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# THE ROLE OF PUBLIC POLICIES IN THE UNIVERSALIZATION OF THE BROADBAND IN SPAIN

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## ABSTRACT

This paper presents the problems of the deployment of telecommunication networks and the role of public policies in order to fulfil the Digital Agenda for Europe targets regarding basic broadband universal service for 2013 and the 30 Mbps universal availability for 2020 for the case of Spain. The impact of issues as the universal service declaration, reframing process and access regulation are analysed as means of bringing the benefits of Information Society closer to all the citizens.

## 1. Introduction

The recent growth in the diffusion of Information and Communication Technologies (ICT) has allowed bringing the multiple advantages of the Information Society (IS) closer to the citizens. It has been proven that there is a positive correlation between the broadband penetration in a certain region and its economic growth, since the transversal character of the ICT leads an increase in local productivity, which in turn, results in higher quality of life for citizens.

Despite its benefits, the Information Society is limited by some economic aspects that slow down or even prevent broadband networks from being deployed in some areas, what causes the so called “*digital divide*”. This fact is especially clear in rural and isolated areas, characterized by low population density and highly dispersed, as well as rough relief, where fix and mobile access technologies find economic limitations because of the low demand of broadband services and the high capillarity of the network required.

Thus, different public institutions are carrying out several initiatives in order to reach those areas, where the private sector cannot find profitability, so that minimal access requirements to broadband for all the citizens can be guaranteed.

The Digital Agenda for Europe [1] manifests the European Commission concern about the provision of broadband services to the whole population. The strategy followed by the Commission for the deployment of new generation networks is part of the Europe 2020 Strategy and appears in the initiative of May 2010 of the Digital Agenda. Due to its high economic and social value, the universalization of broadband has become one of the main political and strategic targets, since it is viewed as an opportunity to increase productivity and employment.

Such initiatives set out several objectives regarding broadband: the universalization of basic broadband in 2013, universal coverage of 30 Mbps by 2020 and having 50 percent of households subscribed to more than 100 Mbps services by 2020. The European Commission recognizes that in order to achieve the pursued targets – certainly ambitious - the use of public funds must be smart and the public measures concrete and coordinated. The debate on public intervention is being guided by the

communication of the Commission “*European broadband: investing in digitally driven growth*” [2] and through the Directives for the public aids for broadband network deployment.

The required investment for the aforementioned targets has been estimated in around 200 – 300 billion of euros for the whole European Union. Therefore, it becomes essential to set out a debate around the investments in the deployment of network infrastructures, in accordance with its impact in the Internet ecosystem. The development of new services and applications obviously need covering the vast majority of the population with adequate networks.

While content and service providers clearly demand faster networks, which enable the development of new services and business models, operators do not rely on enough incentives to invest in new network infrastructures, neither in new generation networks nor in extending the coverage of the existing ones. Moreover, there is a demand of the users for affordable, open and trustworthy services.

In this regard, public policies play a very important role in constructing an Internet model fair with the different agents involved, which keep the incentives for investment in all the *layers* of the Internet ecosystem – network and services -, respecting users’, content creators’ and investor’s rights. Europe needs to walk towards an open and sustainable Internet, but it risks blocking the new generation network broadband.

This paper concentrate on the public policies that could contribute to achieve the targets of the Digital Agenda for Europe of universalization of broadband by 2013, covered in section 2, and universal coverage of 30 Mbps by 2020 through the promotion of NGN in section 3. In both cases the analysis is focused on the case of Spain, describes the state of broadband coverage and analyzes the challenges that public policies still have to face. Section 4 closes the document with some conclusions.

