POLYCENTRISM, STRATEGIC SPATIAL PLANNING AND ITS IMPLICATIONS

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Abstract: Ever since polycentrism was promoted by the EU in ESDP as an a-priori view valuable to adopt it gained popularity and it has been included in policy documents of the Member States. The paper will explain the context of European, national and regional policies and also the visions of regional development regarding urban polycentric regions to highlight their relevance as a distinct spatial level of planning. For the national context we chose the example of the German federal state; its objectives regarding spatial planning are still marked by the contradiction between the principal of balanced spatial development across the country and the promotion of an European alternative model of development. This case also highlights the changes induced by the shift of the political views and inclusion of new development directions in policy documents. Polycentrism on regional level is being exemplified on Randstad scale by pointing out the way the development of this region is promoted by superior administrative tiers and how different forms of governance have emerged. Finally, the paper examines how a model of spatial interaction and residual analysis can provide useful information in pointing out the intensity and direction of the relationships among urban centres, becoming thus a measure of polycentricity

Keywords: polycentrism, spatial planning, federal system, Randstad, residual analysis, spatial interaction model

I. INTRODUCTION

In the 1960s and 1970s strategic spatial planning in a number of Western countries evolved towards a system of comprehensive planning at different administrative levels (Albrechts, 2004). The next decade brings a new dimension to
European urban planning policies, which were focused on land-use regulations and specific development projects. During the 1990s a revival of spatial planning was to be noticed and was marked by the shift in focus from the physical planning of space-using functions such as housing, industry, transport and nature to the development of strategic frameworks and new visions for regional development (Burger et al., 2014). This new direction can be seen as an alienation from neoconservative and postmodern views on ‘makeability of society’ (Albrechts) and is fuelled in part by the problems of coordinating public policy, promoting urban and regional competitiveness through the development of a collective asset base and mitigating inequalities of opportunity across cities and regions (Healey, 2004). Delivering on these new demands implies the development of an adapted strategic planning capacity and a shift in planning style in which the stakeholders are becoming more actively involved in the planning process on the basis of a joint definition of the action situation and of the sharing of interests, aims, and relevant knowledge (Albrechts, 2004).

In the last decades policy decision makers and stakeholders have designed the general framework of urban planning strategies for the European territory; regional development policies are an important part of them as they aim facilitating social, economic and territorial cohesion. In this new strategic planning context, polycentrism, respectively polycentricity have become buzzwords. Polycentric development policies have mainly been introduced to encourage a more balanced spatial distribution of economic activities between geographic units (cities, regions) across an area as well as higher levels of urban and regional competitiveness (Meijers and Romein, 2003).

As polycentrism is a flexible concept regarding the scale of analysis - can be applied and interpreted at macro-, mezzo- and microscale - (Davoudi, 2003), the policy makers that propose and promote the model of polycentric development are taking into account all these forms of spatial organisation. Hence the highest level of analysis is represented by the entire territory of European Union which establishes the principal guidelines of regional policies included in different strategic documents; legislative measures are included in plans adopted by national and subnational (regional and local) administrative levels.

In order to better understand the logics beyond urban polycentric systems (no matter the scale of analysis) we may consider a short inventory of how the concept of polycentrism was included and discussed in strategic plans that offer perspectives on their future development; thus, the paper will explain the context of European, national and regional policies and also the visions of regional development regarding urban polycentric regions to highlight their relevance as a distinct spatial level of planning. The examples of German system and the Dutch Randstad region will be used to highlight the features of implementing policies that
address the issues of a polycentric model of development according to different political views. Finally, the paper examines how a model of spatial interaction and residual analysis can provide useful information in pointing out the intensity and direction of the relationships among urban centres, becoming thus a measure of polycentricity.

II. POLYCENTRISM ON THE EUROPEAN LEVEL

The Single European Act of 1986, which prepared for the advent of the European Union (EU) in 1992, laid the basis for the so-called cohesion policy aimed at a balanced and sustainable development in all parts of the EU to be achieved through policy means, as well as improved life quality for all citizens (Rumford, 2000). The importance of cohesion policy was reinforced by the Treaty of Amsterdam (1997); thus, the regional policy became gradually more complex by aiming to achieve three of the main objectives of the European Union, namely social and economic cohesion, subsidiary principle and sustainable development.

