
Fast roads and urban typologies, creating urban places with fast roads

EURAU '12

ABSTRACT. The development of a mobility network has a direct impact for urbanization. A choice for new or re-use of roads is also an 'urban choice', in the sense of creating conditions for (future) urbanization. It is an act of creating and organizing the urban structure, in a direct or indirect way. Fast roads, like highways, regional roads and main urban streets, have all organizing abilities for the (urban) environment, organizing accessibility and addresses.

In the Porto region the road network is constructed during time, which result is a variety in (fast) road types and systems, that function next to and in parallel to each other. The changing point from a fast movement (traveller or driver) into a slow movement (pedestrian, parking) forms part of the public space of the contemporary urban system. Organising and design of this public space, linked with urban fast roads, is an essential part of the urban structure and planning.

KEY WORDS. urban fast roads, urbanization, urban structure, urban typologies, urban planning, public space

Daniel Casas Valle

*Centro de Estudos de Arquitectura e Urbanismo - Faculdade de Arquitectura da
Universidade do Porto - Rua do Gólgota, 215, 4150-755 Porto, Portugal -
www.ceau.arq.up.pt
+351 93 261 01 74 - dcv@cityeu.eu*

1. Introduction

Mobility networks are essential and increasing in importance (ASHER, 2007), where road mobility has a prominent weight in the total traffic performances.¹ Roads have not only a mobility function, but are also an essential part of the urban structure and conditioners for urbanization. In this, 'The recent speed and diversity of urbanization patterns and extension in the conurbation of Porto (and elsewhere) are cause and effect of the construction of very complex networks, infrastructures and mobility systems.' (PORTAS, 2002). The evolution of the large road network in the last 50 years influenced significantly the urbanization and the daily urban life.

The *explosion of urbanized areas* in many European cities and conurbations (FONT et al, 2004) was possible by a combination of aspects in which the individualized mobility transport, the car, had an enormous influence in the developing and growth of new urban areas at a larger scale. Lower prices for soil, land ownership and more flexible construction regulations/practise outside the existing urban areas, in combination with the ability of the car for the mass, increased the daily scope of persons in time-space perspective. Because of specific technical requirements for road infrastructure, where speed, traffic flows and safety are prominent in the design and realisation, road planning (mobility and infrastructure) and urban planning were decoupled (DOMINGUES, 2006. 25). Which is related with the fragmentation in all urban planning (GRAHAM/MARVIN, 2009). Top down and sectional approach lead to a reduced integration assignment of fast roads in the urban planning, with the main focus to 'fit in' the proposed road into the local environment. In the 'absence' of the responsibility of road planning, urban planning lost one of the most important spatial element and factor in order to organize the environment. In many urban areas, as well in the Porto region², this result in an autonomous road network, detached from its surroundings. Mono functional spaces were realized, like highways and specific 'urban typologies' as drive-inns and shopping nodes based on car accessibility. At the same time, it creates spatial fractures (at a lower scale) and randomly (dis)order for the urban structure (urbanization process).

2. Evolution of mobility networks

The relation between accessibility and urbanization is evident, but how this is organized is depending on many factors and the social economic context. In the urban environment the importance of mobility is clearly expressed in its spatial occupation. Specially large infrastructures as highways, railroads, ports and airports needs a big amount of space with a specific and almost autonomous logic, scale and design regulations. This creates specific morphology and urban occupation. The actual accessibility network is a result of many layers, that in time was constructed in parallel (introduction new mobility systems) and on top of each other (traffic upgrade of existing roads/streets). Streets and roads are the fundamentals for cities and urban areas, where at present time the car is dominant in all aspects³.

According to Hemel/Jannink (2001), a mobility system exist of four developing stages: introduction, implementation, rationalisation and urbanization. Introduction of a new system changes also the existing layered network, in its functionality and position in the network, as well in physical form. A main road can mutate in a secondary road or even get another function, like a shopping street in a historical city, once a main axis in the city that changes into a urban street or pedestrian area (like the Avenida da República in Vila Nova de Gaia and the Rua de Santa Catarina in Porto). Or a road can be upgraded, like a partial use of an existing

regional road for a new highway. At the same time, a network is never finished or complete. It is always in a process of construction, with all its functional and practical (fragmented) problems (GRAHAM, MARVIN, 2001).