## **2. Broadband coverage and the universal service declaration in Spain**

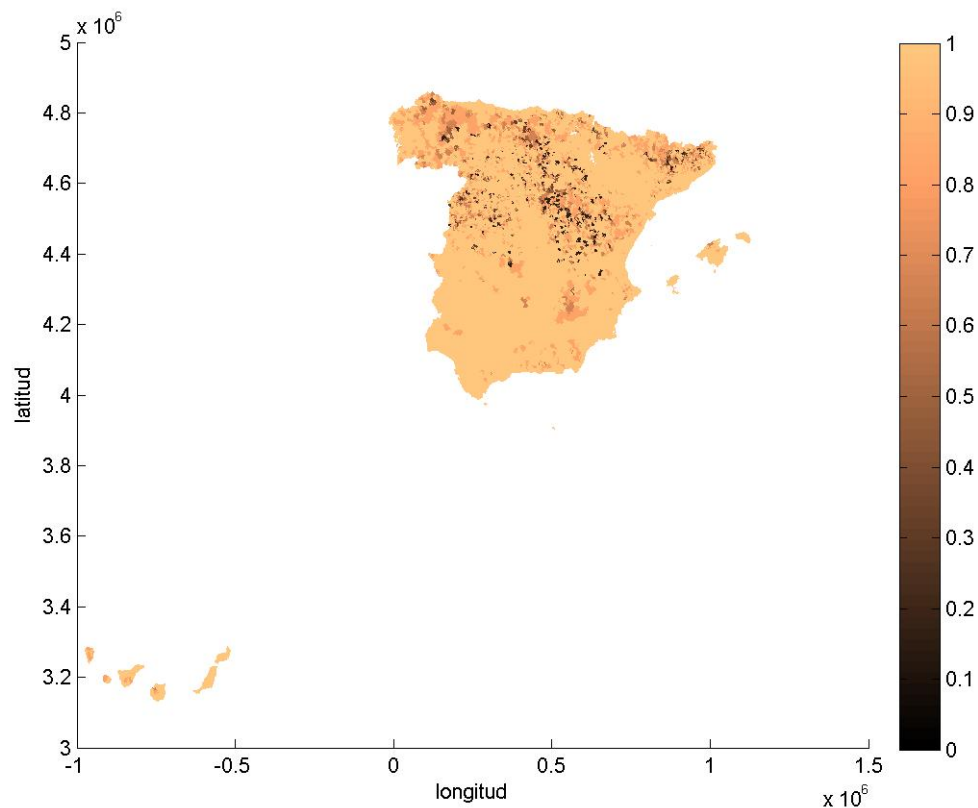
Broadband universalization and the reduction of the so called “*digital divide*” is one of the main objectives of diverse Administrations, in order to bring the benefits of the Information Society closer to the population which lives in low density municipalities and rural areas.

In Spain the universal service declaration came into effect the 1<sup>st</sup> January 2012, which provides access to basic broadband to the whole population independently on where they live. An average download speed of 1 Mbps must be guaranteed within any period of 24 hours, the request must be effective in maximum 60 days and at similar prices as in urban areas.

The Broadband Extension Plan, PEBA (*Plan de Extensión de la Banda Ancha*) carried out between 2005 and 2008 has undoubtedly contributed to mitigate the digital divide, encouraging private inversion through public incentives. However, at the end of 2011, just before the declaration of the universal service, between 0,87% and 1,67% of the population still did not have access to broadband through any technology, which is equivalent to more than half a million people. About 40% of these people are dispersed population which does not belong to any population centre, which makes terrestrial deployments extremely expensive.

Figure 1 shows the distribution of coverage of at least 1 Mbps through the Spanish municipalities before universal service declaration. The darker colours mean lower coverage (i.e. 10% population covered with 1 Mbps broadband access), while the lighter colours means higher coverage (i.e. 100% population covered with at least 1 Mbps). These data have been obtained by processing the data

published by the Spanish Industry Ministry (*Minetur*) [3] regarding the population entities<sup>1</sup> which are susceptible of public aids for the “*Plan Avanza 2*” program [4], in the pillar universalization of basic broadband.



**Figure 1. One Mbps coverage of the municipalities in the Spanish geography**

The main differences found are related to the size of the municipality and the region it belongs to. As it can be appreciated in the figure, the regions with lower coverage match up with those of mountainous regions (i.e. the Pyrenees) and those of lower population density (i.e. south of Aragón and areas of Castilla-La Mancha and Castilla León). On the other side, larger areas of medium level coverage can be found for example in Galicia.

In fact, the higher ratios of non-covered population until the end of 2011 appeared in the region of Galicia, with Lugo heading by far the list of provinces with higher non-cover population, which is shown in table 1, and followed by another Galician province, Orense. On the other hand, at the end of the list we find the provinces of Sevilla, Madrid, Málaga and Barcelona, as well as the two autonomous cities of Ceuta and Melilla in the north of Africa.

