

Nucciarelli, Alberto; Sadowski, Bert M.; Ruhle, Ernst-Olav

Conference Paper

Should next generation access networks fall within the scope of universal service? A EU 27 perspective

23rd European Regional Conference of the International Telecommunications Society (ITS), Vienna, Austria, 1st-4th July, 2012

Provided in Cooperation with:

International Telecommunications Society (ITS)

Suggested Citation: Nucciarelli, Alberto; Sadowski, Bert M.; Ruhle, Ernst-Olav (2012) : Should next generation access networks fall within the scope of universal service? A EU 27 perspective, 23rd European Regional Conference of the International Telecommunications Society (ITS), Vienna, Austria, 1st-4th July, 2012, International Telecommunications Society (ITS), Calgary

This Version is available at:

<http://hdl.handle.net/10419/60393>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Should Next Generation Access networks fall within the scope of Universal Service? A EU 27 perspective

Alberto Nucciarelli^{1*}, Bert M. Sadowski¹ and Ernst-Olav Ruhle²

¹School of Innovation Sciences – Eindhoven University of Technology, Den Dolech, 2 – 5612AZ, Eindhoven, Netherlands; a.nucciarelli@tue.nl;
b.m.sadowski@tue.nl

²SBR Juconomy Consulting, Nordstrasse 116, 40477 Dusseldorf, Germany;
ruhle@sbr-net.com

*correspondence author

Abstract

The review of the Universal Service Obligation (USO) has recently been debated in the European Union (EU). Under discussion there was the extension of the current universal service definition to include broadband access, for which some theoretical and empirical support exists. In fact the determinants of information access, which are modified by market liberalization and technological developments, challenge the traditional definition of universal service and question whether there are new frontiers for the USO in the EU. This paper looks at the origins, the theoretical arguments for, and the empirical basis of the USO in the light of the ongoing debate in the EU, and links these arguments to technological development and changing demand conditions in European broadband markets. The authors predict the inclusion of a wider set of services based on Next Generation Access (NGA) networks in the EU's new regulatory approach, although in November 2011 the European Union has denied this inclusion

Keywords: European Union, universal service obligation, next generation access networks.

1. Introduction

Universal service obligations (USO) have been at the center of an on-going debate concerning the degree of public involvement in the telecommunication

A similar version of the paper has already been submitted to Journal for publication. As the review process has not been completed yet, please do not cite without authors' permission.

sector and its possible extension with regards to broadband¹ as a result of technological development and competitive dynamics. The European Commission has recently delivered a new Communication (COM (2011) 795 Final) concerning the third periodic review of the scope of universal service (i.e. Directives 2002/22/EC and 2009/22/EC) in which it did not recognize the “need to change the basic concept and principles of universal service as an instrument for preventing social exclusion”. Accordingly, summarizing the outcome of the 2011 public consultation on the future of universal service, the Communication considers as “inappropriate to include mobility or mandate broadband at a specific data rate at EU level”. However, the EC builds upon the 2009 Broadband Guidelines and the so-called 2010 Broadband Package by drawing up policy statements to help achieve the goals of the Digital Agenda for Europe (i.e. COM(2010) 245 final/2)². Specifically, by pointing out the way forward for a consistent implementation of USO, the Commission wishes a coherent approach for the definition of “functional internet access” in all EU members and a careful analysis of conditions warranting the extension of USO to broadband. This paper

¹ Despite a continuous discussion on the EU level on broadband technologies, the traditional definition of broadband still refers to Internet technologies enabling a connection speed of higher than 144 Kbit/s (download speed) as reported in the EU Communications Committee document (COCOM10-29) of November 2010 (EC, 2010a).

² In March 2010 the European Commission launched the Europe 2020 Strategy (i.e. COM(2010) 2020) aiming to define the role Information and Communication Technologies (ICT) can play in exiting the crisis by its positive impact on employment, low carbon economy, productivity and social cohesion. The Digital Agenda for Europe is one of the flagships initiatives of the Europe 2020 Strategy. It mostly deals with enabling the potential of the Internet and spurring “innovation, economic growth and improvements in daily life for both citizens and businesses”. Specifically, the “overall aim of the Digital Agenda is to deliver sustainable economic and social benefits from a digital single market based on fast and ultra fast internet and interoperable applications”.

aims to contribute to this ongoing policy debate³ by arguing in favor of the addition of broadband to USO. We analyze the theoretical foundations of universal service and the latest EC policy documents and predict that Next Generation Access networks (NGA)⁴ will fall within the scope of USO in the European Union (EU).

The paper is divided up into four sections. Section 1 analyzes literature on universal service and looks at its development in the EU (Section 1.1). Section 2 introduces the main characteristics of the Information Society in the EU and highlights the determinants of information access by putting technological change in broadband technology into the context of Next Generation Access (NGA) networks. Section 2 also looks at how the USO concept has developed within the EU by identifying its main economic perspectives and the trade-off inherent in USO. Section 3 outlines three pillars for the future development of broadband in EU27 whilst Section 4 examines the arguments in favor of an extension of the USO definition to include NGA in the Commission's forthcoming policy documents on universal service.

³ This debate follows a discussion started in 2009 about the potential inclusion of mobile communications into the scope of universal service. It needs to be considered that the current definition focuses on various services that are defined as universal service whereas next generation access deals with a more encompassing term of the relevant infrastructure allowing a new range of services.

⁴ In this paper we refer to broadband access as to every technology enabling functional Internet access and we refer to broadband connection as the connection of end-users to a public communications network. By Next Generation Access networks (NGA) the EC referred to "wired access networks which consist wholly or in part of optical elements and which are capable of delivering broadband access services with enhanced characteristics (such as higher throughput) as compared to those provided over already existing copper networks" (see Article 11, Recommendation 2010/572/EU of 20 September 2010) (see EC, 2010b). In this paper, we extend this definition considering not only the qualitative aspects of NGA but also the quantitative ones. Accordingly, we refer to NGA as to networks enabling Internet connection speed at least faster than 2 Mbit/s.

1.1. Literature analysis

We start by looking at literature on universal service and the development of universal service in the EU.

1.1.1. The justification for universal service

The origin of the universal service goes back to 1893 when Theodor Vail introduced the concept of “one policy, one system, universal service”, to make basic telecommunications services (i.e. telephony) accessible to the widest number of consumers possible⁵. In that period, universal service was achieved, through the setting up of a monopoly between the State and AT&T who undertook to provide basic telecommunication services and be bound by specific conditions regarding geographic coverage, continuity in service provisioning and fixed charges. In the pre-liberalization period, legally justified public monopolies in different European countries developed along similar lines, providing analogue telephony and facsimile services at fixed rates, to guarantee equality of treatment and transparency.

⁵ For a critical discussion on the foundation and development of the notion of universal service, see Mueller (1993; 1996).

On the basis of published literature, the main economic justifications for universal services⁶ would appear to be: 1) the correction of market failure due to the existence of network externalities⁷; 2) its contribution to the provision of a public good^{8,9}; 3) the wealth redistribution effects (i.e. a policy instrument to reduce inequalities among the population); 4) the existence of regional development goals leading governments to transfer resources; and, 5) the maximization of welfare through the implementation of political actions easily evaluated by the public (Cremer et al., 2001).