The three parallel roads that connect Porto with Maia/Trofa/Famalicão/Braga have all a different typology (Fig.1). The Rua de Godinho Faria (São Mamede Infesta) has continuity at a larger distance, but shows a wide spectrum of variations in its road and public space design. This is expressed not only in the traffic layout, but especially in the organisation of the urban program and its spatial typology. In this, the road dimension is to some extent adjustable to its direct surrounding (pavements, road space, parking typology). This former main road is still being used as an important public transport axis (bus), direct connected to the dense populated areas. The Via Norte/N14 in Maia/Matosinhos, planned and realised in parallel to the Rua de Godinho Faria and the Rua Nova do Seixo⁴ has another design that gives more priority to fast traffic flows. This is expressed by the absent of crossings of local traffic relations on the same physical level as the main road itself (level crossings and pedestrian overpasses). In some parts, direct accesses in one direction along the road are still present. The overall design is more of a highway organisation. Somehow 'in parallel' to the Via Norte/N14, the highway A3 connects on a higher scale Braga with Porto, where all local connections are realized by viaducts or tunnels. This road, mainly functions as a toll road, does not organises direct accessibility and is therefore more detached from its surroundings. The A3, together with other highways, forms a network of fast roads where the main purpose is to travel or transport larger distances in shortest possible time⁵. The road itself is a monofunctional traffic space. However, a highway itself does not create direct accessibility, the connection points with the underlying network are important urban organisers.

This process of 'parallelism' or upgrading of road types next to the existing road system, is also visible in different urban concentrations in the Porto region, like in Famalicão, Vila do Conde-Póvoa de Varzim and in Espinho. In a more abstract manner, Dupuy (2008, 242-261) explains the evolution of various networks through: *Adhesion, Preferential attachment, The fractal approach and Network time*. An example of adhesion (road type) and preferential attachment (position in the network, node) is the area of the highway A1 exit (opened in 1980) and the N223 in Santa Maria da Feira (CM Santa Maria da Feira, 2009). This area, urbanized rapidly in the last decades benefiting the improved accessibility ('space of acceleration' in the sense of urbanization).

In the Porto region the evolution of the main road network followed in general existing structures. In time, new roads were planned and realised 'in parallel' to the exiting main roads. By changing of traffic requirements, new road types were introduced. In this process, fast roads became more and more mono functional with one objective: organising traffic space for fast motorized mobility. Consequence, is that the capacity of main roads to organise direct accessibility vanished and became more indirect. In the last two decades, the mobility network in the Porto region changes significantly, specially by the realisation of many highways (incl. SCUT roads)⁶.

The Porto region show a wide variety of fast road types and systems that functions next to and in parallel to each other. Fast roads are also part of the public space, with shared and conflicted interests, in the perspective of various spatial disciplines (sectional requirements, fragmented knowledge), key players (governance, investors, users) and at different scales (regional, neighbourhood, physical section). In this, a fast road can simultaneously be seen as a space for 'acceleration' (speed, traffic flows, urban development and transformation) and a space of

‘standstill’ (slow traffic/pedestrians, public space, human interaction). This duality defines the characteristic of a fast road place and its urban potential.



Rua de Godinho Faria - São Mamede Infesta



Via Norte/N14 - Maia/Matosinhos



Highway A3

Fig. 1

3. Fast roads in urban areas

Although, a highway system is composed by many elements, as exits and service stations, the ability to create direct accessibility is poor. Idyllically in the perspective of traffic flows, a highway should have a minimum of exits. This is in contradiction with the objective to provide a mobility system where the main objective is to connect people and goods. This paradox of a fast road, it connects at a regional or national level, but disconnects and conflicts with the local context, is mainly problematic in dense urban areas with multiplex spatial demands and objectives. Or like Nijenhuis (2007, 150) mentions: 'City and highway form a disjunctive synthesis, because they do not fit together yet they merged'.

According to Meyer (1999, 387) large infrastructure (in urban areas) is 'seen and treated as an *essential part of the public domain*'. In this perspective, large infrastructure cannot be autonomous as part of a mobility network only, but is interrelated with the urban environment. A clear example of a dual design approach, traffic engineering and urbanism (design), is the ring road Ronda de Dalt in Barcelona (Fig.2). In this project the ring road as a city highway was enclosed, and partial modernized, and at the same time this project gave an urban momentum to improve local environments and public spaces. By choosing for an integral design between road and urban planning, the city of Barcelona has chosen also for a maximum of traffic capacity. This a limitation of an integral design approach.