Provincia	Población no cubierta (promedio)	Número de hogares sin cobertura
Lugo	9,04 %	12.334
Orense	4,67 %	6.763
Soria	4,64 %	2.023
Guadalajara	4,49 %	4.823
Zamora	3,99 %	3.630

<sup>1</sup> A population entity is defined as any habitable area which belongs to the municipality area clearly differentiated within it and known by a specific naming.

Cuenca	3,87 %	3.707
La Coruña	3,83 %	14.183
Ávila	3,48 %	2.863
Burgos	3,04 %	4.970
Santa Cruz de Tenerife	3,03 %	8.401
Salamanca	2,93 %	4.514
Teruel	2,91 %	1.816
Albacete	2,66 %	4.049
Asturias	2,58 %	10.952
León	2,44 %	5.318
Pontevedra	2,33 %	6.713
Lérida	2,23 %	3.090
Gerona	2,14 %	4.814
Segovia	2,02 %	1.344
Cantabria	2 %	3.962
Huesca	1,82 %	1.418
Palencia	1,82 %	1.305
Toledo	1,71 %	3.212
Cáceres	1,69 %	3.004
Guipúzcoa	1,64 %	3.761
Almería	1,54 %	3.007
Las Palmas	1,46 %	4.116
Vizcaya	1,32 %	4.710
Granada	1,31 %	3.035
Jaén	1,31 %	4.302
Álava	1,28 %	1.325
Alicante	1,22 %	2.517
Castellón	1,22 %	6.241
Ciudad Real	1,19 %	2.194
Baleares	1,05 %	3.188
Navarra	1,04 %	2.135
Badajoz	1,02 %	2.467
Córdoba	0,97 %	2.546
Huelva	0,85 %	1.375
Tarragona	0,79 %	1.853
Valencia	0,64 %	5.019
Valladolid	0,63 %	1.289
Murcia	0,62 %	2.477
Cádiz	0,61 %	2.125
Zaragoza	0,6 %	2.387
La Rioja	0,42 %	524
Barcelona	0,41 %	5.998
Málaga	0,39 %	1.811
Madrid	0,33 %	4.651
Sevilla	0,25 %	1.492
Ceuta	0,25 %	49
Melilla	0 %	0

Table 1. Percentage of people with no availability of broadband coverage until the declaration of the universal service.

However, since the coverage levels are in general high, no strong relation could be found between the coverage and some of the variables that should determine it, like population dissemination, distance to a switching station or urban population density, as to consider them as determinate factors. But in

certain regions of the Spanish geography, as provinces of Guipúzcoa, Vizcaya, Gerona or Coruña, a strong relation was found between the level of coverage of a municipality and the dispersion of its population, which can be mainly attributed to the relief.

According to the take-up levels of broadband<sup>2</sup>, the potential demand of the universal service or higher quality services has been calculated for non-covered population until 2012, resulting in a total amount of 40.000 potential households. Results show that these households follow a distribution different from the one of the coverage. Small municipalities, of less than 1.000 inhabitants, usually present geographic and societal characteristics, like old population, low socioeconomic level, number of people per household, etc. which makes that majority of the demand does not concentrate there, but in a little bit bigger municipalities, near to bigger cities.

Figure 2 shows the distribution of the population with access only to universal service as well as the take up rates.

