Ain Shams University
Egypt

University of Stuttgart
Germany

Seasonal Cities: Temporal Changes in the Urban Metabolism of Alexandria, Egypt

A Thesis submitted in the Partial Fulfilment for the Requirement of the Degree of Master of Science in Integrated Urbanism and Sustainable Design

by

Andres Mauricio Estrada Bolivar

Supervised by

Prof. Dr. Mohamed Salheen
Professor of Integrated Planning and Design
Ain Shams University

Prof. Dr. Astrid Ley
Professor of International Urbanism
University of Stuttgart

Dr. Ayat Ismail
Assistant Professor of Urban Design & Planning
Ain Shams University

July 2018

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Planning and Design	International Urbanism	Urban Design & Planning
Ain Shams University	University of Stuttgart	Ain Shams University

Examiners Committee
Title, Name & Affiliation

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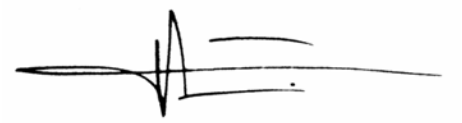

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Ain Shams University
Egypt

University of Stuttgart
Germany

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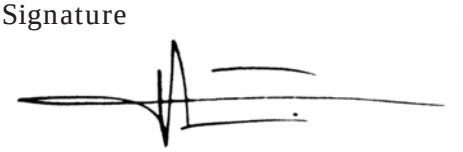

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Te amo papá.

Abstract

The development of cities is dynamic, many of them present specific situations that can be understood as seasonal or cyclical, which mean they change its daily condition for a frame of time. Based on it the topic to be researched is called Seasonal Cities; which refers to periods where a city is subjected to additional or external pressures which modifies its dynamics temporarily and returns to its previous state afterwards. The investigation will be developed on one side on a theory-led approach by means of inputs and perspectives from Urban Metabolism, Urban Sustainability, Urban Resilience, Growth and Shrinkage of Cities, Ecosystem and Infrastructure of urban spaces in order to have a conceptual framework for the topic. On the other side a recommendation-led part is necessary for having an overview of the complexity and diversity of the phenomenon, so there will be introduced concrete cases: Ulan Bator, in Mongolia and Medellin, in Colombia through seasonal events that they face periodically.

Based on those examples, there will be hints and scopes for researching the case study: Alexandria, Egypt. The focus is particularly in the summer time and the massive migration of tourists to the city. The aim is to understand to what extend this time changes and affects the sustainability of the cities and what the perception, reaction and acknowledgement of inhabitants and local authorities is towards this situation. The investigation will be carried out on a first stage of reports from different sources about tourism in the city and how it is affecting the current urban development. This documents contain relevant figures, data and facts, but they are mainly introducing the situations without a deep analysis to outcomes of the summer season, perceptions of residents or awareness of local government about several situations from this specific event. So some of these gaps will be studied in a second stage on a basis of interviews, questionnaires, statistics and participation methods leading to understand the urban metabolism cycle of the case study, not just in terms of numbers but also in terms of influence of people, both locals and tourists, on several processes of the city and how it is visible and tangible in the image of Alexandria.

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Abbreviations

- UM: Urban Metabolism
- GHG: Greenhouse Gas
- MFA: Material Flow Analysis
- MoT: Ministry of Tourism
- AC: Air Conditioning
- AWC: Alexandria Water Company
- MCM: Million Cubic Meters
- ASDCO: Alexandria Sanitary and Drainage Company
- WTP: Water Treatment Plant
- WWTP: Wastewater Treatment Plant
- CO2: Carbon Dioxide
- EEAA: Egyptian Environmental Affairs Agency

Chapter 1
Introduction

In planning the matter of space is the main discussion, the way how such space changes on time is mostly understood through permanent patterns, either even growth or even shrinkage. It is reflected in theoretical and planning approaches towards cities where they are seen as static and one-dimensional places. There are cases of cities with cyclical patterns of change, e.g. they face repetitive dynamics of increase and decrease under the same time and conditions; they were defined for this research as seasonal cities.

Environmental and man-made exchanges are driving forces of urban variations. The environmental component is related to natural cycles, on the other hand man-made activities are related to cultural patterns of consumption. Infrastructure is the mean through which citizens have access to natural resources from the city, yet the current approach of urban metabolism, which study the flow of materials and resources in the urban, does not recognize social dynamics when consumption in cities is assessed, in fact most of reports are quantitative studies of cities without regard on the reasons for consumption or its fluctuations on time. The lack of studies on seasonal changes of cities does not allow to infer their environmental impact on urban sustainability in comparison with permanent shifts. Sustainability might be assessed based on the scale of growth and consumption (Goodland, 1995: p.6), which is a contextual element to evaluate, based on the change, the configuration of the urban to cope with it and the capacity of hinterlands to support urban fluctuations.

The social dynamics on time, their impact in metabolic urbanization and the

outcomes from such processes are aimed to be explored by means of this research, stressing the role of temporality and social patterns of consumption, as they are the gap detected on planning and urban metabolism studies.

The cases selected for this research are currently facing seasonal variations, yet these events are attended from the same paradigm of the city as a static place. A different approach on planning would be needed for understanding the urban as reactors of socio-economic dynamics and consequently tackling their issues on a basis of change instead of in a basis of steady conditions. The cases are crucial for the research, on the one hand due to the absence of studies on social dynamics on metabolic urbanization those events support the literature review, on the other hand, seasonal cities are not related to a specific outcome, their common factor is the urban changes on a basis of time and cycle, so the cases presented explore different conditions, contexts and outcomes so the versatility of the topic as well as common conditions can be explored.

The research is divided in seven chapter, where after introducing the research and exploring a theoretical framework, a couple of reference cases in Medellin, Colombia and Ulan Bator, Mongolia, are used to get insights and clues to learn from, and proceed to study the case study in Alexandria, Egypt. Insights from the three cases are explored and linked in order to build a structure for proposing recommendations and scenarios, in an attempt to approach planning for seasonal changes in cities.

The research of seasonal cities was approach by means of metabolic urbanization of cities. Due to the complexity of the topic, including infrastructural conditions as well as social patterns, quantitative and qualitative data was collected and compared in the exploration of the case study of Alexandria in the summer season, when the population of the city increases dramatically for a frame of time. The results showed the high demand of resources that such season puts on the infrastructure of the city, yet the influence of a permanent undeveloped infrastructure is also highlighted in the outcomes found. The recommendations developed were placed in a seasonal timeline trying to plans some actions following the cycles of change of city. The role of social dynamics in changing the patterns of metabolic urbanization and cities as reactors of those variations were explored throughout the research.

Chapter 2
Research Design

2.1 Problem Statement

Cities are normally understood as if they were stable and one-dimensional. It is reflected in theoretical and planning exercises by focusing on either growth or shrinkage urban patterns, as if there were not dynamics in between. Some cities face fluctuations that can be understood as seasonal or cyclical, which means their patterns are not permanent; they increase and decrease based on specific contextual conditions. On the other hand, urban metabolism has been used as a methodology for monitoring urban development in terms of material consumption, but the temporality and variation of cities has not been recognized by the reports on the topic, they are also understood as steady places. The role of socio-economic fluxes as driver changes of urban dynamics and metabolic flows has not been explored, actually they are seen mostly as tangential urban components, perhaps as part of the paradigm of understanding cities as static and steady places.

The social effects in urban metabolism and the temporality in urban planning can be allocated in specific outcomes that some cities around the world face seasonally, yet they are planned under the same paradigm of permanent conditions. A different approach for seasonal cities has not been developed for planning these contexts based on the temporality of socio-economic dynamics.

2.2 Aims

To study the influence of temporal socio-economic dynamics in the urban metabolism and how cities react culturally and environmentally to such variations.

To place cities in a framework of time in order to understand patterns and

variations based on socio-environmental exchanges.
To analyze seasonal changes in specific cities chosen for this research, outlining the social involvement, its reflection in their urban metabolism and the environmental costs of their fluctuations.

2.3 Research Questions

The research is developed, on the one hand from a theoretical approach of urban changes and metabolic urbanization, and on the other hand from current cases selected to get insights from for the development of the topic. For this reason two different research questions, conceptual and contextual, guided the research.
How urban metabolism is changed by seasonal urban dynamics resulting from socio-economic patterns?
To what extend urban changes affect the sustainability of those cities and what is the perception, reaction and acknowledgement of inhabitants and local authorities towards this phenomenon?

2.4 Methodology

For the study of temporality in cities, the approach of urban metabolism was selected. In the endeavour of exploring seasonal cities, the analysis of metabolic urbanization allows to understand the city as a network, which leads to see temporal urban changes as results and reactions of temporal alterations in its components.
The research is an exploration of seasonal events in selected cities, and the way how each one of them deal with their situations, outcomes and social reactions. Two cases, Medellin and Ulan Bator, were selected as references of the topic to get insights from. These insights were explored in Alexandria, Egypt, the case study of the research.

2.5 Limitations

Conceptual: No studies about the topic of seasonal cities or fluctuations on urban metabolism were found in terms of academic discussion, for this reason the research is supported by papers on urban changes, impacts of man-made activities and cities as ecological systems. Discussion and reflection of studies of urban metabolism for allocation gaps on literature, however the temporality element was not found in reports.
Case Study: For the case study of Alexandria several limitations were faced:
- Institutional: Organizations such as Governorate of Alexandria, and those in

charge of electricity, wastewater and solid waste did not provide any quantitative nor qualitative data due to institutional regulations. For this reason indicators and previous studies on different topics had to be used as there were no one-to-one resource allowed. This was done to have indications on what the current situation is about and how to place it in the discussion of seasonal cities.

- Time: The seasonal condition studied in Alexandria belongs to its summer condition, yet the research was done outside summer. The aim was to study the seasonal condition from metabolic flows perspective and from Alexandrians' perceptions, which do not require summer to be investigated. It was assumed that summer visitors go to the city for tourism purposes, from there the investigation was not about them, but about the urban outcomes they produce.

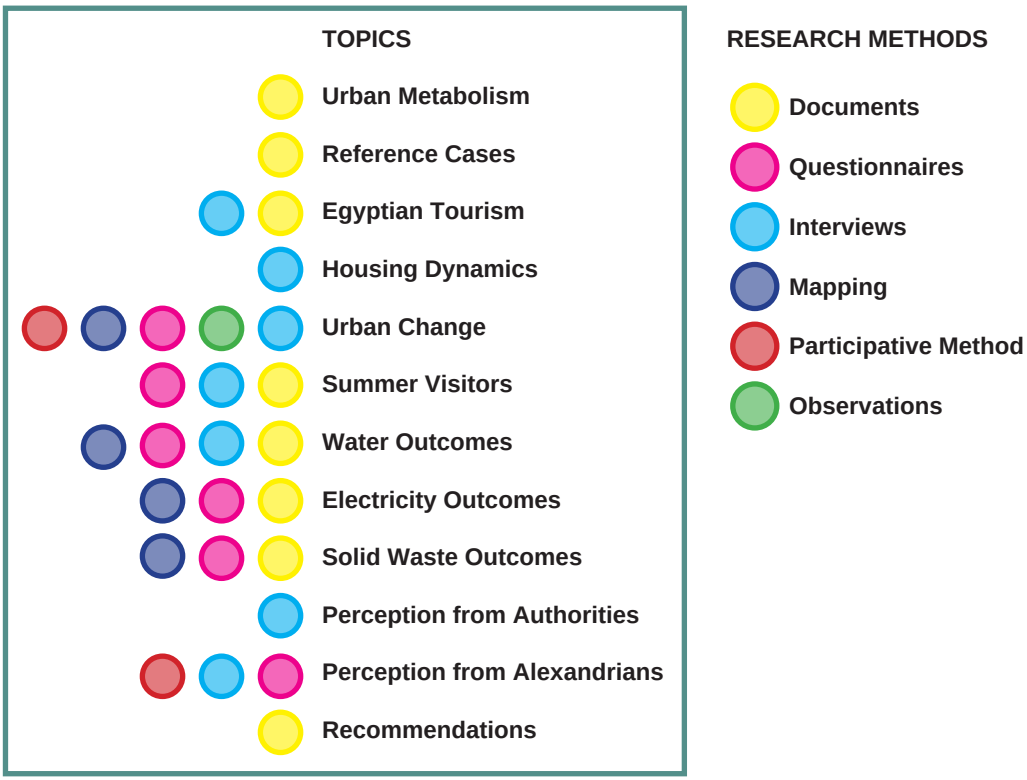


Table 1: Research methods applied.
Source: Author

2.6 Research Methods

Mixed methods were used in the development of the research due to the simultaneous necessity of quantitative and qualitative data according to the topics discussed. The table 1 illustrates each topic and the method(s) applied in the thesis:

- Documents: related to scientific papers, infrastructure reports, articles and

websites.

- Questionnaires: They were answered by students of architecture from the University of Alexandria, currently in the third year. They were selected as respondents due to the knowledge required for the questionnaire, related to urban changes, infrastructure, mapping, demographics and English language (see Appendix). Some of the respondents are seen in the figure 1. The results were used for extracting concepts, perceptions, comments and hints on the seasonality of Alexandria. No quantitative information was extracted from questionnaires due to the size of the sample[1].

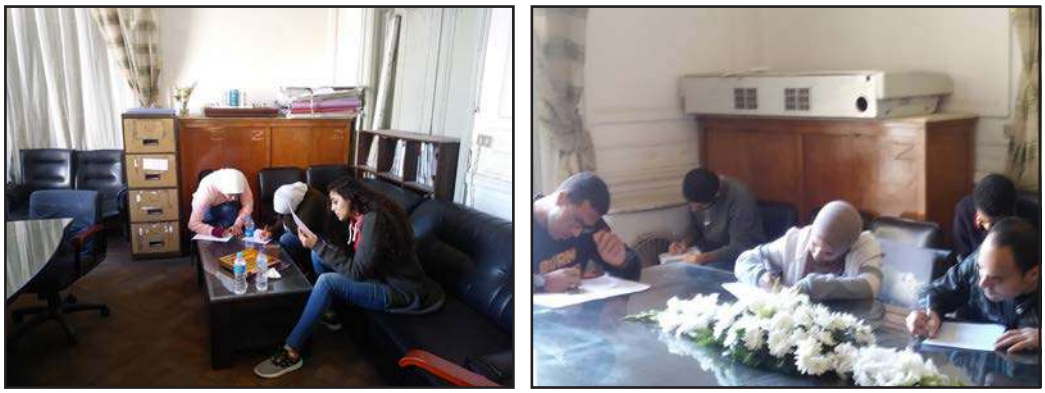


Figure 1: Questionnaires and respondents. Students from third year of architecture. University of Alexandria.
Source: Author

- Interviews: Semi-structured interviews were developed with experts on specific topics contacted, as well as with people inhabiting specific areas of Alexandria or related to specific backgrounds. The main limit for developing the interviews was the language.

- Mapping: Maps and schemes on material flows were developed based on interviews and reports.

- Participative Method: An exercise of mental mapping was proposed to the respondents as part of the questionnaire previously mentioned (see Appendix). The result was illustrated in a map.

- Observations: The research was developed outside summer, which was used as a reason to photograph the city in winter and spring and compare them with pictures about Alexandrian summer found on internet. It helped to confirm the seasonality of tourism in the city.

1 A total of 20 questionnaires were responded. The size of the sample is small to reflect a representative part of Alexandrians.

Chapter 3
Literature Review

3.1 Seasonal Cities

Urban areas subjected to temporary and cyclical changes in its dynamics are investigated under the approach of Seasonal Cities. Modern cities are mostly growing, while shrinkage, on the other hand, is a more recent study topic (Brunner, 2007: p.11) (Richardson & Nam, 2014: p.1). But are there no more urban trends? Is everything summarized as either permanent rise or permanent drop? There are examples around the world of cities affected by periodical and repetitive changes, e.g. alterations in urban conditions which will return to their previous states afterward a frame of time. They will be explored in order to detect their influence on the urban development in each one of the contexts where they take place.

Changes in urban areas might occur in two different ways, either by means of long periods of a steady state in which the city faces small-scale disturbances, or by means of short chaotic periods in which the city faces strong fluctuations (Timmeren, 2014: p.13). The seasonal variations studied in this research are short chaotic periods happening during the same time and under the same conditions, e.g. they are not sporadic but expected due to the same driving forces. This suggests a matter of anticipation or prevention, however specific contextual arrangements will be discussed to show which elements lead the urban to face dramatic alterations presumably without anticipated plans.

3.2 Urban Changes

For understanding man-made urban changes and their influence on ecosystems Grimm et al. (2000) studied cities as urban ecological systems. They highlighted two sorts of sources of urban change: on the one hand anthropogenic variables, associated with human activities, and on the other hand geogenic variables, related to geologic setting, e.g. natural or environmental factors. These concepts seem disconnected, yet the authors highlight their mutual influence.

In order to understand cities as urban ecological systems Grimm et al. differentiated networks within the city from the city as a network, by analysing ecology and cities:

Ecology in cities: Analysis of the ecosystems within the urban

Ecology of cities: Cities as ecosystems, where every part is connected to the whole structure.

From this perspective we can say that any change either in human or in geological features will affect the rest of dynamics. Seasonal Cities are analysed from the approach of the urban as an ecological system, which present a temporal and cyclical change either in its anthropogenic or geogenic conditions, or in both of them simultaneously.

Figure 2 shows a schematic interplay between geogenic and anthropogenic components of urban environments. Although in the scheme both sides are seen as potential and equal driving forces of alterations, human actions modify dramatically the functioning of ecosystems where they live in (Ibid: p.572); (Vitousek, 1997: p.494); (Foley et al., 2005: p.570), which might explain why the literature on urban changes mentions human-dominated ecosystems as a settled condition for pointing the effects on earth's ecosystems.

Urban changes, according to the context, can be studied as a permanent or as a temporal condition. The permanent one is analysed more frequently, perhaps as a result of urban design paradigms, or as a vision of temporal alterations as tangential events to the development of the city. The report made by Warren-Rhodes and Koenig (2001) is a good example, in which they studied the increase of 3 million people in Hong Kong's population between 1971 and 1997 in terms of urban metabolism (UM) including consumption, waste generation and

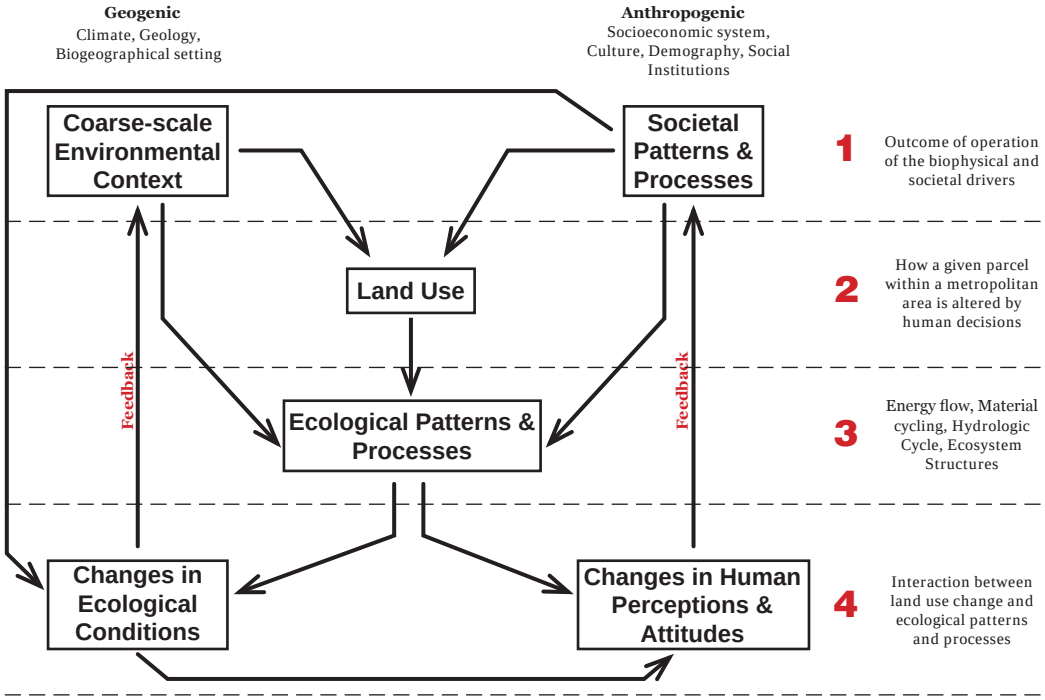


Figure 2: Conceptual scheme for articulating geological (Geogenic) and social (Anthropogenic) systems in urban environments, aiming to reflect temporal dynamics. Four different levels are recognized aiming to show: 1. The input or source of urban changes which can proceed from any of the sides or from both. 2. The place where such change is happening and the characteristics of the change. 3. How such change is reflected in the ecology of the city, in terms of flows, cycles and structures of environmental services. 4. The extend of perceptions and reactions from ecosystems and citizens. This reactions are feedbacks that might lead to create new contextual patterns on both sides. Here it is clear the cycle that inputs and outputs create, having the level number 1 as a source, and the feedback from level 4 returns to the level 1 as a sink.
Source: Author, adaptation from Grimm et al., 2000: p.577

overloading of land services. Perhaps it might be possible to do this study with other cities carrying a similar scale of growth, yet papers focused on temporal growth and affecting UM were not found.

By means of a study of UM in steady growth it is possible to see the amount of resources implied in such increase, the quality of environmental services and the waste generated in such transition. Rising UM entails greater loss of ecosystems, which is reflected in urban areas (Kennedy, 2007: p.43). What if such an increment happened for just a specific period of time and then it decreases to its previous state? Will it be more environmental friendly? Will it not affect the whole urban system as a permanent change would do? The consequences of temporal changes on UM are unknown, as most reports cover steady situations. The seasonal condition might not mean that the effects are also seasonal.

3.3 Seasonal Cities, Resilient Cities?

As seen so far, Seasonal Cities entails a temporal change which will later on allow

the city to go back to its previous state. Are those then resilient cities? Urban resilience is understood as the capacity to come again to an even or balanced state after a disruption (Meerow et al: 2016, p.44). The ability to go backwards might not imply a recovery capacity, that could actually mean that the driving forces of change are not influencing anymore, which does not mean that the city is resilient.

Returning a the previous state might sound like an ideal scenario or solution for a disturbance, however, what if the original state is undesirable? (Ibid: p.44). Defining what is undesirable might rely upon several factors, but surely in the case of the seasonal cities we might consider the state previous to the disturbance to determine the scale of disruption. Categorizing seasonal cities as resilient or not, will not depend just on the fluctuations of alteration and recovery, but also on the socio-environmental conditions (as discussed below) that the urban faces before, during and after the change. The approach of UM looks to analyse such conditions, the sources of change, the environmental implications, the availability of resources either within the ecosystems or within the city, and the role of citizens in consumption and waste generation affect the urban.

The dynamic of change and recovery hints a matter of stability or equilibrium; however, Dovers & Handmer (1992: p.266) understand resilience as a contradiction to stability, describing the competency of an ecological system to persist when changed, but not necessarily to remain the same. The cities here researched as the cases of seasonal cities keep functioning either during or after the disturbance, but does it mean they work as an ecological system? A much deeper analysis to the urban processes and development would be needed in order to answer that question.

For this reason the route for approaching the study of seasonal changes in cities is UM analysis, as such methodology allows us to detect and explore environmental alterations linked to urban dynamics related to flows, distribution, consumption and waste of materials. It belongs to level 3 in figure 2; the crucial aspect of this level is related to what happen in the rest of levels before and after. The anthropogenic and geogenic patterns influence urban areas, which is reflected in urban flows, materials and services. At the same time the waste generated becomes feedback and sources of new patterns from the sources. Although UM correspond to just one level in the graphic, a comprehensive understanding of

this topic will lead to understand the seasonal changes in such processes.

3.4 Urban Metabolism (UM)

The methodology selected for the study of seasonal cities is UM, as certain changes in the infrastructure performance is aimed to be researched. In a broad sense, the UM concept has been used as a systematic approach to understand energetic and material transactions between cities and the rest of the world (Fischer-Kowalski, 2002 in Timmeren, 2014: p.5). The concern on how the urban form and growth are unsustainable for cities has led different stages of planning to develop new frameworks aiming to achieve the so-called sustainable development (Jabareen, 2006: p.38). Perhaps instead of assuming that cities are dangerous *per se*, identifying metabolic processes that affect their sustainability (Kennedy, 2007: p.43) might be a more reliable task in order to clarify specific issues to tackle.

UM's background is a concept rooted in the conception of the modern city as a making of the urban a network of circulatory conduits (Swyngedouw: 2006. p.21) with external sources of energy and materials (Gandy, 2004: p.364). In previous urban studies, Wolman (1965) introduced the idea of the metabolic demands of cities as all the necessary materials to sustain the residents' activities. Even though such conception was broad, his research focused just on quantifying the consumption of three elements for a hypothetical city of one million inhabitants in the USA: water supply, sewage disposal and air pollution. Resources like food, fuel and electricity were not considered, as for the author they presented no problems. It is clear that such perspective is contextual as at the beginning of the paper there is a statement referring to national-wide potable water shortages and low quality of water and air.

Wolman's paper is not based on a real city but on the nationally available statistics for studying its metabolic processes. The accuracy of the paper is debatable. On the one hand the importance of the context is not recognized, whereas on the other hand, when using national statistics for describing the metabolism of a city the information might then look out of scale. Furthermore, the influence of people is recognized just as a quantitative elements. The social dynamics are not recognized.

Recent papers include similar categorizations of materials. Brunner (2007) studies cities with more than 10 million inhabitants. His paper includes fuels and food, but categorizes the elements in three levels placing water and air as the

priority for human activities, just like Wolman did. Kennedy et al. (2007) focus on what they call 4 fundamental flows: water, materials, energy and nutrients, which are defined by means of the study as increasing metabolism per capita in several cities around the world. The paper studies the changing metabolism of cities where most of them exhibit increase. Seasonal or temporal variations are not mentioned. Water is also considered the largest component of UM. The paper of Kennedy et al. (2010) is written under a similar approach but it goes forward by including electricity, heat and fuels for inventorying greenhouse gas (GHG) emissions in several cities and metropolitan regions around the world. This paper stresses a more practical part the UM pointing sustainability indicators, GHG accountability and design tools, which highlight the different scales and ways to approach the topic. A different perspective is made by Timmeren (2014) who does not focus on prioritizing elements but on considering the quality of infrastructure as a crucial condition for the quality of urban metabolism, which might impact the urban sustainability. Data is crucial for evaluating the infrastructure performance is the availability, but there is a risk on relying on the easy to measure data and leaving behind data which demand extra effort to obtain (Sattherthwaite, 1997: p.1670), which might be crucial for urban development.

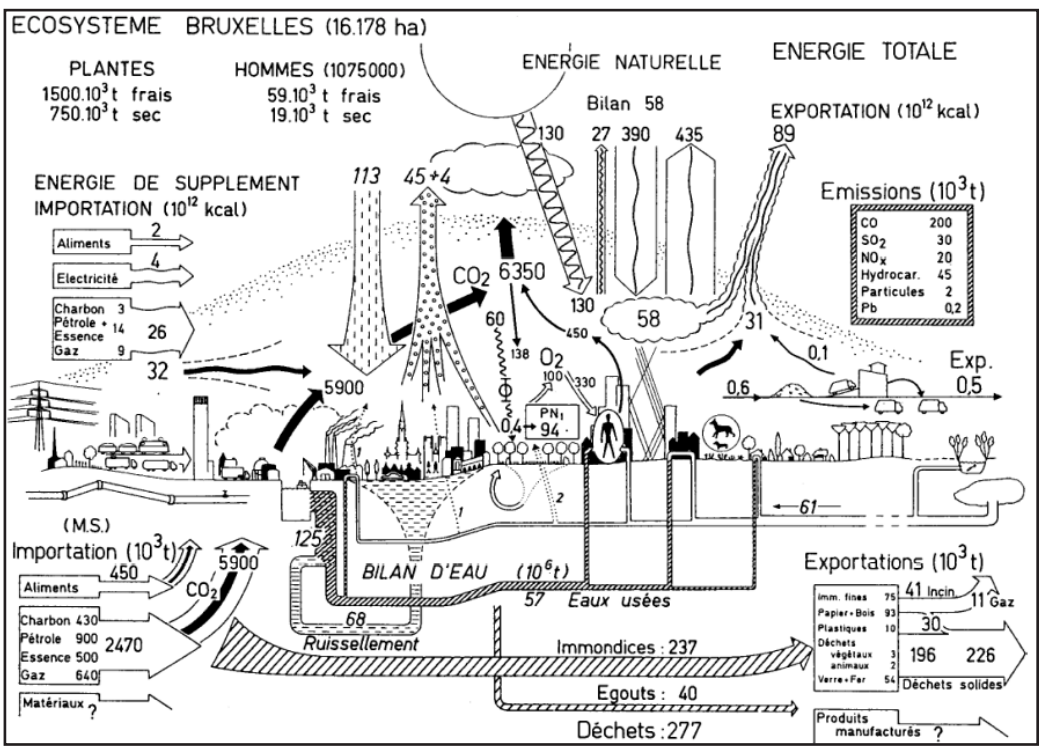


Figure 3: The urban metabolism of Brussels, Belgium in the early 1970s.
Source: Duvigneaud and Denaeyer-De Smet, 1977 in Kennedy et al. (2007: p. 47.); (2010: p.3)

So far, the practical panorama of studies on urban metabolism look like a big picture quantification exercise (Kennedy et al. 2010: p.1), as if the needs and consumption of a city remained always the same. A graphical example of this is the figure 3, where an analysis of the UM of Brussels, Belgium was developed, even including wastes generated by humans, dogs and cats. However, it is never mentioned to which time such quantities and flows belong; is it always the same? Are there peaks and troughs? Are these diagrams created based on the most optimistic statistics?.

In that sense the diagram of Belgium might represent a "screen-shot" of the city, e.g. it illustrates and quantifies the city's demand and consumption in one specific moment or under specific circumstances. The illustration was found in both papers from Kennedy et al. (2007: p. 47.); (2010: p.3) which correspond to the approach of the 4 fundamental flows previously explained. Additionally, in both papers UM is defined as a technical and socio-economic process; however, the social component is scarcely considered. The conception of the city as a dynamic and changing system and its links with external ecosystems is not represented here either; although, imports and exports of materials are mentioned, conditions of sources and disposals are not represented.

3.5 Metabolic Urbanization beyond Material Quantification

Kennedy et al. (2010) see UM as a result of technical and socio-economic processes in urban areas, yet in their paper the attention is put mainly on the technical part, by accounting materials and flows of the services provided in the city. The socio-economic characteristics are left as tangential facts instead of driving forces implied in the consumption of resources. The report previously mentioned from Warren-Rhodes and Koenig (2001) about the increasing population in Hong Kong illustrates this. While there might be assumptions on the reasons for the increasing metabolism per capita that the authors did not explore (Kennedy et al. 2010: p.4), the technical and accountable stage was covered.

In an attempt to go beyond quantification exercises recent reports have included Material Flow Analysis (MFA), which include a qualitative description of the origin and the disposal of resources as well as their flow within the city (Voskamp & Stremke, 2014: p.3). Even though it is a more comprehensive vision of the topic, still leaves the social influence as something outside of the process. An example of MFA is presented through a Sankey diagram in the figure 4, which

reveals the linear characteristic of urban metabolic processes (Kennedy et al., 2010: p.1); (Voskamp & Stremke, 2014: p.4) or linear reactors that current cities represent (Brunner, 2007: p.12).

Such a linear condition is what drift cities apart from functioning as ecosystems. The linearity of current urban areas shown in figure 5, have an origin of the resource, a way to distribute it based on the demand, and a disposal after such resources are used. Natural systems on the other hand are not linear but cyclical and self-sufficient; until the streams of materials in cities cannot be closed and the cycles cannot be managed, a sustainable built environment will be hard to reach (Kennedy et al, 2010: p.1); (Timmeren, 2014 p: 9).

Although UM is seen as an interdisciplinary topic (Kennedy et al., 2010: p.3), it is a fact that the main focus has been put on the accountability of materials. Brunner (2007) states that the focus on materials dimensions provides reliable data to measure the city flows and dynamics, yet the author clarifies that focusing on measures does not mean they are the most relevant condition of a city. If social dynamics are taken as the cause for the demand of environmental services, then consumption should be taken as the effect of UM. This suggest that the effect is the only element being measured without knowing the cause, e.g. there is acknowledgment on the inhabitants consumption without paying attention to the reason. Part of the process is not covered.

By quantifying energy and resources' streams, UM analysis is important for evaluating the city's development (Kennedy et al, 2007: p.44), but it fails to approach the making of the city as a socio-environmental metabolism, e.g. the process of urbanization as a man-made process of converting and rearranging nature (Swyngedouw: 2006: p.33). People's behaviour is influenced by social norms instead of natural laws, and such behaviour is determined by the shape of infrastructure, which affects the quality of the UM (Timmeren, 2014: p.8), so as we see there are many stages to consider where consumption could be assessed.

