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# The Location of Subregional Facilities in Territories with Scattered Population. A Methodological Proposal Based on the Case of Asturias (Spain)

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**ABSTRACT**

It is a political and economic problem to place decentralized services in territories with scattered populations such Asturias (Spain). On the basis of applied research, we propose a method of selecting possible sites; furthermore, we carefully consider the population and the travel time of users. GIS programme is used for calculations. Besides, another application of the method is proposed for the analysis of pedestrians' mobility.

## 1. INTRODUCTION

In 2008 and 2009, the authors of this article undertook two pieces of applied research entrusted by the *Principado de Asturias* for the study of the optimization of the various intermunicipal management bodies, in other words, a lower scope than a region[1]. Such a management has been enforced in different ways (intermediate bodies between provinces and municipalities) rather inefficiently up to this day, to perform the municipal provision of services. The article focuses on such reports to theorize about one section of the above-mentioned research works, its aim being to analyze how to carry out a potential decentralization of certain regional services in order to offer the population the best coverage possible.

On this basis, the method described below was developed, so as to succeed in having 96.9% of the population live within a half-an-hour drive to one of the four selected services sites.

### 1.1. The Asturian and peninsular settlement

A brief summary to put the proposal into context must highlight that, since the ancient times when the *Homo Antecessor* roved all over Iberia, a system of settlements has begun to take shape; that system was subjected to particular and changing ways of appropriation of the space by humans whose footprint, to one degree or another, has outlived to this day. Irrespective of the prehistoric settlements, ever since the first millennium before our Era, a diverse and fragmented territorial structure blossomed into settlements aiming at combining the proximity to the resources with the main sea and land routes, including careful defensive purposes as well. The *Pax Romana* enabled a well-established urban system on the basis of the administrative hierarchy and the Roman road

1 **Méndez, B., Ortega, M. et al. (**2008), *Cooperación intermunicipal en Asturias. Diagnóstico: análisis y evaluación*, Dirección General de Administración Local, Principado de Asturias, Spain.
**Méndez, B., Ortega, M. et al.** (2009), *Cooperación intermunicipal en Asturias. Implicaciones de los agentes (participación) y decálogo de recomendaciones (propuestas)*, Dirección General de Administración Local, Principado de Asturias, Spain.

network. However, in distant territories beyond the reach of Romanization (such as Asturias), the old defensive settlements persisted over time, *Castros* (hill-forts), and *Villa rustica* (countryside villa) gained some importance. The crisis of the third century and the Early Middle Ages brought that urban system to its end: towns lost their population (even to no inhabiting), whereas farming tenancy, was the seed to the beginning of the way to feudalism.

The Muslim invasion in the 8th century, which went on to the end of the 15th century in some territories, was the start of the reallocation of the population up to day. The Muslim rule brought back the urban planning of the territory widely on the basis of the old Roman city (with a few exceptions) and on the network of roads linking them. Nonetheless the deepest footprint of the Middle Ages lies on the "Reconquista" and the repopulation of the territories, as the northern nascent Christian kingdoms pushed the followers of Mahoma down. As a rule, it can be said that the earliest territories recovered by the Christians were and are the smallest settlements, coinciding with a complex orography, above all, in the Cantabric Spain with an oceanic climate, and in *the Pyrenean provinces*, in spite of the attempts to concentrate the population and administration at *polas* (new settlements in Asturias). In the northern Castilian plateau, the resettling process was based on a war economy, on livestock, and on the distribution of land to the *conquistadores*, organized in municipalities; in the northern plains, nevertheless, villages are bigger with hardly any buildings around the settlement. Southwards, so it happens in the southern part of the Castilian plateau and in Andalucía all over the lands El Guadalquivir floods through, it can be said that a resettlement of noblemen sprang up, since it was the military leadership and the military orders that were granted vast tracts of land and, as a result, the population was concentrated and the number of land owners for agricultural purpose was dramatically cut down. After the early modern period, changes in settlements were most slight, but for exceptional inland settling cases and the foundation of new communities. Industrialization, otherwise, came to alter the territorial system significantly and caused the movement of huge masses of people from inland to the shoreline, with important growing settlements closely linked to energy sources (coal), mineral deposits, seaports and the railway network laid in the 19th century.