If until that moment there were created different solidarity instruments (like structural funds, for example) to support the development of regions at European spatial planning community level, the Informal Council of Ministers (CEMAT) approved the European Spatial Development Perspective (Potsdam, 1999) which brought up in foreground a new solution for “a balanced and sustainable development, in particular by strengthening economic and social cohesion” (European Commission, 1999), namely the polycentric development. The main purpose was to encourage each locality to establish its specific objectives and to create specialized centres across the European Union (Faludi, 2000). It is one of documents that concretely adresses issues of spatial development, and of the territorialization of the EU, offering general guidelines for a balanced and environmentally aware approach to spatial planning, without including any active planning policy (Hein, 2006). Further views on the development of the European territory, and specifically on the concept of balanced polycentric development are to be found in spatial strategy documents adopted in the following years.

A year later the same council of ministers adopts the Guiding Principles for Sustainable Spatial Development of the European Continent which on one hand offers principles of planning policy for sustainable development in Europe and on the other hand spatial development measures for different types of regions. According to this document “Europe has the potential for achieving a polycentric development pattern, with a number of significant growth areas, including ones on the periphery, organised as urban networks. In addition to metropolitan areas, the gateway cities [...] represent a step towards a polycentric continent-wide growth model” (CEMAT, 2000 - §18-19, 5). Applying these principles requires
cooperation between spatial planning and sectoral policies and also between different administrative levels (local, regional and national).

The visions promoted in ESDP are updated in the Territorial Agenda of the European Union (Towards a more competitive and sustainable Europe of diverse region) adopted in 2007 which promotes „a polycentric territorial development of the EU, with a view to making better use of available resources in european regions” (“Territorial Agenda of the EU,” 2007); it emphasizes on the following aspects: (a) competitiveness of regions and cities by enhancing the polycentric development and creating innovative clusters, (b) climate changes and (c) territorial cooperation and multi-governance.

The idea of a balanced territorial development based on urban polycentric structures is also included in another document adopted in the same year by ministers responsible with urban development in European Union - Leipzig Charter on Sustainable European Cities.

Another policy document which considers polycentrism as an a-priori view valuable to adopt is the Territorial Agenda 2020; it “provides strategic orientations for territorial development” transposed in cooperation between cities and regions as part of polycentric systems as it „may allow them to improve their performance in European and global competition and promote economic prosperity towards sustainable development” (“Territorial Agenda of the EU 2020,” 2011 - §25, 6). It also promotes “polycentric development at the macro-regional, cross-border and also on national and regional level in relevant cases” (§26, 6).

All the afore mentioned strategic spatial planning documents, consider polycentrism to be an alternative model of development which reconciles two of the main objectives of the European Union, namely competitiveness and social cohesion. This ambivalent perception highlights the importance of polycentrism “as a strategy taking into account the major role of urban dynamics in regional development, with the aim of increasing the potential of the economic and institutional resources of all towns, thus strengthening their assets” (Baudelle, 2007). The concept’s relevance on achieving the two objectives is simplified as follows (table 1).

<table>
<thead>
<tr>
<th>Objective</th>
<th>Competitiveness</th>
<th>Territorial Cohesion</th>
<th>Competitiveness &amp; Cohesion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spatial strategy</strong></td>
<td>Reinforce major poles</td>
<td>Reduce disparities</td>
<td>Consiliate Gothenburg and Lisbon</td>
</tr>
<tr>
<td><strong>Instrument</strong></td>
<td>Growth poles</td>
<td>Zoning</td>
<td>Polycentrism</td>
</tr>
<tr>
<td><strong>Outcome</strong></td>
<td>Efficiency, disparities</td>
<td>Solidarity</td>
<td>Territorial equity</td>
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</table>
Even though the European policy documents offer a general framework for designing national and regional policies, applying them on a concrete level it will depend on each state features and aspirations. Hence, a European territorial cohesion policy will undoubtedly be influenced by national approaches to cohesion and polycentric development as formal competencies for territorial development are embedded at the member states rather than the European level. Learning more about national approaches to polycentric development may thus be valuable as an input to the current European debate (Meijers et al., 2007).

