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Public Rights of Way for Fibre Deployment to the Home

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FOREWORD

The Working Party on Communications Infrastructure and Services Policy discussed this paper at its meeting in May 2007 and agreed to recommend the declassification of the paper to the Committee for Information, Computer and Communications Policy.

The ICCP committee agreed to declassify this paper at its meeting in March 2008. The report was prepared by Mr. Byung Wook Kwon of the OECD's Directorate for Science, Technology and Industry. It is published under the responsibility of the Secretary-General of the OECD.

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TABLE OF CONTENTS

PUBLIC RIGHTS OF WAY FOR FIBRE DEPLOYMENT TO THE HOME: MAIN POINTS 4

I. INTRODUCTION 5

II. WHY RIGHTS OF WAY MATTER IN FIBRE DEPLOYMENT? 6

1. Rights of Way 6
2. Fibre deployment 8

III. RIGHTS OF WAY REGULATION IN THE OECD 12

1. Rights of Way Regulation 12
2. Legal Issues 15
3. Administrative Issues 25
4. Financial Issues 30
5. Regulatory Issues 35

IV. POLICY OPTIONS 43

NOTES 45

PUBLIC RIGHTS OF WAY FOR FIBRE DEPLOYMENT TO THE HOME:

MAIN POINTS

OECD countries have emphasised the importance of broadband technologies, viewing these technologies as having beneficial economic and social impacts. Fibre network deployment in last mile access networks are viewed as a key technology offering high-speed broadband connections with capacity that is symmetric and can support multiple play services. However, the investment costs for fibre deployment in the last mile are high because of the cost of civil works to construct ducts. The cost, especially for those companies that do not have historical access to rights of way and ducts, is increasing the focus by policy makers and communication regulators on how to reduce these costs.

Improved access to rights of way and reduced access costs can be achieved in a number of ways, which include:

- Reducing barriers associated with obtaining authorisation for access to and use of rights of way.
- Ensuring clarification of jurisdiction for both granting rights of way and settling disputes and co-ordination among the public authorities involved.
- Harmonising administrative procedures for access to rights of way and ensuring consistency in the application of these procedures across a country.
- Developing a reasonable system of compensation for access to and use of municipal public rights of way.
- Ensuring that operators investing in ducts are subject to a minimum set of obligations for remediation and maintenance.
- Encouraging and/or obliging sharing of ducts and other rights of way both by incumbent communication companies and by other utilities that have infrastructure.
- Examining the role of public-private partnerships in the deployment of dark fibre and/or third party infrastructure providers for duct sharing.
- Examining the possibility of regulatory measures to facilitate the sharing of inside wiring between operators in multi-dwelling units.
- Developing policies to construct joint ducts by new entrants.

The primary aim of this paper is to examine barriers to rights of way which may slow down the pace of fibre rollout in local access networks, and to suggest the policy options available.

I. INTRODUCTION

There is an increasing demand for high bandwidth communication connections by households in OECD countries. Upgrading the bandwidth of traditional technologies such as digital subscriber lines (DSL) and coaxial cable is becoming difficult as these technologies are reaching their capacity limits. This has led to increased focus on fibre-optic networks which have the advantage over other traditional telecommunications access networks due to their significant capacity.

One reason why the pace of fibre investment in the local loop is relatively slow in many OECD countries is the cost associated with network construction, in particular for rights of way and ducts or poles, as well as the associated legal and regulatory difficulties in obtaining permits for access to streets, roads, and other public land. This issue of rights of way in laying fibre in the last mile is a complex legal, managerial, and technological issue where obtaining public rights of way permission, and constructing the required ducts (or poles) is often closely interlinked with national and/or local government legal frameworks and policies.

There are several reasons why public, especially municipal, rights of way matter in the local access market now. Technologically, fibre in the local loop is likely to be the future platform for residential broadband by providing a flexible and full-service network platform. Although incumbents can use their existing ducts for fibre, new entrants do not have access to their own ducts so that they need access either to existing ducts in towns and cities (these may be telecommunication, cable, utility or municipal ducts) or they need to obtain new rights of way to construct their own ducts.

The opening of communication markets to competition has led to a considerable increase in demand by new entrants for access to public rights of way and ducts. For new entrants to compete effectively in local markets and to facilitate facilities competition, access to rights of way and ducts is crucial. For operators, problems can occur because municipalities in some countries consider access to rights of way as a revenue opportunity, resulting in fees which can be over and above the costs incurred. Similarly, incumbent operators may not be willing to share their ducts, may demand high usage fees or may have insufficient duct space to host both their own new fibre networks and those of new entrants.

Municipalities, on the other hand, may be faced with repeated requests by different telecommunications operators for the excavation of the same street. In addition, given that operators have different business plans, it is difficult to co-ordinate the requests for access to rights of way.

This paper deals only with public rights of way, and access to ducts and poles with respect to the wired local loop and with communication entities, which include cable companies, Internet service providers and facility-based telecommunication operators. Although municipalities play a large role in rights of way for the local loop, there are a number of other important players, including utilities, that have existing rights of way in municipalities. In a number of OECD countries telecommunication regulators also play an important role in the policy framework of rights of way. In addition, a range of different Ministries may have jurisdiction over issues dealing with rights of way.

II. WHY DO RIGHTS OF WAY MATTER IN FIBRE DEPLOYMENT?

1. Rights of Way

Traditionally, a right of way is an easement granted by the property owner that gives the rights to travel over the land and the provision by the property owner of reasonable use of the property to others, as long as it is not inconsistent with the use and enjoyment of the land by the owner. The traditional principles underlying rights of way had their origin in common law which governed the free flow of water or allowed neighbouring landowners to travel over one another's property.[1] Although ownership rights of property may be limited by an easement, the easement nevertheless can benefit society at large by providing additional economic and social benefits.

A right of way provides the right to pass across the lands of another, usually in a strip, acquired for or devoted to building facilities such as roads, railroads, or utilities. A crucial part of a utility project is acquisition of real property interests to form a corridor that will contain poles, wires, cables, or pipes which will, in turn, deliver services to end users. Generally speaking, the real property interests that form a utility corridor are referred to as rights of way.[2]

There are many other types of facilities and rights of way and they can be publicly or privately owned. Private rights of way are normally acquired using a variety of conveyances to establish land usage rights such as through fees or an easement. Pipeline, long distance communications, and electric distribution companies have private rights of way for many of their facilities. In this paper, private rights of way will be dealt with in a very limited way in relation to the regulatory policy implications of both access to public lands for the purpose of constructing ducts or poles and access to private multi-dwelling buildings for the purpose of providing inside wiring for communications networks. Consequently, a "right of way" is narrowly defined, in this paper, as the land and facilities that are maintained and regulated as "public rights of way" and used for direct services that they provide, such as the mobility of people and products, water supply and wastewater treatment, and energy and communication systems. Such a public right of way, or public utility corridor (or strip of land), is managed by public authorities, and is usually provided for by law.[3] Technologically, rights of way are closely interrelated with both civil work for infrastructure construction and technical engineering for network planning, operation, and maintenance.

A public right of way project may involve:[4]

- Public-private partnerships, especially as in the case of utility corridor projects.
- Private access to public rights of way.
- Installation of telecommunications hardware.
- Compensation granted to the owner of the public rights of way which may be over and above administrative costs.

Public utilities are defined as a private or publicly owned line, facility or system, which directly or indirectly serves the public by providing necessary basic services such as water, sewer, telephone, gas, electricity, and cable TV, etc. Utility facilities can either be below ground using a conduit system, sewer or

drainage facilities, or above ground using aerial pole structures for electric or telephone lines. Public rights of way can provide the space for a publicly owned utility that possesses the right of occupancy by virtue of the authority of the government. Privately owned utilities can also occupy public rights of way by virtue of permits or franchise authorisations granted by state or local laws, statutes or other legislative actions.[5]

Historically, each public utility built its own support structure such as aerial pole lines or underground ducts. The evolution of pole structures has moved from sole use to joint use. Nowadays, electric companies, telephone companies, cable television companies, inter-exchange carriers, municipalities, and even individual corporations may jointly use aerial pole structures.[6] Historically, in the communication sector the incumbent operators (cable and telephone) had in many cases ready access to rights of way either because they were government entities, public corporations, or by virtue of their monopoly concession. With the opening of communication markets to competition the demand for access to public rights of way increased considerably. Some of these demands were limited to central business areas of major cities where new entrants built networks to connect large users of communication services. In certain cases new entrants began to wire major cities or interconnected their long distance networks to the incumbent's points of presence.

The granting of public rights of way usually requires the active participation of public authorities (often municipalities) in managing or authorising the civil works needed in constructing ducts or other infrastructure required for networks. A public right of way permit is usually an agreement between a local government and an applicant. Permission to use public lands can guarantee that it will be done according to applicable standards and that the applicant has the legal authority to secure the permit (*i.e.* to provide services to the public). Digging streets and pavements, which is disruptive in terms of the impact on the circulation of traffic and pedestrians and the restoration of pavements to their original state, is often viewed as one of the main challenges which local governments and utility providers are usually facing today.[7] The emergence of competition in the communications market increased significantly the demand to invest in networks and consequently the demand to access public roads.

The move away from the monopoly provision of telecommunication services to the competitive provision of telecommunication infrastructures and services has already brought about significant changes in how new entrants can attain access to rights of way. As an example, the 1996 Communications Act in the United States Section provided that "No State or local statute or regulation, or other State or local legal requirement, may prohibit or have the effect of prohibiting the ability of any entity to provide any interstate or intrastate telecommunications service" (Section 253(a)).

Even though a number of countries have similar provisions to those in the United States, problems have nevertheless arisen with municipal rights of way because requests by different telecommunication operators led at times to the repeated excavation of the same street, resulting in traffic disruptions and in the degradation of roads and pavements. Attempts to co-ordinate different request for access to rights of way have been difficult given that operators have different business plans, revenue streams and construction schedules.

For operators, problems have occurred because municipalities have in some countries considered access to rights of way as a revenue opportunity charging both for restoration work (in the view of some operators over and above costs incurred) and charging for occupation of rights of way through monthly rental charges. In certain cases municipalities have tried to use the granting of rights of way permission as a means to upgrade streets and pavements. Many municipalities have also argued that a telecommunication entity as a "for profit" company should be charged for occupancy of rights of way on the basis that not charging for occupancy would be equivalent to a subsidy.

With reference to the incumbent telecommunication operators' rights of way, telecommunication regulators have usually had the power to make these available to new entrants at cost-oriented prices. In some areas, usually those with heavy demand, the ducts of incumbent operators may be insufficient to meet future demands of incumbents as well as the demands of all new entrants.

2. Fibre deployment

The OECD paper *Developments in fibre technologies and investment* [DSTI/ICCP/CISP(2007)4)/FINAL] provides an overview of developments in fibre investment and the different fibre topologies. The interest in rights of way is being driven by the recent emphasis on fibre investment in the last mile, in particular fibre-to-the-home (FTTH) or fibre-to-the-premises (FTTP). A number of last mile wired technologies have emerged as shown in Table 1 which summarises the main characteristics of wired technologies and their deployment in the local access market.

Table 1. Summary of last mile technologies and deployment

Technology / Issues	DSL		HFC	FTTH		
	ADSL	VDSL		A/BPON	GPON	EPON
Downstream Bandwidth	1.544~ 8 Mbps	Up to 22 Mbps	500 Kbps~ 30 Mbps	622 Mbps	2.5 Gbps	1,25 Gbps
Upstream Bandwidth	16 Kbps~ 1 Mbps	Up to 13 Mbps	100 Kbps	155~ 622 Mbps	1.25/ 2.5 Gbps	1.25 Gbps
Maintenance Cost	High		High	Low		
Installed First Cost	Low		Low	High		
Deployment Time	Fast		Fast	Slow		
Using Existing Plant	All		Most	None		

Source: Fibre-to-the-Home White Paper, Budde Comm, and FTTH Standard, Deployments and Research Issues.

From the perspective of costs for maintenance and installation, both Digital Subscriber Line (DSL) and Hybrid Fibre Coax (HFC) solutions have high lifetime maintenance and service costs, while featuring fairly low installation costs by using existing facilities. Even though fibre in the last mile has low maintenance and service costs, the typical fibre solution has fairly high installation costs, in particular where existing ducts or poles cannot be used.

The main access architectures for fibre to end user premises are:

- FTTC or FTTN (fibre to the curb or node) – fibre is deployed to a street cabinet or node and from there the existing copper loop (usually upgraded) is used to access the home.

- FTTB (fibre to the building) – fibre is deployed up to the building from where copper or Ethernet can be used to connect end user premises.

- FTTH (fibre to the home) – the local loop would simply be constituted by optical fibre from the optical distribution frame (ODF) of the service provider up to the end user's home.

    - In point-to-point FTTH solutions, cable plant provides optical paths from the telecommunications operator's switching equipment to a single contiguous location

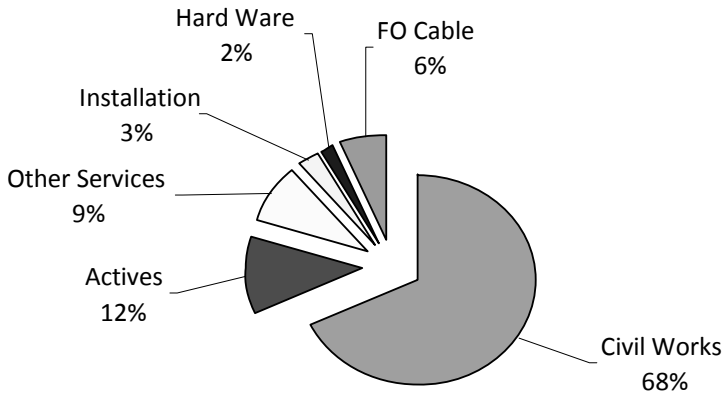
such that the optical paths are dedicated to traffic to and from this single location. In generic terms this, is a star topology.

