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Abstract

Traditional transport infrastructure assessment methodologies rarely include the full range of strategic benefits for the transportation system. One of these benefits is the contribution to cross-border integration. However, this is a key issue in strategic planning and decision-making processes, as its inclusion may increase the probability of large-scale transport infrastructure projects being funded. This paper presents a methodology for the measurement of the contribution of Transport Infrastructure Plans to cross-border integration. The methodology is based on the measurement of the improvement in network efficiency in cross-border regions of neighboring countries, via accessibility calculations in a Geographical Information System (GIS) support. The methodology was tested by applying it to the ambitious road and rail network extensions included in the Spanish Strategic Transport and Infrastructure Plan (PEIT) 2005-2020. The results show significant and important network efficiency improvements of the PEIT outside the Spanish border. For the road mode, while the Spanish average accessibility improvement accounts for 2.6%, average improvements in cross-border regions of France and Portugal are of 1.8%. And for the rail mode, the corresponding Spanish value is 34.5%, whereas in neighboring regions it accounts for 20.2%. These results stress the significant importance of this strategic benefit and the consequent need for its inclusion in strategic planning processes. Finally, the paper identifies the potential of the methodology when applied at different administrative levels, such as the local or state levels.

THE CONTRIBUTION OF TRANSPORT INFRASTRUCTURE PLANS TO EUROPEAN INTEGRATION

The concept of spillover effects

The effects of large-scale transport infrastructure projects, such as national transport infrastructure Plans, spread outside the limits of the corresponding nation, generating 'spillover effects' in neighboring regions. These effects are related with the contribution of transport infrastructure to cross-border integration with neighboring nations. In strategic European transport policy documents (1) this contribution is acknowledged as playing a critical role in the success of the European integration process. Since the concept of spillover effects may be addressed from a wide variety of perspectives; (2), a brief theoretical background on the approach followed in this paper is included below.

One of the first steps in the assessment of any transport infrastructure project is the definition of the area in which its effects are to be assessed. In the majority of cases, these effects will extend outside the limits of this area, generating *spillover effects* (3,4). Despite the fact that the scientific literature calls for the integration of spillover effects in any integrated assessment methodology, their inclusion is uneven and scarce (5,6), notwithstanding that the assessment of spillover effects may justify politicians to enhance its acceptability (7).

The concept of spillover effects is closely linked with that of *network effects* (8), more commonly used in the literature. Network effects measure the contribution of a certain infrastructure improvement to the transport network as a whole, and therefore are related with concepts such as 'network integration' or 'network efficiency' (8).

Spillover effects are also related with *distributive* impacts; i.e. impacts that do not focus on the magnitude of the effect, but on its distribution among regions or groups or individuals. Depending on the scale chosen, the assessment of spillover effects may give an estimate of the *transfers* of costs and benefits between different regions and/or groups of individuals (3,9).

Cross-border integration: a key issue for European transport policy

This general concept of spillover effects can be analyzed from the particular perspective of a national Transport Plan of a European Member State, where the study area is usually set up to cover the corresponding national territory of the country under consideration. In this case, spillover effects will be generated outside the frontiers of this country, mainly in cross-border regions of neighboring countries (9).

Following this rationale, in most European-related studies these spillover effects are linked with the concepts of 'European added value' (8), 'community component' (10), or the contribution to 'cross-border integration' (11). This latter term is the one that will be used in this paper. Moreover, from a financing perspective, the measurement of the contribution to cross-border integration is crucial for the appraisal of certain transport infrastructure projects which would not be profitable if only the effects inside the national frontiers are assessed (10). The existence of these strategic benefits would therefore provide the justification for national authorities to apply for

European Funds, such as in the case of the projects included in the trans-European Transport Networks (TEN-T) (8,12).

The most relevant European Transport Policy documents address the above issues and reflect the need that European Structural and Cohesion Funds co-finance those transport infrastructure projects, such as the TEN-T, which have a European interest. These projects are mainly concentrated in peripheral and structurally lagging regions, on the assumption that an enhanced efficiency of the transport infrastructure network may result in increased economic activity (5,12).

In particular, the recently published Mid-Term Review of the European Union (EU) Transport White Paper (1) states that:

> "by co-financing transport infrastructure, the Structural and Cohesion Funds will continue to help the regions lagging behind in terms of economic integration or suffering from structural handicaps The outermost regions suffer from a strong accessibility deficit not only in relation to the continental internal market but also in their own hinterland. Transport policy instruments and state aids could be used to reduce the effects of remoteness on their competitive position and to improve connections with the rest of the EU and with neighboring third countries (…)
>
> (…) considering the limited resources available, the EU will need to focus its co-financing from the TENs budget on the critical border-crossing sections and the other main bottlenecks on the priority projects. Moreover, Member States should optimise the use of the EU Structural and Cohesion Funds to support the financing of transport infrastructure. EU funds will be concentrated on those projects which offer the greatest added value for Europe and where active collaboration with national and other financing organizations is guaranteed"

Accessibility indicators to measure cross-border integration

Accessibility indicators have a wide potential for their application in strategic planning processes (13,14,15). In particular, in the context of this paper, the network efficiency accessibility indicator (14, 17) is especially useful and constitutes a valuable planning tool for the strategic assessment of the contribution of transport infrastructure improvements to cross-border integration (11).

