

## **Sustainable Transport Planning to Balearic Island University Campus**

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### **INTRODUCTION**

Planning tasks of university infrastructures usually requires considering the accessibility of the new buildings and resorts and the transport facilities of students and staff from the campus. The University of the Balearic Islands (UIB) is seven kilometres from the city of Palma de Mallorca. The UIB has about 15,000 students of which 7,000 live in Palma. Bus Line 19 from Palma to the UIB managed by the Municipal Company of Transports (EMT) of the City council of Palma makes a total of 1.200.000 trips per year which means an average of 3,000 passengers per day. Therefore, approximately half of the students go to the UIB by private vehicle. The economic and environmental costs of the transport are high and policies and actions to improve and promote public transport must be developed

At the island of Majorca, with a singular tourist vocation it is especially important to set up policies of sustainable transport based on the development of the public transport and reduction of the use of the private vehicle (BANISTER, 2002). In this sense, in the next months the Regional Government is going to start up a new line of Palma-UIB underground (metro) that will give a strong impulse to the public transport. For that reason the EMT will have to adapt the route of line 19 to the new distribution of the potential demand.

Now the line of bus Palma/UIB has a frequency of 10 minutes and takes about 20 minutes. The UIB/Palma line has a frequency of 20 minutes and also takes 20 minutes. The new underground line will have a frequency of 13 minutes and a temporary cost Palma/UIB/Palma of 13 minutes. In addition some of the underground stations will be in contact with the bus stops. It is therefore evident that the impact of the new infrastructure on the transport model will be very important.

It is in this frame that the EMT has commissioned the UIB to study the proposal of a new supply route of bus Palma/UIB that satisfies the new demand model established after the implantation of the underground.

### **METHODOLOGY**

First of all, the demand of university transport has been characterized. We have made an address matching of mailing addresses of the 7,000 students and other personnel of the University of the Balearic using digital street guide of TeleAtlas Inc.

Later we have analysed the potential density of demand by means of an interpolation process and obtained. a map of potential demand of university transport.

Then, the 25 routes of bus of Palma and each one of their bus stops have been digitalised with the information provided by the EMT. Attributes of each route and each bus stop relative to average

speeds and frequencies have also been obtained. The new underground route with its corresponding stations has also been digitalised.

The frequencies of bus/metro and their travel times have been considered for the modelization of the road network. Finally, we produced isochrones from each one of the vertices of the graph network of Palma to the UIB and vice versa. First only taking into account the bus network and then incorporating the new underground Line.

In order to assess the impact of the new line of underground and to propose a new itinerary of bus, a cartographic weighted model has been developed considering the information of potential demand together with the travel time to the campus (GUTIERREZ, 1998) , Maps of priority zones are obtained showing actual and /future needs of each area according with its transport service level to the University.

The project has been made using the software ArcGIS vers. 9.2 and the Network and Spatial Analysis Extensions. ( ©Environmental Systems Research Institute).

