

# MOBILITY PATTERNS IN PERIPHERAL/DISTANT AREAS OF MULTICENTRIC METROPOLITAN REGIONS: RADIAL VS. TANGENTIAL FUNCTIONAL LINKAGES. THE CASE OF CASTILLA-LA MANCHA IN RELATION TO THE MADRID METROPOLITAN REGION

**Inmaculada Mohino Sanz**  
**José María de Ureña Francés**  
**Eloy Solís Trapero**

Departamento de Ingeniería Civil. Escuela de Arquitectura. Universidad de Castilla-La Mancha  
inmaculada.mohino@uclm.es ; josemaria.urena@uclm.es ; eloy.solis@uclm.es

## I. INTRODUCTION: THE NEW URBAN AND MOBILITY PATTERNS

During the last decades, traditional monocentric metropolitan areas have evolved towards more polycentric/multinodal urban structures, and consequently more complex mobility patterns (centre-periphery, periphery-centre, periphery-periphery) have emerged (Clark and Kuijpers-Linde, 1994; Van der Laan, 1998). There are undoubted relations between mobility and urban form, which have mainly been studied through labour commuting flows since they constitute the greatest daily recurrent travel.

This paper complements existing studies by analysing if complex functional relationships taking place within traditional metropolitan areas also characterize more distant areas of Multicentric Metropolitan Regions (approximately between 50 and 250 km from the metropolitan centre).

The analysis is focused on the Madrid Metropolitan Region, which has undergone noteworthy changes in its urban structure and transport system during the last three decades. As a consequence, metropolitan processes started to overflow beyond Madrid province administrative boundaries, giving raise to strong functional linkages with adjacent provinces. In parallel, during the 1980s a state re-scaling took place in Spain. Therefore, in order

to analyse the influence of these processes on mobility patterns, the study area covers two different Spanish Autonomous Communities (NUTs-2 in the European Nomenclature), that are, Castilla-La Mancha (CLM) and Madrid, and the study period spans from 1981 to 2012, before and after the consolidation of these politico-administrative regions. CLM has traditionally been defined as a disorganised, without functional cohesion and acephalic/leaderless region conspicuously influenced by Madrid.

Three main sources of information have been used to carry out the analyses: the 1981 Spanish National Census, the 2001 Spanish National Census and a self-administered mobility survey carried out in 2012 (since the information of the 2011 Spanish National Census is still not available).

The present analysis of territorial articulation is carried out under a double approach:

- On the one hand, by looking at the commuting patterns evolution (1981-2001-2012). Firstly, in absolute terms (as the number of trips originated at each municipality) to identify cities leading regional mobility patterns (in terms of strength of interaction). Secondly, in relative terms (as the percentage of outward commuting directed to a certain destination) to understand the centrality re-configuration of destinations.
- On the other hand, by characterizing 2012 regional business travel patterns and comparing them with the 2012 regional commuting ones. Besides, by analysing the evolution of business relationships (between 2006 and 2012) for one of the Castilla-La Mancha provinces (Ciudad Real).

In order to characterize the polarization capabilities of the CLM main centralities of the Multicentric Metropolitan Region, different types of relationships are identified according to the centres they are directed to: intraprovincial (hierarchical towards the capital city and non-hierarchical towards other provincial destinations), radial (hierarchical towards the metropolitan centre and non-hierarchical towards the rest of the Madrilénian municipalities), tangential (hierarchical towards the regional capital city, Toledo, and non-hierarchical towards the rest of the CLM municipalities, excluding those of the same province of residence) and interregional (towards other Spanish regions excluding Madrid).

## **II. EMPIRICAL RESULTS**

### **II.1. A noteworthy increase and a greater multidirectionality of commuting patterns**

Out-commuting flows have greatly increased both in intensity and in number of municipalities reached between 1981 and 2012, multiplying by 2-10 times in 2001 and by 3-20 times in 2012 those existing in 1981. This noteworthy increase could be explained by the duplication of car ownership and female working ratios, by the travel time reductions within the study area thanks to transport improvements and by the progressive integration of CLM into metropolitan processes.