Focusing on quantifying means to leave behind many driving forces that can produce a comprehensive understanding of the socio-environmental interactions of the city. These dynamics are crucial for the study of seasonal cities as they are the source of urban changes. So before understanding cities by means of figures, they need to be understood by means of synergies, whose fluctuations generate

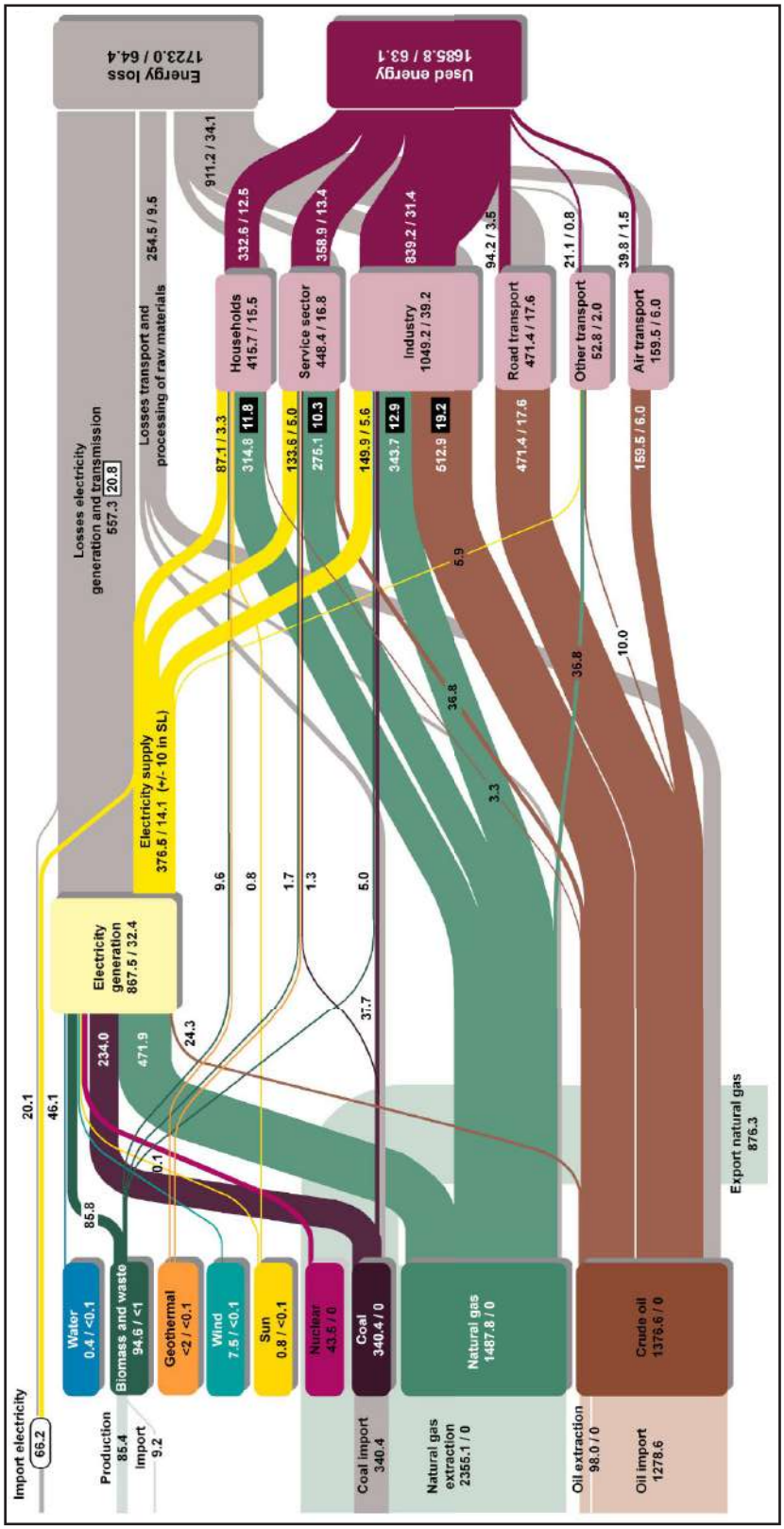


Figure 4: Sankey diagram of the energy flows in the Netherlands and South Limburg. Illustrating UM as a linear process.
Source: Voskamp & Stremke, 2014: p. 5.

the seasons and cycles aimed to be studied in this research. The magnitude of the interplays might be reflected in the the UM, which will affect the sustainble performance of urban areas.

3.6 Urban Metabolism and Sustainable Development

Studies on UM processes have inspired new thoughts on sustainable development (Voskamp & Stremke, 2014: p.4). The linear characteristic previously explained considers the inputs and outputs of material flows in the city, which in urban sustainability studies are considered sources and sinks of materials and wastes (Dovers & Handmer, 1993: p.219); (Sattherthwaite, 1997: p. 1670). MFA make these two environmental services visible: sources of resources before the urban cycle, and the sink of the waste generated after its usage. Besides this, it opens up the question on how self-sufficient urban areas are, as well as what is the carrying capacity of the hinterlands, both as providers and as disposals (Goodland, 1995: p.13).

This thesis reflects on seasonal changes in cities. Goodland (1995) points out that there cannot be sustainability in growth, which represents change. He also defines unsustainability according to the scale of growth, consumption and the environmental capacities for increased rates of resources and waste. This idea of equilibrium in cities is not useful for the reality of the situation, as Brunner (2007) and Kennedy et al. (2007); (2010) show that growth is implicit in the metabolism of cities. In practical terms UM increasing represents loss of hinterland ecosystems and biodiversity, at the same time adding more pollution to cities (Kennedy et al., 2007: p.43). These circulatory conduits of stock generate the urban as a continuously changing socio-ecological landscape (Swyngedouw, 2006: p.21). Yet, urban changes are mostly assumed as a permanent fact, but if such change is temporal, is it sustainable then?

Brunner (2007) points three main problems from growth in materials and energy, yet it raises a question on the growth characteristics, as they can be permanent or temporal (as explained above), and this condition might influence their effects on ecosystems:

1. Resource Availability: Related to geogenic elements of every context (Kennedy et al. 2007: p.45), and the cultural paradigms and perception from consumption and resources (Van Timmeren, 2014: p.7). Do temporal increases on UM affect such availability? Can scarcity of resources create a season of stress in cities?

Seasonal cities take place during the same time of the year and under the same driving forces, which suggests a matter of anticipation to some events. Generally cities are not planned based on anticipation of events or cultural understanding of resources.

2. Justice in Resource Access: Van Timmeren (2014) examines these terms from global and local scales. The author mentions the global tendency of access to resources and how the global economy is itself a system of exploitation and dependencies on other parts of the world, forcing people to give up their right to their own resources. Based on this importance of local consumption is highlighted. For the research of seasonal cities the scale of urban change will be crucial for understanding the distributions of goods and resources. Based on that scale the access to resources and the impact on citizens will be clearer to define.

3. Environmental loadings: it is explained from both source and sink, as the transfer of environmental costs from consumption to other people, ecological systems and even to next generations (Sattherthwaite, 1997: p.1678). Here the seasonality aspect is relevant to be included. The theory on UM takes those loading as permanent and even cycles in cities, sometimes examining the effects for the hinterlands involved. Yet it is not clear if seasonal increase would be more beneficial or environmentally safer than permanent events. The temporal condition is not the only factor to study; the magnitude of the change might be more relevant if specific outcomes were to be detected.

This transfer is what the UM studies have been measuring so far, yet as we see there are many other instances, even globally, to consider when metabolic urbanization is studied and sustainable development is the goal. Nevertheless, if sustainability and change are opposite terms, how should it be approached in seasonal cities? By understanding the magnitude of changes that some cities face periodically due to contextual drivers, specific threats will be allocated for understanding the cause of the change and to which extend cities are able to prevent or to rearrange themselves in order to cope with expected outcomes.

3.7 Conclusions

The approach of seasonal cities and the reasons for the study from an UM approach were explained. The temporal changes and outcomes in cities will be analysed by means of their circulation of material and resources, and how the

environmental and man-made interactions can modifies the urban flows leading to negative impacts on urban areas.

Papers provide several perspectives to the topic. Although no studies on seasonal urban changes or temporal fluctuations of UM were found, the discussion about scales of urban change, the influence of man-made activities on ecosystems, and the links of UM and urban sustainability provide insights for a theoretical framework for this research.

Cities with short chaotic periods can be assessed by means of several approaches proposed by UM. Yet these approaches are focused just on the quantification of materials and flows in the city without considering socio-economic processes, which are related to social understanding of environment and resources and cultural patterns of consumption. This link of geogenic and anthropogenic sources will be repeatedly discussed in order to allocate the specific sources or urban change related to the cities involved in this study.

The UM process is mentioned as a lineal process and the city as a linear reactor, yet it should be seen as merely a source and sink process; the city is a middle point of such operation and the quality of its infrastructure might significantly influence the urban, and consequently, environmental impact.

Cities need to be understood beyond growth and shrinkage patterns. There might be processes in between needed for exploration and research. As cities are planned for ideal static conditions, how to plan for fluctuations? Are the environmental impacts of temporal changes of cities also seasonal?

Chapter 4
Reference Cases

4.1 Introduction

In the previous chapters several concepts explained the approach and aim of the study of Seasonal Cities focused on UM analysis. The phenomenon of temporal changes in cities was explored and contrasted with the traditional paradigm to understand the urban from permanent and steady perceptions, which is reflected on papers of UM describing cities from a static moment instead of as a dynamic process. This chapter aims to gain insight into seasonal changes of cities by means of a couple of examples, showing how the alterations are reflected on the UM of each context. Here the previous chapter is the base for the upcoming analysis.

The presentation of these reference cases is not looking for an assessment of the urban issues. On the contrary, the aim is to explore every situation, so that a comprehensive understanding of sources and consequences of seasonal urban change will be developed, in order to apply that recognition of elements in the next chapter, where the case study of the thesis will be analysed.

In this chapter two cases of seasonal cities will be introduced: Medellin, Colombia and Ulan Bator, Mongolia. The driving forces of every case are different due to the influence of contextual elements; however, they share a similar outcome related to overload of air pollution in the city for a specific frame of time, which modifies not just the urban landscape but also the salubrity of citizens. The interplay of elements in every case, the way every case deals with seasonal conditions as well as some current attempts at solutions are recognized here as lessons and hints to be applied in the case study of this thesis, related to Alexandria, Egypt.

As we will see, Seasonal Cities is not related to specific outcomes or contexts; its main framework is the time factor summed to specific urban conditions and cycles.

4.2 Selection Criteria

Even though changes in urban places are faced all around the world, not all of them are seasonal nor adjust to the framework defined for the studies of seasonal cities. These examples were selected tracking reports about the periodical condition in every place along many years, from which patterns and sources of change start to be not just visible but also relevant to understand.

4.3 Parameters of Exploration

First, the geogenic and anthropogenic elements will be detected and analysed in terms of their relationship with the specific urban change, as a consequence of the alterations in the metabolism of the city. Then the magnitude of the change will be discussed supported by graphic data, and finally the solutions implemented will illustrate the planning state in every context and how that is reflected on facing the same dramatic changes every year.

4.4 Medellín, Colombia

Every year between February and April this city reaches an extreme state of air pollution (Hinge et al., 2017: p.10); (Alsema, 2018: para.9). During those days the Medellin City Hall declares red alert in the air quality, which lasts until the indicators of contamination show improvement in this issue. Changes in the urban landscape are a part of the consequences .Additionally it modifies also the routine of many inhabitants, who avoid being out in the streets for long periods of time (explained below) due to the risk that the contamination represents for their health.

The local authorities created a website[2] covering the whole situation, with statistics, graphics and detailed explanations about the different causes of the cyclical rise of pollution. This suggests their acknowledgement of the main factors as well as of the seasonal condition. The information compiled on the website was produced by means of the cooperation of several institutions such as Ministries, the Metropolitan Area Authority and the City Halls of areas dealing with the issue, planning authorities, NGO's, private sector, academic and scientific institutions and the civil society (CALIDADDELAIRE, 2018). At the same time it opens the question of how effective decision making is. The information about the environmental event is clear and the institutions are willing to work together, so why does this issue remains as one of the biggest environmental issues of the city every year?

4.4.1 Allocation of change sources

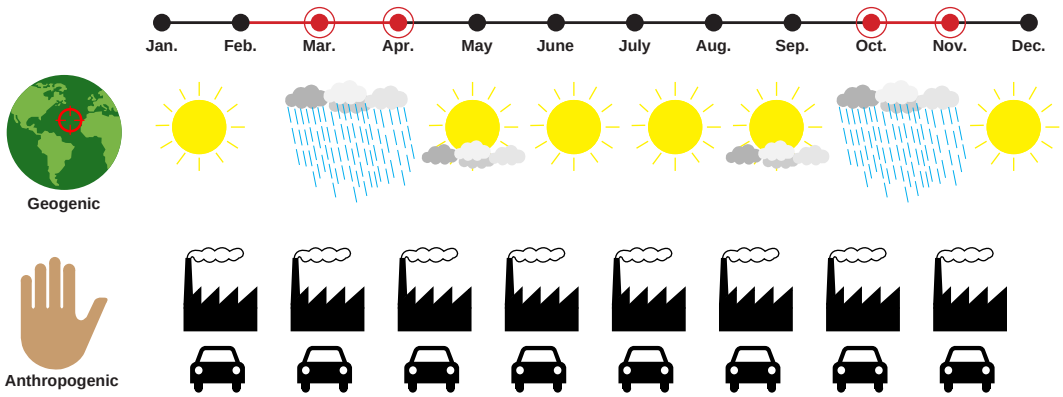


Figure 5: Allocation of driving forces of seasonal change in the air quality of Medellin. Significant meteorological changes (above) lead the constant pollution of the city (below) to accumulate and deteriorate the air quality of the city.
Source: Author

2 http://www.calidaddelaire.co/ (Website in Spanish, information translated by the author)

As we can see in figure 5 the changing component in this case is the geogenic one. Nevertheless, this does not mean that the anthropogenic sources are not influencing the seasonal air deterioration of the city (CALIDADDELAIRE, 2018); (Hinge et al., 2017: p. 9&10). The man-made emissions remain high the whole year; the seasonal red alerts are resulting from the combination of the pollution plus the climatic fluctuations of the territory. For such outcome specific component on every source of change should be explained:

Geogenic Sources

- Meteorology: Between February and April there is a transition[3] between dry and rainy seasons in the territory where the city is located. This increases humidity, a thick layer of clouds is produced which makes the natural ventilation difficult and affects the solar dissemination within the city, which leads to trap the pollution in the valley (Hinge et al., 2017: p.10).

- Topography: The city is located in the Andes mountain range, within a valley. This characteristic is crucial to the air pollution situation (Ibid: p.9), as the ventilation of the city varies on a basis of the climatic condition. In addition, the geography represents an obstacle for the air to flow along the whole area.The influence of both elements is illustrated in the figure 6.

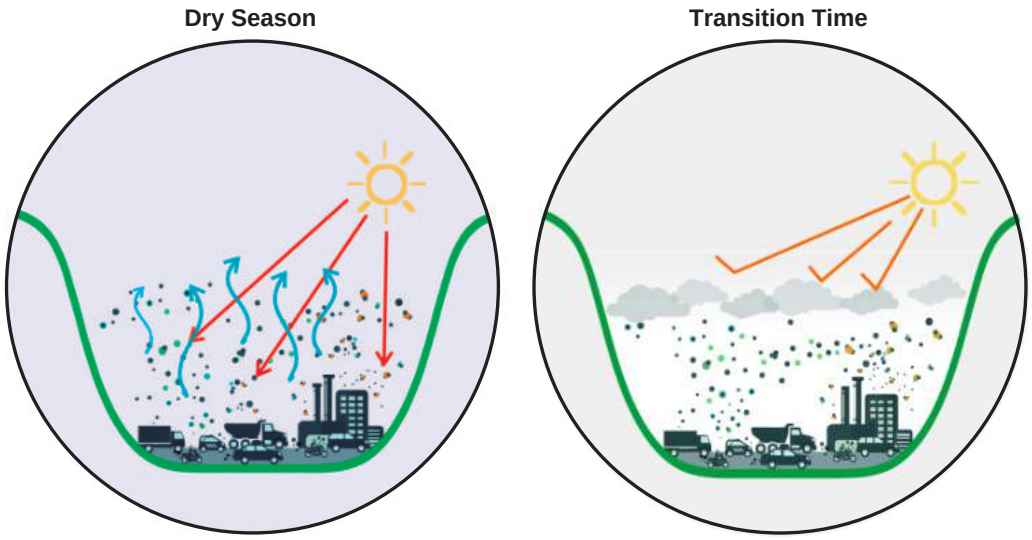


Figure 6: Illustrations of dry season and transition time in Medellin. Pollution flows or get trapped based on climatic conditions.
Source: http://www.calidaddelaire.co/condiciones-especiales.php

3 There is a second changeover between October and November, as seen n in the fig. 4. The red alerts takes place normally in the first transition time of the year. Information or analysis about red alerts in October as well as why such change does not happen in that month was not found.

In addition to the previous explanation, we can see in the figure 6 how both geogenic conditions, meteorology and topography, influence the accumulation of air pollutants. In the left circle the "dry" season is shown, where the absence of clouds plus the natural ventilation take the contaminants out of the city. In the right circle the transition between sunny and rainy days is shown, where a layer of clouds plus the topography of the valley become obstacles for the pollution to be removed, leading to accumulation of this material within the valley.

Anthropogenic Sources

The reports found in this research for the study of Medellin as a seasonal city mention two different man-made generators of pollution.

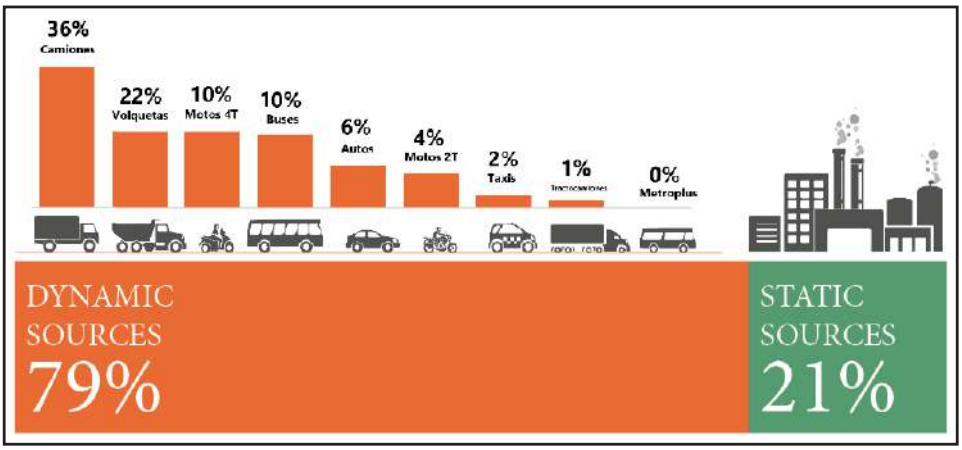


Figure 7: Influence of sources of pollution in Medellin, based on reports.
Source: http://www.calidaddelaire.co/condiciones-especiales.php

- Dynamic sources: are related to the mobility within the city. No fluctuations are reported which is why in figure 5 it is shown as a constant influence in the pollution generated.

- Static Sources: which mean permanent urban activities. In this case they are related specifically to industrial enterprise in the city.

The allocation of these sources is based either on environmental reports from governmental and scientific institutions or on statistics on mobility, as the increasing number of cars in the city and the consequences for the air deterioration is highly pointed in all the articles. Hinge et al. (2017) allocates different types of pollutants and compared them to those generated by industries, which is similar to the information illustrated in the figure 7.

It is hard to determine the accuracy of the percentages in the previous figure, yet their influence in the pollution is clear, not only through the reports that mention them, but also through the solutions implemented by the City Hall (see below), as once they are applied the levels of urban pollution are visibly and statistically reduced. There are not indicated fluctuations for the percentages reported in figure 7; it is clear that those figures decrease during the time of red alert thanks to the regulations applied by the public authorities, but they are implemented until the pollution stops being at a danger level[4]. After that, the influence or percentages of the pollution sources are not statistically clear. The graphic belongs to a specific time or measurement, the cycles of the city are not shown.

Additionally, it should be considered that the industries included in the Static Sources are not responsible for electricity generation in the city (EPM, 2018: para.8), such is the problem in several cities around the world such as Paris or Santiago de Chile (CALIDADDELAIRE, 2018); therefore, we cannot say the city is polluted as a result of its basic utilities.

4.4.2 Outcomes and Feedbacks

The change of the geogenic condition and the permanent load of anthropogenic emissions take the city to a high level of pollution on a seasonal basis, such is illustrated in figure 8.

Figure 8: Impact of the seasonal accumulation of pollutants in the urban landscape of Medellin. Comparison between February (above) and March (below).
Source: https://www.lafm.com.co/colombia/comenzo-regir-pico-placa-6-digitos-medellin-la-contaminacion-del-aire

4 See figure 9.

The figure 8 is explicit in showing the dramatic change that the urban landscape of Medellin faces between February and March. Alternatively, the air pollution condition before and after the red alert can be discussed, as from the photos it can be inferred that the rest of the year the air quality is acceptable for the residents. Such a scenario does not correspond to the constant pollution from anthropogenic (static and dynamic) sources pointed out in figure 5. So, what is the situation between the seasonal events? Perhaps this is something that cannot be summarized in only a couple of photos.

A more detailed approach is developed in figure 9, where monthly levels of contamination within the city throughout two years are shown. The air pollution condition is highlighted in red which stresses the seasonality of the phenomenon. The extreme contamination season has an end, produced either by the temporality of the climate transition or by the solutions implemented by the City Hall trying to tackle the issue (see below). Yet, the city is polluted all year round at a level of risk.

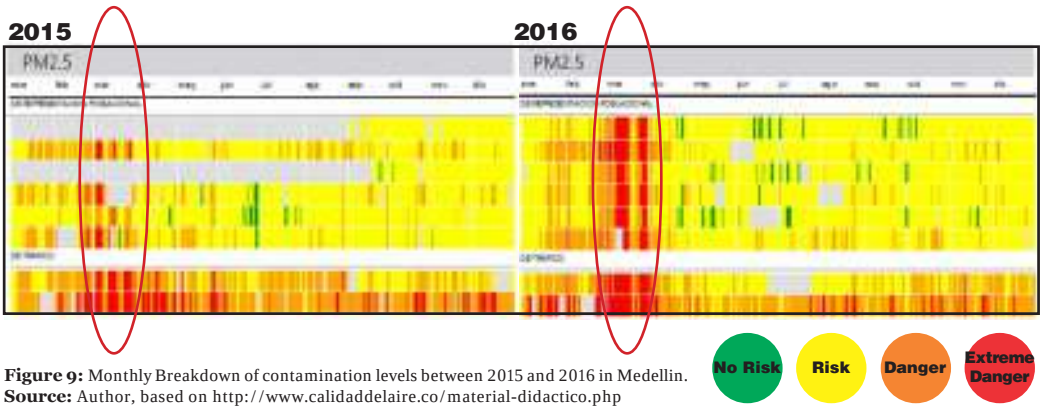


Figure 9: Monthly Breakdown of contamination levels between 2015 and 2016 in Medellin.
Source: Author, based on http://www.calidaddelaire.co/material-didactico.php

The magnitude of the pollution in both years is highlighted in the previous figure, as can be seen the magnitude is different, yet in both years the red alert state was declared by the public authorities. Is the magnitude associated with the seasonality? Normally the emergency in the city is related to visible changes plus alteration in the system of urban pollution measurements. For instance the one shown in figure 10, where all the measurement spots in the metropolitan are pointed out. The four colours of contamination levels are based on standards established by the City Hall[5]. As long as the contamination keeps reaching extreme levels, this event will keep being seasonal. The opposite scenario is also possible; the season can stop.

5 See figure 11 for specific figures on PM2.5 pollutants, for a clearer understanding of how the levels are divided.

The permanent pollution of the city was shown; consequently, this does not mean that when the red alert finishes then the environmental condition of the city is ideal; in fact, it seems like the city's contamination status is not divided between clean and polluted, but between polluted and more polluted. Perhaps exploring the reactions and solutions that the City Hall implements every year in order to deal with this issue might give us some perspectives on how effective they are.

Figure 11 illustrates the measurement of air deterioration in the city throughout several years, when it is explicit that after the initial months of the year, there is a dramatic increase of pollution. Several attempts of solution have been implemented in the recent years, those actions are taken during the air crisis time, so no approaches or prevention have been detected or reported so far.

4.4.3 Perceptions, Reactions and Attempts of Solution

This situation is not new in the city, which explains the acknowledgment from local authorities regarding the periodical condition. Yet, temporal solutions have been proposed in times of red alert. When such is declared the website for air quality and several media indicate the inhabitants how to proceed and how to take care of their health, explained in Alsema's report (2018: para.1&2). On the other hand, the actions proposed from the authorities for reducing the emissions might not be effective, which is a reason for the seasonal phenomenon persisting until the current year. The solutions correspond to inhabitants, here they are introduced:

- Sensitive inhabitants Group

Seniors, pregnant women, children and teenagers, people with respiratory diseases and people who practice sports in open areas are categorized as sensitive inhabitants group during red alerts. For them the recommendation is to avoid exposure to open spaces. The accountability of governmental institutions in these proposals or their effects on those inhabitants have not been reported. These measures are proposed for protecting people, not for reducing the contamination.

- General Population

Beside avoiding exposure to open spaces governmental entities have also implemented general measures such as forbidding sports in public schools, transportation by metro for free, and encouraging telecommuting allowing people to work from home (Arango, 2016), so that their exposure to pollution will be fewer.

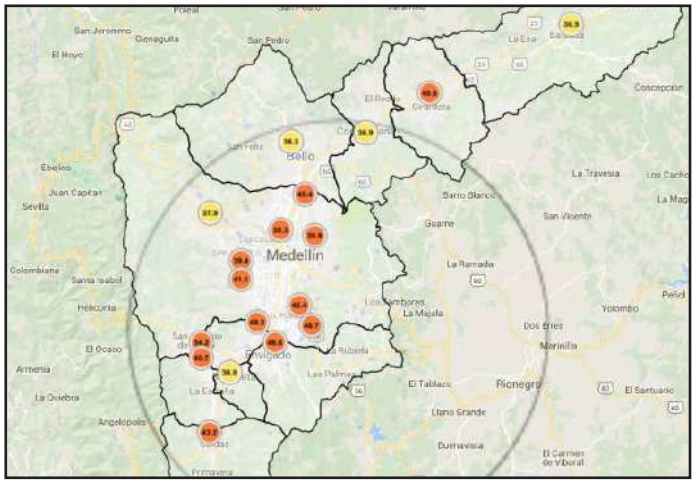


Figure 10: Measurement of pollution in Medellin. March 23th, 2018.
Source: http://caracol.com.co/emisora/2018/03/23/medellin/1521805425_796839.html

- Mobility

According to the City Hall, mobility is the main pollutants generator, as it was seen in the figure 7. In Colombia some cities have a system called "Pico y Placa" used for reducing traffic congestion, this restricts the transit of vehicles based on their license plate number on a rotation basis. On red alert time the City Hall reorganizes the "Pico y Placa" for reducing congestion, therefore pollution, as more vehicles are not allowed to circulate in the urban area. With that rule it is expected the traffic to reduce up to a 60% during the red alert (Arango, 2016: para.14). This plan reduces the pollution temporarily.

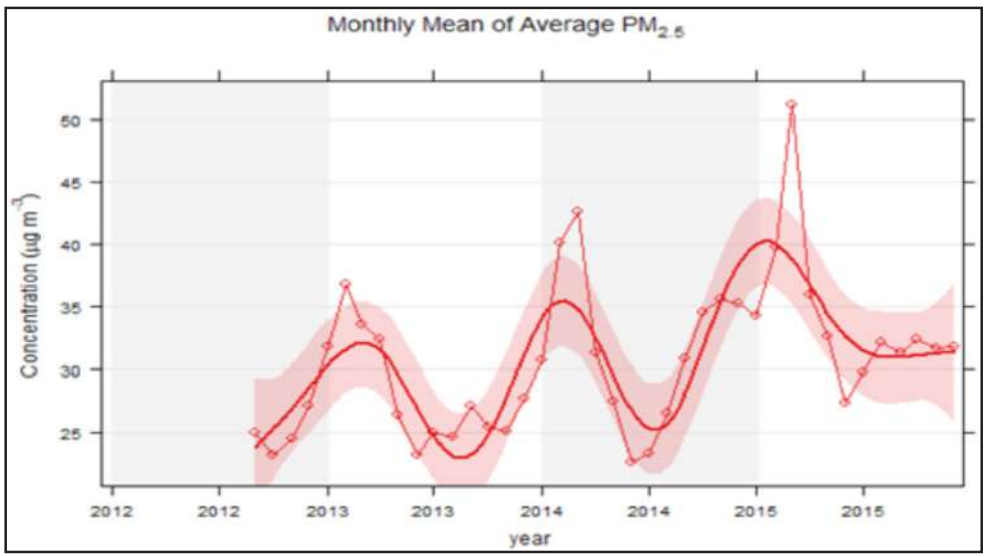


Figure 11: Monthly measurement of air quality in Medellin from 2012 to 2015. Seasonal increase of average 2.5 are seen.
Source: Hinge et al., 2017: p.24

- Industries

Even though industries were recognized as a pollutant generator, there were not official protocols from authorities in time of extreme pollution. Now they have a limit of pollution they can generate, when such is surpass they must stop their activities. The allowed range of pollution is shown in the figure 12 in terms of PM 2.5. Both pollution sources, static and dynamic, are here recognized.

Figure 12: Levels of pollution established in Medellin for determine state of alert.
Source: https://twitter.com/Areametropol/status/971120136429211648

4.4.4 Insights from the case of Medellin

How is this situation related to UM? Kennedy et al. (2007: p.52&53) link transport energy demand and urban form, where transportation charges a meaningful part of urban anthropogenic energy. Energy here correspond to the material requirements and the environmental cost of urban mobility. The case of Medellin, , does not correspond to increase of consumption, but to permanent overload of pollution, which the geogenic element such as topography and weather fluctuations make visible by means of the accumulated pollutants in the air.

The solutions applied by the Medellin City Hall, particularly the “Pico y Placa”, aim to reduce the anthropogenic waste generated by urban mobility. This leads to a temporal modification in the UM of the city, as less cars in the streets means

less pollutants. Key elements that take part in the seasonal event of Medellin will be highlighted as knowledge that can be transfer or contrasted with the main case study of the research:

Insights of Reference Case: Medellin	
Cooperation of Institutions	- Public and private sector as well as civil society are involved in the generation of plans of contingency. - Data about the problem is public and available for citizens. - Information exists but still the seasonal pollution is taking place every year. Is it reaching people? - Importance of cooperation is highlighted; current plans of the city are developed thanks to integration of institutions.
Plans and Solution	- Big efforts are put on plans for people's health instead of plan for tackling permanently the overload of pollution. - The pollution event takes place during the same time and under the same conditions, which mean they can be anticipated. - Solutions and plans should address prevention instead of temporal improvement.
Influence of the territory	- The topography of the city is related to the seasonal pollution. Pollutants are trapped in the valley. - Links between UM and configuration of territory in terms of geography and resources are seen in this reference case. Geogenic components does not mean just weather.
Information	- How urban changes are tracked and assessed? - Is the pollution season a result of visible changes or of alterations in the measurement system? See figure 9. - Is the intensity of pollution the same every year? In the figure 8 patches are different, still alert was declared.
Urban Banning	- "Pico y Placa" restricts the transit of vehicles in the urban area. It improves the issue temporaly, after the alert citizens keep the same driving patterns. - Solutions from authorities encourage citizens to stay indoors and avoid the urban environment. - Banning works as a quick temporal solution. - Technical, governmental and cultural elements need integration for more significant improvements.
Season	- The season of contamination is a reaction of the urban environment to continuous contamination plus meteorological changes. - The accumulation of pollution is likely to be improved but the geological fluctuations cannot be changed.

Table 2: Insights from the reference case of Medellin.
Source: Author

4.5 Ulan Bator, Mongolia

This city is recognized as the coldest capital city in the world in winter (Gamble, 2015: para. 4), which leads it to be one of the most polluted cities in the world in terms of air quality all along this season (Geoghegan, 2014: para. 15); (Jacob, 2013). The cold days are not the problem by itself; such is more related to the reactions and means that inhabitants use to overcome the extreme weather, explained below. This is seen in the figure 13 where the situation is allocated just in the coldest period of the year, below the anthropogenic driver changes are also illustrated.

The contribution of cities to global warming is discussed for different scholars[6], industries, power stations and transport are pointed as the main GHG sources. Housing, on the other hand, is barely mentioned as a contamination fount, Ulan Bator represents a clear example of it.

