Two cities, two mobility systems, the same quest for a transition

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Introduction

The starting point of the present discussion is the emergency of reducing the negative impacts brought by contemporary mobility systems.

The focus is the road transport, the dominant transport mode, in terms of passenger kilometres (Kemp et al, 2012). The analysis addresses the road transport at an urban scale. This is due to the fact that nowadays the majority of human population is living in cities (Girardet, 2007). Cities are places full of social and economic activity, where a major part of transport supply and demand is concentrated, and responsible for big environmental impacts (Hodson et al, 2010).

The object of the analysis is the transport mode people choose in order to commute. Commuting is a mundane practice and, because of that, strategic for the transition into a sustainable mobility.

There are two big options for commuting: take a public transport or take an individual transport (automobility). Here automobility means driving a car. That is, it excludes soft transport modes such as bicycle.

There is a consensus among visions of sustainable urban mobility that a transition implies the switch from individual to public transport in the practice of commuting (Banister, 2008). Obviously, environmental impacts *per capita* of public transport are lower than those of individual transport.

This assumption has inspired public policies aiming the transition of urban mobility systems into more sustainable paradigms (Banister, 2008). A result has been a heavy investment in public transport infrastructures and supply.

This is the case of the city of Curitiba, in Brazil, worldwide known by its policies in the area of transport and urban planning. Curitiba implemented in the last quarter of XX Century a BRT - Bus Rapid Transit system, which has been emulated by cities around the world.

This is also the case of the city of Porto, in Portugal, place of birth of the author. Porto metropolitan area benefited with the implementation of a metro light rail system in the beginning of XXI Century.

The problem is that these investments only had a temporary return. In both cities nowadays the car is the dominant transport mode.

The present paper launches the discussion about the drivers and inhibitors of a transition into a public transport based/sustainable mobility system. The paper makes an introduction to Curitiba and Porto cities, briefly describes their mobility systems and highlights preliminary evidence regarding the desired transition.

The scope and deepness of this working paper is necessarily short since it consists in a preliminary output of a research project in progress.

Two cities

The city of Curitiba is the capital of the State of Paraná, located in the Southern part of Brazil. The city's 1.8 million inhabitants are spread in 430 km2. Curitiba became, in 2010, the eighth largest city in Brazil in terms of population (Miranda et al, 2012).

Curitiba is the heart of a metropolitan region formed by twenty-six municipalities and over 3.1 million inhabitants (Miranda et al, 2012). This is considered a medium size metropolitan area in the Brazilian panorama.

In terms of GDP – Gross Domestic Product, the city of Curitiba occupies the 4th position in the ranking of Brazilian capitals. The services sector contributes significantly to the composition of the GDP, accounting for 77% of the total GDP. Industry accounts for almost 23% and agriculture for less than 1% of the slice[1].

Notwithstanding the dominance of the services sector in the city, Curitiba metropolitan region is marked by considerable economic activity around the industry sector, notably, automakers. Paraná state, by its turn, is strong in agriculture. Paraná is the largest Brazilian producer of grains, namely soybean, corn, wheat, together with a considerable production of sugarcane[2].

The economic activity and the quality of life standards in Curitiba attracted migrants from several parts of Brazil. As a consequence, Curitiba experienced an intense development in the 1970s, which reached to an average rate population growth of 5.3% in that decade. In the end of the first decade of the XXI century the rate was down to 1.7%, mainly due to the drop in the birth rate[3].

The city of Porto is the second largest city in Portugal, with 238,000 inhabitants, in 41 Km2 of land area. Porto is considered the main pole of North region of Portugal and, in particular, of Porto metropolitan area, which comprises a territory of seventeen municipalities, populated by 1.7 million inhabitants in 2011[4].

The metropolitan area of Porto has the second largest GDP in Portugal. While Porto Municipality is economically dominated by the service sector, this city and its surrounding metropolitan area benefit of a heavily industrialized Portuguese Northwest and of a Portuguese North Region that is home to nearly 45% of Portuguese exporting Companies. The textile industry is unquestionably the main contributor for exportation, with highlight also to the electrical machinery and equipment and to footwear industries[5].