- In a point-to-multipoint solution (a shared infrastructure topology using PON (passive optical network)), cable plant provides branching optical paths from the telecommunication operator's switching equipment to more than one contiguous location, so that portions of the optical paths are shared by traffic to and from multiple locations. In generic terms, this is a tree topology.

FTTH/B networks can deliver services to residential users in individual homes or in multi-dwelling units such as apartments/condominiums (MDUs) or to large, medium, and small business users. Businesses may occupy MTU (multi-tenanted units such as office blocks/towers) or STU (single-tenanted units such as a stand-alone office buildings or warehouses).

The main barrier slowing down investment in local loop fibre networks is cost. The main cost component for fibre local loops, between 50-80%, is civil work which involve costs associated with opening (and closing) trenches and laying ducts. This cost depends on the size of the city and population density. According to Corning, fibre costs less than 6% of the total cost of a new network and civil works account for 68% (Figure 1).[8] Clearly any policy which can reduce the costs of civil works would provide an important impetus to stimulating the roll-out of fibre.[9]

Figure 1. First year cost of rolling-out a new fibre network



Source : Corning.

The second major cost item when deploying fibre in the local loop is providing inside wiring in customer premises, which can cost between EUR 300 and EUR 500 per subscriber, according to ARCEP.[10] The relatively high cost is exacerbated by the time needed to negotiate the right to provide installations in common areas of buildings – a process which is made more difficult when decisions are required from representatives of property under co-ownership.

In addition to the actual costs of civil engineering works and in-house wiring, the costs of deploying fibre to the home can also increase as a result of administrative or legal barriers in obtaining authorisation to obtain permission to use public rights-of-way.

Three broad categories of issues may arise in the context of rights of way:[11]

- FTTH investors who are trying to roll out their network across multiple jurisdictions are often required to submit multiple applications to the different authorities. Procedures may also differ according to the municipality.

- FTTH investors need to obtain rights of way permits on a timely basis. Undue delay can increase the costs of deployment.

- Both the charges for using rights-of-way and reconstructing and maintenance requirements can be unreasonable and place undue burdens on FTTH investors.

Potential fibre network investors include the incumbent cable and telephone operators as well as new market entrants, utility companies, municipalities, and new greenfield housing developers. The strategy of many incumbent telephone companies is in many cases to deploy fibre infrastructure in new buildings, while incrementally upgrading their existing infrastructures. Among the incentives to replace the existing telephone local loop by fibre to the home is to respond to competition by providing very high speed data access and video services, reduce costs by lowering maintenance costs, and the need to replace aging infrastructure.[12] The incumbent cable television companies seem to be slower than the incumbent telephone companies in deploying fibre in the local loop. The alternative service providers, who do not have infrastructure often use fibre directly when they begin constructing infrastructure since it is the most "future proof" of the access technologies.

A number of different utilities often try to leverage their existing rights of way by entering into the telecommunication market. In some cases utilities, especially electrical companies, have networks which are used for their existing business so that they can use existing expertise in deploying and maintaining fibre networks to broaden their business. Utilities often partner with telecommunication service companies in order to overcome their lack of experience in the sector.[13]

Some local governments are also directly investing in local access networks. They use a range of models: provide dark fibre, form public/private partnerships to offer services over these facilities or in some cases become full service providers. The typical example of an open access municipal network is Stokab, a dark fibre provider in Stockholm owned by the municipality.[14] Stokab was founded in 1994 and has the mandate to provide dark fibre and lease it to operators at cost-oriented prices. Stokab provides fibre to about 50 operators and is the only provider in Stockholm city (other than the incumbent, Telia) with the right to deploy fibre. The Stokab model is characterised by structural separation in that Stokab only deploys dark fibre and does not provide services.[15] The Swedish Urban Network Association (SSNf) is an association of 300 municipalities aimed at providing fibre through an open access model, and reducing street digging.[16]

In the Netherlands local projects include Citynet Fibre Amsterdam, Smart City Project, and Rotterdam projects. Citynet Fibre Amsterdam, in which the municipality has a minority ownership, is investing in point-to-point fibre to the home. The municipality is aiming to provide access to 450 000 homes and businesses by 2010.[17] The Smart City project, located in the cities of Eindhoven and Helmond, was designed to advance the roll-out of high-speed local access fibre networks, with the investment fund going to 30 000 participating homeowners rather than infrastructure or service providers.[18] Rotterdam, based on a city-owned open access FTTH model, decided to roll out a FTTH backbone to the entire city in early 2006.[19]

A number of fibre-to-the-home networks have been constructed in OECD countries by non-incumbent communication companies. In the United States, FTTH projects have been undertaken by a number of

small independent carriers. Rural local exchange carriers have built fibre networks in their service area.[20] Home developers installed fibre networks during initial construction, partnering with competitive local exchange carriers as a means of differentiating their developments. In addition, many municipalities, dissatisfied with the broadband offerings of the incumbent providers, have invested in advanced FTTH networks. In Japan a number of alternative carriers independently deploying FTTH infrastructure such as USEN, Tokyo Electric Power Company, PowerCom, K-Opticom, IP Revolution, Softbank, and KDDI.[21]

In Denmark a few power utility companies like DONG Energy[22] have launched commercial fibre roll-outs to residential and business users within their respective power supply areas. This fibre network is not owned by municipalities – but many of these energy corporations are owned by their subscribers.[23] In late 2004, the municipality of Aarhus, Denmark's second largest city, signed up with Netdesign to deliver fibre optics to 130 municipal localities such as administration offices, libraries and schools. The fully extended municipal network comprises 1 500 localities, of which approximately 700 will be home/work places. The network is based on an open access model to increase competition and services.[24]

III. RIGHTS OF WAY REGULATION IN THE OECD

1. Rights of Way regulation

Every country has legal and administrative requirements which have to be met in order for a company to obtain permission to lay down their network on public property. These requirements may act at times as a barrier to investment if they slow down investment plans or act as a disincentive to investment. Four main factors come into play to obtain rights of way permission; *i.e.* legal, administrative, financial, and regulatory factors.

Requirements to obtain rights of way			
Legal Factors	Administrative Factors	Financial Factors	Regulatory Factors
• Jurisdiction - Municipalities - Other entities • Dispute resolution	• Procedure • Deadlines	• Compensation • Financial burden	• Ducts sharing • In-house wiring

Tables 2 to 5 below summarise the requirements pertaining to rights of way for 20 OECD countries.[25] In OECD countries, local governments usually have authority to manage public rights of way with Austria and Canada being the exception. Nevertheless, local government management of public rights of way varies widely from country to country.

In Australia, many telecommunication facilities, such as overhead cables and the majority of telecommunications towers are subject to relevant state/territory legislation and require the approval of the local council. However, under Australian Government legislation carriers are permitted to install "low-impact facilities" without the need to obtain local government planning approval. Low-impact facilities are those that are considered essential to maintaining telecommunications networks, but are of low visual impact and unlikely to cause significant disruption to the community during installation or operation. They include, but are not limited to, telecommunication towers less than 5 metres high attached to buildings, underground cabling and in-building subscriber connections. This legal requirement is particularly important since state and territory planning laws, which are generally administered by local government, vary widely from state to state and from municipality to municipality. In addition, carriers have access to each other's infrastructure through licence conditions provided for in a Schedule of the Telecommunications Act 1997.

In Austria, Section 2 of the Austrian Telecommunication Act (TKG 2003)[26] prescribes special rules for the granting of rights of way. Under this Act, providers of a communications network shall be entitled to exercise wayleave rights[27] on public property, such as streets, footpaths, public places and the airspace above – with the exception of public water facilities – free of charge and without special authorisation. Furthermore, providers shall be entitled to exercise wayleave rights on private properties under the certain conditions.[28] In Belgium, public rights of way are regulated according to articles 97-98 of the Act of 21 march 1991. Under the terms described in this Act, every public telecommunications network operator is entitled to use the public domain and properties to lay cables, overhead lines and corresponding equipment

and to carry out all necessary work on these, provided that the purpose and the legal and regulatory provisions regarding their use are observed.

In Canada, telecommunications is an exclusive federal jurisdiction. Sections 42-44 of the Telecommunications Act[29] provide the right of access for carriers to enter public places in order to construct, maintain and operate their transmission lines. These provisions also confer power on the Canadian Radio-television Telecommunications Commission (CRTC) to grant carriers permission to construct lines, if they cannot obtain municipal consent on terms acceptable to them, and to resolve complaints by municipalities about carriers.

In the Czech Republic, the legislation deals with public rights of ways in general terms where the provisions are specified which regulate in general the relevant entities (the extent of the authorisation to use other owners' property; the agreements between the businesses providing the public communication networks and the owners of the affected property). These issues are specifically addressed in Section 104 of Act No. 127/2005, on Electronic Communications and on Amendment to Certain Related Acts (the Electronic Communications Act).

In Denmark, the legal requirements specific to public rights of way for the last mile in the fixed telecommunications/electronic communications sector are building permits concerning masts and/or an access to laying cables.

In Finland, the legal provision regarding public rights of way is stipulated in section 161 of the Land Use and Building Act, under which property owners and titleholders are obliged to allow the location of service conduits serving the community or property in the area they own or hold the title to, unless the location can be organised satisfactorily by some other means and at reasonable cost. Unless agreement is made on compensation under this Act, the matter shall be resolved as laid down in the Expropriation Act. Nevertheless, practically always the property owner and telecommunication network operator reach agreement on the installation of telecommunication cables.

In France, under Article L. 45-1 of the Post and Electronic Communications Code (*Code des Postes et des Communications Electroniques*, CPCE),[30] public operators can benefit from a right of way on public highways and from easements on private property mentioned in Article L. 48. When the concessionary authorities or managers of public property other than highways provide access to network operators they are required to do so by means of an agreement under transparent and non-discriminatory conditions insofar as such access is not incompatible with usage or available capacity.

In Germany, under the German Telecommunications Act (TKG), the operators of public telecommunications networks are entitled to use thoroughfares (public roads, paths, squares, bridges and waterways) for deploying telecommunications lines free of charge. On application, this free use is authorised by the Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railways. The application must designate the area for assigning right of use. The deployment of telecommunications lines also requires the consent of the agency in charge of road construction, *i.e.* the local urban or municipal authority and possibly others, such as the office for the protection of architectural monuments. The powers of the municipality are confined to technical matters, such as cable laying depth, safety and ease of traffic flow.

In Japan, the legal provision regarding approval of business to make it possible to use private land is stipulated in article 117 of the Telecommunication Business Law, under which any person who intends to obtain approval may obtain approval from the Minister. In addition the provision regarding the use of other personal land, etc. by approved telecommunication carriers, is stipulated in article 128 and 129 of the Law. The "Guidelines for Use of Poles, Ducts, Conduits and Similar Facilities Owned by Public Utilities"

providing a managerial standard for the provisions of the Law, was formulated in 2001. The Guideline was amended in 2007 to add the provisions regarding facilitation of procedures for promoting installation of lines for the last mile.

In Korea, the Law on Public Roads describes the procedures on public rights of way, and the district office (municipality) is the main authority which deals with public rights of way issues, except some special cases such as military areas, cultural heritage areas or preservation areas.

The legal requirements in the Netherlands do not make a distinction between rights of way for the last mile or other parts of the network. Rights of way are granted by law to anyone who wants to install, maintain or remove a public electronic communications network. Before actually installing a network any installer needs administrative approval of the municipality with respect to the timing of the construction, the specific location and the way the work will be carried out, including safety measures taken. The municipality cannot refuse a licence.[31]

In New Zealand, the legal requirements specific to roads for laying and maintaining telecommunications lines are set out in Part 4 of the Telecommunications Act 2001. A registered telecommunications network operator has the right to lay and maintain telecommunications lines in any road subject to meeting notice requirements and subject to any reasonable conditions imposed by the relevant local authority or other person who has jurisdiction over that road.

In Norway the main principle, where the property is owned by a municipality, is that the provider of the telecommunications network must apply for permission from the municipality. Nevertheless, in exceptional circumstances, the Ministry of Transport and Communications may make a decision on or give its consent to expropriation of property rights in order to grant rights of way for the local loop. The legal base for such decisions is laid down in the Electronic Communications Act and the General Expropriation Act.

In Portugal, Law 5/2004 (Electronic Communications Law – LCE) recognises that all undertakings who provide publicly available electronic communications networks and services have the right to use on an equal basis the public domain for burying, crossing or passing over, as necessary, for the installation of systems, equipment and other resources (article 24, nr. 1, b). The LCE also states that the concessionaire of the telecommunications public service shall make available, via an agreement, access to ducts, masts, other installations and property it owns or manages to undertakings providing publicly available electronic communications networks and services for installing and maintaining systems, equipment and other facilities thereof (Article 26 of LCE). The concessionaire shall render available an offer of access to ducts, masts, other installations and property, which shall comprise the access and usage conditions, on terms to be established by the National Regulatory Authority (ANACOM). The Reference Conduit (ducts) Access Offer (RCAO) of the concessionaire (PT Comuciascoes) has already been established through several decisions of the NRA.[32]

In Singapore, a multi-prong approach is applied to facilitating access to rights of way. This is addressed through legal requirements on both access to existing telecommunications infrastructure and access to public roads. For access to existing telecommunications infrastructure, three main legal instruments are put in place to address the need for the incumbent operator, non-dominant operators, and building owners to make available their rights of way infrastructure/facilities to other operators; first, as dominant licensee, the incumbent operator is required to offer lead-in ducts at cost-based pricing through a Reference Interconnection Offer (RIO); second, as non-dominant licensees, all the other operators are required to offer infrastructure deemed as "Critical Support Infrastructure"(CSI)[33] to requesting operators at cost-based pricing through the Telecoms Competition Code; and third, as non-licensees, all building owners are required to build in infrastructure/facilities through the Code of Practice for Info-

communications Facilities in Buildings (COPIF). For access to public roads, the Code of Practice for Road-opening Works that is managed by the Land Transport Authority ensures that operators have access to road openings. The Code of Practice gives instructions on the information that is to be supplied to apply to road openings, the requirements on the opening of roads, the laying of utilities, and the reinstatement of roads.