4.5.1 Allocation of change sources

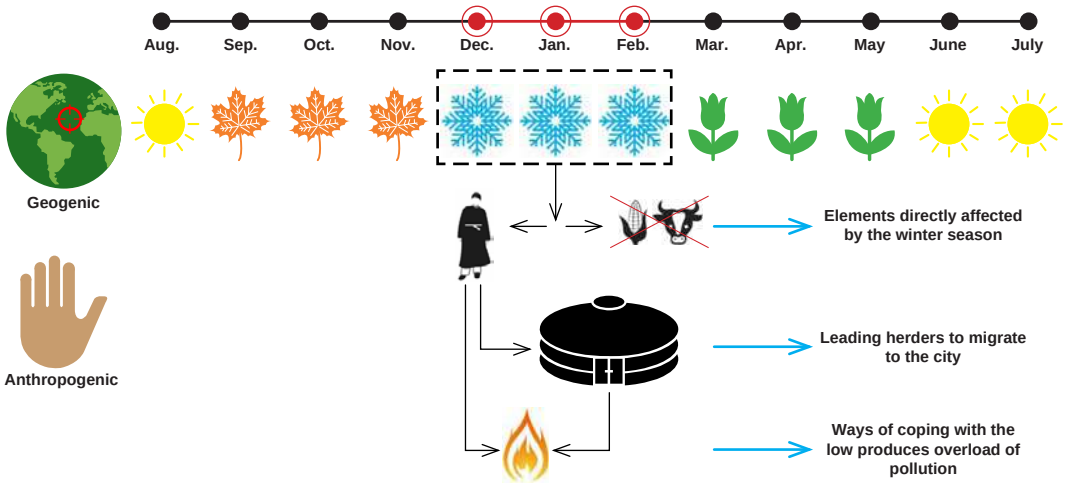


Figure 13: Allocation of driving forces of seasonal change in the air quality of Ulan Bator. Winter is not the issue itself. Such is more related to cultural reactions to the season without infrastructure.
Source: Author

The different meteorological times throughout the year are represented in the figure 13, where is noticed which anthropogenic driver changes belong just to winter, while the rest of the year apparently they do not influence on environmental changes. Industries and mobility are also pointed as activities that contribute to the urban contamination (Sayed, 2010: para. 6), yet the housing dynamics in winter are highlighted as the major cause of the seasonal pollution (WorldBank, 2012: para. 4).

6 For instance Satterthwaite, 2008.

Geogenic Sources

Climatic Season:

Every winter the temperature in Ulan Bator decreases to an average of -33°C (Gamble, 2015: para. 4), it is even considered a sort of natural disaster (Shibli, 2017: para.7), as illustrated in figure 14. In 2010, for instance, the climate dropped to -50°C, killing almost 10 million livestock in Mongolia (Branigan, 2010: para. 6).

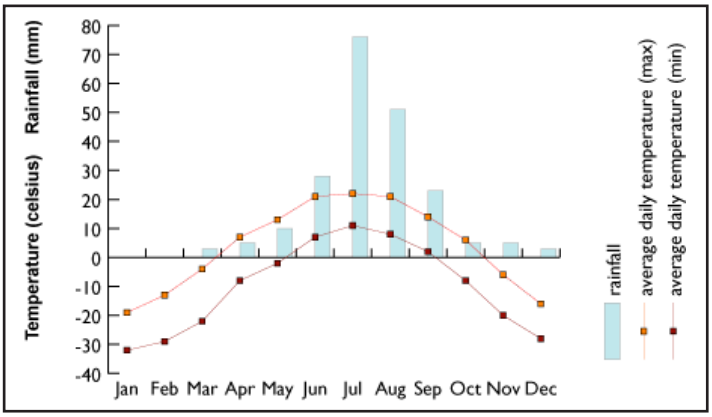


Figure 14: Average temperature and rainfall in Ulan Bator.
Source: http://home.cc.umanitoba.ca/~umthrife/2390/mongolia.html#Climate

Anthropogenic Sources

Herders Migration:

Around 40,000 people migrate from rural areas to Ulan Bator every year (Geoghegan, 2014: para. 8), many forced by the droughts, strong winters and the livestock losses (Bittner, 2016: para. 6).

Housing:

When the newcomers reach the city they build a typical felt tent –a *ger*- (Biennale, 2016), located in the periphery of the city, with no infrastructure (WorldBank, 2012: para. 1), including heating, which is crucial for surviving in winter. The only sources of heat that migrants have are low quality stoves or boilers powered by coal, wood and/or rubbish. Black tar dipped bricks and car tires burning are used by people to get warm (Sayed, 2010: para. 5). Most of the air contamination comes from *ger* areas (Seaniger, 2016: para. 12), in other words, informal or unplanned settlements are the cause of the environmental deterioration, see figure 15.

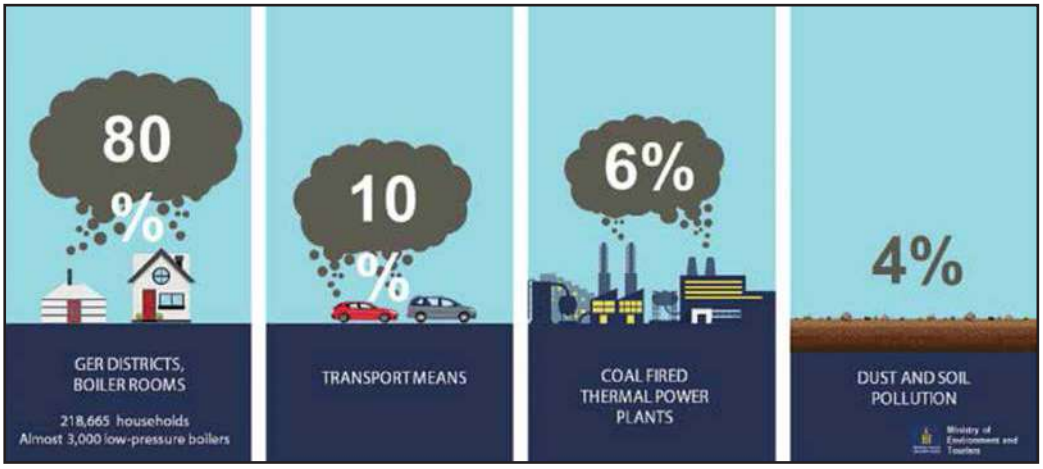


Figure 15: Percentages of sources of pollution in Ulan Bator. The influence of housing in the outcome is evident.
Source: https://mongolianobserver.mn/wp-content/uploads/2018/01/Pollution-source-pg-16.jpg

Different sources of pollution contribute to 20% of pollution, which is low in comparison to the generation from housing, which is 80%, based on the previous figure. There are not indication of the time of the year that those figures belong to, but considering that the rest of the year the weather is warmer[7], a better air quality is assumed, which would lead to decrease the percentages of pollution related to housing. A couple of perspectives on the *gers* built by the newcomers as well as the air deterioration they produced is shown in the figure 16.

Figure 16: Ger areas of Ulan Bator, which are pointed to produce a significant proportion of the air pollution in the city.
Source left image: Geoghegan, 2014
Source right image: http://ireport.cnn.com/docs/DOC-674603

4.5.2 Outcomes and Feedbacks

The figure 17 illustrates the impact of the extreme cold condition in the rural areas of Mongolia, which is the cause for herders and farmers to move to the capital city. Consequently it creates the seasonal environmental emergency in the city, as herders deal with the weather. The time of highest pollution in the

7 As shown in Figure 14.

city is a consequence of informal settlements built by rural migrants. The level of acknowledgement of the problem from the local authorities is unclear and no reports were found with that information, but apparently this situation is no being prevented as it is seen and felt every year in the whole city.

Figure 17: Comparison of rural areas of Mongolia between summer and winter. Such impact is what leadd herder to migrate to the city.
Source: https://www.newsecuritybeat.org/2012/07/in-mongolia-climate-change-and-mining-boom-threaten-national-identity/

The air quality in Ulan Bator is the equivalent to smoke five packets of cigarettes per day. Several plans from the government to tackle the pollution (explained below) want to reduce that figure to the equivalent of two packets (Jacob, 2013).

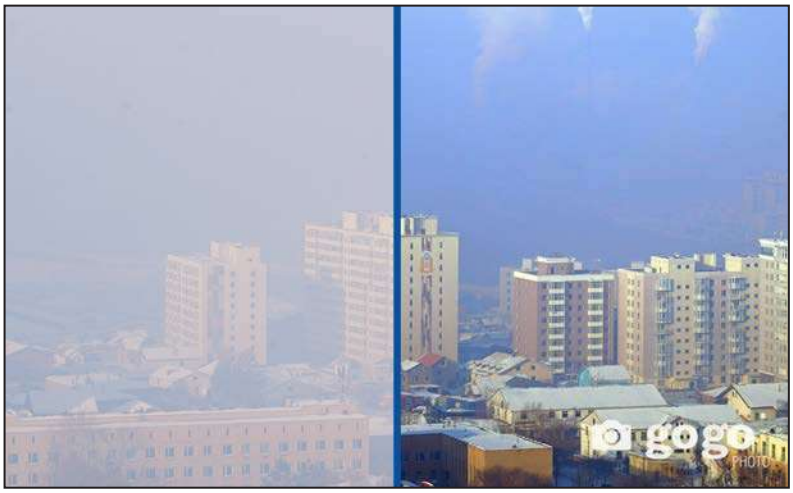


Figure 18: Comparison of Ulan Bator within and without winter. The impact of pollution is felt in the whole city, according to reports.
Source: http://mongolia.gogo.mn/r/160352

A comparison of Ulan Bator within and without winter is shown in the figure 18. This is, however, just two spots throughout the year. Is the air quality in the city appropriate for citizens the rest of the year? The air pollution monitoring along four years in the figure 19 shows the peaks and drops of the wind condition, where the dramatic increases in winter, between December and February, can be perceived when correlated with the rest of months.

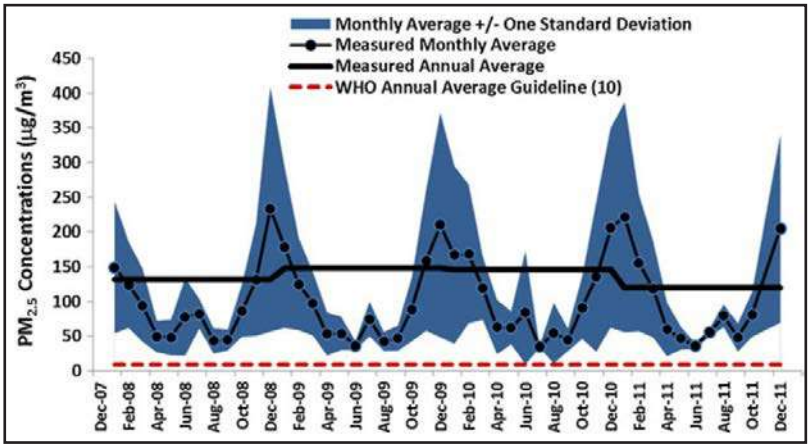


Figure 19: Monitoring of air quality of Ulan Bator from 2007 to 2011. Peaks of dramatic pollution increase are seen every winter.
Source: http://urbanemissions.blogspot.com/2008/12/clean-air-analysis-for-ulaanbaatar.html

The seasonality of the phenomenon is clear. Although in the previous figure the lowest pollution point of the city is above the World Health Organization (WHO) standards, it must be said that such standard is low, especially for a city with an undeveloped infrastructure when compared with its growth process (Sayed, 2010: para. 6). The data in this figure is not recent, yet some up-to-date reports show that this situation keeps being a current winter outcome[8], so the situation has not improved significantly. Local authorities launched recently measures for improving the air quality and reducing the threat to the salubrity of citizens.

4.5.3 Perceptions, Reactions and Attempts of Solution

Apparently, the tolerance of inhabitants of Ulan Bator towards the contamination reached a limit, as seen in their demonstrations at the end of 2016 (Adiyasuren, 2016) and at the beginning of 2017 (The New York Times, 2017), asking the public authorities for actions and solutions. Consequently, the government implemented some shifts aiming to reduce the pollution during that winter by means of regulations in social, infrastructure and housing matters.

- Social Regulations

Banning migration from rural areas of Mongolia to Ulan Bator for the whole year 2017 was one of the main decisions by the Mayor of the capital city. These migrations are pointed as a national security threat (Boldsukh, 2017: para. 3). It is ignoring the fact that the nomadic way of life is part of the culture of Mongolia, which is even mentioned in the national constitution (Shibli, 2017: para.12).

8 for instance Gillete, 2018.

No updates on banning were found, but gaps on its implementation, on the improvement of heaters of the current newcomers and on the lack of interest for improving the rural conditions, for people not to migrate, are pointed by Seaniger (2017: para.13,18&19).

- Access to Services

The government offered free night-time electricity to *ger* residents (Turmunkh, 2016: para. 6), for encouraging changes to electric heaters and reducing the air deterioration. This answers the question of the previous paragraph related to the improvement of heaters, but still the herders, farmers and nomads remain unattended.

- Housing

Housing and relocation strategies are plans for decreasing informality and air pollution (Bittner, 2016: para. 18). Rural infrastructure remains unattended, and no infrastructure provision in *ger* areas is informed. No reports state housing as the main issue to deal with, additionally the economic conditions of urban herders (Shibli, 2017: para.12); (Geoghegan, 2014: para. 10&16) should be considered before implementing housing projects.

4.5.4 Insights from the case of Ulan Bator

The case of Ulan Bator is an example of cities as a permanently changing socio-ecological landscapes (Swyngedouw, 2006: p.20), where cultural reactions to natural processes, related to climatic seasons in this case, generate outcomes in the urban. Here the outcome in UM correspond to the energy cycle of the city, which associates energy production[9] to the air contaminants from such process (Kennedy et al., 2007: p.54).

Key elements from the situation described in Ulan Bator will be explained, as they offer insights on seasonal situations that will complement those found in the case of Medellin. Such knowledge will be applied in the case study of this research.

9 In terms of the ways used by the urban newcomers to generate heat in winter.

Insights of Reference Case: Ulan Bator	
Cooperation of Authorities?	- No indication of cooperation or collaboration between public institutions are reported. - Rural areas remain unattended, no report states institutions taking care of migration, just the City Hall stating such measure.
Seasonal Migration and Housing Dynamics	- After migrations in winter, no indications of herders going back to the countryside are reported. So, they settle down in the city. - More migration means more expansion of *ger* areas, which are the main cause of pollution. - No plans for infrastructure provision of *ger* areas were found, yet they keep growing.
Urban Banning	-Here the banning is in terms of entering to the city. - Rural migrations are seen as a threat for the salubrity of residents. - Here banning can be seen as a form of bio-political securitization (Palmer & Warren, 2013: p.80)
Infrastructure	- In a multifaceted issue the issue that the local authorities decided to tackle was migration, without regard on infrastructure. - Stopping migration might work for stopping ger areas expansion, but if infrastructure is not provided residents will behave the same in winter. - Infrastructure must be included in the air quality improvements of the city.
Cultural Aspects	- Culturally, individuals have the right to move freely national wide in Mongolia, yet, Herders cannot go to the capital city. - Cultural aspects have to be considered when plans are proposed looking for social integration and urban development in parallel.
Scale and Allocations of Sources of Change	- Pollution is reported in the whole city, yet specific sources of contamination were pointed, which provides an allocation of such source and a scale of the impact. - This allocation allows to tackle directly the problem and infer outcomes.
Seasonality	- The situation is a product social reactions to a strong climatic condition. Winter is not the cause of pollution, such is more related to a low infrastructure provision. - Climatic seasons are not issues by themselves, cultural reactions requires further analysis.

Table 3: Insights from the reference case of Ulan Bator.
Source: Author

4.6 Conclusions

By means of these reference cases exploration and understanding of seasonal urban changes were aimed in order to allocate specific driving forces, outcomes, social reactions to these events and attempts of solutions. As seen, the study of seasonal cities do not belong to a specific sort outcomes, such is more related with its temporal characteristic.

Both contexts are different, yet both face situations of air deterioration. The elements to upgrade are not the geogenic factors, e.g. winter or climatic transition, the element to deal with is the cultural reaction to specific urban or environmental events. Anthropogenic behaviours toward natural resources influence negative results in cities. Timmeren (2014: p.8) points the infrastructure providers, instead of consumers, as responsible of the ecological impact of utilities provision. Such idea is debatable, the cultural paradigm resources might also have environmental impacts, regardless of the quality of infrastructure and its providers.

Further common grounds in both cities are the relevance of cooperation of institutions, the way how cities track and assess the information related to the urban change, the importance of scale and allocation of the temporal event, and finally urban banning. These topics might not be exclusively for the topic of seasonal cities, yet they (among other elements discussed above) are shared insights from both cities and their temporal urban challenges that will be compared and contrasted below with the case study of the research.

Chapter 5
Case Study: Alexandria, Egypt

"For decades a well-established tradition dictated that Egyptian families flee to the Mediterranean shores and their cool sea breezes in the summer months, especially from Cairo. The city of Alexandria's population was said to almost double in the summer, and under the monarchy the whole government moved to Alexandria for the summer months. It was estimated that by the early 1980s over one million Egyptians spent the summer on the Mediterranean coast."

(Sims, 2014: p.191)

Part I

5.1 Introduction

Alexandria was funded in 331 BC by Alexander the Great, nowadays it is the second biggest city in Egypt. It is located in the north of the country having the Mediterranean Sea along the city. Despite these highlights in terms of history and location, tourism in the city is described as a seasonal activity, taking place mainly during summer (Brizzi, 2005: p.2); (FooP, 2014: p.52); (Eldaidamony, 2011: p. 57) ;(Rady, 2002: p.11). As described previously by Sims, the population of Alexandria seems to increase dramatically during summer, consequently it modifies sharply the public utilities and infrastructure performance. In other others, the UM change in summer. No special plans or actions adopted in the city during the sunny days were detected, has not the city been planned for this periodical change?. Still, it wants to be promoted as an important tourist destination.

The transition of climatic seasons throughout the year can be seen in the figure

20, where linked with the social changes reveals the situation in summer, when residents and summer visitors must share the city for a frame of time. Tourism is recognized by Fagence & Kevan (1998: p.134) as a sort of seasonal migration. Push and pull factors are categorized in their paper; on the one side as environmental elements (geogenic) which are climate- or weather-related, and on the other side as man-made elements (anthropogenic), related to what the tourist are looking for or are trying to avoid during this time, in other words, cultural aspects.

As explained above by means of the reference to Ulan Bator, the cultural background can be crucial for considering the sources of change or the outcomes of them. How relevant the influence of culture on the consequences of the seasonal activity in Alexandria is?

First, the allocation of specific driving forces on the situation of Alexandria offers hints for understanding the situation.

5.2 Allocation of change sources

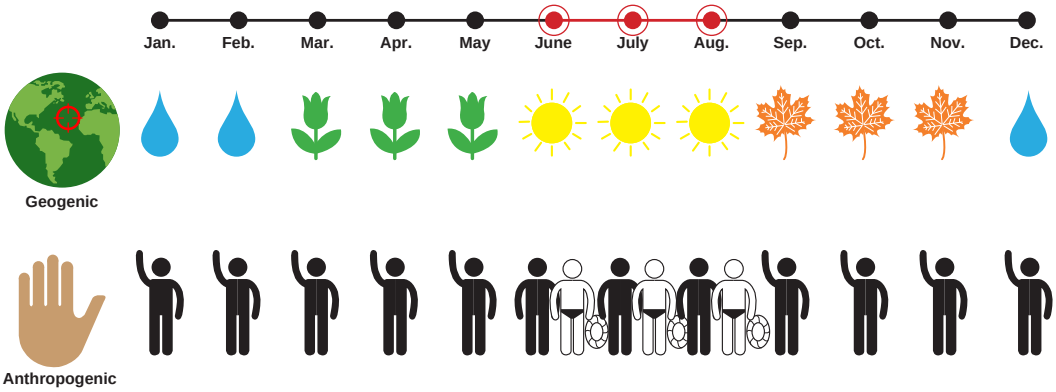


Figure 20: Allocation of driving forces of seasonal change in Alexandria. In summer residents and newcomers must share the city.
Source: Author

Geogenic Sources

- Climatic Seasons:

From June to September approximately, the average temperature ranges between 20°C and 30°C as seen in the figure 21. Simultaneously, in cities like Cairo the average weather is higher, which might explain the reason of people to migrate to a fresher place, like Alexandria. Yet, the summer newcomers come from several places of origin, explained below.

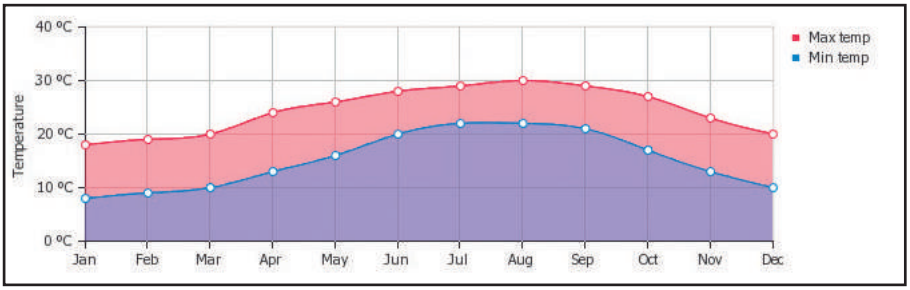


Figure 21: Monthly breakdown of maximum and minimum temperature in Alexandria, Egypt.
Source: https://weather-and-climate.com/average-monthly-min-max-Temperature,Alexandria,Egypt

- Location:

Alexandria city lies on the Mediterranean Sea, extending around 32km along the coast. The city has been traditionally acknowledged as an affordable summer destination for Egyptians, as beach tourism is one of the main attractions on local and national level (FooP, 2014: p.12).

Figure 22: Alexandria in summer.
Source: Fouad, 2015

The combination of both elements, fresh weather and the Mediterranean Sea together might suggest the reason of Egyptians for spending summer in the city every year (Fouad, 2015: para.1). Warmer cities in Egypt in summer, affordability, and the cultural tradition of spending the sunny days in Alexandria are also important factors (explained above) that leads the city to be temporally crowded.

Anthropogenic Sources

Summer Visitors:

Domestic tourism is the main cluster of this season in the city (FooP, 2014: p.52) (Sims, 2014: p. 191). Egyptian families are able to go to tourist areas only during the 3 months of summer, as in Egypt it is the only time during the year where people have holidays (Rady, 2002: p.11). This is recognized by Eldaidamony (2011) as shown in the figure 23, where a comparison between Egyptian and international visitors in Alexandria is presented.

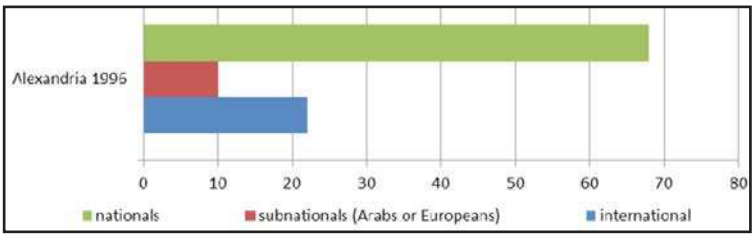


Figure 23: Percentages of number of tourists by origin in 1996. The difference of attendance of Egyptians in comparison to people from other destinations is evident.
Source: Eldaidamony, 2011: p.55

Even though the previous figures belong to 1996, similar differences in proportion of Egyptians compared with foreign visitors were found in the questionnaires developed for this research in March 2018. At a first glance it would indicate that such trend remain the same, however an important difference was pointed by the respondents as well as by Mr. Osama El-Kholy (General Manager Ministry of Tourism in Alexandria, personal communication, 21 March 2018): previously the summer visitors in the city used to come from Cairo, nowadays they come from rural areas in the north of Egypt, the so-called Delta region. This change on the background of the newcomers has social and spatial connotations in Alexandria (FooP, 2014: p.28); (Gaber, 2016: para.1), reflected in the current outcomes of the summer season in the city.

> *"Most of them (summer newcomers) belong to low and middle classes. People belonging to higher classes usually prefer to go to resorts in the North Coast and Red Sea". Comment from questionnaires.*

The current visitors in Alexandria are different than those who used to spend the summer days there in the past e.g. high class people. Now they go to the western part of Alexandria, recognized national wide as the North Coast.

5.3 Outcomes and feedbacks

The summer overcrowd in the city is foreseeable, in fact such change was recognized by all of the interviewees and respondents implied in this research. Such seasonal alteration is also acknowledged on national media, for instance Hona El-Asema, a television show from the local channel CBC[10], reports on Alexandria as a summer destination, where the predominance of the city for Egyptian families is identified, additionally the privatization of beaches, the continuously-growth amount of summer visitors each year and the consequently restriction for Alexandrians to enjoy their city is also stated. Based on the geogenic and anthropogenic sources previously explained, it is assumed that the summer visitors go to the city for tourism, yet the consequences on residents are not reported and their knowledge is crucial for understanding the scale of the change and the effects on them and on the city. There are several constant outcomes of this season, but its predictability does not mean that the city is prepared to deal with this annual change.

Figure 24: The Cornish, main street in Alexandria. Comparison between winter (left) and summer (right)
Source left image: Author. **Source right image:** http://sharek.almasryalyoum.com/cities/alexanderia/455352/

A comparison between Alexandria in winter and in summer is shown in the figure 24, where the increase of population previously mentioned is explicitly illustrated. What is not shown is how Alexandrians deal with such change. Looking for escaping from this issues during the sunny days, some residents leave the city and go to the western part (North Coast), where several resorts and gated communities are located (Nasra Saleh, Head of Technical Support Sector, Alexandria Water Company, personal communication, 03 March 2018). The use of this spot outside the urban area is also seasonal (Brizzi, 2005: p.16), as a mean for residents to find calm from the overpopulated Alexandria during

10 The report can be seen on https://www.youtube.com/watch?v=mHaTJVIoxiA&t=1s (in Arabic language, translated by Yara El-Maghrabi).

summer (FooP, 2014: p.28); (Dr. Heba Aboul-Fadl, University of Alexandria, personal Communication, 22 December 2017). This indicates that the effects of this cyclical phenomenon goes beyond the city boundaries.

The western part of the city is a destination for Alexandrians and people from Cairo who belong to specific socio-economic levels, on the other hand the situation for those who stay in the city during summer is just partially known and reported. An example of what the residents must deal with is the infrastructure condition of the city, which is below requested when compared with the demand of summer (Eldaidamony, 2011: p.95), pointed as the peak season, causing overloading due to the rise of visitors in the city (FooP, 2014: p.27,50&145). The failures on infrastructure are repeatedly reported, however they are not explained nor analysed in detail. Is this matter an additional reason for some Alexandrians to flee from the city?

Specific outcomes on utilities were detected by means of several articles, and confirmed by interviewees and respondents, such as shortages of water (Yahia, 2017); (OOSKANews, 2012: para. 11), shortages of electricity (Al-Youm, 2015); (El-Gundy et al., 2014); (EgyptianStreets, 2016: para.7), and drastic accumulation of garbage in the streets (Gaber, 2016); (Albawabhnews, 2017), although the rubbish condition in summer is not recognized by The Ministry of Tourism (MoT) as an issue to solve. Apparently, the basic utilities of the city fail in summer, yet the upgrading on infrastructure is mainly reported in terms of roads, especially at the Cornish (Brizzi, 2005: p.11-12), one of the main streets in the city, extended along the shore. It suggests also mobility issues, pointed by the respondents in the questionnaires. These outcomes represent what those Alexandrians who stay in the city in summer must face.

> *"(In summer) Some of the infrastructure cannot function at its best"*
> *Comment from questionnaires.*

The elements of the outcomes here detected correspond to those mentioned and quantified by the UM papers introduced above, which means that the UM of Alexandria is changed in summer in terms of water, energy and material flows, leading the city to the outcomes previously described. The role of the newcomers plus the condition of infrastructure will be discussed below.

5.4 Perceptions, Reactions and Attempts of Solution

The summer outcomes in the UM of Alexandria were previously mentioned, as common findings from different sources on information used in this research. How the residents of Alexandria and the local authorities perceive and react to these events? If the socio-economic aspect of the UM is aiming to be studied, as mentioned in the chapter 3, then the social perception of the current summer outcomes must be consider, so that the level of involvement of the society can be recognized.

5.4.1 Perceptions from Public Authorities

The summer tourists and the seasonal situation itself was contradicted by Mr. Osama El-Kholy (General Manager of Ministry of Tourism in Alexandria, personal communication, 21 March 2018):

Tourists:

The summer newcomers are not officially recognized as tourists by the Ministry of Tourism(MoT); they are seen just as Egyptians in the city. The MoT has a specific profile and expectation of what a tourist is, and such is mainly based on the place of origin. The reason is the spending capacity, as international currencies provides more money to the national economy of Egypt.

> *"It is not about nationality, it is about economics"*
> *Comment from interview at MoT.*

Similarly, this governmental body is not in charge of the summer Egyptians in the city, they just care about international visitors, e.g. real tourists, according to their standards. The Governorate of Alexandria was pointed by MoT as the responsible entity for the local visitors in summer[11].

Accommodation as Acknowledgement:

For MoT, Alexandria is not a seasonal place, on the contrary, they state that the city receives visitors the whole year. The figure 25 shows a monthly breakdown of tourists in Alexandria throughout five years, which might support the point of view of MoT considering the city as permanent destination, even though the highest figures are related to summer, highlighted in red colour.

11 There was no cooperation from this entity to talk and discuss the topic and its role with the outcomes of summer. Yet MoT stated that both institutions meet regularly regarding the summer situation, but so far there are no settled plans towards this situation.

Year / Month	2009	2010	2011	2012	2013
January	9239	8232	11524	7502	12405
February	8600	10897	3623	8108	11128
March	7188	9789	11547	9934	13017
April	10238	11866	8853	9844	15059
May	8852	9985	6489	10322	16319
June	9494	15503	8877	14264	27670
July	13798	29133	11628	18378	11592
August	18231	11700	6303	12564	10034
September	13279	15163	8324	13050	9582
October	11641	13470	9420	14023	11318
November	9787	17041	7241	10875	6824
December	8456	14139	8142	10834	9364
Total	128803	166918	102071	139698	154312

Figure 25: Monthly breakdown of visitors in Alexandria. Information based on official lodging. Domestic tourism is not included.
Source: Central Agency For Public Mobilization and Statistics, Passports, Emigration & Nationality Administration (Ministry of Interior), 2014 in FooP, 2014: p. 25

This information is based on official statistics of lodging, e.g. hotels and hostels. However, domestic tourism, e.g. Egyptian visitors in this case, depends mostly on second homes and villas as accommodation (Rady, 2002: p.11), and available statistics do not report them (Brizzi, 2005: p.7). If the previous affirmations are correct, then the monthly figures do not correspond to domestic tourism, but to international, which is the cluster that MoT manages.

Figures found on news and reports about Alexandrian summer are another way to contrast the data from official lodging, the amount of visitors ranges from hundreds of thousands (Yahia, 2017: p.2), to more than one million (Integral Consult, 2005: p.11); (El-Rayis et al., 2008: p.1); (Wetskills, 2012: para.1), to no less than two millions (Ela, 2014 in FooP, 2014: p.27), to two millions or more (Cities Alliance, 2007: p.21); (AbuZeid, K., et al, CEDARE, 2016: p.15); (Nasra Nour, Head of Technical Support Sector, Alexandria Water Company, personal communication, 03 March 2018); (Elgazzar et al.,2017: p.2), and finally to double the Alexandria's population (Sims, 2014: p.191). This different figures suggest, on the one hand, a bold increase of population, much bigger than the existing data, previously shown in the figure 25. On the other hand, a lack of accuracy in the acknowledgment of the situation resulting from the different means of accommodation used by summer visitors might be concluded[12].

"Some of them sleep in the streets, some use mosques, and some rent apartments as accommodation" Comment from questionnaires.

12 Housing discussion explained below.

5.4.2 Perceptions from Alexandrians

"They make the city so ugly" Comment from questionnaires.

The western part of Alexandria was previously explained as a destination for those residents looking for leaving behind the city in summer. Then, the outcomes in infrastructure that those who stay must deal with were also explained. What is their perception of these days?

"Most of newcomers come from the countryside near Alexandria" Comments from questionnaires.

Their place of origin in relation to the negative impact in the city was indicated by Mr. Mostafa Ginedy (Inhabitant of Alexandria – Real estate investor, personal communication, 01 March 2018) as well as by some respondents of the questionnaires. Their level of education, habits, and behavior in the city and to its citizens were highlighted as aspect that Alexandrians find unpleasant. For instance, how they look and walk on the streets was mentioned by them, as well as by Fouad (2015).

Figure 26: Example of habits and behaviour in the city and to its citizens from summer newcomers, highlighted as aspects that Alexandrians find unpleasant from them.
Source: http://assets2.akhbarak.net/photos/articles-photos/2015/7/31/19397771/19397771-v2_xlarge.jpg?1438332823

"You can say they are the newcomers because Alexandrians do not dress or behave like that" Interview with Mr. Ginedy

Behaviour also represents their impact in the residents' daily life as well as in the city landscape. On the one hand, sexual harassment was pointed by the

respondents and by Fouad (2015: para.11), as a situation that women have to face from the newcomers. On the other hand, the aspect of the city changes due to the lack of interest from visitors to keep it clean.

Figure 27: Solid waste generation from summer newcomers.
Source of left image: http://img.youm7.com/Albums/albumimages/82015181529398144-(1).jpg
Source of centre image: http://img.youm7.com/Albums/albumimages/82015181529398144.jpg
Source of right image: http://img.youm7.com/Albums/albumimages/82015181529398145.jpg

> *"They do not maintain the streets or the beaches clean. They throw garbage in the sea water and food in the streets or in the beaches" Comment from questionnaires.*

Social media is a common (virtual) place where these feelings and perceptions are shared between Alexandrians, presumably they are part of those citizens who stay in the city in the sunny days. Some groups found on the website Facebook are proof of that, as just their names are inviting to stop or to get rid of the summer newcomers in the city. Fouad (2015) mentions similar reactions from some residents towards newcomers, besides Facebook groups, setting rules for vacationers or spreading rumours and fake news about the city in order to persuade them to not come, are included.