Universal service is defined as “the obligation of an operator to provide all users with a range of basic services of good quality at affordable prices” (Cremer et al., 2001). To understand which services should be included in this definition, Cremer et al. (2001) used four criteria: i) being essential to education, public health or public safety; ii) being subscribed to by a substantial majority of residential customers; iii) being deployed in public telecommunication networks by telecommunication carriers; and iv) being consistent with public interest, convenience and necessity. These criteria have been increasingly used in the liberalized market environment to define a set of essential services within the concept of universal service.

⁶ See for example Cremer et al. (2001), Mueller (1999), Bohlin and Teppayayon (2009) and Alleman, Rappoport and Banerjee (2010).

⁷ See Lehr et al. (2006) for the discussion on market failure and basic infrastructures rationales justifying government intervention in the broadband sector.

⁸ We use the definition of public good as defined by Gomez-Barroso and Perez-Martinez (2005).

⁹ See Picot and Wernick (2007) for a detailed discussion of government activities with regard to broadband as a public good.

A number of studies have looked at the features of universal service and have investigated the concept from both a normative and positive perspective¹⁰. From a normative point of view, justification for universal service stems from the existence of substantial network externalities, the need to impose redistributive pricing, contribute to the provision of a public good, and conduct regional policies. The positive perspective considers USO the result of political and economical processes influenced by public opinion and various lobbying activities in favor or against incumbent operators (Cremer et al., 2001). Governments have traditionally justified the creation of public monopoly structures on the basis of concerns over national security, the protection of natural monopoly structures and costs subadditivity¹¹. As costs concepts have been difficult to measure (Gasmi, Laffont, & Sharkey, 2002), market failure rationales have frequently been used to justify public ownership of telecommunications carriers (Bauer, 1999).

1.1.2. The development of universal service in the EU

Several studies have investigated different aspects of the evolution of universal service in the European Union. Bauer, for example, in 1999 commented on the formulation of universal service in the light of information access and competition rights after the liberalization process in the late 1990s. In his work, he criticized the narrow approach of European institutions in defining the

¹⁰ According to Cremer et al. (2001), the normative perspective deals with the understanding of the “whether” and the “why” universal service as a public policy can be justified on welfare grounds. The positive perspective explains why the universal service is implemented.

¹¹ For a detailed analysis of natural monopoly justifications and economics see Sharkey (1982).

borders of universal service, arguing that the late 1990s definition had limited universal service to a “minimum set of safeguards for basic services and constrained the ability of member states to fund such programs”. Michalis in 2002 analyzed EU policy framework according to changes in the information society as a result of technological convergence. She argued in favor of a greater focus on USO with regards to content and information rather than communication links and high-speed Internet. Accordingly, her arguments centered on the necessity to include “aspects traditionally associated with universal service in broadcasting”. More recently, Blackman and Forge (2008) questioned the inclusion of broadband networks in the definition of universal service, arguing that competitive markets basically erode the need for universal service (vulnerable groups apart). Finally, Bohlin and Teppayayon (2009) were partially in favor of the inclusion of broadband after studying the outcome of the 2005 and 2008 periodical review of the scope of universal service and the results of the 2005 and 2010 public consultation conducted by the European Commission. They argued that its inclusion would depend on the impact that funding mechanisms would have on the relationship between the universal service regime and competition.

2. The information society in the European Union

Since 1998, the liberalization of telecommunication markets and technological developments have fostered the convergence of telecom, media and informatics leading to the creation of Information & Communication Technology (ICT).

A similar version of the paper has already been submitted to Journal for publication. As the review process has not been completed yet, please do not cite without authors' permission.

Developments have particularly affected the competitive structure of the industry, the emergence of new access technologies and essential services, and competitive entry of service providers. Moreover, changes such as the abandoning of legal monopolies in fixed telephony, developments in broadband and cellular technologies and their widespread diffusion across the European Member States¹² have challenged the traditional definition of universal service (Table 1).

Information access until liberalization			Information access after liberalization		
TELECOMMUNICATIONS SECTOR			INFORMATION & COMMUNICATION TECHNOLOGIES (ICT)		
Competition	Legal monopoly in fixed and monopoly (or duopoly) in mobile telephony.		Competition	Open access vs. vertical integration models within an Internet ecosystem with layered architecture Horizontal competition (among players in the same relevant market) Vertical competition (inter-platform or intra-platform)	
Access Technology	Copper network; Mobile: GSM and (E)TACS (residual in some countries)		Access Technology	Copper, cable and fiber networks; Wi-Fi; Satellite; Mobile (competing each other)	
Essential services	Fixed telephony, Emergency services, Public pay phones, facsimile, Services for disabled people		Essential services	Telephony (fixed and mobile), Emergency services; Services for disabled people; e-services (T) (e.g. e-health, e-learning, e-government)	
Service providers	Incumbent		Service providers	Incumbent, Single Internet Service Providers (ISPs), Platforms of ISPs	
Traditional universal access			New frontiers of universal access		
Variables	<i>Obligations</i>	Fixed telephony, Emergency services, Public pay phones, Facsimile, Services for disabled people	Variables	<i>Obligations</i>	Access at a fixed location and provision of telephone services; Directory enquiry services and directories; Public pay telephone access; Measures for disabled users; Functional Internet Access
	<i>Coverage</i>	100% population (irrespective of location)		<i>Coverage</i>	Aimed to 100% population
	<i>Technology</i>	Copper network		<i>Technology</i>	Competing technologies
	<i>Provision by</i>	Monopolistic operator		<i>Provision by</i>	Incumbent and new network investors
	<i>Financing</i>	Public funding		<i>Financing</i>	Public and sector funding; Alternative funding mechanisms

Table 1 - The evolution of information access and the new frontiers of universal access. Source: our elaboration

2.1 The determinants of information access

Over the past twenty years, market liberalization and technological change in telecommunications have led to increasing competition among different providers of infrastructure, such as cable access, as well as the diffusion of new

¹² Although traditional access technologies (fixed telephony) and public payphones have reached a high level of diffusion, penetration levels of broadband technologies and in particular fiber technologies have been uneven across the EU.

services, especially those based on Internet technology. This indicates a shift from a monopolistic to competitive model of USO regulation. In contrast to the strictly vertically integration of monopoly, competition stems from the layered architecture of the Internet ecosystem (Fransman, 2010) and allows forms of horizontal as well as vertical competition (inter- and intra-platforms).

Within a liberalized environment, an increasing number of access technologies allow consumers to switch among these technologies using fixed and mobile networks interchangeably¹³. As these technologies evolve, so do essential services related to their use, and this evolution should be reflected in the definition of universal service. In fact, voice services can no longer be considered the main feature of universal service; affordable Internet access (fixed or mobile) is increasingly considered of equal importance and broadband access, a basic requirement (see Table 2).