Porto city also benefits of the economic effects brought by an international harbour of goods and passengers and by an international airport, the biggest in the North of the Iberian Peninsula[6]. Both infrastructures are located in the metropolitan area of Porto.

Porto city lost more than 80,000 inhabitants between 1981 and 2008 while its neighbour municipalities saw their population increase in this period (Torres et al, 2015). Recently, Porto city has been living a touristic boom related with the attractions of its historic centre, classified as World Heritage site by UNESCO, with its cultural life, its higher education institutions and with the low cost Airline trends in Europe. Porto city was awarded with the European Best Destination Prize in 2014, by the European Best Destinations Organization.

[1] Source: http://www.curitiba.pr.gov.br/idioma/ingles
[2] Source: http://www.ipardes.gov.br/index.php?pg_conteudo=1&cod_conteudo=3
[3] Source: http://www.curitiba.pr.gov.br/idioma/ingles
[4] Source: http://portal.amp.pt/pt/
[5] Source: http://www.ccdrn.pt/sites/default/files/ficheiros_ccdrn/af_ccdrn_brochura_regiao_ing.pdf
[6] Source: http://www.ccdrn.pt/sites/default/files/ficheiros_ccdrn/af_ccdrn_brochura_regiao_ing.pdf

Two mobility systems

The city of Curitiba is worldwide known for the pioneer design in the 1970s of an integrated BRT system, consisting of high-capacity buses running on fully dedicated lanes (Carvalho et al, 2012).

The novelty of Curitiba's approach was an effective combination of urban planning and land use with public transport supply and management.

Curitiba's BRT system consists in a trinary road system along five axes. Each line is formed by a set of three parallel streets, in which the external streets are used to provide connections between the central business district and the city periphery (and vice-versa) for the general traffic. Conversely, the central streets are reserved for express transit routes (internal lanes) and access to the local traffic (external lanes) (Miranda et al, 2012).

Regarding urban planning, services and commercial activities were allowed and stimulated in the central streets, as well as higher buildings, with the aim of concentrating higher densities of population and thus transit demand along those corridors (Miranda et al, 2012).

The BRT system concept is inspired in the subway systems, but operated by buses. Buses were specially adapted to increase the comfort of passengers and to allow fast passenger boarding.

One of Curitiba's brands is the link between urban transport and environmental quality. This concern refers not only to the infrastructure but also to the fuel used by buses. The city progressively raised buses' emission standards and recently developed a new fully dedicated bus corridor ("green line"), where all buses run on 100% biodiesel (Carvalho et al, 2012).

Curitiba's strategy originated impressive results in the end of XX century: 75% of Curitiba's population used the BRT system in order to commute (Girardet, 2007). Nowadays this percentage is down to 45%. Most people prefer automobility, namely the car. Curitiba reached, in 2010, to a number of 700 vehicles per 1000 inhabitants, which is the highest motorization rate of Brazil (Miranda et al, 2012).

The metropolitan area of Porto has historically a polycentric urban structure related to the location of industrial activities. Porto city shows a high concentration of jobs but, as written, is experiencing a process of population and employment decentralization towards the surrounding municipalities (Pinho et al, 2010).

Moreover, Porto's transport structure is characterized by a dense motorway network, with several radial and circular routes. Public transport is mainly based on bus. The network has dedicated bus lanes but in the majority of lines buses share the road with cars. There is also a radial railway network including suburban train (Pinho et al, 2010).

The serious congestion problems at Porto city's main entry and exit points, caused by the decentralization trends, was one of the main reasons for the public investment in a new light rail system which serves the metropolitan area of Porto.

Inaugurated in 2002, the system is powered with electricity and runs underground in the central area of Porto and overground in the other municipalities. Priority was given to linking the new system with other means of transport, particularly the connection to the bus network, the airport and the two

main railway stations[7]. The network is composed by 6 lines, with a total railroad extension of 67 km. One drawback is that this network is mainly radial and, in Porto municipality, limited to the city centre (Pinho et al, 2010).

