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Analysis of the modal choice of transport at the case of University: Case of University of the Basque Country of San Sebastian

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Abstract

Transportation has significant and long lasting economical, social and environmental impacts, and so is an important dimension of urban sustainability.

Any effort that is made to achieve sustainability must take into account that universities are unique places functioning in specific contexts.

Any university working towards sustainability must deal with the issue of transportation as students, staff and visitors commuting to and from campus represent one of the most important impacts a university has on the environment and society

Through the analysis of a specific experience, the main reflection of this paper is to improve the mobility patterns of the University of the Basque Country of San Sebastian in favor of the most secure, sustainable, fair and efficient ways of transport.

Introduction

The City of Donostia / San Sebastián sits within 6,000 hectares of Basque Country on the north coast of Spain, 20 km from the French border. Although 34% of the territory is urban and 66% rural nearly half the population (185,000) live within the City itself.

Thirty years ago there was a steep increase in the use of private cars, with considerable impact on the environment and town planning, which led to a new mobility and urban quality policy to be launched in 1990 to promote more walking, cycling and public transport and recover public space. The City's objectives for sustainable transport were laid down in the Urban Development Master Plan that was passed in 1995. Within the framework of the general plan, several action plans were approved including The Civic Mobility Pact (1999); The Bicycle Plan (2000); Donostia is Walking (2001); the Public Transport Plan (2004); and the Plan for Traffic Safety and Security (2007). In 2007 the different plans and actions for sustainable urban transport were integrated into "The Plan de Movilidad Sostenible". In 2008 the CIVITAS ARCHIMEDES project provided an opportunity to further promote sustainable mobility in the city. The CIVITAS ARCHIMEDES project brings together the six European cities Aalborg (DK), Donostia-San Sebastián (ES), Brighton & Hove (UK), Iasi (RO), Monza (IT) and Ústí nad Labem (CZ). They are approximately of the same population size and another similarity is that all the cities seem to have a large population of young people. The cities are all facing challenges in mobility that they want to address to make the city a better place for the citizens.

In this context, in Donostia-San Sebastián, the University of the Basque Country (UPV/EHU) has formed a Mobility Management Team with the aim to promote changes in the organisational model of University, in order to ease the use of corrective transport and other energy-saving transport means. In this paper we have taken the opportunity to work hand in glove with our students. Obviously, college campuses are privileged places to communicate sustainability and to help reshape society's transportation patterns (Balsas, 2003).

This work is motivated by the following considerations:

College must be reference of sustainability. Any university working towards sustainability must deal with the issue of transportation as students, staff and visitors commuting to and from campus represent one of the most important impacts a university has on the environment and society (Miralles and Domene, 2010).

Students are more open-minded and have the potential to become 'movers and shakers' if properly motivated, they can become powerful forces for the establishment of a sustainable transportation.

Any effort that is made to achieve sustainability must take into account that universities are unique places functioning in specific contexts. Some universities are beginning to include sustainability as a strategic priority in their plans and programmes. The main objectives of these plans are to increase the level of accessibility without increasing individual mobility in private modes of transport. Most of the actions adopted in these universities can be included in transportation demand management (TDM).

The real purpose of TDM action is to change individual travel behaviour which is driven by many factors including structural variables such as distance, time, cost in terms of money, urban

density, road characteristics, public transport services; and individual variables such as purpose for trip, work schedule and time constraints, environmental concern, number of people, age, income, gender, attitudes and lifestyles (Pooley and Turnbull, 2000; Miralles-Guasch, 2001; Thoegersen, 2006; Collantes and Mokhtarian, 2007; Eriksson et al., 2008; Sandow, 2008).

In this way, this investigation project sticks to improve the mobility patterns of the students of the UPV/EHU of San Sebastian, giving advantage to those transports that are safer, sustainable, equitable and efficient. Thereby, the main objective of this investigation is the production and implementation of a safe and sustainable displacement plan for the different collectives that daily move about the different campuses of the UPV/EHU. The ultimate goal is to change mobility habits towards more sustainable transport modes.

So, with our study we aim to answer questions that, to date, are under-treated and not solved properly. We need an in-depth understanding of the factors influencing these travel patterns and the extent to which these measures can change these conditions.

This paper should be of interest to transportation city planning, campus planners, transportation demand management coordinators, environmental advocates, and professionals engaged in implementing alternative strategies. Our reflections should also be relevant to other campus environments.

Methodology

To achieve the basic objective, it is estimated the need for a complete analysis and diagnosis of the UPV/EHU of San Sebastian, from the different angles of a Comprehensive Mobility, and at the same time, if necessary, propose strategies and possible actions that favor those transportation safer, sustainable, equitable and efficient.

The study will focus on the students who attend UPV/EHU. For data collection instrument used was a questionnaire, designed in the UPV/EHU. The questionnaire covers questions about habits, attitudes and desires of the people interviewed. To get the results, teachers of the University were interviewed personally with students. Once the data was collected, the next step was to write a report which contained the results and conclusions of the study.

Once given the current situation of students taking UPV/EHU, we proceed, using the results of the questionnaire, to analyze the group, in order to take radiography of the school to be able to act for the benefit of the university community, the city in which it is located and citizens live there.

Analysis of the Current Situation of Students UPV/EHU

This section aims to diagnose student's situation of UPV/EHU of San Sebastian. The situation of these students is as follows:

The 68.2% of the students interviewed on campus are women and 31.8% men. The age group 18 to 21 years is the most represented in percentage (69.8% of total). A 19.9% are between 22 and 25 years, 7% are between 26 and 35 years and 3.2% over 35 years.

	Women	Men
Sex	68,2	31,8

Table 1. Sex of the students surveyed

An 80.7% of the students reside in Gipuzkoa. Of the rest, 11.2% came from Bizkaia, 2.9% from Araba and about 5% from other provinces.