Country	Fixed wireline per 100 inhabitants	Proportion of people using a mobile phone*	Public Pay Phones per 1000 inhabitants	Internet Access per household	Fixed Broadband Access per 100 household**	Cable Internet per household	Fiber-to-the-Home per household
AUT	38,9	90,4	2,1	69,8	57,8	16,0	0,2
BEL	43,5	88,2	0,7	67,4	60,3	29,9	0,0
BGR	29,2	78,2	1,6	29,6	n.a.	4,2	0,3
CYP	47,6	90,6	2,0	52,8	n.a.	3,8	0,0
CZE	20,4	92,5	2,0	54,2	48,9	10,5	3,2
DNK	37,7	93,3	n.a.	82,5	76,0	22,1	5,5
EST	36,8	92,6	0,5	63,0	62,0	15,0	13,3

¹³ As pointed out by the OECD (2006), the switch to mobile might also be fostered by “price rebalancing” strategies implemented by incumbents to balance the fall in revenues in long-distance calls. The consequences of such actions could even “threaten the quest for universal service on the fixed network”.

FIN	26,9	97,3	n.a.	77,8	73,7	9,2	n.a.
FRA	56,9	83,5	2,3	63,0	57,5	n.a.	1,1
DEU	59,3	86,5	1,1	79,1	64,6	5,9	0,3
GRC	47,0	82,0	4,7	38,1	33,1	n.a.	0,1
HUN	30,7	93,5	1,8	55,1	50,9	21,5	3,0
IRL	46,1	94,6	0,4	66,7	53,7	11,6	0,4
ITA	36,2	90,2	n.a.	53,5	39,0	n.a.	n.a.
LVA	28,6	89,5	0,2	58,0	n.a.	3,4	2,3
LTU	22,7	87,9	0,4	60,0	n.a.	4,0	15,3
LUX	54,2	95,1	0,8	87,2	71,1	13,2	n.a.
NLD	44,1	92,3	n.a.	89,7	77,0	31,6	2,5
POL	25,2	77,5	1,2	58,6	51,1	11,6	0,6
PRT	39,7	84,5	3,1	47,9	46,2	20,6	0,8
ROM	25,0	75,1	1,5	37,9	n.a.	6,7	1,4
SVK	22,6	93,7	1,3	62,2	41,7	3,3	7,3
ESP	45,3	88,8	n.a.	54,0	51,3	12,4	0,1
SWE	55,7	95,2	n.a.	86,0	79,5	13,0	15,4
GBR	52,2	93,2	n.a.	76,7	69,5	14,9	0,0
SVN	51,2	89,3	1,5	63,9	n.a.	15,0	9,8
MLT	59,9	85,9	1,8	64,4	n.a.	38,4	n.a.
EU 27	40,1	88,9	1,6	62,9	58,2	14,1	3,6

Table 2: Information Access in the European Union 27 (year 2010, * data for 2008).
(Source: ITU 2010, OECD 2011).

2.1.1. Universal service in the EU policy framework before liberalization

In the 1990s, the notion of universal service was basic voice telephony services and the network access supporting it, fax and low speed data access services¹⁴. The goal of universal service in this “monopoly era” was uniform availability to all customers and incorporated into the concept of universal service, was the methodology for calculating the net costs of universal service provision and mechanisms for funding its deficit. A number of important policy documents were drawn up at the time including, the ONP Voice Telephony Directive¹⁵ (1995). This Directive described the scope of universal service as the

¹⁴ See <http://ec.europa.eu/archives/ISPO/infosoc/telecompolicy/en/tcstatus.htm#ILG>.
(retrieved 26 May 2011)

¹⁵ See <http://ec.europa.eu/archives/ISPO/infosoc/legreg/telecom.html#UniversalService>

provision of an affordable voice telephony service via a line supporting the use of fax and low speed data transmission. It also introduced new aspects for the financing of the service. Clearly the challenges that existed with respect to the provision and financing of universal services before full liberalization differ from those posed by today's competitive environment.

The National Regulatory Authorities (NRA) of the varying European Member States were given a certain degree of discretion with regards to the financial provision of universal service. The NRAs could opt

- i. not to finance US because obligations to provide such a service did not imply net cost, or (i) the net cost established was not to be considered an unfair burden for the operator(s) concerned or (ii) the net cost did not justify the administrative costs of a specific financing scheme;
- ii. to consider the US obligation as a burden to be financed directly or indirectly by the state;
- iii. to consider the US obligation as a burden to be financed through a specifically targeted financing scheme in line with community law.

Option 3 entailed the creation of a scheme on a national level and a methodology for calculating universal service costs and net deficits taking into account¹⁶:

¹⁶ See <http://ec.europa.eu/archives/ISPO/infosoc/legreg/com96608.html> for more detailed information.

- (i) the cost, less revenues and associated benefits of providing universal service obligations to a customer or group of customers;
- (ii) quantification of the intangible benefits of being a universal service provider;
- (iii) the net cost of public payphones, emergency services and the provision of special equipment or services (e.g. to disabled users).

2.1.2. Criticism of the universal service after liberalization

Since the liberalization process of the late 1990s, the implementation of universal service has come under criticism (Alleman, Rappoport and Weller, 2000; Cremer et al., 2001; Alleman, Rappoport and Banejee, 2010). In fact, welfare redistribution effects can generate price distortions and lead to non-efficient solutions when the weight of consumer groups is misrepresented. Cross-subsidies can then lead to efficiency losses both in a monopoly and a competitive environment unless specific measures such as competitive, neutral financing mechanisms or auctions are introduced, as suggested by Cremer et al. (2001) and Alleman, Rappoport and Weller, (2000).

Market liberalization and the convergence of telecom, media and informatics into the Information & Communications Technology (ICT) industry (Fransman, 2010) have resulted in a dwindling public role in this sector (Gomez-Barroso and Feijoo, 2010). However the positive impact of broadband on Gross Domestic Product (GDP) growth (Czernich et al., 2011) as well as the expected direct and

indirect effects on public welfare (Katz and Suter, 2009) have once again brought public stakeholders back on board to discuss future visions for broadband networks¹⁷. However, the return of the public stakeholder in the ICT sector may inhibit competition and might have adverse effects on wealth redistribution (Mueller, 1999; Alleman, Rappaport and Weller, 2000).

2.2. Universal service in the EU policy framework after liberalization

In 2002, the Universal Service Directive (EC, 2002) modified the definition of the scope of universal service. Article 8 of the Directive dictated the provision of a single narrowband connection to the public telephone network at a fixed location at an affordable price as a key requirement. The definition was technology neutral and the connection was required to “be capable of supporting speech and data communication at rates sufficient for access to online services such as those provided via the public Internet.” A specific reference to the speed of 56 Kbit/s was also given, although different technical and commercial conditions in Member States may have resulted in some variation. The Directive also addressed other issues such as public pay telephones, special measures for disabled users, affordability of services, control of expenditure, quality of service, and costing and financing issues. Broadband as it is known today, was not mentioned.

In 2010, the universal service Directive was amended and integrated into the “Citizen’s Rights Directive” (EC, 2009a). The scope of universal service now

¹⁷ See also Crandall and Jackson (2001).

includes (see Article 4) the provision of local, national and international telephone calls, facsimile communication and data services. The section concerning data services, Article 5, echoes Article 8 of the 2002 Directive but does not impose a specific speed for connections or mention the addition of broadband to the definition of universal service. Broadband issues with regards to universal service were addressed in a communication in 2008 by the EU commission (EC, 2008a) but no clear indication was made concerning a future approach to universal service. In 2008 and 2010, the EU commission initiated public consultations concerning the strategy to be adopted towards Universal Service but it didn't provide any clear definition of the future obligations of US. Table 3 summarizes the development of policies concerning USO up to the 2010 Review (EC, 2009a).