The formulation of the network efficiency accessibility indicator (14), is included in Equation (1):

$$E_i = \sum_j \frac{\frac{I_{ij}}{II_{ij}} \cdot P_j}{\sum_j P_j} \qquad (1)$$

where E represents network efficiency accessibility of node i. The indicator calculates, for each origin-destination (i-j) pair, a population (P) weighted mean of ratios between travel time using the network (Iij) and an 'ideal' travel time ($IIij$), measured as 'as the crow flies' travel time using an ideal transport infrastructure. Further details can be found in (14).

This indicator has already proved its usefulness as a strategic planning tool for large-scale transport infrastructure assessment methodologies (15,17). The fact that the

results offered by most accessibility indicators are heavily influenced by the geographic position of the nodes (13,14,15) makes these measures unsuited for determining the transport infrastructure needs of each region. The formulation of the efficiency indicator neutralizes the effect of the geographic location, and allows making judgments on the relative 'ease of access' (i.e. network efficiency) of each location.

This indicator gives important information on how efficient the network connections are from a given node, independently from its geographic position: the closer the value is to 1, the higher the accessibility the network provides to that node. It may therefore be the case that a region which is peripheral according to the location indicator is highly accessible in terms of network efficiency. Hence, this indicator is a valuable tool to support transport investment decisions, as it is more sensitive than the location or potential models to the transport infrastructure needs of each regions (15, 17).

The term efficiency embraces different concepts, such as competitiveness, network efficiency, regional development, economic development or growth (18). The efficiency of transport links between major economic activity centers is considered as one of the factors determining competitiveness. These activity centers may be located inside or outside the national boundaries; therefore the improvement of cross-border links is frequently included as a policy goal for improved competitiveness (9), particularly in European peripheral countries, such as Spain or Portugal. Moreover, cross-border cooperation is intended to develop cross-border economic and social centers through joint strategies for sustainable territorial development (16).

In this context, the paper fills the existing gap in assessment methodologies with the development a methodology for the assessment of spillover effects of national transport infrastructure Plans. The suggested approach is based on the calculation of network efficiency accessibility improvements in cross-border regions of neighboring countries. The complete methodology is described in the following section.

METHODOLOGICAL FRAMEWORK

The methodology consists in the assessment of the contribution of transport infrastructure Plans to cross-border integration via the calculation of network efficiency accessibility improvements in cross-border regions of neighboring countries.

The methodology computes the cross-border integration index (*CB*) of a given transport infrastructure Plan (*s*), as a percentage change in network efficiency accessibility compared with the do-nothing alternative (*0*), as shown in Equation (2):

$$CB_s = \frac{\left[\sum_i E_i \frac{P_i}{\sum_i P_i}\right]_0 - \left[\sum_i E_i \frac{P_i}{\sum_r P_i}\right]_s}{\left[\sum_i E_i \frac{P_i}{\sum_r P_i}\right]_0} \cdot 100 \qquad (2)$$

, in which E_i, representing the network accessibility value of each node *i* in cross-border regions of neighboring countries, is computed using Equation (1).

Therefore, the calculation of the cross-border integration index of the Plan *s* (CB_s) gives a population (*P*)-weighted aggregated value of the percentage accessibility

improvements in these regions. These improvements are considered as an index of the contribution of the Plan to cross-border integration (11).

The necessary calculations are made with the support of a Geographical Information System (GIS), in the following three stages:

Stage 1: Definition of the study area

This stage includes the delimitation of the study area, which includes both the national territory of the Plan under consideration and the cross-border regions in neighboring countries. The level of aggregation and the zonification is also defined in this stage. This is needed to select the centroids both for the origins (i) and destinations (j) for the accessibility analysis.

The set of origins i includes those centroids located in cross-border regions of neighboring countries, whilst the set of destinations j includes both these centroids and national ones. Hence, benefits accruing outside the national boundaries, i.e. spillover effects, are accounted for.

Stage 2: Implementation of the transport and socio-economic system in the GIS

In this stage each of the centroids i of the study area defined above is characterized in terms of its transport and socio-economic data. The transport system is modeled in a vectorial GIS, resulting in an intermodal graph containing the road and rail networks. For each arc on the road network, the length, estimated speed according to type of road and resulting travel time are also recorded. For the rail mode, each arc is given a commercial speed according to both infrastructure and quality of service characteristics (for more details see 15,17).

Stage 3: Accessibility calculations

The next step after the input database is stored in the GIS consists in the calculation of the road and rail travel times between each i-j pair. These travel times, along with population destination data, are subsequently introduced in Equation (1) to obtain each node accessibility value.

Finally, the accessibility values of each origin centroid are computed and stored in the GIS. The contribution to cross-border integration is measured using Equation (2).

The validity of the above described methodology was tested by applying it to the Spanish Strategic Transport and Infrastructure Plan (PEIT) 2005-2020, which is introduced in the following section.

DESCRIPTION OF THE CASE STUDY:
THE STRATEGIC INFRASTRUCTURE AND TRANSPORT PLAN 2005-2020

The Spanish Transport and Infrastructure Strategic Plan 2005-2020 (PEIT) includes an ambitious extension of the Spanish high capacity land transport networks. The situation of Spain, in the periphery of the EU of 27 Member states is showed in dark color in Figure 1.

FIGURE 1: Peripheral situation of Spain in Europe

The PEIT objectives have a strategic nature and they include the enhancement of the transport system's efficiency and its general sustainability, the contribution to social and territorial cohesion, and the promotion of economic development and competitiveness.

The PEIT network extension includes the construction of 5,000 km of High Capacity Roads (HCR) and 6,000 km of High-Speed Rail (HSR) lines, which amounts to €32.105 billion and €83.450 billion, respectively. The HCR and HSR network extensions planned in the PEIT are shown in Figures 2 and 3, respectively.

