1. INTRODUCTION

One of the most common characteristics of small and medium size Greek cities, by means of their population, is that the pupils of every single public primary school live in a specific nearby area. The distance from residence to the primary school does not exceed 1-1.5 km and that’s due to the way Greek cities were built, which is densely populated urban areas with apartment buildings of 4-5 floors.

Every single working day during school time, thousands of pupils move walking from home to school and vice versa affecting the traffic in a wide area around school. A lot of parents, mostly of the younger pupils, insist on bringing to and picking them from the school using their private car, either due to relatively long distance, or due to safety reasons. Taking also into account that some pupils (the elders) use public transportation (mainly busses), it is obvious that the traffic and safety conditions during peak hours (school opening and closing) are getting harder.

Another characteristic of small and medium size Greek cities is the lack of a remarkable number of private primary schools. In any case, the pupils of private schools are moving using private school busses, because the schools are located to the suburbs, mostly away from residence areas.

The problem of pupils’ safety during travel to school is arising from the fact that there is no plan according to which the existing urban areas have been developed. The location of primary schools in most cases is random, without any pre-existing infrastructure and the road safety, beyond several traffic calming measures, is taking into account during traffic management processes and studies. Nowadays, only during urban area widening, by incorporating new areas, there is a clear land use designation in which the school areas and the relevant infrastructure are well designed.

During the last decades the car ownership in Greece has increased dramatically, making the travel in urban areas more and more exhaustive and stressful, increasing thus the safety problem for the pedestrians and much more for the pedestrian pupils.

The scope of this paper is to exhibit all the parameters concerning a safe travel to school, taking into account the discreteness of the small and medium Greek cities urban area and to point out the axes for the conversion of existing road infrastructure to safe school travel paths.
The benefits of using well designed, safe and attractive travel to school paths can be summarised as follows:

- Upgrade the road safety level of pedestrian pupils on their way to and from school.
- Upgrade the road safety level of all the users of these paths (or part of these paths) during all day. This fact is of major importance regarding the part of population with specific needs, such as Aged, handicapped etc.
- Car use reduction for school travels and thus better traffic condition and environmental pollution reduction.
- Upgrade of pupils’ adaptation to traffic environment.

2. INTERNATIONAL EXPERIENCE

The problem of children road safety is of major importance for Greece and for Europe as well.

Recently published European Road Statistics (2006) give a number of 19 road fatalities per million inhabitants for EU 25 average (age group 0-14 ) and a number of 25 fatalities for Greece.

The problem of students’ safety on their travel to school significantly differs from country to country due to the different urban organization and plan. The distance of primary schools from the residential areas is a parameter of major importance regarding the mode of transportation.

Greek cities, though they have a significant particularity, they have much more similarities with other European countries that the US ones.

The basic travel mode to primary school in Greece is on foot, so the bibliographic review is focused mainly on child pedestrian safety.

There have been a number of research studies on the topic of pedestrian traffic flow in different countries under various traffic conditions, but few studies have been dealt with conditions of mixed traffic of pedestrians, bikes and cars. Mixed traffic in narrow streets is very important to many countries where pedestrian spaces have not been secured in spite of rapid motorization and economic growth.

With this background, Kwon at all, (1998) has analyzed the interaction phenomena among pedestrians, bicycles and cars in terms of influence distances, behavioural changes of pedestrians with road traffic conditions, and time and space concepts for road occupancy indices. Finally, level of service standards for mixed traffic conditions have been suggested to assist with the evaluation of these road facilities.

Pedestrians prefer to walk along streets that are safe and comfortable for walking. Considering this, the sidewalk and street use behaviour of pedestrians was observed for different street environments and different traffic conditions.
flow conditions. While the decisions by pedestrians to either use the sidewalk or the street more stochastic than deterministic, Kwon et alls (1998), tried to find any trends or parameters which reflect these behavioural characteristics. Factors influencing the walking position of pedestrians were observed for survey streets that had various street environment conditions and level of traffic. There is a significant relationship between the share of pedestrians walking on the sidewalk and the adjacent street's car speed, car flow per lane, and pedestrian flow per unit sidewalk width.