23rd European Regional Conference of the
International Telecommunication Society, Vienna, Austria, July 1-4, 2012

	Before 1998 (Directive 95/62/EC)	EU framework 1998 (Directive 98/10/EC)	2002 Review (Directive 2002/22/EC)	2010 Review (Directive 2009/136)
Definition		“minimum set of services of specified quality which is available to all users independent of their geographical location and, in the light of specific national conditions, at an affordable price”		
Scope of universal service¹⁸	Although the u.s. is not defined neither addressed directly, several services are to be provided and provision has to be ensured by NRA. They include: (1), (2), (3), (4), (5)	(2), (3), (4), (6), (7)	(2), (3), (4), (8)	(2), (3), (4), (9).

¹⁸ (1)= Voice telephony via a line supporting the use of fax and of low speed data transmission; (2) = Public pay phones; (3) = Directory Services; (4) = Measures for disabled users; (5) = Operator assistance and emergency services; (6) = Connection to the fixed public telephone network at a fixed location and access to fixed public telephone services; (7) = Capable of allowing users to make and receive national and international calls, supporting speech, facsimile and/or data communications; (8) = Provision of access at fixed location, (9) = Provision of access at fixed location and provision of telephone service

A similar version of the paper has already been submitted to Journal for publication. As the review process has not been completed yet, please do not cite without authors' permission.

Consideration of broadband	No	No	Connection provided shall be capable of allowing end-users to make and receive (...) facsimile communications, at data rates that are sufficient to permit functional Internet access (...),	Connection shall be able to provide voice, facsimile and data communications at data rates that are sufficient to permit functional Internet access.
Cost calculation	Not addressed except for possible link to interconnection charges	Net cost approach, (Annex III of Directive 97/33). The calculation shall be based upon costs attributable to: i) elements of the identified services, which can only be provided at a loss (...). ii) specific end-users, who can only be served at a loss (...)	Net cost approach: to calculate the net cost of the universal service obligation, taking into account any market benefit, which accrues to an undertaking designated to provide universal service, in accordance with Annex IV, Part A ¹⁹ .	Net cost approach: to calculate the net cost of the universal service obligation, taking into account any market benefit, which accrues to an undertaking designated to provide universal service, in accordance with Annex IV, Part A ²⁰ .

¹⁹ Annex 4 part A e.g. covers the following.: "In undertaking a calculation exercise, the net cost of universal service obligations is to be calculated as the difference between the net cost for a designated undertaking of operating with the universal service obligations and operating without the universal service obligations. This applies whether the network in a particular Member State is fully developed or is still undergoing development and expansion. Due attention is to be given to

<p>Financing of deficit</p>	<p>Directly to operators or through a fund (see http://ec.europa.eu/archives/ISPO/infosoc/legreg/9673.html)</p>	<p>Member States may set up universal service funding schemes for the shared financing of those services, in conformity with Community law and, in particular, with Directive 97/33/EC on interconnection.</p>	<p>If net cost constitutes an unfair burden: Option A: introduce mechanism to compensate undertaking for the determined net costs from public funds; and/or, Option B: to share the net cost of universal service obligations between providers</p>	<p>If net cost constitutes an unfair burden: Option A: to introduce a mechanism to compensate that undertaking and/or, Option B: to share the net cost of universal service obligations between providers of electronic communications networks and services.</p>
------------------------------------	--	--	---	---

Table 3 – The development of policies concerning USO.

correctly assessing the costs that any designated undertaking would have chosen to avoid had there been no universal service obligation. The net cost calculation should assess the benefits, including intangible benefits, to the universal service operator.”

²⁰ See previous footnote.

2.3. Changing models for public investment in the broadband sector

Table 4 shows how investments in traditional fixed voice telephony in the EU 27 have continued to decline in recent years. This trend has been counterbalanced by the growth in the market for broadband services. However, even in these markets, new entrants have managed to take a major share leading to a fall in available revenues for incumbent operators.

Country	Growth rate fixed network	Growth rate broadband subscriptions	Growth rate mobile telephony subscription	Growth rate mobile broadband subscription
AUT	-3.42	11.98	7.18	49.96
BEL	-0.84	11.74	6.83	132.79
BGR	-2.99	55.59	14.08	251.07*
CYP	-0.33	53.32	7.96	129.12**
CZE	-9.97	17.89	4.90	163.13***
DNK	-11.41	11.42	5.83	103.64
EST	2.75	13.85	17.13	201.77
FIN	-9.37	6.91	9.94	200.69
FRA	1.30	20.08	5.49	124.01***
DEU	-2.90	23.36	7.28	81.29
GRC	-4.51	86.01	6.69	103.77
HUN	-2.64	30.33	6.06	160.74
IRL	0.33	31.91	3.35	30.98**
ITA	-3.53	15.88	5.33	32.81
LVA	-3.12	62.06	6.09	189.78
LTU	-1.72	28.28	3.32	51.33
LUX	1.90	22.81	9.00	58.72**
MLT	4.92	19.78	6.84	39.56
NLD	-0.93	9.54	7.55	93.19**
POL	-5.13	51.06	11.33	234.93
PRT	0.13	12.47	8.61	60.55
ROM	4.98	65.07	17.44	157.09
SVK	0.47	43.74	4.90	255.99
SVN	6.09	24.93	4.53	118.19
ESP	1.10	17.83	4.59	124.26
SWE	-2.22	3.92	6.34	109.47
GBR	-1.46	16.50	5.26	50.85

A similar version of the paper has already been submitted to Journal for publication. As the review process has not been completed yet, please do not cite without authors' permission.

EU - 27	-1.58	28.45	36.00	122.58
---------	-------	-------	-------	--------

Table 4: Growth of telecommunication infrastructure in the European Union 27 (2005-2009)

(Source: ITU 2011) (Notes: * data for 2006 -2009, ** data for 2007 – 2009, *** data for 2005 – 2008)

A variety of market parties such as cable operators or infrastructure developers²¹, and non-market parties such as local governments and municipalities, have invested substantially in fiber-based networks. In fact, telecom incumbents, competitive access operators, infrastructure developers and service providers have all stepped into this market, often in close collaboration with utilities or local governments, adopting different forms of public-private partnerships (PPPs). Municipalities have often taken the lead in these initiatives. Indeed as Ruhle et al. (2011) highlighted in their comparative study of supply side interventions in NGA, the public role can take varying forms: “motivator”, “enabler”, “operator”. However the authors also underline the fact that the achievement of economic and social targets cannot be separated from improvements in regulatory issues associated with the promotion of measures to incentivize investments.