The extent to which these groups have influenced in the regulation of entry, permanence or behaviour of summer visitors is unknown. Yet, the names suggest the same perception than those collected by means of questionnaires and interviews: there is a general negative perception from Alexandrians about both the sunny days situation and the visitors implied in the outcomes. Those who stay in the city are the most affected by this seasonal situation, probably some of them take part in the Facebook groups shown in the figures 28, 29 and 30.

> *"Summer is not something exciting to the original inhabitants." Comment from questionnaires.*

Figure 28: Association of summer newcomers' haters in Alexandria, Facebook group. (Screenshot 29 April 2018)
Source: https://www.facebook.com/groups/24568091573/about/

Figure 29: Alexandria under the invasion of summer newcomers, Facebook group. (Screenshot 29 April 2018)
Source: https://www.facebook.com/groups/180069515379710/about/

Figure 30: Campaign for preventing rural people from entering Alexandria, Facebook group. (Screenshot 29 April 2018)
Source: https://www.facebook.com/groups/415594345129351/about/

"Summer means Occupation to the city" Comment from questionnaires

In the chapter 3, the paper from Warren-Rhodes and Koenig (2001) about the dramatic increase of the Hong Kong's population and the subsequent change in its UM was mentioned. The changes in consumption of resources were covered and quantified, while the social part in terms of perceptions and reactions of the growth process[13] was not covered. In Alexandria we have a seasonal increase of two million people approximately, which exemplifies a short chaotic period in the city (Timmeren, 2014: p.13). Based on the outcomes mentioned above, saying that a seasonal growth event is more environmental friendly is far from the reality. As seen so far, the perceptions gathered from the field research are not positive, either from local authorities or from Alexandrians. How can citizens ask for an infrastructure upgrading for summer if some of their reactions include leaving the city or to joining groups against visitors?

Although this subchapter is supposed to explore the attempts of solutions, no plans for mitigating the impact of summer were found for the situation of Alexandria. As explained above and will be complemented below, there is not a recognition of a problem and, when so, institutions turn a blind eye on the problem, as explained with the interview of MoT.

Part II

5.5 Metabolic Urbanization and Flow Analysis

The case study of Alexandria, as well as the reference cases in the previous chapter, were explained by allocating the anthropogenic and geogenic sources of change, subsequently the outcomes of such interaction were analysed and finally the perceptions and reactions from authorities and inhabitants were mentioned and discussed. The aim of this to analyse the impact that the summer newcomers in Alexandria generates in the infrastructure and the UM of the city. In this endeavour the seasonal alteration in consumption and waste generation is explained and quantified as a consequence of social activities and behaviours, resulting from the massive attendance of visitors already explained. These interactions and feedbacks are comprehensively discussed in order to understand the impact of human activities in ecosystem dynamics (Grimm et Al., 2000: p.573) by means of infrastructure (Sattherthwaite, 1997: p.1685) under an UM approach[14].

13 Which can be reflected in the social equality of access to resources and their availability throughout time, also explained in the chapter 3. Such is crucial for understanding changes in the consumption patterns, which modifies the UM cycles and outcomes.
14 Figure 2 shows this sequence of interactions and feedbacks.

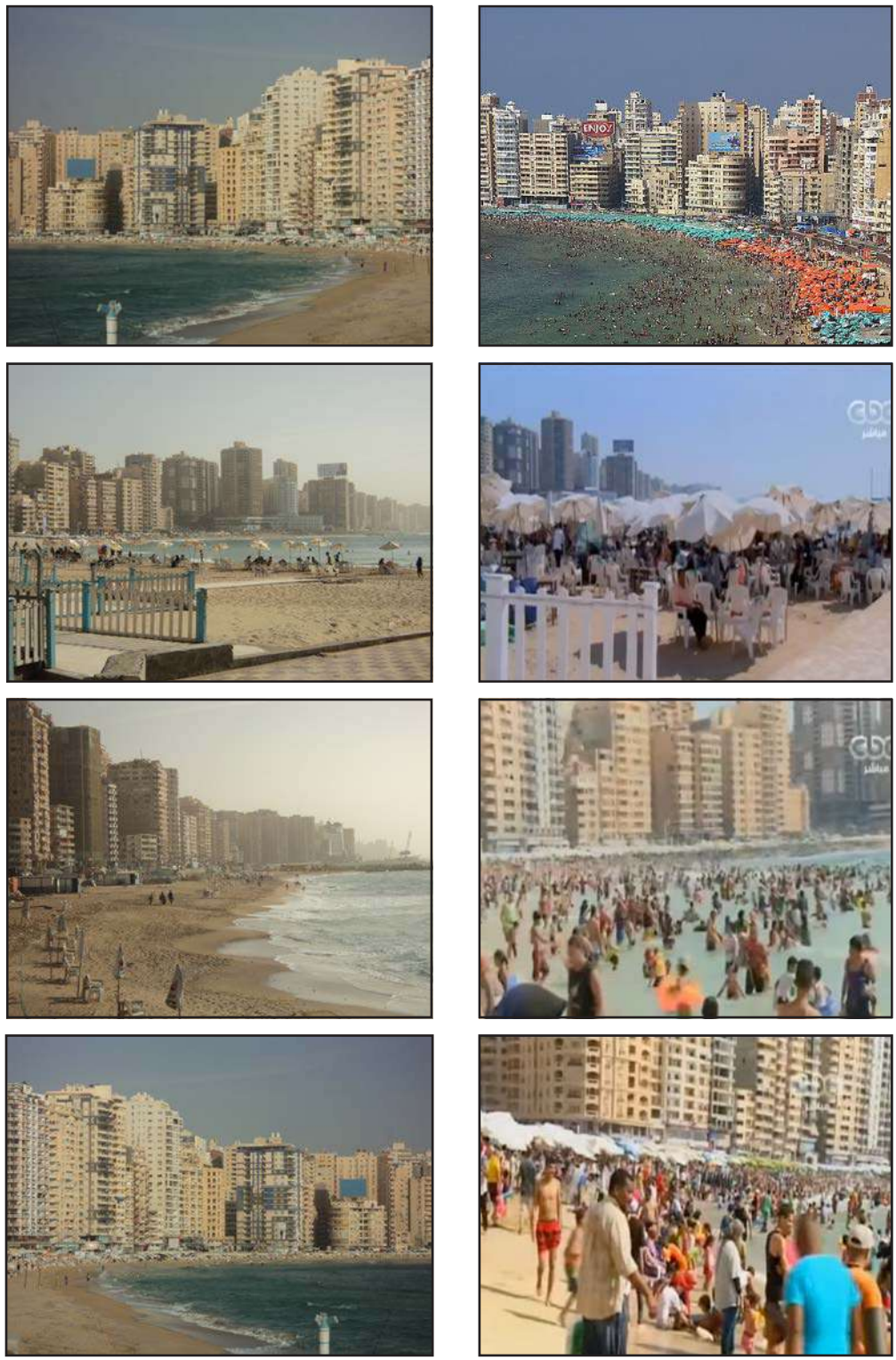


Figure 31: Demographic comparison of Alexandria without summer (left images) and with summer (right images).
Source left images: Author
Source right images: - https://i.pinimg.com/originals/56/8c/72/568c72ec557058164cb867ada8033520.jpg
- https://www.youtube.com/watch?v=mHaTJVIoxiA&t=15s

Even though Egyptians do not represent tourists for MoT, it is a fact that the city get overcrowded by a big amount of visitors. The changes on population are not just compared in relation to winter; the images included in the collage of the figure 31 offer a comparison between the month of March[15], where the local beaches are scarcely used by the residents of the city, and the summer season.

A hint of seasonality is detected by means of this comparison[16]. Winter and spring were shown without detecting major changes in the city landscape or population, especially in the tourist areas. How else can be said that this case study is seasonal? Eldaidamony (2011) compares the situation of tourism between Barcelona and Alexandria, where in the first case a steady concurrence of people to visit the city throughout the year is detected, while in the second case the concurrence is the opposite, taking place mainly in summer, with a lower percentage of visitors the rest of the year. Has summer created a strong negative perception of Alexandria for the permanent residents?, What is the reason for beaches to be empty even without the so-called rural or summer visitors in the city? Is it related to the weather in March, which is still below the summer average temperature?

> *"Normally Alexandrians don't go to the beach in the city, just farmers go there. Cairo people go to the North Coast". Interview with Hassan Esmail, resident of Alexandria.*

5.5.1 Scale of change

Until this point different sources recognize the seasonal change in Alexandria, yet they mention it as if the whole city was affected by this condition. Is it possible to spot this situation more accurately? By means of interviews different names were mentioned as typical places where summer newcomers spend their time. Additionally, in the questionnaires developed for this research an exercise of Mental Mapping was proposed, asking the respondents to allocate their place of residency as well as the places where summer visitors go, based on their perception. The places mentioned in the interviews and questionnaires were similar, some of them also stated by Fouad (2015: para.5). They are shown in the figure 31.

The areas pointed by the respondents were redrawn in the figure 32, whose

15 Month of field work for this research.
16 Also by those shown in the figure 24.

"Some spots like Miami, Asafra and Sidi Bishr become very hard for the people living there. They (the visitors) stay up until very late at night and streets become very crowded". Comment from questionnaires.

Figure 32: Scale of summer change. Map of allocation of specific areas in Alexandria impacted by the urban changes during summer. Result from mental mapping from respondents.
Source: Author

names were also indicated. The allocation of their residence area looked for reveal their acknowledgement of the situation based on their location in the city. This suggests they a shared similar perception regardless of the place where they live.

> *"Alexandria was a seasonal city in the past, now it is an ordinary city with a seasonal part" Interview with Mr. Hamido Osman, Housing Broker in Alexandria.*

> *"They (the summer visitors) can be perceived everywhere in the city" Interview with Mr. Mostafa Ginedy.*

This couple of last comments show the different perceptions gathered by means of interviews, where on the one hand only one part of the city is recognized as seasonal, while on the other hand the whole city is recognized as such. The background of the interviewees might influence their opinions. The first one is from a housing broker, who is aware of the location and fluctuations of the housing market in the city. The second one is from a resident of Alexandria, who even with his job as a real estate investor, perceives the whole city crowded by the summer newcomers. The areas mentioned by the broker were similar to those pointed in the figure 32.

Perhaps the election of these areas from visitors might be related to the local beaches, as they are located in this part of the city. These areas were photographed in the collage (figure 30). The rest of the shore does not provide open areas like beaches or belong to private Cafés[17]. This might be the cause for the congestion of people at waterfronts, however, as explained, such congestion either demographic or infrastructural, takes also part in many other spots in the city.

5.5.2 Profile of Summer Visitors

> *"They are from near villages around Alexandria. They come with their families" Comment from questionnaires*

Through data collection a more specific profile of the summer visitors was built.

17 Situation reported also in the television show from the channel CBC, previously mentioned. See https://www.youtube.com/watch?v=mHaTJVIoxiA&t=1s for more information (in Arabic language, translated by Yara El-Maghrabi).

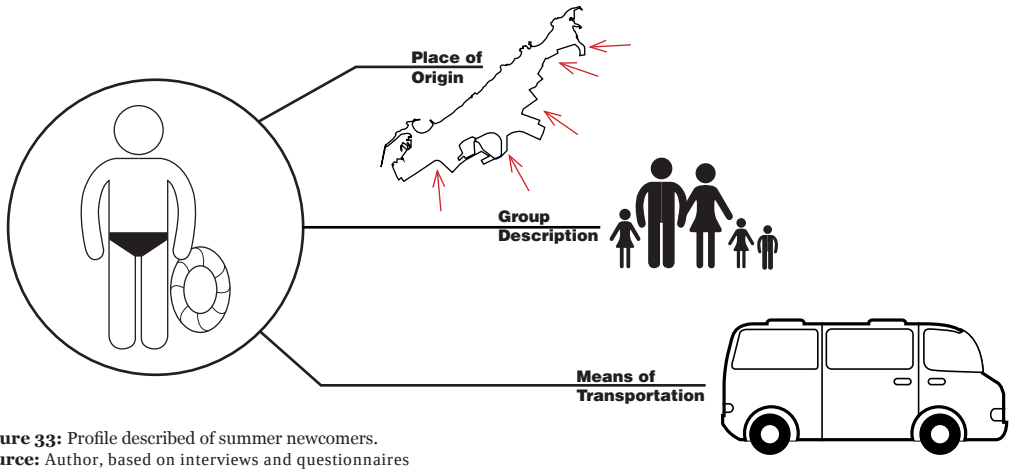


Figure 33: Profile described of summer newcomers.
Source: Author, based on interviews and questionnaires

They were described mainly as men, who travel with their families, coming from rural areas close to Alexandria, or even from governorates like Kafr El-Sheik or Beheira[18] mentioned Hassan Esmail (Resident of Alexandria, personal communication, 08 May 2018), inhabitant of Asafra, one of the areas pointed in the figure 32, from the Mental Mapping exercise. Families were described as groups between 5 and 7 people. Groups of men travelling together were also mentioned. Their level of education was questioned by most of the interviewees and respondents as a cause of the undesired outcomes that the citizens have to face[19].

> *"All in all, low levels of education lead to a very uncivilized behavior"*
> *Comment from questionnaires*

Microbuses were recognized as their main transportation system. However, it does not mean that they use one of this vehicles per family, on the contrary, they tend to share it with more people in order to reduce costs. This fact makes more difficult the task of generating accurate data on the amount of visitors every summer, as it is not known specifically the sharing preference of each family or visitor.

Something not mentioned by respondents is the influence from a second profile of visitors, who come from other urban areas in Egypt, as Cairo. Their influence is more related to housing fluctuations, which influences the extra demand of

18 See figure 46 for reference the location.
19 See figures 26 for reference.

utilities in summer. So both outlines of newcomers come during the sunny days and return to their places afterwards. This can be understood as a sort of circular migration, illustrated in the figure 34, with Alexandria as a middle point being affected by different demand from people with different social backgrounds.

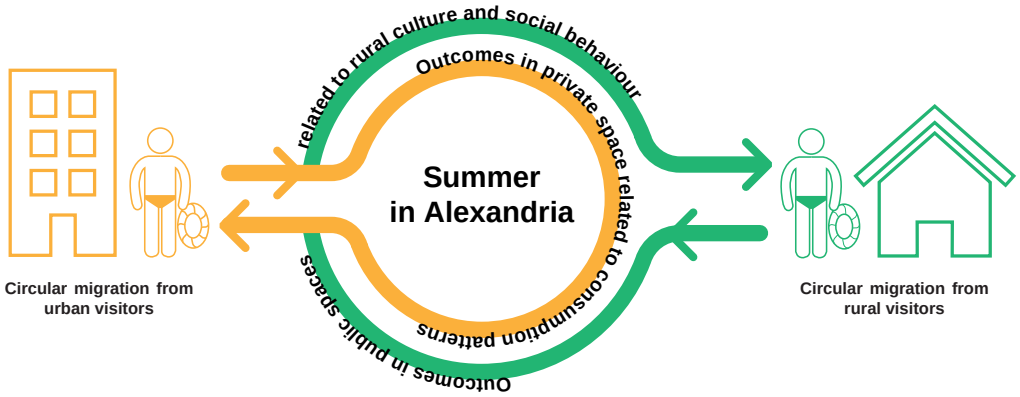


Figure 34: Circular migration of visitors from different places of origin. They inhabited diverse spaces in the city producing specific outcomes.
Source: Author

5.5.3 Housing: transitory and seasonal

The papers introduced in the literature review describe UM as a quantitative material analysis. At the same time, due to lack of integration of social dynamics in the theory, there is not recognition of specific spaces or land uses in the city where the flow of energy and materials take part. Warren-Rhodes and Koenig (2001) study the permanent increase of three million in Hong-Kong, but the housing implications in such process, which is a requirement for accommodating such amount of people, is not covered in their paper. The case of Ulan Bator reveals the importance of housing dynamics in the metabolism of the city, and how the increase, even seasonally, can lead the city to drastic outcomes. Accommodation findings will be explained before introducing the seasonal outcomes on the infrastructure of Alexandria (see below), as both components are linked.

> *"Close to my place there are hotels, but the majority (of summer newcomers) go to apartments for financial reasons" Comment from questionnaires.*

Where can the city accommodate an average of two million new people yearly and temporally? This was considered by Dr. Heba Aboul-Fadl (University of Alexandria, personal Communication, 22 December 2017) as an important remark from summer to consider. A high number of flats are rented just in the sunny season, therefore they are empty the rest of year. During these months

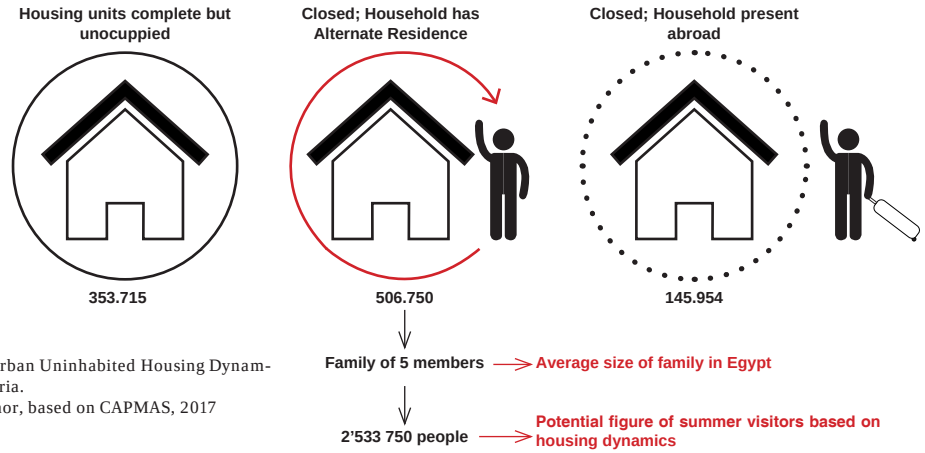


Figure 35: Urban Uninhabited Housing Dynamics in Alexandria.
Source: Author, based on CAPMAS, 2017

the rent is high enough to compensate nine to ten months of closure. Moreover, Mr. Mostafa Ginedy (Inhabitant of Alexandria – Real estate investor, personal communication, 01 March 2018) states that such idea of having an empty flat during the whole year is impossible because of the profits. Housing situation is just representative for those who can afford to pay for it, MoT mentioned that many of the newcomers are unable to pay for accommodation in the city, as such is 25% more expensive in summer. For Mr. Hamido Osman (Housing Broker in Alexandria, personal communication, 02 March 2018) the increase is 50%, and for Mr. Ginedy it is three to four times higher than the rest of the year. By means of these percentages the fluctuations and dynamics of housing in summer can be understood, however such is not visible in the national statistics.

The national statistics of Egypt counts nationwide 7,5 million uninhabited residential units (Central Agency for Public Mobilization and Statistics CAPMAS, 2006 in Borg, 2013:p. 110). Several status of inhabited housing are recognized in Alexandria, three of them are illustrated in the figure 35. The most similar case to what the study of Seasonal Cities aims is the situation of Alternate Residence, which means that the flat is inhabited periodically. Assuming that all of them are used just for the summer season, a simple mathematical operation suggests that the amount of visitors might be close to those mentioned previously by means of reports; around two and a half million people.

On the other side, Mustafa Abu Ella (architect, resident of Alexandria, teaching assistant at Arab Academy for Science in Alexandria, Architecture Department, personal Communication, 02 March 2018) indicates another situation: not all of the summer visitors stay in the city for many days, sometimes it is just a one day

trip. This was also mentioned by the respondents in the questionnaires.

> *"Sometimes they stay for a day and leave at dawn, and sometimes they stay for few days, renting an apartment for a fair price. Usually they come with their families and siblings." Comment from questionnaires.*

Figure 36: Influence of transportation for summer visitors. Micro-buses as multifunctional temporal spaces.
Source: Author

Transportation plays an important role on this case, as seen in the figure 36, where families or visitors do not use micro-buses just as a mean of transportation but also as a space for several other activities.

The housing and permanence patterns represent an obstacle for producing accurate data about the summer season in Alexandria. As it has been shown, hotels, hostels and formal lodging is not what summer visitors are looking for, and perhaps the summer newcomers are not the clients that the formal lodging is trying to reach either.

So far we have approximately two million new people, temporally staying in the city, in different sorts of accommodation. How is this connected to infrastructure and urban metabolism? Borg(2013: p.60) describes the current urban development of Alexandria, where five floors historical buildings are being replaced by twenty floors towers to contain the city steady growth. Such paper describes outcomes in the infrastructure of the city such as electricity, sewage, rubbish collection systems, transportation and traffic[20]. The network of services

20 Similar to the outcomes found on papers about summer. This suggests that these issues do not belong just to the sunny days, but they are more visible in such time.

Figure 37: Alexandria urban profile in 2008

Figure 38: Alexandria urban profile in 2013

Figure 39: Alexandria urban profile in 2018

Source 2008: https://www.flickr.com/photos/93715485@N00/2346377092/
Source 2013: https://www.flickr.com/photos/niko-tine/8758692257/
Source 2018: Author

in the city is not updated following the new constructions[21], which explain why the infrastructure might be overloaded: there are bigger demand of services and bigger generation of wastes in the same plot, but the current infrastructure for dealing with it is not prepared. FooP (2014, p.145) also recognizes the overload of the urban services due to the rise of tourists. Such is the way how the city changes, on the one hand seasonally resulting from summer visitors, and on the other hand permanently resulting from the housing market development.

There are no specific indications relating this demolitions and new constructions as a consequence of the summer season, however Mr. Mostafa Ginedy (Inhabitant of Alexandria – Real estate investor, personal communication, 01 March 2018) based on his experience with the housing market, states that many people in the city buy new flats for renting them to someone else, as it is more profitable. This leasing trend from buyers might find the summer season as an ideal cluster to invest. Lack of available land for new constructions was also mentioned as a reason for demolishing and building new and taller housing units[22]. The sequence of the figures 37, 38 and 39 shows how the urban scale of the city has been changing throughout the years as a consequence of insufficient land for urban expansion.

The changes on the profile of the city can be observed throughout the years 2008, 2013 and 2018. Dr. Heba Aboul-Fadl (University of Alexandria, personal communication, 22 December 2017) points how the first line of constructions facing the shore remains almost the same[23], while the second and third line of constructions look taller and newer. Many of this constructions are illegal, mentions Dr. Aboul-Fadl as well as Eldaidamony (2011: p. 95) and Brizzi (2005; p.17), which might represent part of the difficulty for coordinating them with the required infrastructure upgrading of the city. The changes in the city landscape are linked with the urban development of Alexandria, yet their links to seasonal events are so far no reported.

5.5.3.1 Housing Dynamics

Three different dynamics were recognized by Dr. Aboul-Fadl as well as by Mr. Mostafa Ginedy (Inhabitant of Alexandria – Real estate investor, personal communication, 01 March 2018) related to the ownership and renting dynamics in

21 In fact many of them are described as illegal constructions, as a result of the events occurred the 25th of January 2011.

22 The rent control law was also mentioned: issued in 1920 by the Government, looking for guarantee stable housing for all citizens. The condition was to freeze the rent value as well as renew the contract between the tenant and the owner. In addition, allowing the passing of rental contracts through generations. This is also mentioned by Borg (2013: p.109).

23 This area is pointed as an obstacle for developing new projects related to tourism (Brizzi, 2005: p.4,7&16).

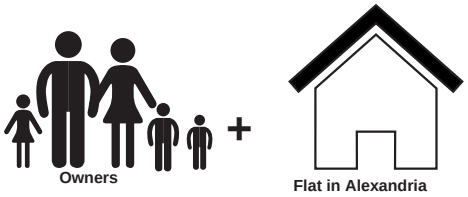


Figure 40: Housing Situation in Alexandria I
Source: Author

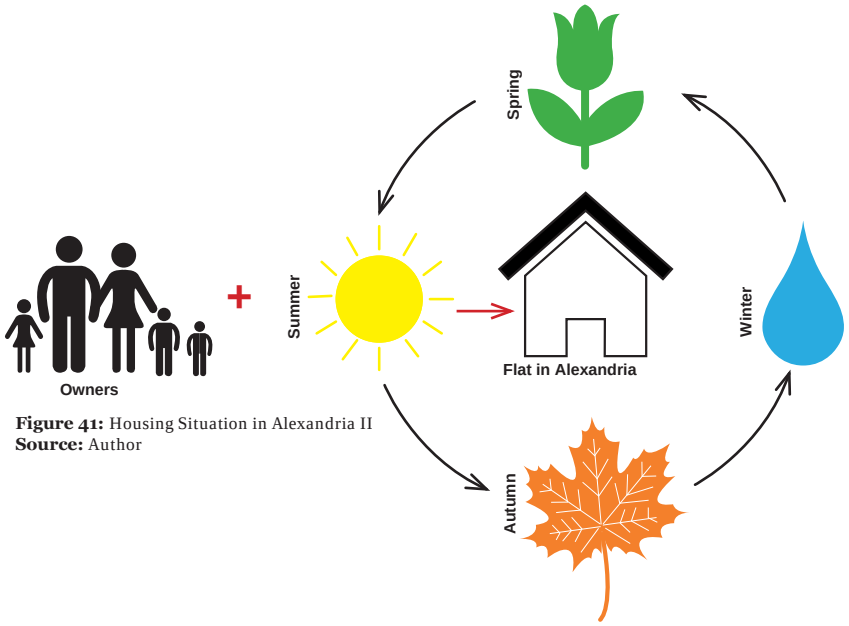


Figure 41: Housing Situation in Alexandria II
Source: Author

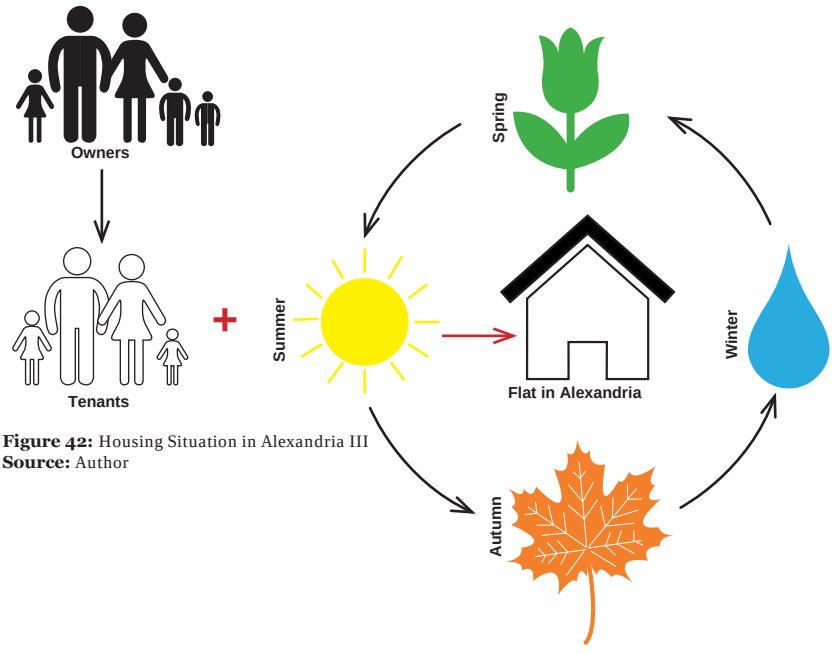


Figure 42: Housing Situation in Alexandria III
Source: Author

the city. The figure 40 represent a typical situation according to the interviewees, where an Alexandrian family owns a residential unit and live there. Another situation is presented in the figure 41 where a family owns a flat but do not live there; they live in a different one or in another one, for instance Cairo. The flat is inhabited by them just in summer, therefore the rest of the year it is unoccupied.

A similar dynamic is shown in the figure 42, where the residential unit is leased just in summer. These housing dynamics contrast with the findings previously explained about rural visitors and their means of accommodation, so summer visitors do not come exclusively from rural areas, they are also owners of flats who live outside Alexandria and come temporally during summer[24]. Perhaps their percentage is lower than the rural newcomers, which might explained why they were not frequently mentioned by most of the sources in this research. Another reason could be the visibility of their impacts, urban newcomers inhabit a specific flat, while the rural ones inhabit the streets and open spaces, so thet and their outcomes are more visible.

The questionnaire involved in this research[25] enquired after the summer visitors, without specifying if there were rural or urban. The answer from all the respondents pointed just rural visitors, seen also in the figure 30, by means of a Facebook group inviting Alexandrians the prevent the city from this population. The interviewees also refereed to rural newcomers with the exception of Hamido Osman (Housing Broker in Alexandria, personal communication, 02 March 2018), whose job involved clients from Cairo, as he mentioned in the interview.

A reason for this might be the negative transformation of the city during summer, which is reflected in the perception of interviewees and respondents (and presumably more residents), when enquired after this season in the city. The answers from local authorities did not recognize the urban newcomers in summer either, and as mentioned, no plans for organizing those who come from rural areas were found or mentioned.

24 As mentioned with figure 34 about circular migration.
25 See Appendix .

5.5.4 Outcomes of summer in the infrastructure of Alexandria

As mentioned above, infrastructural outcomes in Alexandria related to shortages of water and electricity, as well as waste overproduction and accumulation were mentioned by difference sources of information for this research. Even though these fallouts are not comparable with those found in Ulan Bator, the driving forces are similar, related to cyclical housing dynamics linked to circular migrations, leading to changes in consumption patterns. Water, electricity and materials are considered by Kennedy et al. (2007: p.45) as fundamental urban cycles. In their paper they study the permanent changing metabolism of several cities around the world. Here the aim is to study the seasonal changing metabolism of Alexandria.

5.5.4.1 Water

The differences in population and occupation in the city in summer put more pressure on the water demand (AbuZeid, K., et al, CEDARE, 2016: p.7), which increases from 2,5 to 3,2 million cubic meters per day when compared to the rest of the year (Nasra Saleh, Head of Technical Support Sector, Alexandria Water Company, personal communication, 03 March 2018). Specific social influence was pointed by the interviewees as the reasons for increasing water demand in different arenas:

Public Space: At public beaches showers are open all day long, even at night when no one is at the beach (Hassan Esmail, resident of Alexandria, personal communication, 08 May 2018). So apparently the rise of water expenditure does not mean that such is being properly used.

Private space: At home, either visitors or residents, deal with summer in similar ways. Not everybody can afford to have air conditioning (AC) in every flat, so they consume more water by drinking it or taking more showers per day due to the weather. Mrs. Nasra Saleh (Head of Technical Support Sector, Alexandria Water Company, personal communication, 03 March 2018) stresses this in visitors, as they also take showers every time they go to the beach, which does not happen commonly with residents, mentioned the interviewees.

> *"In summer there are explosions and damages in many pipes in the streets due to the overloading caused by the high demand" Interview with Hassan Esmail, resident of Alexandria.*

From this comment Mr. Esmail explained that in such case, in order to fix the pipes, the water provision must be cut in specific areas based on the location of the damage. That could explain why the shortages of water were recognized by some interviewees and respondents, while it was denied by many others, including Mrs. Nasra Saleh, who states that those Alexandrians leaving to the North Coast balance the water demand imposed by the summer newcomers. According to her, shortages were a past issue that the company is not facing anymore. However, several respondents pointed it as a constant summer issue.

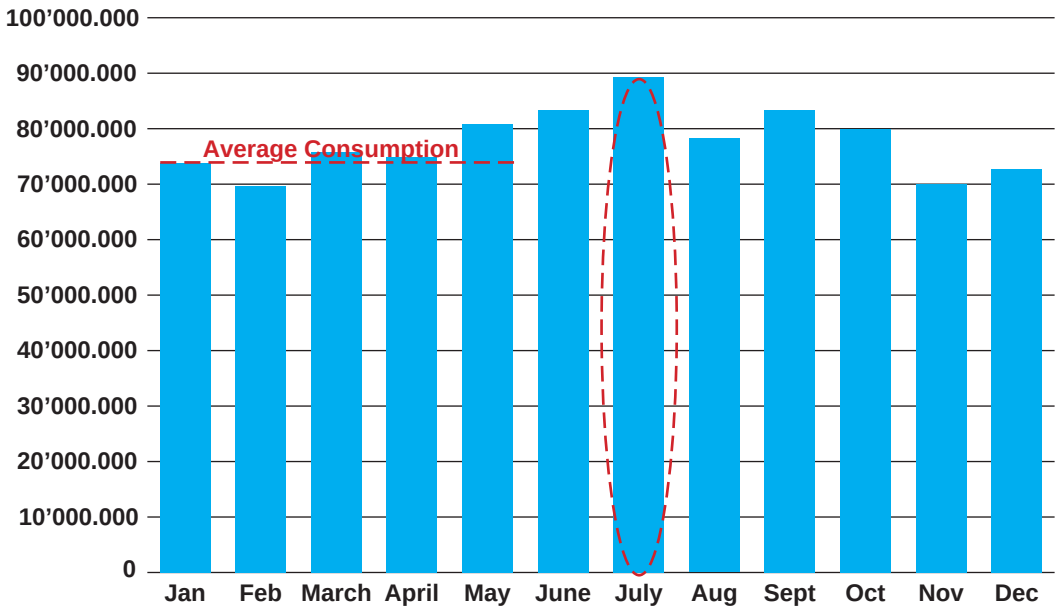


Figure 43: Monthly breakdown of water consumption in Alexandria 2016/2017. Million cubic meters (MCM) per day.
Source: Author, based on information provided by Alexandria Water Company (AWC)

The figure 43 illustrates the most recent monthly breakdown of potable water consumption in Alexandria, where the summer increase can be seen, especially in the month of July. The increase does not look sharp, which explains why Mrs. Saleh talked about a balance in consumption of those who leave and those who come to the city for summer.