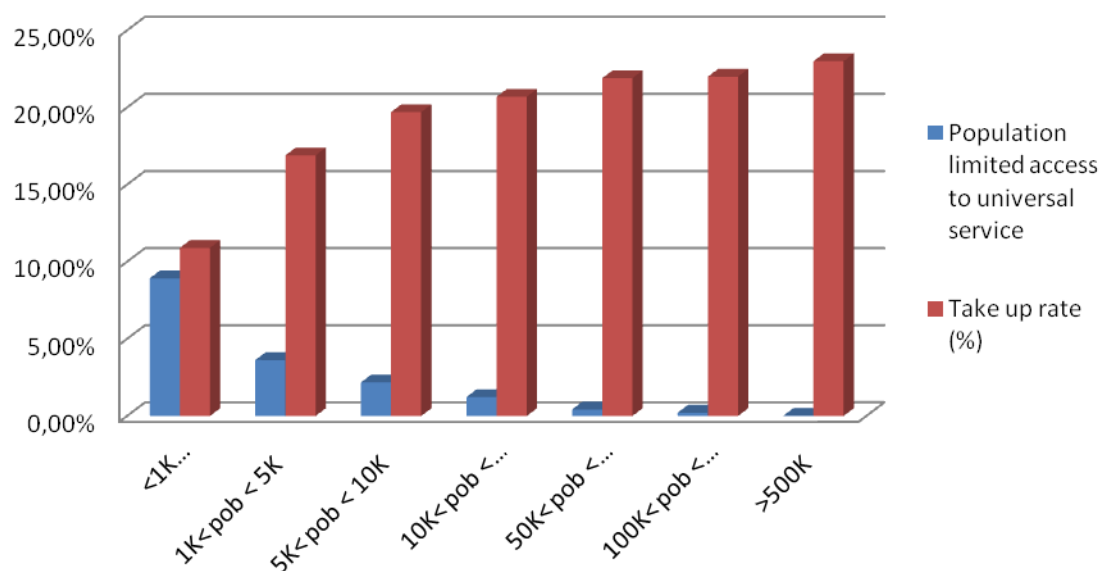


Figure 2. Population with access only to universal service and take-up, according to size of the municipality.

Public policies should find a trade-off between supply-side policies or demand-side policies. In accordance with the technologic neutrality principle, it seems reasonable that for the municipalities characterized by high dissemination level of the population, terrestrial deployment of infrastructure could be more costly than a satellite connection, which by definition offers 100% coverage. In this regard, satellite plays an important role in the reduction of the need for supply-side policies, especially in disseminated or isolated population.

Regarding the demand side, it seems that still much work can be done. As it is shown in figure 2, the take up levels in small municipalities (>1000 inhabitants) are lower than in the bigger size ones.

The funding of the universal service, until now, for the telephone universal service, the cost of every universal service request is analyzed and in case it implies an unfair charge for the designated operator, this cost is divided between the operators obliged to fund it. Telephone universal service have cost between 70 and 80 million Euros for the telecom sector in the last years. The inclusion of broadband in

<sup>2</sup> Take up is defined as number of broadband lines by every hundred inhabitants with coverage.

the universal service has arisen the debate around funding mechanism for it and the role that the state plays in order not to burden the sector.

## **Spectrum refarming**

One of the pillars of the public policies in universalizing broadband is related to the spectrum refarming process carried out, envisaged in the Real Decreto 458/2011 [5]. In July 2011 took place the spectrum auction of frequencies in the bands of 800 MHz and 900 MHz, old television bands, as well as the new band of 2.6 GHz.

The disposal of spectrum followed two procedures: tender, for some blocks of the 900 MHz band and the band of 1800 MHz, and auction for the band of 800 MHz, blocks of the 900 MHz band and the 2600 MHz band, which added up a total amount of 310 MHz.

The tender was used by the state to impose deployment compromises linked to the use of the spectrum in order to extend the coverage to rural areas. The 5 MHz FDD tender in the 900 MHz band implied a deployment compromise of 126 million € in infrastructure for the provision of mobile communications in municipalities smaller than 5.000 inhabitants.

However, the new frequencies for mobile communications, which will be able to provide fixed broadband services or broadband services by dongles, will not be available until 2014, which excludes this technology from the immediate future solutions.

## **Diffusion and barriers removal**

Several regional administrations have developed demand-side policies for the adoption of broadband in those areas which did not have terrestrial coverage by funding the costs of the installation and equipment of a satellite connection, which can add up to 800 €. Regions like Cataluña, Castilla y León, Navarra or Cantabria have promoted these policies, with different success.

These public policies are able to intercede in network and services deployment in order to bring forward the economic and social benefits of the introduction of broadband in non-covered places until now. However, the mechanism of subsidies for the installation and equipment – as the main barrier for the adoption – must be combined with technological neutrality, no competition distortion and efficient use of the public resources, for which results essential that criteria for the subsidy announcement are reviewed, considering not only the lack of access, but also the contribution to the productivity and education activities of the people who uses it.

## **3. Promotion of the deployment of NGN**

The other relevant target of the Digital Agenda for Europe regarding broadband availability by 2020 is having 100% of the households with ultrafast networks able to provide at least 30 Mbps.