Nowadays, local and national governments increasingly perceive broadband networks as a means of reducing the digital divide and stimulating the economic development of regions (Lehr et al., 2006; Fornefeld et al., 2008; Katz and Suter, 2009; Huigen and Cave, 2008). However, public involvement varies significantly

²¹ For the purpose of this paper, “infrastructure developers” is a term comprising different kinds of enterprises deploying passive infrastructure and / or operating it without providing retail services such as energy utilities, developers of new properties comprising residential and office buildings, operators of highways, railways which have a communication network component originally for internal purposes.

between EU Member States (Berkman Center for Internet & Society, 2010; Bouras et al., 2009; Infante et al., 2009; Nucciarelli et al., 2010). In some cases, PPP models are used to deploy city-wide networks to avoid market failures e.g. Amsterdam; in other cases, public utility models have been employed to reduce the digital divide e.g. Florence. Therefore the type of PPP or business model adopted can entail competition at different layers e.g. passive or active layers, which could, potentially affect the open access of infrastructures and consequently, intensity of competition, prices and quality of services.

The degree of infrastructure sharing and access can stimulate competition differently, especially when infrastructures overlap²², and given that the essential facility doctrine has been intensively applied to telecommunications²³, public involvement in the deployment of broadband networks may result in a "future essential facility" dilemma. This dilemma could also arise within the policy framework in the EU (Renda, 2010), as a result of the differing degree of infrastructure openness to competition. In addition, two recent documents issued by the European Commission, the NGA Recommendation and Guidelines on the application of EU State Aid rules, would appear to consider broadband networks as public goods (Renda, 2010). This interpretation might have a strong impact on the investment decisions of European incumbents.

In a nutshell, incorporating broadband into the USO means redefining the role and financial commitment of public authorities in digital Europe. Public

²² See EC (2010a; b).

²³ See also Knieps (2011).

subsidies, network access charges or even the creation of a US fund might distort competition. However, the Universal Service Directive (see Articles 12 and 13, and Annex IV) has left space for less intrusive policy strategies, by asking the determination - under transparent conditions - of net costs of each single undertaking requiring compensation. When calculating net costs, NRAs will need to take into account the direct and indirect benefits of broadband not only in the ICT sector, but also in a series of others, such as education, health, and transportation. In addition, the limits imposed on public institutions by liberalization need to be evaluated in the light of the role that local and national governments may play. If direct investments, even in form of subsidies, are excluded or heavily restricted by the EU Treaty, there might be room, in fact, for some forms of shared investments or for alternative funding mechanisms for increasing broadband availability (e.g. public funding programs and investments, funding through non-profit organizations, public-private partnerships) (Falch and Henten, 2009)²⁴.

3. Three pillars for the future development of broadband in EU27

The shape and form of public involvement in ICT (and certain forms of private investments in NGA networks as well) should be such as to avoid the risk of new

²⁴ The 2009 Broadband Guidelines (EC, 2009c) together with the NGA Recommendation (EC, 2010b) and the 2010 Broadband Communication (EC, 2010c) support this argument by providing a framework for action to member states in financing broadband network also with both public-private resources.

bottlenecks and a substantial re-monopolization of end user markets²⁵. As Bauer affirmed in 2010, public investment and innovation incentives in NGA networks differs significantly from the past because of the new ICT ecosystem (see also Fransman, 2010), as well as new forms of inter-modal competition and collaboration, and the need to build most of the infrastructures to be regulated. Aside from the incentivizing of public and private investment in NGA networks, the increasing demand for greater bandwidths creates markets for new broadband services. In fact, basic requirements for participation in societal and work processes go far beyond voice telephony so that access to video-based services such as e-health and elderly home assistance may be soon considered socially desirable services. This transition to a European society with a wide and intense use of broadband is based on three pillars of EU regulation: the first concerning the definition of NGA, the second, State Aid Guidelines with respect to NGA and lastly the evolution of the notion of Universal Service with respect to broadband.

²⁵ The European Commission (EC) considers the deployment of broadband networks as a key issue for economic development and the reduction of the digital divide in the European Union (EU) (EC, 2008b; 2008c). In its i2010 Lisbon agenda, the EC also postulated that the European-wide adoption of broadband networks could lead to wide social and economic benefits. The focus of the Lisbon Strategy shifted slightly as a result of the i2010 Mid-Term Review (EC, 2008b), promoting the leading role of Europe in the transition to NGA in its efforts to overcome the digital divide. The necessity of encouraging investments through a stable and predictable regulatory environment is one of the key points addressed by Viviane Reding (2008) when arguing how technological development has the potential to increase competition to the benefit of consumers. Reding (2009) also reinforced her position in favor of an active intervention within the broadband sector by public investors (e.g. regional and local authorities) affirming that the “deployment of [NGA] infrastructures [...] could act to create jobs or [as] a short-term fiscal stimulus”.

3.1. Next Generation Access (NGA) technologies

A variety of broadband access technologies fall within the European Commission's (EC) definition of NGA networks and its initial two tier strategy was to draw up a set of access obligations and subsequently define the extent to which State Aid rule applied to these new access technologies. Consultations started in autumn 2008 and two different migration paths were taken into consideration: one related to fiber rollout, limited in terms of geographic coverage, and the other based on "fibre [that] will often be deployed in parallel with the copper circuits in the network of the Significant Market Power (SMP) Operator"(Article 3) (EC, 2008d). The consultation process concluded in November 2008 but the only action implemented as a result of this consultation was the addition of a paragraph to the 2009/140/EC Directive (EC, 2009b) to "encourage investments by the operator, including investments in next generation networks" by taking "into account the investment made by the operator, and allow him a reasonable rate of return on adequate capital employed, taking into account any risks specific to a particular new investment network project"(Article 9). No specific migration paths towards NGA networks were mentioned.

In 2010 the Commission implemented a Recommendation on regulated access to NGA networks (2010/572/EU of 20 September 2010) which consolidated the pro-competitive approach of the current framework but attempted to regulate access prices. In doing so, it intensified the debate on the upcoming role of regulation in fostering the adoption of broadband networks. In fact, as Siciliani

(2010) argued, “ex-ante regulatory intervention - or the threat of it - might spoil incentives to invest in NGA” also in light of the lack of information (pending on both the regulator and regulated company) regarding the foreseeable demand trend.

However, some issues within the Recommendation deserve further consideration. As Ruhle and Lundborg (2010) noted, the EC regulates the opportunities of National Regulatory Authorities (NRA) to incorporate a project-specific risk-premium within the costs of access to new infrastructures (see Points 6 and 7 of Annex 1 for technical specifications). In addition, NRAs need to take into account that a multi-fiber approach might imply improved competition and thus less need for regulation. Lastly the EC recommends long term contracts and obligations for the wholesale buyer to be associated with lower prices to enable wholesale customers to share the risk of investment in new networks.

It is clear from the above that the EC is aware of the increasing diversity of stakeholders and their business models in broadband investments including public investors. The EC’s Recommendation gives detailed guidelines on how NRAs can implement existing European Directives for Telecommunications regulations but does not narrow down the scope and possibilities for individual NRA decision-making. A good example of this is discounts for long-term commitments or higher risk premiums for new investments which might have an impact on regulated prices, but only as long as this is reflected in the underlying

costs (i.e. it is in line with LRIC as a cost standard, which is stated in the European Directive) (Lundborg et al., 2010).

Thus, in other words the NGA recommendation is a “soft law”: it does nothing to accelerate the deployment of NGA networks and the impact of the Recommendation on investments in NGA is modest. Therefore, in its current form, the contribution of the NGA recommendation to broadband as a universal service is rather limited.