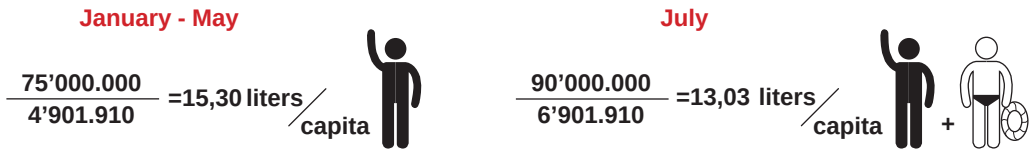


Figure 44: Consumption per capita based on figure 43 and population numbers of Alexandria with and without summer.
Source: Author

The fact that the previous statistics reveal the water expenditure does not mean that such is the water demand. From January to May the average utilization

of water is around seventy-five MCM per day approximately, which give us a consumption per capita as seen in the figure 44. On the other hand in July, when the water is used the most, the figure increases up to ninety MCM per day, as a result of residents and visitors sharing the liquid. The same mathematical exercise in the figure 44 shows that the water utilization per capita decreases in summer, based on the statistics. Considering geogenic elements such as warm temperature and the anthropogenic elements such as social influence on consumption, decreasing the water consumption in summer is not likely to happen statistically or in the reality.

The water demand in summer is higher than the consumption. Lack of the enough liquid for attending the seasonal demand might be one of the reasons for the reports and comments about shortages reported. Are there more reasons for the water shortfalls? By analysing the water cycle of the city some challenges faced in terms of provision will be explained.

5.5.4.1.1 Alexandria Water Cycle

The shortages previously discussed are caused by the over demand from the summer visitors and the residents sharing the city. The water cycle of the city takes also part in such shortfall. In the figure 45 such cycle was drawn, the Mahmoudia Canal is highlighted as it is the main water source of the city.

Most of the potable water treatment plants are located along the main water source. The canal comes from one of the branches of the Nile River, which begins beyond the boundaries of southern Egypt and ends in the Mediterranean Sea. There is a close up of the main water supply in the figure 46, where the division of Lower Egypt in several governorates is shown also.

At some point the Nile River divides in several branches, two of the biggest are Rosetta, which is the source of the Mahmoudia Canal, and Damietta, both of them highlighted in the map. The quality instead of the quantity of available water is the major cause of the shortages. In the figure 47 the chart shows the pollution condition along the Rosetta Branch throughout 5 years, measured in every one of the governorates implied in the flow of the water body[26]. The governorates of Kafr El-Sheik and Beheira presented the highest pollution, as seen in the chart, and the water source canal for Alexandria comes from the confluence of both

26 These governorates can be allocated in the figure 46.

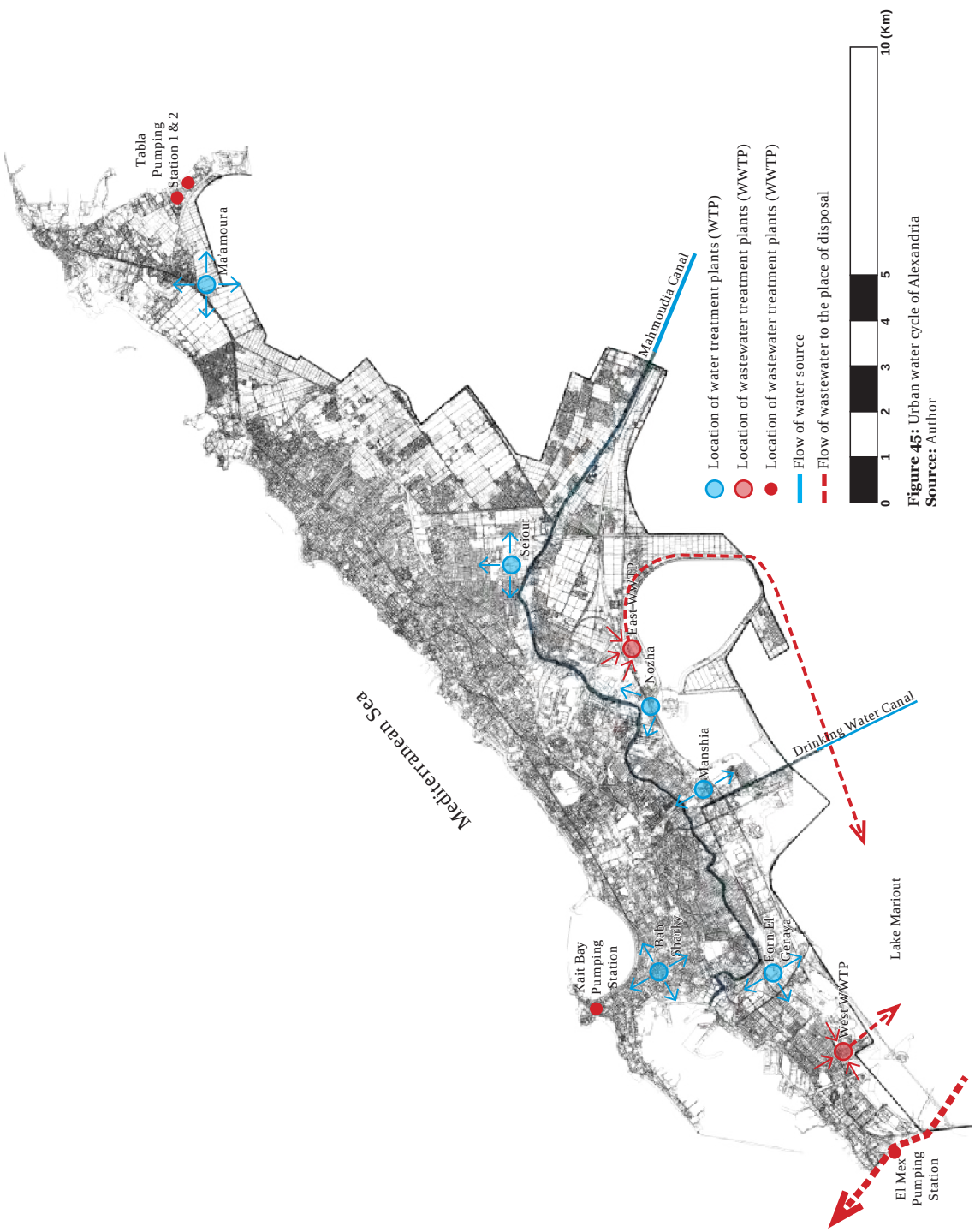


Figure 45: Urban water cycle of Alexandria
Source: Author

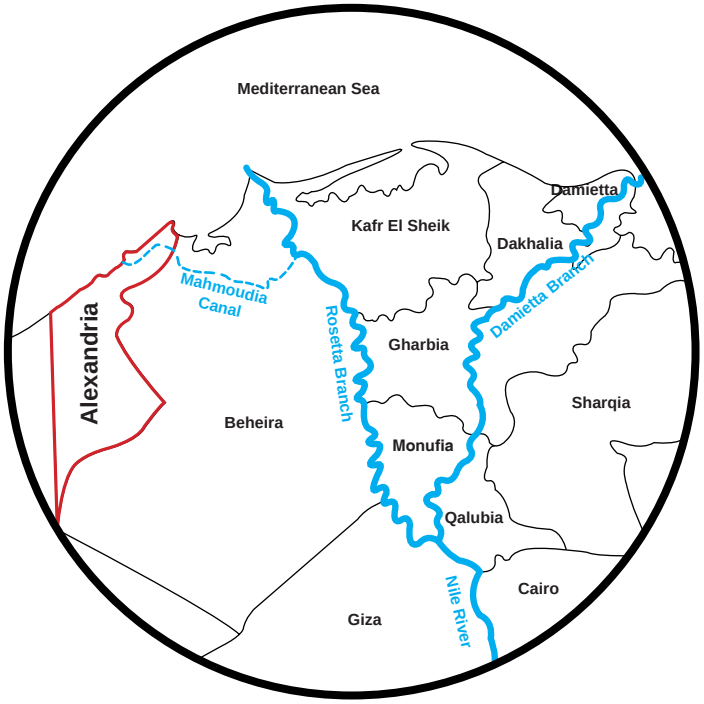


Figure 46: Alexandrian water cycle from its hinterland. The Mahmoudia Canal comes from the branches of the Nile River, also receives the pollution from the governorates involved in the water flow of the Rosetta Brach.
Source: Author

governorates. We can conclude then that Alexandria is receiving polluted water in its main source of the liquid, as a consequence of the interactions of other governorates with the Nile River and its branches[27].

> *"The pollution come from bacteria and mood in the water sources"*
> *Comment from Interview AWC.*

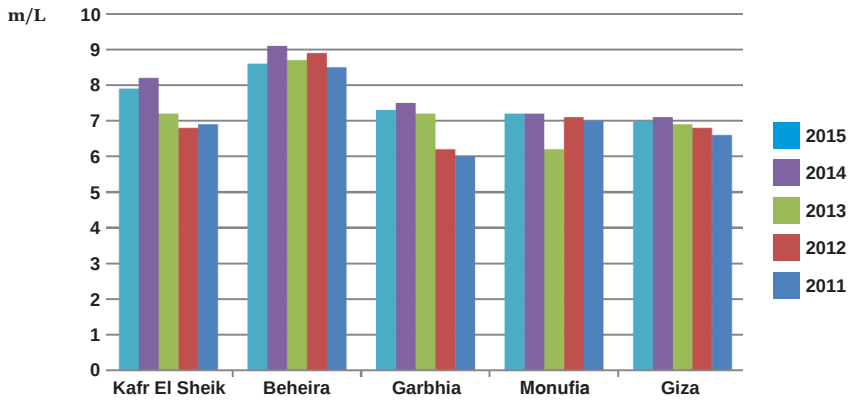


Figure 47: Concentration of Biological Oxygen Demand (BOD) along the Rosetta Branch. It must not be more than 6 m/L.
Source: Egypt State of Environment Report, 2016

27 In the Egypt State of Environment Reports the quality of water is measured since the Governorate of Aswan in the south of Egypt. Those figures are not here included as the aim of this research is not going into details about technical quality nor about a national wide pollution comparison.

Additional issues of contamination in the Mahmoudia Canal are reported by Yahia (2016), where solid waste and invasive species are pointed as causes of clogging the canal and decreasing the water way. This means that water becomes more polluted as it flows along the city, the image 48 illustrates the situation.

Figure 48: Current condition of the Mahmoudia Canal, the main water source in Alexandria.
Source: Yahia, 2016

After the treatment process in every plant, the AWC have a minimum level of potable water[28] that they must reach in order to pump it to the citizens by means of their machines. If such level is not accomplished the machines must be turned off for preventing damages to the pumping engines as well as transfer of polluted water to the residents, mentioned Mrs. Saleh from AWC, as well as Yahia (2016: para.10). Shutting down the machines means no water pumped to the city, in other words, water shortage. This means that the quality of the water that the city receives is another reason for the (lack of) availability of the liquid for residents. Even though it is not related to summer, such season put an extra demand on the resource, that the city, by means of AWC, cannot always provide.

> *"In summer, where the consumption is higher the AWC have reservoirs of potable water for the city. They work just for 4-5 hours as the increase in the consumption is higher than the stored water". Comment from Interview with AWC.*

The AWC is responsible for guaranteeing potable water until the fourth floor of every building in Alexandria[29]. In every edifice the residents must have their own pumping machine, so that the water can reach the upper floors. During summer due to the excessive water demand, it reaches just the second floor, while in winter it reaches the seventh floor without mechanical assistance. This means that the provision of this service must rely on the electricity availability, as the

28 Recognized in Alexandria Water Company as "Safe Level"
29 The construction of new and tall housing towers previously shown in the figures 37, 38 & 39 were pointed as an big challenge that the company is facing for accomplishing that level.

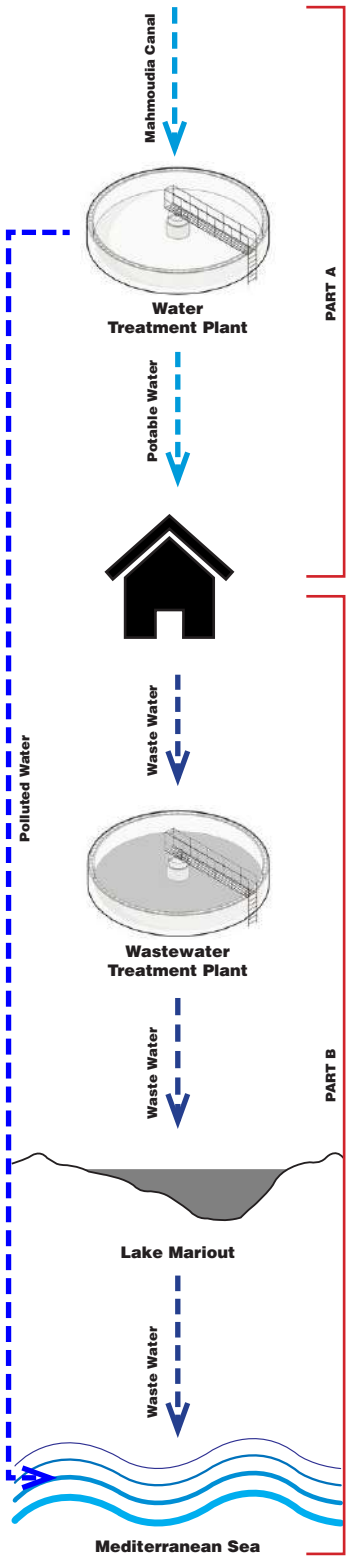


Figure 49: Main stages of urban wastewater cycle in Alexandria.
Source: Author

machines cannot work without it.

> *"Electricity service is not responsibility of Alexandria Water Company, our task is to provide potable water" comment from interview with AWC.*

This comment suggest a lack of cooperation between the service providers of Alexandria. The answer was similar when enquired after the wastewater company, which is crucial for understanding the whole water cycle in the city in relation to the sources and disposals of the service, as well as the ecosystems involved in such process. The extend to which the lack of cooperation affects the summer outcomes is not known and was not stated in interviews, yet low collaboration of services providers can affect the city at any time, but in times of overloading synergies are necessary.

An overview of the whole urban water cycle is shown in the figure 49. So far the part A was explained, where the main water source of the city was allocated and described environmentally and qualitatively. As soon as the liquid is used and goes to the wastewater network, the responsibility relies on Alexandria Sanitary and Drainage Company (ASDCO), which belongs to part B of the figure. The treatment plants of both companies were allocated in the city scale in the figure 45, however it does not mean that they work together, every company works isolated, as explained.

After the liquid is used it goes to the Wastewater Treatment Plants (WWTP) and right after to the Lake Mariout, which is a common place in the Governorate of Alexandria not just for urban wastewater disposal,

but also from agriculture, industries and rural zones. Finally the water is discharge in the Mediterranean Sea. The figures 50 and 51 show the treatment capacity of WTP paralelly with WWTP[30]. The capacity for treating potable water is much bigger than the capacity for treating wastewater, which suggests an extensive amount of untreated water thrown to the sea as the last dumping point (Mahgoub et al., 2010: p.1102); (Dr. Mohamed El-Raey, Department of Environmental Studies, Alexandria University, personal communication, 21 February 2018).

Plant	Capacity (m^3/d)
El-Nozha treatment plant	120,000
El-Seiouf treatment plant	750,000
Bab Sharky treatment plant	400,000
El-Manshia treatment plant	600,000
El-Ma'amoura treatment plant	150,000
Mariout treatment plant	320,000
Forn El-Garya treatment plant	60,000

Figure 50: Water treatment plants. The water is treated in seven plants with a total capacity around 2.3 million cubic meters per day.
Source: Mahgoub et al., 2010: p. 1101

Plant	Type	Actual capacity (m^3/d)	Design capacity (m^3/d)
West WWTP	Primary treatment	450,000	607,000
East WWTP	Primary treatment	350,000	462,000
Eskan Mubark WWTP	Secondary treatment	15,000	15,000
Hanoville WWTP	Secondary treatment	20,000	20,000

Figure 51: Wastewater treatment plants. The water is treated in four plants with a total capacity around 835,000 cubic meters per day.
Source: Mahgoub et al., 2010: p. 1102

Authors such as Mahgoub et al. (2010: p.1103) and Soheil (2004: p.809-811) emphasize the importance of coastal wastewater due to the accumulation of several pollutants at the shore of Alexandria. Presumably the high demand for potable water in summer generates more wastewater, which means more untreated material thrown to the Mediterranean Sea. Kennedy et al. (2007: p.55) understand these elements as nutrients, as they can also be integrated in urban new cycles, mention that when they are not re-cycled their accumulation often leads to negative effects, such as the coastal pollution described.

The figure 50 illustrates the urban water system of Alexandria, which is the scale selected for this research. However, for a more realistic understanding of the environmental implications, the "non-urban" components have to be add to the cycle, especially those related to waste treatment, see figure 51.

30 This comparison is done with figures from 2010. Papers with more recent figures were not found and companies in charge of these services were reluctant to provide that detailed information.

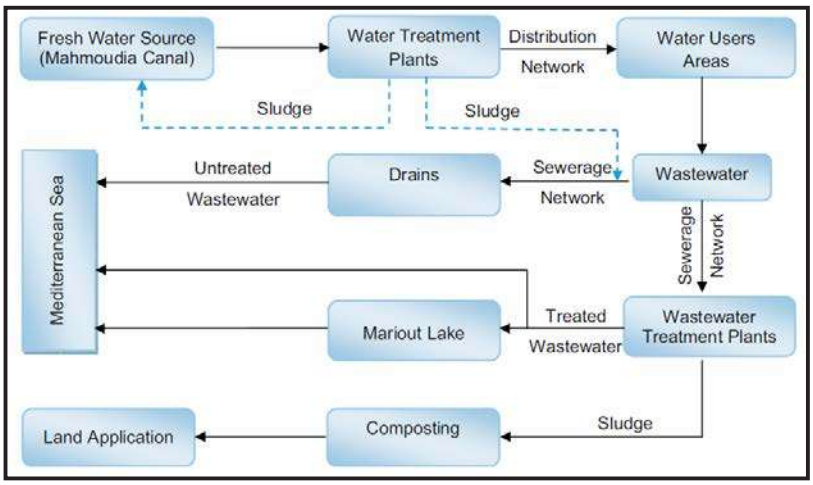


Figure 52: Schematic of Alexandria's urban water system.
Source: Mahgoub et al., 2010: p. 1101

Both, the Mariout Lake and the Mediterranean Sea are the main ecosystems affected by the rise of population and the lack of treatment capacity from water companies in Alexandria.

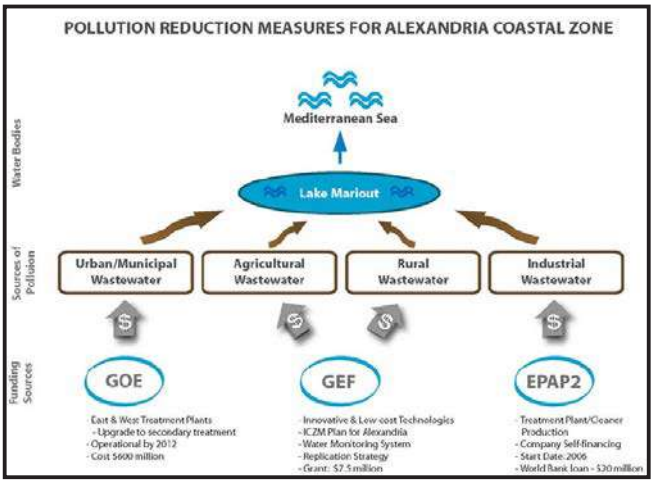


Figure 53: Sources of Pollution of Lake Mariout
Source: http://documents.banquemondiale.org/curated/fr/585041468024580829/pdf/536610PAD0P095101Official0Use0Only1.pdf

5.5.4.1.2 Conclusion

The UM process is not just a linear circulation of taking materials from A to B. The transformation of these materials in every context, as well as the sources ans sink of the urban dynamic might also impact the availability and quality of the resource. The urban water cycle in Alexandria is affected by the seasonal raise of population, yet the quality of the water source and the energy demanded in the process also influence the shortages. The quality and capacity for the wastewater treatment represents pollution to hinterlands.

5.5.4.2 Electricity[31]

The influence of the growth of population in the higher power consumption as well as the electricity shortages in summer (Figueras, 2016: para.1) was recognized by several interviewees and respondents.

"In summer electricity always goes off" Comment from questionnaires.

Several causes of this issue were detected, on the one hand related to different patterns of consumption from people, and on the other hand related to infrastructure characteristics.

Figure 54: Power shortage report
Source: Fick, 2014

Figure 55: Power shortage report
Source: Al-Youm, 2015

31 For the analysis of Electricity and Solid Waste(below) the companies in charge did not provide any official information for this research. The information used for the study of these elements belongs to reports, scientific papers, data from these companies found on internet, as well as the testimony and perceptions from interviewees and respondents.

5.5.4.2.1 Consumption Patterns of Summer

A monthly breakdown of electricity consumption in Alexandria is illustrated in the figure 56, where a dramatic increase on power utilization in summer, between June and September, is observed. The chart does not represent a citywide monitoring of power utilization due to methodological obstacles faced in the research process[32]. The graphic represents the expenditure of energy of one residential building in Alexandria, based on Elharidi et al.(2013: p.8), tracked throughout one year. How similar do the electricity annual charts could look for places like Cairo, Aswan or Sharm El-Sheikh, which are also places that tourists tend to visit? Even though summer might be dealt in corresponding ways to Alexandria (explained below), by means of mechanical ventilation which modifies the electricity consumption, no places with seasonal population growth patterns comparable to Alexandria were found in Egypt, meaning that the summer statistics of other cities might also increase but perhaps in a different way in comparison to the figure 56.

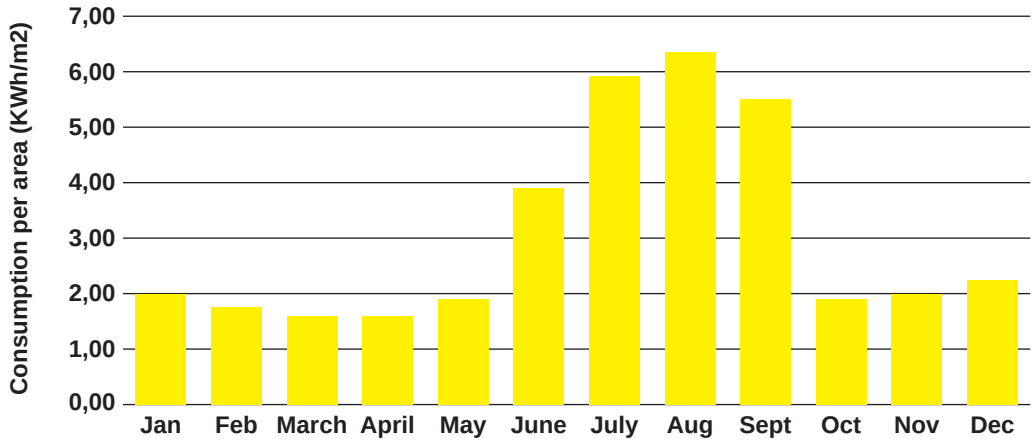


Figure 56: Electricity Consumption in Alexandria. Data based on the analysis of one residential building in Alexandria.
Source: Author, based on Elharidi et al., 2013: p. 8

Perhaps the data from one building might not seem representative enough, however due to the fact that national wide the residential sector consumes half of energy generated (as shown in the figure 57), the previous chart is considered relevant for the purpose of illustrating the seasonal changes in a city scale.

Two different sorts of power consumption were detected. Allocating figures on the electricity consumed by the summer visitors in comparison to residents was not possible due to the lack of available data. Yet for the explanation it is necessary to recognize the two places of origins of newcomers (explained above), coming

32 Explained in the chapter of Research Methods.

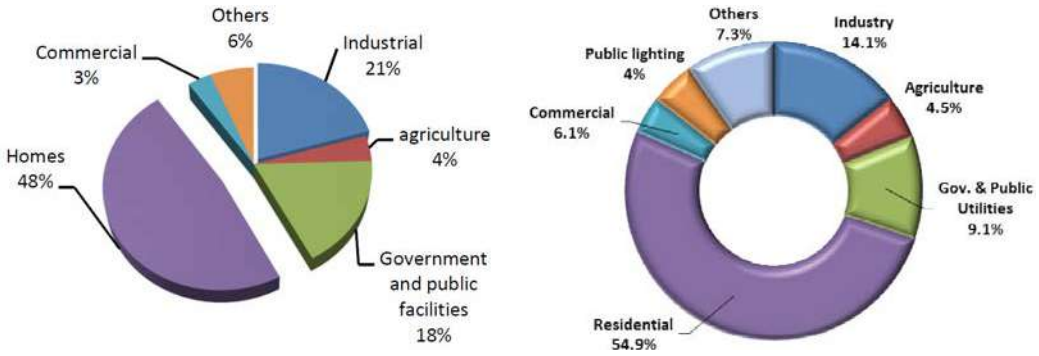


Figure 57: Percentage of Electric Power Consumption in Different sectors in Egypt. 2009/2010 (left chart), 2015/2016 (left chart).
Source left chart: Elhari et al., 2013: p: 2
Source right chart: Egyptian Electricity Holding Company. Annual Report 2015/2016: p. 47

either from rural or from urban areas. The electricity consumption is unlikely to be related to rural newcomers, who as mentioned, cannot afford to pay for accommodation in the city. This would be more related to urban newcomers plus Alexandrians. The explanation of the consumption might give specific insights on the topic:

Direct Consumption: It is related to people, residents or newcomers, who require electricity during summer. The most common way they spend electricity is by means of AC, which they keep running day and night due to the weather (Fick, 2014: para.8). The mechanical ventilation plus the influence of pumping machines in every building for people to access the water service in the upper floors were pointed by Hassan Esmail (resident of Alexandria, personal communication, 08 May 2018), as the most common activities in which electricity is involved.

Indirect Consumption: Those are related to services that require power for working. This is specifically related to the potable water and wastewater network in the city. The energy consumption seems to be the main environmental impact of the transportation of the liquid in the whole city, specially the pumping of potable water (Mahgoub et al., 2010: p.1103-1104). This reveals the high dependence on electricity to access the water services, either in a city scale, by means of the pumping machines in every WTP, or in a single building scale, through the pushing engines that every building must have in order to pump the liquid to the upper floors.

5.5.4.2.2 Alexandria Electricity Cycle

Alexandria Governorate belongs to the West Delta Electricity Company in Egypt, as well as the Governorates of Matrouh and El Behera. Alexandria city does not have power plants in the inner city, they are located in the outskirts or in rural areas. In order to recreate the cycle, it is necessary to look beyond the city boundaries, is this cycle related to the shortages of electricity that the city is facing? The figure 58 shows a broad panorama of the electricity companies in Egypt as well as their sources of energy.

Company / list	Cairo	East Delta	Middle Delta	West Delta	Upper Egypt	Hydro	Fast Track Plan	Private Sector	Renewables	Total
Gas	1665	2364	0	180	0	0	3636	0	0	7845
Steam	3320	3506	420	3650	1854	0	0	2048	0	14798
Combined Cycle	3915	1200	5004	908	1500	0	0	0	0	12527
Hydro	0	0	0	0	0	2800	0	0	0	2800
Renewables	0	0	0	0	0	0	0	0	887	887
Total	**8900**	**7070**	**5424**	**4738**	**3354**	**2800**	3636	**2048**	**887**	**38857**

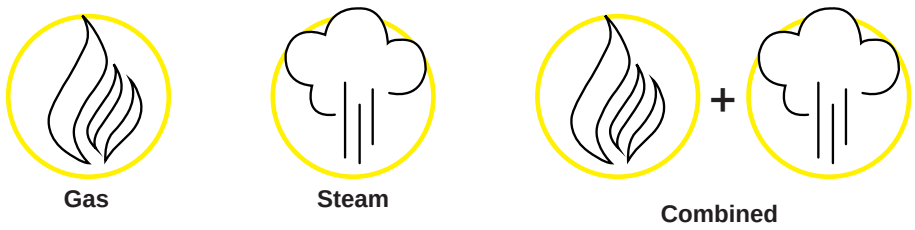


Figure 58: Power Sources of Egypt
Source: Author, based on Egyptian Electricity Holding Company. Annual Report 2015/2016: p. 20

Based on the previous figure the main source of energy where Alexandria is located is steam, yet in a national level the main source is Gas[33] which accounts around 75% of the total fuel consumed in by the power plants (Figueras, 2016: para.6). The situation to consider is that the Egyptian domestic gas production is lower than its consumption (Farouk, 2016: p.9), leading to gas shortages for electricity supply in summer and even in winter (Fick, 2014: para.8). For this reason Egypt started to import gas from several countries in the East Mediterranean (Ismail, 2017: para.12), such as Iraq through the Jordanian territory (Al-Youm, 2018: para.8), Cyprus (Iqtsad.net, 2018) and Israel (Cohen & Rabinovitch, 2018), as illustrated in the figure 59. Summer is pointed as the time when gas sources are demanded the most in the whole year (Egypttoday.com, 2017: para.1).

One of the outcomes of electricity generation national wide is the Carbon Dioxide

33 Gas is included in the combined cycle.

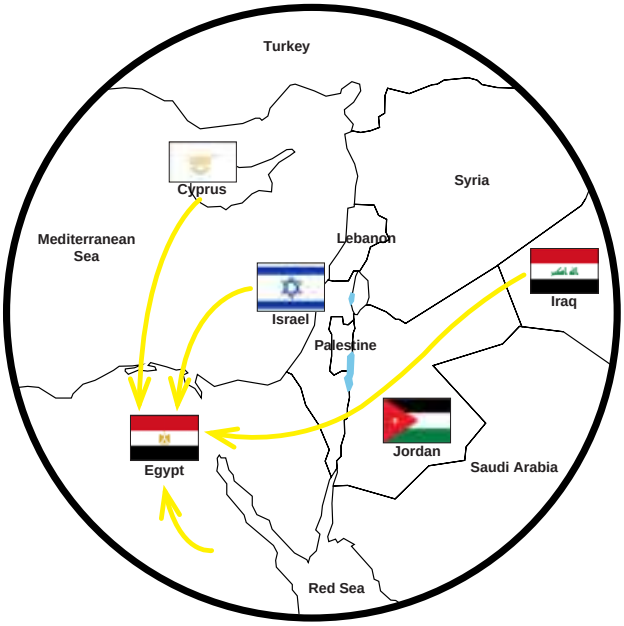


Figure 59: Sources of Gas for Egypt.
Source: Author, based on Al-Youm, 2018: para.8; Iqtsad.net, 2018; Cohen & Rabinovitch, 2018.

(CO2) emissions. The figure 60 reveals how the main source of contamination in Egypt is the generation of electricity, due to the high petroleum and gas required. This information is not available city by city, perhaps the reason is the location of power plants, which in the case of Alexandria are located outside the urban area. This exemplifies how the GHG generation from cities is not always happening within them[34]. The electricity infrastructure so far seems unable to keep increasing with the rapid growing demand for electricity in the country (Fick, 2014), especially for temporal fluctuations such as summer.

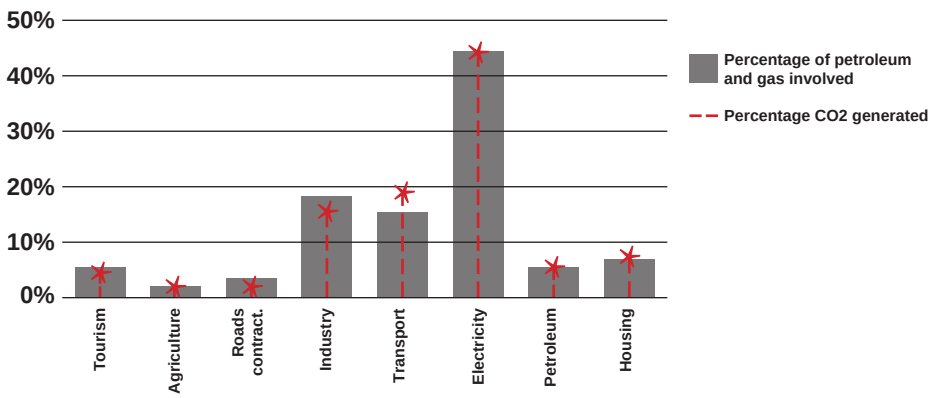


Figure 60: Percentage of Petroleum and Natural Gas Consumption and Subsequent CO2 Emissions in Egypt, Sectorial Distribution.
Source: Author, based on 2017 Egypt Statistical Yearbook, Environment Section. Figures of 2015/2016. p. 15 - 16. CAPMAS

34 Satterthwaite (2008) offers a comprehensive analysis about this idea.

Besides the fuel sources for power, additional elements that might intervene in the generation of electricity are pointed in the figure 61. The lack of upgrading of several power plants are explained to be a reason for not having benefits of their total capacity.