In Spain, the Spanish Constitution states limitations to regional and local administrations in the development of their own regulations. Article 148.1.3 of the Constitution provides that Regional Communities may have jurisdiction for land distribution, town planning and dwelling-related issues and, through Article 148.1.9, they may have jurisdiction for environmental management issues. Furthermore, Article 149.1.21 provides that the State has exclusive jurisdiction for telecommunications. The pertinent legislation for the regulation of the rights of way is provided for in General Spanish Act 32/2003, of 3 November, on telecommunications; in Royal Decree 424/2005, of 15 April, wherein the regulations on the conditions for the supply of electronic communications services, universal service and user protection are approved; and in Royal Decree 1066/2001, of 28 September, wherein the regulations providing the conditions of radio electric public domain protection, restrictions to radio electric emissions and health protection measures against radio electric emissions are approved. Regardless of the above, regional and local administrations are also drafting their own regulations, mainly related to the environmental and town-planning issues for which they are responsible.

In Switzerland, public rights of way are administered at the level of the 26 cantons (Kantone) and the 2 700 municipalities. A national law obliges the owners of public grounds to allow the use of these grounds for the building and the use of lines and of public telephones, on condition that they do not hinder public use of these public grounds.

In the United Kingdom, the Communication Act 2003 confers on Ofcom the ability to give certain rights known as "Code powers" to Electronic Communication Network (ECN) providers and to providers of systems of conduits which are made available for use by ECN providers to install and maintain apparatus in, over and under land. These rights are described in detail in the Electronic Code Powers 2003.[34]

In the United States, access to public rights of way typically is regulated at the state or local level. Especially, the Communications Act of 1996 provides for the Federal Communications Commission (FCC) to regulate "the rates, terms, and conditions" of attachments by a telecommunications carrier or cable television system to poles, ducts, conduit, and rights of way that are owned or controlled by a utility,[35] to the extent that a state does not regulate such attachments. However, under the Act, "a utility providing electric service may deny a cable television system or any telecommunications carrier access to its poles, ducts, conduits, or rights-of-way, on a non-discriminatory basis where there is insufficient capacity and for reasons of safety, reliability and generally applicable engineering purposes." The incumbent wireline telecom operator must show that competitors can obtain access to poles, ducts, conduits, and rights of way within reasonable time frames and on reasonable terms and conditions, with a minimum of administrative costs, and consistent with fair and efficient practices.

2. Legal Issues

For operators it is important to be clear on the applicable laws in their country and which entity has jurisdiction for granting public rights of way and, in the event that there is a dispute, which entity is responsible for settling disputes. In many countries, authorisation to use public lands may also be subject to other legislation which aims at meeting other objectives, such as environmental protection or the preservation of historic sites, etc.[36]

In general the laws and rules governing public rights of way apply to the general public, and are not limited to the activities of telecommunication facility providers alone, although there are exceptions. For example, in Canada the Canadian Radio-television and Telecommunications Commission (CRTC) can regulate the construction of telecommunication transmission lines without the consent of the municipality (see Box 1).

Box 1. Canada: Powers of the CRTC on rights of way

Section 43 of the Canadian *Telecommunications Act* provides the right to any Canadian carrier to "enter on and break up any highway or other public place for the purpose of constructing, maintaining or operating its transmission lines…". However, carriers need to obtain the consent of the municipality or other public authority. If, however, the carrier "(43(4)) cannot, on terms acceptable to it, obtain the consent of the municipality or other public authority to construct a transmission line, the carrier or distribution undertaking may apply to the Commission for permission to construct it and the Commission may, having due regard to the use and enjoyment of the highway or other public place by others, grant the permission subject to any conditions that the Commission determines."

The Federal Court of Canada upheld the powers of the CRTC in December 2006 following appeals by a number of municipalities and the Federation of Canadian Municipalities.

Earlier, in 2001, the CRTC had granted a company permission to construct fibre lines in Vancouver without the need to pay occupancy fees. The Industry Canada Telecommunications Policy Review Panel, which reported in March 2006, recommended that the CRTC should be allowed to impose comprehensive access agreements on municipalities, should have responsibility for the siting of antenna towers and that municipalities should not be entitled to obtain any occupancy fees.

For new entrants the legislative and administrative procedures applying to public rights of way are in particular important in that their main competitor, the incumbent telecommunication or cable operator, already has access to public rights of way. Given that there is limited space in the rights of way already used by incumbents, new entrants will have to rely to a large extent on access to public rights of way.

An important question in the context of legal frameworks for rights of way is the extent to which municipalities can prevent new entrants from accessing public rights of way. For example, Stokab in Stockholm has the responsibility to "build, operate and maintain the fibre optic communication network in the Stockholm region and to lease fibre optic connections. The company is competition-neutral and provides a network that is open to all players on equal terms."[37] Although the city provides on request access to dark fibre, undertaking new construction is not allowed, effectively leaving the former monopoly which had historical rights of way and Stokab with control of ducts.

Another important issue is the extent to which cities make, or can make, the rights of way of other utilities (water, sewers, etc.) available to communication entities for their networks. This may partly depend on the control the city has over those rights of way. Linked with this issue is the question of whether public authorities can discriminate among utilities in the provision of rights of way and, in particular, whether municipal utilities obtain preference in obtaining rights of way compared to private entities.

Problems can also arise in developing rights of way when, in contiguous municipal areas, policies of the municipalities differ. This may distort investment strategies of companies laying fibre and slow down their investment plans. A lack of co-ordination between public authorities often results in delays and imposes unnecessary costs on the applicants.[38] For example, in Belgium, new entrants have complained that the lack of a proper co-ordination mechanism between the regions and municipalities is a major problem and constitutes a barrier to market entry. In Belgium, there is in particular a conflict of law between the federal government and the regions (notably Flanders) on the competence and on the legality of charging for rights of way. The federal government takes the view that the regions should not charge for

use of rights of way, but Flanders charges a fee based on parameters such as distance in metres and density of population of the area concerned.[39]

Current legal status in the OECD

Table 2 summarises the legal position, in those OECD countries responding to a questionnaire, with respect to jurisdiction for granting municipal public rights of way for the local loop and the process of settling disputes for public rights of way for the local loop.

The powers available to telecommunication regulators in some countries, such as Austria and Canada, have ensured that telecommunication operators have access to rights of way and can construct ducts with little interference from municipalities. Similarly, the powers granted to telecommunication operators in the United Kingdom in terms of "code power" and in Australia where carriers do not need permission for rights of way for so-called "low-impact facilities" helps in facilitating the roll-out of networks. It is, in particular, important in Federal jurisdictions to ensure that telecommunication operators are not faced with diverse procedures so that the CRTC's powers are in this context very helpful although there has been pressure by municipalities to change this power.

Procedures for settling disputes range from referral to administrative courts to providing the telecommunication regulator with powers to arbitrate or the use of a Telecommunications Industry Ombudsman as is the case in Australia. In Finland, France, Germany, Korea, the Netherlands and New Zealand court procedures are usually used to settle disputes, whereas in Australia, Austria, Canada, Denmark and Portugal the national telecommunication regulator has a role in facilitating the settling of disputes.

Table 2. Legal requirements

Country	Jurisdiction		Dispute resolution
	Other entities	Municipalities	
Australia	The Australian Government has the power to allow carriers to enter land and install low-impact facilities without approval from local authorities under a Schedule of the Telecommunications Act 1997. However, no other public entities have this power.	Generally, access to the rights of way is negotiated directly between the carrier and the utility. So municipalities may have no legal authority to make the ducts of other utilities available to communications entities for their network, and cannot prevent access to public rights of way by companies wishing to invest in new ducts. Nevertheless, where a facility is not a low-impact facility then a municipality can prevent access through its local planning approval process.	Where a person cannot resolve the dispute with the carrier directly, the person can request the Telecommunications Industry Ombudsman to resolve the dispute. Furthermore, if the agreements on terms between the carriers can not made, an arbitrator appointed by the carriers can determine the terms of agreement. Furthermore, if the parties concerned fail to agree on the appointment of an arbitrator, the Australian Competition and Consumer Commission becomes the arbitrator.
Austria	Under certain circumstances the Austrian Telecom Offices or the National Regulatory Authority have jurisdiction for granting rights of way or joint use both for the local loop and other parts of telecom networks.	The municipalities cannot prevent the granting of rights of way but under certain circumstances they can regulate the physical access to their public property, for instance by restricting permission for digging to the specified periods.	Disputes are settled in the case of municipal public rights of way for the local loop by decisions issued by the Telecom Offices or the National Regulatory Authority.
Belgium	Rights of way on public domains can be granted by any authority that is in charge of the public domain in question. This includes for example municipalities, provinces, regions, etc.	There is no relevant legislation regarding the authority of municipalities to make ducts of other utilities available to communications entities for their network and to prevent access to public rights of way. Nevertheless, the authorities concerned have to abide by the rules of due diligence: a refusal must therefore be motivated, non-discriminatory and based on a careful consideration of pros and cons. If not, a claim can be lodged with the Council of State.	Before laying cables, overhead lines and corresponding equipment on the public domain, each public telecommunications network operator will submit the implementation plan and its details for approval by the authority in charge of the public domain. This authority will decide within two months from the day of submission of the plan and will notify the public telecommunications network operator of its decision. After expiry of this term the authority's silence will be taken as consent. In case of persistent disagreement, the matter will be settled by royal decree.
Canada	Telecommunications is an exclusive Federal jurisdiction. The Telecommunications Act provides that Canadian carriers have a right of access to public streets and other public property in order to construct, maintain and operate transmission lines, but shall not break up a highway to construct a transmission line without the consent of the municipality or other relevant public authority.	The municipalities may have no legal authorities both to make the ducts of other utilities available to communications entities for their network and to prevent access to public rights of way, but it is recognised that municipalities have an important role to play in the co-ordination of all parties seeking to occupy and use municipal rights of way, especially the larger municipalities.	Where Canadian carriers cannot obtain the consent of the municipality or other public authority on acceptable terms, they may apply to the Canadian Radio-television and Telecommunications Commission (CRTC) for permission pursuant to subsection 43 (4) of the Act. In addition, municipalities can apply to the CRTC to settle disputes under section 44 of the Act. CRTC decisions are subject to appeals to the CRTC, the Federal Court and the Governor in Council.

Country	Jurisdiction		Dispute resolution
	Other entities	Municipalities	
Czech Republic	The decision on the acquisition of rights of way is made by the relevant Building Authority.	The municipalities can make the ducts of other utilities available to communications entities for their network. The availability depends on bilateral agreements, provision of electronic communication networks for national security purposes, whether activities are in the public interest, etc. Nevertheless, municipalities cannot prevent access to public rights of way by companies wishing to invest in new ducts.	Disputes proceedings are initiated by a petition filed by the public authority, legal entity or natural person by whom the object of expropriation is to be used for the purposes for which it is being expropriated, in accordance with the Building Act. If the body competent for the expropriation proceedings is the petitioner, an appellate body must determine which other Building Authority under its jurisdiction is to carry out the proceedings and issue the expropriation decision.
Denmark	Public entities, other than municipalities, have no jurisdiction for granting municipal public rights of way for the local loop.	The municipalities have jurisdiction for granting municipal public rights of way for the local loop. Nevertheless, it is the fibre-companies who have the infrastructure at their disposal. So, municipalities have no authority to make the ducts of other utilities available to communications entities for their networks.	Pursuant to the Act on the Establishment and Joint Utilisation of Masts for Radio-communications Purposes etc., chapter 3, owners of masts, buildings and structures shall meet requests for access to mount antenna systems on the mast, building or structure in question. The rural zone authority, or in cases where the rural zone authority is not involved, the building authority, may issue an order to give access to mounting antenna systems on masts, buildings and other high structures. Such order may replace, supplement or modify agreements referred to above. In both cases, where there is a dispute over payment for the agreed or ordered access to mounting of antenna systems, the owner who makes an agreement, or who receives an order about this, and any other rights holders, shall receive full compensation as a minimum. The payment obligation shall rest upon the party who has made the request for, or who is given access to, mounting of antenna systems. When failing agreement on compensation, a court of arbitration for which each of the parties shall choose one arbitrator shall settle this. If agreement cannot be reached between the arbitrators, settlement shall be made through an award given by an umpire appointed by the president of the relevant High Court. The

Country	Jurisdiction		Dispute resolution
	Other entities	Municipalities	
			decision under the first and second sentences hereof shall be made on the basis of a proposal from the rural zone or building authority for the intended permission or the intended order. In the two cases where there is a dispute over access to use a third party's areas or payment for this, and mounting of antenna systems will therefore imply expropriation, the rural zone or building authority, before giving its permission, shall submit the case to the National IT and Telecom Agency for the purpose of any subsequent submission to the expropriation commission under the procedure in section 15. The rural zone or building authority's submission of the case to the National IT and Telecom Agency shall contain a proposal for the intended permission or the intended order.
Finland	Other public entities, other than municipalities, have no jurisdiction for granting municipal public rights of way for the local loop.	The municipalities have jurisdiction for granting municipal public rights of way for the local loop. Especially, the municipal building supervision authority can grant the rights of way to the telecommunications operator if the cable route plan meets the general aims. Furthermore, municipalities can make the ducts of other utilities available to communications entities for their network, according to LBA section 161, also prevent access to public rights of way by companies wishing to invest in new ducts, in some special cases or areas like in the example of LBA section 128.	The municipal building authority may order that a decision be complied with before it has become final. If a complaint is filed against the decision, the appellate authority may prohibit the decision from being put into effect until the complaint has been resolved. An appeal may be filed against a building supervision authority to the Administrative Court as provided for in section 190 of the Land Use and Building Act.
France	On public property, a right of way permit is issued, first, by the “préfet” for motorways not operated under a concession and national roads with the exception of structures under concession, second, by the concessionaires on motorways and structures under concession, and third, by the executive body of the local authority or the public intercommunal co-operative body	Local authorities, or groups of local authorities, may become infrastructure operators for service operators or electronic communications service operators in their own right and therefore use these facilities for their own networks in accordance with Article 1425-1 of the General Code for Local Authorities, under certain conditions strictly regulated by legislation. Furthermore, under Article L. 45-1 of the CPCE (Post and Electronic Communications Code), a competent authority may refuse to issue a right-of-way permit or	Any dispute regarding a decision to refuse occupancy of public property is referred to the administrative courts since it questions the government’s powers.