3.2. The inclusion of a NGA definition in State Aid guidelines

The second tier of the EC’s strategy was to establish whether the NGA concept is in conflict with State Aid regulation. The EC examined all projects on NGA which involved public investment since 2003, leading to number of decisions based on case-law ²⁶. In May 2009, the European Commission set up an extensive consultation process with all of the parties involved in NGA deployment, in order to offer better guidelines for the involvement of municipalities and national governments in NGA networks.

In the Consultation Document on Broadband Guidelines (EU, 2009c), the European Commission defined migration paths currently available in the broadband market in more detail. The Commission also defined the speed

²⁶ Until the European Commission introduced the Broadband Guidelines in September 2009, the Commission had to decide on 47 possible cases of State Aid in several regions in Europe. The Commission initially provided support to regions with under-provisioning of broadband, but later provided support to areas where broadband networks were already available.

requirements for NGA networks (i.e. 40 Mbps/15 Mbps downstream/upstream for ADSL; more than 50 Mbps symmetrical for cable networks; more than 100 Mbps symmetrical for fiber). After the public consultation round closed in summer 2009, the European Commission, wishing to avoid specifying different migration paths, described common elements in these market developments. In the Final Document on the Community Guidelines (EC, 2009c), the EC described NGA networks - in contrast to basic broadband networks - as: a) wired access networks, b) consisting wholly or in part of optical elements and c) capable of delivering broadband access services with enhanced characteristics such as higher throughput. This definition went further than previous attempts by the EC to define NGA, in four ways: 1) it explicitly referred to the coexistence and co-development of a number of competing broadband technologies in the local loop; 2) it characterized fiber elements within these networks and the higher capacity services provided via these networks as the common denominator; 3) it made a clear distinction between broadband technologies and copper technologies and 4) it showed that there are major differences between basic broadband and NGA technologies. The EC's new definition not only described the different technological options available in broadband markets but also pointed out the limitations of existing incumbent market players and the emergence of new players able to implement NGA technologies in broadband markets.

With the Broadband Guidelines, the European Commission provided not only a "roadmap" based on a state-of-the-art summary of case law in the area of municipal network initiatives, but it also took on board criticism from the

discussion on the Consultation Document. It detailed further “safeguards” in the event of insufficient investment of existing market parties in “black areas” thus giving municipalities the opportunity to offer financial support (article 77 and 78). It also specified the technical aspects of NGA networks in a “technology neutral” manner on the infrastructure and service side (article 53 and 54). It included some of the discussion on public policy objectives (e.g. on making sure that there is no emerging “new digital, NGA divide”) and discussed the different Commission decisions on State Aid broadband in the context of applying the SGEI principle (articles 20 to 29). A public consultation on the revision of the guidelines on public funding to broadband networks concluded on August 31, 2011. A revision of the State aid broadband guidelines will be delivered in September 2012.

3.3. Universal service in the Internet era: updating vs. abandoning

As widely stated in the Digital Agenda for Europe (DAE), the EU intends to promote the digital inclusion of all its citizens²⁷ and recognizes that broadband development is a valuable means of achieving this goal. In fact, broadband networks are considered a key factor in the transition towards an information society because they reduce the digital divide. Accordingly, the expansion of the universal service definition and the inclusion of broadband in the scope of USO

²⁷ As already pointed out by Clarich (1998) at the very beginning of the Internet era, the issue of universal service needs to be continuously updated to avoid “a two-tier society” Clarich (1998) where access to information services would impinge on the cultural and economic growth of the society itself.

may become a necessity, if the aims of the DAE are to be achieved. However, there is still no formal inclusion of broadband services in the USO definition in the EU, although technology development has accelerated the process of making the notion of universal service receptive of new customers' needs in terms of connectivity and access to NGA. As Bohlin and Teppayayon (2009) argued, this lack of updating of the USO definition is mainly the result of the fact that broadband is not yet used by the majority of consumers. In fact in the 'second periodic review of the scope of universal service in electronic communications networks and services' (EC, 2008c), the EC identified a substantial gap in DSL coverage within Member States noting that one of the "major drivers for broadband development is competition between parallel infrastructures (telecom and cable networks) combined with effective ex ante access regulation". In addition, it stated that "although broadband adoption [had] not yet reached levels of coverage and take-up that would qualify it for consideration under the universal service framework, it [was] approaching these thresholds rather quickly, whilst the number of narrowband connections [was] progressively decreasing" (see Annex V of the Directive 2002/22/EC which refers to the general conditions of market failures which would justify public intervention). Moreover, in the third periodic review of the scope of universal service (EC, 2011), the EC has acknowledged that at households level "the threshold of broadband usage by a (simple) majority of consumers in the EU has been reached", but it cannot be considered a 'substantial majority of the population'. In addition, the EC argued that substantial disparities in take-up

among EU Member States would affect disproportionately both telecom providers and consumers. In the following section, we outline the counter-reasons for including broadband (and NGA) availability and access into the US framework on the basis of data, information and trends within the European broadband sector²⁸. However, we are aware that the EC and national regulatory authorities need to minimize market distortions (e.g. creation of barriers to entry) arising from the implementation of any policy measure taken in this direction.

4. Discussion

The aim of this paper is to contribute to the ongoing debate concerning the inclusion of broadband access within the scope of universal service. Here we look at broadband take-up and average connection speed in Member States which we believe is such as to justify the inclusion of broadband within the scope of universal service in the next step of EU regulation. We also go a step further by predicting the inclusion of NGA within the scope of universal service.

4.1 Arguments in favor of NGA networks being incorporated into universal service obligations concept: concluding remarks

The landscape in Europe has changed radically since incumbent operators acting as monopolies used copper-based access technologies to provide essential services and fixed telephony. Today's landscape reflects a new competitive

²⁸ For a discussion on availability and access related to universal service obligation, see Levin (2010).

picture in which there is horizontal and vertical competition among differing service providers using competing access technology. As a result, new models of information access have emerged which challenge the traditional concepts of universal service. The EC has recognized this and in its new Digital Europe agenda expanded the definition of “functional Internet access” from the availability of a connection that is capable of sustaining a dial-up modem to the availability of broadband access. Moreover, the EU is aware that the take up of EU subscribers is leading to a growing proportion of the population exploiting the benefits of broadband speed and its functionalities (although significant differences exist across EU countries).

The USO concept has evolved over time, taking into account issues such as changing essential services, the digital divide and different investment strategies of public and non-public parties. However this evolution must now take into account: i) the existence of “specific services available to and used by a majority of consumers [and their] lack of availability or non-use by a minority of consumers [which] result[s] in social exclusion; ii) the “availability and use of specific services [which] convey[s] a general benefit to all consumers such that public intervention is warranted in circumstances where the specific services are not provided to the public under normal commercial circumstances”.

Recent EU data show that broadband reaches levels of coverage and take-up that qualifies it for consideration under the universal service framework (as mentioned in the Communication on the second periodic review of the scope of

universal service i.e. EC, 2008a). In fact, EU data on household access to Internet and broadband connections indicate that at the end of 2010, more than 50% of households had broadband access (including DSL, cable-modem, mobile and satellite networks) in 13 of the 27 EU countries. Accordingly, broadband availability and access among EU27 is now consistent with the criteria for a revision of the scope of universal service.