	Gipuzkoa	Bizkaia	Araba
State of residence	80,7	11,2	2,9

Table 2. State of residence

During the week, 21.5% of all students interviewed said that travel less than 2 kilometers from their place of residence to the university and 78.5% farther than 2 kilometers. This brings that, 33.7% of students use between 15 and 30 minutes traveling from their residence to their school. 28.3% of the students say they need between 30 and 60 minutes, 18.7% indicated that requires no more than 15 minutes, 13.8% require between 60 and 90 minutes and 5.4% over an hour and a half.

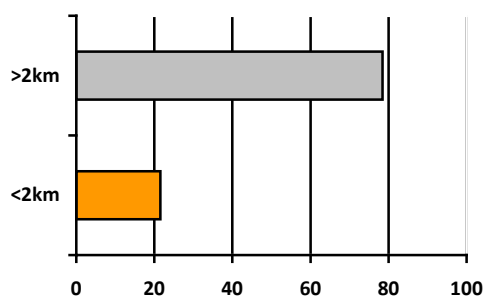


Fig.1: Distance (in kilometers) traveled in commuting during the week

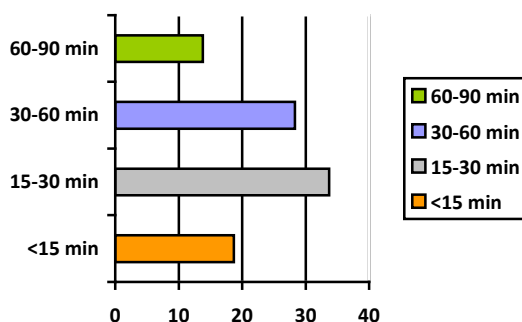


Fig.2. Time spent traveling to Campus (in minutes)

Relative to the **modal distribution of transport**, transport with students who regularly use are those observed in the following figure:

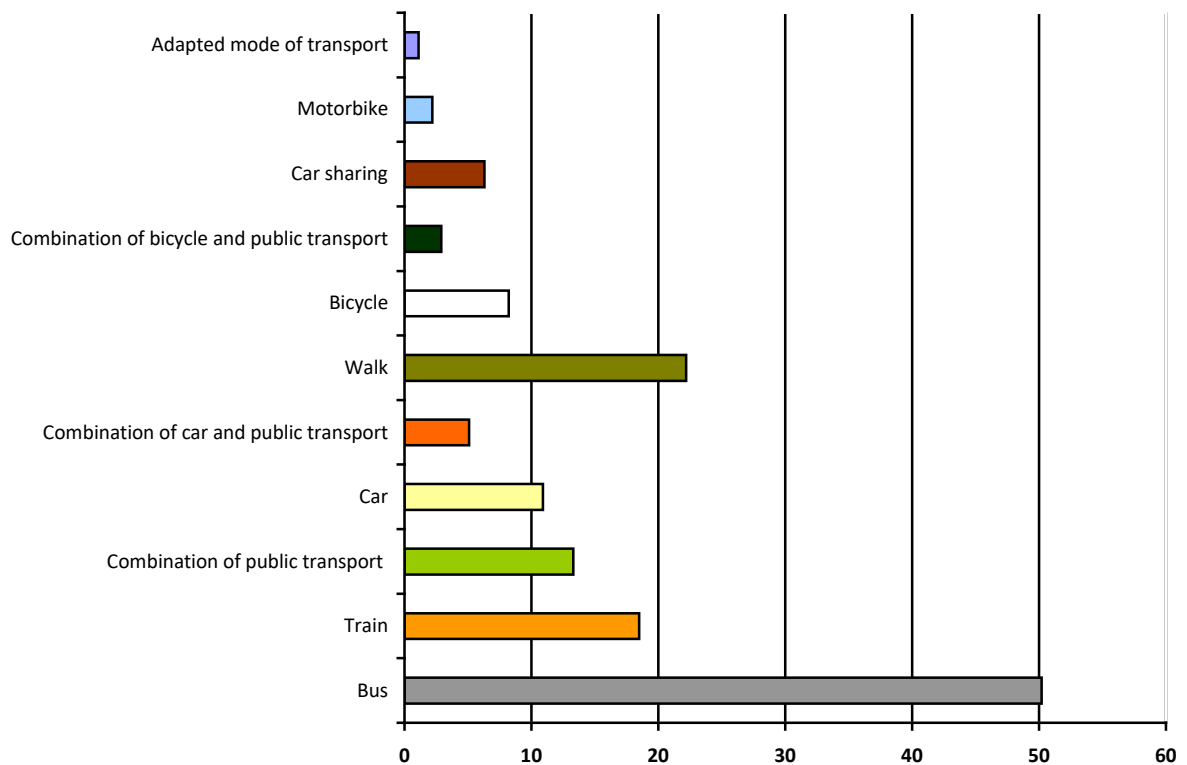


Fig.3 . Modal distribution of transport

The bus transportation is the most used by students who come daily to the Campus and 50,2% say they use it regularly. The reason argued for the use of this mode of transport is the impossibility to use an alternative option (53.3%). Comfort is the second most popular reason (35%) above the financial savings use (3.6%) and environmental awareness reasons (1.5%) or the level of security offered (0.5 %).

Furthermore, 60% of university students used as a regular mode of transports train. Obligatory (53.3%) and the comfort (35%) are more justified reasons above savings (3.6%), consciousness (1.5%) and / or safety (0.5%).

17.6% of students used a combination of public transport as a mode of transport. The 55.8% of students who used a combination of public transport identified compulsory for this election and 28.3% who values comfort. 7.5% points savings, 3.3% reasons of conscience and 1.6% for health reasons.

24.5% of students use the car as a regular mode of transport. Convenience (67%) is the reason argued for use above the obligatorines in the absence of alternative mode of transport (22.1%), savings (2.4%), safety reasons (1.8%) and consciousness (1.2%).

