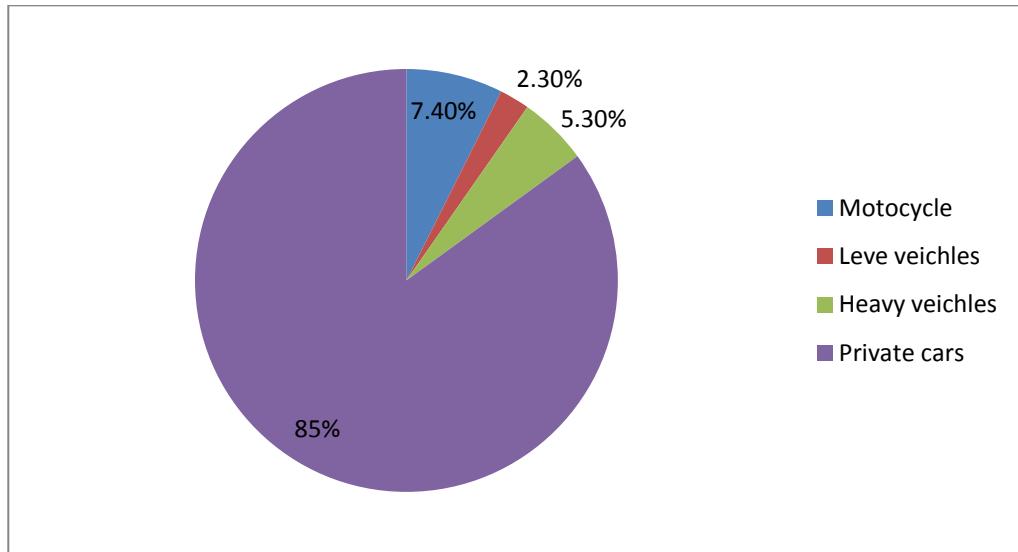


Figure 4: Distribution of vehicle fleet in Lebanon. Source: MOE/UNDP/GEF (2000)

Transportation way	Transport system on 1970	Transport system on 1999	Transport system on 2012
Private cars	52%	83%	92%
Public transport and taxi	48%	17%	8%
Walking	Unavailable	Unavailable	Unavailable
Biking	Unavailable	Unavailable	Unavailable

Table 1: The decline in public transport, in favor of private car movement within four decades (Ascowa made by the author)

Air quality

The deterioration of air quality in Lebanon is an environmental problem that worsens over time as compared to world indicators, because of the presence of smog, particulate matter and toxic pollutants which are a source serious health effects resulting with increasing number of people with cancer by an annual rate of 5%¹, according to reports of the World Health Organization in 2018.

¹ "The International Agency for Research on Cancer (IARC), Lebanon ranked first among Western Asian countries, the number of injuries compared to the population of the 100,000 Lebanese, 242 have cancer, while the Minister of Public Health in the caretaker government Ghassan Hasbani disclosed what is happening is scary and frightening, because the proportion of people with cancer increased by "about 5 % annually, between 2005 and 2016, and there 7000 cancer patients are treated at the expense of the ministry,



Exposure to pollution for long periods means exposure for breathing difficulties and the risk of many diseases. The transport sector in Lebanon (land, sea and air) is the main source of pollution and emissions of gases. The standard for measuring pollution rates of air depends on three elements¹: Particle (PM)², Nitrogen Oxide (NO₂) Ozone (O₃).

Air Pollution Figures in Greater Beirut Compared to World Health Organization (WHO) ³ Standards			
The poisonous polluter	MHO standard (annual average threshold)	Registered number in 2008	Registered number in 2014
Mini Particles	10 microgram/m ³	61	83,27
Nitrogen dioxide (NO ₂)	40 microgram/m ³	58	62,22
Ozone (O ₃)	100 microgram/m ³ médiun 8 hours	Zero(2010)	

Lebanon therefore lacks monitoring stations to produce a periodic database available for the whole world⁴ about maintaince the quality of air. The national report of the United Nations Conference recognizes the absence of adopting any air quality indicator to be published on a daily basis to inform citizens of the extent of air pollution, especially in Beirut.