Fig. 2

3.1. Fast roads in the Porto region

In Portugal, the average exit distance of highways differs depending on the surrounding of the highway. In general, this distance is shorter in more urbanized areas, like the Circular Regional Exterior do Porto (CREP) and the Via de Cintura Interna (VCI) in the Porto region (Fig.3). Remarkable is that the VCI has an average exit distance of 1,2km.. Taking into account the needed space and minimum distance between two exits, the VCI can be considered as a continuous space of exits, which interact and conflict with its traffic flow functionality.

highway	construction	length km	crossing with other highways	exits	average exit distance x/km
A2	1996-2002	240	6	15	16,0
A1	1960-1990	303	18	31	9,8
A22	1991-2003	133	1	18	7,4
CREP	2002-2011	62	7	24	2,6
VCI	1963-2007	21	6	17	1,2

Fig. 3

The accessibility of a road depends on its typology. Essential aspect between the mobility network and the urban space is the changing moment between traveller or driver into pedestrian, or from a fast to a slow movement. This defines directly the possibilities of programs and organising addresses. The mono functional character of highways makes direct accessibility limited or not possible. Drive-in types as service areas operates in an autonomous way together with the highway network. This is especially on toll roads. In general, the changing moment of a highway is on the point of an exit, where it connects with the underlying road network of regional and urban roads and streets.

In the Porto region, the highway system has 54 exits and 14 nodes, with a average proximity of circa 3x3 km² for each exit. Eight exits are combined with highway nodes, 15 exits are connected with another main road (N-roads and Avenues⁷), in which 5 exits also with the local street network, and 31 exits are only connected with local streets. The program around every exit divers in composition, typology and scale. Globally, two exits have a specific and restricted use (Lipor II and the port of Leixões), 18 exits serve production and working areas, including the airport area, in which 5 of these exits have also drive-in commercial types, and 6 exits serve mainly commercial areas (all with different typologies, but all with large parking capacity). Figure 4, shows the different exit density between the highways A1/A3 and the other highways. Specially the VCI and the IC1 (axis Matosinhos – Vila Nova de Gaia along the coast line; partial a former SCUT road) have a high density of exits. Parts of the IC1 function even as organization for the urban environment, inclusive parallel street patterns as in the area of Zona Industrial do Porto and the A28 zone of IKEA/Mar shopping in Matosinhos. The right figure, which shows the relation between the highway exits and the built areas, shows that the built structure along the other highways is more attached to the local structure.

Accessibility, for motorized transport, on a regional level is not only served by the highway system. Indeed, most urban accessibility is organized on the underlying network. This network is composed of regional roads, urban main roads and local streets. Every type has another traffic function and divers in hierarchy. In general,

how lower the speed, how more kind of traffic users (cars, public transports, bikes, pedestrians). Lower speed makes it also possible to park directly next to the road, what increases the potential of developing and organizing programs along the road. The 'Rua da Estrada' (DOMINGUES, 2009), in the Porto region, is a special mixture between, normally, a regional connection and an urban organizer (intermediate scale). This mixture and intermingling of users is a result of a long and slow urbanization process. This type of road is in itself an urban typology, with programs as shops, working areas, offices, shops, car dealers, restaurants, bars, hotels, housing, municipal buildings, school, gas stations, etc.. These roads became in some parts even a mixture between a space for speed & acceleration and a space of slowness & standstill. The almost absent of pedestrian areas, street light, urban furniture and urban traffic regulations, contrast and conflicts with the fast traffic objectives of the road and the 'urban use' of this space. Re-arranging parts of this kind of roads, like the N1 in Venda Nova, could be an important 're-urbanization' assignment (Portas, 2011), in the perspective of the regional underlying network and the quality of its space.