6.7% of students used a combination of car and public transport as the usual mode of transport for travel to / from school. Of these, 52.2% argues obligatoriness, 36.9% said the convenience as the primary reason and 6.5% economic reasons for its use.

A 23.6% of students walk daily to his school. The obligatoriness to move on foot (27.3%), health reasons (26.7%) and convenience (24.2%) are the most often mentioned by the students, followed by reasons of conscience (7.4%) and the cost savings of not using other mode of transportation (6.8%).

The 10.1% of students used the bicycle as a common mode of transport. Convenience is the main reason argued for employment (42%), followed by health reasons (23.2%), conscience (14.5%) and the savings achieved by this alternative (10.1%).

4.2% of students used as a regular mode of transport combination of bicycle and public transport. Comfort is the most mentioned reason (51.7%), followed by the obligatory (34.5%), health reasons (6.9%) and reasons of conscience and economic savings (3.4%).

7.2% of students travel daily to the Campus using car sharing. The most prominent reason for their choice are comfort (63.2%), the mandatory (16.3%), reasons of conscience (8.1%) and savings (6.1%) offered this alternative.

Almost 5% (4.5%) of the students used the motorbike as a regular mode of transport. The comfort provided this mode of transport is the most appropriate reason (80.6%).

The 1.2% students used an adapted mode of transport. The comfort provided (62.5%) and the obligatoriness (37.5%) were the reasons given.

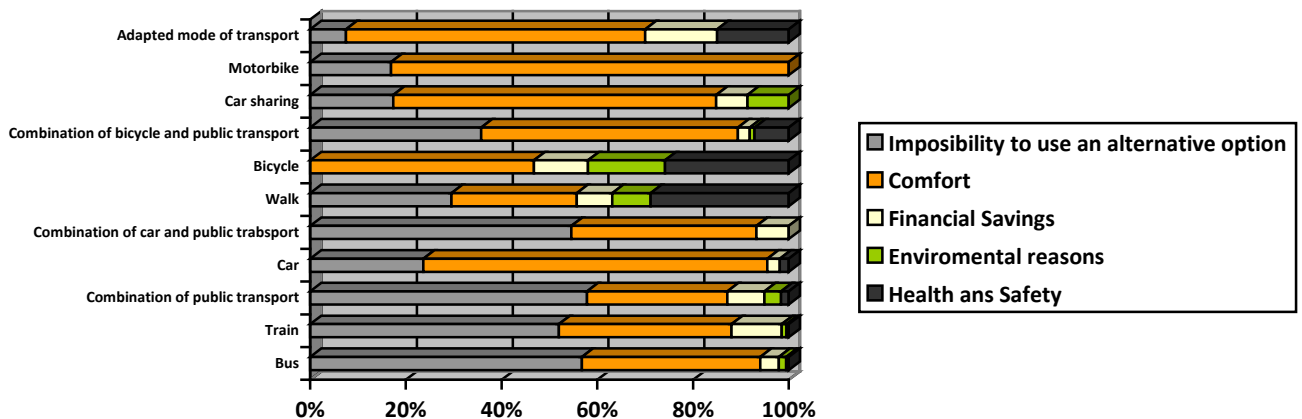


Fig.4 . Reasons for using a mode of transport

After analyzing the mode of transport used by the students, we have studied **the willingness to use another mode of transport.**

48.6% of the surveyed population is willing to use a different mode of transport. On the other hand, 51.4% of the students are not.

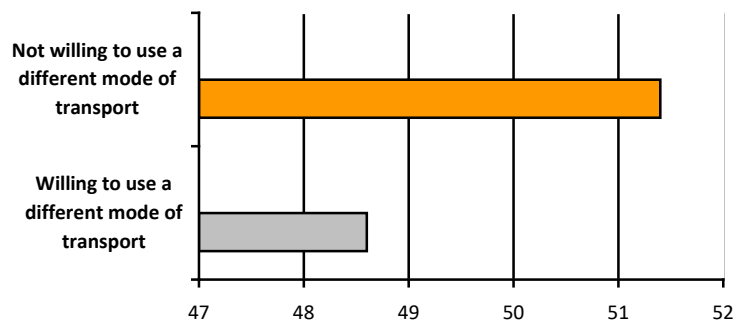


Fig.5 . The willingness to use another mode of transport.

Students who are willing to change their way of traveling, would be chosen the following means of transport:

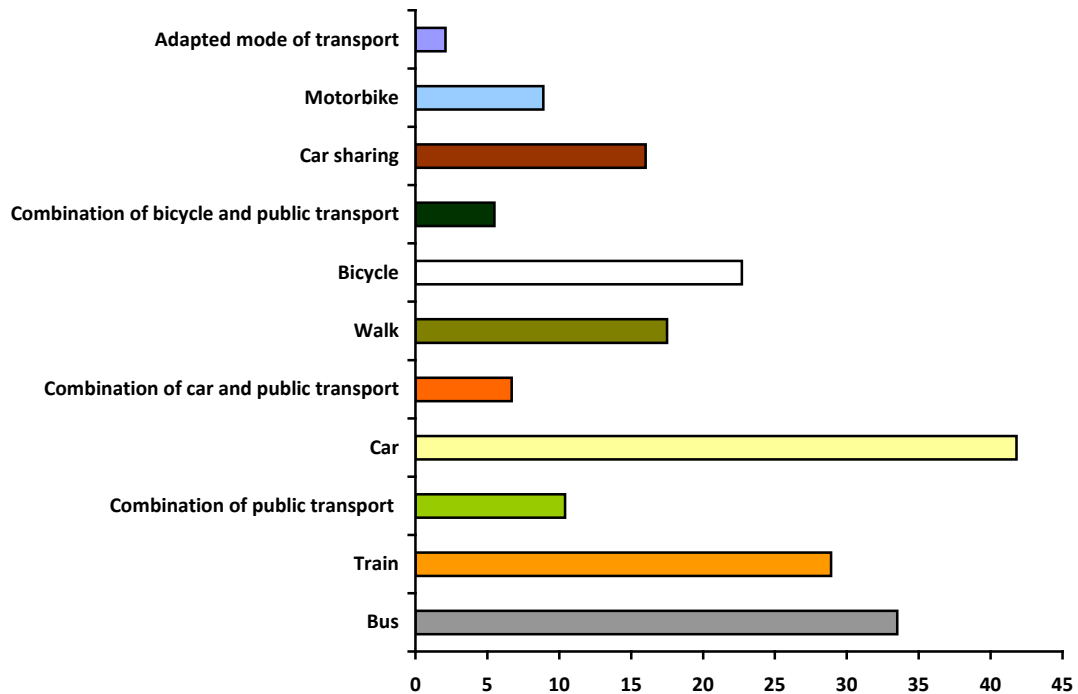


Fig.6 . Mode of transport willing to use

Of the total respondents showing willingness to change their usual mode of transportation, a third (33.5%) are inclined to the bus. They argue for this decision the convenience offered by this service (62.4%), the mandatory in the absence of other viable alternatives (11.9%), reasons of conscience (11%) and the cost savings (4.5%).

A 28.9% choose the train or tram and argue as fundamental reasons for this decision the convenience offered by this service (55.3%), reasons of conscience (15.9%), economic reasons (10.6 %) and the mandatory in the absence of other alternatives (7.4%).

A 10.4% of the students willing to change their usual mode of transport choose the combination of public transport as an alternative to regular mode of transport. More than half (52.9%) said that the convenience offered by this alternative, the mandatory (18.6%), the conscience (11.7%) and economic reasons (16,8%) are the reasons for this decision.

A 41.8% opt the car as a transport alternative to their usual mode of transportation. Among the reasons argued highlights the convenience it provides (86%) and, to a much lesser extent, the nature of their use in the absence of alternatives (4.4%) and the cost savings resulting from their use (3.7%).

A 6.7% choose the combination of car and public transport as an alternative to the usual mode of transportation. 59% argued convenience as the main reason for their use, followed by the obligatory (18.2%) and the cost savings offered by this alternative (13.5%).

A 17.5% of the students interviewed are willing to move walking to their school as an alternative to regular mode of transport. Health reasons (43.8%), convenience (28%), the cost savings (14%) and the absence of other alternatives (10.5%) are the reasons argued.

A 22.7% of the students surveyed would opt for the bicycle as alternative transportation. Health reasons (44.6%), convenience (28.4%), reasons of conscience (16.2%) and savings (9.4%) are the most used to argue this decision.

Only 5.5% choose the combination of bicycle and public transport as an alternative to their usual mode of transportation. Convenience (50%) is the most mentioned reason followed by the obligatory (33.4%) and health reasons (16.6%).

Almost one in six respondents (16%) opt car sharing as an alternative to the usual mode of transportation. The reason argued to justify this decision is convenience (61.5%) followed by the cost savings (19.2%), reasons of conscience (7.6%) and the requirement (5.7%).

An 8.9% opt the motorbike as an alternative to the usual mode of transportation. The comfort (86.2%) is the main reason for this decision followed by the obligatory (10.3%) and savings (3.4%).

A 2.1% of the students interviewed choose adapted transport as an alternative to their usual mode of transportation. The comfort (71.4%) and reasons of conscience (14,3%) and health (14.3%) are given to explain this decision.

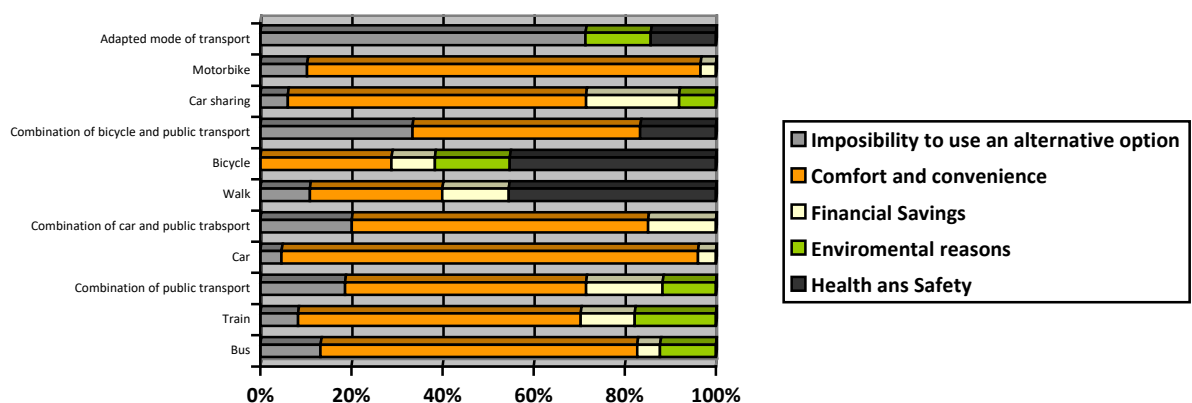


Fig.7 . Reasons for choosing a mode of transport

There are a lot of factors that influence travel mode choices and one of the most important is the provision or not of the car. It is why the study also analyzes the provision of car, whether or not used for the displacement to college and so on.

Just under a third (32.5%) of the students that study in universities located in the Campus have car.

Provision of car	Not provision of car
32,5	67,5

Table 3. Provision of car

A similar percentage (32.7%) says that use the car on a regularly or occasionally to move to/from the University.

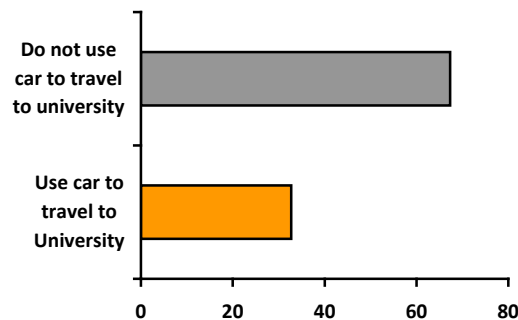


Fig.8 . Use the car for travel to University

It is interesting to note that a 53.2% of the respondent group is willing to change the car to public transport. However, the conditions which would indicate to replace the use of private vehicles to public transport are the existence of a higher frequency of services, the establishment of any bonus who gives cheaper public transport, the existence of more routes and/or more direct routes to the University, improved public transport equipment and the establishment of a fee for parking for private vehicles.