Country	Jurisdiction		Dispute resolution
	Other entities	Municipalities	
	managing the property in accordance with the first paragraph of Article L. 47 of the CPCE.	be party to an occupancy agreement if the resulting occupancy of public property would not be compatible with the designated use, the best interests of utilities and public order (public safety, health, etc.)	
Germany	The enterprises are legally entitled to use public roadways free of charge. On application, they are issued a permit by the Federal Network Agency, the jurisdiction of the agency in charge of road construction, that is, the local authority for municipal roadways and the Federal Road Administration for federal roads, being confined to technical aspects.	There is no special legislation governing the joint use of non-TC ducts. Under general competition law, however, enterprises holding dominant market positions may be required to make their facilities available to requesting operators under certain conditions like a bottleneck situation. Furthermore, Municipalities have no authority to prevent access to public rights of way by companies wishing to invest in new ducts. They are generally entitled to use public roadways free of charge.	In the case of irreconcilable disputes about technical or planning issues (*e.g.* protecting architectural monuments when deploying above ground) between enterprises and municipalities, these can petition the courts (administrative court).
Japan	Public entities other than municipalities have no jurisdiction for granting municipal public rights of way for the local loop.	Municipalities can make their own ducts available to telecommunications carriers for installing telecommunications circuit facilities, in so far as the use of telecommunications carriers does not seriously interfere with the application or purpose of the ducts. In addition, there is no article of municipal authority to prevent access to public rights of way.	Article 129 of the Telecommunication Business Law stipulates that an approved telecommunications carrier may apply to the Minister for the use of private land etc., when negotiations fail to come to an agreement or to start.
Korea	The district office (municipality) has jurisdiction for granting municipal public rights of way. A telecommunication operator should apply to the district office for occupying public roads to install ducts or poles. A telecommunication operator may negotiate to use poles, ducts or rights of way of other public utilities. There are exceptional cases where a telecom operator should apply to the head of the management office for permission for using special areas such as nature parks, etc.	In principle, municipalities cannot make the ducts of other utilities available to communications entities for their network. However, telecommunication operators have rights to ask to use poles and ducts managed by public entities. If terms and conditions are not agreed in three months, the Minister of MIC negotiates with other Ministers who have jurisdiction over these public entities.	There is no legal procedure applied to disputes between a telecom operator and municipality. Because the municipality has superior bargaining power, the telecom operator generally accepts the decision of the district office. If the telecom operator finds the decision of the municipality unreasonable, he may ask for prudence or reduction of fines. If the municipality refuses to adjust the decision, the telecom operator may file a lawsuit against the local government. Then, it is processed as a non-litigation case and takes two or three years to reach a judgment.

Country	Jurisdiction		Dispute resolution
	Other entities	Municipalities	
Netherlands	Rights of way are not granted by municipalities or other public entities; these rights are granted by the telecommunication act. Municipalities and other owners of territory have to allow networks to be installed or removed. There is one exception: if ducts/cables are not used for 10 years, the owner of the ground does not have to allow the presence of cables/ducts in the ground any longer and could demand removal of the cables/duct. It is possible that other public entities, like provinces and water board districts, have to grant permits related to their specific tasks (*e.g.* safety of waterworks). These permits do not concern the granting of rights of way, but the timing of construction, safety measurements, etc. The municipalities have to make sure that their conditions and the conditions of other (possible) public entities are not conflicting.		In case a provider does not agree with the conditions set in the licence he can submit his case to an administrative judge.
New Zealand	Public entities other than municipalities have no jurisdiction for granting public ROW, but public entities responsible for national highway and rail infrastructure have jurisdiction over rights of way with respect to the national highway and rail corridors.	Municipalities have no authority to make the ducts of other utilities available to communications entities for their network and to prevent access to public rights of way by companies wishing to invest in new ducts.	If there is a dispute over the conditions imposed by the local authority or other person who has jurisdiction over the road the network operator may appeal to the District Court in respect of those conditions.
Norway	If the telecommunications network is planned alongside a public owned road, an additional permission is needed from the owner of the road, which could be a Municipality, a County or the Public Roads Authority.	The municipalities can make the ducts of other utilities available to communications entities for their network. Furthermore, municipalities can prevent access to public rights of way by companies wishing to invest in new ducts. For example, if the ducts are not included in the municipality area plan, authorisation will be denied.	If authorisation is denied by a municipality, the denial can be brought to a higher administrative level for consideration. In exceptional circumstances, the Ministry of Transport and Communications may make a decision on or give its consent to expropriation of property rights in order to grant rights of way for the local loop.
Portugal	Municipal enterprises, concessionaires (some of them are not public) and entities under the tutelage, supervision or superintendence of bodies of local authorities may have jurisdiction for granting municipal public rights of way.	The municipalities can make the ducts of other utilities available to communications entities for their network but only in the case of municipal companies. Furthermore, municipalities can prevent access to public rights of way by companies wishing to invest in new ducts, according to the applicable law regarding the power for granting public rights of way.	The telecommunication law foresees a specific procedure for settling disputes between companies who provide publicly available communications networks and services and the concessionaire of the telecom public service. Disputes not involving the concessionaire may also be solved by intervention of the NRA. In these cases, without prejudice to the possibility of either party bringing an action before the courts, the NRA, on request, must give a binding decision to resolve any disputes between undertakings.
Singapore	Singapore is governed by a central government and does not have different municipalities. The same set of rights of way rules therefore applies through the country.		

Country	Jurisdiction		Dispute resolution
	Other entities	Municipalities	
Spain	The competent authority to grant rights of way is the owner of the public domain. Regardless of granting, Spain's General State Administration arranges for the forced expropriation procedure, which is the ultimate procedure conducted when there is no agreement with the owner of the property for the installation of infrastructure. Operators shall be entitled to occupy the private property when it is strictly necessary for the installation of the local loop insofar as provided in the technical project submitted and as long as there are no other economically viable alternatives, either through forced expropriation or through the declaration of forced right of access to install the electronic communications public network infrastructure. As the technical project is being approved, local administrations must grant the necessary urban development licences, which may vary in each case, as well as the licence of activity.	Over the last few years, several municipalities have fostered the integration into service galleries of all the cabling of the different exploiting companies. To such end, a procedure is created through which different service companies must inform the others of the works executed in the public highway, in case they are interested in using the gallery foreseen. However, municipalities cannot prevent access to public rights of way by companies wishing to invest in new ducts, but the non-excessive canalisation works through ordinances intending to avoid excessive concentration in time of works for the installation of service infrastructure is encouraged. Therefore, the shared use of the said infrastructure and co-ordination among the different supplying entities is boosted.	Like all administrative decisions, municipal decisions may be appealed against before the Jurisdiction dealing in cases brought against the State by an individual or Organisation, regulated by Act 29/98, of 13 July, of said Jurisdiction.
Switzerland	Other than municipalities, the cantons may have jurisdiction for granting public rights of way, depending on the respective cantonal laws.	Municipal jurisdiction depends on the legal systems of the cantons and municipalities. They can, however, oblige companies to co-ordinate with other companies planning construction projects within three months of each other and to combine these construction projects. They can also oblige the companies to inquire about other companies' projects. Some municipalities have reacted to bankruptcies of telecommunication providers by preventing access to public rights of way for longer periods (up to five years after a street has been rehabilitated).	The way disputes are settled depends on the canton. As a general rule, one can appeal to the administration that takes the original decision. After that, the appeal goes to a court of justice.

Country	Jurisdiction		Dispute resolution
	Other entities	Municipalities	
United Kingdom	The legislation grants general planning permission and/or powers at a national level to bodies specified in the respective legislation. Where a proposed development is not covered by these powers then operators may have to apply for planning permission to undertake developments. Individual local planning authorities will then consider the planning application based on the details of the individual application and grant or refuse approval.	Regarding municipal authorities, there are no legal powers to require sharing of ducts, but operators have a statutory duty to co-operate with the street authority and other operators. Street authorities would encourage operators to share ducts if an opportunity presented itself. In addition, the Secretary of State and local planning authorities have powers under the General Permitted Development Order (GPDO) to withdraw the general planning permission.	In terms of planning, where operators do not have general planning permission to undertake development (*i.e.* where no permitted development right exists) then the operators can apply for planning permission to local planning authorities. If permission is refused then operators will have a right of appeal to the Planning Inspectorate, (which acts on behalf of the Secretary of State for Communities and Local Government) which will determine the case.
United States	Public entities other than municipalities have jurisdiction over rights of way, such as tribal governments in the case of tribal lands, or the federal government in the case of federal lands.	Regarding municipal authority, this would depend upon the relevant state or local law.	The disputes regarding access to public rights of way typically are addressed at the state or local level. To the extent that a state or local government's regulation of rights of way prohibits or has the effect of prohibiting the ability of any entity to provide any interstate or intrastate telecom service, the affected party could file a petition with the FCC to pre-empt that decision pursuant to section 253(a) of the Communications Act. In addition, the disputes regarding pole attachments regulated by the FCC are dealt with through complaints filed with the FCC.

Policy Considerations

In order to ensure the clarification of jurisdiction for granting public rights of way, it is important for governments and/or regulators to be clear on which entity has jurisdiction for granting public rights of way permits, and which entity is responsible for setting disputes. For the clarification of jurisdiction between federal/central government and local government, one way is to confer jurisdiction for granting public rights of way to the federal/or central government:

- Either by prescribing special rules for the granting of rights of way in telecommunication-specific legislation, as in the case of Canada and Austria.

- Or by giving "Code powers" to communication network providers as in the case of the United Kingdom.

In many countries it may not be possible to reduce the powers of municipalities for political or constitutional reasons. In such cases providing more autonomy to network providers, such as using the option of designating certain facilities as "low impact facilities" whereby no permit is required, as used in Australia, can be useful. In addition, by providing the regulator with powers to require the sharing of ducts and conferring full authority to local government to make the ducts of other utilities available to communications entities for their network would also facilitate the roll-out of new networks and help reduce costs.

In the context of resolving disputes the option of using the court system, while it may be important as a last resort, is often costly and lengthy. Using the national telecommunication regulator, or an Ombudsman, can speed up the process of resolving disputes.

3. Administrative issues

An important factor affecting access to public right of way permits relates to whether there are any centralised information points where network investors can easily access information on rights of way procedures and how transparency on procedures to provide permission to use or construct rights of way is ensured. Normally, to apply for permission to construct rights of way in the public domain information is needed on the appropriate contact point or agency concerned (preferably through having a 'one-stop shop'), information on application forms, fees, and other permit requirements is also needed.[40] In this respect, the accessibility and quality of general information available are critical for applicants to obtain public right of way permits. Complaints often cite that potential applicants encounter a confusing set of regulations and incomplete information to apply for permits. The resulting uncertainty can cause delays and slow down the pace of FTTH deployment and is likely to impact more on new entrants who have fewer legal resources to untangle different procedures.

Although most public authorities require relatively similar information from public rights-of-way applicants, their procedures for collecting information appear to vary widely. As a consequence, when investing in a network which crosses a number of different municipalities, applicants may be required to provide the same information but in different formats for different public authorities, which can cause applicants to spend unnecessary time and resources to satisfy administrative requirements.[41]

While municipalities should have the right to invest in networks this should not be used to pre-empt other operators from entering the market. The example given earlier of Stokab in Stockholm is a case in point – even though Stokab provides dark fibre on a non-discriminatory basis, the city has prevented other companies from investing in the city reducing the effectiveness that potential market entry may have on the market. In the case of Milan in 1998, a 9 month delay (retroactive ban of 2 years) prevented new entrants

from building networks, while a city-owned utility was constructing ducts for telecommunications purposes.[42]

Current administrative status in the OECD

Table 3 summarises the current status of administrative issues on both setting up a streamlined administrative procedure for application of access to public rights of way in the local loop and securing any system of safeguards ensuring a deadline to receive public rights of way permits for investment in telecommunications local loop.

A streamlined administrative procedure can be put into place either at the national government level or in local legislation. At the national level, telecommunication specific laws can prescribe transparent, swift, and non-discriminatory procedures. At the local level, local authorities are in some countries required to have their own guidelines or codes of practice for rights of way, while in some cases a centralised website is used for providing information on right of way permit requirements. There are diverse systems in place with respect to setting deadlines to receive public rights of way permits for investment in the local loop with the delay time ranging from 14 days to no deadline.

Table 3. Administrative requirements

Country	Procedure	Deadlines
Australia	Under Australian Government legislation, carriers are permitted to install low-impact facilities without the need to obtain local government planning approval.	Where new infrastructure falls outside the guidelines of the low-impact facilities legislation, carriers will need to seek local government approval.
Austria	The Austrian Telecommunication Act (TKG 2003) prescribes that the applicant has to provide the owner with detailed information about the structures to be installed, enclosing a sketch.	N/A
Belgium	There is no relevant legislation regarding both setting up a streamlined administrative procedure for application of access to public rights of way and any system of safeguards ensuring a deadline to receive public rights of way permits for investment in telecommunication local loops.	
Canada	There is no federal legislation, however, Canadian municipalities have their own guidelines and codes. The Federation of Canadian Municipalities is best suited to provide the information.	There is no system of safeguards ensuring a deadline to receive public rights of way permits.
Czech Republic	Municipal public rights of way for the local loop are covered in general terms within the public rights legislation.	There is a system of safeguards in place which ensures that deadlines for decisions concerning ROW permits are respected Under Section 116(1) of the Building Act.
Denmark	The relevant legislation is the Act on the Establishment and Joint Utilisation of Masts for Radio communications Purposes etc., the Building Act, the Planning Act, and the Nature Protection Act. In the area of Telecoms legislation, NITA is responsible for the Act on the Establishment and Joint Utilisation of Masts for Radio communications Purposes etc. and the Act on Cable Laying Access and Expropriation etc. for Telecommunications Purposes. The NITA's website contains relevant information, including a guide elaborating information about relevant legislation, information about the networks and network planning and examples of typical mast cases.	There is a system of safeguards in place, which ensures that deadlines for decisions concerning permits are respected. The Act on the Establishment and Joint Utilisation of Masts for Radio communications Purposes etc., chapter six, §§ 22-24, fixes access to complaints, including the review processes.

