Cities & Schools in a Low Carbon approach

1. Introduction

In this communication we intend to prove that without a link between urban and educational planning we have a longer way to 'retrofit' our outworn city areas and plan the new ones.

"*School Urbanism*" can be a great help to restructure the cities as a whole and to obtain a lower carbon performance. We have tried to highlight this with several study cases in average cities in Portugal.

2. Trends in Portuguese Cities & Schools

2.1 Demographic increase in Cities

In the last century we have seen a demographic increase in cities. In Portugal we have gone from 22% that lives in towns with more than 10.000 inhabitants, in 1960, to a majority of urbanized population in the last 50 years (INE). With the accelerated migration from the rural world to the urban one, people have changed their places and habits.

The biggest concentration is in the coastal area, and essentially around the Cities. From Viana do Castelo till Setúbal and the Algarve coast. Especially in the Lisbon and the Porto Metropolitan Areas as well as the district capitals in the interior. Cities know better how to capitalize the effects of structural funds given through the integration in the European Community. These Community funds have made cities more attractive and with more and better employment opportunities. The highways net infrastructure has grown and increased the proximity and access to public services and facilities in cities, which allow and increment the internal migration.

The city polarization has enlarged the sprawl around them. The fundamental reasons for this have been the transports, mainly the private one that has allowed the growing distance between house and work. The Motorization Index has quintuplicated in the last 50 years in Portugal, in particular since the seventies and the urbanized territorial area triplicated. But the total population has only grown only less than 2 million, about 8.800.000 inhabitants, in 1960, and 10.600.000, in 2008 (INE).

If in a first stage the exude of the fields represents a transference of the rural world to cities but since the nineties the urban invaded the rural. The opposition city-country can't explain the social and territorial heterogeneity, at the metropolitan or city level (Marques, 2004).

This enormous change has caused an unbalance in the whole national urban structure. This is reflected in all aspects of daily life and has had a great impact in the equipments in particular in the proximity ones. The weak school network has grown systematically since then, but not always in the best direction. The school sites, sometimes, weren't in the appropriate locations and the facilities were made rapidly with bad insertions in the urban space.

As cities have grown more in space consumed than in population, the results aren't sustainable. The historic city and even the consolidate one is losing inhabitants for their suburbs areas.

2.2 Generalization and growth of compulsory education

In the sixties, 33% of the total Portuguese population was illiterate. Now the number has fallen to 9%, in 2001, which is concentred in the older generation. We can say that from the seventies all children go to school and most of them have done the compulsory education. With the generalization of compulsory education for all and its enlargement, from the 6th grade to the 9th, until now, and the announcement to the 12th grade, this year has created big challenges for the educational system as well as the urban one.

2.3 Maladjustment between City & School Planning and the reality

The City Planning and School Planning have never been linked as they should. In Portugal, there is a tradition between the State and the Municipality Administration level to articulate the responsibilities: the first one pays (State) the project and the construction of the facilities and the second gives the site (Municipality). But without a planning culture, a land policy and with poor Administration (and country) the majority of the times the site chosen isn't the most adequate location for the communities they have to serve. And the care and attention with the territorial and social insertion and connectivity, sometimes, isn't the best one.

The good paradigm of the well articulated planning, both urban and educational, is still the Alvalade Plan (1945), projected and made in the middle of the last century (Pisco, 2005). Here the main idea was the *neighbourhood unit*, which constitutes the cells of the plan. Each of them has a school in the middle. The plan organizer is the school. And inside each cell the ways to school are protected from the heavy traffic. The trails to schools were designed to walk safely. This was a good plan where we can still learn but it was an exception in the Portuguese planning history.

With the enlargement of the educational system and the changes verified in the cities we presence a generalized imbalance between offer and demand. Some schools had to close, especially in rural areas and in the inner city, but in the most dynamic metropolitan areas and cities they had to extend the double schedule to face the overcrowding of students in their neighbourhoods.

As there has been a trend of city polarization the urban sprawl has extended. In the planning sector, as in the educational one this has caused some problems to adjust to reality. Because the inner city has aging and decreasing and the outskirts are expanding with new families. The older school facilities in the consolidated area have fewer pupils in there catchment areas and they have to travel longer distances to get there.

3. The problems caused

3.1 Congestion and Air pollution (Travel mode to school)

With the increase of motorization and the longer distances to schools, the students have been walking and cycling less, relying more on transports, especially the private one. There is a tendency in the most developed world and Portugal is no exception. In all the cities in Portugal, even in the smallest ones, in the traffic congestion we can see the differences between the school and holiday time.