It is interesting to note that a 61.8% of students surveyed were in favor and willing to share car. Among the reasons are the cost savings of sharing costs, the opportunity to travel by car when this is not available and traveling accompanied.

Conclusions

Contributions and Proposals

Universities should take a leading role in the search for concrete solutions to environmental conflicts that our society faces. However, from the data obtained from the questionnaire is concluded that despite all the attempts made in recent times, no doubt that Basque youth remain largely accusing from the point of view of behavior around the current forms of mobility, some of the weaknesses that lead to the use of public transport, non-motorized alternative mode such as cycling, the use of car sharing, etc. not done properly.

In this way, daily journeys between home and the university campus constitute a significant proportion of traffic problems in the neighbourhood where the university is located. Paradoxically, these traffic problems are frequently referred to by the university community as a justification for the use of the car to access the university. However, these journeys create even more traffic problems. This constitutes a problem from a safety and environmental point of view and also more importantly regarding the long term alleviation of these problems and the

increased people's awareness. University's community do not take up walking or cycling as they should do. So the measure is focused primarily on develop sustainable travel behaviour in the long term in accordance with the necessities of the specific community group chosen, but is specially designed for students because they are an strategic target group in the long term as we point out.

The first important finding is that the car is gaining ground in the overall mobility, with a widespread presence in all areas, regardless of the reason. Moreover, if we consider the age of the students, there is a high rate of motorization. This is the enormous roots and prevalence in the use of private vehicles.

Although this is presented as a weakness, the economic slowdown has stopped the growth of the private vehicle fleet , which should reduce the high rate of motorization. This along with the rising price of fuel is presented as an opportunity to change the mode of transport to another more sustainable.

On the other hand, there are relatively short distances between residential areas and college students. This is a strength that should encourage pedestrian mobility and bicycle commuting. Still, other mobility motorized transport outstrips these less polluting means.

Opportunity presents itself, the great willingness to change how you scroll the students surveyed. We see that in general, respondents are willing to change their way of getting around a more sustainable environment.

In this sense, the commitment of the University relating to the implementation of actions in sustainable mobility is a great opportunity. So, once the real situation is known, the agents involved on finding a more sustainable mobility, should exploit the availability offered by the university students to change how you scroll to a more sustainable way. In this sense and in order to offer help, we analyze the strategic positions to be provided, in the future, to improve those safer mobility patterns, sustainable, equitable and efficient.

The path of action for sustainable mobility should be seen in the three components of sustainability. Firstly we have the economic component: efficiently meet the mobility needs resulting from economic activities, thereby promoting the development and competitiveness. Secondly we have social component: to provide suitable conditions of accessibility of students to labor markets, goods and services, promoting social and territorial equity, and healthier modes of transport. Finally and not least we have environmental component: to contribute to environmental protection and health of students in particular and citizens in general, reducing the environmental impacts of transport, contributing to reducing emissions of greenhouse gases and optimizing the use of non-renewable resources, especially energy.

We propose the following strategies for students are based on a diagnosis of the situation and present a series of actions as a guide for development, are designed to be students, proactively, who develop, since they are including the generator of wealth and have the task of playing the lead role. Each person will prioritize actions deemed necessary depending on their current situation.

These proposals can be applied in the context of developing an alternative Mobility Plan or individually to solve specific problems affecting the mobility of students in a study center.

As in many other planning strategies it is important not only to have a plan but also to pay close attention to planning processes and implementation. Some measures to combine the implementation of a mobility plan may include the following:

	USING PUBLIC TRANSPORT	RECOVER OR IMPLEMENT SCHOOL ROUTES	SERVICES EXPRESS / SHUTTLE	ENCOURAGE THE USE OF BICYCLE
Stakeholders involved:	<ul style="list-style-type: none"> -Group ridership students. -School management. -Public or private companies transport concessionaires. -Town halls. 	<ul style="list-style-type: none"> -Student's road users or potential users of school. -School. -Companies that provide transport services 	<ul style="list-style-type: none"> -Students -School Management -Services operating companies. 	<ul style="list-style-type: none"> -Specific group of students on the use of the bike. -School management -Association's cyclists in the area. -City.
Resources needed for improvement:	<ul style="list-style-type: none"> -Bus lanes or bus-HOV on motorways. -Canopies accessible, safe and comfortable. -Bus fleet renewed and accessible. -Order opening railway stations or halts. -Provide updated information on schedules, stops, routes and frequencies. 	<ul style="list-style-type: none"> -Contract with a transport company: to provide a shuttle transport service regular of regular character. -These services must be adapted to the needs of each school: minibus routes or bus routes. 	<ul style="list-style-type: none"> -It is well applied to both regular transportation as a service that connects directly to a transport interchange or station without making intermediate stops and choosing faster routes. -It is desirable that the routes flow through low traffic areas or have priority over other media. 	<ul style="list-style-type: none"> -Red cyclist or cycling itineraries favorable for the municipality. -Parking for bikes safe inside the school. -Room showers and changing rooms. -Polishing on best routes and conditions of accessibility to public transport.
Advice for students:	<p>The best way to change the mode of transport when it is private car user is to try a school day computing (through existing information) travel times and convenient travel planning.</p> <p>You must calculate all stages of the journey between home and school.</p>	<p>Organization of journeys to school:</p> <ul style="list-style-type: none"> -It must be flexible to adapt to the demands of students. It should avoid unnecessarily prolonged itineraries and travel time. -Several mini routes are preferred routes covering shorter than a single route to increase the travel time of students residing in the head. -Schedule should be updated periodically to adapt to the demand for new students. 		<p>You must create a student group bicycle users. You can edit an information leaflet which collects basic recommendations to make the journey to school by bike. Among others we can say that:</p> <ul style="list-style-type: none"> -The vehicle is in good condition, where appropriate clothing and all safety systems (regulatory vest, helmet, lighting, etc.). -Respect traffic rules and road safety. -Plan the route and perform a test ride in the weekend to calculate the time spent. -Start cycling a day of any class. -Find a classmate who performs the same route.
Multimodality:	<p>There should be connections that facilitate temporary physical transfer between different modes and mode of transport.</p> <p>Since some students take more than one step in traveling to school, you need to change transport mode having the lowest possible waiting time.</p>	<p>Stops shall be provided on those points which are transport hubs and interchanges or train stations.</p>	<p>You must connect with interchanges and stations in coordination with the services raised so as to avoid waiting periods.</p> <p>You could negotiate between the direction of the school and mass transit operators (rail, metro, tram or bus) to adapt their services to the schedules of entry / exit of the school.</p>	<p>For those who reside more than 5 kilometers from school, railway stations can extend the coverage radius cyclist.</p> <p>In Donostia, RENFE and Euskotren enables access by bike on the train. To ensure the conditions will be found on the website.</p> <p>Students who use the bike should have secure bike parking at railway stations.</p> <p>Finally, they can request bike rental systems at interchanges that provide access to the place of study as a bike shuttle.</p>
Benefits:	<ul style="list-style-type: none"> -Saving transport time. -Economic savings. -Reduction contaminants. -Decreased volume of vehicles in circulation. -Reduced risk of accident in itinerant. -Students come to school rested and stress free. It is a viable option for students who do not drive. -Reduces the need to create more space for parking. 	<ul style="list-style-type: none"> -Economic, cost to be borne by the school. -Reduces tiredness and stress of the student. -Reduces the risk of accident. -Bring closer the student to the school entrance. -The delays caused by congestion are not taken into account when the student is in the path (in this case you should consider the time of transport and time of study). 	<ul style="list-style-type: none"> -Saving transport time. -Economic savings. -Reduction contaminants. -Decreased volume of vehicles in circulation. -Reduced risk of accident in itinerant. -Students come to work rested and stress free. -It is a viable option for students who do not drive. -Reduces the need to create more space for parking. 	<ul style="list-style-type: none"> -Improves fitness and health of students. -Reduces energy consumption, air pollution and noise in cities. -Students who previously led save money and in many cases can receive financial compensation in kind (free credits, bicycle, bonds to the gym, ticket restaurants.).

	PROMOTE MOVEMENT ON FOOT	PROMOTING THE CAR SHARING	MANAGING THE PARKING	TIME FLEXIBILITY	TELESCHOOL
Stakeholders involved:	-Students. -School. -Town halls. -Pedestrians Associations.	-Students found in the car-sharing group. -School. -Car hire companies to share	-School. -Students. -City.	-School. -Students	-School. -Students who are able and willing to adapt to these new forms of study.
Resources needed for improvement:	Itineraries appropriate to facilitate the march on foot (sidewalks, crossings, places to stay and the meeting journeys protected from the weather, etc.). -Designated shower and change of clothes (can be shared with cyclists).	-Pairings computer program, web page on the internet or intranet. -Questionnaire on travel preferences and the origins and destinations. -Informal meetings to strengthen the relationship between future fellow travelers. -Model contract to sign the agreement between car sharing (insurance, expenses, etc.). -Program back home guaranteed. -Car Park (rental or purchased by the school). -Students who take advantage of this system can sign a contract specifying the different travel conditions; sharing of expenses, changing vehicles, etc.	-Private parking spaces on school property or rented. -Computerized card program. -Maintenance Service Parking.	-Design individual scheduling (For example: Teaching On-line)	-Housing students. -Telecentre. -Computer and telephone connection.
Advice for students:	-To study the best route between home and school, looking for the shortest path and safe, the routes should be well lit. -The recommended distance is less than 2 kilometers. -Previously consider the footwear of choice, it should be comfortable, the clothes will be appropriate and should not be overloaded. You could ask the school to install some lockers for books that do not have to take home the day before. -You can start making a part of the journey by public transport or car, and the rest walking, and finally complete the whole journey on foot. -On the other hand, you can start walking to school one day, two days next week so until we complete the week. -It is advisable to try to walk together with a classmate or faculty that is close to our school. -Multimodality: -Good pedestrian connections to transit stations (interchanges and railway stations) which satisfy the conditions of accessibility and security.		What is? Conditions must exist when parking to give priority to those students most in need: -People with reduced mobility -Students carpooling -Other cases to consider.		Organization proposal: -The TV studio can be full or part time, being able to face coordination meetings with the teacher at school (once a week or every 15 days). -Another way of putting the TV studio is only the weekdays most contentious for congestion and other access to school. The days and how they make must be an agreement between student and teacher.
Multimodality:		It should be expected that this system can be made a part of the route, for example: a person who lives far you can take the train and then make the journey to school by car sharing.	Implementation of the proposal: -Existing parking shall be ordered by counting the exact number of places available. All must comply with the appropriate dimensions and not disrupt the movement of other modes (pedestrian or cyclist). -It should ensure that the seats are protected from the weather and parking space is properly urbanized accompanied revegetation that will enhance the look of these spaces as harsh.	Features: There are certain classes that are not subject to a specific time or stage of the course, simply have to be made within a specified period but no matter at what time. For this reason it can adapt the entries and exits of the school to periods of circulatory congestion, which will save time jams. These flexible hours, also be applied to the personal needs of students.	-The student avoids traffic congestion on the way to work. -It also mode saving money. -The student can manage their time as they see fit.
Benefits	A physical form and health of students. Economic savings. Reduced environmental impacts for the traffic to work.	Students found in the car-sharing group. School. car hire companies to share	-School. -Students. -City.	-School. -Students	-School. -Students who are able and willing to adapt to these new forms of study.