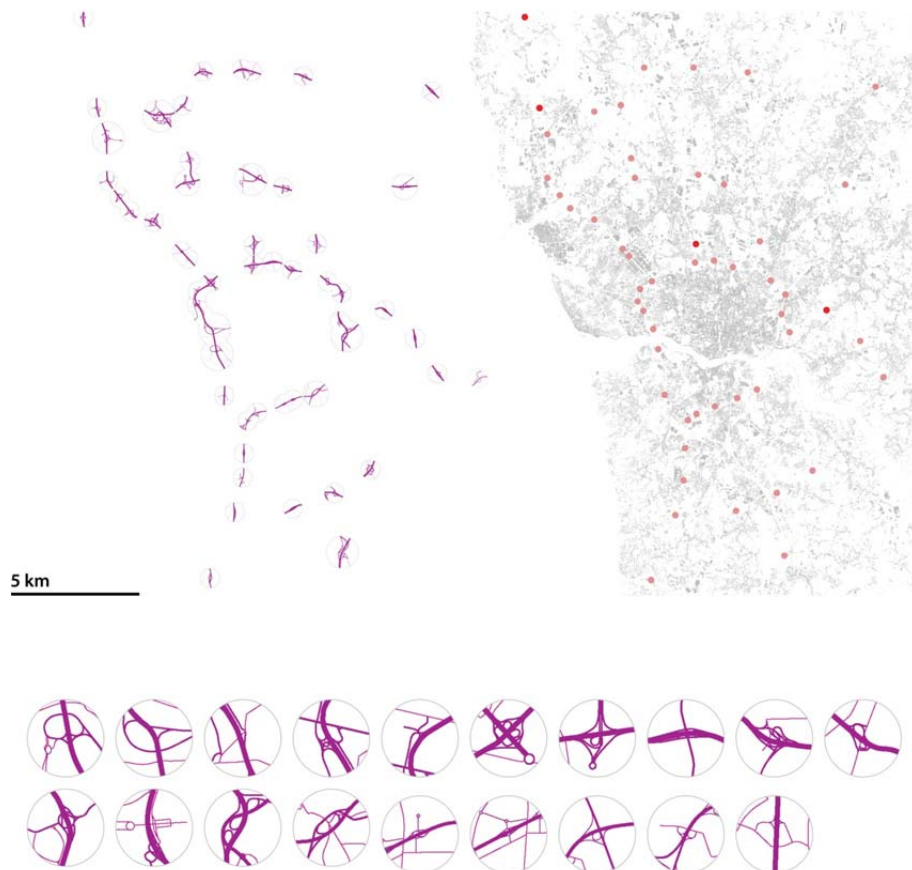


Fig. 4

3.2. Via de Cintura Interna, as a fast road example

The VCI was originally projected as an 'Avenida de Cintura' ('Plano Geral de Urbanização', 1948) and changed during planning and implementation process from an urban road typology into a road with a highway layout (SUCENA, 2003). The planning, implementation and realisation of the VCI took several decades. The first part of the VCI was realised in 1963, including the construction of the Arrábida bridge. By the construction of the last part in Vila Nova de Gaia, in 2007, the ring road was enclosed. This last part, connects the highways A1 and A20 directly with each other, and the two main bridged for motorized traffic in the Porto region, the Ponta da Arrábida and the Ponte de Freixo. Indirectly, it was possible to downgrade the traffic function of the Avenida da República in Vila Nova de Gaia and to improve its public space, including the integration of an urban metro. As an integrated part of the urban and road structure at a municipality level, two new main urban roads were introduced (VL8 & VL9), what made the closing for motorized traffic on the upper-level of the Ponte Luis I possible. In the realisation period of the VCI, not only the road section and technical traffic design changed with the newest requirements of that moment, but also the tracing of the VCI itself and with that the position and functionality in the network changed as well. At the same time, the VCI changed the road network in the Porto region. Through this, it was possible to realise an urban shopping centre/building at the crossing point of the VCI and the Avenida da República⁸. This shopping centre has a unique combination of high level public transport, by metro, and direct connection with the VCI, including a large parking capacity. Or in urban terms: it is a combination between a regular urban building type with access on a main street and a drive-in type, directly connected to the regional road network.