Some studies in the USA point to a decrease in walking and biking to school. According to the National Household Travel Survey released in 2001 (cited by the U.S. **E**nvironmental **P**rotection **A**gency, 2003, p. 2) less than 15 percent of students between the ages of five and 15 walked to or from school, and only 1 percent biked. And according to the same agency, in 1969, 48 percent of students walked or biked to school. Even children living close to schools were not walking or biking: only 31 percent of children ages five to 15 who lived within a mile of school walked or biked. In 1969, it was close to 90 percent (U.S. **E**nvironmental **P**rotection **A**gency, 2003, p. 2).

In Portugal, there isn't a comparative statistic along the years, about the travel mode to schools, but all the observation and inquiry towards mobility say that more and more people are travelling to schools and to work by transport, the automobile being the most used. But historically Portugal is less motorized than USA and the urban scale is more humanized than the American even so the trends seem to be the same.

A survey done by EPIS (2008), through a direct questioner to the students from the 7th to 9th grades (2007/08) in three cities around Lisbon – Amadora, Setúbal and Santarém – also reveals this trend in Portuguese cities. Only the Amadora municipality has more than 50 percent of the students walking to school (58%), Setúbal has 44 percent and Santarem (the most rural and sprawled) only 16 percent of the students walk to school regularly.

In several studies (U.S. **E**nvironmental **P**rotection **A**gency, 2003 & Ewing *et al.*, 2004) we can identify three main critical aspects of the travel mode to school: *i)* Travel Time and Distance; *ii)* Socioeconomic Status; *iii)* School location and Built Environment.

i)   Travel Time and Distance

The travel time and distance are two of the most important aspects in all the literature reviewed. Students with a shorter walk or bike times to school proved significantly more likely to walk or bike (Ewing *et al.*, 2004). In the EPIS survey in all the three cities analysed, 90 percent of students that walk to schools spend less than 15 minutes in the journey which means that they live near than a 1,5 Km (about a mile) from school.
When inquired, the parents' first barrier to their children walking and biking, are long distances (Almeida, 2005 & U.S. **E**nvironmental **P**rotection **A**gency, 2003).

ii)   Socioeconomic Status

Students from households with higher incomes and more vehicles per capita were less likely to walk to school compared to another travel mode (Ewing *et al.*, 2004). An empirical study, made by Almeida, about the *Physical Activity and Development of the Mobility Independency in Children in Differentiated Social Contexts* refers that socioeconomic status has a big influence in the travel mode to school. The EPIS survey points in the same direction. A closer study at schools' neighbourhood level we can see clearly that the schools with the highest Socioeconomic Status have the smallest percentage of students walking to school even when schools have a similar integration in the urban tissue.

iii)   School location and Built Environment

A study showed that school location and the quality of the built environment between home and school affect how children get to school (U.S. **E**nvironmental **P**rotection **A**gency, 2003). Better sidewalks and more people walking in the city streets could help to improve this effect. The same study tells us that neighbourhood schools can reduce traffic, produce an increase in walking and biking and a reduction of carbon emissions.

Travel time and distance, Socioeconomic Status and Built Environment matters to a more sustainable Cities & Schools in a low carbon approach.

The decrease of walking and biking to school is causing two bad tendencies: increase in the greenhouse effects and economically - family and public funds have been growing every year. These trends aren't sustainable and they are incrementing health and safety problems and a notorious degradation of the quality of life in cities.

3.2 A Growing Health and Security problems

With less activity and a more motorized way of moving, in general, the modern society is going through a new kind of problem known as the "civilization disease". The health issues – child obesity and respiratory problems – and security – less people on foot and the sense of the unknown amplifies the feeling of urban fear and public space degradation. These two issues have a very important role in our contemporary world. Walking and biking to schools can be a strategic way to prevent this "civilization diseases" and to revitalize urban space and social habits.

Very complete world review of literature made by Davison & Lawson (2006), which asks if *attributes in the physical environment influence children's physical activity?* This has highlighted the links between the physical environment and children's physical activity. The Portuguese study made by Almeida also emphasizes the same idea. The lack of childhood physical activity and autonomy has been a big responsibility in the increase of the health and security problems and this trend is increasing in the developed world.

"*Low levels of physical activity and the failure to meet physical activity recommendations have notable health consequences among children including increased risk of obesity, low bone density, and low physical fitness. Furthermore, children who are not physically active are denied the positive social and emotional benefits of physical activity including higher self esteem, lower anxiety, and lower stress*" (Davison & Lawson, 2006). And the findings of the health studies indicate that the childhood good habits, as physical activity, have a positive link with the adult good habits. If a child doesn't walk when he's growing up he will probably keep the same habits. The car dependency isn't only functional, it's psychological too. Sometimes, and for some people, it's the only way to feel safe in the street. These habits are bad for the environment, for the human and city health, creating a lack of urban culture, more traffic and gas emissions with all the pollution associated problems.