III. POLYCENTRISM ON NATIONAL LEVEL

European debates regarding the development of an integrated urban system and the effects induced on national levels generated numerous discussions among policy makers and stakeholders from Member States. In Germany, for instance, these preoccupations started to emerge since the 1990s, when the political speeches were focused on the role of cities in the global network, city-regions and the changes these could have on territorial development.

The promotion of polycentric development model was not always a priority for the German state. In the first decades of the twentieth century, the legal body of spatial planning had its roots in local zoning plans, emerging in response to economic and population growth within large cities and the need to regulate land use in Germany’s rapidly developing industrial growth regions (Harrison and Growe, 2014). After the Second World War, strategic spatial planning in Germany has focused chiefly on securing a more balanced geography of economic development, rather than on supporting further concentration within agglomerations, in order to ensure comparable conditions throughout the country (Knapp et al., 2006).

The first federal law on spatial planning (Bundersraumordnungsgesetz) was established in 1965. Since then the duty of federal law has seen the federal level outline the principles (Grundsätze) of regional spatial planning and the Länder concretize these principles (Harrison and Growe, 2014), as they have the responsibility of spatial planning. These political options were promoted until the beginning of the 1990s, moment which marked a shift in political views towards the concept of ‘metropolitan region of European importance’. Considering all the changes that characterized this period – German reunification, deindustrialization, EU enlargement, increasing globalization – the Federal German government intensified its efforts to integrate the cities and regions into European and global circuit of capital accumulation.

Two documents related to these strategic issues created the framework for developing and promoting the model of polycentric development based on inter-
urban cooperation. The first policy document is ‘Guidelines for regional planning’ (Raumordnungspolitischer Orientierungsrahmen) published in 1992; it outlines and communicates the prospects, principles and strategies for spatial and urban development in the Federal Republic of Germany (Schmitt et al., 2003). As Harrison and Growe (2014) point out the German example shows how the status as a state with a polycentric urban system was used by the Federal State to argue that promoting the strategic importance of ‘metropolitan regions’ was necessary given that spatially concentrated economies grow faster in globalization, contributing thus to achieve the long-standing objective of spatial equivalence in Germany.

The Federal action plan for national spatial development, 1995 (Raumordnungspolitischer Handlungsrahmen) followed the 1992 document and focused on defining new spatial units in the German planning context, the so-called ‘metropolitan regions of European importance’. They were no longer conceptualized as being congested areas which should be protected from further growth, but as constituting a critical mass for economic competitiveness in a national as well as an international context, being characterized as ‘driving forces’ or ‘motors of spatial development’ (Knapp et al., 2006). At that moment these were the six most important cities (Berlin/Brandenburg, Munich, Rhine-Ruhr, Rhine-Main, Stuttgart) on a global scale, each of them assuming various national tasks and forming important clusters in key areas of business activity, human capital, information and technology exchange, cultural experience and political engagement (Harrison and Growe, 2014). In 2005 four new regions were included in this category: Bremen-Oldenburg, Hanovra-Braunschweig-Göttingen-Wolfsburg, Nürnberg and Rin-Neckar. All eleven regions incorporate in 2010 57.54 million inhabitants, representing 70.38% of total population, but within exhibit scale and spatial flexibility – from 2.36 million inhabitants in Rhine-Neckar to 11.63 million in Rhine-Ruhr region (BBSR and IKM, 2013). The types of regions included in these policy documents are displayed in the table below (table 2).