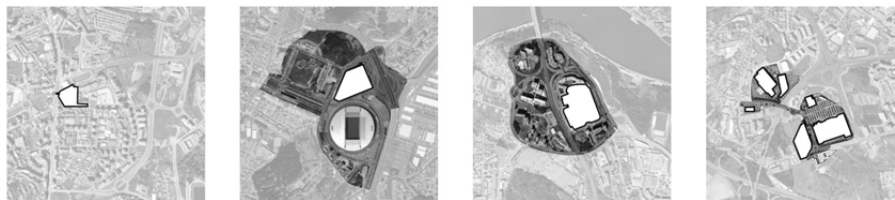


Fig. 5

The attachment and the interaction with the urban environment along the VCI, expressed in the variety of exit types, is each time unique (Fig.4). This varies in terms of having direct connection with the main streets, the exit design and layout in relation with the orientation and logics of the urban structure and the programmatic relation (shopping, education, health). The VCI has 6 nodes with other highways, including the Via Norte⁹ and the IC 29, and 19 exits. Four exits are directly connected with commercial programs (Fig.5), each with a different urban morphology. In the example of the commercial centre in Vila Nova de Gaia, as described above, the building typology is integrated in the local street network, including pedestrian sidewalks and an urban design of the public place. In this example the parking program is fitted in a five-store underground parking garage. In the example of the Estádio do Dragão, the combination of the ring road exit and re-arranging of the football program was an accession to re-arrange the local urban structure. A new main street axis (Alameda das Antas) is created. Beneath this axis, a tunnel for motorized traffic is directly connected with the VCI. The urban plan for the area Antas (Plano de Pormenor das Antas, app. 39ha.) consist of a mix

urban program, including housing, offices and a shopping centre. The area is connected with the main local streets and it has a metro station. Also in this example, the major part of the parking program is integrated in buildings. The Arrábida shopping is direct connected with a exit to the VCI. With this development it was also possible to finance and realize a part of a new main urban avenue, the VL8. The ambition was to create an urban environment with a mix program, that consist in shopping, housing, hotels and a hospital. Every program has its own parking program. Because of the dependency on car accessibility and partly because the road design is strong focussed on motorized traffic flows, the interaction between the programs and the local attachment to the street network is not strong. Although, a big part of the parking program is integrated inside buildings, this area can be considered as an urban drive-in typology because its unilateral relation with the car. The fourth example, the Gaia shopping, is a classical example of a drive-in typology. Big shopping programs with big open air parking areas. In this example, the connections with the surrounding shows spatial ruptures and discontinuities, like in the organisation of the public space.

The four examples show a range of highway exits in urban environments, from urban to drive-in commercial typologies. The parking solution is an essential element in order to define or to achieve an urban environment. Not only because of the enormous space needed for parking, but also in the possibilities to integrate and to mix with other users. However, fast roads are difficult to integrate in the urban environment, the four examples show different typologies in the connection of the fast road network with the local urban context. All are adapted to the local conditions and create, at the same time, new conditions for the urban environment. The design of an exit and its condition to the local street network is in this an important factor for the urban planning.

5. Fast roads and urban planning

Urbanization and mobility network have a direct, intense and interrelated correlation. Without accessibility there is no conditions to organize or re-arrange the urbanization. But without urban areas and without concentrations of people or work areas, the need for a large mobility network is absent or not strong.

Traffic has an important impact for the local social conditions. Speed and traffic intensities influences directly the social interaction of people that live or work in a certain street or road (APPLEYARD, 1982) and with that, a road can create social spaces of interaction, linear or concentrated. The way fast roads are attached and integrated with the local urban context is therefore an important aspect of urban planning. An integrated and balanced approach between mobility and spatial organisation could be an important requirement in the modernization of the fast road network in the Porto region. In the evolution of the fast road network *rationalisation* and *urbanization* are the next stages of development.

Notes

1. In France the car is responsible for 80% of the mobility performance (Ascher, 2010, 137), in The Netherlands this is 75% (CBS/Ilona Bouhuijs, 2008). In the Porto region, 80% of all mobility computing movements was by motorized transport (2001).

2. The Plano Rodoviário Nacional de Portugal (1985) introduced a new road type exclusive for motorized traffic, Sucena 2010, 209.

3. As weight in the total traffic performance, spatial use for motorized transport (including parking), amount of public investments and the car-based economy (´the magic Circle of Asphalt´, Asphalt Institute, 1966 in Dupuy, 86).

4. Highway evolution in Portugal (km): 1960:40, 1970:66, 1980:132, 1990:316, 2000:1.482, 2007:2.613 (partially with European funds). Source: Eurostat (1970-2007), International Road Federation, UN-Economic Commission for Europe. In 2010, an electronic pay system was introduced on the former SCUT (Sem Custo para os Utilizadores) roads in the Porto region. Ministério das Obras Públicas, Transportes e Comunicações (MOPTC), 2010.