This result shows that the share of pedestrians using the sidewalks increases with increased car speed and car traffic flow. However, it decreases with an increase in pedestrian traffic flow because the pedestrians tend to avoid conflicts with others.

A lot of research work has also been done, regarding walk ability, pedestrians rights etc. ((2005), Pedestrians Research Problem Statements, Transportation Research Circular E-C084) and ((2002) Walkability Checklist U.S. Department of Transportation)


As traffic grows worse, parents become more worried about letting children make their own way to school, and more likely to drive them there. Up to one in five cars in the morning rush hour is now on the school run. That's four times as many as twenty years ago. The apparent result is more traffic... and more danger to children. Parents are also influenced by other pressures. Anxiety about strangers worries about bullying and plain lack of time in the mornings all encourage people to choose the car.

Children driven to school are losing out in lots of ways. In busy traffic, children inside a car breathe in more pollution than they would by walking along the pavement. Children need the daily exercise that walking or cycling to school can offer. Evidence shows that more active children are likely to become more active adults. That means less risk of heart disease and other health problems in later life. For older children, making their own way to school is a chance to learn 'skills for life', becoming more independent and self-confident.

A school travel plan is a series of practical steps for improving children's safety on the school journey. The project has benefits for both the school and the wider community. It aims to:

♦ reduce accidents and danger on the journey to school
♦ enable parents and children to choose walking, cycling and public transport with confidence
♦ cut congestion at the school gate
♦ improve children's health and fitness through walking and cycling

©Association for European Transport and contributors 2006
♦ equip children with better road awareness and give them familiarity with public transport
♦ give children the opportunity to have a say in decisions which affect them
♦ provide an interesting focus for class work within the national curriculum
♦ build links within the whole school community
♦ make the area around the school safer and more enjoyable for everyone.

A school travel plan works by looking in detail at children's needs on the school journey. Parents, governors, teachers and children work together to find the right solutions for their school. By involving the local authority and other outside agencies it can be made safer and easier for children to walk, cycle or use public transport. A plan can be geared to the needs of a primary or a secondary school.


The targets of such strategic research programs may be:

♦ Social, economic and environmental factors in child pedestrian accidents
♦ Child risk perception
♦ Child pedestrian training
♦ Training parents
♦ Child cycle training
♦ Guidelines for safer journeys to school
♦ Computer-based child pedestrian training
♦ Training children in the use of designated crossings
♦ Road safety of children with disabilities

Children in the United States travel to and from school and school-related activities by a variety of modes ((2002) The Relative Risks of School Travel - A National Perspective and Guidance for Local Community Risk Assessment). Because parents and their school-age children have a limited understanding of the risks associated with each mode, it is un-likely that these risks greatly influence their school travel choices. Public perceptions of school transportation safety are heavily influenced by school bus (i.e., “yellow bus”) services.

When children are killed or injured in crashes involving school buses, the link to school transportation appears obvious; when children are killed or injured in crashes that occur when they are travelling to or from school or school-related activities by other modes, however, the purpose of the trip is often not known or recorded, and the risks are not coded in a school-related category. Despite such limitations and the fact that estimates of the risks across school travel
modes are confounded by inconsistent and in-complete data, sufficient information is available to make gross comparisons of the relative risks among modes used for school travel and to provide guidance for risk management.

The risk factors associated with the variety of transport modes are complex and highly interrelated. ((1996) A Guidebook for Student Pedestrian Safety) Changes in any one characteristic of school travel can lead to dramatic changes in the overall risk to the student population. Thus, it is important for school transportation decisions to reflect input from those representing a spectrum of disciplines and perspectives, including policy makers, transportation planners, traffic engineers, school administrators, drivers, parents and students, and possibly others who may have knowledge or expertise regarding the use and safety of the various modes used for school travel.

Road traffic accidents are one of the main causes of death and injury to children of school age.