FIGURE 2: Road network of the alternative A_{PEIT}

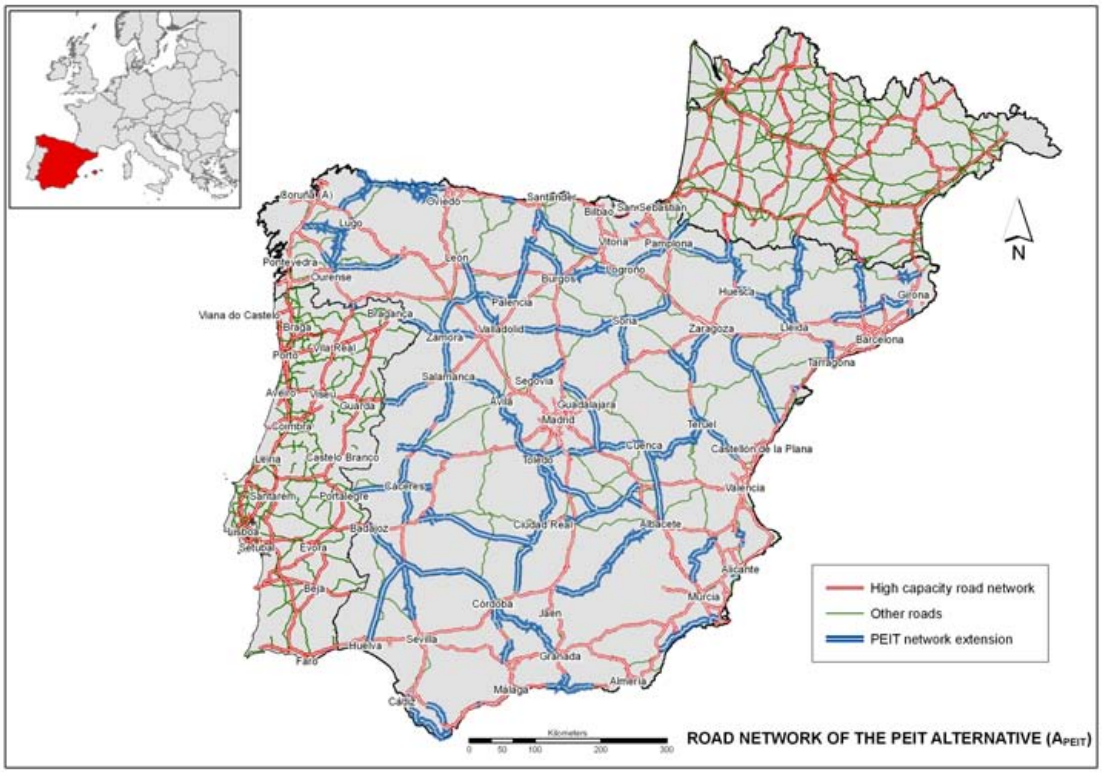
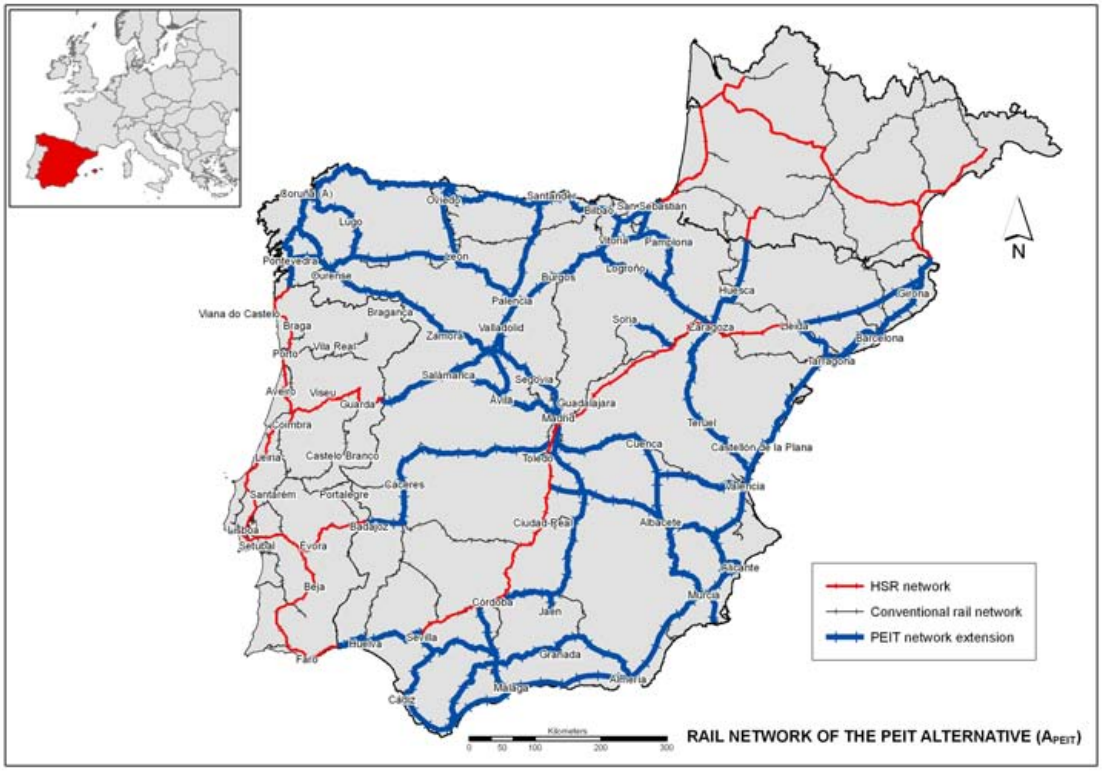