<table>
<thead>
<tr>
<th>Types of metropolitan regions</th>
<th>Examples</th>
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<tbody>
<tr>
<td>Monocentric</td>
<td>Berlin-Brandenburg, Hamburg, Munich, Nürnberg, Stuttgart</td>
</tr>
<tr>
<td>Bi-polar</td>
<td>Bremen-Oldenburg</td>
</tr>
<tr>
<td>Formed around multiple centres</td>
<td>Hannover-Braunschweig-Göttingen-Wolfsburg, Halle/Leipzig - Sachsendreieck</td>
</tr>
<tr>
<td>Polycentric</td>
<td>Rhein-Neckar, Rhein-Ruhr, Rhein-Main</td>
</tr>
</tbody>
</table>
These regions are not politico-administrative bodies; they provide urban and regional stakeholders with a platform to campaign and put pressure on state, national and European institutions to recognize their superior strategic importance within spatial development policies (Blotevogel and Schmitt, 2006).

A decade after the last policy document new guidelines regarding spatial planning were designed. Hence in 2006 the Federal Government and the federal state ministers responsible for spatial planning adopted the ‘Concepts and strategies for spatial development in Germany’ (*Leitbilder und Handlungsstrategien für die Raumentwicklung in Deutschland*). It aims the following priorities: (a) growth and innovation; (b) ensuring services of public interest and (c) conservation of resources and shaping the cultural landscape. Focused on developing a polycentric network, it had as main objectives “cooperation and joint responsibility not only in suburban metropolitan regions but especially in catchment areas of metropolitan regions and in the cross-border context as well. This expansive approach is designed to intentionally integrate subareas with different structures, for example, economically strong and weak, rural and urban, peripheral and central subareas, into one development strategy” (Göddecke-Stellmann and BBSR, 2010).

A central place in achieving all the objectives is ascribed to concept ‘growth and innovation’. Thus, there were identified three types of area: (a) 11 European metropolitan regions, (b) dynamic growth areas outside metropolitan regions (are located outside the immediate metropolitan spheres of influence, but they act as independent spaces, with a profile based on endogenous growth) and (c) areas with need for stabilization – rural or old industrial areas, with peripheral positions, located near borders and fall in between areas of growth (Lutter, 2006).

The document presents a new image of the German space economy which is no longer simply being discussed in relational terms, but as a web of relational connectivity and networked ‘space of flows’ – developments that could amount to a trans-region and relationally networked embryonic national spatial plan for Germany based on interacting, but hierarchically differentiated, city-regions (Harrison and Growe, 2014).

Even though the federal German government highlights the importance of metropolitan regions for developing a polycentric urban system, beyond this initiative still exhibits the contradiction between long-standing principle of equitable and balanced spatial development of entire German space and the promotion of superior strategic importance of the concept of ‘European metropolitan regions’ (aimed to follow-up the development patterns of EU). Therefore, the image of the German urban system displayed in Leitbilder can be interpreted from a threefold perspective according to Harrison and Growe (2014):

- *agglomeration* to identify existing metropolitan regions and their core;
scale to present this idealized structure of more networked forms of regional cooperation and collaboration at a federal level;
- **hub and spokes** to connect metropolitan regions to other cities with metropolitan functions in the first instance, but also identify growth areas outside metropolitan regions.

Another aspect that is worth mentioning is the lack of administrative boundaries of delineated areas; the only political boundary that was taken into consideration is the national border, aspect that reveals on one hand a restrained behaviour of the federal government regarding trans-border cooperation and on the other hand the discursive character of these policy measures, as the metropolitan regions have no competencies in spatial planning, the decisions being taken by Länder.

These measures are revised and redefined in 2013 by federal state ministers responsible for spatial planning who included among strategic plan the development of trans-border cooperation areas and coastal areas, the role of national border being thus diminished.

The federal type of governmental structure in Germany means that the national state leaves the spatial planning to the regional levels making it up to them how to structure the planning process in the administrative and operational way. In other words, the federal states have the power to decide the organizational structure of the whole region, but the municipalities (local level) have a high degree of self-government, with large competences to interpret the planning strategies from the administrative levels above, though bound to act within the overall federal regulations (Nissen, 2008).