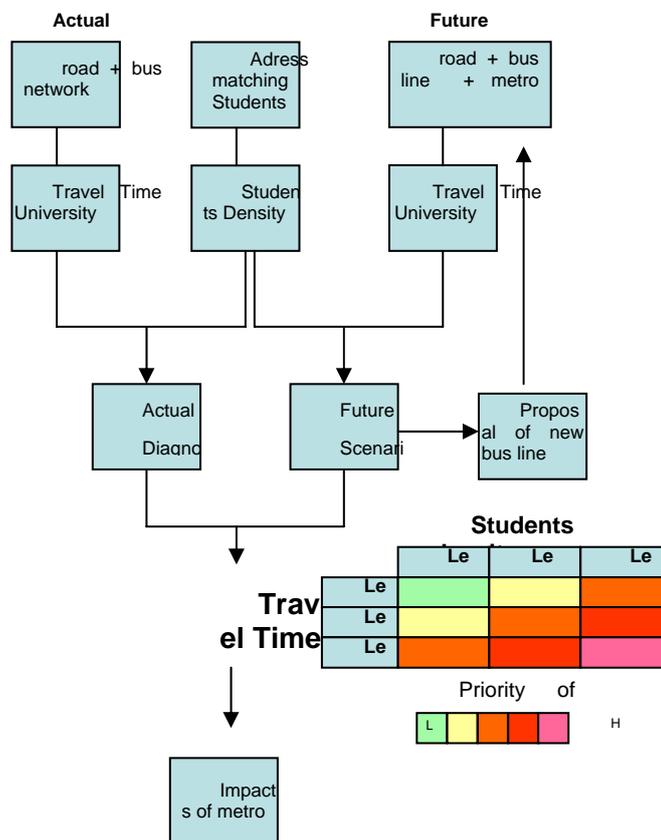


Figure 1. Methodology of the project

## RESULTS

The distribution of the university students in Palma shows greater densities at the peripheral zone of the city. Blanquerna , Aragon and Progreso are the three areas with maximum values.

The bus lines of the Municipal Company of Transports are mainly radial and they are mostly concentrated at the perimeter of the centre of the city (old city).

Time distance to the University in the present situation presents a clear deformation towards the axis formed by the itinerary of the bus line 19. The set up of the underground will considerably improve the accessibility to the University reducing travel times and providing service to more extensive areas.

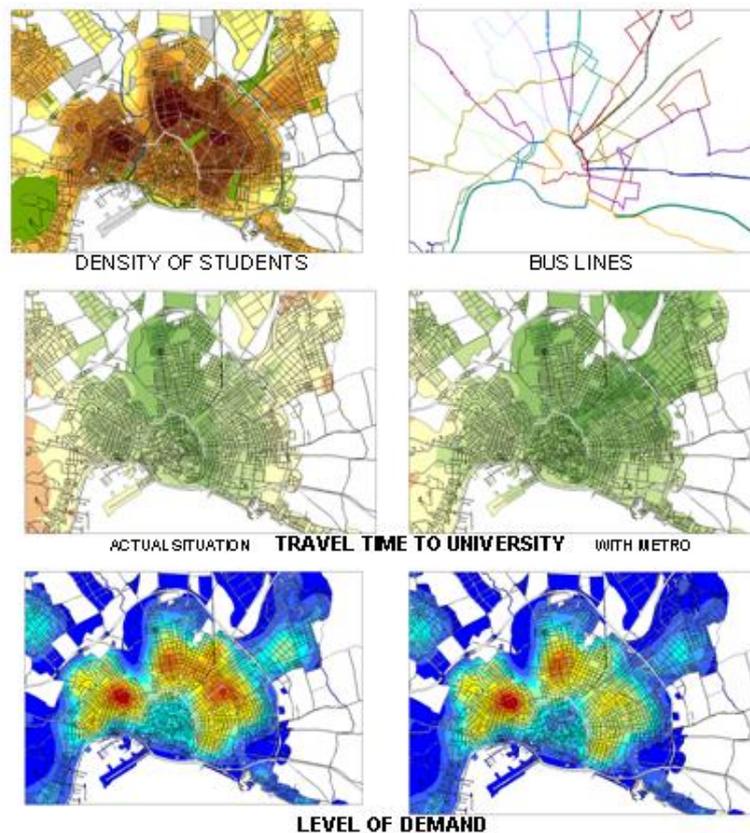


Figure 2. Maps of transport demand and supply

The transport demand will be reduced with the underground activity. Nevertheless, there will still be areas in need of improvement. Specifically the west of the city (Progres) shows a high demand and large travel time. It is important that the new bus route to the University covers these necessities but also the frequency of buses in those zones should be increased. So, a new bus route to the University

has been proposed to compensate the effects of the underground line according with the factors considered. Finally, the impact of the proposed route has been analysed using the network model. The result shows that the accessibility of the University for their students has been improved in 30%.

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