Executive summary

The city is the stage of our activities and often the target of our work. In this direction is essential to understand it and study it. Currently with urban growth and expansion of the suburbs new problems such as congestion, pollution, among others emerged and has not been stated what’s the best strategy to handle this growth. However, all theorists agree that the solution lies in rethinking urban planning, transport, like all other systems in the city in an integrated manner so that all work with one single objective.

Recognizing this need this dissertation deals with the theme of the theory of compact city and ways to manipulate it and apply it in several cases. This theory appears as an attempt to respond to internal problems of the city, as well as the sustainability problems associated with the development of urban areas. In addition to this study is necessary to understand the urban form and structure. In search of the ideal urban form, often the theory of compact city induces a monocentric form, however this no longer reflects the current needs of the population, and is not sustainable and viable from a certain size. In this sense is introduced the concept of compact decentralization in the dissertation. But to understand in depth this concept is necessary to understand how to manipulate the land use and the transport system.

We can summarize the characteristics of the compact city, according to its implementation:

- High residential and employment densities.
- Diversity of use of land, so that the basic needs of the population are at a walking distance from their residence.
- Division of land use in small areas, avoiding the large only residential areas.
- Increase the social interaction, through good design of public space.
- Continued development, the buildings are continually reused.
- Contained urban growth and delimited boundaries.
- Multimodal transport system, the focus is the use of non-motorized transport.
- High accessibility, both at regional and local levels.
- High connectivity on the streets, through wide sidewalks and bike lanes, encouraging people to travel on foot or transport in muscle strength.
- High land cover in order to maximize the capacity of the city.
- A few open spaces, except the gardens and public spaces.
- Coordinated planning and urban development.
- Ability to finance government infrastructure and equipment.
- Homes more expensive and less space at home.
- Higher rates of mortality from respiratory diseases.
- Improvements in public transport.
- Less mortality from mental diseases.

- Less social segregation.
- Major extensions of spaces for walking and cycling.
- More facility in getting a job for people with lower educational qualifications.
- Increased accessibility to services.

The theory of compact city grows in Europe because urban development has progressed very differently in the world. While U.S. and Australian cities developed their suburbs in areas with low density, with only accessibility by car, in Europe urban development was a movement of population from the big cities to small towns and villages. Thus the urban pattern is quite different and the theory of compact city is much easier to apply in Europe. Because of this urban decentralization comes the theory of compact city, which applies the concept of compact city to a model with multiple centres. We can summarize the features of this model of compact decentralization in:

- Policies designed to limit urban growth must exist and urban growth should slow down.
- The proposals of the compact city monocentric are unrealistic and undesirable.
- Various forms of cities or groups of cities are appropriate, being the peripheral model and polycentric more effective due their strong center with a sub-centers, all connected by effective public transport.
- The downtown should be rejuvenated, reducing the loss of population.
- Public transport should be improved between the cities.
- Should be encouraged the diversify of land uses.
- Must be developed the area around the railway stations.
- Should be promoted urban green spaces.
- Should be promoted systems combined heat and power in order to increase the efficiency of power stations.

It is necessary however to know how to manipulate the characteristics of land use and transport and the impacts that this manipulation brings:

Variables of land use:

- Size: cities that grow around a single centre become unsustainable when reaches a certain size, and is no longer viable to apply the concepts of compact city. It is important that cities have an integrated multi-core, with different importance between them, and with a public transport system that links all the centres and provide bilateral flows.
- Density: in the theory of compact city densities must be high, both housing and employment. In fact, increasing density brings negative aspects such as increased road congestion and therefore more pollution in areas rather. In the evidence of congestion people will be encourage to use public transport. This mends that there are more passengers, and this imply a more efficient public transportation with more availability and frequency, reducing the waiting time and total time of travel.

- Diversity: one aspect is also very important and essential to implement the concept of the compact city, in fact, the diversity of land uses allows you to find the services in shorter
distance, which can often be travelled on foot or by non-motorized transport. So diversity has two large gains, one is the reduction of travel distances, which means a decrease in travel time and the other is the increased use of non-motorized transport.

- Urban structure: as noted earlier monocentric urban structure does not provide the population needs and the best structure is the polycentric form, where the jobs are located in employment centres and subcentres, which are linked by efficient public transport systems, and where housing is located along the corridors of public transport. However the polycentric structures are associated with greater use of the car, but if the structure is complemented with an effective and well planned public transport system that reality may not be significant.