- In that sense, between 1981 and 2012, intraprovincial (generally greater towards the provincial capital cities) and radial (in general, greater towards Madrid) flows have

considerably increased. The reinforcement of the last ones has been more significant between 1981 and 2001, since during that period of time some Madrilenian municipalities start acquiring a metropolitan sub-centre role.

- In regards to the tangential flows towards Toledo, whilst they didn't exist in 1981, they appear in 2001 favored by the state re-scaling and the conformation of the regional capital in Toledo in 1982, except for those municipalities for which Madrid was in between (Guadalajara province). In 2012, travel time reductions, thanks to the new CM-42 motorway, has had a notorious impact on these tangential flows, increasing from the central CLM area (Alcázar de San Juan, Tarancón and Villarrobledo). Conversely, the rest of tangential flows already existed in a few municipalities in 1981, although they were weak. In 2001, all surveyed municipalities showed this type of flow, having increased for most of them (fifteen out of twenty municipalities) in 2012. This multinodal mobility pattern supports the hypothesis of emerging new centralities within the CLM region.
- Similarly, interregional flows were weak in 1981, being more significant in the most distant municipalities from Madrid (and especially for eastern municipalities, traditionally more related to Mediterranean Metropolitan Areas). Between 1981 and 2001 there was a general increase of this type of flows, while they reorganize between 2001 and 2012, increasing in the two capital cities more distant from Madrid (Albacete and Cuenca) and decreasing in the three other provinces.

Looking at the organization of these out-commuting flows, two tendencies can be observed. The first one between 1981 and 2001, when Madrid reinforced its traditional attraction as the main destination of extraprovincial flows, both for near and distant municipalities. The second one during the last decade, characterised by a weakening, in percentage terms, of Madrid's polarisation role together with a strengthening of tangential relations (although still weak and only in a reduced number of municipalities close to the central area of CLM), giving rise to more complex mobility patterns.

## **II.2. Business flows spatial patterns**

The comparison between the 2012 regional commuting and business travel patterns reveals that: firstly, the latter ones take place along longer distances; secondly, business trips are less complex since flows are centralised in a smaller number of high centrality destinations (mainly Madrid and to a lesser degree, the provincial capitals); and thirdly, total tangential business linkages are clearly greater than tangential commuting ones.

On the other hand, the diachronic analysis of business travel (between 2006 and 2012) shows the consolidation of a more complex mobility pattern due to destination diversification.

## **III. CONCLUSIONS**

The present article complements recent literature on Multicentric Metropolitan Regions by analysing their more distant territories and by exploring if complex mobility patterns

occurring up to a certain distance from metropolises (approximately, 40-50 km) also take place further away (up to 250 km).

Empirical results show that distant areas of the Madrid metropolitan region have considerably increased their work-related intermunicipal flows during the last three decades, after the Spanish State re-scaling process. Moreover, the structure of functional relationships have increased their complexity, with new functional linkages in addition to the traditional ones towards the provincial capital cities: tangential between similar territories within these distant areas, radial between these distant areas and the traditional metropolis and interregional between distant areas and other regions. Despite the emergence of these complex interaction patterns within distant territories of metropolitan regions, they are still much less developed than those of nearer areas and they are still dominated by intraprovincial and radial flows.

Nevertheless, several new spatial patterns are appearing and can be recognised in these distant parts of the metropolitan regions:

- Municipalities closer to the metropolis maintain or increase their radial flows, being the only ones that interact with other metropolitan sub-centres of the Madrid province.
- The attraction capacity of the metropolis means that up a certain distance (in Madrid around 150 km) radial interactions are stronger than hierarchical ones to the provincial capitals.
- The high relevance of intraprovincial flows in distant areas evidence the low development of polycentric structures at the intra-regional level, where each provincial capital still exerts an important influence, while only a limited, although growing, number of trips take place beyond each province's administrative boundaries.
- Attraction capacities of new regional capitals do not reach that of metropolitan cores, and only for business-related flows total tangential relations equal or even exceed total radial ones.
- Municipalities with greater centrality capacities (size, public administration, public services, economic activities, etc.) tend to develop intermediary roles attracting a greater percentage of flows from lower centrality level municipalities and conversely their own outward relations increasingly take place with the metropolises or other municipalities of their same centrality level.