FIGURE 3: Rail network of the alternative A_{PEIT}



Due to the Spanish status as an European Union (EU) 'cohesion country' in the 1980s and 1990s, with GDP per capita below 75% of EU average, it received substantial support from the Structural and Cohesion European Funds for infrastructure development. This was particularly the case for transport, in which Spain received a third of the total EU investment in improving the transport network over the periods 1994-99 and 2000-2006, contributing on average some 20%-30% of the Spanish Ministry of Public Works and Transport infrastructure expenditure. These investments were mainly used for the extension of the Spanish HCR and HSR networks, as part of the priority projects of the trans-European transport networks (TEN-T). The result is that Spain has reduced significantly its disparities in network endowment with the rest of the EU. This fact, along with the progressive convergence of Spanish GDP per capita values has meant that this financial support will be substantially reduced in the near future.

However, there is an increased need for additional capacity of the Spanish transport infrastructure network. This is mainly because the growing integration of European economies has caused international transit traffic in Spain to rise significantly in recent years. Moreover, there is also potential for expansion of the flows between the North of Africa and Europe, which inevitably cross the Spanish mainland.

Despite the existence of the above transport infrastructure investments needs, the financial framework of the Spanish Ministry of Public Works and Development will presumably have to deal with a possible cut in European funds in the near future. If the investment levels of the last few decades are to be maintained, this may ultimately require an increase in off-budget financing sources, such as public-private partnerships (PPP). In this context of scarcity of public funds, the assessment of the full range of benefits of large-scale projects (12), such as those included in the PEIT is crucial in order to increase its probability of funding.

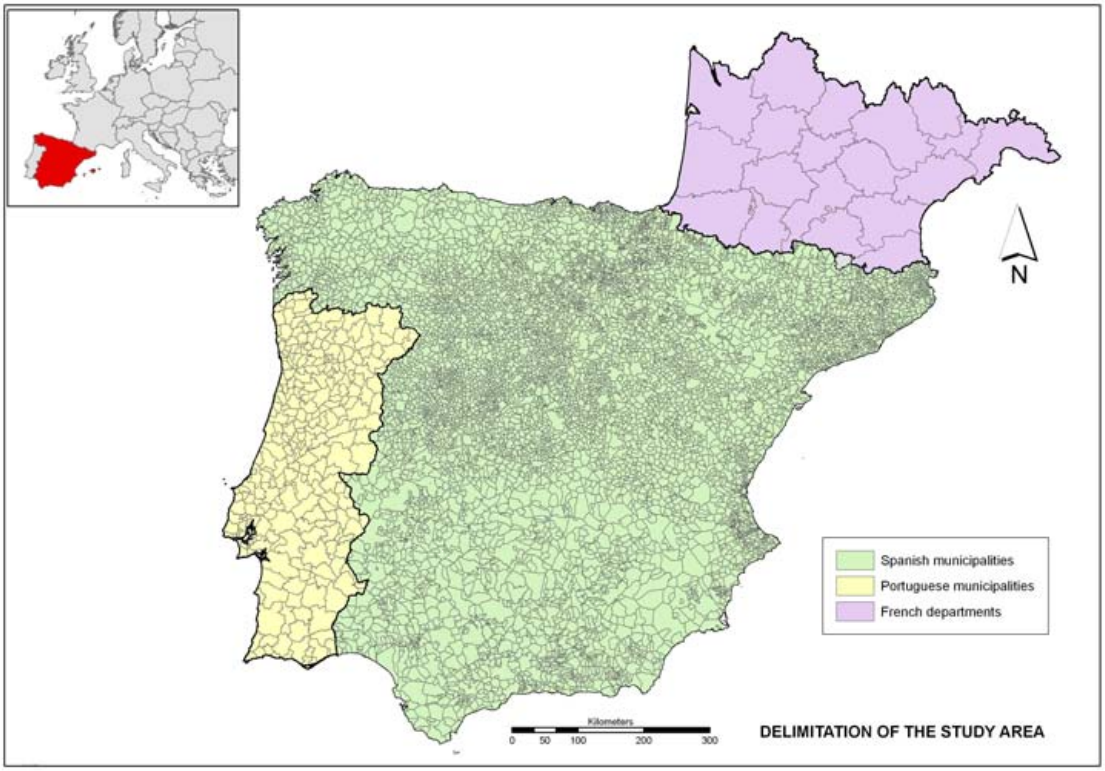
CASE STUDY APPLICATION

The assessment is carried out on the basis of the comparison between the 'construction alternative' (A_{PEIT}) and the 'do-nothing alternative' (A_0). The accessibility calculations were made using a network accessibility analysis toolbox software (19). The general methodological stages explained in the previous section are given as theoretical background for the case study application which follows next.

Stage 1: Definition of the study area

The study area basically comprises the Spanish mainland and its corresponding cross-border regions in neighboring countries, which include Portugal and the three southern French NUTS-2 (Nomenclature of Territorial Units for Statistics, defined by the Statistical Office of the European Communities, i.e. EUROSTAT) regions. The study area and the corresponding aggregation level used (municipalities in Spain, districts in Portugal and departments in France) is represented in Figure 4.

FIGURE 4: Study area and zonification



Stage 2: Implementation of the transport and socio-economic system

Transport system

In order to calculate accessibility values, a dense intermodal (road and rail) network was modeled with the support of a GIS; in this case the ArcGis software was used. The road and rail networks of the PEIT alternative are shown in Figures 2 and 3, respectively.