**IV. POLYCENTRISM ON REGIONAL LEVEL**

To exemplify the polycentrism on regional level we have chosen the most used example that scientific literature provides – Randstad region in the Netherlands. It forms an urban constellation in the western side of the country, the four main cities (Amsterdam, Rotterdam, The Hague and Utrecht) delimiting the so-called Green Heart. The polycentric pattern is basically inherited from the past, as fragmented political and administrative structures have prevailed in this area for centuries (Dieleman and Faludi, 1998). However, the Randstad, as it is nowadays, is also the result of urban and regional planning, being, with its counterpart the Green Heart, at the core of Dutch planning policies since the 1950s (Zonneveld, 1991; Faludi and van der Valk, 1994) (apud Meijers, 2005).

The legal and institutional basis of the Dutch system is laid down in the Spatial Planning Act of 1962 (which became effective in 1965); since that time the spatial planning was conceived as a co-ordination activity (Zonneveld, 2005). The
regional policy in the 19950s and 1960s had as objectives “the integration of weak regions into the national economy and equal opportunities for people leaving in different parts of the country; the main instruments were subsidies for companies to relocate and government investments in the general business environment” (Zonneweld and Waterhout, 2007). The cohesion policy was revised during the 1980s, when the government supported the development of Randstad region, while other areas had to exploit their own potential without receiving any help from the national government.

These national strategies were seen as urban development policies until 1988 when the government published the Fourth Report on Spatial Planning which introduced the term ‘spatial-economic main structures’, referring to those areas, urban regions and transport axes playing the most important role when it comes to the competitive position of the country as a whole (Zonneweld and Waterhout, 2007). In this spatial context, a key concept is represented by urban nodes – a limited number of cities highly competitive on national and international level; notwithstanding the Randstad region was still in the limelight together with other cities located in the central and southern part of the country, delineating what planner called Central Netherlands Urban Ring. This configuration of the urban system can be characterised as having polycentric features, even though the term was not explicitly used.

A new point of view on the Dutch urban system is presented in the Fifth Report in 2001; it is defined as a national network formed of subnational (the Randstad is renamed as Deltametropolis) and regional networks. The concept of urban network meant the return of polycentricity in the thinking and policies on spatial planning for urban areas (Zonneweld and Waterhout, 2007). The government delineated six national urban networks and eight regional urban networks aimed at improving the competitive position of the Netherlands as a whole. Thus, polycentricity was being deployed at two spatial level – national (the main issue is the competitiveness of the country) and regional (local governments should cooperate for developing common urban policies, their success being financially rewarded by national government).

The shift of political orientations has brought a new revision of policy documents. The new National Spatial Strategy adopted in 2006 highlights the importance of regional organising capacity – the power of national government was diminished, while local authorities (especially provinces) gained more development control; the six national urban networks are kept, but the document does not mention the composition of each of them. The idea of regional network was no longer promoted, but the government supported local initiatives for cooperation and coordination of such policies. They introduced another urban concept – ‘economic core areas’ – which would have received financial
subventions from the government. These measures were also promoted in the next policy document - *Structural Vision on Infrastructure and Space* – which aimed the development of a competitive, accessible and safe state able to provide a better quality of living.

In all strategic spatial planning documents, the Ranstad region is promoted as a spatial concept, but it does not have an official administrative status and hence no formal administrative boundaries. The region is divided into two ‘wings’. The North Wing covers the urban area from Haarlem via Amsterdam to Utrecht, while the South Wing stretches from Dordrecht to Leiden (Hoppenbrouwe et al., 2003).

As the briefly presentation reveals, the Dutch administrative structure basically consists of three different tiers: the national, the provincial and the municipal. As regards spatial planning, national government provides the overall policy framework (long term goals, general strategies) while executive planning powers tend to be in the hands of the municipalities. A key responsibility of the provinces (12 in total) is to ensure a minimum level of coordination between local development initiatives and to check whether they are consistent with ongoing national policy directives (Lambregts et al., 2006). The region extends over four provinces and 175 municipalities, which complicates the recognition of and dealing with the complex, multiscalar interplay of spatial trends and forces in an integrated way. Although several attempts have been made to add a formal administrative tier, in particular at the supralocal scale, the existing framework has proved to be rather resistant to changes. It has become slowly apparent that multilevel governance requires co-operation across scales and across actors, including private actors (Meijers, 2005).