As a major countermeasure to this threat, road safety education is an essential part of a child's education. It can contribute to the general educational goals of the whole curriculum by promoting moral, cultural, mental, and physical development and preparing children for the opportunities, responsibilities and experiences of adult life. ((2002) Road Safety Education in Primary Schools, BITER – TRL, London)

A recent national survey of British schools provided a wealth of ideas from teachers for helping children to find out about: how to keep themselves and others safe, now and in the future; the road environment and how it functions; how to influence changes in that environment.

3. RESEARCH SETUP

The research was based on questionnaire, which was designed in order to give all the essential data to evaluate:

- The existing road infrastructure (pavement, sidewalks, traffic lights, pedestrian crossings, vertical signs, pavement markings etc).
- The traffic characteristics (Traffic volumes, Speeding, parking etc).
- The condition of the most common travel to school paths. (Aesthetically, functionally).
- General safety issues. (Mavericks, marginal persons, gangs etc.)
- The level of pupils' training regarding their behaviour as pedestrians, cyclists or vehicle’s passengers.

A typical medium size Greek city, Volos, was selected to perform the research, because it has the most common typical characteristics such as:

- Densely populated wide centre. (Apartment buildings of 4-7 floors).
- Less densely populated suburbs (Apartment buildings of 2-3 floors and individual houses.)

©Association for European Transport and contributors 2006
City plan that consists mainly from parallel and transverse streets.

- Narrow urban streets (Pavement width of about 5-7m, sidewalk width of about 1-2 m).
- The primary schools are “neighbourhood schools” and the longest walking distance is of about 500 m.
- The primary schools are open only during the morning (from 8.0 to 14.30).
- There are no significant differences in social characteristics between the families of the pupils.

![City Map of Volos – Selected Primary Schools](image)

During the last 10 years, a measure that is popular and effective is the so-called “School Traffic Policemen” who are privates, usually parents, who voluntarily manage traffic, helping the pupils to cross safely wide roads in the area around the primary school.

In order to obtain typical data, five different schools without “School Traffic Policeman” were selected; three near the city-centre and two near the centre’s perimeter.

The primary school in Greece consists of six sessions-classes. In order to evaluate the travelling to school behaviour of the pupils, only the 4 upper classes were selected to involve in the questionnaire research, because in the first two classes the pupils are rather young and they usually are escorted by their parents or other members of their family.

In order to inform the parents for the research effort, a promotional campaign was held for about 2 weeks, using local TV, radio and newspaper spots.
Finally, about 500 questionnaires were collected and subjected to statistical processing using the statistical software SPSS, in order to bring out the essential conclusions regarding the needs, the expectations of the users and the preconditions towards the adoption of specific paths as the principle travel to school paths.

4. RESULT ANALYSIS

The analysis of the data derived from questionnaires leads to the following remarkable comments:

• The width of the sidewalks generally, is rather small and thus its serviceability to pedestrian flow is very low. The sidewalks need more systematic maintenance, because their surface condition, in most cases, is unacceptable. In minor junctions at grade, there is lack of sidewalk infrastructure, regarding handicapped pupils.

• It is always very difficult to cross wide streets (main arterials) due to high traffic volumes. During the peak hours (school opening and closing), this phenomenon is getting even worse.

• The traffic infrastructure (traffic lights, pavement markings, signs, barriers etc) has to be reviewed due to many deficiencies. Emphasis should be given to the optimization of traffic lights programs in order to serve better the pedestrian needs during the peak hours. There is lack of traffic infrastructure (facilities) regarding handicapped pupils.

• A lot of pupils prefer to cross the street at random locations rather than existing crosswalks at signalised intersections at grade and obviously this is due to lack of traffic education and culture.

• On the contrary, the raised crosswalks seem to be much more attractive to pedestrian pupils due to safety feeling they inspire.

• Illegally parked cars are obstacles of major importance, to the proper access to secondary roads, because they constrain the required visibility.

• In secondary streets, there is lack of road infrastructure, regarding handicapped pupils.