Table4 . Proposals

To carry out the above proposals should require the University to make arrangements with the administration to get funding. The University also has to do their part so that students get involved in any of these alternative modes are compensated in some way, either by credit or some other factor that the student sees fit.

Collaboration among stakeholders, encourage sustainable modes of transport and insurance, discourage the use of private transport and learn about the regulatory framework are some of the measures that can be performed in the school to improve labor mobility.

Measures taken and results obtained

At this point let's see how the measures taken have progressed at the University under study:

The UPV formed a Mobility Management Team with the aim to promote changes in the organisational model of the University, wherever possible, in order to ease the use of collective transport and other energy-saving transport means.

A Mobility Management Plan was defined for the UPV, including measures under the following strategic lines:

1. Create the adequate structural conditions to guarantee the viability of the actions.
2. Information and awareness programs for all the students and staff.
3. Active participation in decision making structures and institutional bodies to promote a sustainable change and effectiveness in mobility matters.
4. Actions to promote the use of public transport among the university community.
5. Bicycle promotion at the campus.
6. Pedestrian promotion at the campus.
7. Car sharing and car pooling promotion at the campus.
8. Inclusion of "sustainable mobility" in every university's learning processes.

In the framework of this Plan, UPV organised awareness raising campaigns for the UPV/EHU to communicate the definition of the plan in general and some of the specific measures with the goal to change the habits towards more sustainable transport modes and towards more responsible and efficient car driving.

Another important achievement of the measure was the setting up of an Observatory for Mobility Management. This provided a framework for common work and exchanges of experience, as well as for monitoring mobility management measures. It was an expression of the political, financial and social will to foster the development of the Plan, including the possibility of

extending it further in order to get other transport plans off the ground. Invitations to participate were given to different public institutions and private entities or NGOs with an interest in the subject.

Finally, the sustainable mobility concept was included throughout the University educational and curricular system. Sustainable mobility analysis was included in master degrees such as Sustainable Development Postgraduate Course and Local Agenda 21 Manager. Also a "Sustainable Mobility and Road Safety" subject was included in several degrees, either as a trunk subject or an elective one, depending on the degree.

Finally, the results of the measures taken were as follows:

Bicycle use significantly increased in modal share after the implementation of the Mobility Management Plan at the campus (3.4 percent increase), while walking slightly decreased (-1.4 percent). Also, the number of trips made by car and motorbike decreased (7.3 percent and 3.4 percent respectively), while carpooling, which represented a 1.4 percent of all trips in 2014-2015, accounted for 25.3 percent of all passenger trips accessing the campus after the implementation of the Plan. These results show that the carpooling scheme implemented is widely used by students and staff. As a consequence, the average occupancy rate for cars increased from 1.2 to 1.7 occupants per car.

From a public perception perspective, the most remarkable result was the increased accessibility and security perceived by cyclists resulting from the changes in accessibility and mobility patterns at the University.

After the implementation of the measure, most of the university community (90 percent) knew the measure that focuses on the campus. They agreed with the actions taken and perceived a comprehensive sustainable mobility planning for the campus as an urgent need.

Study Lines Open

In this section, new lines of study will deepen and extend the findings of this study. We believe that this work does not present a definitive model in the analysis of mobility patterns, but should be a point and followed.

The following are the most interesting:

The project has been framed within the UPV/EHU. We are currently working with a private University of San Sebastian, Deusto, and making a comparison between the results obtained at different universities.

We could expand research to other universities, making a comparison between the results obtained from the different universities. The comparative analysis can be extended to other regions of the state.

We can also expand the study to the faculty at the university, making a comparison between students and college professors.

It could also extend the study to companies, making comparison between the results obtained between different companies, comparative analysis can be extended to other regions of the state.

It may be interesting to perform the same analysis at different observing times.

In short, the possibilities opened by this investigation are many and we continue to work in the future.

Finally, we insist that the University must become a center exemplary and laboratory of Practice sustainable development

References

AEMA, Agencia Europea De Medio Ambiente, 2014 El medio ambiente en Europa. Tercera Evaluación.

Agencia Europea del Medio Ambiente, 2001. Indicators Tracking Transport and Environment Integration in the European Union.

Arana, Pilar. Influence of weather conditions on transit ridership: A statistical study using data from Smartcards. *Transport Research Part A: Policy and Practice*.

Balsas, C., 2002. New directions for bicycle and pedestrian planning in the US. *Planning Practice and Research* 17 (1), 91–105.

Balsas, C.J.L., 2003. Sustainable transportation planning on college campuses. *Transport Policy* 10, 35–49.

Basu, D., Maitra, B., 2010. Stated preference approach for valuation of travel time displayed as traffic information on a VMS board. *J Urban Plan Dev* 136(2), 214–224.

Beatley, T., 2000. *Green Urbanism, Learning from European Cities*, Island Press, Washington, DC.

Booz Allen Hamilton, 2003. ACT Transport Demand Elasticities Study. Report for Department of Urban Services, ACT, Australia.

Brown, J., Baldwin Hess, D., Shoup, D., 2001. Unlimited Access. *Transportation* 28, 233–267.

Clarke, A., 1997. Green modes and ISTEA in the United States. In: Tolley, R., (Ed.), *The Greening of Urban Transport*, 2nd ed, Wiley, New York.

Cleary, J., McClintock, H., 2000. The Nottingham cycle-friendly employers project: lessons for encouraging cycle commuting. *Local Environment* 5 (2), 217–222.

Collantes, G.O., Mokhtarian, P.L., 2007. Subjective assessments of personal mobility: what makes the difference between a little and a lot? *Transport Policy* 14, 181–192.

CUTR, 1996. *Commute Alternatives Systems Handbook*, Author, Tallahassee.