During the years different cooperation networks have been created in order to overcome the lack of an administrative level between municipalities and provinces or between provinces and national government. Each of the largest cities together with adjacent localities have created cooperation platforms (the so-called ‘city regions’) which address issues like transportation, regional development, employment, housing, economic affairs etc. Following this pattern around smaller cities (Dordrecht, Leiden) have also emerged similar networks. At a higher spatial level, Randstad has the cooperation networks of the two wings. At the scale of the entire Randstad, two co-operation networks have emerged in recent years. The first is a formal co-operation between the four provinces, four regional authorities (city-regions) and four major cities in the Randstad, together organising the ‘Bureau Regio Randstad’ (Randstad Agency); its objectives are a balanced and dynamic development of the western region of Netherlands and strengthen the international competitiveness of the Randstad, in particular within Europe. The second one is an informal co-operation platform - the Delta Metropolis Association including housing corporations, organisations of the agriculture and horticulture branches, an
employer’s organisation, the transport sector, environmental organisations and water boards, being in fact a lobby group for the interests of the Randstad region (Meijers, 2005).

In order to analyse the interdependencies between Dutch localities and so the polycentric features of the regional networks, we will conduct a residual analysis on commuter flows, the predicted values being calculated using a spatial interaction model.

The gravity model is a simple mathematical formulation used to model the interaction between two locations. It has been used to account for a wide variety of interactions such as telephone calls, automobile trips, and migration and merchandise flows. The model takes the form

\[ I_{ij} = \frac{k \times (P_i + P_j)}{D_{ij}^\beta}, \]

where

\( I_{ij} \) is the interaction between places \( i \) and \( j \), \( k \) is an empirically determined constant, \( P_i \) and \( P_j \) are measures of the importance (or mass) of \( i \) and \( j \) (e.g., their populations), \( D_{ij} \) is the distance between \( i \) and \( j \), and \( \beta \) is the friction of distance, an empirically derived parameter that represents the difficulty or cost of moving between \( i \) and \( j \) (Warf, 2006).

Starting from this model, Claude Grasland derived a new model based on the hypothesis that as the size of centres increases and the distances between them decreases, the intensity of commuting will also increase; in other words close regions will exchange more commuters than remote areas. Thus, the interaction between two centres \( (I_{ij}) \) is directly proportional to the product (or sum) of their masses \( (P_i \text{ and } P_j) \) and inversely proportional with the distance between them \( (D_{ij}) \).

The intensity of flows is a non-linear function of the distance. Tests show that the best fit is obtained in a log-log marker which indicates the existence of a power type relationship - in some cases, the best fit is obtained for a semi-logarithmic mark which would indicate an exponential relationship (Grasland, n.d.). The intensity of flows is calculated using the following expression:

\[ I = \frac{F_{ij}}{(P_i \times P_j)}, \]

where \( I \) is the intensity of flow, \( F_{ij} \) is the interaction between \( i \) and \( j \) (in our case, commuting flows), \( P_i \) and \( P_j \) are the population of \( i \) and \( j \).

A bi-logarithmic graph uses for adjustment \( Y = \log \left( \frac{F_{ij}}{(P_i + P_j)} \right) \) and \( X = \log(D_{ij}) \).

Hence, the model of spatial interaction gets the following mathematical expression (according to the bi-logarithmic graph):
The final form of the model used for our analysis is

\[
F_{ij} = \frac{e^{b \times (P_i + P_j)}}{d_{ij}^b}
\]

Both exponents are empirically determined by calibration using regression models.