Accessibility values are obtained for each node of the network, which coincide with the nodes of the road network, which is nearly 12,000km. Using interpolation techniques, aggregated NUTS-5 values in Spain, and NUTS-3 values in Portugal and France, are derived from node values.

The first task consisted in modeling the road network of the do-nothing alternative (A_0). A vectorial GIS was used, in which the network is modeled as a graph with a set of nodes and arcs. For each arc on the road network, the length, estimated speed according to the type of road (120 km/h for highways, 110 for expressways, 90 for interregional roads, 80 for other roads and 50 for urban roads) and resulting travel time were also recorded. For the rail mode, each arc is given a commercial speed according to both infrastructure and quality of service characteristics. Rail network modeling tasks are significantly more complex than those of the road mode, as it is necessary to include track gauge (Iberian/UIC) data, the location of the stations and frequency of service information in order to calculate travel times, as described in (11), which is not possible to detail in this paper for space reasons.

Land transport infrastructure networks in Portugal and France correspond to the estimates of the European Commission for 2020. This way the effects from the Spanish network extension can be isolated from those derived from the development of socio-

economic variables and the infrastructure extension in neighboring countries in the period 2005-2020.

Socio-economic system

The population is the selected variable to measure each destination's attractiveness in the accessibility model. The population for Spain and cross-border regions for 2020 has been estimated on the basis of prognosis of available historical data series. The information sources used were the corresponding three national Statistical Institutes. In the three countries, population data correspond to prognosis based on past trends of these variables for 2020, based on linear regression models .

In Spain, the selected destination centers correspond to the centroids of the approximately 8,000 municipalities of the Spanish mainland. Centroids in Portugal and the three southern French regions were included as destination centers at a more aggregated level, namely the 18 districts in mainland Portugal and the 19 departments in the three southern French regions. These are shown in Figure 4.

In the accessibility calculations with origins in Spain, populations in France and Portugal have been reduced by a factor of 0.25, to take into account that destinations in neighboring countries are visited less than national ones .

Stage 3: Accessibility calculations

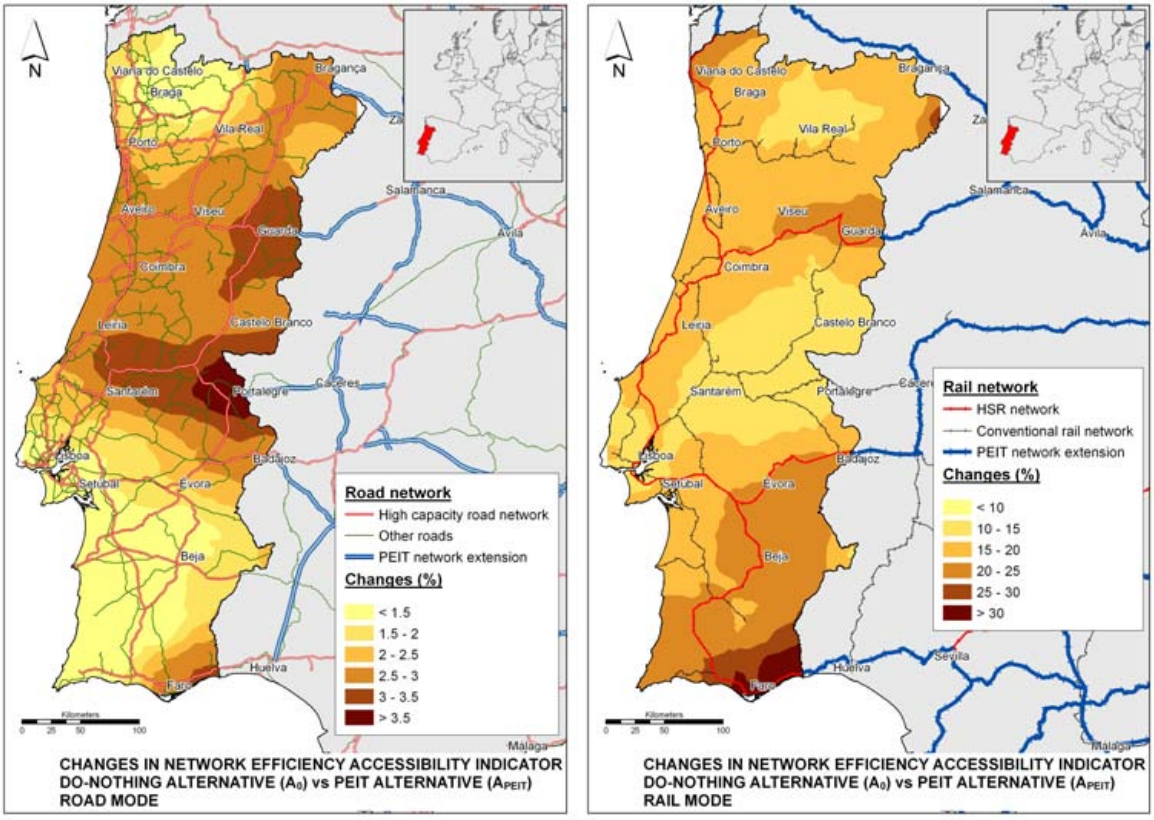
In this stage, the accessibility values of each origin centroid *i* is computed, using Equation (1). Intermediate calculations include the measurement of each *i-j* travel time, using minimum-path algorithms embedded in the GIS. Subsequently, following Equation (2), the cross-border integration index of the PEIT is computed as the percentage improvement of the construction alternative (A_{PEIT}) with respect to the do-nothing alternative (A_0).