5. Both streets have regional continuity, but their names changes constantly.

6. Portas calls this the ´tunnel effect´, 2011.

7. Commercial centre El Corte Ingles; MVCC Arquitectos/António Babo.

8. Avenida da República/Matosinhos, Avenida da Boavista/Porto and the Avenida Vasco da Gama/Vila Nova de Gaia.

9. The southern part Via Norte has a highway layout.

Legends

Fig. 1 - Parallel roads, changing of road type along the evolution of the actual road network, figure by author, 2012.

Fig. 2 - Ronda de Dalt in Barcelona, photograph by author, 1998.

Fig. 3 - Four highways in Portugal. Source: Estradas de Portugal, 2012, Wikipedia Portugal, 2012.

Fig. 4 - Highway exits in the Porto region and VCI highway exits, maps by author, 2012. Source: Carta Militar de Portugal, 1948 and 1998, Plano Rodoviária Nacional 2000 (PRN, version 2009), PDM (Porto, Matosinhos, Maia, Vila Nova de Gaia) and CEAU/FAUP.

Fig. 5 - Four VCI exits with commercial program, all with a different urban morphology and parking typology, map by author, 2012.

References

ASCHER F, APEL-MULLER M, et (2007), The double sharing of the street, The street belongs to all of us!, Vauver,: Au diable vauvert, 24-31

ASCHER F (2010), *Novos Princípios do urbanismo & Novos compromissos urbanos*, Translated by Margarida de Souza Lobo and Ana Valente, Livros Horizonte (original in French, 2001 and 2008)

CM Santa Maria da Feira, Atlas, 2009.

DOMINGUES A (2006), *Cidade e Democracia, 30 anos de Transformação em Portugal*, Lisbon: Argumentum

DOMINGUES A (2009), *A Rua da Estrada*, Porto: Dafne editora

DUPUY G (2008), *Urban Networks – Network Urbanism*, collection of key articles, Amsterdam: Techne Press

HEMEL Z, JANNINK J (2001), *Verbinden, naar een integrale netwerkstrategie*, Den Haag, Directie Strategie en Coördinatie, Ministerie van Verkeer en Waterstaat

FONT A, INDOVINA F, PORTAS N (2004), *The Explosion of the City, Morphologies, Observations and Motions within recent territorial transformations in the South Europe Urban Regions*, Barcelona: COAC

GRAHAM S, MARVIN S (2001), *Splintering Urbanism, networked infrastructures, technological motilities and the urban condition*, London & New York: Routledge, edition 2009

INE, *Movimentos Pendulares e Organização do Território Metropolitano: Área Metropolitana de Lisboa e Área Metropolitana do Porto - 1991 – 2001*

MEYER, H (1999), *City and Port, transformation of Port Cities* (London, Barcelona, New York, Rotterdam), TU Delft, Utrecht, International Books, 387

NIJENHUIS W, Van WINDEN W (2007), *De diabolische snelweg*, Rotterdam: 010, 121-150

PORTAS N, DOMINGUES A, CABRAL J (2002), *Políticas Urbanas, Tendências, estratégias e oportunidades*, Lisbon: Fundação Calouste Gulbenkian, 2nd edition, 2007, 141-151 and (2010), *Políticas Urbanas II, Transformações, Regulação e Projectos*

SUCENA S (2003), *A Via de cintura interna como element de estrutura urbana? Uma análise e comparação com a Ronda de Dalt Barcelona.*

SUCENA S (2010), *Red viaria y territorio en el Vale do Ave, Barcelona/Porto*, Ph.D. thesis

Bibliography

Daniel Casas Valle (Utrecht, 1973) is an urban planner, designer and researcher. He graduated on spatial/urban planning (*Ruimtelijke Ordening en Planologie*, Utrecht, 1997) and on urban design (*Stedebouw*, Amsterdam, 2002), both in The Netherlands. He worked at several organizations as the Municipality of Amsterdam, *Must urbanism* and the *Architekten Cie*. In parallel, he was involved with academic and education activities at the Academy of Architecture in Amsterdam (2002-2010) and at other universities in Europe.

His actual Ph.D. research, at the Faculdade de Arquitectura da Universidade do Porto, focus on the relation between fast roads and urbanization in urban areas, with the Porto region as case study area.