According to the 2016 Environmental Performance Index, based on data from 2014, it is derived from images of satellites, in conjunction with modeling chemical transport of contaminants (4)⁵, the Lebanese people are exposed to bad air quality, especially in Beirut, indicating high levels of dioxide Nitrogen (NO₂) and particulate matter, the later being compared with a standard threshold of 10 Micrograms/m³, defined by the World Health Organization.

which allocated \$ 54 million, in 2016, to provide free medicine for cancer patients, who treat 42% of them, at the expense of the Lebanese state".

¹ WHO(2003).World Health Organizatio.Health Aspects of Air Pollution with Particulate Matter, Ozone and Nitrogen Dioxide.

² Particulate matter with a diameter of 2.5 or 10 micrometers or less according to the World Health Organization, these particles can penetrate into the respiratory system, making a health hazard increasing mortality rate

³ WHO (2005), Wold Health Organization. WHO guidelines on air quality have been developed to provide guidance on reducing the health effects of pollution Air. Link: http://apps.who.int/iris/bitstream/10665/69477/2/WHO_SDE_PHE_OEH_06.02_ara.pdf

⁴ Watching two air quality institutions, the Environment and Development Monitoring Center of the Federation of Municipalities of Fayhaa and the University of Balamand. The control included suspended particles, TSP, PM particles and suspended particles in the Shaka and Shalaa industrial areas

⁵ National Information Agency (NNA) (2016), Environmental Performance Index in Lebanon, 69.14, Office of the Minister of Environment, Economy and Environment, Link: <http://nna/leb.gov.lb/ar/show-news/211638>



Accordingly, Lebanon recorded an average of 62,22 $\mu\text{g}/\text{m}^3$ in the population exposure rate for nitrogen dioxide and 83,27 $\mu\text{g}/\text{m}^3$ for fine particles, indicating a risk (WHO, 2016)¹ Table 2.

Quality of environment in the city

Sound pollution affects the quality of life in the city, whether it is day or night. This stems from many sources, such as public works and traffic, particularly motorcycles and generators, rather than the distribution of industrial premises in the city, as major and more continuous sources. Some studies, including one in 2010(5)², indicate that the noise rate in Beirut exceeds 75 decibels³ in many areas and streets of Greater Beirut, exceeding the maximum allowed by Lebanese standards (Table 4).

Maximum allowable noise level in Lebanese standards Unit of measurement: decel dbA						
Type of region	Per day		Per evening		Per night	
	From	To	From	To	From	To
Comercial administrative	55	65	50	60	54	55
Residential	50	60	45	55	40	50
Residential at the Center of the city	45	55	40	50	35	45
Quiet residential	40	50	35	45	30	40
Surrounded by hospitals	35	45	30	40	25	35
Industrial	60	70	55	65	50	60

Table 2: Maximum permissible noise according to Lebanese standards Source: (CDR 2012)

¹World Health Organization (WHO), 2016, Countries, Lebanon, statistics for more: <http://www.who.int/countries/lbn/ar>

² Choueiri, E. M., Choueiri, G. M., & Choueiri, B. M. (2010, June). Analysis of accident patterns in Lebanon. In 4th International Symposium on Highway geometric Design, Valencia, Spain. www.4ishgd.valencia.upv.es/index_archivos/62. Pdf.

³ Green Area (2015): **Beirut is an open city for a hidden assassin named Noise:** The term "dB" is used as a unit for measuring the intensity of the sound. DB represents the swish of calm trees leaves, 90-100 dB representing thunder intensity, 130 dB represents the threshold of pain in humans, and is 85 dB limit which may be subjected to 8 hours in the workplace. Multiplied by 3 dB. Therefore exposure should not exceed 88 decibels for four hours. For example, you should not be exposed to music in a nightclub for more than an hour, because it is more than 95 decibels.



The World Health Organization (WHO) presents a more rigorous schedule than the Lebanese one:

Daytime noise rate according to WHO					
Type of region	Residential	Commercial	Industrial	Educational	Sanitary
Noise meter in unit decibels dbA	25-40	30-60	40-60	30-40	20-30

Table 3: WHO noise Standards (WHO)

To determine whether there is any action by the Lebanese authorities to combat this phenomenon, we find that the figure recorded in 2010 has escalated in 2015, registering a general average in Greater Beirut 97 dB (6)¹ per day, thereby exceeding Lebanese standards, and automatically World Health Organization.