However, the rural exodus did not depopulate most agrarian communities, underdeveloped and distant from important centres and more dynamic urban areas. Thus, in Asturias, even though about 10% of the communities were deserted, there are still eight thousand to be serviced in equal quality conditions to those of urban areas, the latter being concentrated in a functional metropolitan central area with 75% of the population dwelling in 25% of the territory, and including the *villas*, service administrative centres with an area of municipal influence, located on the coast or in some well communicated valleys out of its milder relief, as compared to most part of the territory, in which next to 80% of the lands have slopes of more than 20% gradient.

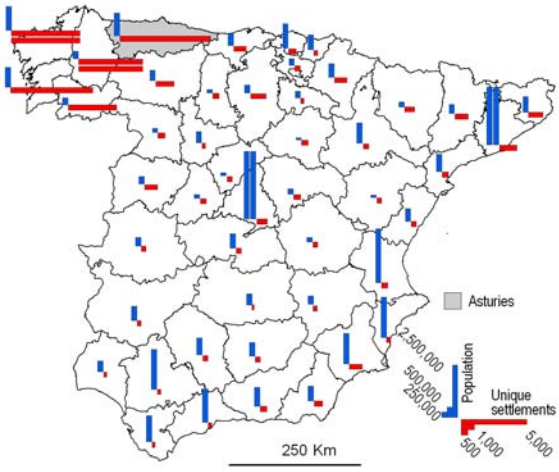


Fig. 1. Settlements and population in peninsular Spain per provinces (NUTS 3) (2010).

### 1.2. The provision of decentralized services

The Spanish public administration is inherent to any strongly decentralized state organized at different levels to cover the political representation and the provision of public services: the one ruled by the state, the communities and the municipalities (above eight thousand). Besides, most of the autonomous communities (almost federal states) are divided into provinces with their own administrative bodies, competences and functions. Furthermore, there exist intermediate management bodies among the single-province autonomous regions, the provinces and the municipalities with various legal systems. Such bodies often carry out functions given to the local administration by norm (provinces and, above all, municipalities) with two targets: to bring the services closer to the citizen (the principle of subsidiarity) and provide the small helpless municipalities (with a low population and a low financial capacity to afford them) with the services planned both by the legislation at the local level (now antiquated) and the ones citizens demand as the welfare state develops.

The services which such intermediate bodies (consortia, municipal councils, regions, counties only by law, and by far associations of municipalities) usually provide services that can fall into the following groups: facilities (slaughterhouses, parks, equipment maintenance for local road network, swimming pools, etc.); waste, water and cleaning (water supply, collecting and treatment of hazardous waste, etc); culture (youth, leisure, linguistic policy, etc); information (consumer's agency and consumption

information, taxes, legal services, technical department, informatics department, etc.); environment and territory planning (city planning); productive sectors (development and employment agencies, touristic promotion, grazing land administration, etc.); or social promotion of public services (women and family assistance, social assistance, no state-regulated schooling, prevention of occupational risks, etc.). The dispersion of the population in small villages and the time it takes to reach serviced towns turn it to be highly costly in autonomous communities like Asturias, with a scattered population and complex landforms. Notwithstanding, such populations demand quality services like the better located ones, the municipality map (in use at least since the first half of the 19th century) not being able to provide such services properly and efficiently. By the method proposed hereafter we will attempt to work out a part of the problem: the suitable location of services will bring costs down and cover the demand without moving the scattered population to bigger towns (otherwise, this would turn into depopulation, disabling both productive uses and leisure uses, or second homes in vast territories of the region).

## 2. THEORY AND METHODOLOGY

The method under discussion takes, as a basis, the Geographical Information Systems (GIS) with multicriteria analysis techniques. In this regard, the following should be noted:

- it was meant for use at a regional level. In fact, the testing proved efficient in smaller scale calculations (nation, region), with certain deficiencies for municipality scales (to this end, network analyst is more suitable), and with high marks in very detailed scales and pedestrian mobility;

- the programme used was ArcGis (ESRI) and the extension Spatial Analyst. This is why sometimes the program language is employed. However, the technique can be transferred to other commercial products, such as Geomedia, Idrisi o GvSig-Sextante.