The main progress in the deployment of ultrafast access networks are related, on the one side, to the investments that cable operators have done to upgrade its networks to DOCSIS 3.0, which reached by the end of 2010 41% coverage of the European households, and on the other side, to those made by incumbent operators to deploy FTTN deployments with high coverage, reaching approximately 30% of

European households by the end of 2010. However, FTTH network deployments have experienced lower ranges, since they have only achieved 9% coverage of European households.

Nonetheless, it is not foreseen that the upgrades of cable networks – 92% already carried out – will allow wider coverage than already achieved. Thus, it seems reasonable that to reach Digital Agenda targets, first of all, higher investment efforts need to be done by the incumbent operators, but followed by the whole alternative operators, through joint investment initiatives.

The recently published HSBC report “*make or break for fibre*” sets out the complex situation of Europe regarding the investment and deployment of FTTH networks. The current competition and pricing models result incompatible with the start of an investment process in order to fulfill the targets of the Digital Agenda for Europe. To break with this dynamic, resolute signs must be sent to investors, regarding the transition to a more consistent model, which allows an increase in the rates and thus, in the incomes of the sector, respecting their capacity to provide new services and find appropriate incentives regarding investments.

The main issues to consider are:

- An open debate about changes in the pricing of *legacy* network access, avoiding signs that encourage investments and trust of investors in the telecommunication sector. A decrease on the prices of copper would mean higher adoption barriers for fibre, since the current difference of prices between the two options would increase. This would restrict the possibilities of fixing higher rates for the new services and would impact negatively for the operator’s business model.
- A higher level of geographic segmentation is very relevant in order to build an effective regulatory model. This model would allow a less regulated approach in the so called black zones, the promotion of co-investment and risk sharing in grey zones, and public aids for the deployments in white and some grey areas.
- Regarding the fibre pricing model, the cost based approach set out by the European Commission constraints the capacity of service differentiation and rates segmentation of the operators, which is one of main mechanisms to increase the service penetration. In addition, the cost based approach does not take into account the multi-side nature of broadband platforms, which can make business model innovation difficult.
- Other relevant issues to encourage investment are: (i) the reduction of deployment barriers, at both regulation and fiscal levels, and (ii) the establishment of models which allow the effective sharing of in-building access or which allow attributing these costs to the owners of the households.

In the case of Spain, the ultrafast network deployments are mainly carried out by cable operators, which have upgraded virtually their whole network to DOCSIS 3.0, reaching the 51% of Spanish households. Nonetheless, the incumbent operator, Telefónica, has deployed FTTH infrastructure in some of the urban areas with high competition, as well as in new developed areas. However, it reaches only the 6% of households, although it is increasing.

Between the 51% and the 58% of Spanish households can already access to at least one infrastructure of at least 30 Mbps, promoting competition – for cable operators – and the increase of the coverage of these networks will require relevant investments.



In the dissertation of Dr. Arturo Vergara [6], a techno-economic analysis of different fixed NGA platforms is carried out for the 2020 horizon, where the competition between alternative platforms is analysed. The results classify Spanish geography in black, grey and white zones, according to the European Commission taxonomy.

#### **a. Black zones**

This scenario considers the following situation: the incumbent operator deploys a NGA network platform in order to compete mainly with the existing cable alternative platform, which has been upgraded to DOCSIS 3.0. At the same time, alternative operators can deploy in those zones where it is economically feasible, either separately or jointly. The potential range of black zones, where a simultaneous competition between two or more platforms would exist, is estimated to be between 46,1% and 50,2% of households of the country, depending on the level of joint investment of the alternative operators.

In the base scenario, the cable operator would reach up to the 40% of the households investing 1.150 million euros, while the incumbent operator would find a feasible deployment in the 46,1% of households, requiring an investment of 4.578 million euros. On the other hand, alternative operators, would only find feasible deploying in the 13, 5% requiring an investment of 500 million euros. This range could increase up to 27% - 33,7% depending on the joint investment scenarios.

The requirements needed to reach this scenario are:

- Access to the passive infrastructures of the incumbent operators.
- The importance of an adequate framework for the sharing of in-building access and the participation of the households' owners can result very beneficial regarding investment and timelines.
- Provision of joint investment initiatives and risk sharing.