It should be noted that every 10 dB increase in noise science represents, by logarithmic calculation, ten times more powerful, the sound measured at 30 dB, is 10 times sharper, than the sound is measured at 20 dB and the senses are two times higher than 20 dB. And 40 dB, is 100 times sharper, than 20 dB, and you hear, like four times higher. And 80 dB, is a million times more severe, than 20 decibels, and is heard higher by 64 times(7)². This is a dangerous indicator about the suffering people of Beirut, and even more dangerous, it is in constant elevation, in the absence of any concrete actions to treat this growing phenomenon.

The phenomenon of inactivity on the health of the population

Lebanese people suffer of obesity (30%) while growing up³ and this number is an increasing rate. The post-2000 generation has been threatened with diabetes due to the increasing unhealthy diet pattern more

¹ Green Area (2015), Beirut is an open city for a hidden assassin named Noise (6)

² Iman Nowayhed (2006), (2006), Map of the Noise in Lebanon, Journal of Environment and Development, <http://www.afedmag.com> (7)

³ <https://www.annahar.com/article/677974-67>



than in previous generations. Dieting is not sufficient in cities that lack the infrastructure while depending on confronting the phenomenon of excessive "inactivity", the fact is that we live in a place where there is no useful park that helps us to lose weight; and what is more dangerous than that is the percentage of drivers under the age of thirty has reached 54% of the total number of drivers which represents a dangerous index (Choueiri, 2010)¹

According to a British study, "Gluttony versus sloth" which monitors the relationship between "diet", "weight" and "idle", found that the later two are more interrelated. Dr. James Levine² proved "that obesity comes primarily from sitting more than two hours a day without moving than adopt a coherent diet. Studies emphasize what can be called" the environment that causes inactivity".

Another incision about health indicates that 20% of children in Lebanon are asthmatic and are contaminated³, so that this number doubles over time due to emission of pollutions in all their forms, especially vehicles. This leads us to predict about the "urban forecasting factor "VMT"⁴ for asthma problems in the city. Another health factor is that the biggest killer in urban ranges is vehicles and we mean "accidents". According to statistics of the Lebanese security forces, more than 700 Lebanese die each year, that means, 17 per 100,000 citizens besides people with disabilities, this number is frightening if we compare it and learn from the experiences of countries like Japan, which reduced this number to 4 per 100,000 people (WHO, 2015)⁵; San Francisco and New York States reduced this number to 3 (WHO, 2015)⁶. The main reason is whether we are designing our cities to arrange the movements of the cars or for the comfort of population ??

¹ Choueiri, E. M., Choueiri, G. M., & Choueiri, B. M. (2010 June). Analysis of accident patterns in Lebanon. In 4th International Symposium on Highway geometric Design, Valencia, Spain. www.4ishgd.valencia.upv.es/index_archivos/62.pdf.

² Levine. J. (2015). Sick of sitting. *Diabetologia* . 2015 August ; 58(8): 1751–1758. doi:10.1007/s00125-015-3624-6

³ Dr.. Elias Al Asfar, 2013, lkdg.org, issue 9581

⁴ Rentziou, A., Gkritza, K., & Souleyrette, R. R. (2012). VMT, energy consumption, and GHG emissions forecasting for passenger transportation. *Transportation Research Part A: Policy and Practice*, 46(3), 487-500.

⁵ Who(2015), World Health Organization report in 2015.

⁶ Same as previous



3. Four requirements to make our cities more flexible

To know the general theory of Mobility Cities¹, an example of Speck (2013) confronts the traditional view of a city whose population depends on the car as a mandatory means of mobility. The main idea is:

"If you want the city residents to adopt flexible mobility in their movement, you have to make the process more enjoyable than driving".

We learn from the theory two main pillars required by this process can be relied upon in the case of Lebanon:

- 1- Flexible mobility to handle the expansion of the city.
- 2- A city with a "safe environment for flexible mobility".

3.1 Flexible mobility to handle city expansion

The planning for infrastructure of cities develops with the evolution of causes. In the nineteenth century the population were suffocated because of the chimneys, therefore, the planners were forced to separate the housing from work and the population rushed to the suburbs leading to consume more land. This type of urban planning was called "Euclidean zoning"² creating a "new reason" for distance between work and housing which strengthened the status of the car, and the alternative was posed by theorists today called "flexible mobility cities". There is a distinct opportunity in the Lebanese city which can be defined by the short distances between work and housing for a wide average of people, which leads us to the principle of "Integrated city" approach to the diversity of uses of urban space, because the housing, work, shopping and education centers are close together that create mobility flexibility and streets to make safety cities. In the last two decades a large phenomenon is created: the proliferation of residential complexes outside the

¹ Speck, J. (2013). Walkable city: How downtown can save America, one step at a time. Macmillan.