• The aggressive behaviour and the violation of pedestrian’s right of way are the most common problems arising from the vehicles’ drivers. It is remarkable that almost all the pupils and their parents consider this behaviour rejectable.

• Most of the pupils follow school travel paths along main streets due to safety reasons, although there is much more air pollution and traffic noise. That’s due to the existence of mavericks (dogs) and to the lack
of proper lighting (mostly in winter). On the contrary, there is still no unsafe feeling due to gangs’ action.

- The great majority of pupils and their parents consider the usually followed path to school as unpleasant, due to lack of neatness and of course due to high pollution levels. It is obvious that a path to school, neat and “elegant” is far more attractive, even if it may be longer.

- Almost none of the pupils consider the travelled distance to school as exhausting and that’s due to very short distances they have to cover.

- A remarkable number of parents escort their children to school, mostly due to potential traffic dangers. The vast majority of the parents escort their children on foot and just a few of them by car. Of course the oxymoron in this behaviour is the fact that the parents as drivers probably behave without respect to pupils pedestrians.

- The vast majority of the parents assert that they already have underlined the potential dangers due to traffic to their children, training them towards to safer traffic behaviour. They also assert that they continuously point out the safer paths which they have travelled together for several times.

There were no significant differences among the 5 schools, which mean that the safety problems to school journeys were similar, despite the differences in the density of population.

All the comments exist in the sphere of so called “common sense”, and thus they should be taken in to account in any traffic management projects and should be incorporated in every project study concerning new urban residential areas.

5. CONCLUSIONS

In Greece, the urban street network belongs (by means of construction and management) to the municipalities. So, according to the comments derived from the questionnaire research, in order to upgrade the safety of primary school travel, the Municipality of Volos is about to follow a procedure outlined as follows.

- The residence area that corresponds to the school should be divided in to few sections, according to the density of population.

- Specific paths, consisted of selected street or streets, will be adopted as official school journey paths, enhancing their geometric and operational characteristics.

- The specific paths should be very few, in order to keep the uniqueness of their character.
The selected streets should have wide enough sidewalks (at least 2.5-3m) and narrow pavement, in order to promote pedestrians rather than vehicles. They should have very good lighting, drainage and several rest areas.

The construction materials of the street infrastructure should differ from the surrounding environment, constituting a path which will be aesthetically unique and attractive. The local authority should maintain them frequently and the local police should handle all the matters of safety.

The crosswalks on the main streets should be raised according the national regulations, and the signalised intersections should have all the appropriate pedestrian facilities, plus the facilities for the handicapped persons.

Finally a continuous and persistent promotion of the benefits of the use of these paths should be done in order to be accepted as safe school paths.

6. BIBLIOGRAPHY


(2002), Road Safety Education in Primary Schools, British Institute of Traffic Education Research – Transportation Research Laboratory. London
Abstract.

The scope of this paper is to review and evaluate the known as far, traffic calming measures and traffic enforcement and to adapt all the effective measures to a typical Greek City, in order to achieve safer school journey.

A comparison study, between the working “school travel plans”, mostly in several European Countries, will be elaborated, in order to obtain all the characteristics that are applicable to Greek urban environment (Traffic, walking conditions etc.)

A questionnaire research will be elaborated in order to acquire the needs, the complains and the remarks of the final users (Pupils and their parents). The research will focus on primary schools (Pupil ages between 6-12 years old) and in urban areas with high inhabiting character.

The questionnaire will include checklists referring to walk ability conditions and existing traffic infrastructure data (traffic lights, signs, pedestrian facilities etc).

It will also include, several questions in order to obtain and evaluate the socio-economic characteristics of the population participated to this research (Parents education level, family population/age distribution, average income, vehicle ownership, working timetable, travelling habits etc.).

A statistical acceptable data file will be analysed using certain statistical procedures in order to evaluate the adaptability of a variety of effective measures.

The final conclusions-measures will be proposed the Greek Town Authorities, to be adopted in urban school areas planning.