### 2.1. Initial selection of possible sites

It has been considered that, to equip a territory, this must be located in an urban area or next to it, under the presumption that towns and “villas” (in Asturias, towns under ten thousand inhabitants but with an urban morphology and functions) have a supporting previous infrastructure, therefore enabling considerably lower costs inherent to new ones. Previous infrastructures are the ones related to urban services (supplies, wastewater treatment, sanitation, power supply, telephone network, etc.), as well as other public and private facilities assisting widely demanded services (hotels and food service, shopping and the like). By using the 2007 data, an initial shortlist of more-than-2000-inhabitant towns was made in the region. It might be striking to consider the cut-off criterion if we overlook that the Asturian case will even include the capitals of municipalities quite below that figure considered as soil and urban spaces; these ones were certainly included. A number of 43 towns had more than two thousand inhabitants, although this piece of data was excluded when two towns were too close together and shared the same services, and then just one of them was chosen, the capital being preferred to avoid wrong calculations. Except for two municipalities, (Corvera and Aller), where there are towns that comply with the population criterion without being capital municipalities although, morphologically speaking, they have obvious urban features and hold distinctive features.

The results of the selection are shown in table 1 and represented in figure 2; such towns might be the sites for services or the concentration or relocation of services in use in their own sites.

Table 1. Shortlist of towns.

| No. | Town | Town population 2007 |
|---|---|---|
| 1 | Gijón | 260,866 |
| 2 | Oviedo | 184,121 |
| 3 | Avilés | 78,766 |
| 4 | Langreo | 39,901 |
| 5 | Mieres | 25,039 |
| 6 | Pola de Siero | 11,794 |
| 7 | Piedras Blancas | 9,444 |
| 8 | Pola de Lena | 8,728 |
| 9 | Pola de Laviana | 8,723 |
| 10 | Las Vegas* | 7,667 |
| 11 | Grado | 7,223 |
| 12 | Cangas del Narcea | 6,615 |
| 13 | Candás | 5,768 |
| 14 | Villaviciosa | 5,707 |
| 15 | Luanco | 5,174 |
| 16 | Noreña | 5,072 |
| 17 | Pravia | 5,071 |
| 18 | Llanes | 4,470 |
| 19 | Luarca | 4,420 |
| 20 | Sotrondio | 4,003 |
| 21 | Navia | 3,986 |
| 22 | Cangas de Onís | 3,713 |
| 23 | Tineo | 3,702 |
| 24 | Ribadesella | 3,146 |
| 25 | Posada | 3,127 |
| 26 | Vegadeo | 2,823 |
| 27 | Moreda* | 2,736 |
| 28 | Arriondas | 2,503 |
| 29 | Tapia de Casariego | 2,393 |
| 30 | Nava | 2,184 |
| 31 | Infiesto | 2,139 |

(*) Not municipality capital.


Fig. 2. Location of possible towns.

### 2.2. Isochronal calculation

An isochrone map (isochrone plan, isochrone diagram) in urban planning is a map showing areas related to isochrones between different points. An isochrone is defined as "*a line drawn on a map connecting points at which something occurs or arrives at the same time*". Such a map is sometimes termed simply an isochrone. Isochrone maps are commonly used to depict areas of equal travel time. They allow a travel-time arrangement to calculate quantities of population on the basis of their access to facilities, etc.

It was necessary to model the information to simplify reality not to change it substantially and preserve the objectives. Thereafter, we based on the vectorized map (1:200,000) provided by the Regional Road Service of the *Principado de Asturias* and brought it up to date with a view to the near future, including roads under construction.

On the other hand, the railway was ignored, as today's travel-time access is superior to the one by road. As a result, a road network speed model was developed according to the road classification, seen in table 2.

Now, in view of the process of the work, the objectives and the available information, we decided to conduct the method by way of raster (or grid) rather than by a network analyst. This meant some miscalculations, as we did not count on an arc-nod topology suitable for networks, several inaccessible spots such as bridges and junctions were not considered[2]. This involved a certain margin of error, but so insignificant on the scale of the project that it could be disregarded, what proved the efficiency of the method on medium scales (after the relevant analysis of various other procedures).

In any case, the conversion from vectorial data to raster raised a problem and led, then on, to a solution:

- *problem:* the disregarded net road space should be completed with some data. Logically, it all led to thinking that no mobility is possible without a road.

- *solution:* to fall back on the capacity to give values to the net-road interstitial spaces to indirectly bring in the vast local net road of Asturias (omitted in the reference map, as well as the streets of the urban spaces. Consequently, we incorporated the term "filling", as shown in table 2, to give that kind of alleged route a very low estimated speed.

Table 2. Speed model.

| Motorway | Estimated speed (km/h) | Cost (minutes per km) | Time |
|---|---|---|---|
| Highway | 110 | 0.54 | 32 sec. |
| Main road network | 80 | 0.75 | 45 sec. |
| Local road network | 50 | 1.2 | 1 min. 12 sec. |
| Filling | 25 | 2.4 | 2 min. 24 sec. |

"Filling", the space void of routes in the reference cartography, but provided with a network of ways and lanes.