² Hall, E. (2006). Divide and sprawl, decline and fall: A comparative critique of Euclidean zoning. *U. Pitt. L. Rev.*, 68, 915.

Harvard Definition: Euclidean zoning is characterized by the segregation of land uses into specified geographic districts and dimensional standards stipulating limitations on development activity within each type of district.

city leads to doubling the number of cars, with huge tracts of park land (Figure 5), and a huge number of stations to supply them with fuel

and spend a stock of fresh water for washing them, besides other invoices.



Figure 5: Sample taken from Google to show land loss in favor of vehicles (author's preparation)

This reason takes us from the model of a "city that is flexible in mobility" to a model of "city expansion which cannot be controlled later", and this should motivate us to begin changing the existing design bases to face a stereotype that is being reinforced day by day "to release the lebanese dream of having a private home facing the increase influx of vehicles and thus the huge traffic at the entrances of the cities and turn the city into a mere large car park"(Figure 6), a community which drives the car and then park it and use the elevator.

The fundamental principle here is the promotion of a balance between the housing and working areas by intervention in the stereotypical "movement Population" (accommodation - schools - restaurants - entertainment - worship - offices - trade - parking..). The proximity of these places to each other will increase the chances of relying on flexible mobility and thus dispensing the use of vehicles, and this coincides with the promotion of mass mobility and the creation of a model of "flexible flight". The issue it relies is an effective intervention to bring the population closer to their workplace and to consider the choice of a nearby school to student housing

and may extend the procedure to extend the standardization of the quality of education between schools to dispel the logic of preference between schools regardless of their distance.



Figure 6: Congestion In Beirut (2016) that shows that extended suburbs, offset by increasing in the number of vehicles (author)

Natural human beings seek to protect themselves instinctively from the dangers of any possible accident, so it is not possible to walk regularly unless its conditions of comfort and safe environment are guaranteed, which requires an explicit and clear presence of the mobility places that are separated from the places of transport of vehicles, and this niche is reinforced by the creation of a concept "Pleasant mobility", a humanistic motivational feature. The width rate of a street to the height of buildings is an ideal measure associated with specific and clear divisions, so we can take many examples of contemporary street partition involving a clear distribution of the elements of the street to have a safe environment for flexible mobility,

including a model adopted by the city Abu Dhabi¹ (Figure 7), and its divisions are divided into five distinct parts of the figure and we found it dependent on many contemporary cities.



Pedestrian services Bike protection Park



Figure 7: A model adopted by Abu Dabi in the distribution of elements of the street (with illustrations by the writer)

¹ Council, A. D. U. P. (2010). Abu Dhabi urban street design manual. *Abu Dhabi: UPC.*



For this, we notice that streets structural intervention has become necessary in the process of transition to a flexible mobility culture and the image of the city.

4. Discussion and SWOT analysis

In response to what has been discussed previously, SWOT analysis provides a deductive analysis on the four key aspects of the desired transformation process, which are concerned with strengths and weaknesses, opportunities and risks that threat them.

4.1 Strengths:

- The existence of investment in road construction can be transferred to the establishment of infrastructure based on smooth mobility.
- The existence of vast areas acquired by the vehicles can be converted to favor this structure.
- The housing, labor, schools and universities sectors are concentrated in large numbers in the city with distances that don't take more than one-third hour on the bike.
- The desire of a large segment of the Lebanese people to reduce the expenses rather than the need to find time to exercise and reduce the inactivity.

4.2 Weaknesses

There are weaknesses that may make the process of transformation difficult and it is required to overcome the consequences:

- The existence of many narrow streets in the city makes it difficult to be divided and this is a big challenge that requires a bet on transformation board in the culture of the population to adopt flexible means and thus to abandon the vehicle, so the streets will have a descending route in the number of vehicles accompanied by an upward path in bike or exercise walking.
- It is very difficult to make the citizen think of dispensing his own private car; this requires action including the improvement of public transport and the enactment of laws that takes into account the proportion of cars to the population.