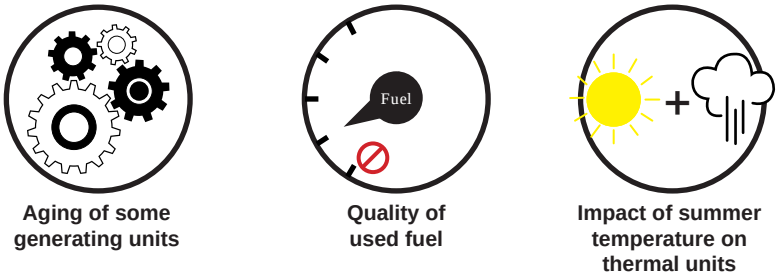


Figure 61: Current conditions of electricity infrastructure that might impact the generation of power.
Source: Author, based on Egyptian Electricity Holding Company. Annual Report 2015/2016: p. 20

> *"The weather changes, the humidity gets super high and the shortage of electricity occurs" Comment from questionnaires.*

Similarly to the case of Ulan Bator, where the changes of the air quality in the city are caused by the rural migrants looking for climatic comfort in winter, in Alexandria both residents and visitors look for climatic comfort also during the summer, which is why there are more pressure put on the electricity infrastructure[35] by means of mechanical ventilation used in flats. For this reason understanding the seasonal migration related to housing fluctuations in both, Ulan Bator and Alexandria, is crucial for a comprehensive analysis of their seasonal outcomes. Timmeren (2014: p.8) discusses the repercussions of the infrastructure of the city linked to the ecological footprint of inhabitants, pointing the infrastructure providers as responsible of the quality of such footprint instead of consumers.

Are the power shortfalls caused by the seasonal demand generated by the increase of population or are they caused by the sources of electricity and the condition of the infrastructure involved in the process? Perhaps for having an accurate panorama more detailed information is needed. However, as explained above, both the social changes and the infrastructure quality are involved in the electricity shortages in summer, mentioned and pointed by the respondents.

35 Which is at the same time demanded for the provision of water in the city.

5.5.4.2.3 Conclusion

The cycle related to electricity in Alexandria have national wide similarities in terms of power sources, as the country cannot rely on the national production of gas, so it has to be imported. Perhaps the exponential increase of visitors is one of the driving forces of the electricity outcomes in summer, however the role of the provider is also important to consider. Some ideas about availability of resources and global economy were mentioned in the literature review, where the importance of localization was stressed, e.g. utilities sources from local founts.

Furthermore, considering the electricity necessary for the urban water pumping, makes cooperation between providers crucial if summer situations are to be improved or at least analysed. With this issue two scenarios are possible, either new power sources are found or new ways to provide water in a different way are proposed, so that the pressure in the infrastructure decreases without generating water scarcity for residents.

Even though this discussion has been theoretical and explorative due to the lack of official data, the comments from respondents are clear, associating summer with blackouts. Their perception about summer visitors is contradictory: on the one hand only rural visitors are mentioned in the questionnaires parallel with electricity outcomes, but for them affording accommodation in the city is not possible, therefore they do not use power. On the other hand, shortages of electricity are mentioned to be from flats and housing spaces, which based on the profile of the rural visitors, are not related to them.

5.5.4.3 Solid Waste

Among all the activities where solid waste is produced, apparently food is the main way of summer newcomers to generate rubbish in Alexandria. Several commercial activities are also seasonal, as they depend on those who spend the sunny days in the city to be profitable. Lack of products during summer in places like super markets or pharmacies was pointed by Hassan Esmail (resident of Alexandria, personal communication, 08 May 2018), which shows the difference of consumptions patterns in the city.

> *"Prices at some places are raised, so they take advantage of the newcomers" Comment from questionnaires.*

This activation on the economy during summer was also recognized by Mr. Ginedy (Inhabitant of Alexandria – Real estate investor, personal communication, 01 March 2018), but he states that even though more garbage is produced, the city remains as clean as the rest of the year. Mr. Esmail, on the other side, points the fact of raising the prices in local businesses as the reason that leads the rural newcomers to cook at the beach with their families, which consequently generate more garbage in the streets, as they do not clean after cooking.

> *"Normally the city barely survives being clean, in summer when there are a lot of visitors the things collapse" Interview with Mr. Esmail.*

Figure 62: Left image from the month of March, right image from the month of July. Changes on solid waste generation.
Source left image: Author
Source left image: https://pbs.twimg.com/media/CmWqjlnWEAAgWXv.jpg:large

Daily amount of solid waste in Alexandria Governorate 2006 - 2016 (ton/day)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Population*	3'919.290	4'164.750	4'238.100	4'316.741	4'397.946	4'463.887	4'564.979	4'658.381	4'760.374	4'853.103	4'901.910
Solid Waste Production**	2500	2500	–	–	–	4000	4000	4000	4200	4000	–
Summer's Waste Production***	3050	3050	–	–	–	4880	4880	4880	5124	4880	–

Table 4: Monitoring of solid waste production in Alexandria from 2006 to 2016 compared with population increase. Figures related to summer were calculated about 22% of seasonal increase as an average from summer's figures reported.
Source: * CAPMAS, 2016
** Egypt State of Environment Report 2006 - 2016
***Average of 22% of seasonal increase of solid waste. Average established from Integral Consult (2005: p.11); Veolia (2006: p.3) and El-Salam & Abu Zuid (2015: p.580).

An example of the seasonal change of garbage generation can be observed in the figure 62, where exponential generation and massive accumulation in the streets is seen when compared the same place in another season. It is hard to establish if the main issue is the generation of solid waste itself or the lack of collection. In the photos several plastic bags are seen, which presumably come from flats or private places, this suggests that the increasing of solid waste is not generated just in the streets, but also in private areas, where the residents and urban newcomers live temporally.

Information about rubbish generation in national reports of Egypt is presented as single figures and does not recognize the fluctuations of summer in such numbers, illustrated in the Table 4, parallel to the increase of population between 2006 and 2016. These numbers come from different sources of information which might be the reason for their lack of correspondence; on the one side, the population increased steadily every year, but on the other side from 2011 to 2015 the garbage production remained almost the same, which does not make sense with the amount of inhabitants permanently growing.

More accurate data about fluctuations of solid waste generation is reported by Integral Consult (2005: p.11), Veolia (2006: p.3) and El-Salam & Abu Zuid (2015: p.580), where the increase between summer and the rest of the year is around 22%[36]. This percentage was applied in the third line of the table 4 as an attempt to infer the summer figures based on the existing information. Such table was created until 2016 as that is the last issue of the Egypt State

36 The increase reported ranges from 17% (Integral Consult, 2005: p.11), to 24% (Veolia, 2006: p.3) and to 26%(El-Salam & Abu Zuid, 2015: p.580). 22% is established as an average of these three figures.

of Environment Report with numbers on trash. Additionally, Montasser & El-Nakeeb (2017: p.169) mention in their paper similar annual figures on rubbish than those here reported but state that the facilities in Alexandria are able to collect less than half of the rubbish produced[37], in contradiction with NILE et al.(2013: p.20) where more than half of the waste is collected, according to the report. Regardless of the proportion, there is a gap reflected in the solid waste reported and the one found in the street, illustrated in the pictures of the figure 62. In conclusion, fluctuations are not recognized in the public statistics, apparently the summer outcome for garbage is permanently increasing, and there is a permanent lack of proper infrastructure for dealing with the waste that become more visible in summer.

> *"They (summer newcomers) don't maintain the cleanliness of the streets or the beaches" Comment from questionnaires.*

Even though it is a fact the negative perception of inhabitants about the newcomers, there is also an evident lack of preparation from local authorities to deal with the outcomes. Absence of permanent trash cans in the city, especially along the Cornish which is one of the most crowded places during the whole year, was pointed in one of the interviews. The garbage bins situation is also mentioned by Montasser & El-Nakeeb (2017: p.169) as one of the barriers faced by the city in terms of solid waste, as well as collection routes, costs (Moustafa et al., 2013: p.939), a lack cooperation of citizens towards dustbins in the street and lack of organization between recyclers and Nahdet Misr, the current garbage company in the city. Perhaps these issues are a consequence of the lack of the municipal solid waste management law pointed by Moustafa et al. (2013: p.936), not just in Alexandria but in a national scale.

Figure 63: Solid waste production per Capita, on the left side it is based on the data from table 4, on the right side it is based on the increase of 22% of rubbish and 2 million more people in the city.
Source: Author
***Most recent figures on rubbish on the left side (Montasser & El-Nakeeb, 2017: p.169), plus additional 22% of summer increase on the right side. Percentage of used previously in the Table 2.
****Inhabitants of Alexandria based on Table 2 on the left, plus additional two million visitors in sumer on the right.

By means of mathematical exercises in figure 63 the increase and accuracy of

37 The city produces daily between 4500 – 5000 tons, but the facilities are able to compile between 2000-2500 tons of it (Montasser & El-Nakeeb, 2017: p.169).

existing figures can be assessed. When based on average statistics (on the left), the result is similar to the one reported by El Gazzar & Gomaa (2014: p.1206), which ranges around one Kilogram per capita per day. When summer increase figures are applied (on the right), the waste production decreases. This suggests that the rise of figures might be much higher either in population or in waste, to correspond to what the photos, reports, interviews and respondents expressed while this research was developed in terms of exponential increase of garbage.

5.5.4.3.1 Alexandria Solid Waste Cycle

The source of solid waste in the city is apparently produced by the massive consume of goods by the summer visitors. Previously the inability of the collection system for dealing with all of the waste was mentioned. What happen then with the waste that is collected? The figure 64 presents the solid waste cycle of the city based on El-Salam & Abu Zuid (2015: p.580), after the daily collection the garbage it is taken to three transfer stations, where the biodegradable material is separated and transported to compost plants, while the rest is discharge in El Hammam Landfill, located 80Km away from the city.

This figure can be seen as the reported solid waste cycle, as it belongs to the process organized by the company. On the other side Elgazzar et al. (2017: p.3); Montasser & El-Nakeeb (2017: p.169) and El Gazzar & Gomaa (2014: p.1206), describe the unreported or unofficial part of the cycle, which involves the intervention of the so-called Zabbaleen[38] in the collection process, by separating what they consider valuable waste for selling it. This is the situation for the collected rubbish, yet their influence in the uncollected material is not reported. Additionally, the process described does not look completely accurate when Yahia (2016: para.4) by describing the pollution in the Mahmoudia Canal[39], points refuse trucks using the canal as a dumping trash spot. The garbage chain is then a linear process with several interferences[40].

The way how the city have dealt with the solid waste in summer is not different from the way they do it the rest of the year, and that is problematic when both population and therefore solid waste generation have a seasonal significant rise. The rubbish cycle has a background. Two different landfills are mentioned by

38 Individual solid waste compiling people.
39 See figure 48.
40 Based on the assumption that the solid waste company is in charge of generate the numbers used in the Table 4, it is not clear if they consider these interferences in the statistics, which might affect their accuracy. Still these figures are used as they are the only existing information in the Egypt State of Environment Reports.

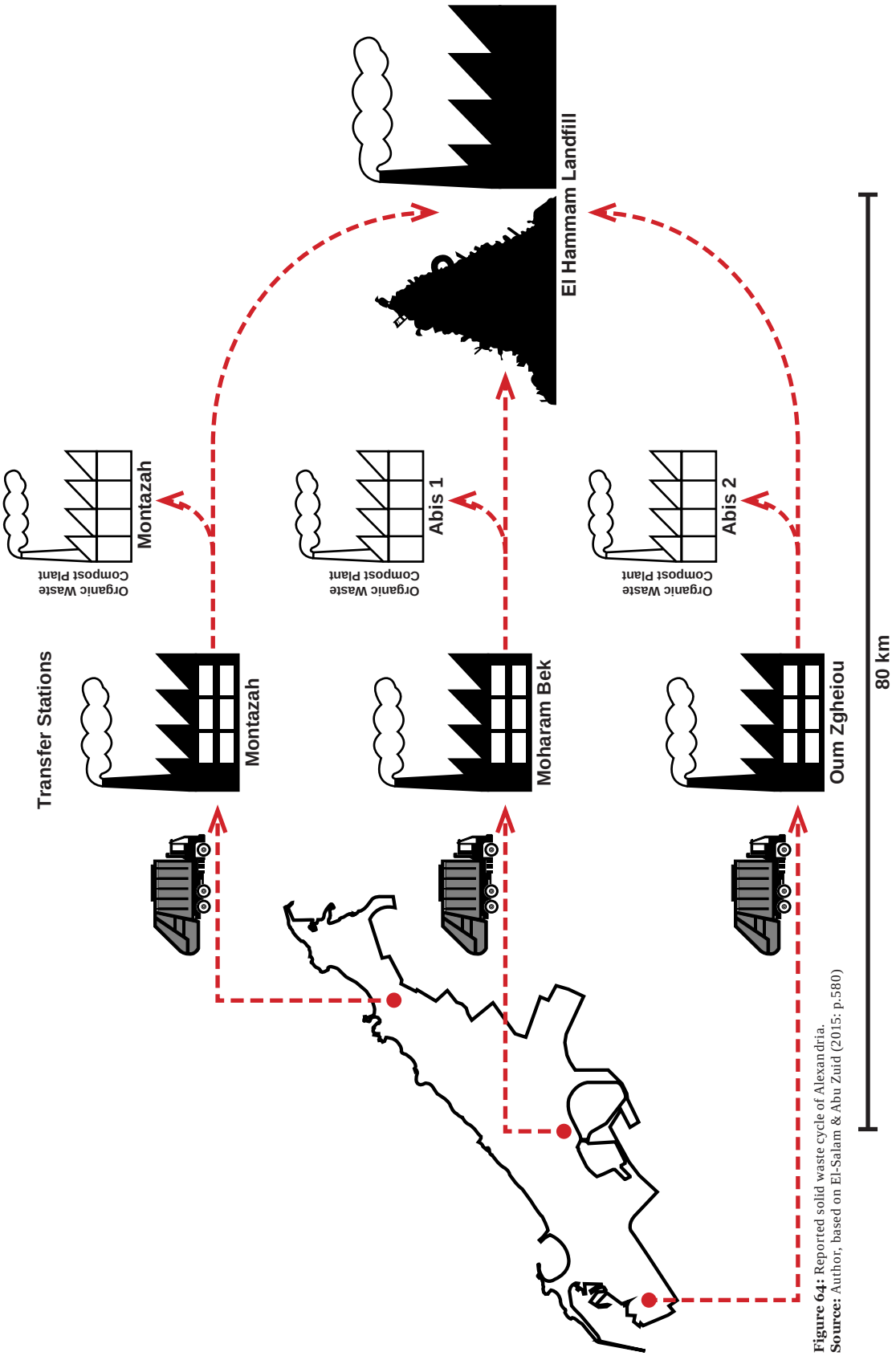


Figure 64: Reported solid waste cycle of Alexandria.
Source: Author, based on El-Salam & Abu Zuid (2015: p.580)

El-Salam & Abu Zuid (2015: p.580) and Integral Consult (2005: p.10): one of them called El-Hammam, used exclusively for summer, and another one called Borg El-Arab, used for the rest of months, the reasons found for this separation is contractual between the Governorate of Alexandria and the solid waste companies involved. Both of them are pointed in the figure 65, where the proximity to each other and to the Mediterranean Sea is seen. They are located in the west part of Alexandria, the same side of the North Coast, where the gated communities and resorts of high class people are also located. The location of Borg El-Arab influenced on its closure, as it was affecting the residents and Bedouins inhabiting in the surroundings (Rashed, 2004: para.3). Now the only landfill for Alexandria city the whole year is El-Hammam[41], pointed in the figure 64.

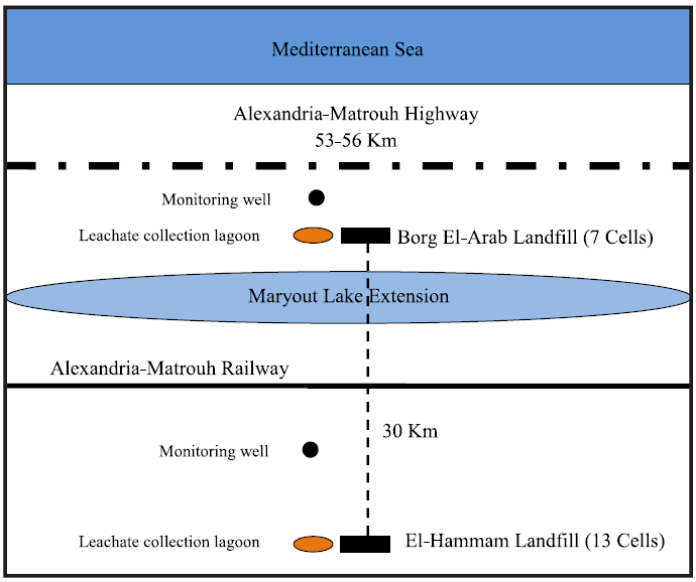


Figure 65: Allocation of two landfills that the city used to have in the past. Now just El Hammam remains as the only disposal place for the city.
Source: El-Salam & Abu Zuid, 2015: p.580

Differences of collection dynamics between winter and summer are described by El Gazzar & Gomaa (2014: p.1206) by means of a study done in Al Mamurah[42], which is considered a main attraction in summer for both high and low class people, according to Hassan Esmail (resident of Alexandria, personal communication, 08 May 2018). Their paper describes how in summer the garbage production in this area doubles in comparison to winter, which doubles consequently the necessity of collection as well. Specific times managed by the refuse trucks in both seasons are illustrated in the figure 66, however the veracity of such schedule is not reliable

41 Mentioned in the website of Nahdet Misr, current garbage company of Alexandria. For more information http://nahdetmisr.com.eg/en/Services_Details.php?id=%204 (Seen on 05.06.18)
42 One of the areas pointed in the figure 32.

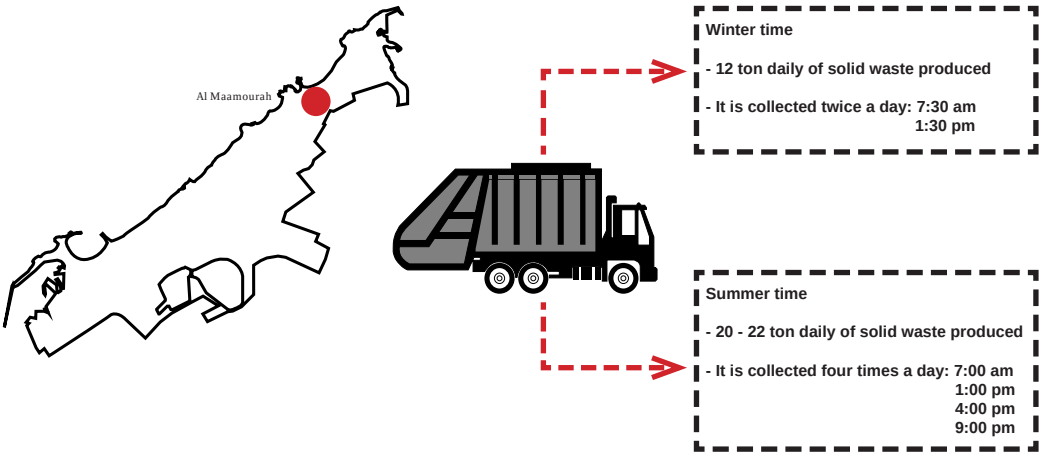


Figure 66: Difference of schedule for trash collection in Al Mahmoura. Such data is debatable when summer traffic jams are considered.
Source: Author, based on El-Gazzar & Gomma, 2014: p.1206

when massive traffics jams as a consequence of the temporal overpopulation are considered (Rady, 2002: p.44); (Brizzi, 2005: p.3,9&15).

The necessity of a permanent rubbish compilation produces additional outcomes in the city related to a different sort of waste. A study carried by Sandhu et al. (2015) about refuse lorries reveals all of the different emissions that such vehicles produce, from which half of them occur in the city due to their low speed. Issues on routing of waste collection transport are pointed by Moustafa et al. (2013) which means on the one hands concerns not just on generation and collection of solid waste but also in its transportation, and on the other hand no special routing plans for the traffic jams mentioned to take part in summer, which can make difficult the waste compilation and disposal process. More rubbish means more collection needed, but no summer plans were found.

Figure 67: Allocation of landfill with respect to the city.
Source: Google Maps

5.5.6.3 Conclusion

The analysis of the solid waste cycle in Alexandria is not just related to quantitative fluctuations; qualitative components such as the influence of Zabbaleens, unofficial waste dumping areas, and the effectiveness of collection and transportation have an important role in this process. Perhaps thinking that the solution is to reduce the waste production is unrealistic if necessary infrastructural components such as trash cans or an appropriate routing system for was collection are not implemented.

This provide insights on the mentioned linearity of the UM process, which goes beyond materials going from A to B as mentioned above, the context have a transformative role in the metabolic process and in the outcomes. A contextual component in this case might be the influence of Zabbaleen, which are reported as negative components of the solid waste process, while they can work together with the waste company in order to keep the city clean.

Chapter 6
Recommendations and Scenarios

"In the Egyptian old movies, when someone was stressed, it was normal to see the doctor recommending to go to Alexandria for a couple of days. The sea and the atmosphere were always good reasons"

Comment from interview with Dr. Heba Aboul-Fadl

In this comment from Dr. Aboul-Fadl the presence of Alexandria as a summer destination in the collective memory of Egyptians can be perceived. As said above, the reason for the seasonal issue in the city is not the summer season itself, such is more related to the conditions and capacity of the urban to deal with the temporal overpopulation. Summer as a social event is part of the Alexandrian culture. The city requires specific shifts in its urban, ecological and planning systems, so that the impact of the season can be reduced.

The summer season in Alexandria was explored in the previous chapter by analysing to what extend the seasonal change in the UM affect the sustainability of the city and by recognising the perceptions, reactions and acknowledgement from inhabitants and local authorities, which was the query raised in the research question related to the case study, in the chapter 2. Before that, in the chapter 4, by means of the study of reference cases on seasonal urban issues, several insights were detected and explained[43]. Those insights are concepts, knowledge and ways to cope with the temporal changes in each one of the contexts selected

43 See Tables 2 and 3.

for analysis. The insights detected in Alexandria are described in the table 5. They were detected by elaborating the research of the Alexandrian summer, similarities with the insights from Medellin and Ulan Bator were observed, as illustrated in figure 68. They and the potentials found in the urban configuration of Alexandria, guided the specific recommendations and scenarios proposed in this chapter.

From Insights to Actions

The observations from table 5 are summarized in the figure 68, linked simultaneously to the reference cases. The case study has more connections with the example of Ulan Bator as both are related to seasonal migrations, housing and overload of waste. The situation in Medellin has different driving forces, but still some hints to Alexandria were extracted.

Recommendations must deal with the complexity of urban places, as well as with the complexity of the seasonal issues described in this thesis. For this reason the insights from Alexandria were allocated in the four urban subsystems illustrated by Merrow et al. (2015: p.45), where governance, metabolic flows, built environment and socio-economic dynamics aim to conceptualize urban systems. Links and networks within each subsystem and in the whole system itself are recognized by the authors. So instead of developing recommendations for each subsystem, they were connected following their approaches; governance and community dynamics on the one hand, and built environment and metabolic flows on the other hand, were associated due to their mutual effects and influence[44]. Creation of more comprehensive recommendations is also another reason for these connections. Links between all the levels must be taken into consideration.

Top-down or Bottom-up Recommendations?

A similar dilemma is enquired by Tjallingii(2012: p.108), where benefits and disadvantages of both perspectives are explained. A mix of both is suggested by the paper, yet the context might have an influence on which one could have more advantages to focused on. Social and economic assets from the bottom-up approach are described by the author, but in the case of Alexandria the reaction of people to the summer season will make difficult the implementation of such approach. Reactions are refereed to leave the city during the sunny days, or get rid of the newcomers, or bad behaviour in the city, strongly pointed by interviewees

44 See figure 68 on the right side.

Insights of Case Study: Alexandria	
Cooperation of Institutions?	- No cooperation between utilities providers and public institutions. - Water provision depends on electricity availability. - MoT is just involved on a specific profile of visitors. No interest in dealing with the rest was shown.
Seasonal Migration and Housing Dynamics	- It can be describe in terms of a circular migration from rural or urban areas to Alexandria. (see fig. 67) - Migration leads to housing fluctuations, overload of services is a consequence. - There is a housing market in Alexandria just for summer, which mean the rest of the year flats are uninhabited.
Infrastructure below Requested	- Climatic comfort necessities in summer lead people to use mechanical ventilation in household, which overload infrastructure. - Electricity is necessary for water provision. - Capacity for solid waste collection in summer was found below increase on waste production from seasonal newcomers.
Scale and Allocations of Change	- The whole city is reported as changed in summer- - The main are for summer was pointed by respondents, names of places were given also. - Allocation allows to give a scale to the season as well as a starting point for implementing solutions and plans.
Changes in Consumption Patterns	- It is related to undeveloped infrastructure, scale of migration in summer and the consequent cultural patterns of consumption during the season. - Cultural understanding of resources and consumption must be considered.
Cultural Background	- Summer visitors in Alexandria in the past and at the moment belong to two different social backgrounds. - Visiting Alexandria in summer is part of the Egyptian culture. - Situation is chaotic for Alexandrians despite the tradition. - If Economic benefits are considered for the summer season, still the lack of data from authorities does not allow to see the advantages.
Urban Banning	- Hints for banning were found on social media, by means of groups on the website Facebook. - Participants in those groups as well as respondents understand summer visitors just as rural people, but there two groups of newcomers, as seen in fig. 67. - Are those rural visitors more visible due to their outcomes?
Seasonality	- The issue to tackle is not summer or Alexandria as a summer destination. - Such is seasonal changes on UM and availability and consumption of resources. - Planning for the season is required.

Table 5: Insights from the case study of Alexandria.
Source: Author

and respondents from rural newcomers. A bottom-up approach is then difficult to implement and track.

Due to the previous reasons a top-down approach is proposed for Alexandria. Lack of institutional cooperation was found throughout the research, which would suggest also difficulties for this sort of recommendations, yet incentives and some institutions working already with urban development in the city (explained below) might support the creation and implementation of future plans for the city.

6.1 Recommendations for Policy and Community Dynamics

These recommendations are approached from a policy perspective with specific regard on regulating the social dynamics related to the summer season, from both visitors and residents. Planning, migration, consumption patterns and culture are topics here grouped in policy packages or mix of policy interventions (Hickman et al, 2011: p.1555), which means that the recommendations work by themselves but simultaneously applied would have a more significant impact.

6.1.1 Summer State of Art.

Official information about the Alexandrian summer season was not found, as so far there are not documents reporting it. Satterthwaite (1997: p.1670) highlights the risk of decision making based on the existing information or on the data easy to measure, e.g. there might be crucial issues to be solved but they have not been studied due either to the lack of figures or to the difficulty to detect them.This was seen by means of the tourism plans of Alexandria mentioned by FooP(2014: p.29), Eldaidamony(2011: p.30,53,70), Rady(2002: p.19-24) and Brizzi(2005:p.18,22); where they are addressed to attend international visitors, therefore the data included is based on official sources, while the gap on dynamics from Egyptian visitants is not considered. A summer plan for Alexandria focused on local attendees is recommended, but before this task is developed the focused would be on elaborating a state of art of summer, so that the current impact and consequences can be acknowledged. Such is explained in table 6.

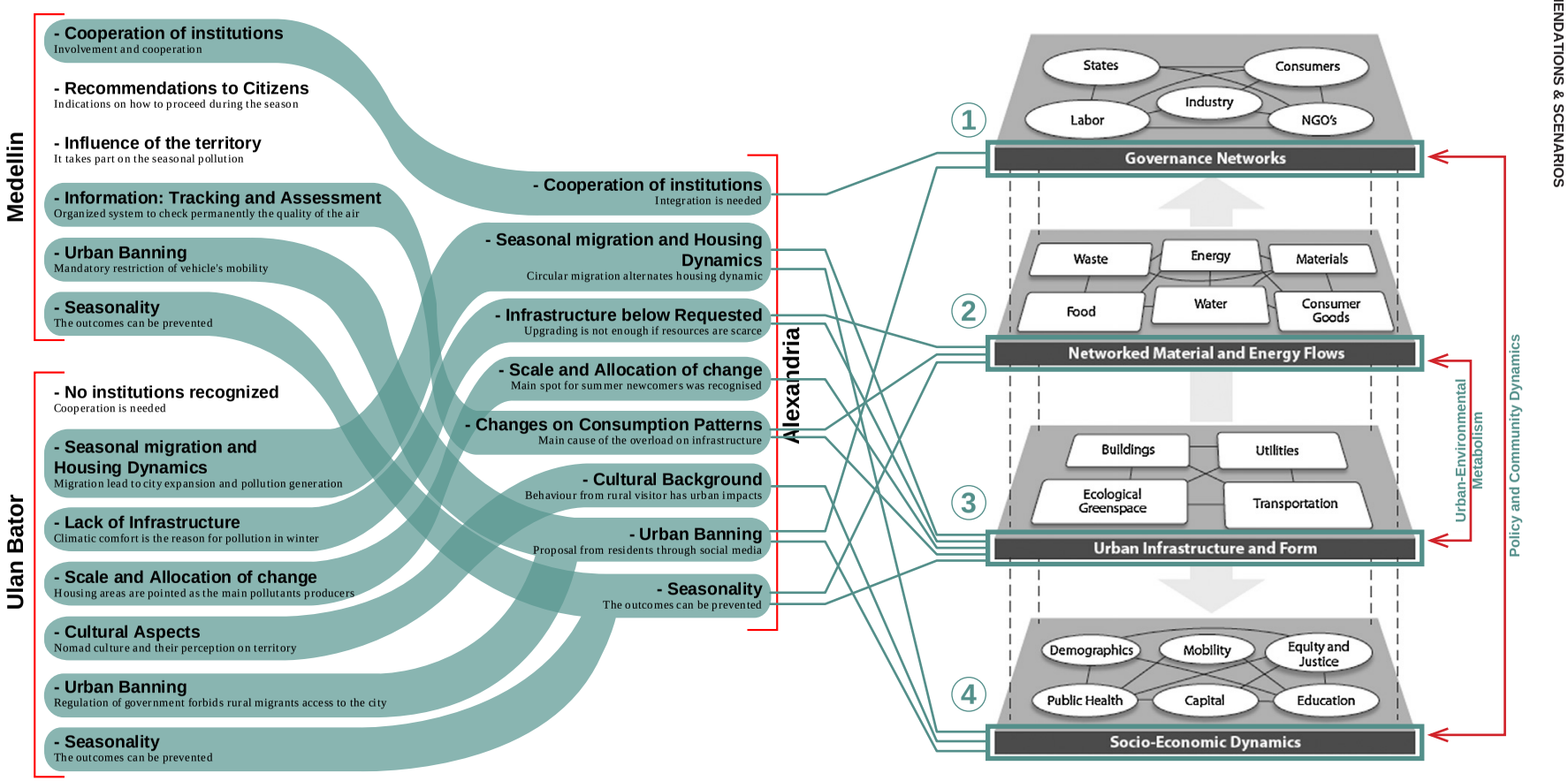


Figure 68: Synthesis of insights from the study of cases of seasonal cities on the left, similarities, contrasts and concepts were extracted and linked based on their outcomes. Insights from Alexandria were related to the conceptual scheme for urban system from Merrow et al. (2015: p.45) based on the approach of each level. Categories were associated and with it the approaches of recommendations were defined.
Source: Author

Summer State of Art

Aim

- To close the gaps of information about Alexandria in summer, as a support for decision making.
- To create a comprehensive document reporting the urban outcomes of the summer season and their scale of change

Description

- Developing plans for summer requires a report about the complexity of the situations.

- A document will be created stating the different outcomes that the city faces during the sunny days. Demographics, housing, infrastructure, transportation and social perceptions from residents need to be included.

- The interdependency of services should be highlighted, so that it becomes visible and relevant for suggesting cooperation.

- The economic benefits of summer for the city should be analysed as an incentive for organizing and plan the city for those days.

Cooperation Needed

- No common plans for the institutions in charge on utilities in the city were found, so they are currently making decisions in isolation.

- Specific institutions are working on urban development plans for Alexandria, see figure XXX. They are a first suggestion for cooperation as they might possess the most updated information of the city. They are:

- **General Organization for Physical Planning (GOPP):**
They were in charge of the Strategic Master Plan for Alexandria 2032. Beside having information they can also support on further plans after the creation of the state of art.

- **Center for Environment and Development for the Arab Region and Europe (CEDARE):**
They led the Strategic Plan Alexandria 2030 for Integrated Urban Water Management, so they know the water cycle of the city and are aware of the future environmental challenges.

- The issues in Alexandria go beyond water provision and built environment, yet those institutions could support a first stage of a summer state of art.

Scenarios

Business as Usual
The summer state of art of Alexandria is not created, seasonal changes on demography, society, infrastructure and environment are not addressed nor tackled in future urban plans.

Worst Case Scenario
Alexandrians start to implement measures by themselves as authorities do not do it. Perception of summer get worse and no plans for improvement are developed.

Best Case Scenario
The summer state of art is created as a first step for a tourism plan for Egyptian visitors. New findings suggest incentives for institutions to take part as well as economic benefits for the city.