However, several questions still remain unanswered in the current debate on USO. If the justification for expanding USO to include broadband relies on the speed of Internet access and the services it enables, it still remains to be answered how fast the evolution of demand (and the willingness to pay of customers) will push single Member States to use public financing to set higher standards in terms of quality and speed. This would expand the set of essential services from triple-play (i.e. telephony, Internet and TV) to new e-services accessible to the majority of the population by NGA. Furthermore, if USO covers rural and less populated areas, there would be a case for mixing complementary technologies, for example, satellite and mobile technologies in conjunction with fiber networks.

A shared universal service policy is needed at a European level to facilitate the achievement of the objectives of the Digital Agenda for Europe. However, Member States will be asked to find the most appropriate mix of public commitment and private investment by defining a sustainable tool of public

funding and avoiding market distortions. In this sense, the upcoming revision of State Aid guidelines might facilitate a wider use of public-private partnerships.

4.2 Concluding remarks

The achievement of the ambitious objectives of the EU Digital Agenda and the dynamic nature of the e-communications sector call for a constant monitoring, evaluation and updating of the 2009 Broadband Guidelines by the European Commission. The Digital Agenda has awarded a leading role to fast and ultra-fast Internet and the development of interoperable applications in the delivery of sustainable economic and social benefits, as well as to the achievement of a digital single market. However, major technological and market developments (e.g. the uptake of wireless and mobile networks, the implementation of “open access” business models by public-private partnerships led by municipalities, etc.) may hamper the adopting of the contents of the Broadband Guidelines.

In 2009, the inclusion of the principle of services of general economic interest (‘SGEI’) into the Broadband Guidelines led the European Commission (EC) to define that its clear-cut strategy in the field of State Aid rules applied to the deployment of broadband networks. Within the meaning of Article 106(2) TFEU, the SGEI principle can now be applied by public authorities to address the unavailability of public services in certain areas. Since then, many decisions have been adopted by the European Commission, which enable an assessment of the

compatibility of local and national broadband initiatives with the European regulation in the field of State aid.

In 2010, to avoid the risk of creating new bottlenecks and a substantial re-monopolization of end-user markets, the Commission consolidated its pro-competitive approach. In fact, in the Next Generation Access (NGA) Recommendation – adopted together with the Communication on broadband infrastructure investment (EC, 2010c) – major steps were taken to reach the targets stated in the Digital Agenda. The Communication on European Broadband advocates the involvement of national and local government in the process of NGA deployment. This is based on the following premises i) Internet access speed is a key factor in achieving an efficient use of Internet; ii) operators including incumbent operators are usually reluctant to invest in the upgrading to Fiber-To-The-Home (FttH), and the absence of sufficiently attractive services for which customers might be willing to pay a premium price; iii) regulatory strategy may change within the investment timeframe; iv) financial and operational risks need to be mitigated; and finally, v) the substantially high costs of civil work (approximately 80% of total costs of high-speed broadband deployment).

A critical assessment of whether and how the European policy framework – and in particular, the Guidelines on State Aids for broadband – should be updated is essential for a timely deployment of fast and ultra fast Internet. In addition, market data now impose a further updating of the 2009 definition of NGA

networks (including other access technologies), the application of unbundling to FTTH P2P and GPON architectures as well as the assessment of the impact of open access on competition.

References

- Alleman, J., Rappoport, P., & Banerjee, A. (2010). Universal service: A new definition?. *Telecommunications Policy*, 34, 86-91.
- Alleman, J., Rappoport, P., & Weller, D. (2000). *Universal service: The poverty of policy*.
http://www.colorado.edu/engineering/alleman/print_files/universal_service_la_w_review_revised-paper.pdf
- Bauer, J.M. (1999). Universal Service in the European Union. *Government Information Quarterly*, 16(4), 329-343.
- Berkman Center for Internet & Society. (2010). *Next Generation Connectivity: A review of broadband Internet transitions and policy from around the world*. Final Report. Harvard University Press.
- Blackman, C., & Forge, S. (2008). The future of universal service in Europe. *Info*, 10(5/6), 152-165.
- Bohlin, E., & Teppayayon, O. (2009). Broadband universal service: A future path for Europe?. *International Journal of Management and Network Economics*, 1(3), 275-298.
- Bouras, G., Gkamas, A., Papagiannopoulos, J., Theophilopoulos, G., & Tsiatsos, T. (2009). Broadband municipal optical networks in Greece: A suitable business model. *Telematics and Informatics*, 26, 391-409.
- Clarich, M. (1998). Servizio pubblico e servizio universale: evoluzione normativa e profili ricostruttivi, *Diritto Pubblico*, 194-209.
- Crandall, R.W., & Jackson, C.L. (2001). *The \$500 Billion Opportunity: The Potential Economic Benefit of Widespread Diffusion of Broadband Internet Access*. Criterion Economics, L.L.C., retrieved on June 2 on http://www.itu.int/wsis/stocktaking/docs/activities/1288617880/CriterionEconomics_USA.pdf.

A similar version of the paper has already been submitted to Journal for publication. As the review process has not been completed yet, please do not cite without authors' permission.

Cremer, H., Gasmi, F., Grimaud, A. & Laffont, J.J. (2001). Universal Service: an Economic Perspective. *Annals of Public and Cooperative Economics*, 72, 5-43.

Czernich, N., Falch, O., Kretschmer, T., & Woessmann, L. (2011). Broadband infrastructure and economic growth. *The Economic Journal*, 121(552), 505-532.

European Commission. (2002). *Directive 2002/22/EC of the European Parliament and the Council of 7 March 2002 on universal service and users' rights relating to electronic communications networks and services (Universal Service Directive)*. Official Journal L 108, 24/04/2002 P. 0051 – 0077.

European Commission. (2008a). *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the second periodic review of the scope of universal service in electronic communications networks and services in accordance with Article 15 of Directive 2002/22/EC*, COM(2008) 572 final. Retrieved on April 8, 2011 on <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0572:FIN:EN:PDF>.

European Commission. (2008b). *Preparing Europe's digital future: i2010 Mid-Term Review*, COM(2008) 199 final.

European Commission. (2008c). *Broadband: Commission consults on regulatory strategy to promote high-speed Next Generation Access networks in Europe*, IP/08/1370.

European Commission. (2008d). *Commission Recommendation on regulated access to Next Generation Access Networks (NGA)*, Draft, C(2008). Retrieved on April 12th, 2010 on http://ec.europa.eu/information_society/policy/ecomm/doc/library/public_consult/nga/dr_recomm_nga.pdf

European Commission. (2009a). *Directive 2009/136/EC of the European Parliament and of the Council of 25 November 2009 amending Directive 2002/22/EC on universal service and users' rights relating to electronic communications networks and services, Directive 2002/58/EC concerning the processing of personal data and the protection of privacy in the electronic communications sector and Regulation (EC) No 2006/2004 on cooperation between national authorities responsible for the enforcement of consumer protection laws*. Official Journal of the European Union, L337/11, 18.12.2009. Retrieved July 9, 2011 from <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:337:0011:0036:En:PDF>.

A similar version of the paper has already been submitted to Journal for publication. As the review process has not been completed yet, please do not cite without authors' permission.