The model was applied in order to conduct a residual analysis on commuter flows data for LAU 2 units in Netherlands. The data were provided by ESPON DATABASE 2 M4D Project. One can calculate the matrix of residuals of spatial interaction model as the difference between observed and theoretical stream flows

\[
R_{ij} = F_{ij} - \hat{F}_{ij}, \text{ where } F_{ij} \text{ is the observed value and } \hat{F}_{ij} \text{ is the predicted value.}
\]

The analysis of the actual residual streams can identify regions that maintain preferred relationships (positive residuals) and those that are instead separated by barrier effects (negative residuals). The margin analysis of residue matrix helps to identify areas that have received or sent globally more (or less) of migrants that foreshadowed the model. One can deduce residual mobility coefficients or residual attractiveness (Grasland, n.d.). The final results of this analysis are displayed in fig. 1.
The absence of negative residuals indicates that all observed values are higher than the ones predicted by the model, aspect that indicates a higher intensity of commuter flows than one would expect to be. The main cities (Amsterdam, Rotterdam, the Hague) have registered the lowest values of residuals as they have already consolidated their position due to their highly specialized economic profile as receiving centres and to a lower extent as areas that send migrants. On the other hand there are also cities that are actually more attractive to commuters than the model predicted;

**Fig. 1 - Residual analysis on commuters flows in Netherlands**

The residuals represent the difference between the observed value of the dependent variable and the predicted values. $R_{ij} = F_{ij} - P_{ij}$, where $F_{ij}$ is the observed value and $P_{ij}$ is the predicted value.

The theoretical flows were calculated using a model of spatial interaction, with the following form: $F_{ij} = (e_{ij} \cdot x + (P_{in} \cdot P_{jn})^\beta)$.

The image displays the flows higher than 800 commuters.

The data were provided by ESPON DATABASE 2 MAD Project.
these have high values of residuals based on the large number of connections they established with localities from their proximity. It is the case of Utrecht, Eindhoven, Groningen, and Leeuwarden.

Another aspect worth mentioning is the highly intensive flows between Amsterdam and the Hague, which were diminished by the theoretical model, reducing thus their potential of sending and receiving commuters.

The Dutch urban system appears to have gained its polycentric features by developing some regional micro-networks based on multidirectional inter-connections that cover not only the Randstad region, but also areas from northern, central and southern part of the country.

V. CONCLUSIONS

Analysing in different spatial contexts (European, national and regional) the policies that promote the polycentric development, a common feature can be pointed out – the emergence of networks through spatial integration of different sized urban centres. At regional level have emerged horizontal synergies between cities which create the premises of developing a polycentric region and implicitly a national network (or a European network); these could contribute to enhancing the competitiveness on different spatial levels and also to territorial cohesion (through a balanced development either in EU or in the states in question).

The case studies included in this paper offer a perspective on the way the historical, socio-economic and political factors (which have differentiated behaviours according to a territory features) influence the development, organisation and functioning of a polycentric system. The decision of developing a polycentric urban region is usually taken by national or subnational administrative tiers, without being supported with effective measures. Furthermore, the cooperation initiatives within a region are not officially recognised and as a consequence do not have decision making attributions.

The feasibility of developing and implementing a regional polycentric view as part of strengthening the competitiveness and quality of life depends upon the involvement and support of various groups of local, regional and even national actors (Romein and Meijers, 2003). Hence the regional organizing capacity plays a key role in supporting the future
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development of a region and consequently in putting into practice the concept of polycentrism. The emergence of governance is determined by the spatial behaviour of centres which could be marked by either cooperation or rivalry relations. These inherited features can influence the willingness of actors to cooperate and implement such policies. Thus even if the distances between cities favour cooperation relationships which also offer competitive advantages, keeping the past inherited linkages still has a great influence on governance structure. Therefore delineating a polycentric urban region should be a bottom-up approach, from the local to national level, in order to take into consideration the actual needs of the territory in question.

Another important aspect when it comes to establishing the administrative boundaries (which also determine a coherent functioning of an area) of a polycentric urban region is the existence of common cultural elements which create a region’s identity and also the feeling of belonging together for inhabitants, public and private decision making actors and urban stakeholders.

The residual analysis conducted on commuters flows in LAU2 unit of the Netherlands has revealed the existence of a polycentric pattern, mainly in the Randstad region, but also in central, southern and northern part of the country, the absence of negative residuals indicating a higher intensity of commuter flows than a theoretical model would predict.

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