However, these requirements will not be enough so as for the investments to be made, because of the uncertainty on the demand and the additional incomes that can be obtained. The obligations of wholesale access based on costs will constrain the range of these zones which can have competition between platforms.

#### **b. Grey zones**

"Grey zones" are characterized by having a unique platform or network infrastructure. The scenarios considered for these zones estimate between 22% and 26% of the households and locals would be placed in grey zones. In the base case, almost six million households (26% of the whole), could only have access to the incumbent operator infrastructure, requiring an investment of 3.460 million Euros. Although investments made by the incumbent operator are feasible in a static scenario, lower competition and the imposed cost based approach can prevent investment from occur.

Together with fixed deployment, mobile network deployment must be considered which will take place from the availability of frequencies in the 800 MHz band in 2014. The deployment of mobile alternative operators could generate a different competition dynamic, where a big amount of the ultrafast accesses are provided by mobile network. This process could speed up the investment in the fixed network as a consequence.

Access regulation in grey zones should allow the establishment of flexible retail prices, which allow service adoption and increase incomes. Likewise, it is important that the regulation model imposed will not avoid joint investment agreements and risk sharing, and that allow a more balanced risk distribution, higher sustainability of investments in grey zones and a higher competition between the different operators.

Finally, demand-side public policies would enable an early adoption of the deployments, which would reduce the risks related to a low demand.

### **c. White zones**

The so called “white zones” are those regions where deployment costs and demand characteristics are not enough so as to justify a feasible deployment of fixed NGA infrastructure as a private initiative. In the analysis performed, the 27,9% of the households in Spain are placed in white zones. The deployment costs for these zones is estimated in about 4.425 million Euros, for FTTN, and 7.905 million Euros, in case of FTTH, which represents relevant investment requirements which do not create any expectation of profit.

In these regions, the availability of ultrafast broadband would depend on the integration of different technologies, mainly the mobile and satellite ones, but is it not foreseen that the access can be the same as in other regions for the 100% of the population, unless there were relevant public funds.

As previously mentioned, one of the main resources to promote deployments in these regions is the deployment compromises acquired at the auction of the spectrum licenses. The successful bidders in the auction of at least 10 MHz FDD in the 800 MHz band must offer jointly at least 30 Mbps to the 90% of the population of municipalities smaller than 5.000 inhabitants before 2020, aligning the Spanish targets with the Digital Agenda for Europe.

The 27,9% of households in white zones could be divided into:

- 11,3% of households placed in municipalities of more than 5.000 inhabitants, and thus out of the coverage obligations of the spectrum auction. In this zone, the deployment of ultrafast broadband could be related to commercial deployment of mobile networks, as well as by public-private agreements for fixed networks.
- 14,9% of households place in municipalities of less than 5.000 inhabitants and under the obligations of service provision by 2020, according to the constraints of the spectrum auction.
- 1,7% placed in municipalities of less than 5.000 inhabitants, out of the obligations by the spectrum auction. This results a more complex case, but the most cost effective solution could be the subsidy of equipment for satellite solutions.

## **4. Conclusions**

The declaration of the universal service in Spain has given access to basic broadband of 1 Mbps to the more than half million people that could access the benefits of Information Society until the 1<sup>st</sup> January of 2012. 40% of these people do not belong to any population centre, which makes deployments extremely expensive. The reframing process will help mitigating the digital divide due to the deployment compromises acquired by operators through the spectrum tender in 2011 and additional satellite connections could solve the basic access problems.

On the other hand, the target of the Digital Agenda for Europe of providing full coverage access of 30 Mbps will need important efforts in order to be fulfilled. Regulation must provide a stable framework, which encourage investments by assuring an increase in the incomes through the offer of new services. Joint investment initiatives, access to passive infrastructure of incumbent operators and contribution from owners to in-building access funding, would allow around 50% to have Next Generation Access Networks of two or more competing platforms. Grey zones, where only the incumbent operator would find profitability, will be 25% of the Spanish households, where flexible retail prices and demand-side public policies will be important to achieve the targets. In the last 25% of households NGA networks would not find profitability, where thus, new generation mobile networks, spectrum refarming compromises and satellite solutions will play key roles.

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