For clarity reasons, the results were calculated independently for road and rail modes. Therefore, the analysis of results included below was split in the two corresponding subsections.

Road mode

Figure 5 (left) and Figure 6 (top) represents relative percentage improvements in network efficiency accessibility values in Portugal and French cross-border regions, respectively, due to the completion of the PEIT, for the road mode.

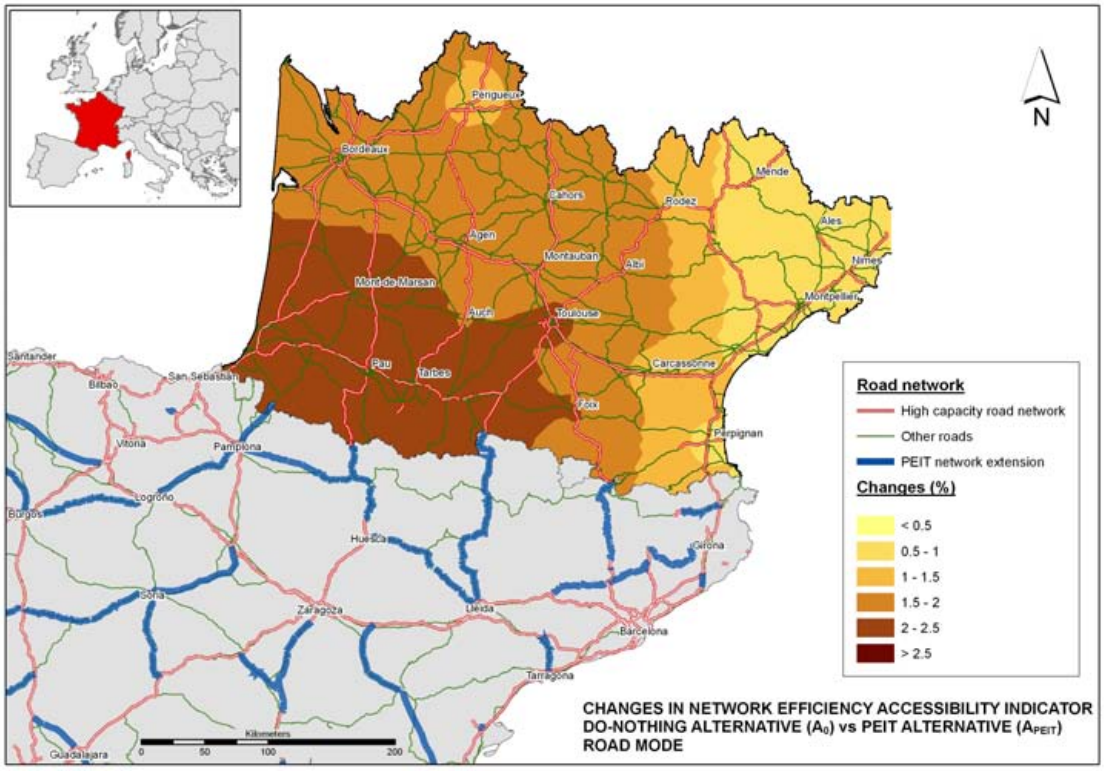
FIGURE 5: Network efficiency improvements in Portuguese cross-border regions. Road (left) and rail (right) modes



It is beyond of the scope of this paper to analyze comprehensively the spatial distribution of the resulting changes. However, some general considerations can be made. First, the key issue that arises when interpreting the maps is that the spatial pattern followed by relative improvements is a result of both the planned cross-border links included in the PEIT and, to a lesser extent, the network distance to most important destinations.

On the one hand, in Portugal (left Figure 5), since the northern and southern links (via Porto and Faro, respectively) already existed in the do-nothing alternative, those are the regions with lower benefits. In contrast, the central Portuguese regions, such as Guarda, Castelo Branco or Portalegre, are the links which benefit most from the new cross-border links. The values obtained in each Portuguese district capital, in both alternatives, and the corresponding percentage improvements are included in Table 1 and are coherent with what the maps have pointed out. Percentage changes vary from the 4.10% improvement achieved by Portalegre to the 1.15% obtained by Beja. In summary, the population-weighted average accessibility improvement in Portugal results in a 2.03%.

FIGURE 6: Network efficiency improvements in French cross-border regions. Road (top Figure) and rail (lower Figure) modes