Country	Procedure	Deadlines
Finland	Only if the parties do not reach an agreement on the installation of a telecommunications cable in an area owned or controlled by another, does the operator have an obligation to do a cable route plan.	In cable installation the notification procedure is used. For example, building or other activity may begin if the local building supervision authority does not, within 14 days of receiving the notification, require an application for a permit for the project concerned to be made. (TMA Section 129)
France	Public network operators benefit from a right-of-way on public highways in accordance with the CPCE. Procedures for access to the public highway are specified in the CPCE. Specifically, the CPCE sets the maximum fees payable for occupancy of a public highway. On public property other than highways, concessionary authorities or the manager of public property other than highways providing access for electronic communications network operators must do so "under transparent and non-discriminatory conditions."	Regarding the deadlines, in accordance with Article L. 47 of the CPCE, the competent authority must deliver its decision within two months of the application for a permit.
Germany	Besides the TKG provisions, which specify the basic right of free use and comprise framework regulations on use, the German Association of Towns and Municipalities has published recommendations in co-operation with the Federal Network Agency that include specimen contracts as well as rules of procedure.	There is no system of safeguards ensuring a deadline to receive public rights of way permits. Use is always free of charge.
Japan	The legislation setting up a streamlined administrative procedure for application of access to public rights of way is stipulated in Articles 128 and 129 of the Telecommunication Business Law. Furthermore "The Guidelines for Use of Poles, Ducts, Conduits and Similar Facilities Owned by Public Utilities" functioning as a managerial standard for the provisions of the Law, was formulated in 2001 and the Guideline was amended in 2007 to add the provisions regarding facilitation of procedures for promoting installation of lines for the last mile.	Under Article 129 of the Telecommunication Business Law, the approved telecommunications carrier may apply to the Minister to obtain the right to use the land etc., when negotiations fail to come to an agreement or to start with owners of the land etc.. In addition, the provision awarding the rights of way shall specify the time of the commencement of use is stipulated in the article 132 paragraph 2 item3 of the Law.
Korea	A telecom operator can apply for public right of way via Internet (hidig.seoul.go.kr) with authentication. In addition, by changing Section 16 of the Acting Rules of Law on Public Road in January 2006, a telecom operator is exempted from the submission requirement of a design sketch of the construction and the written opinion of managing officer of the underground facilities when the telecom operator submit the construction plan. The City of Seoul is now operating an electronic system of digging and restoration of public roads. This system handles all the processes related to digging and restoration of the public roads on the Internet.	There is no system of safeguards ensuring a deadline to receive public rights of way permits. In the Acting Rules of Law on Public Road, the District Office's deadlines for whether the telecom operator is granted the right to occupy the public road to install telecom facilities are set for each type of construction and area; for example, in the case of general occupation of a public road the deadline is within 5 days, in the case of a temporary occupation of the public road within 2 days, in the case of installation of an advertisement tower within 4 days, and in the case of installation of manufactured items within 10 days.

Country	Procedure	Deadlines
Netherlands	The General Administrative Act provides rules concerning decisions of administrative bodies such as rules about procedure and hearing of involved parties. In general, the municipality has to decide within eight weeks after the moment the operator has formally announced that it wants to install a network. If the operator does not agree with the conditions of the licence, it can demand that the municipality reconsider its decision within six week. If the operator does not agree with the renewed decision, it can submit the case to an administrative court.	The rules guarantee that there is a decision within a reasonable time. In addition to these, the Telecom Act rules that the date on which the operator is allowed to perform the works is no later than 12 months after the date he formally announced that he wanted to install a network.
New Zealand	Local authorities are required to have codes of practice for access to roads by persons such as telecommunications network operators.	There is no regulation for the deadlines.
Norway	There are general rules on administrative procedure and deadlines in the provisions of the Norwegian Public Administration Act (Act of 10 February 1967).	
Portugal	The Communications Law only foresees that procedures for the granting of rights of use shall be transparent and duly published, applied without discrimination and without delay, and the attached conditions to any such rights shall follow the principles of transparency and non-discrimination. Article 24, nr. 4 obliges all authorities with legal power over public domain to elaborate and publish transparent, swift and non-discriminatory procedures as regards the exercise of public rights of way. Furthermore, the various determinations and decisions made by National Regulatory Authority, which resulted in the creation of a reference offer to access the incumbent's duct known as ORAC.[43]	There is no sector-specific legislation for the deadlines, but ORAC established deadlines and other relevant quality of service parameters.
Singapore	For access to existing telecommunication infrastructure, the Reference Interconnection Offer gives detailed instructions on the procedure to order and request the provisioning of rights of way infrastructure/facilities from the incumbent operator. Standard application forms with clear application fields (*e.g.* type of infrastructure/faculties required) is also provided in the Reference Interconnection Offer. For access to public roads, the Code of Practice for Road-opening Works gives detailed instructions on how to apply for a road opening. Standard road opening application forms with clear application fields (*e.g.* contractor's details, type of road works necessary etc.) are provided in the Code of Practice. A check-list on other documents which operators have to submit with the application forms (*e.g.* maps of area of evacuation, work schedule, insurance policies etc.) is also provided.	For access to rights of way infrastructure owned by the incumbent operator, the Reference Interconnection Offer states the Service Level Guarantees which the incumbent operator must provide and the financial compensations which are due to the requesting operators for the failure to meet the Service Level Guarantees. As an example, the incumbent is required to notify requesting operators of the outcome of some of their application requests within 1 business day from the day of the application request, or financially compensate the requesting operator at rates proportional to the period of delay. For access to public roads, It is indicated in the Code of Practice for Road Opening that the Land Transport Authority will take up to seven days to approve a road opening request upon the receipt of a complete application which complies with the Code of Practice.

Country	Procedure	Deadlines
Spain	All procedures followed in all public Administrations, including those related to the granting of rights of way, comply with Act 30/1992, of 26 November, on the Legal Regime of Public Administrations and Common Administrative Procedures.	The administrative procedures followed by each of the Administrations involved in this process must abide by Act 30/1992, of 26 November, on the Legal Regime of Public Administrations and on Common Administrative Procedures and, therefore, the deadlines provided therein must be observed. Furthermore, the Sector-based Commission for the Deployment of Radio communication Infrastructures (created as a result of the General Telecommunications Act and where the federal, regional and local Administrations are represented) has created a single reference procedure for dealing with the dossiers of radio communications installations. This procedure includes the deadlines and the competent authorities for the purpose of dealing with the different formalities involved. This is aimed at reducing deadlines by conducting different actions at the same time. However, the application of this procedure is voluntary for local Administrations.
Switzerland	The Telecommunications Law requires that administrative procedures be streamlined. The execution of this requirement varies from one municipality to another. Procedures can take as little as two weeks. Sometimes they take over a year.	The system of safeguards depends on the legal systems of the cantons and the municipalities.
United Kingdom	In terms of acquiring Code powers, Code power applications have no fixed deadlines, but on average take 8-10 weeks from the point of application to Ofcom.	In terms of street works, statutory operators must give notices of work within timeframes set out in regulation, which currently depends on the nature of works.
United States	The access to public rights of way typically is regulated at the state or local level. To the extent that there are streamlined procedures and specific deadlines, they would depend upon the relevant state or local law. For instance, pole attachments regulated by the FCC must be either granted or denied within 45 days (47 C.F.R. § 1.1403(b) of the Communications Act.	

Policy Considerations

In order to secure the harmonised and consistent administrative procedures for the access to public rights of way, it would be helpful to set up a clear roadmap on how to obtain public rights of way permits by creating a centralised information point by using a central web portal and updating individual agency web sites and link them to the central web portal. The Australian concept of so-called low-impact facilities,[44] whereby the carriers are permitted to install facilities without the need to obtain local government planning approval, can be particularly important to prevent confusion when municipalities try and impose varying requirements. At the same time the concept of low-impact facilities encourages carriers to roll out networks using components that fall within strict type, size, colour and location limitations, thereby minimising the impact of telecommunications infrastructure on the community.

Delays in rolling-out networks can be costly for operators, and can delay the development of competitive markets. To prevent delays in the application process for rights of way, a system of safeguards is required which ensures that deadlines for decisions concerning permits are respected. Establishing

targeted time frames for various steps of the ROW process helps in providing predictability to the applicant, and provides agencies with a way to measure their performance.

4. Financial issues

An important factor affecting the access to public rights of way is the financial cost of access to and use of rights of way. Table 4 summarises the system of compensation for access to and use of municipal public rights of way which would apply to the local loop in some OECD countries. In some countries, new entrants are charged fees for municipal rights of way whereas the incumbent, based on its historical monopoly franchise, is not subject to fees for rights of way. In several countries public rights of way are not subject to payment (Denmark, Germany, Luxembourg, Austria, Finland, the United Kingdom).[45] In France and Italy payment is determined at the local level and may vary substantially at that level.[46] However, even though the use of public rights of way may not be subject to usage charges, in some countries (Germany, Denmark, and Luxembourg) fees are imposed, aimed at recovering costs which can be high.[47] Some local governments also assess charges that reflect the market value of the public rights of way used by communication facility providers. The term "market value" in this context implies fees which are above cost. In some countries municipalities have charged facility providers revenue-based fees, which evidently have no relationship with the costs incurred by municipalities. Such fees would be reflected in any usage charges of the communication service provider, so indirectly constitute a tax on the residents of the municipality.

Table 4. Financial requirements

Country	System of financial compensation
Australia	There is no legislative requirement for compensation for access to installing new infrastructure with the exception of where a person suffers financial loss or damage because of anything done by the carrier. In such a case compensation is payable as agreed between the parties or as determined by a court of competent jurisdiction. Carrier licence conditions require carriers to provide access to their towers and underground ducts to other carriers on terms agreed between the parties or, failing agreement, determined by an arbitrator appointed by the carriers. If the parties fail to agree on the appointment of an arbitrator, the Australian Competition and Consumer Commission becomes the arbitrator.
Austria	Providers of a communications network are entitled to demand rights of way on public property, such as streets, footpaths, public places and the airspace above, with the exception of public water facilities, free of charge and without special authorisation. This basically also applies for rights of way concerning the local loop. Private property owners otherwise are entitled to demand compensation corresponding to the loss in value.
Belgium	For the right of use, the authority may not impose any tax, levy, dues or fees of any kind upon the public telecommunications network operator concerned. Moreover, every public telecommunications network operator disposes, free of charge, of a right of way for cables, overhead lines and corresponding equipment on public or private building sites, which are laid on the public domain (article 98 of the Act of 21 march 1991). Nevertheless, the authorities concerned may ask the operators for compensation of the costs incurred.
Canada	In its Telecom Decision CRTC 2001-23,[48] issued on January 2001, granting Ledcor access to municipal rights of way, the CRTC ruled that Vancouver was entitled to recover causal costs only, such as plan review and inspection fees, relocation costs, pavement restoration and lost productivity, but it was not entitled to collect fees for the right to use those rights of way (economic rent). The CRTC stated in its reasons that, while its decision was based on the particular facts of the case, the causal costs principle would assist municipalities and carriers in negotiating the terms on which municipal consent would be given for carriers to construct, maintain and operate transmission lines on municipal property. The decision was appealed to the Federal Court of Appeal which upheld the CRTC ruling and in 2003 the Supreme Court of Canada refused to hear a federation of Canadian Municipalities appeal.