Transport features:
- For the theory of compact city work is necessary also to re-evaluate the transportation system, in addition to the characteristics of land use.
- Calm traffic: the policies of calm traffic are very efficient when it comes to discouraging car use, since it reduces their effectiveness. These measures include the reduction of lanes, insertion of radar speed controllers, among other measures.
- Reduction of parking and insertion of park-and-ride: these two measures are also very effective. The first discourage car use by reducing parking or impose tariff, and causes the passenger to lose more time or spend more money on the trips, which makes the system more efficient public transport compared to car transport. The second encourage the use of public transport in the city centre, combined with individual system outside the city, and is usually very used by the population that live in the suburbs. For this to happen must be located in the interfaces of faster public transport, particularly rail, and structuring road routes, in addition to its location the park should be situated on a very short distance from the station, have security and ensure that have the necessary capacity. These systems work well if combined with the monthly passes of public transport, forming a single ticket and guaranteed fixed seats in the park.
- Measures to improve the efficiency of public transport: these measures are improving the accessibility to the vehicle, organization and increasing the frequency of vehicles, increasing speed, integrating fares, improving information systems, advertising campaigns and marketing and awareness of the polluting effects of automobile use.
- Measures to encourage the use of non-motorized transport: these measures are both campaigns and practical measures like creating their own circuits, allowing the carrying on public transport, among others.

Lisbon, the case study of this thesis, is a city of great importance in the national context and focuses a great economic power. The housing density is high in all the neighbourhoods, which means that the whole area has sufficient capacity for the insertion of a public transport system, which happens in reality with the bus and tram. But it is possible to conclude that there is a higher density in areas surrounding the historic district within the railway line. But when it comes to business densities, they are heavily concentrated in two main poles, the Avenida da Liberdade and Chiado. The corridors of expansion of these poles are the avenues Fontes
Pereira de Melo and Avenue of the Republic. To understand the relevance of this areas is necessary to now that are more jobs in here that active people in the whole city. The diversity is essentially confined to these areas, making the rest of the city mostly residential. There is the exception of Oriente and Benfica, two areas that create new centralities within the city. This area of economic concentration has been growing and the need for rapid public transport as been satisfied by the subway network that has the most stations and interfaces in this area. But the suburban rail stations have been forgotten (except terminal Rossio and Cais do Sodré that are located in the central area) and have many difficulties specially in pedestrian accessibility. The fact that there is plenty of parking in the downtown area, as well as the presence of weak system of park-and-ride, means that there are still many incentives to car use.

You can associate the characteristics of Lisbon to the characteristics of compact city and conclude that the positive ones are:
- High densities of housing, which would allow an efficient public transport.
- Urban growth contained, the expansion did not exist in terms of area, but more in terms of expansion to the villages and towns adjacent to Lisbon.
- Comfort in public transport, in fact due to constant concern of public transport companies the comfort, hygiene and safety is high.

And the negative ones are:
- Low diversity of land uses, except in the highly developed areas. There must be more diversity, particularly at the interfaces of public transport system.
- Many open spaces, abandoned, that not maximize the potential of the city. One way to enhance these spaces is transformed them in parks or urban spaces that balance and complement the diversity of the various areas in the city.
- Poor design of public spaces and routes, which in addition to not encourage travel by foot or non-motorized transport also decreases the accessibility to services and reduces the possibilities of social interaction. In this sense it is important to extend sidewalks, create bike paths, among other measures, so that people feel comfortable and encouraged to circulate on walkway.
- Degraded green is a common feature in the city of Lisbon, especially the older parks.
- The existence of unoccupied buildings, is one of the biggest problems the city of Lisbon have, in fact this buildings can reaches 40% in the oldest neighbourhoods, and lead to various problems of desertification, insecurity, environmental degradation, among others. In this sense a rehabilitation of all these spaces should be performed.
- Lack of a multi-modal transport system, although in reality there are interfaces between the various modes of public transport, these are not widely used because there are no integrated rates for all transport modes. This difficulty forces the population to travel more distances and take longer time to not increase the cost of the trip. Therefore it is essential to create a single ticket for a single journey, regardless of how many modes of transport the people use.
- There is not intensification, in the interfaces of suburban rail, which means that they are not attractive to passengers.
- There are few measures to increase the efficiency of public transport, like measures to increase speed, increase accessibility to stations, among others.
- There are few measures to calm traffic.
- There are few systems for park-and-ride.

You can verify that Lisbon is very monocentric and the intensification on the public transport corridors doesn’t happened. To implement the concept of the compact city is necessary to manipulate the land use and create less decentralized form, with good operation of public transport and the proper intensification. In fact the implementation of these measures is not very complicated because there are many empty spaces in the urban areas, and as the city of Lisbon did not attend the city's expansion at low densities the implementation of these concepts becomes simpler. The implement of these aspects should pass by acting in specific points:

- Rehabilitation of the historic centre.
- Rehabilitation of green spaces and abandoned spaces, so that they become green places of leisure or urban places that increases the diversity of neighbourhood that are located.
- Intensification of railway stations with jobs and diversity of uses.
- Implement a single ticket that allows people to use all modes of public transport in the same trip.
- Create more park-and-ride systems.
- Restoring the public space and traffic routes, reversing the current hierarchy and giving more importance to pedestrians and users of non-motorized transport systems and public transport.