Other innovation of Porto's public transport system was the integration of the ticketing systems of the different public transport operators. Nowadays, the same ticket and fare are valid for bus, metro and suburban train, which promotes multimodal travels.

Despite these infrastructure changes in the local mobility system, the last Portuguese general Portuguese survey, made in 2011, showed that, with regard to the modal split in Porto City, 52.1% of respondents stated the use of car in their journeys for work and school while only 26.1% use public transport and 21.6% walk[8].

The quest for a transition

Up this point, several differences between Curitiba and Porto were identified: dimension, demographic dynamics, economic specialization, transport technologies, just to name a few. Nevertheless, both cities have been investing on an identical driver for a transition, namely, the development of public transport infrastructures. Apparently, this kind of policy originated a similar outcome too. Present data reveals weak performance in the substitution of car as the preferred mode of transport for commuting.

The focus of mobility policies in infrastructures is based on the assumption that transport demand is closely linked to transport supply (Greene et al, 1997). That is, the provision of transport and its infrastructure is sufficient to stimulate demand.

This premise does not take into account that changes in supply might generate unpredictable changes in other elements of the system, for instance, in human behaviour. A classic example is the decision of widening a highway as a congestion relief measure. People that didn't use to drive on the highway, might start to do it in response to a reduction in time and in cost of travel. This induced travel might cause new traffic congestion sooner than expected (Goldman et al, 2006).

One-sided approaches have the risk of falling in the classic environmental fallacy[9]:

Every problem has an "environment" to which it is inextricably united. If you stop x from growing (or declining), you will make other things grow (or decline), and these changes you have created may very well be as serious, and as disastrous, as the growth of x (Goldman et al, 2006).

It's important to note that a local mobility system is complex, composed of a number of different elements where different actors intervene. It's an open, porous system, embedded in other systems (Goldman et al, 2006).

Embracing the complexity of the system, adopting a holistic vision and facing the object of analysis and intervention in a multiple and systemic perspective might bring advantages (Geels, 2012).

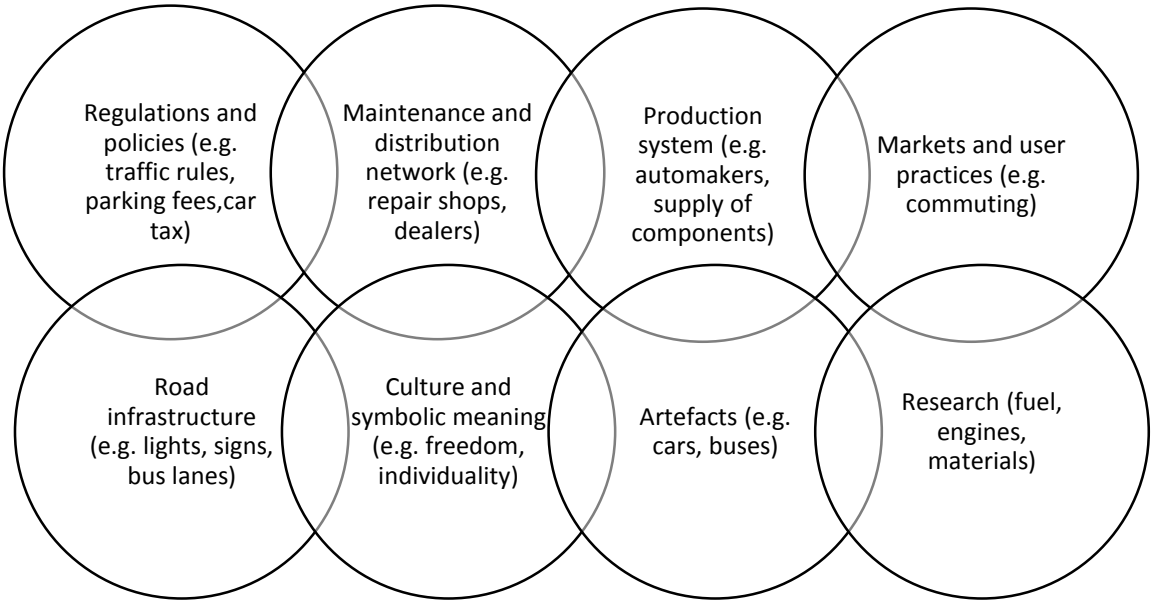
[7] Source: http://ec.europa.eu/regional_policy/en/projects/portugal/metro-do-porto-enhances-citizens-mobility
[8] Source: http://www.epomm.eu/endurance/index.php?id=2809&city=259
[9] Churchman, CW (1979), "The systems approach and its enemies." New York: Basic Books Inc.