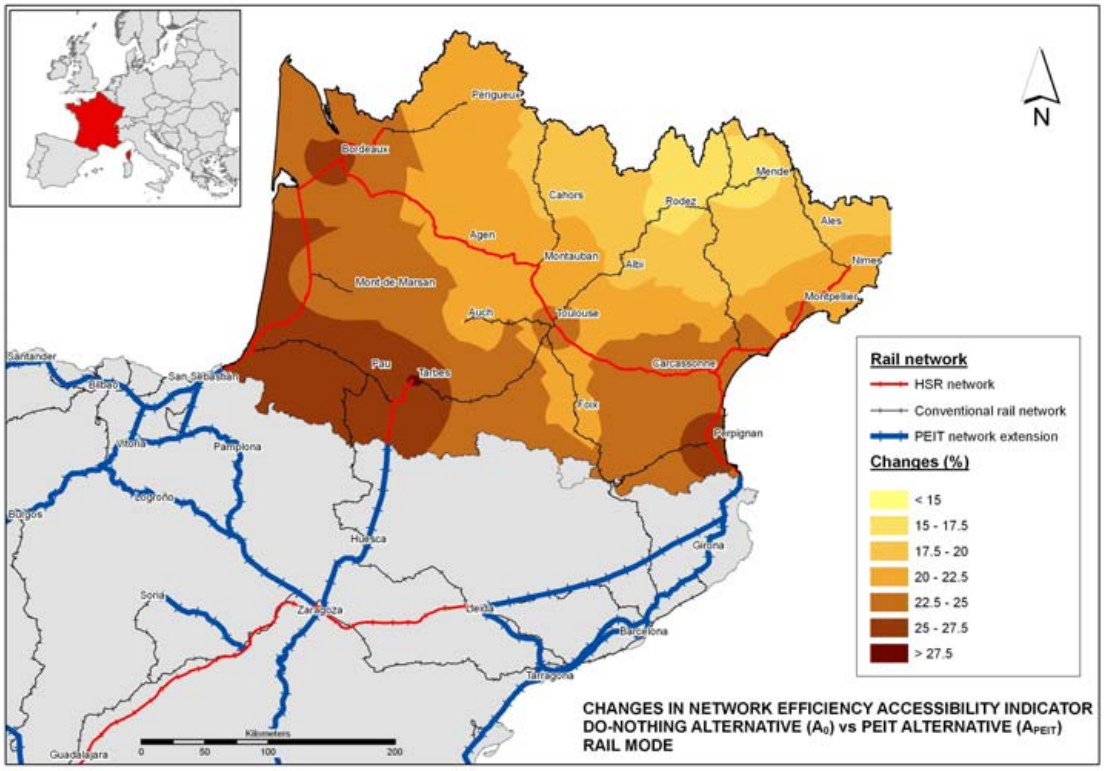


TABLE 1: Network efficiency accessibility (E) in the do-nothing alternative (E_0), the PEIT alternative (E_{PEIT}), and % change. Road mode.

PORTUGAL				FRANCE			
Name	**E_0**	**E_{PEIT}**	**% change**	**Name**	**E_0**	**E_{PEIT}**	**% change**
Aveiro	1.363	1.327	2.64	Agen	1.328	1.307	1.64
Beja	1.333	1.317	1.15	Albi	1.367	1.342	1.85
Braga	1.369	1.350	1.41	Ales	1.357	1.351	0.45
Bragança	1.363	1.320	3.18	Auch	1.360	1.333	1.96
Castello Branco	1.464	1.421	2.94	Bordeaux	1.272	1.250	1.72
Coimbra	1.363	1.325	2.77	Cahors	1.378	1.357	1.57
Évora	1.338	1.313	1.82	Carcassonne	1.336	1.320	1.20
Faro	1.286	1.250	2.80	Foix	1.355	1.326	2.16
Guarda	1.420	1.374	3.30	Mende	1.409	1.397	0.84
Leiria	1.339	1.298	3.07	Montauban	1.339	1.312	1.98
Lisboa	1.329	1.313	1.23	Mont-de-Marsan	1.349	1.320	2.18
Portalegre	1.421	1.363	4.10	Montpellier	1.262	1.256	0.52
Porto	1.370	1.335	2.56	Nimes	1.257	1.251	0.49
Santarém	1.332	1.297	2.63	Pau	1.347	1.312	2.60
Setúbal	1.308	1.291	1.26	Périgueux	1.350	1.333	1.30
Viana do Castelo	1.362	1.341	1.50	Perpignan	1.300	1.292	0.60
Vila Real	1.428	1.395	2.31	Rodez	1.384	1.364	1.49
Viseu	1.428	1.387	2.87	Tarbes	1.376	1.346	2.20
				Toulouse	1.297	1.268	2.21
Portuguese average			*2.03*	*French average*			*1.48*
Portuguese and French average (CB_{PEIT})							**1.80**
Spanish average							**2.60**

On the other hand, in the French case (top Figure 6), given that the highway connection with Perpignan already existed in the do-nothing alternative, lower percentage increases concentrate in the eastern part of the French territory. This means that, as we move westwards, higher accessibility improvements are achieved. Moreover, accessibility improvements are progressively reduced with the distance to the frontier. Table 1 includes the network efficiency results obtained in French NUTS-3 centroids in both alternatives, as well as the percentage change between them. Indeed, it can be observed that lower (below 1%) percentage changes concentrate in eastern departments capitals, such as Ales, Mende, Nimes, Montpellier or Perpignan. Higher percentage increases do not surpass the 2.60% value recorded in Pau, with the lowest value (0.45%) being recorded in Ales. In summary, the population-weighted average accessibility improvement in France results in a 1.48%.

After this initial assessment of accessibility benefits, and following Equation (2), the contribution to cross-border integration of the PEIT (CB_{PEIT}) is computed as a population-weighted average percentage change in the network efficiency accessibility indicator. This average was computed for both Portuguese and French territories, resulting in an aggregated value of the indicator of CB_{PEIT}= 1.80%.

An important conclusion can be drawn at this point. If the same indicator is computed, the resulting average network efficiency improvement of Spanish regions accounts for a 2.6%, as detailed in previous studies (11). This means that the 1.80% average network accessibility improvement in cross-border regions corresponds to a

relatively high value, if compared with the 2.60% value obtained in the Spanish territory.

Rail mode

Figure 5 (right) and Figure 6 (lower) represent relative percentage improvements in network efficiency accessibility values in Portugal and French cross-border regions, respectively, due to the completion of the PEIT, for the rail mode. The interpretation of the resulting values requires a combined analysis of each centroid's population, its starting situation in terms of accessibility, and its proximity to new HSR stations. Although this analysis is beyond the scope of this paper, general considerations can be made, similarly to the road mode.