Country	System of financial compensation
Czech Republic	Under Section 111(1) and (2) of the Building Act, the entity or person whose property has been expropriated is entitled to compensation of an amount corresponding to the usual price of the land or of the building or structure, including all and any appurtenances thereto, if the ownership title has been withdrawn, or of an amount corresponding to the price of the right of way if the ownership title was limited by establishing the right of way or if a right corresponding to the right of way has been withdrawn or limited. In addition to these compensations, the entity or person is entitled to reimbursement for the costs of moving away, costs of changing the place of business and any other such costs as may be reasonably incurred by the entity or person being expropriated due to and in connection with the expropriation. The method of determination of such compensations, and the amounts thereof, must correspond to the financial damage suffered by the expropriated entity or person as a result of the expropriation. In the event that the usual price is lower than the price determined on the basis of price provisions, the compensation should be in the amount of the price determined on the basis of the price provisions.
Denmark	When applications or notifications of placing cables and siting masts are similar to ordinary planning and building cases, the municipality in question may charge for the review process. These fees must be made public on the municipality's website. Additionally, the municipalities can ask the companies to contribute with suggestions to the district plan and hereby carry expenses on to the companies.
Finland	Only a fee concerning supervision measures and other official duties must be paid to the local authority, in accordance with a tariff approved by that authority.
France	The fees for public highway usage by electronic communications operators are set by the local executive authority within the limits stipulated by Article R.20-52 of the Code and in accordance with the criteria set out in Article R.20-51. The decree allows some leeway at the discretion of the authorities, as follows; first, the authority may set fees at the level it wishes. It must balance revenues against the indirect advantages of promoting the development of electronic communications in its jurisdiction; second, the very principle of a fee for the use of public property enables the local authority to require land use plans, which will facilitate any subsequent infrastructure sharing; third, the Decree opens the door to differential duct fees depending on occupancy, which is an option for identifying reserve capacity and for providing an incentive to operators to manage resources economically.[49] The total fees take into account the duration of occupancy, the rental value of the location occupied and the material, economic, legal and operating advantages to the permit-holder. The manager of public property can set a lower fee for unoccupied than for occupied ducting. The sum of these fees is paid to the property manager or concessionaire in accordance with the conditions set in the right-of-way permit of article R. 20-51 of the CPCE.
Germany	There is no article directly stipulating financial compensation for access to and use of municipal public rights of way. Use is always free of charge. Only a small fee may be charged for granting permission to install cables (technical specifications).
Japan	There is no article directly stipulating financial compensation for access to and use of municipal public rights of way.
Korea	The fee for an application for occupying a public road is USD 1.00 per case. The restoration of the excavated road is performed by the district office at the cost of the telecom operator to prevent moral hazard of the telecom operator after installing ducts or poles. A telecom operator must pay charges for occupying public roads according to Section 43 of the Law on Public Roads. Section 26-2 of the Presidential Order on the Law on Public Roads describes how to calculate charges for occupying public roads, which varies according to areas (Seoul, other metropolitan areas, and non-metropolitan areas) and facilities (poles, public payphone booth, ducts, and other facilities). Section 44 of the Law on Planning and Use of National Land requires that a telecom operator obtain permission from the head of the District Office to occupy common utility pipe conduit for telecom, gas, electric power, water or sewage, and pay the charges for occupying the conduit determined by the decree of the district office. It is also possible to use the wall space of the subway system after negotiation with Seoul Metro. However, the usage is minimal because the charge is much more expensive than that set by the district office.
Netherlands	If a provider wants to use a third party's network, this third party has to share its network if it is technically possible. Charging for it may be possible, but there is no compensation system. When applications or notifications of placing cables and sitting masts are similar to ordinary planning and building cases, the municipality in question may charge for the review process. These fees must be

Country	System of financial compensation
	made public on the municipality's website. Additionally, the municipalities can ask the companies to contribute with suggestions to the district plan and hereby carry expenses on to the companies.
New Zealand	There is no legislative requirement for compensation for access to installing new infrastructure.
Norway	The system of taxation and other financial burdens on network owners is different from municipality to municipality. There is no common approach to financial compensation for access to and use of municipal public rights of way which would apply to the local loop. The compensation is based on the value of alternative use of the land or rights.
Portugal	There is no specific rule requiring financial compensation for access and use of municipal rights of way to the local loop. For access and use of municipal public rights of way the law foresees a municipal fee for rights of way – MFRW.[50] The rights and charges as regards implanting, crossing or passing over of systems, equipments and further resources of undertakings providing publicly available electronic communications networks and services, at a fixed location, of a public or private municipal domain, may give rise to the establishment of that municipal fee. In municipalities where the MFRW is collected, the undertakings who provide publicly available electronic communications networks and services, at a fixed location, shall explicitly include the amount due in the bills to their end-clients.
Singapore	Access to the incumbent's rights of way infrastructure/facilities is charged in a cost-based manner. Rates can be referenced from Schedule 9 (Subsection 5) of the Reference Interconnection Offer which is available at IDA's website. Access to building owners' facilities as spelt out in the Code of Practice for Info-communications Facilities in Buildings (COPIF) is made available without charge. For road excavations, the Land Transport Authority levies an administrative charge to process applications. Operators are also made responsible for repairing the roads after the works.
Spain	The general tax levying capacity corresponds to local entities, pursuant to the local tax agencies' law, whereas fixing rates per licence corresponds to what the respective tax ordinances of local Entities provide for. The rates fixed in the General Telecommunications Act correspond to the General State Administration and have nothing to do with local taxes. On the other hand, the Local Tax Agencies' Regulating Act (Royal Decree 2/2004, of 5 March, wherein the revised text of the Local Tax Agencies' Regulating Act is approved) provides for the method to calculate the rates foreseen for exclusive use or for exploitation of the local public domain.
Switzerland	Financial compensation may only cover the costs of the municipal public rights of way.
United Kingdom	The telecom-related legislation and regulation does not specify any financial compensation for access to and use of municipal public rights of way which would apply to the local loop. Code operators are, however, required to put in place funds (a bond, insurance policy or other financial instrument) to meet any specified liabilities to protect Highways Authorities against incomplete street works. The specified liabilities would arise should a Code operator cease to trade and leave apparatus on, under or over public highways. The Highway Authority may choose to remove the apparatus or need to reinstate the public highway and would be able to claim against the funds put in place by the Code operator to cover its costs in removing the apparatus or reinstating the public highway. In terms of planning for access to and use of municipal public rights of way, applicants have to pay fees to local planning authorities to consider applications for prior approval and planning permission. However, such fees are to enable the local planning authority to provide a good quality service – they are not intended as compensation for access to a right of way. For street works, under a permit system operators will be charged per permit they apply for. This fee is to cover the costs involved in issuing a permit and co-ordinating the works with others in the locality, which insure that a number of different works, by different utilities, are not taking place at the same time in close vicinity to each other. Permit fees are only intended to cover the cost to the local highway authority of administrating utility led street works. Fees should not be set at a level which generates surplus revenue for the local highway authority; this is regulated by the Department for Transport which sets the maximum fee limits. Therefore, permit fees are not compensation but allow local authorities to mitigate some of the disruption caused by the works.
United States	Section 224 of the Communications Act specifies "just and reasonable" rates for attachments by telecommunications carriers to provide telecommunications service and for attachments by cable television systems used solely to provide cable service. The system of compensation specified by section 224 is based on an allocation to the attacher of a portion of the costs associated with the

Country	System of financial compensation
	usable and unusable space on the pole. The FCC uses these rate formulas when the parties are unable to resolve a dispute regarding the attachment rate themselves.

The CRTC in Canada has questioned the concept that there is a "market" for underground public rights of way and, on this basis, argues that monthly "occupation" charges should not be paid by telecommunication entities. Canada municipalities have argued that telecommunication carriers are "for profit" companies and as such should compensate municipalities for use of rights of way. The Federation of Canadian Municipalities has developed a draft Model Access Agreement for users of public rights of way. The Model Agreement puts forward the principle, *inter alia*, that "municipal governments must recover all costs associated with occupancy and use of rights-of-way," and that "recognising that rights-of-way have value, municipal governments must receive full compensation for occupancy and use of municipal rights-of-way". [51]

Although it is evident that communication entities that dig up streets need to ensure that the public facilities are returned to their original state, it is less evident that occupancy of public property causes costs, which need to be recuperated through monthly charges. In many cases monthly charges assessed are a "per kilometre" charge. Weighed against this is the public interest in having access to fibre and broadband services at low cost and ensuring that the market has more than one access provider. Many municipalities have themselves invested in fibre networks because they have concluded that broadband networks help in economic development and value creation. The contrary argument used by some municipalities is that charging below "market rates" (however this may be defined) provides the communication sector with benefits which are not warranted and deprives taxpayers of a fair return on municipal resources. Municipalities making these arguments tend to ignore that the network investor will pass on charges to their customers who are also taxpayers in the same municipalities.

Given the costs of constructing new public rights of way conduits it is clearly important for the industry how levels of compensation for access to public rights of way, if any, should be determined. Clearly, unreasonable charges for use of the rights-of-way will impede FTTH deployment.

Policy considerations

It is clear that in order to reduce cost in the construction of fibre to the home, governments and/or regulators should attempt to ensure that any fees associated with using public rights of way should be reduced or eliminated. In addition, the rights of way applicants should be subject to a minimum set of obligations for remediation and maintenance.

Countries are using various methods to determine the system of compensation for using public rights of way. These include:

i) Determining the maximum pole attachment rate for both cable television systems and telecommunications carriers as well as the conduit rate applicable in either case as in the case of the United States (See Box 2).

Box 2. US: Pole attachment formulae

Many pole attachment complaints allege that the annual rates charged for attachments are not just and reasonable. As directed by Congress, the FCC has devised formulae for calculating the maximum lawful rate that can be charged for attachments. Rates for cable television system attachments are governed by a different formula than telecommunications attachments.

The FCC applies the following formula to determine the maximum allowable annual pole attachment rate for cable television systems that do not also provide telecommunications services:

$$\text{Maximum Rate} = \text{Space Factor} \times \text{Net Cost of a Bare Pole} \times \text{Carrying Charge Rate}$$

$$\text{Where Space Factor} = \frac{\text{Space Occupied by Attachment}}{\text{Total Usable Space}}$$

where Space Occupied is presumed to be one foot, Usable Space is presumed to be 13.5 feet and Pole Height is presumed to be 37.5 feet.

The FCC applies the following formula to determine the maximum allowable rate for pole attachments that provide telecommunications services:

$$\text{Maximum Rate} = \text{Space Factor} \times \text{Net Cost of a Bare Pole} \times \left[\text{Carrying Charge Rate}\right]$$

$$\text{Where Space Factor} = \left[\frac{\left(\text{Space Occupied}\right) + \left(\frac{2}{3} \times \frac{\text{Unusable Space}}{\text{No. of Attaching Entities}}\right)}{\text{Pole Height}}\right]$$

where Space Occupied is presumed to be one foot, Unusable Space is presumed to be 24 feet and Pole Height is presumed to be 37.5 feet.

The FCC applies the following formula to determine the maximum allowable conduit rate for cable television systems and providers of telecommunications:

$$\text{Maximum Rate per Linear ft./m.} = \underbrace{\left[\frac{1}{\text{Number of Ducts}} \times \frac{1\ \text{Duct}}{\text{No. of Inner Ducts}}\right]}_{\text{(Percentage of Conduit Capacity)}} \times \underbrace{\left[\text{No. of Ducts} \times \frac{\text{Net Conduit Investment}}{\text{System Duct Length (ft./m.)}}\right]}_{\text{(Net Linear Cost of a Conduit)}} \times \text{Carrying Charge Rate}$$

where the number of ducts is presumed to be two. Simplified as:

$$\text{Maximum Rate Per Linear ft./m.} = \frac{1\ \text{Duct}}{\text{No. of Inner Ducts}} \times \frac{\text{Net Conduit Investment}}{\text{System Duct Length (ft./m.)}} \times \text{Carrying Charge Rate}$$

where the number of ducts is presumed to be two.

ii) Determining the total annual fees, depending on duration of occupation, advantages to the permit-holder and rental value of the location occupied as in the case of France (See Box 3).

Box 3. France: The Total Annual Fees

The total annual fees, determined in each case in accordance with Article R. 20-51, depending on duration of occupation, advantages to the permit-holder and rental value of the location occupied shall not exceed:[52] (Article R. 20-52 of the CPCE)"

Ⅰ. Public property (highways):

1. For use of ground or under ground level, per kilometre, per cable: EUR 300 for motorways; EUR 30 for the rest of the road network.
2. In other cases per kilometre, per cable: 40 EUR.
3. For facilities other than radio stations: EUR 20 per m^2 of surface area. No charge applies for land-take for supports for cables mentioned in 1 and 2.

Ⅱ. Public property other than highways, excluding maritime property:

a) Public property (rivers):
   1. For use of ground and underground level, per kilometre and per cable: EUR 1 000.
   2. In other cases per kilometre and per cable: EUR 1 000.
   3. For facilities other than radio stations: EUR 650 per m2 of surface area. No charge applies for land-take for supports for cables mentioned in 1 and 2.

b) Public property (railways):
   1. For use at ground or underground level, per kilometre and per cable: EUR 3 000.
   2. For other cases, per kilometre and per cable: EUR 3 000.
   3. For facilities other than radio stations: EUR 650 per m² of surface area. However, no fee applies for the land-take for supports for the cables mentioned in 1 and 2.

c) On other annexes of public property other than highways:
   1. For use of ground and underground level, per kilometre and per cable: EUR 1 000.
   2. In other cases per kilometre and per cable: EUR 1 000.
   3. For facilities other than radio stations: EUR 650 per m^2 of surface area. No charge applies for land-take for supports for cables mentioned in 1 and 2.

iii) Using the concept of MFRW (Municipal Fee for Rights of Way) which is determined on the basis of the application of a percentage on each bill issued by undertakings providing publicly available electronic communications networks and services, at a fixed location, to all final clients of the corresponding municipality as in the case of Portugal.

5. Regulatory issues

As identified above the two main high cost items for deploying FTTH are the civil engineering works and in-house wiring. These can be considered as bottlenecks restricting the deployment of FTTH. The incumbent operator normally owns ducts inherited from its historical monopoly and as a result is in a more advantageous position so that the requirement to have access to ducts is mainly an issue for new market entrants and facilitating duct sharing could significantly reduce the corresponding costs for new entrants.

With regard to the in-house wiring, it is doubtful that there will be more than one rolling out of in-house wiring because of costs, lack of space in cable trays, and refusal of co-ownership property representatives to grant access to more than one operator. Furthermore, there are risks of pre-emption of this facility by the first operator reaching the building. Thus, sharing of the in-house wiring is crucial for facilitating the roll out of fibre to the home.

Nevertheless, there are operational difficulties in sharing mainly arising from issues of security and shared liability. In the United Kingdom, even though Ofcom has powers under Section 73(3) of the Communications Act 2003 to impose access-related conditions including sharing of infrastructure and is, therefore, the responsible authority, it has chosen not to exercise these powers as operators and local authorities who are responsible for the maintenance of public highways have not indicated significant interest in infrastructure sharing. Moreover, concerns have been raised about potential network integrity issues – many operators having access to the same trench and duct could result in unintentional damage to another operator's infrastructure. Therefore to date, Ofcom has taken a soft approach to infrastructure sharing.