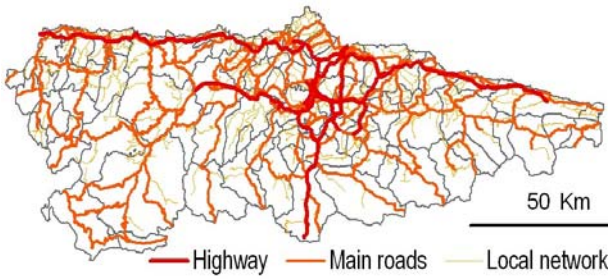


Fig. 3. Reference road network.

The result is a grid, in the customary format of the ESRI products, with a 150 m space resolution cell in the values of table 2. As of it, the ArcGis function, so-called cost-weighted distance, was applied, consisting of storing the value of displacement from the start (in the case being, the potential selected towns) in accordance with the given cost expressed in time (minutes/km according to the kind of route, table 2).

Thirty-one isochronal maps were produced, one for each selected town sites, and a synthetic map with a simultaneous calculation for every potential towns, as shown in figure 4 (an instance of the 31 maps) and 5 (a summary intersecting the isochrones of all the towns).

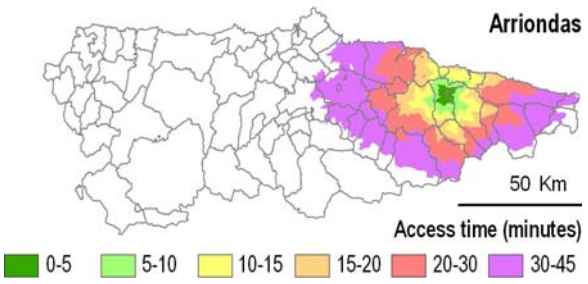


Fig. 4. An example of one of the thirty one isochronal maps.

[2] These matters are further dealt with by PRAT, E; PESQUER, L; OLIVET, M. et al. (2009).

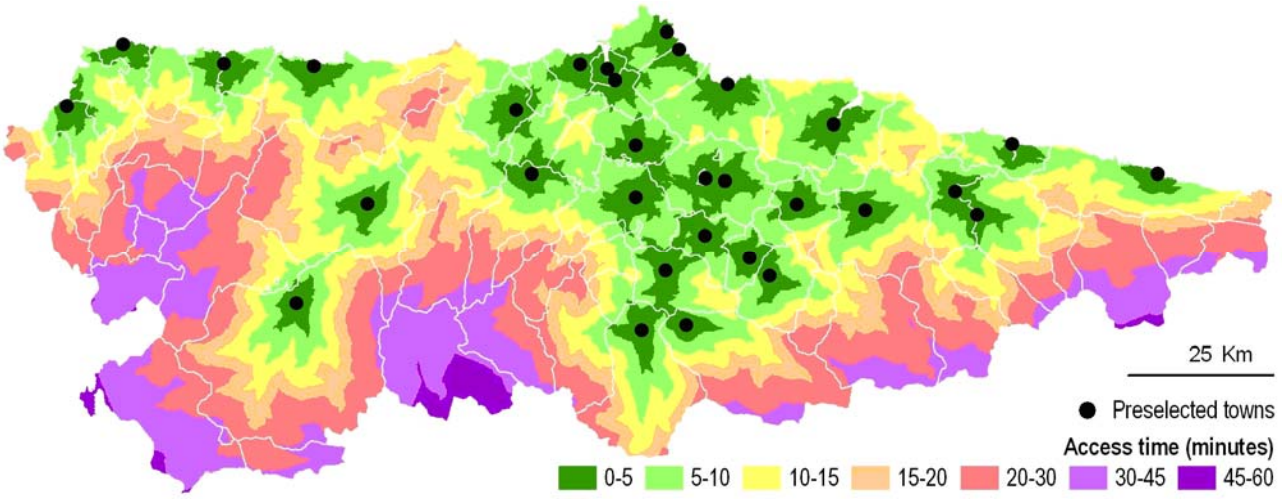


Fig. 5. Summary of access time to selected towns.

It must be noted that the results of this calculations come from a raster of continuous values. However, in order to enable the coming decision makings of the proposal, we chose to classify the access times to the sites (0-5; 5-10; 10-15; 15-20; 20-30; 30-45 min.) and turn it into a vectorial format again.