- There is a large segment of citizens living outside the city of Beirut, the evidence of congestion wide at the entrances, this demonstrates the importance of making the plan of "a broad-based strategy".

- The absence of a modern urban planning system in Lebanon and a huge cognitive failure in the planning process has a weak gap that makes it difficult to work with ambitious plans unless they are remedied.

4.3 Opportunities

There are many opportunities that can not be counted if a drastic shift is made from vehicle adoption as a main unit, as we will mention:

- Reduction of the health bill upon the government and citizens and turn this cost into the development of sectors mostly needed.

- Relieve existing congestion and create more flexible modern mobility alternatives with all the attendant mitigation aerial and audio pollution.

- Reduction of the invoice of the imported vehicles with the consequent maintenance and waste water on their washing as well as the cost of their violation.

- Reducing deaths and disabilities resulting from massive accidents.

- Mitigation of pollution resulting from vehicle waste, particularly oil, damaged tires and car structures scattered in cities.

4.4 Threats

The experiences of cities that have become a model of "flexible mobility" have shown us that the process has not had any bit of risk, but standing up to the risks of staying on the existing planning approach will lead us to the following consequences:

- More than 40,000 vehicles will continue to flow into Lebanon's road network each year, thus polluting the environment (Air, sound ..)

- The economic burden and the health bill will increase.

- The gap between the Lebanese city and the contemporary model of the attractive and competitive city will increase and it is reflected negatively on the sectors of health, mobility, and tourism.

- The phenomenon of population inactivity will be exacerbated by reliance on the prevailing model of mobility and will increase its health consequences on the population and weaken their index of happiness.



- The technical community that survives the relevant work may be affected (mechanics - supply stations - Insurance companies ...), but a new technical community linked to flexibilities will be established with the infrastructure required for the transformation process, which is sustainable .

5. Conclusions and recommendations

The approach in the urban planning process in Lebanon suffers of a large knowledge gap in its performance, especially in treating the existing traffic system and its lack of control over the negative variables which accompany them, and this leaves serious effects on the national economy (two billion dollars), and raises from the bill health of citizens and increases the phenomenon of "indolence" and "wasting time". This lead the lebanese cities, like Beirut, to lose their state as a "competitive features" as we have seen before. The idea of "turning into a city with a safe environment for enjoyable and stimulating mobility" is fundamental to get a modern transformation in the cities to a sustainable, competitive with healthy environment and attractive urban attractions contemporary.

We may conclude that the expansion of the Lebanese city is now consuming irreplaceable land and exacerbating mobility crisis is a clear reason for adopting "flexible mobility as a processing tool".

It is essential to consider the importance of spatial space and arranging it with transport plans in stage planning because any positive or negative omission in the study can lead to an unstable relationship between space, residents and between the arteries of the city, which in turn leads to what we have already mentioned of negative effects at the economic, environmental and health levels.

The choice of the city pattern has a great importance in determining its services where we notice that the random extension, as we have discussed previously, leads to a defect in the transport system. From this point of view, we refer to the importance of a stage planning and taking into consideration the importance of creating jobs and the orientation towards organizing the relationship between population and space spatial services, industrial zones, commercial areas and others. Unplanned patterns lead to increase the number of trips per person that contributes to the creation of pollution at the environmental levels (noise - tension- idle - decline in productivity level).



Connecting workplaces and transportation centers increases the efficiency of space and raises the fun of relying on more sustainable transfer, so that we notice that the workplace which is near to the residential area reduces the number of journeys of citizens and relieves the pressures resulting from noise and congestion.

Here are the recommendations as a context to answer the research question, yes there are many alternatives based on a scenario consisting of **two pillars**:

First: investment in the construction of a modern and advanced transport system (transport fleet, buses, railways, tunnels within cities for trains and others) to reinforce citizens' confidence in public transport by making them more enjoyable lessen the usage on one transportation mean.

Second, the idea of "turning into a city with a safe environment for a pleasurable and stimulating mobility" is a fundamental element to transform the city into a sustainable, competitive and healthy environment with the attractive features of modern cities.

This claims the planners in Lebanon to take lessons, seize opportunities and rely on strengths and foresight the risks in this transformation process, as the economic, political and social realities of a country in which the citizen loses his confidence in the government, thus, there must be a change in the policies of transport and movement.



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