European Commission. (2009b). *Directive 2009/140/EC of the European Parliament and Council of 25 November 2009 amending Directives 2002/21/EC on a common regulatory framework for electronic communications networks and services, 2002/19/EC on access to, and interconnection of, electronic communications networks and associated facilities, and 2002/20/EC on the authorization of electronic communications networks and services*. Official Journal of the European Union, L337/37, 18.12.2009. Retrieved July 14, 2011 from <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:337:0037:0069:EN:PDF>.

European Commission. (2009c). *Community Guidelines for the application of State aid rules in relation to rapid deployment of broadband networks*. Official Journal of the European Union, C235/7, 30.09.2009. Retrieved May 6, 2011 from <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2009:235:0007:0025:EN:PDF>.

European Commission. (2010a). *Communications Committee. Working document on broadband access in the EU27: situation at 1 July 2010*. (COCOM10-29). Available on http://ec.europa.eu/information_society/newsroom/cf/document.cfm?action=display&doc_id=719.

European Commission. (2010b). *Commission Recommendation of 20 September 2010 on regulated access to Next Generation Access Networks (NGA)*. 2010/572/EU, Official Journal of the European Union, L251/35, 25.09.2010. Retrieved May 9, 2011 from <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:251:0035:0048:EN:PDF>.

European Commission. (2010c). *European Broadband: investing in digitally-driven growth*, COM(2010) 472. Retrieved May 9, 2012 from http://ec.europa.eu/information_society/activities/broadband/docs/bb_communication.pdf

European Commission. (2011). *Universal service in e-communications: report on the outcome of the public consultation and the third periodic review of the scope in accordance with Article 15 of Directive 2002/22/EC*. Retrieved May 12, 2011 from <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0795:FIN:EN:PDF>

Falch, M., & Henten, A., (2009). Achieving Universal Access to Broadband. *Informatika Economica*, 13(2), 66-174.

- Fornefeld, M., Delaunay, G., & Elixmann, D. (2008). *The impact of broadband on growth and productivity. A study on behalf of the European Commission* (DG Information Society and media), MICUS.
- Fransman, M. (2010). *The New ICT Ecosystem. Implications for Policy and Regulation*. Cambridge: Cambridge University Press.
- Gasmi, F., Laffont, J., & Sharkey, W. (2002). The Natural Monopoly Test Reconsidered: An Engineering Process-Based Approach to Empirical Analysis in Telecommunications. *International Journal of Industrial Organization*, 20, 435-459.
- Gómez-Barroso, J.L., & Feijoo, C. (2010). A conceptual framework for public-private interplay in the telecommunications sector. *Telecommunications Policy*, 34, 487-495.
- Gómez-Barroso, J.L., & Pérez-Martínez, J. (2005). Public intervention in the access to advanced telecommunication services: Assessing its theoretical economic basis. *Government Information Quarterly*, 22, 489-504.
- Huigen, J., & Cave, M. (2008). Regulation and the promotion of investment in next generation networks – A European dilemma, *Telecommunications Policy*, 32(11), 713-721.
- Infante, J., Sagarra, R., Macian, C., & Oliver, M. (2009). Public-private partnership in FTTH passive infrastructure deployment: the 22@BCN case. *International Journal of Management and Network Economics*, 1(3), 327-342.
- ITU (2010). *World Telecommunications Indicators*. Geneva: ITU.
- ITU (2011). *World Telecommunications Indicators*. Geneva: ITU.
- Katz, R., & Suter, S. (2009). *Estimating the economic impact of the broadband stimulus plan*. Columbia Institute for Tele-Information. Working Paper. Retrieved March 24th, 2010 on <http://www.gcbpp.org/files/BBSTIM/KatzBBStimulusPaper.pdf>.
- Knieps, G. (2011). The three criteria test, the essential facility doctrine and the theory of monopolistic bottlenecks. *Intereconomics. Review of European Economic Policy*, 46(1), 17-21.
- Lehr, W., Sirbu, M., & Gillett, S. (2006). Wireless Is Changing the Policy Calculus for Municipal Broadband. *Government Information Quarterly*, 23, 435-53.

- Levin, S.L. (2010). Universal service and targeted support in a competitive telecommunications environment. *Telecommunications Policy*, 34, 92-97.
- Lundborg, M., Ruhle, E-O., & Bahr, C. (2010). *Discounts and Price Discrimination in the Telecommunications Regulation of NGA Networks*. ITS Regional Conference - Copenhagen, September 2010.
- Michalis, M. (2002). The Debate over Universal Service in the European Union: Plus ça change, plus c'est la même chose. *Convergence*, 8, 80-98.
- Mueller, M. (1993). Universal service in telephone history. A reconstruction. *Telecommunications Policy*, 17(5), 352-369.
- Mueller, M. (1996). *Universal service, competition, interconnection, and monopoly in the making of the American telephony system*. Cambridge: The MIT Press.
- Mueller, M. (1999). Universal service policies as wealth redistribution. *Government Information Quarterly*, 16(4), 353-358.
- Nucciarelli, A., Sadowski B. , & Achard, P.O. (2010). Emerging models of public-private interplay for European broadband access: evidence from the Netherlands and Italy. *Telecommunications Policy*, 34(9), 513-527.
- OECD (2006). *Liberalisation and Universal Access to Basic Services*. OECD Trade Policy Studies. Paris: OECD Publishing.
- OECD (2011). *Key ICT Indicators*. Paris: OECD.
- Picot, A., & Wernick, Ch. (2007), The role of Government in Broadband Access, *Telecommunications Policy*, 31, 660-674
- Reding, V. (2008). *Europe's Way to the High Speed Internet: Why Effective Network Competition is the Freeway to the Future*. Speech/08/355, ECTA Annual Conference, Brussels, June 25, 2008. Retrieved on April 8th on <http://europa.eu/rapid/pressReleasesAction.do?reference=SPEECH/08/355&format=DOC&aged=0&language=EN&guiLanguage=en>.
- Reding, V. (2009). *Towards a European Strategy of High Speed Broadband for all: How to Reward the Risk of Investment into Fibre in a Competitive Environment*. ECTA Conference, June 25, 2009, Brussels, Belgium. Last retrieved April 20th on <http://europa.eu/rapid/pressReleasesAction.do?reference=SPEECH/09/312&format=HTML&aged=0&language=EN&guiLanguage=en>.
- A similar version of the paper has already been submitted to Journal for publication. As the review process has not been completed yet, please do not cite without authors' permission.*

Renda, A. (2010). Competition-regulation interface in telecommunications: What's left of the essential facility doctrine. *Telecommunications Policy*, 34, 23-35.

Ruhle, E.-O., & Lundborg, M. (2010). EU policy for next generation access – an innovative or incremental step forward?. *Telecommunications Policy*, 34, 36-44.

Ruhle, E.-O., Brusic, I., Kittl, J., & Ehrler, M. (2011), Next Generation Access (NGA) supply side interventions — An international comparison. *Telecommunications Policy*, in press.

Sharkey (1982). *The Theory of natural monopoly*. Cambridge: Cambridge University Press.

Siciliani, P. (2010). Access regulation on NGA-A financial, market-led solution to bridge the gap between US and European diverging regulatory approaches. *Telecommunications Policy*, 34(5/6), 287-298.