Departamento de Medio Ambiente y Ordenación del Territorio, *Anuario Ambiental* 2008, 2008.

DNP, Departamento Nacional de Planeación, 2010. *Transporte de carga y Agenda Interna*.

Domene, E., Saurí, E., 2006. Urbanisation and water consumption: influencing factors in the Metropolitan Region of Barcelona. *UrbanStudies* 43(9), 1605–1623.

Eriksson, L., Garvill, J., Nordlund, A.M., 2008. Interrupting habitual car use: the importance of car habit strength and moral motivation for personal car use reduction. *Transport Research Part F* 11, 10–23.

Estevan, Antonio y Sanz, Alfonso, 1996. *Hacia la reconversión ecológica del transporte en España*, Madrid, Bakeaz, Los libros de la catarata y CCOO.

Forester, J., 1994. *Bicycle Transportation*, 2nd ed, MIT Press, Cambridge.

- Forester, J., 2001. The bicycle transportation controversy. *Transportation Quarterly* 55 (2), 7–17.
- Frankena, M.W., Pautler, P.A., 1984. An Economic Analysis of Taxicab Regulation, US Federal Trade Commission, Bureau of Economics Staff Report.
- Gardner, G., 1998. When cities take bicycles seriously. *World-Watch* 11 (5), 16–23.
- Gobierno Vasco, 2007. Estudio sobre Juventud y transporte.
- Gosling, G., 2008. Airport Ground Access Mode Choice Models: A Synthesis of Airport Practice. Airport Cooperative Research Program Synthesis 5, Transportation Research Board, Washington D.C.
- Hanson, S., Hanson, P., 1976. Problems in integrating bicycle transportation into the transportation planning process. *Transportation Research Record* 570, 24–30.
- Hensher, D.A., Rose, J.M., Greene, W.H., 2005. *Applied Choice Analysis: A Primer*. Cambridge University Press, Cambridge.
- Hodgson, F., Tight, M., 1999. Raising awareness of transport issues: the potential to bring about behavioral change? *International Journal of Sustainable Development and World Ecology* 6, 281–292.
- Horna, J., 1994. *The Studies of leisure*, Oxford University Press.
- Ihobe, 2012. Plan de Movilidad Sostenible.
- Kay, Jane Holtz, *Asphalt Nation*, 1997. How the automobile took over America and how we can take it back, California, University of California Press.
- Llano, C., 2009. Estudio de Movilidad.
- Litman, T., 2001. Campus Trip Reduction—TDM Encyclopedia (available at <http://www.vtpi.org/>).
- Ministerio de Fomento, 2015 (available at www.fomento.es).
- Miralles-Guasch, C., 2001. Circular o arribar? *Revista Catalana de Sociologia* 14, 171–183.
- Miralles-Guasch, C. and Domene, E., 2010. Sustainable transport challenges in a suburban university: The case of the Autonomous University of Barcelona. *Transport Policy* 17, 454–463.
- Newman, P., Kenworthy, J., 1999. *Sustainability and Cities—Overcoming Automobile Dependence*, Island Press, Washington, DC.
- OCDE, 1996. Strategies for housing and social integration in cities.
- OCDE, 1997. Better understanding our cities. The role of urban indicators.
- Poinsatte, F., Toor, W., 2001. *Finding a New Way: Campus Transportation for the 21st Century*, 2nd ed, University of Colorado, Boulder.
- Pooley, C.G., Turnbull, J., 2000. Modal choice and modal change: the journey to work in Britain since 1890. *Journal of Transport Geography* 8 (1), 11–24.
- Pucher, J., 1997. Bicycling boom in Germany: a revival engineered by public policy. *Transportation Quarterly* 51 (4), 31–46.
- Pucher, J., Komanoff, C., Schimeck, P., 1999. Bicycling renaissance in North America? Recent trends and alternative policies to promote bicycling. *Transportation Research A* 33, 625–654.
- Pucher, J., Dijkstra, L., 2000. Making walking and cycling safer: lessons from Europe. *Transportation Quarterly* 54 (3), 25–50.
- Queensland Transport, 2000. National Competition Policy Review of the Transport Operations (Passenger Transport) Act 1994, Sept 2000.
- Rose, J.M., Bliemer M.C.J., 2013. Sample size requirements for stated choice experiments. *Transportation*.

- Sandow, E., 2008. Commuting behaviour in sparsely populated areas: evidence from northern Sweden. *Journal of Transport Geography* 16, 14–27.
- Schimeck, P., 1996. The dilemmas of bicycle planning, paper presented at the Joint International Congress ACSP/AESOP. Toronto, July (available at <http://danenet.wicip.org/bcp/dilemma.html>).
- Thøgersen, J., 2006. Understanding repetitive travel mode choices in a stable context: a panel study approach. *Transportation Research Part A. Policy and Practice* 40 (4), 238–261.
- Tolley, R., 1996. Green campuses: cutting the environmental cost of commuting. *Journal of Transport Geography* 4 (3), 213–217.
- Tolley, R. (Ed.), 1997. *The Greening of Urban Transport, Planning for Walking and Cycling in Western Cities*, 2nd ed, Wiley, New York.
- Toor, W., 2003. The road less travelled: sustainable transportation for campuses. *Planning for Higher Education*, 131–141.
- Shoup, D., 1997. The high cost of free parking. *Journal of Planning Education and Research* 17 (1), 3–20.
- Train, K.E., 2009. *Discrete Choice Methods with Simulation*, 2nd edn. Cambridge University Press, Cambridge.
- Vuchic, V., 1999. *Transportation for Livable Cities*, CUPR, New Brunswick.
- Weenen, H., 2000. Towards a vision of a sustainable university. *International Journal of Sustainability in Higher Education* 1, 20–34.
- Whitelegg, J., 1997. *Critical Mass, Transport, Environment and Society in the Twenty-First Century*, Pluto-Press, Chicago.