Malho (2004) in her study "*The Child and the City*" refer that most children don't play and walk in the urban space, especially in the big cities. The felling of safety is connected with the sense of knowing. When we don't know the city everything frightens us. But when most people leave the streets, the degradation and the unsafe felling is amplified.   Most parents want the best for their children but if they don't let them grow, are they doing the right thing? To be autonomous they have to construct their own independency and mobility and this is one of the key aspects to achieve that goal. Improving the sense of place and neighborhood can be a beginning, a means and an end to upgrade the relationship between the citizens and their cities (Beaumont& Pianca, 2002).

Having healthier and urban friendly habits we are all contributing to low carbon cities. The approach to schools by a whole community can be a big help to reduce carbon emissions.

3.3 Urban Sprawl versus Inner Cities

Motorization has been one of the main factors that allow the urban sprawl. With an individual way of transport anybody can go anywhere at any time they want. This movement towards the outside of the city began with the housing and enlarged to the rest of urban vital functions. In the last two decades, in Portugal, we have gone through a great expansion of the urban scale to the suburban areas and even to rural ones. School network have had to adjust to this new reality.

Sometimes, in suburban areas, there are children and now schools and in outworn city areas there are schools with no children in the closer neighborhoods. In the bigger cities or metropolitan areas there are strong feelings of this tendency, even in the average cities, such as the district capitals. In some residential places the students have to travel long distances to school, and they lose autonomy, especially when they don't have public transport to go home and are entirely dependent on the family.

These trends put the vitality of the inner cities in danger and the new suburb areas have become dormitories. In Portugal this first area, in the oldest towns, is the historic center which is one of the main identities of those cities and has a strategic dimension at an economic level, like tourism, one of the most important and vital activities for the Portuguese development. But the new suburbs can't be forget and abandon to chance but find the right balance and think of the city as a whole and not as parts, as we have done till now.

But with the 3rd oil and the world economic crises, and the new sustainable paradigm we all have to face a new reality. The urban sprawl in a large scale has now a forced interruption. We could think now. We have to.

Some structural decisions have to be made at the planning level, to face this reality with new answers to the old questions. Planning Cities & Schools together could be a critical issue to build a new approach to Low Carbon Cities.

4. What *School Urbanism* can do for *Low Carbon Cities*?

But City and school planning are normally disconnected. Both are seen as sectors apart and disconnected in their planning and management activities. School Urbanism is a way to putting it, by studying and giving answers to the school system and the urban system, as one.

All the problems caused by an inefficient way to articulate Cities & Schools aren't school or city problems but a *Development, Cohesion and Equity* problem that planning and public policies have to solve. These three principles are, in the authors' opinion, the main goals for School Urbanism.

The Human Development (UN) is the process of the increase in peoples' choices, that allows them a longer and healthier life, acquire   knowledge, have access to resources in their territory to have a dignifying level of life and with quality, while preserving them for future generations, with the right to protection and personal security and to reach equal opportunities.

Territorial Cohesion which values the "territory" as a privileged space of behavioural integration, focusing in the greater or smaller capacity of a territory (county, region, city, neighbourhood) to be able to balance the development of a building process of a competitive economy and a cohesive society.

By Equity we understand being equivalent to Equality, but in a sense of Equal Opportunities to all in a fair but not equalitarian way. This implies Equality provided by the means and resources available to all and not imposed by anyone. Equity links Equality with Justice. Educational Equity represents the level in which the individuals may benefit from education and training, in terms of opportunities, access, treatment and results. A system is equitable when the outcome of education and training are independent from the social-economic environment and other generating factors of educational disadvantages and when the treatment reflects the specific needs of the individuals in terms of learning.

School Urbanism must study the reality and create strategies and planning instruments to assure the best ways of getting a more sustainable future. Cities & Schools must be linked to each other to get a new low carbon approach too.

4.1 What Cities can do for schools?

According to the information available the majority of the world inhabitants are living in cities. In the developed countries we achieved this in the last decades. These are the places where we can improve the conditions for the larger number.

City problems are development problems. Cities should provide the most stimulating environment for learning. This is the most important issue because we live in a knowledge economy. As we change time we are changing space. Learning time and places are expanding. They tend to be everywhere but the trends show that school spaces will prevail (Lackney, 2000).

But the city planning should provide better links between homes and schools. As previously mentioned in *travel time and distance,* this seems to be a determinant factor for walking and biking to schools. Density and diversity of the land use near and on the road to school could be important to generate and stimulate walking neighborhoods.

Accessibility to school is also important. School must have a good urban insertion. With a new attitude, the cities must provide pedestrian-friendliness sidewalks on the roads and streets to school. To promote neighborhoods is to promote cohesion and sense of pride in their communities. All barriers should be crossed.