### 2.3. Population connected to access time

When incorporating the variable of the dispersion of the population in many towns and parishes in Asturias, we encountered the problem that no space database was available then, comprising the 6,894 singular parishes in relation to the state index of cities, towns and villages (nomenclature).

Nevertheless, 856 parishes had luckily been included. Anyway, the fact that the parishes mostly lack in population was no hindrance to consider them suitable for a reliable result.

However, it was necessary to adapt the database to get the outmost of the process. Thus, the parishes appeared as polygons, so their geometry was turned into points; by default, the point is placed in the centre of each polygon, so it was necessary to move a certain number of registers either toward a singular parish with several villages (villas and towns), or by putting aside the deserted mountainous lands south of the region.

Over the process of adjustment, it was necessary to take many space measures to relate the isochrones with the above-mentioned parishes; thereby, we could quantify the number of inhabitants and the distance to every selected town to find out the required time. See the results table 3.

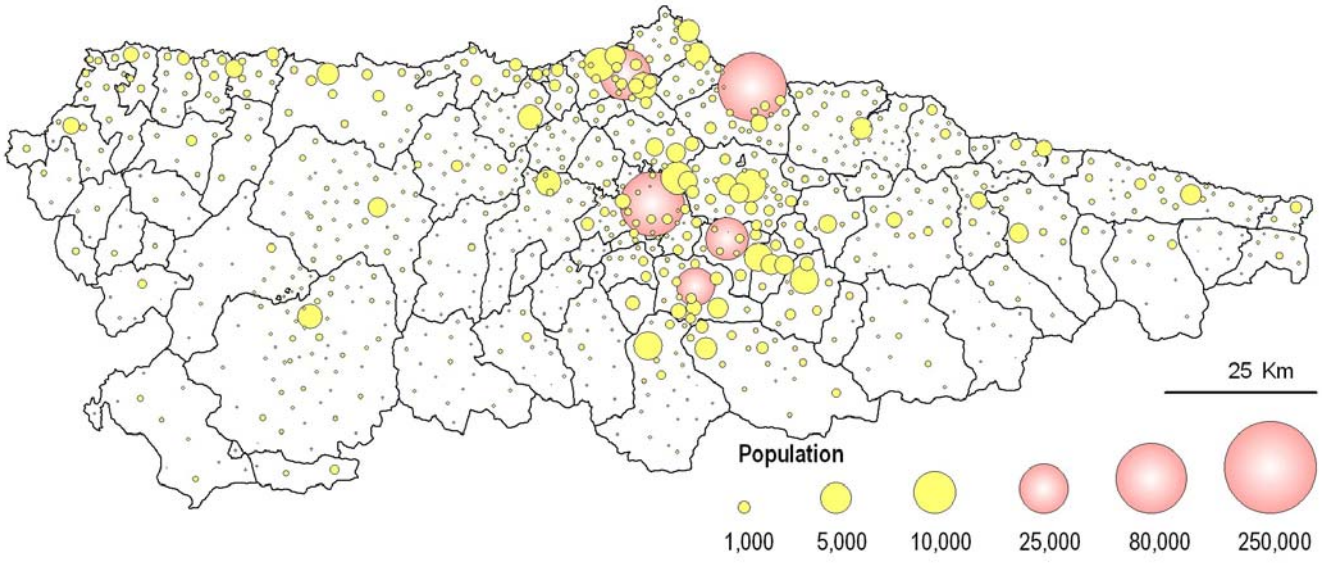


Fig. 6. Population at every parish consisting of several villages. 2007.

Table 3. Population according to access time to preselected towns (minutes).