Furthermore, depending on both the network topologies and the cost-related factors associated with different FTTH architectures, local loop unbundling may be easy for some FTTH applications, or difficult for the others In detail, in point-to-point FTTH solutions, it may be possible to unbundle the local loop in a manner very similar to that used today for copper, that is full local loop unbundling can occur at the ODF. On the contrary, in a point-to-multipoint solution (a shared infrastructure topology using PON (passive optical network)), it is not possible to associate a single physical element of connectivity with a particular end user. Nevertheless, one of the primary drivers for deployment of PON FTTH is the absence of active electronics between the provider's central office and the customer, which in some cases has facilitated as much as about an 80% decrease in maintenance costs over a copper architecture covering the same territory. Thus, for the implementation of local loop unbundling in FTTH applications, it is necessary to take into consideration both technical difficulties associated with providing last mile access and cost-related factors. In this regard, some OECD countries have determined not to impose unbundling, considering that there are costs to unbundling, even though they found it appropriate to unbundle these networks, while a number of OECD countries have decided to use local loop unbundling as a tool to stimulate competition in the local access market.

However, under certain network architectures it may be necessary for new entrants to connect at the curb (street cabinet). If this is the case access to rights of way will become crucial for new entrants since they will have to build their network out to the street cabinets. In addition, if LLU takes place at the street cabinet it may be necessary to increase the size of street cabinets or to have more than one cabinet. This again will be an issue where the availability of rights of way will be important.

An important consideration which needs to be examined for sharing of ducts and of the end part of the fibre loop is how best to facilitate new entrants in accessing subscribers given that incumbents already have access to rights of way and given the high cost in constructing ducts in municipalities. There are a number of potential solutions in order to facilitate more competition in the construction of local loops and move away from a service competition model or a duopoly model based on existing telecommunication and CATV competition.

Current regulatory status in the OECD

Table 5 shows the current status of regulatory issues on sharing fixed incumbent telecommunication and cable municipal ducts with new entrants and access to private multi-dwelling buildings for the purpose of providing in-house wiring for communications networks in a number of OECD countries.

With respect to sharing of ducts most countries have specific requirements in their telecommunications legislation covering the sharing of municipal ducts with new entrants on a non-discriminatory basis or on a technologically neutral basis. Furthermore, even though there is no legal requirement for sharing, the establishment of Public Utility Coordinating Committees (PUCC) as in the case of Canada or the co-operation between municipalities and the electricity supply companies as is the case of Denmark, are supported and encouraged for the purpose of duct sharing.

In a number of countries there are no legal or regulatory provisions with respect to access to private multi-dwelling buildings for the purpose of providing inside wiring for communication networks. Nevertheless, some countries have legal provisions or guidelines for in-house wiring with notable features such as low-impact facilities in Australia; permitting in-house wiring by a majority vote of all of the co-owners of the building in France; granting in-house wiring by regulating a building to be mandatorily equipped with LAN facilities in Korea; and adopting different regulation based on the type of in-house wiring like home wiring and home run wiring in the United States.

Table 5. Regulatory requirements for duct sharing and in-house wiring

Country	Duct sharing	In-house wiring
Australia	With respect to a carrier obtaining rights of way access to existing infrastructure of another carrier, a standard carrier licence condition is that a carrier must provide another carrier with access to its telecommunications transmission towers, the sites of telecommunications towers, and underground facilities that are designed to hold lines.	The Telecommunications (Low-impact Facilities) Determination 1997 (Amendment No. 1 of 1999) provides for telecommunications carriers to be able to install cables in private multi-dwelling buildings for the purpose of providing subscriber connections.
Austria	A person/company having made use of a right of way pursuant to other federal laws or pursuant to the Telecommunication Act must permit joint use of the communications lines installed on the basis of these rights, or of parts thereof. The person having to tolerate joint use shall be paid appropriate compensation in monetary terms, where the costs of the installation, including the costs of the acquisition, as well as the current operating expenses of the system subject to joint use shall be adequately considered. Under certain circumstances this rule also applies to ducts.	Providers of a public communications network are entitled to demand rights of way on private properties and thus also in private multi-dwelling buildings under certain circumstances. Private property owners are qualified for compensation corresponding to the loss in value of their property.
Belgium	There is no relevant legislation regarding duct sharing.	In 1999, the Belgian Institute of Postal Services and Telecommunications (BIPT) published an announcement stating that: If an operator operates an electronic communications network and the cabling on a private domain is part of that network, this operator will put the cabling involved at the disposal of the operator taking his place, in the state in which it was used. This will be done according to the relevant guidelines published by the Institute and will in any case be based on a cost-oriented price and on reasonable terms. However, it is not clear whether these provisions can be maintained with regard to the Access Directive etc.
Canada	There is no legal requirement for sharing, however, the Commission supported the establishment of Public Utility Co-ordinating Committees (PUCC) noting the importance of joint planning. The CRTC noted the following: “The Commission recognises that municipalities have an important role to play in the co-ordination of all parties seeking to occupy and use municipal rights-of-way, especially the larger municipalities whose downtown cores are experiencing the highest demand for space. In particular, the Commission agrees with those carriers who advocated increased reliance on joint planning and co-ordination arrangements such as	The Commission developed regulatory principles governing access to multi-dwelling buildings (MDUs). It covers contractual arrangements between telecommunications carriers and building owners and sets rules with respect to use of equipment rooms, risers, ducts and in-buildings wiring. Parties are expected to follow these guidelines when negotiating MDUs access arrangements and apply for relief to the CRTC where agreement is not possible. The CRTC noted its intention to enforce guidelines pursuant to section 42 of the Telecommunications Act.

Country	Duct sharing	In-house wiring
	PUCCs, involving all users of municipal rights-of-way, not just carriers."	
Czech Republic	The legal requirements for sharing fixed incumbent telecommunication and cable municipal ducts with new entrants are covered in general terms within the Electronic Communications Act on a technologically neutral basis for electronic communication networks and services.	There are no legal or regulatory provisions with respect to access to private multi-dwelling building for the purpose of providing inside wiring for communications networks.
Denmark	There are no legal requirements for sharing fixed incumbent telecom and cable municipal ducts with new entrants. The co-operation is between municipals and the electricity supply companies. The electricity supply companies are not significant market power providers and for this reason not subject to regulation. Thus, it is not possible to order them to give access.	There are no rules regarding access to private multi-dwelling buildings for the purpose of providing inside wiring for communication networks. It is up to each private multi-dwelling building to provide inside wiring for communications networks.
Finland	The Finnish Communications Regulatory Authority may impose an obligation on a telecommunications operator with significant market power to lease out a radio mast antenna site or part of a cable duct to telecommunications operators. The regulator may impose the obligation on an operator that does not have significant market power to lease out a radio mast antenna site or part of a cable duct to telecommunications operators if the construction of a parallel radio or cable duct is not appropriate for reasons of environmental protection, nature conservation or land-use planning or another comparable reason (TMA Section 26).	There are only technical provisions regarding access to private multi-dwelling buildings for the purpose of providing inside wiring for communications networks.
France	For the purposes of implementing the provisions of the third paragraph of Article L. 47 of the CPCE, the competent authority shall ask the two parties to come to an agreement on the shared use of the facilities concerned. It shall notify the parties concerned of this request no later than one month from the date of filing of the application for a right of way permit. Should negotiations on facility sharing fail, no later than three months from the request to share the facilities, an operator which has been unable to secure sharing of existing facilities may confirm its application for a right of way permit stating why it was not possible to use existing installations. When an occupancy application is referred to it, the competent authority may reach an agreement with the applicant stipulating that investment is to be shared among the parties.	The law on the co-ownership status of buildings states that decisions concerning the installation or modification of a communal antenna or electronic communications network inside the building may be passed by a majority vote of all of the co-owners when they concern the communal areas of the building. Usually, the management agency therefore has to issue an invitation to tender (a minimum of three competitive bids) for work in excess of a given amount, which is set by the general meeting.

Country	Duct sharing	In-house wiring
Germany	If new telecommunications lines cannot be installed due to capacity constraints or the high economic cost of deployment, an incumbent telecommunication firm with lines must acquiesce to joint use of facilities. Adequate recompense must be made for joint use to the company granting the concession.	Under the law, a competitor has a right to joint use of TC lines in multiple dwellings in accordance with civil law provisions on rights of property and tenure. The company obliged to grant the concession is recompensed commensurate with the costs of efficient service delivery.
Japan	The procedure to provide fibre owned by municipalities to telecommunication operators can be undertaken either: by municipalities becoming telecommunication carriers pursuant to Article 165 in the Telecommunication Business Law and then providing wholesale telecommunications services to other carriers, or by municipalities leasing their own dark fibre to telecommunication carriers based on IRU (Indefeasible Rights of Use) contracts.	There is no direct article stipulating access to private multi-dwelling buildings.
Korea	According to Section 33-5 of the Telecommunications Business Act, a telecom operator (implying KT) who possesses and controls bottleneck facilities (poles, ducts, cables) should provide those facilities to other telecom operators at cost-based prices. MIC Order on Sharing Telecommunications Facilities and Determining Charges explains what kinds of facilities must be shared and how to calculate their costs.	It is the responsibility of the constructor to install facilities for electric power, telephone, broadband Internet or intelligent home networking according to Section 2 of Construction Law. Later, the ownership of these facilities is transferred to buyers of the buildings. Telecom operators have to get permission from the owners to go into residential buildings to install telecommunications facilities. According to Section 30-3 of the Telecommunications Framework Law, a building constructed by Construction Law must be equipped with LAN facilities and certain physical areas be connected with public telecommunications equipment. This provision can be interpreted as granting all telecom operators equal access to private multi-dwelling buildings regardless of time of entry in the telecommunications market.
Netherlands	If a provider wants to use a third party's network, this third party has to share its network if it is technically possible.	It must be possible for individuals to get access to private multi-dwelling buildings for the purpose of providing inside wiring for communications networks. To make that possible it may be necessary that providers get access to the property of others in order to install wiring.
New Zealand	There are no legal requirements for sharing fixed incumbent telecom and cable municipal ducts with new entrants.	There are no legal or regulatory provisions with respect to access to private multi-dwelling buildings for the purpose of providing inside wiring for communications networks.
Norway	Some municipalities have established their own cable ducts and are offering these to interested telecommunications companies. Network providers with their own ducts offer on demand available capacity in their ducts and the rental price is negotiated on commercial terms. The Electronic Communications Act requires the incumbent to offer co-localisation etc. to other providers at non-discriminatory prices.	There are no specific regulations regarding in-house wiring, but the legal framework for expropriation applies in general.

Country	Duct sharing	In-house wiring
Portugal	According to the law (LCE), the concessionaire of the telecommunications public service is obliged to give access to ducts, masts, other installations and property it owns or manages, via agreement, to all companies who provide publicly available electronic communications networks and services, for the installation and maintenance of systems, equipment and other facilities. The concessionaire is allowed to request an appropriate remuneration for the use of ducts, masts, other installations and property it owns or manages. The price for using those infrastructures is established by agreement between the concessionaire and undertaking providing publicly available electronic communications networks and services. In the absence of agreement any party may request an intervention of the NRA, which shall determine, by means of a substantiated decision, the access conditions, namely the price, which shall be cost-orientated. Nevertheless, the maximum prices for access to the ducts owned or managed by the concessionaire are already established in the Reference Conduit (ducts) Access Offer (RCAO) of PT Comunicações.	Decree-Law nº 59/2000, of 19 April, lays down the regulations for the installation of telecommunication infrastructures in buildings and the respective connections to public telecommunications networks, as well as regulation of the activity of certification of the installations and evaluation of conformity of equipment, material and infrastructure. Article 30 of the above-mentioned Decree-Law determines that operators and providers of telecommunications services have the right to access telecommunications infrastructures in buildings on equal conditions, within the scope of the activity being undertaken, with a view to providing services. That right includes the right to access the infrastructures, in particular for connection of operators' or providers' cables to distributors in accordance with applicable technical specifications, or for the passing of cables in the ducts and spaces of the building which form part of these infrastructures with the objective of reaching users directly.
Singapore	For the incumbent operator, rights of way infrastructure and facilities are made available to requesting operators at cost-based rates through the Reference Interconnection Offer ("RIO"). As an example, the use of each lead-in duct is charged at USD 4 per metre per year. Details of the charges for various infrastructure/facilities can be referenced from Schedule 9 of the RIO at IDA's website.	All building owners in Singapore are required build in infrastructure (*e.g.* Main Distribution Frame rooms, risers, manholes, lead-in ducts), and facilities (trays and trunking) in their buildings. These buildings owners are also required to offer the infrastructure and facilities for all requesting operators for free. The requirements to build and the technical specifications for the items build are spelt out in the Code of Practice for Info-communications Facilities in Buildings (COPIF).[53]
Spain	Article 30 of the General Telecommunications Act and Article 59 of the Regulations approved by Royal Decree 424/2005, of 15 April, provide that Public Administrations shall encourage the execution of voluntary agreements between operators for the shared location and use of infrastructure located in state-owned or private property. Therefore, when the operators holding an acknowledged right of occupation cannot separately exercise the said rights, as there are no alternatives for justified reasons in environmental, public healthcare, public safety or urban and land distribution-related reasons, the competent Administration in the said fields, after carrying out the pertinent public information formalities, shall agree upon the shared use of the public domain or private property where the electronic communications public networks or the shared use of the infrastructure supporting the said networks are to be set up, as necessary. The economic compensation for shared use shall be included in the agreements to be executed between the interested parties. If there is no agreement, the shared use conditions shall be provided, with a	The common access infrastructure to telecommunications services within buildings comprises the telecommunications systems and the networks performing such functions as first, receiving and adjusting sound broadcasting and terrestrial television signals, and their distribution to connection points located in the different homes or offices of the building, and the distribution of television and satellite sound broadcasting signals to the above-mentioned connection points and second, providing access to basic telephone services and cable telecommunications services. According to this regulation, no authorisation may be granted for the construction or full refurbishment of any building comprised within the scope of action of the regulation if the corresponding architectural project is not accompanied by a project foreseeing the installation of a telecommunication common infrastructure in the building. The proper execution of this infrastructure is guaranteed through the obligation to submit the corresponding certificate or work termination bulletin, without which the