This is the approach of conceptualizing urban mobility systems as “socio-technical systems”.

A socio-technical system is viewed as a network of actors (individuals, firms, and other collective organizations) and institutions (societal and technical norms, regulations, standards of good practice), as well as material artefacts and knowledge. The different elements of the system interact, and together they provide specific services for society (Markard et al, 2012). In the case of a mobility system, it is mobility that is given to the system users.

The different elements of the system are tightly interrelated and dependent on each other. This has implications for the dynamics of the system and especially for system transformation (Markard et al, 2012).

Bellow, an illustration of a road transport socio-technical system is given (Geels, 2005):



Road transport socio-technical system

This socio-technical system, comparable to a biological organism, is in constant transformation (Markard et al, 2012).

In addition, recall that there are several socio-technical systems at an urban level. A city can be viewed as a system which offers several services to the population: health, education, employment, goods production, mobility, culture, safety, food, energy, drinkable water, land use, habitation and sanitation. These subsystems are embedded and interfere with each other.

Events in a subsystem or the interaction between subsystems might prevent transition efforts made in other subsystem. The present paper defends the existence of evidence that urban sprawl has been preventing the effectiveness of policies aiming to promote the adoption of public transport, both in Curitiba and in Porto.

On one hand, urban sprawl has been fed by the mobility increase of population. Mobility was brought by the development of new forms of transport, namely automobility in the XX century (Pinho et al, 2008), and by low fuel prices (Greene et al, 1997). High levels of mobility cause higher physical and spatial separation of human activities.

Together with this long term trend, there are particular reasons for Curitiba's urban sprawl. As written, Curitiba's economic activity and quality of life propelled a migration flux from other parts of Brazil. Furthermore, high economic growth and redistributive policies in Brazil, in the beginning of XXI century, increased the purchase power of Brazilian population allowing the fulfilment of material aspirations, such as owing a car.

In Portugal, before 2008 financial and economic crisis, more than economic growth, the acquisition of houses and/or cars was stimulated by favourable credit conditions, brought by Euro Zone low interest rates. Locally, one assisted to a housing bubble in Porto's neighbour cities, whose lower prices (in relation to Porto's centre), attracted population from the centre to the external ring of the metropolitan area. This reinforced the economic decentralization of the Porto metropolitan area that was already occurring.

On the other hand, urban sprawl creates mobility needs (Girardet, 2007). While urban sprawl has not been provoking the increase of travel time, the fact is that both distances and speeds have been rising (Banister, 2008). Local public transport, cycling and walking have become less attractive, and this in turn has resulted in greater use of the car (Banister, 2008).

Final remarks

The present paper highlights preliminary evidence that urban sprawl and automobility are self-reinforcing trends which are inhibiting Curitiba's and Porto's mobility policies towards the adoption of public transport.

Applying the systemic approach's terminology: the desired transitions in Curitiba and Porto's urban mobility subsystems are finding opposing forces in other subsystems, namely, habitation, land use, goods production.

This preliminary conclusion showcases the uncertainty associated to the socio-technical-economic dynamics which occur in the urban space.

Regarding the governance dimension, the present work calls attention to the advantages of taking an integrated approach while designing urban policies.

This integrated view was one of the trademarks of Curitiba in the end of XX Century. In contrast, a coordinated institutional framework was missing when the new light rail system was implemented in Porto (Torres et al, 2015).

In any case, even a supposedly coordinated policy might lose strength in the quest for a transition if important variables of the urban system dynamics are not included in the equation.

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