| Town | Municipality | Population 2007 | 0-5 | 5-10 | 10-15 | 15-20 | 20-30 | 30-45 | Altogether 20 min | Altogether 30 min |
|---|---|---|---|---|---|---|---|---|---|---|
| Gijón | Gijón | 260,866 | 264,443 | 11,080 | 70,287 | 378,434 | 118,133 | 104,117 | 724,244 | 842,377 |
| Oviedo | Oviedo | 184,121 | 222,123 | 32,929 | 119,202 | 409,785 | 121,005 | 51,449 | 784,039 | 905,044 |
| Avilés | Avilés | 78,766 | 102,194 | 21,941 | 40,681 | 511,062 | 126,811 | 145,397 | 675,878 | 802,689 |
| Langreo | Langreo | 39,901 | 52,788 | 77,111 | 254,960 | 313,480 | 188,434 | 62,724 | 698,339 | 886,773 |
| Mieres | Mieres | 25,039 | 25,039 | 68,335 | 286,633 | 35,364 | 421,094 | 103,434 | 415,371 | 836,465 |
| Pola de Siero | Siero | 11,794 | 23,759 | 75,658 | 512,547 | 75,637 | 209,898 | 57,357 | 687,601 | 897,499 |
| Piedras Blancas | Castrillón | 9,444 | 19,422 | 107,153 | 23,371 | 51,533 | 576,799 | 161,432 | 201,479 | 778,278 |
| Pola de Lena | Lena | 8,728 | 14,037 | 36,949 | 61,718 | 244,541 | 369,296 | 200,350 | 357,245 | 726,541 |
| Pola de Laviana | Laviana | 8,723 | 18,895 | 15,041 | 56,242 | 66,524 | 576,042 | 194,313 | 156,702 | 732,744 |
| Las Vegas* | Corvera | 7,667 | 99,284 | 34,699 | 41,539 | 497,305 | 134,646 | 139,555 | 672,827 | 807,473 |
| Grado | Grado | 7,223 | 9,354 | 7,583 | 222,094 | 132,414 | 214,593 | 373,972 | 371,445 | 586,038 |
| Cangas del Narcea | Cangas del Narcea | 6,615 | 8,576 | 1,812 | 3,840 | 2,665 | 11,411 | 36,449 | 16,893 | 28,304 |
| Candás | Carreño | 5,768 | 9,299 | 20,639 | 363,074 | 51,009 | 344,584 | 141,091 | 444,021 | 788,605 |
| Villaviciosa | Villaviciosa | 5,707 | 7,306 | 6,976 | 17,864 | 299,419 | 366,447 | 243,686 | 331,565 | 698,012 |
| Luanco | Gozón | 5,174 | 14,883 | 5,651 | 366,647 | 37,016 | 347,118 | 143,753 | 424,197 | 771,315 |
| Noreña | Noreña | 5,072 | 23,894 | 281,362 | 308,487 | 79,886 | 203,988 | 58,326 | 693,629 | 897,617 |
| Pravia | Pravia | 5,071 | 7,503 | 14,675 | 38,030 | 105,310 | 290,747 | 486,578 | 165,518 | 456,265 |
| Llanes | Llanes | 4,470 | 6,675 | 2,689 | 2,751 | 8,162 | 13,630 | 28,145 | 20,277 | 33,907 |
| Luarca | Valdés | 4,420 | 6,003 | 8,013 | 9,274 | 10,098 | 38,396 | 156,860 | 33,388 | 71,784 |
| Sotrondio | SMRA | 4,003 | 17,726 | 60,985 | 34,681 | 288,192 | 359,545 | 182,348 | 401,584 | 761,129 |
| Navia | Navia | 3,986 | 8138 | 8297 | 9044 | 9604 | 15259 | 51551 | 35,083 | 50,342 |
| Cangas de Onís | Cangas de Onís | 3,713 | 4,673 | 6,287 | 3,778 | 11,014 | 24,294 | 348,553 | 25,752 | 50,046 |
| Tineo | Tineo | 3,702 | 4,388 | 3,051 | 4,790 | 7,486 | 45,610 | 422,532 | 19,715 | 65,325 |
| Ribadesella | Ribadesella | 3,146 | 4,429 | 2,189 | 4,384 | 10,734 | 33,333 | 348,753 | 21,736 | 55,069 |
| Posada | Llanera | 3,127 | 21,281 | 227,053 | 438,305 | 82,332 | 126,059 | 58,219 | 768,971 | 895,030 |
| Vegadeo | Vegadeo | 2,823 | 4,248 | 1,441 | 3,989 | 7,516 | 16,177 | 17,525 | 17,194 | 33,371 |
| Moreda* | Aller | 2,736 | 4,137 | 15,534 | 48,015 | 274,688 | 376,861 | 203,632 | 342,374 | 719,235 |
| Arriondas | Parres | 2,503 | 4,350 | 6,964 | 10,096 | 11,947 | 27,590 | 630,032 | 33,357 | 60,947 |
| Tapia de Casariego | Tapia de Casariego | 2,393 | 4,226 | 5,918 | 9,587 | 10,101 | 13,267 | 16,931 | 29,832 | 43,099 |
| Nava | Nava | 2,184 | 5,237 | 8,723 | 60,145 | 85,306 | 574,848 | 212,903 | 159,411 | 734,259 |
| Infiesto | Piloña | 2,139 | 4,053 | 4,090 | 14,215 | 29,868 | 606,421 | 253,927 | 52,226 | 658,647 |

### 2.4. Selection of candidate towns

Based on the data of the process a decision can be made about which towns are the most suitable to bring service facilities considering the shortest time for the population and the best territorial coverage possible; let's also consider that the largest towns are relatively in reach of one another, particularly in the Central Area, where its "hinterland" is prone to overlap each other.