Starting with the Portuguese results, in this case, the location of HSR stations is a key factor influencing the final results. Indeed, it can be observed in Figure 5 (right) that those centroids in which a HSR station is not planned, such as Portalegre or Castello Branco, suffer from lower accessibility gains. Moreover, the effect of the new links spreads through the corridors of the already existing HSR network. The corresponding values obtained in Portuguese district capitals are included in Table 2. The average population-weighted accessibility improvement in Portugal is a 17.23%.

TABLE 2: Network efficiency (E), in the do-nothing alternative (E_0), the PEIT alternative (E_{PEIT}), and % change. Rail mode.

PORTUGAL				FRANCE			
Name	**E_0**	**E_{PEIT}**	**% change**	**Name**	**E_0**	**E_{PEIT}**	**% change**
Aveiro	3.833	3.030	20.95	Agen	3.459	2.667	22.91
Beja	3.598	2.686	25.34	Albi	3.980	3.238	18.64
Braga	4.667	3.868	17.10	Ales	3.211	2.591	19.31
Bragança	6.853	5.817	15.11	Auch	4.694	3.809	18.84
Castello Branco	5.311	4.599	13.41	Bordeaux	2.911	2.118	27.23
Coimbra	3.775	2.952	21.80	Cahors	3.872	3.149	18.69
Évora	3.721	2.888	22.39	Carcassonne	3.281	2.467	24.81
Faro	3.592	2.437	32.16	Foix	4.466	3.538	20.78
Guarda	4.215	3.202	24.03	Mende	4.226	3.613	14.49
Leiria	3.832	3.058	20.21	Montauban	3.502	2.725	22.19
Lisboa	4.619	3.920	15.12	Mont-de-Marsan	4.077	3.096	24.06
Portalegre	4.849	4.124	14.94	Montpellier	2.843	2.177	23.42
Porto	5.610	4.804	14.36	Nimes	2.851	2.227	21.89
Santarém	4.560	3.881	14.90	Pau	4.238	3.076	27.41
Setúbal	4.369	3.650	16.46	Périgueux	3.608	2.909	19.37
Viana do Castelo	3.751	2.887	23.03	Perpignan	3.152	2.285	27.51
Vila Real	3.902	3.151	19.23	Rodez	4.238	3.567	15.84
Viseu	4.473	3.567	20.27	Tarbes	4.496	3.200	28.82
				Toulouse	3.299	2.480	24.82
Portuguese average			*17.23*	*French average*			*23.51*
Portuguese and French average (CB_{PEIT})							**20.21**
Spanish average							**34.52**

In the French case (lower Figure 6), and as happened in Portugal, the proximity to the stations of the HSR network is one of the main factors determining the final percentage improvement. This is reflected in that higher percentage gains, in some cases above 25%, which are located in those regions with a better connection with the stations of the three cross-border planned links (through both frontier extremes and the one connecting with Tarbes). These observations are verified with the numerical results included in Table 2. Indeed, Bordeaux, Pau, Tarbes and Perpignan appear as those capitals with higher percentage increases (in all cases above 25%), whilst capitals located far from the planned HSR links, such as Rodez or Mende, have lower accessibility increases, with values around 15%. The resulting value of the average population-weighted accessibility improvement in southern France is 23.51%.

The contribution to cross-border integration is computed, similarly to the road mode, as a population-weighted average percentage change in the network efficiency accessibility indicator, following (2). This average has been computed jointly for both Portuguese and French territories, resulting in a value of the indicator of CB_{PEIT}= 20.21%. As happened with the road mode, the value obtained confirms the significant spillover effects in neighboring countries due to the extension of the Spanish HSR network, when compared with the 34.52% improvement of Spanish regions (11).

The detailed results obtained for the road and rail modes and a comprehensive analysis of these differences can be found in (11). However, it is worth pointing out here that the rail percentage change (23.5%) is significantly higher than that of the road mode which is 1.8%. The main causes for this phenomenon are the differences between the initial situation of both networks and the higher differences between HSR and conventional rail speeds, when compared to those of highways and conventional roads.

CONCLUSIONS

The assessment of cross-border integration effects of transport infrastructure Plans is important from a strategic transport planning perspective. In an European context, this contribution is critical for the success of the European integration process which is currently underway. This paper has suggested a methodology for the strategic assessment of the contribution of transport infrastructure Plans to cross-border integration and hence to the European integration.

The validity of the methodology has been tested with its application to the Spanish PEIT. This application has made it possible to determine the improvement of network efficiency allocated in neighboring regions of Portugal and France. These improvement values have resulted in relatively high levels if compared with the ones obtained in the Spanish territory. They correspond, for the road mode to a 1.8% increase, compared to an increase of 2.6% in Spain; whereas for the rail mode they amount to a 20.2%, when compared to a 34.5% average Spanish improvement.

The main conclusion of this study is that accessibility benefits located outside the borders of the country under consideration should not be left out of the planning process. They have shown to constitute important additional benefits, which should justify a co-financing of the corresponding transport infrastructure investments. In the PEIT case, this co-financing may be sponsored by the EU Structural or Cohesion Funds, or even by Funds from the Ministries of Public Works of neighboring countries.

The paper also highlights the transferability of this methodology to lower administrative levels, such as the assessment of regional/state Transport Plans, in which the benefits of nearby regions/states should be assessed.

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