The public transport system in cities must be available and friendly to students and assure their parents of its safety conditions for their children to use. City transports and children could benefit reciprocally and provide clear routes to low carbon cities.

At a State level, in Portugal, a "*Season School Ticket*" (4 to 18 years old) was implemented with a 50 percent discount in the public transport fees. The success of this measure drove the Government to a possible extension to the ages of 18 to 23 years old, for the potential university students' use. This top-down administrative policy and its extension to the whole country, implies a big effort at State level for a financial compensation to the transport companies. But this is an acknowledgement of the local level incapacity to solve the problem.

This kind of policy could be an incentive to the new generation to break the pre-concept of the social stigma that public transports started in the last decades in Portugal, where most users are old and of a low income.

Low Carbon City is a place which knows how to develop a mobility culture to use the public transports where these are a fundamental urban value and the car abuse has become socially and culturally penalized.

As rates of walking to and from school are different, because some parents leave their children at school on their way to work (Schlossberg *et all.* 2006). But given this, cities can articulate with schools, a way to manage a *Walkbus* or a *Pedybus* in which organized groups of children, normally with an adult, walk to school together.

More students and adults walking and biking on streets and roads could turn over the *insecurity* felling about cities and its public spaces improving the urban quality of life. The community *health* improves with more physical activity and a better atmosphere with less carbon emissions. The traffic jams around schools could be better and reduce its bad influence on stress, giving more time to families and students.

The *socioeconomic status* is a determinant aspect to school mobility and to student outcomes too. School catchment areas should promote a mixed income population as well as housing policies fomenting affordable houses. With this we can assure diverse and equitable travel modes to school and simultaneously better quality in public education. This strategic approach is good in the both senses addressed: planning for growth and for city restructuring.

4.2 What Schools can do for Cities?

School facilities are a big energy consumer, not only in accessibility, but with their activities too. Energy efficiency in schools is exemplar to students and its neighbourhoods and with a

low carbon approach urban planning and management are able to improve the relationship with the city.

Schools in the inner cities could be one of the fundamental ingredients to city restructuring. Keeping the old school in the historic neighborhoods is normally a better option than create a new one. This equipment could be a "retrofitting" to outworn city areas upgrading them. School isn't only a facility is an institution which needs time to build, and the older schools in general have better outcomes (Pisco, 2005). To close a school isn't a smart policy.

The old historic centers could be a great place to install the Creative or Learning Cities Concept. And for the perfect environment for creativity and learning nothing is better than having a school around. In Portugal many of these historic centers are walk friendly (with no cars) which can provide good places for children to move between the several facilities nearby, like museums and libraries, in a safe context.

The "*cities of learning*" have to promote social interaction, and to achieve this goal we have to create some restrictions for individual transport and create an appropriate transport network with students as one of the central service goals.

Schools can organize new strategies to improve energy efficiency and reduce carbon emissions with families and local administrations. They can provide local plans for a "smart mobility" to school or even for neighborhoods with the participation of the whole local community. And by promoting reflection and by setting the example schools can improve energy efficiency in their own facilities and share their knowledge, not only with the students, but also with their families and communities.

To reduce the tendency of the middle class households' to use their cars to transport children, schools have to encourage new mobility habits for these families. Defending sustainable and healthy values and organizing activities to promote walking and biking as a "fashionable" way to move in the city among young people and their parents, school could help change the tide. A living city has to be an important value to all. To create public spaces which have to be lived not only by cars but also by people.

When we are planning for growth, school must be planned as a centre of community and shared with other activity generators and public services, some facilities and common spaces (e.g. parking, gardens, canteens, transports, auditoriums, etc). Mobility and connectivity should be one of the first issues to be assured.

Big schools aren't friendly to a healthy mobility, because they have to be bigger catchment areas. And according to some studies small schools are better to equity because the students are less prepared and the ones with disabilities benefit from smaller facilities.

6. Conclusions

In this paper we intend to prove that without a link between urban and educational planning we have a longer way to 'retrofit' our outworn city areas and for planning the new ones and that "School Urbanism" can be a great help to restructuring the cities as a whole and to obtain a lower carbon performance.

As we have seen, *School Urbanism* can stimulate a *strategic Land Use Planning for a Low Carbon Cities* when:

Development provides the increase in peoples' choices (e.g. more schools and better mobility), that allows them a longer and healthier life (less carbon emissions more physical activity), acquire   knowledge (learning everywhere), have access to resources in their territory to have a dignifying level of life and with quality (good access to schools and strong communities, and urban design) , while preserving them for future generations (less green

house effect), with the right to protection and personal security and to reach equal opportunities (mixed income households, cohesive communities with less crime and equity with better schools for all).

Cities & Schools together can create a genuine "win win" strategy that provide a clear approach to low carbon cities.

7. Acknowledgements

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