The outcome of the analysis suggests:

a). The potential town must be placed in the Central Area, as it is the most crowded space. The capital of the Autonomous community (Oviedo) is the best location because it is the highest populated town within its 20-minute isochrones (then on, Posada) and 30 minutes (followed by Noreña), with little differences, though. This would enable to make decisions about locations of the most important urban reach in the area at a larger scale.

b). In the western area, the need is to select two potential towns, since the distances from the coast to the mountain line are too far away, so as to work it out with just one town. Accordingly:

- the main candidates on the shoreline are Luarca and Navia, the former with the substantial advantage of a 20-minute isochrone, the latter has the biggest population with a 30-minute isochrone.

An accurate selection needs using two other criteria: the overlap on other potential towns (thus, Luarca overlaps Oviedo and the eligible town for the southwest further on), and the space and population beyond a reasonable accessibility (Luarca, once more, leaves a considerable stretch of the Asturian western end out of the 45-minute isochrones):

- in the west inlands, Cangas de Narcea is obviously the best town for a candidate sites, Tineo being its only potential competitor, which bluntly overlaps Oviedo and the western sea town, apart from leaving the larger parishes of Ibias and Degaña out of its 45-minute isochrone (amongst other minor ones in the southwest mountains);

- in the east, the barely 8 km between the two potential towns (Arriondas and Cangas de Onís) makes it difficult to pick out between the two "villas", as their isochrones are very much alike. Nonetheless, Arriondas has the advantage of being nearer to the large towns of its natural hinterland, as the case is with Ribadesella and Llanes.

## 3. RESULTS AND DISCUSSION

### 3.1. The selection of four candidate towns

In the reference inform for the submitted model the town proposed for governing bodies and administration of the territorial cooperation units was one of the final recommendations; the proposed units went up to thirteen covering 76 out of the 78 in the autonomous community (the two largest towns excluded). Furthermore, we gave more importance to the location criteria, facilities, and equipments to be shared amongst the municipalities of each unit:

- the potential towns were evaluated according to the serviced population and road accessibility; this is: the location of the administrative town ought to be near the urban reference unit, but not necessarily in it;

- on the other hand, the location of the other facilities (machinery fleet parks, service buildings, etc.) should be located within each cooperation unit to enable better service (as the case is customarily), so that the services and citizens' travelling time should be cut down for the fulfilment of the principle of access in conditions of equality. In any case, the aim is not just to "distribute" the locations under a balance basis to the associated municipalities, but to keep territorial balance;

- the location of services should contribute to stop the well-known trend in the less dynamic areas toward mass concentration in urban towns (recent rural exodus of short distance, both populations on and off active service who demand shopping and health services, etc.).