Table 6: Recommendation of summer state of art.
Source: Author

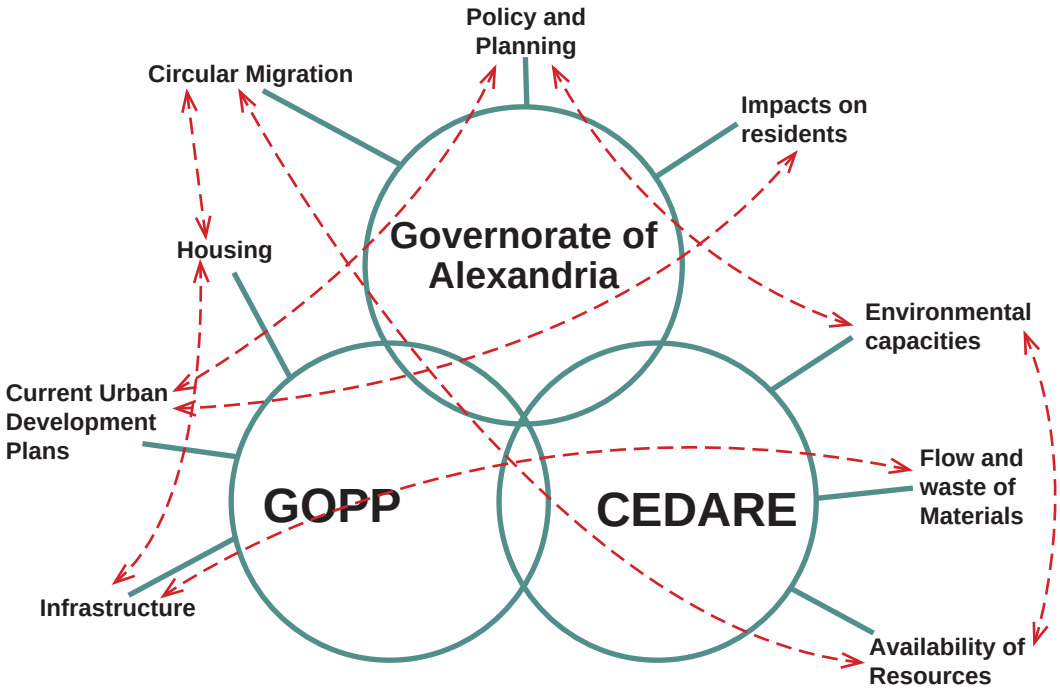


Figure 69: Initial institutional support proposed for the summer state from institutions currently involved in plans for urban development in Alexandria
Source: Author

This recommendation is proposed in terms of recognition of issues before the creation of comprehensive plans, following the idea of Satterthwaite (1997) towards the importance of information for decision making. The suggestion of a state of art is addressed to assess the changes and necessities of the city during the sunny days, some of them were detected and studied in this thesis. Obstacles in terms of access to information as well as in terms of institutional cooperation will have to be faced, which is why relying on organizations different from services providers was pointed. GOPP[45] and CEDARE[46] are highlighted in the table 6

Perhaps in operational levels the creation of such state of art is not necessary for the upcoming recommendations to be described, yet without such assessment the rest of proposals will work with unclear attention on the issues to be tackled.

45 The Strategic Master Plan for Alexandria 2032 was not included in this thesis as the last draft from GOPP was not officialy approved throughout the time of the research. There is still no information published about it, but an introduction to the plan can be seen on http://www.as-p.com/projects/project/masterplan-alexandria-184/show/ (Accessed 15.07.18).
46 Look at AbuZeid, K. et al., CEDARE, 2016.

6.1.2 Balancing the Seasonal Growth of Visitors.

A suggestion of banning visitors was found in the groups on the website Facebook[47], but is it possible to limit the entrance of people to the city? And if so, is it an effective measure for dealing with the outcomes experienced in summer?

The urban outcomes found in this research are produced by the massive temporal migration during the sunny days, therefore balancing the flow of people would mean that their impact in the city would be reduced. Similar conditions with tourism is being faced for instance in Rome and Venice, Italy; in Barcelona, Spain; and in Dubrovnik, Croatia (Bendeich, 2017). No-go-zones, taxes and traffic control are the reported solutions respectively. Measures on traffic look convenient when summer increase of vehicles in Alexandria is considered (see fig.70). For this reason balancing the amount of visitors by means of cars is proposed, explained in the table 7.

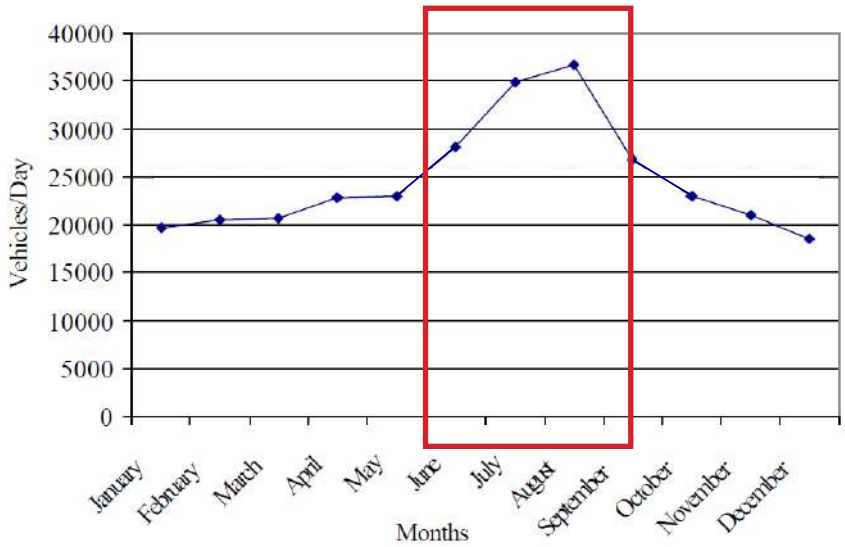
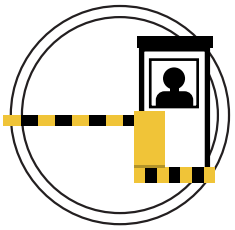


Figure 70: Monthly average daily traffic at the Cairo-Alexandria tolled road. Sharp increase in summer is highlighted.
Source: Abbas, 2003

Here the regulation is planned in terms of vehicles, with strong regard on private ones, which consequently might lead to regulate the increase of the summer population. If due to this measure people make their minds to share transportation or to use train, at least cars in the city would be reduced during the season, which is a starting point for introducing more changes.

47 See figures 28, 29 and 30.

Balancing the Seasonal Growth of Visitors



Aim

- To regulate the access of visitors to Alexandria in summer based on the capacity of the city and its infrastructure to attend the seasonal population.

Description

- Based on the Summer State of Art a maximum capacity of cars per day during summer in Alexandria will be established, based on the capacity of the city.

- This measure will be applied by the local authorities in the Cairo-Alexandria tolled road, as well as in all the vehicular entrances to the city. So every day in summer, when the limit of vehicles and visitors is reached, the highway tolls do not allow more of to access to the city.

- Abbas (2003) considers that seasonal increase of traffic (see fig. 70) should be reflected on seasonal adjustments of toll rates.

- In summer the toll fees will be increased, with this the city generate profits to invest on upgrading the infrastructure and deal with summer outcomes.

- Theoretically less visitors mean less impacts from summer. Pilot projects are required before implementing this measure for the whole summer.

- Public transport, trucks, and summer tenants are excluded from this measure. The aim is to tackle private transportation, whose influence is the biggest part of traffic composition in the Cairo-Alexandria tolled road (see figure 71).

Cooperation Needed

- Cooperation from mobility authorities will be required for controlling the access to the city in the tolls.
- Deciding the maximum capacity of vehicles allowed to enter to the city will need further analysis and scenarios, for this reason a summer state of art is recommended as a basis for such decision.
- Summer tenants can be identify my means of a document provided by the broker or landlord. They are allowed to enter to the city because they have a place to stay, which they pay for.
- Summer visitors might decide to take the train for avoiding tolls. Trains have already frequencies and capacities, which is already a limit for passengers.

Scenarios

Current Condition
It is the starting point of the analysis, see figure 73.

Business as Usual
It means the regulation is not successful or not implemented and the amount of visitors keeps increasing year by year with a top in August, as seen in figure 74.

Best Case Scenario
It refers to a balanced increase of visitors in the sunny days. A maximum capacity is defined with positive results in the first summer (fig. 75) and further improvements in the second one (Fig. 77)

Table 7: Recommendation of balancing the seasonal growth of visitors.
Source: Author

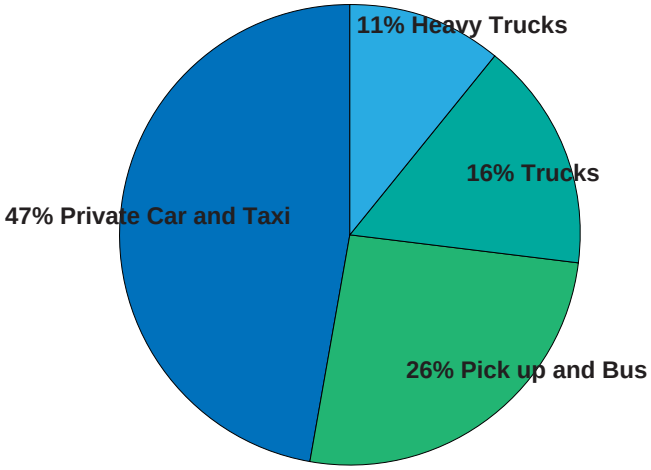


Figure 71: Traffic distribution in the Cairo-Alexandria tolled road.
Source: Redrawn by author for this thesis, taken from Abbas, 2003

This thesis is not suggesting figures for the recommended limit, on the contrary, a preliminary study either the state of art previously recommended or any other analysis should be done in order to make such decision. In this thesis the amount of visitors found ranged from less than a million to more than two millions, that gap plus all the housing dynamics found will make any figure from this research unreliable. The idea is to balance the access to Alexandria to a level that the city in terms of infrastructure can cope with, so the city and its resources must be assessed before the decision.

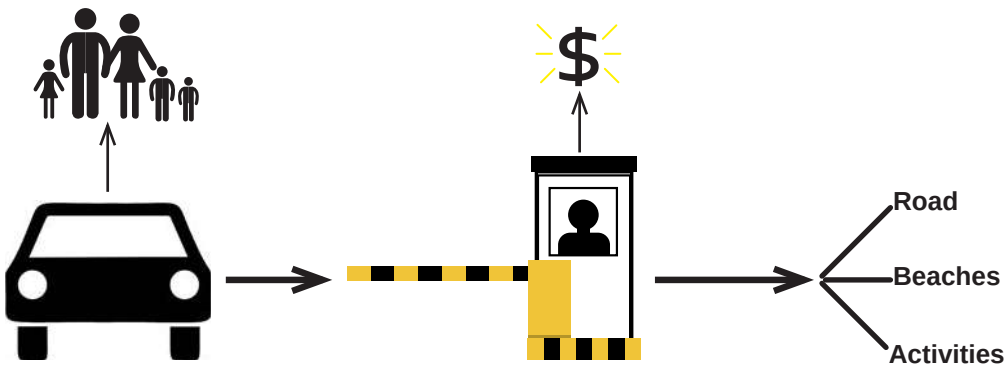


Figure 72: Dynamic proposed in the tolled roads. Access of people is regulated in the tolls in terms of a maximum amount per day during summer. Toll fees are increase in summer, so on the one hand the city generates profits from the season, and on the other hand these resources are for the maintenance of roads, beaches and summer activities to be implemented.
Source: Author

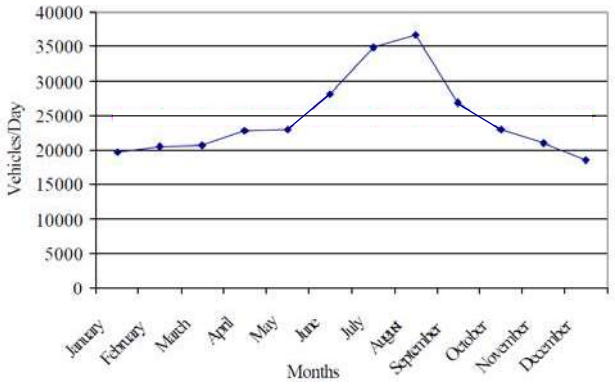


Figure 73: Current Condition
Source: Abbas, 2003

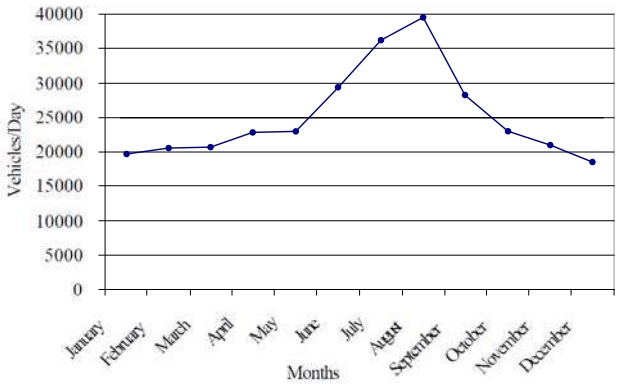


Figure 74: Business as usual scenario
Source: Author

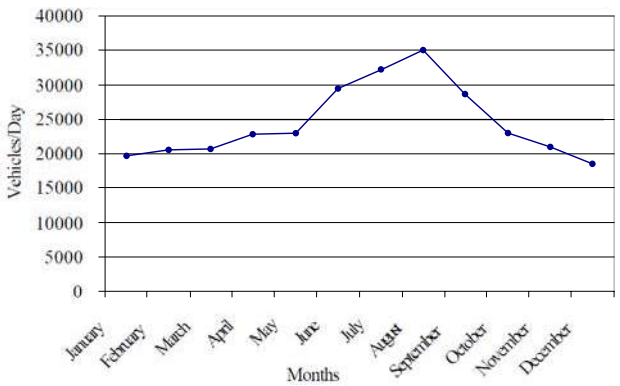


Figure 75: Best Case Scenario
Source: Author

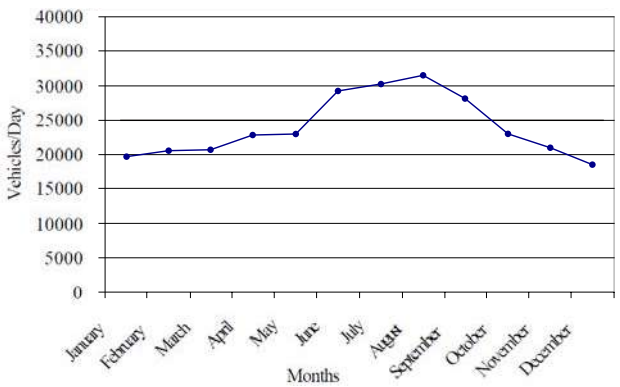


Figure 76: Best Case Scenario, further improvement
Source: Author

6.1.3 Limits on Electricity and Water Consumption

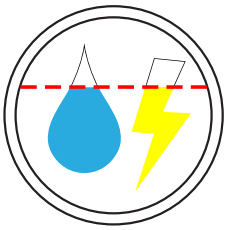
Changes in consumption patterns in summer were recognised in the UM analysis as an insights from the case study of Alexandria. It is not just an outcome from summer but from cultural understanding and use of resources. Here the recommendation is to settle limits of electricity and water consumption during the sunny days, so it is addressed in a policy and operational level.

In the chapter 5 the water cycle of Alexandria showed its environmental challenges, its energy demanded, and the ways how people use it, e.g the seasonal demand. Would it be effective to determine a temporal maximum level of consumption? In Colombia, for instance, when climatic events like El Niño[48] produces long droughts, the government establishes a basic range of consume of the liquid per household, when such is surpassed they must pay taxes for the extra resource consumed (Semana, 2016). This solution was achieved not just through governance measures; awareness campaigns in different media, and by the local authorities in every region were crucial. The success of this plan is leading to implement this ranges of consume permanently, as the national patterns of consumption changed.

Statistics of the household size in Alexandria is necessary to settle the seasonal range of consumption of water an electricity. The community involvement in the definition of summer ranges of consumption is a key element to take into consideration, especially at the moment of communicating the regulation, previous to the summer season.

48 El Niño is a cyclical climate phenomenon in the western Pacific Ocean.
More information: https://www.theguardian.com/environment/2015/mar/05/what-is-el-nino

Limits on Electricity and Water Consumption



Aim

- To establish limits on utilities consumption during summer as a attempt to reduce pressures on infrastructure in the peak season.
- To generate awareness about responsible consumption.

Description

- To settle limits of electricity and water consumption during summer.

- Those who surpass the limit will have to pay extra taxes for the additional consumption.

- Previous studies such as a state of art will determine the availability of resources in summer in order to establish the temporal limit.

- The Egyptian household size will have to be considered also.

- Community campaigns for a more conscious expenditure of resources will be required in order to support people to act and to understand the benefits.

- With limits on consumption shortages can be controlled if cooperation of institutions is assured.

- The income from extra consumption can be used on infrastructural update.

Cooperation Needed

- Providers of water and electricity are crucial to be involved in this proposal.

- Cultural campaigns need to be created, the Governorate of Alexandria and educational institutions can crate alliances promoting the responsible consumption of resources in summer, which is the time of more consumption, and also the rest of the year.

- GOPP and CEDARE with their plans for urban development and water respectively are likely to be involved to the repercussion on resources that this measure might have in the future.

Scenarios

Business as Usual
Related to the lack of actions from local authorities in terms of consumption. Utilization of resources in summer will keep increasing, as well as shortages.

Regulation with Partial Commitment
Limits on consumption are established but providers do not guarantee the availability of resources.

Regulation with Full Commitment (Best Case Scenario)
Limits on consumption are established and service providers guarantee its availability based on previous assessments

Table 8: Recommendation of limits on electricity and water consumption.
Source: Author

6.1.4 Civic Culture Campaigns

The necessity of this topic in Alexandria is twofold, on the one hand the newcomers are pointed as generators of negative changes, but the role of residents must be accounted as well. On the other hand, the perception that residents have from newcomers needs to be changed. No proposal looking for improving the city in summer will be successful if the rejection of summer visitors is still present in Alexandrians.

This recommendation must be top-down focused as no initiatives from citizens looking for improve any of the summer issues were found. Civic culture can be incorporated in the city planning, Zhang (2015) and Acevedo & Carreira (2016) mention the case of the metro system in Medellin, Colombia and the cultural factor included in the planning process. The use of sense of belonging of public utilities for the creation of new cultural behaviours is highlighted, additionally identifying traditional values that can counteract potential threats is also pointed.

Local pride is pointed is pointed as the guide for the creation of the Metro Culture in Medellin. The institution recognises that such model can be replicated by other cities or organizations aiming to create a new civic culture (METRODEMEDELLIN, 2018).

Is it possible to replicate it in Alexandria? Key elements can be related to local pride and sense of belonging, perceived in the comments from respondents where they asked for respect not just to people but also to the city in summer. This opens the question of the local pride of public authorities in Alexandria, do they also want the city to be respected? Perhaps for institutions is not easy to promote something they do not believe in.

Civic Culture Campaigns

Aim

- To launch social campaigns encouraging Alexandrians, based on their sense of belonging, to take care of the city in terms on insfrastructure and waste in order to support the previous proposals.

Description

- Social campaigns spreading messages of responsible consumption are necessary in Alexandria.

- Even though newcomers are those pointed as generators of change, the role of inhabitants must be also considered.

- Perception of newcomers: No proposal will improve the city if rejection of Alexandrians towards summer visitors persist.

- Local pride and sense of belonging of Alexandrians can be used as tools for residents to take care of the city.

- Campaigns asking visitors to respect the city will be more significant once the residents are doing it.

- People will be encouraged to reduce utilities consumption as well as producing less solid wastes by means of example in the daily life, of things they can avoid or do different.

Cooperation Needed

- Here the trustworthiness will rely on the quality of cooperations between the Governorate of Alexandria, by means of its Directorate of Housing and Utilities.

- Alliances with the dictatorate in charge of education or of social affairs will guarantee a big influence spreading the message on people.

- To motivate people for stop using plastic bags might be a starting point, from which more campaigns can be added. Social campaign are not just related to summer but can decrease the impact of such season.

Scenarios

Business as Usual
Residents think they can use as much resources as they want and local institutions think their job is to provide utilities and not to take care of people

Worst Case Scenario
Authorities have invested money on implementing changes and upgrading in the city and its infrastructure, yet authorities do not see civil society as something to invest in.

Best Case Scenario
Thanks to campaigns Alexandrians reduced their consumption. Summer is expected for good results. Universities and NGO's joint the initiative. More support from authorities is expected.

Table 9: Recommendation of civic culture campaigns
Source: Author

6.2 Recommendations for Urban-Environmental Metabolism

These recommendations are approached from a perspective of metabolic flows and built environment. Links with the previous proposals, related to policy and community dynamics will be pointed, as both approaches look for tackling similar issues from different stages; human resources and policy on one hand, and environmental flows in the city on the other hand.

Integration and cooperation of institutions were pointed in the previous part from a governance point of view, but such is also necessary in concrete situations related to material flows in the city and infrastructure:

- Water sources: In interview with AWC, Mrs. Saleh pointed the necessity of additional water sources different to the Mahmoudia Canal, as it will be affected by the construction of the Nahda Dam in Ethiopia, which represents a threat to the flow of the Nile River and consequently to the water source of Alexandria, see figure 77.

Figure 77: Location of Nahda Dam, pointed as a threat to the flow of the Nile River, and consequently to the water source of Alexandria.
Source: https://dilemmaxdotnet.files.wordpress.com/2013/06/nile-river.jpg

A current idea of AWC for alternative water provision is considering the desalination of sea water. However, this would require additional spend of energy in the water process, besides the amount already involved in the WTP. It would produce additional load to the already overloaded electricity system, so the idea

does not seem convenient if pressure on infrastructure is aimed to be reduced. Desalination plants have not been implemented in the city, and such initiative will require evaluation on development of technologies and on the power needed (AbuZeid, K., et al. CEDARE, 2016: p.14). In this sort of situations is where the integration of institutions become relevant and useful for the city.

In the plan 2030 for Integrated Urban Water Management (IUWM) of Alexandria, AbuZeid, K., et al. CEDARE (Ibid) mention existing and future sources and uses of urban water such as groundwater, rainwater, wastewater, agricultural drainage, sea water and graywater. What they do not consider is the energy implied in the treatment and distribution of the liquid in the city. This solves the issues partially because new sources of water will not be able to reach people without the power required.

- Electricity: Besides the household consumption, such is crucial for the whole water cycle in the city. No plans for institutional cooperation are reported. In interview with Egyptian Environmental Affairs Office (EEAA) future plans for clean energy were mentioned, yet Alexandria is relying on gas as a main power source[49]. Perhaps while clean power sources are implemented the efforts should be put on decreasing the pressures on the electricity provision related to direct and indirect consumption[50], so that impacts in summer can be balanced.

- Urban Planning: Beyond a matter of design and regulation, it needs to take part in the local tourism development of the city. Residential tourism is recognized in the city but is not stated in the official statistics on the housing dynamics in summer. This can be difficulty for upgrading the infrastructure based on the real demand of services in the city.

- Solid Waste: Concrete linkages between the solid waste organization and more companies were not found, yet considering the influence of refuse trucks on traffic and pollution on the one hand, and the Zabbaleens involved in the waste cycle on the other hand, then we can say that such cycle is more complex that what reports mention. Is it possible to decentralize the solid waste management? Can the outcomes from refuse trucks be reduced?

49 It is the main source national wide.
50 Explained in the electricity consumption patterns of summer, chapter 5.

Creation of New Urban Cycles

The paper from Tjallingii (2012) highlights strategies for the management of water in cities. The influence of the urban configuration in metabolic processes is expressed by the author. If cities are described as linear reactors in the UM (Brunner, 2007: p.12); (Kennedy et al.,2010: p.1); (Voskamp & Stremke, 2014: p.4), is because they are designed for a single-use consumption and new cycles are not aimed to be created.

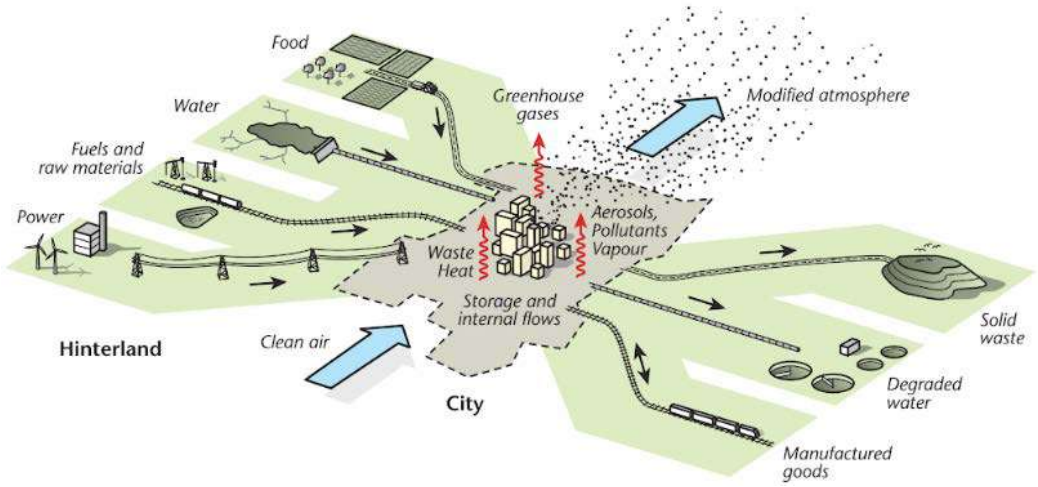


Figure 78: Representation of the linearity of metabolic urbanization. Current cities are designed for a single-use consumption, new cycles are not conceived in urban planning.
Source: Oke et al., 2017: p.4

The figure 78 illustrates the single-use consumption city; on the left side resources are extracted and taken to the city, then the urban (the grey patch) transforms those materials by means of their consumption, and finally they are taken again outside the city. Such is the strategy of current cities, Tjallingii (2012) points potentials of cities for creating new cycles, which is the aim of the following strategies, as well as reducing the consumption of resources and the energy needed in several dynamics:

6.2.1 New Water Source in Households

In the chapter 5 the dependence on pumping machines in every building for the highest floor to have access to water was pointed, which means in times of no electricity there is not access to both services. In the figure 79 the drawing on the left illustrates the current situation. On the right, creating an extra source for buildings from rainwater is proposed, so it can be gathered on the roof and spread down to the flats by means of gravity. Additionally, grey water from every household will be also recycled within the flats. See table 10 for further explanation.

New Water Source in Households

Aim

- To use the built environment of the city to generate new sources of water by means of collection and re-cycles of the liquid.
- To generate new water cycles within the city.

Description

- It is proposed to create an extra source for buildings from rainwater, so it can be gathered on the roof and spread down to the flats by means of gravity.

- Gray water from every household will be also recycled within the flats before it goes to the sewage system.

These founts are not potable water so they will be used for flushing toilets, which means in times of no electricity the inhabitants have access at least to sanitation services.

- IUWM states that reusing grey water and rainwater in Alexandria could introduce to the city 14 and 23 Million Cubic Meters (MCM) a year respectively (AbuZeid, K., et al. CEDARE, 2016: p.32).

- It means simultaneously less power spent in treatments and pumping processes, as well as less demand from the Mahmoudia Canal.

Benefits are not related specifically for summer, however energy and water savings are required the whole year.

Cooperation Needed

- IUWM recognises the complexity of installing these systems in every flat and building of the city.

- Buildings found as illegal will have to implement these systems as part of the legalization process, as a first stage of the proposal. Feedbacks from them will be assessed before spreading the water recycling in the city.

- Involvement of CEDARE in the developing of the installation and assessment is recommended.

Scenarios

Business as Usual
Institutions consider a risk to invest on buildings as water providers, furthermore Alexandrians do not support the idea due to the cost of implementation.

Best Case Scenario
AWC created an economic model for implementing water recycling progressively with a low impact in the economy of residents. The idea is being promoted in Alexandria.

Table 10: Recommendation of new water source in households.
Source: Author

A way to implement these systems is by means of illegal constructions in the city. They were built during the events of January 2011 and at the moment they are being tracked by local authorities looking for legalizing its status, commented Mr. Ginedy during the interview. When they find an edifice as illegal the owner must either pay a fine or modify the property in order to reach the requirements from planning laws. If the owner of the property decides to modify it, then installation of grey water system in the flats and storm water on the roof will be mandatory as part of the requirements from authorities.

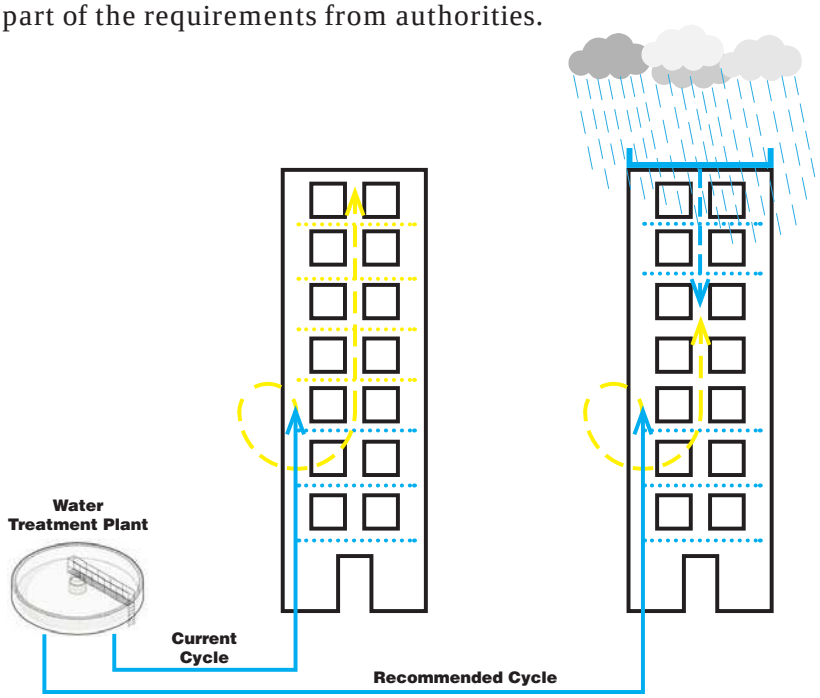


Figure 79: Dependence of electricity in the water process. New source of the liquid spread by means of gravity is proposed.
Source: Author

6.2.2 Alternative Water Cycle in Open Areas

The previous recommendation pointed the recycling of rain and grey water in buildings, here the aim is to highlight the reuse of the same resource in open areas. Although cities by means of their density are proper places for rain water catchment, when surfaces are sealed most of the liquid becomes run-off (Tjallingii, 2012: p.95), so it goes to takes part of the sewage process.

The recommendation is to separate gradually the rainwater network from the wastewater one, in order to create another cycle for irrigation without using potable water, as explained in table 11. Three different dynamics between sewage water and storm water are illustrated in the figure 80. The situation number 1 is the current condition of Alexandria, where both elements are mixed in a main

Alternative Water Cycle in Open Areas

Aim

- To create a new cycle for storm water separated from the wastewater network, so that it can be used for necessities that do not require potable water.
- To generate a new resource for irrigation of open areas.

Description

- To separate gradually the rainwater network from the wastewater one, in order to create another cycle for irrigation without using potable water.

- A consequence will be not taking rainwater to WWTP, which implies energy consumed in a treatment that is not necessary.

- The current rainwater cycle has the sea as a final disposal. Here it is proposed to use it for the irrigation of parks and open areas in Alexandria, so that potable water is used for atteding human needs.

- Rain in Alexandria takes place just in winter and as scattered showers (Aziz, 2016: p.67), that is why storing it is proposed for later usage, see fig. 81.

- The benefit is not directly linked to summer, but to decrease the pressure on infrastructure in other season.

-Aziz (2016) recognises the usage of high-quality water in maintenance os open areas in Egypt. No report found stating a different procedure in Alexandria.

Cooperation Needed

- Different sectors from the Ministry of Water Resources and Irrigation in Alexandria should be included.

- CEDARE could use this initiative as a pilot project of the implementation of the IUWM plan..

- Supervision from EEAA is required in terms of irrigation methods and water quality. This proposal can be integrated to outcomes from the summer state of art or the plans from GOPP.

Scenarios

Business as Usual
Utilities institutions do not consider important the creation of a rain water network just for winter. AWC consider this useless as they provide already water for irrigation.

Best Case Scenario
Implementation of a network for rainwater is included. Institutions work together. Results from the harvesting pilot project in Alexandria (Abdel-Shafy & Regelsberger, 2010: p.247&254).

Table 11: Recommendation of alternative water cycle in open areas.
Source: Author

network. The recommended situation for the city would be a combination of the situations 2 and 3. The ideal one is the number 3 where the city itself becomes a retention network of rainwater, however the urban density of Alexandria makes difficult to create new areas for water retention in open areas like streets and sidewalks. For these reasons the creation of an extra network for rain water is more recommended in order to take the liquid to specific retention points in the city. That water will be used for the irrigation of parks and open areas.