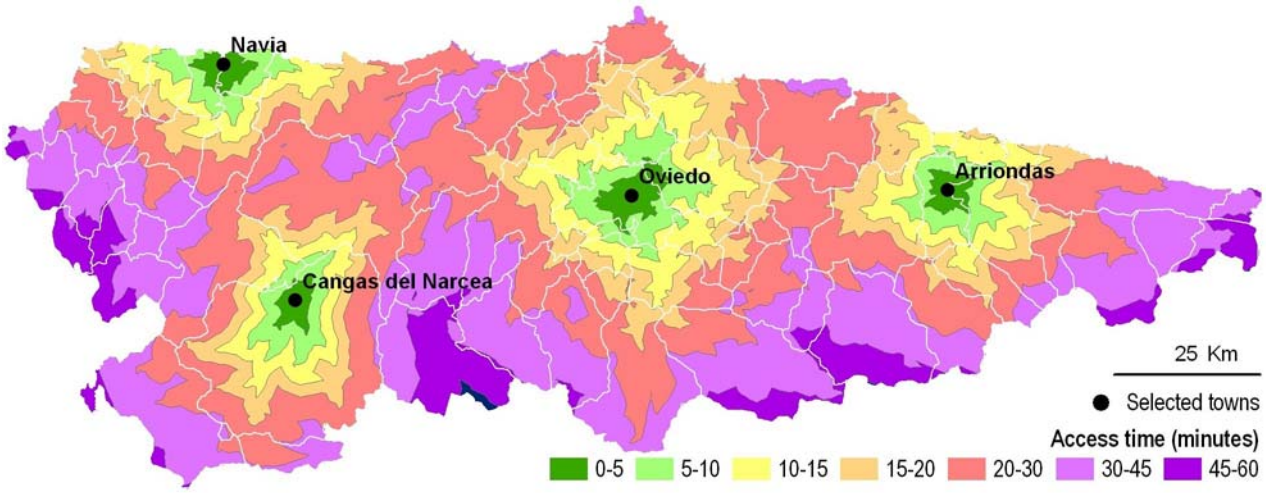


Fig. 7. Road accessibility to the four selected towns.

### 3.2. Territorial disparities and accessibility-based planning

As to Asturias, former territory planning experiences have proved how useful, practical and fair is to bring basic services nearer to citizens. So, the "Directrices Regionales de Ordenación del Territorio" (Regional planning) of 1991 turned to be most useful to develop a hospital decentralized network and other health minor centres (outpatients health centres, e. g.), within the corresponding "healthcare areas" covering the municipalities and bringing the services near to the potential users. Two decades later, the positive effects of the management are obvious: better territorial balance by diminishing the comparative backwardness of the wings of the region (far away from the central metropolitan space), creation of reference spaces and buildings (at times, as urban regeneration drivers), the gain in quality service activities as well as in skilled workers, etc.

In any case, the demographic size of the Central Area, the economic weight, the functional predominance, etc., force us into a rationalization and right-sizing of the essential services requiring specific approaches and territory impact assessments (as well as those of accessibility) so as to match the quality of

services with their equal distribution, in areas of territorial sustainable development.

### 3.3. Application of the method for pedestrians in urban areas

In previous sections, it has been underlined how convenient it is to use the method of analysis dealt with for urban scales and for the development of proposals connected with pedestrian's mobility.

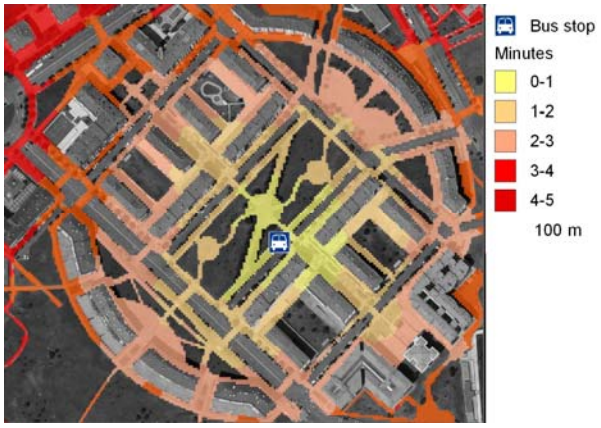


Fig. 8. Test of the method for pedestrians.

Although it has not been put into practice, but for a few tests and many theoretical reflections, it has proved most valid in this task. Nevertheless, a few adjustments are necessary, namely:

- the relation of points of access, that is to say, where the facilities can be put up; in this case, they can be premises, plots, etc., the necessary and available for each specific approach;

- the speed used is taken, in principle, as a constant; the most logical thing would be to take 4 km per hour which is the average estimation of human pace (15 minutes a km). However, if studying the mobility of, for example, elderly people or disabled people, etc., other values could be considered. Even if we wished to evaluate traffic, zebra crossings might do as a different correcting speed;

- the major difference would come from the treatment of the cartographical basis. Besides using a constant speed, the barriers (spaces that do not allow people move on) become highly relevant, which might be solved by increasing the amount to make it impossible to get through (for instance 999 minutes per km). That goes with buildings and roads (except for signposted crossings, fences and other obstacles);

- to conclude with, the application of the above-mentioned method with duly corrections for a big scale can be considered practical for a better mobility and accessibility, as compared to the customary method of network analysis, especially for squares, boulevards, and the like, which do not fit in the network data structure.

## 4. CONCLUSION

The selection of candidate towns to place services on the basis of the GIS provides interesting results. It enables solutions based on a multicriteria analysis, which cuts down the risk of unscientific decisions. The method proves highly useful at a sub-regional scale (NUTS3) and at a large scale (pedestrians' mobility).

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