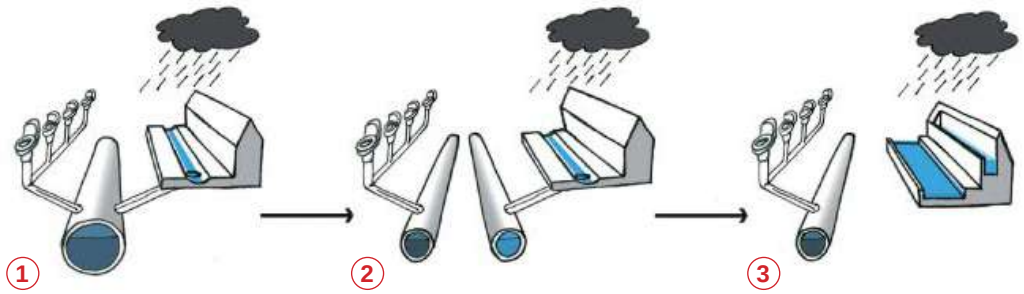


Figure 80: Dynamics between sewage water and rainwater networks. Number 1 : Both liquids mix in a main pie. Number 2: every liquid has its own network, which allows recycling. Number 3: waste water has pipes and the city becomes a retention point for storm water.
Source: http://marcovermeulen.eu/themes/11/waterindestad/46/watersquares/english/

The system proposed is illustrated in the figure 81, in which the liquid is collected, cleaned and irrigated.

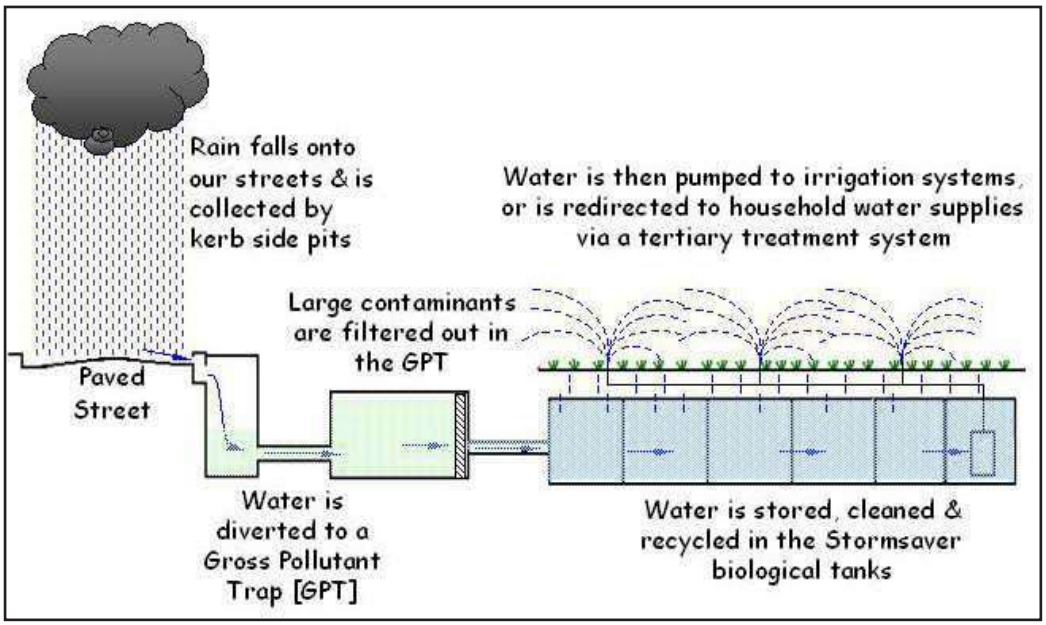


Figure 81: Rain water collection system proposed for irrigation of open spaces in Alexandria. It will allow to use potable water for supplying demand from citizens.
Source: https://lowercarbonhomes.blogspot.com/2009/07/stormsaver-rainwater-harvesting-system.html

6.2.3 Recommendation for Solid Waste Dynamics

Two lines of discussion guided this topic, on the one hand seasonal increase of solid waste and interference of Zabbaleens on the collection process, and on the other hand the transportation of waste and its influence on urban traffic and pollution. Here the recommendations are given in the same topics:

6.2.3.1 Solid Waste Treatment

El Gazzar & Gomaa (2014: p.1205) state that 100% of the waste in Egypt is likely to be recycled, they also recognized that half of the garbage remains uncollected. Additionally, for the case of Alexandria Montasser & El-Nakeeb (2017, p.169) present waste classification in the figure 82, which indicate the predominance of organic waste. That might be a clue on the influence of food consumption pointed in summer, even the authors do not relate these percentages with a specific time.

Types of Waste	Percentage
Organic	50-60%
Cartoon	8-12%
Plastic	10-15%
Glass	1-3%
Metal	1.5-2%
Textile	2-3%
Paper	11-18%

Figure 82: Alexandria solid waste classification
Source: Montasser & El-Nakeeb, 2017: p.169

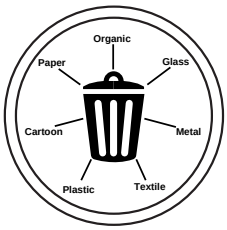
This goes to the point that Zabbaleens can be incorporated on the waste collection as they have already experience with solid waste. Elements will be separated and the organic materialcan be taken to biodigestors looking for producing gas out of it. Look table 12 for more information.

6.2.3.2 Waste Collection

The schedule of summer waste collection in Al Mahmoura[51] presented by El Gazzar & Gomaa (2014: p.1206) is unlikely to be realistic considering the traffic congestions in the sunny days. For this reason implementing collection in summer at night and dawn is suggested, so that trash collection is less impacted by traffic jams. Similar changes have been developed in countries like Spain (Carlos, 2006), Costa Rica (REPRETEL, 2018) and Mexico (Gonzalez, 2016), with positive results in terms of speeding up the compilation process, generating less traffic jams and less pollution. See table 12 for more explanation.

51 See figure 66 for reference.

Solid Waste Dynamics



Aims

- To decentralize the solid waste process in the city.
- To generate new resources from the organic waste in the city.
- To implement shifts in the waste collection process.

Description: Solid Waste Treatment

- Organic waste, which accounts for at least half of the material produced, has potentials to be transformed into gas by means of biodigestors, leading to provide this service to the city in a small scale.
- Incorporating Zabbaleens in the solid waste collection. Using their experience with solid waste for supporting specific collection tasks or facilitate the process of garbage separation.
- With the implementation of Biodigestors the company for solid waste in Alexandria have gradually more capacity for collection.

Description: Waste Collection

- Changing the collection of wastes to the night time in summer, so that this activity is less impacted by the accumulation of cars and people in the streets, and similarly the lorries generates less traffic congestion and pollution.
- The issues on routing system for waste compilation (see Moustafa et al, 2013) will not be solved with a change of schedule, yet collection might be more effective as traffic will not be a factor to consider.
- Pollution from lorries might also be reduced by making the process faster, as half time if produced idling in urban areas, where contaminants are produced (Sandhu et al, 2015: p.306).

Cooperation Needed

- The cooperation here is a challenge as incentives must be given to the company in charge of solid waste in Alexandria for accepting a more opened or decentralized system.
- Benefits can be mentioned in terms of: - Faster collection process
  -Treatment of rubbish in the city, which reduces transporportation costs.
  - Social inclusion, by means of incorporing Zabbaleens to the official waste process
- The engagement from EEAA in Alexandria is important as the environmental authority to guarantee a more effective process without human risks.

Scenarios

Business as Usual
The company in charge does not see these changes useful or needed. They have already a system implemented and there are not intentions to change it.

Best Case Scenario
The collection process starts to be decentralize through pilot projects outside summer. Assessments will be considered to see how feasible this measures are in a long term.

Table 12: Recommendation for solid waste dynamics
Source: Author

6.3 Scenarios on time

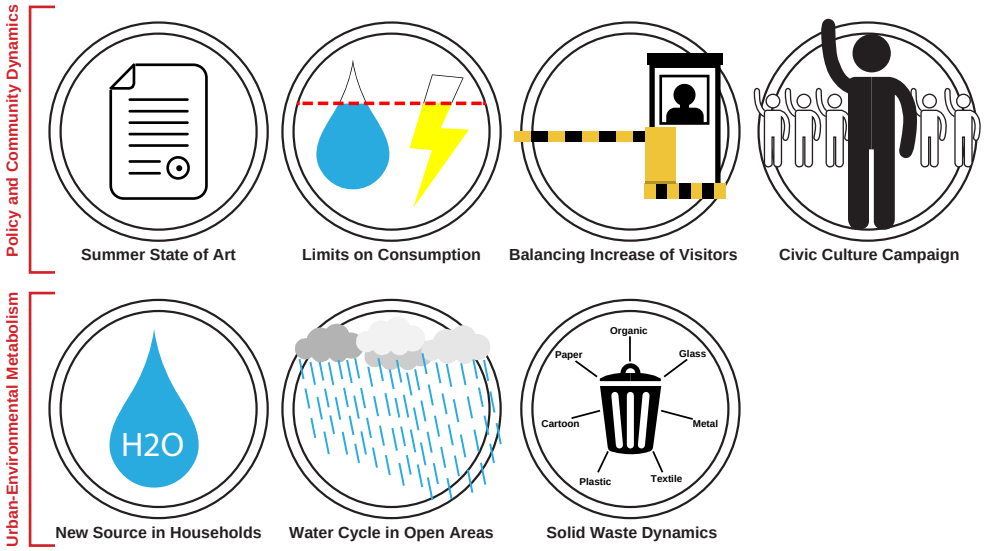


Figure 83: Compilation of proposals for shaping the impact and reducing the pressure of the summer season in Alexandria.
Source: Author

The 7 recommendations previously explained are summarized in the figure 83. They are divided in two groups but their materialization should be mixed and simultaneous in order to reach more significant impacts. The result will depend on which of them is mixed. Some combinations were created, the following potential outcomes are inferred:

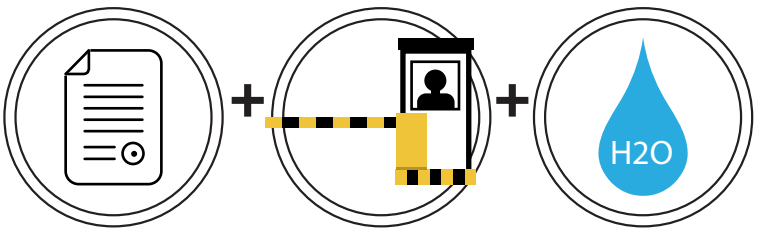


Figure 84: Combination 1: Summer State of art + balancing increase of visitors + new water source in household.
Source: Author

- State of art is created, access to the city is regulated as well as recycling of water. No civic culture campaign, so consumption might remain the same.

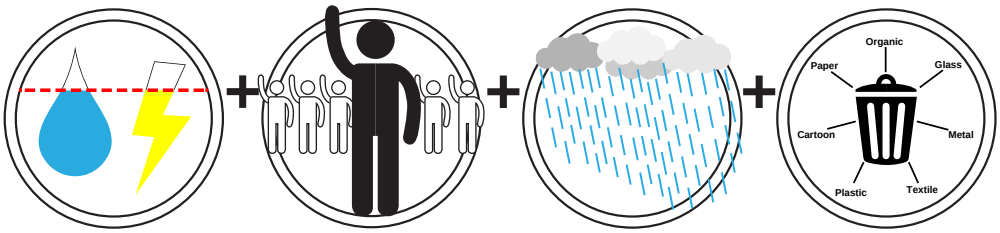


Figure 85 Combination 2: Limits on consumption + civic culture campaign + water cycle in open areas + solid waste dynamics
Source: Author

- Campaigns for community dynamics launched. No state of art of summer, so

plans were created without basis. Rainwater is collected, but benefits for summer are unknown. Solid waste is separated. These actions are beneficial for the city but do not belong to any specific plan.

Figure 86: Combination 3: Summer state of art + civic culture campaign + new source in households
Source: Author

- State of art created and civic culture campaign launched. The interventions are just in terms of infrastructure, demographic changes are no attended.

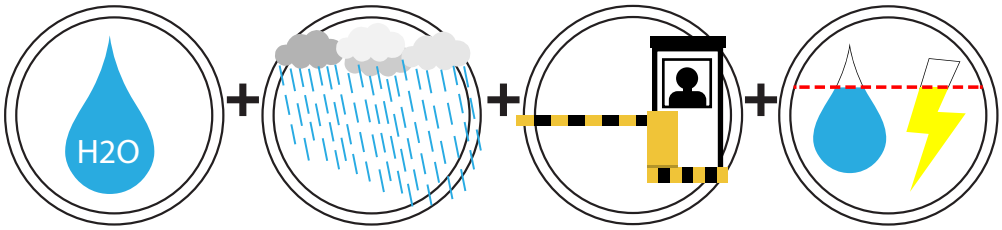


Figure 87: Combination 4: new source in households + water cycle in open areas + balancing increase of visitors + limits on consumption
Source: Author

- Infrastructural and demographic measures were applied, no document to guide procedures and outcomes. Solid waste issues are not yet tackled.

From the previous combinations two insights must be highlighted, on the one hand the importance of simultaneous application of strategies, and on the other hand the selection and order of the implementation, e.g. those which are selected are as crucial as those which are not. The order of implementation is related to the time factor; time in terms of change, when the outcomes are produced, and time in terms of planning for seasons instead of for permanent conditions. The ideal time for implementation was described in every proposal.

Observations of planning for a season are illustrated in the figure 88. Following the case of Alexandria, summer is repeatedly highlighted in a seasonal timeline as the problematic time, yet outcomes and feedback from summer should be considered for implementing changes in the low-stressed time, whose outcomes and feedbacks might be assessed in the next high-stressed time.

A seasonal timeline was created for Alexandria in the figure 89, applying the recommendations previously described. After the summer state of art is created; outcomes from the it are assessed the first summer by regulating the entrance of visitors; results are registered in an up-to-date state of art, simultaneously a civic culture campaign is launched before the next summer. Outcomes from the cultural initiative are assessed the second summer with new regulations in Alexandria for visitors and consumption. More comprehensive outcomes are reported and considered for the first infrastructural interventions, which are evaluated during the third summer. The state of art becomes a dynamic report as new assessments are needed after summer. They are relevant for decision making in Alexandria.

6.4 Conclusion

This chapter is a result of the insights gained from the study of cases of seasonal cities. Two groups of recommendations, one focused on governance and community dynamics and another one focused on urban-environmental metabolism. Seven recommendations were developed to the city tackling issues such as lack of data, demographic changes, consumption and cultural patterns and recycling of resources in the city.

Beyond the proposals themselves, their integration and simultaneous application might lead to more significant outcomes. Furthermore, the time factor is crucial to be considered due to the outcomes within and without the season. The seasonal changes in the UM can be planned when the alterations have time patterns either in social or in environmental dynamics. Cooperation of institutions as well as social inclusion in the planning of infrastructure can determine specific community behaviours necessary for specific infrastructure performance. Cities with this temporal conditions can incorporate these dynamics to the core of their planning process, so cities are seen as reactors of socio-environmental changes.

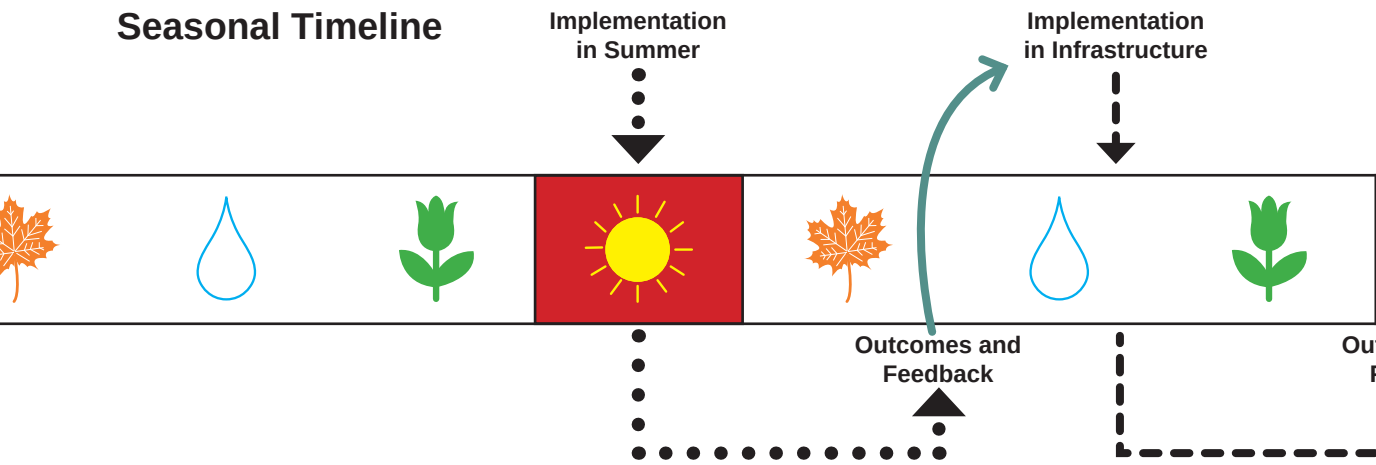


Figure 88: Dynamics of a seasonal timeline, cycles of implementations and feedbacks might work as a guideline when planning for a season is required.
Source: Author

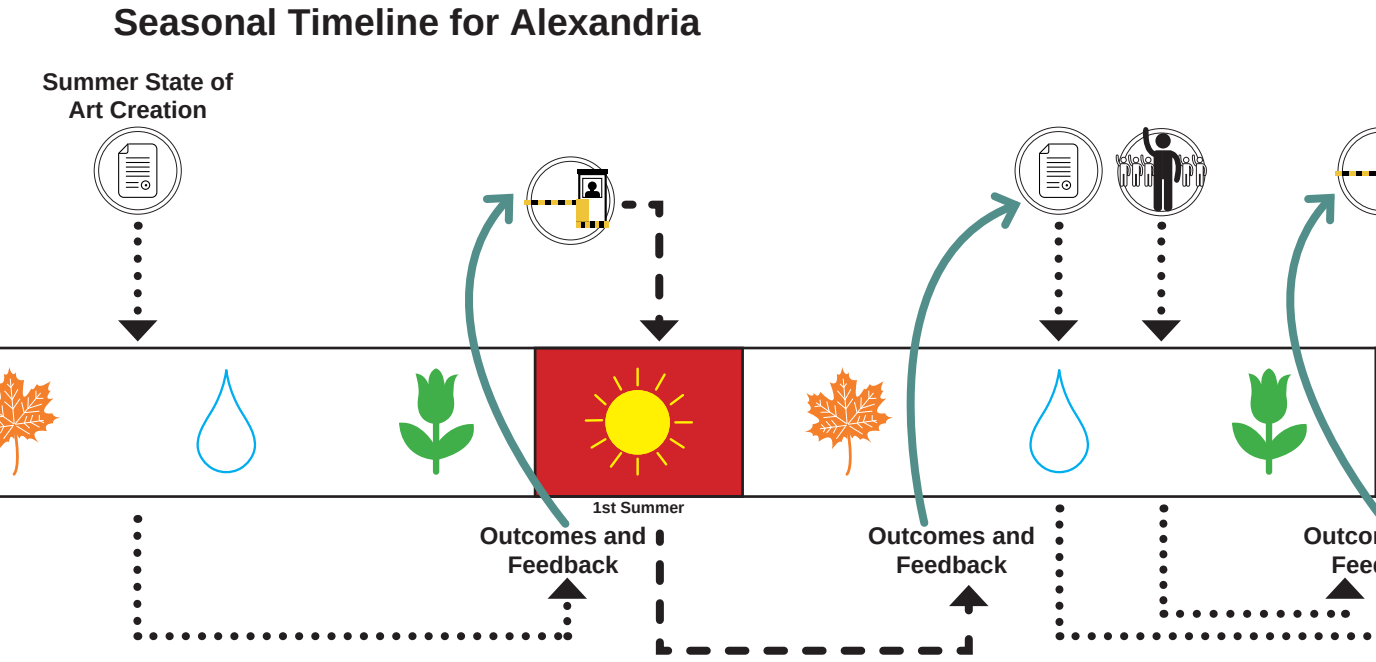
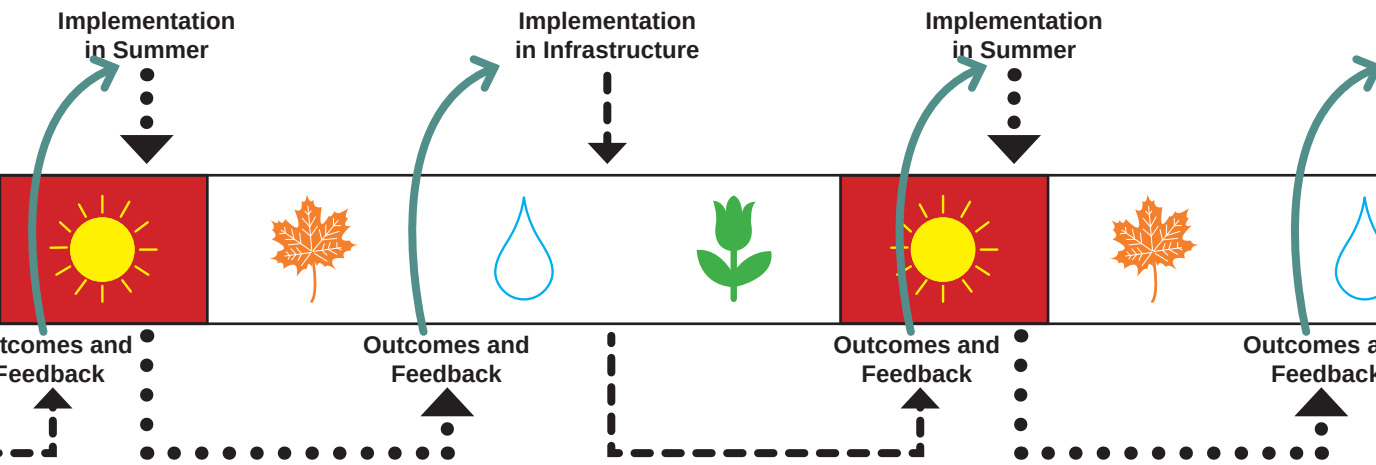


Figure 89: Application of the recommendation for the Alexandrian summer in a seasonal timeline following the cycle described in the previous figure. The creation of a summer state of art is the starting point for implementing the proposals progressively, based on the obtained feedbacks. Here the description was based on three consecutive summer seasons, yet, the complexity of the situation might take longer.
Source: Author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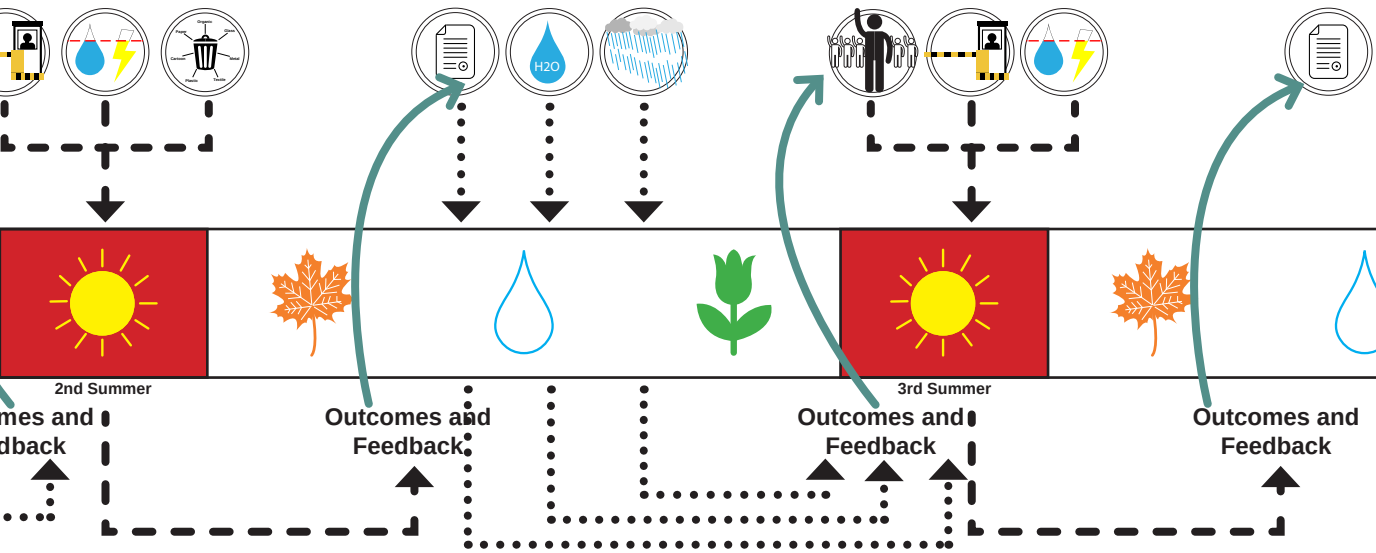
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Chapter 7
Conclusion

This thesis aimed to explore the temporality of cities under the approach of urban metabolism. Seasonal cities was the name to define places subjected to cyclical changes which take place constantly during the same time and under the same conditions. Gaps in literature were found on the one hand related paradigms of urban planning, where cities either grow or shrink but no processes in-between are reported, which suggested understanding the urban as a static and one-dimensional place. On the other hand the link between cities and time is not represented in the material flow analysis from urban metabolism studies, where quantification of urban activities is also seen as a static process and does not represent the social influence and its effect in urban cycles.

The topic was explored by means of three specific contexts where seasonal fluctuations are faced. The situations of Medellin, Colombia and Ulan Bator, Mongolia, allowed to get insight of metabolic seasonal changes in their urban areas. Observations from these reference cases supported the study of the Alexandrian summer and the variations experienced by this city in comparison to the rest of the year. Studying changes the consumption of resources, allowed to assess the current condition of the infrastructure and its preparation for the time of additional pressures. In addition matters of seasonal migration, cultural patterns of consumption and social understanding of resources were discussed in order to understand the social dynamics as a driving force of the seasonal changes of Alexandria.

Results led to determine the permanent low capacity of the city for the supply

of utilities, in terms of infrastructure conditions on the one hand and in terms of environmental quality of hinterlands and sources on the other hand. Summer makes these issues more visible due to the high demand of resources from the high arrival of newcomers, when the city returns to its previous state some of these issues are still faced.

Urban Metabolism is described by scholars as a linear process, which is understandable approached on figures and statistics. However, this topic is unlikely to be summarized as taking materials from A to B when the quality of the sources can influence the availability of the supply and the social dynamics can modify the demand, the urban cycle and the quality of the waste to be taken back to hinterlands. The city here becomes a processor of resources by means of its infrastructure, whose urban configuration should be planned in terms of times of consumption instead of quantity of such. Human actions do not impact just environmental ecosystems, the city as an urban ecosystem is also impacted by social dynamics. The usefulness of incorporating social patterns to metabolic urbanization relies on changing the idea of cities as abstract consumers and understand them more as reactors from consumption patterns of inhabitants which change based on cultural and environmental requirement.

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Appendix

Questionnaire: Summer Season in Alexandria City

Age: _____ Studies: _____

1. Do you live permanently in Alexandria city? ☐ Yes ☐ No

2. What do you do in the summer season?
☐ Stay in the city ☐ Leave the city ☐ Other? _____

Why?_____

3. From your experience, what is your personal perception of the summer season in Alexandria city?

_____

_____

4. Do you think Alexandria city changes in the summer season? ☐ Yes ☐ No

If yes, what does it change?_____

_____

5. Have you experienced or heard of any of the following situations during summer?
☐ Shortages of water ☐ Shortages of electricity ☐ Increasing / Accumulation of garbage production

☐ Population growth / Overcrowded beaches ☐ Traffic Jams Any other?_____

Which of them take place **JUST** during summer?_____

6. What do you know about the summer newcomers in Alexandria?_____

_____

7. What do you think is their nationality? ☐ Egyptians ☐ Arabs ☐ Other

8. Any particulars about them? Family members? Means of transportation? Accomodation? Behaviour?

_____

_____

9. Does the summer season changes the whole city aspect and livability or just some specific areas?
If specific areas, please mention their names _____

10. What do you think is the opinion of Alexandrians about the summer newcomers?_____

_____

11. Is there summer newcommers accomodation close to your residency place? ☐ Yes ☐ No
If yes, how close to your place? If no, where do they stay? Please specify in the map.

12. If there is an aspect missed in this questionnaire that you consider crucial for understanding the summer season in Alexandria city, please mention_____

Please if possible kindly use a pen with colour different to black.

- Can you please indicate in the map your residency location?
If the place is out of the map, then please write your residency address.

- If in the question **9** you mentioned specific areas affected in summer, please highlight them in the map.

- If you want to highlight or explain in the map something you consider relevant during the summer season and was not included in the questionnaire, feel free to do it.

The purpose of the information asked in this questionnaire is strictly academic, regarding the Master thesis "Seasonal Cities: Temporal Changes in the Urban Metabolism of Alexandria, Egypt". Thanks for your time and cooperation. :)

المدن الموسمية: التغيرات الزمنية في التفاعلات الحضرية في الإسكندرية، مصر

إن تنمية المدن ديناميكية، وكثير من المدن تقدم حالات محددة يمكن أن تُفهم على أنها موسمية أو دورية، مما يعني أنها تغير حالتها اليومية لفترة من الزمن. وبناء على ذلك، فإن الموضوع الذي سيتم بحثه يسمى المدن الموسمية؛ والتي تشير إلى فترات تتعرض فيها المدينة لضغوط إضافية أو خارجية تعيد دينامياتها مؤقتاً وتعود إلى حالتها السابقة بعد ذلك. وسيتم تطوير الدراسة من جانب واحد حول النهج الذي تقوده النظريات من خلال المدخلات ووجهات النظر من التفاعلات الحضرية والاستدامة الحضرية والمرونة الحضرية والنمو وانكماش المدن والنظم الإيكولوجية والبنية التحتية للمساحات الحضرية من أجل وضع إطار مفاهيمي للموضوع. ومن ناحية أخرى، من الضروري وجود جزء يقوده التوصية للحصول على نظرة عامة على تعقيد الظاهرة وتنوعها، لذلك سيتم تقديم أمثلة ملموسة: أولان باتور، في منغوليا وميديلين، في كولومبيا من خلال الأحداث الموسمية التي يواجهونها دورياً.

وبناء على تلك الأمثلة سوف تكون هناك تلميحات ونطاقات للبحث في دراسة الحالة: الإسكندرية، مصر. التركيز بشكل خاص في فصل الصيف والهجرة الهائلة من السياح إلى المدينة. والهدف من ذلك هو فهم إلى أي مدى هذا الوقت يغير ويؤثر على استدامة المدن وما هو تصور، رد فعل، واعتراف السكان والسلطات المحلية نحو هذا الوضع. وسيتم تنفيذ الدراسة على مرحلة أولى من تقارير من مصادر مختلفة عن السياحة في المدينة وكيف أنها تؤثر على التنمية الحضرية الحالية. وتحتوي هذه الوثائق على أرقام وبيانات وحقائق ذات صلة، ولكنها تقدم في الاساس الحالات دون تحليل عميق لنتائج الموسم الصيفي، وتصورات السكان أو وعي الحكومة المحلية بشأن عدة حالات من هذا الحدث المحدد. لذا فإن بعض هذه الثغرات سوف يتم دراستها في مرحلة ثانية على أساس المقابلات والاستبيانات والإحصاءات وأساليب المشاركة مما يؤدي إلى فهم دورة التفاعلات الحضرية من دراسة الحالة ليس فقط من حيث الأرقام ولكن أيضاً من حيث تأثير الناس، سواء من السكان المحليين أو السياح، على عدة عمليات في المدينة وكيف أنها واضحة وملموسة في صورة الإسكندرية.

إقرار

هذه الرسالة مقدمة في جامعة عين شمس وجامعة شوتجارت للحصول على درجة العمران المتكامل والتصميم المستدام. إن العمل الذي تحويه هذه الرسالة قد تم إنجازه بمعرفة الباحث سنة ...

هذا ويقر الباحث أن العمل المقدم هو خلاصة بحثه الشخصي وأنه قد اتبع الإسلوب العلمي السليم في الإشارة إلى المواد المؤخوذه من المراجع العلمية كلٌ في مكانه في مختلف أجزاء الرسالة..

أندريس ماوريسيو استرادا بوليڤار

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مقدمة للحصول على درجة الماجستير في العمران المتكامل والتصميم المستدام

أندريس ماوريسيو استرادا بوليڤار

المشرفون

أ.د.محمد صالحين
أستاذ التخطيط والتصميم العمراني المتكامل
جامعة عين شمس

أ.د.أستريد لاي
أستاذ العمران الدولي
جامعة شتوتجارت

د .آيات إسماعيل
مدرس التصميم والتخطيط العمراني
جامعة عين شمس

لجنة الحكم

أ.د .....الممتحن الخارجي
أستاذ.....
جامعة .....

أ.د.....
أستاذ.....
جامعة .....

أ.د.....
أستاذ.....
جامعة .....

الدراسات العليا

ختم الإجازة
موافقة مجلس الكلية .../.../...

29/07/2018

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إعداد

أندريس ماوريسيو استرادا بوليڤار

المشرفون

أ.د.محمد صالحين
أستاذ التخطيط والتصميم العمراني
المتكامل
جامعة عين شمس

أ.د.أستريد لاي
أستاذ العمران الدولي
جامعة شتوتجارت

د .آيات إسماعيل
مدرس التصميم والتخطيط العمراني
جامعة عين شمس

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