Country	Duct sharing	In-house wiring
	prior mandatory report being sent by the above-mentioned competent Administration, by means of a decision adopted by the Telecommunications Market Commission.	corresponding licence of first occupation cannot be granted. Furthermore, the above-mentioned regulation includes the provisions related to the installation of this infrastructure in existing buildings.
Switzerland	There are legal requirements for duct sharing. Compensation is determined by the LRIC-method.	There are legal provisions regarding in-house wiring. Landlords must give access to these if inhabitants demand the wiring and support the costs.
United Kingdom	Ofcom has taken a soft approach to infrastructure sharing to date. However it should be noted that any new provider applying for Code powers must show that they would be willing to share their infrastructure should they be requested to do so and should it be practical. In addition, as part of its review of NGA, Ofcom is re-examining options for duct access.	Under relevant housing powers, the rights of the landlord and the tenant of a private multi-dwelling building are governed by the terms of the lease or the tenancy agreement. This is drawn up between the parties and can normally only be varied by agreement. There is no UK specific legal requirement to allow access for ducting or networking infrastructure within buildings.
United States	"Utilities" including incumbent local exchange carriers, generally are required to provide access to their conduit to other telecommunications carriers and cable television systems. A utility shall provide a cable television system or any telecommunications carrier with non-discriminatory access to any pole, duct, conduit, or right-of-way owned or controlled by it. Notwithstanding this obligation, a utility may deny a cable television system or any telecommunications carrier access to its poles, ducts, conduits, or rights-of-way, on a non-discriminatory basis where there is insufficient capacity or for reasons of safety, reliability and generally applicable engineering purposes (47 C.F.R. § 1.1403(a).	There are legal and regulatory provisions which address access to private multiple dwelling unit buildings (MDUs) by telecommunications and cable providers. With respect to cable providers, the FCC has adopted regulations that govern use of existing cable wiring when the incumbent cable provider no longer has a right to remain in the MDU or to serve individual occupants in the building. With respect to telecommunications carriers, FCC rules require incumbent local exchange carriers (LECs) to provide competitors access to the inside wiring that they own or control in multi-unit premises. Competitors have a right to access the inside wire subloop at any technically feasible point. These rights under FCC rules are effectuated through interconnection agreements reviewed by the relevant state Commission. Recently, the FCC has adopted an order on access to multiple dwelling units to foster greater competition in the market for the delivery of multichannel video programming by banning the use of exclusivity clauses for the provision of video services to multiple dwelling units or other real estate developments.

Policy considerations

In order to facilitate competing fibre local loops, reduce costs and reduce multiple excavation and other civil works in municipalities the sharing of existing ducts, both those of telecommunication and cable companies, but also those of other utilities, is an important policy requirement. Similarly access to building and sharing of wiring is important to ensure effective competition in the market. In order to enhance the construction of competing local loops governments and/or regulators could:

i) Ensure that existing frameworks for sharing of both incumbent telecommunication/cable rights of way and inside wiring are fair.

ii) Encourage and/or oblige sharing of ducts and other rights of way both by incumbents and by other utilities that have infrastructure.

iii) Examine whether it would be feasible to develop a framework that would allow for FTTH providers to have access to the rights of way of existing municipal public utilities (water, sewer, electricity). Such a framework may only be feasible if these utilities are publicly owned.

iv) Develop a framework to allow for joint construction of ducts that can be shared by potential investors in FTTH. A framework in which municipalities are directly involved would be better in ensuring the success of rights of way projects that are mutually owned.

v) Examine the possibility of regulatory measures for facilitating the sharing of inside wiring among operators in multi-dwelling units.

IV. POLICY OPTIONS

Considering the priority most OECD governments have given to high-speed broadband for economic and social reasons, it is important that the question of making available competitive high-speed networks to business and residential customers is also given priority. Initiatives in the context of communications regulatory frameworks can play an important role in providing a framework for new entrants and incumbents to invest in FTTH networks. In many cases regulators dealt with the issue of providing access to the incumbent's rights of way and ducts in the early days of introducing competition in the PSTN market, but such regulations may warrant revisiting to ensure that they adequately reflect requirements in a FTTH environment.

Given the costs associated with the rollout of FTTH networks (*i.e.* mainly construction costs) a key initiative by governments (and communication regulators if they have the necessary legal powers) is to take action to provide new entrants with improved access and to facilitate investment in municipal rights of way. Existing utility infrastructures are increasingly being used for fibre networks and they have an advantage in that they usually connect all buildings and housing in a municipality. As an example, sewers are used in Paris, Tokyo (850km), Vienna (400km), Hamburg (100km), and Berlin (50km).[54] Gas and water systems are being examined as potential conduits for FTTH networks and technology developed in recent years has demonstrated the ability to safely and efficiently transmit data through cable systems installed inside gas or water pipes.[55] Aerial FTTH installation is ideal when an overhead infrastructure exists and is very fast and cost effective.[56] However, many municipalities are moving towards burying overhead cables so that this option is not always available.

In addition, granting access to existing facilities (ducts/in-house wiring) of telecommunications operators, especially of the incumbent, is an important option. Arguments against duct sharing mainly dwell on the difficulties of practical implementation: that is, the problem of how to define the available space capacity, issues of network integrity, etc. If there is no more space in existing ducts, the sharing of new civil engineering works can be another option for providing new entrants with improved access and to facilitate investment in municipal rights of way. This option is mainly related to the role of local authorities, who are generally in charge of rights of way. They can generally help to co-ordinate civil works in their territory rather than impose sharing.

Another possible option can be using dark fibre available from "third party infrastructure providers", usually those based on a public-private partnership with municipalities, even if it can be treated distinctly from poles, ducts, conduit, and rights of way in a country. The motivation for municipalities to invest in fibre networks is often based on promoting economic development in the municipality. In many cases, especially in rural municipalities, investment in fibre local access networks is undertaken because the incumbent has indicated that it believes it is not cost effective to upgrade the existing network to fibre in the local community, or has indicated that the larger cities have priority in plans for upgrading the network. Although access to dark fibre can be encouraged as a way to introduce facilities competition in the limited cases with above-mentioned motivation, it should not be viewed as replacing direct investment by communication operators. That is, the existence of a dark fibre network in a municipality should not prevent other companies from investing in their own network if they so wish.

It is important to review the existing administrative and financial disincentives that may limit new entrants from investing in fibre to the home networks but also examine models that can help to reduce the

costs of building and using fibre networks. One model for consideration is for public involvement in the process of deploying FTTH on the basis that *i)* ducts can be both scarce and under-utilised, *ii)* the civil infrastructure can present features of a natural monopoly. A single duct could carry several cables containing multiple fibres, each of which can support several frequencies, and carry tens of billions of bits per second. As a result, a single duct offers the capability to provide for virtually unlimited bandwidth.[57]

In such a model there are a number of roles that governments or municipal authorities can play:

i) Review and where necessary reform ordinances or regulations that affect private FTTH deployment. This would include streamlining the permit process, providing reasonable and economic access to utility rights of way and poles, and co-ordinating fibre optic deployment with other civil construction in municipalities.[58] In this context it is also important to clarify jurisdiction, create centralised information points, create standardised and timely rights of way permit processes, and set appropriate and reasonable financial conditions to cover costs.

ii) Municipalities should, if they wish, be able to enter into public and private partnerships in order to construct fibre networks. However, care should be taken not to crowd-out private investment. Their role should be limited to providing dark fibre and this should not foreclose investment in fibre networks by other private entities. Access to dark fibre should be on a non-discriminatory basis and at cost-based prices.

iii) Municipalities and central governments could facilitate the roll-out of fibre networks through demand-side policies, in particular, a municipality can use its local role as a major telecommunications customer to stimulate demand by enhancing government applications and networking public facilities like schools, libraries, police, fire, etc.[59] Under this option, government does not have to finance construction of the FTTH network and assumes no responsibility for its ongoing operation.

NOTES

1 See: http://real-estate-law.freeadvice.com/zoning/right_way_zoning.htm.

2 See: http://www.allbusiness.com/north-america/united-states-north-carolina/650763-1.html.

3 See also note 1.

4 See: https://www.fhwa.dot.gov/tfhrc/safety/pubs/its/resourceguides/sharedres-finalrept.pdf.

5 See: Paul Davaney, *Right-of-Way Management*, UPROW Committee, October 2001. Available at: http://www.apwa.net/Documents/ResourceCenter/Rights-of-Way_Mgt.pdf.

6 For more information about aerial pole structure and rights of way, see Jeffrey L. Sheldon, *Pole Attachments and Rights-of-Way: Rights and Opportunities*. McDermott Will & Emery, 23 May 2005. Available at: http://www.mwe.com/info/events/utc0505a.pdf.

7 Ibid., p 6-1.

8 See: http://www.europeftthcouncil.com/extra/PDF/181_FTTH_Regulatory_Barriers_24-06__fin_3.pdf.

9 Another cost estimate estimates that buried cable in existing conduits costs CAD 7-10 per meter compared to new trenching and laying of conduit at CAD 35 per meter – see: The Case for Municipal Fibre White Paper, 15 August 2000 at www.smartwinnipeg.mb.ca/Municipal_Fibre.htm.

10 See: "FTTH in France" WIK, Tuesday 22 March, 2007, Konigswinter, Gabrielle Gauthey, ARCEP.

11 See: http://www.ntia.doc.gov/ntiahome/speeches/2005/Attwell_FROW_012705_files/frame.htm.

12 See: http://www.ftthcouncil.com/documents/FTTH%20White%20Paper%20PaulGreen%200203.pdf.

13 For example, overbuilders may partner with electric utilities in order to obtain rights of way.

14 See: http://www.ssnf.org and http://82.182.148.110/pps_www/se_eng.asp.

15 Stokab benefits from easy access to all the city's tunnels and ducts for transport (metros), water, sewer and electricity. The close links to the city ensure minimal red tape for new installations.

16 SSNf is a non-profit group of 300 municipalities, telecom operators, energy companies and others whose mission is to *i*) give cities an open infrastructure for everyone; *ii*) stimulate the market by offering new operator capacity at below self-cost; *iii*) reduce digging in the streets; and *iv*) create and own a network for each city. For more information, see: http://www.corning.com/docs/opticalfiber/r9575.pdf.

17 See: http://www.citynet.nl.

18 The aim of the smart city project was for end-users to choose the infrastructure and content providing package appropriate to their needs. For more information about Kenniswijk-Eindhoven Smart City Project, see: *Europe-Infrastructure-Ftth, NGNs&IP* Paul Budde Communication, 27/08/2006.

19 The city of Rotterdam owns the collocation spots, duct and fibre (municipal network), while a communication operator owns the opto-electronics and sells the bandwidth to service providers on a non-discriminatory basis. For more information, see: http://www.ist-muse.org/Documents/ECOC/Muse_ECOC_2004_2_Whitman.pdf.

20 See: http://ftthcouncil.org/documents/C201%20Intl%20FTTH%20and%20Bband%20Deployments.pdf.

21 See: http://www.corning.com/docs/opticalfiber/r9575.pdf.

22 As of 2006, the fibre installation in Denmark in the northern parts of Zealand north and west of Copenhagen was being performed by the power company DONG Energy as part of a project to convert their airborne power infrastructure into one consisting of underground cables. For more information, see: http://en.wikipedia.org/wiki/Fiber_to_the_premises.

23 See: http://www.citynet.nl/upload/Danish%20Comp%20Auth%20on%20FTTH%20by%20electricity%20companies%20summary.doc.

24 See: *Europe-Infrastructure-Ftth, NGNs&IP* Paul Budde Communication, 27/08/2006, and see also at: http://www.itogtelestyrelsen.dk/image.asp?page=image&objno=163093653.

25 As an observer country to CISP and ICCP, Singapore is included in this paper.

26 See: http://www.rtr.at/web.nsf/englisch/Telekommunikation_Telekommunikationsrecht_TKG+2003.

27 Way leave rights are the rights to use someone's property.

28 Providers of a public communications network shall be entitled to exercise wayleave rights on private properties unless prevented by public considerations and if the dedicated use of the property is not or only slightly restricted permanently by such use and if *a*) there exists no line or system on a property or *b*) an existing system is to be expanded, *c*) there exists a line or system on a property which, however, is not owned by the person who wants to make use of the property, and joint use of the existing line or system is not possible or practicable or the owner of the line or system is not obliged to permit joint use. (§ 5 of Section 2 of the Austrian Telecommunication Act).

29 See: http://laws.justice.gc.ca/en/T-3.4/index.html.

30 See: http://www.legifrance.gouv.fr/WAspad/VisuArticleCode?commun=CPOSTE&code=&h0=CPOSTESL.rcv&h1=2&h3=21

31 Municipalities have to formulate additional rules concerning operating procedures, fine-tuning activities with other providers (not only telecommunications, but also water and energy providers), how to promote sharing networks with other providers, and operating procedures in case of an emergency.

32 These decisions are available at: http://www.anacom.pt/template15.jsp?categoryId=126599.

33 Currently, the telecom regulator, the Infocomm Development Authority (IDA), has designated the three as CSIs; that is, first, radio distribution systems for mobile coverage in train or road tunnels, second, in-building cabling, and third, lead-in ducts and associated manholes.

34 These rights are described in detail in the Electronic Code Powers 2003 and include: first, certain exemptions under the Town and Country planning regime in the form of permitted development; second, the power to carry out street works in connection with the installation of apparatus in the streets under the new Roads and Streets work Act 1991 without the need to obtain a specific street works licence; third, the right to apply to the Court conferring a right, where agreement could not be reached with the owner of private land, to execute work in private land.

35 The term utility means any legal person who is a local exchange carrier or an electric, gas, water, steam, or other public utility, and who owns or controls poles, ducts, conduits, or rights-of-way used, in whole or in part, for any wire communications. Such a term does not include any railroad, any legal person who is co-operatively organised, or any legal person owned by the Federal Government or any State.

36 In the case of the United States, while the Federal Land Policy Management Act of 1976 (FLPMA) is the most significant of the laws authorising federal agencies to grant easements and other rights of way, numerous laws like the National Environmental Policy Act, the National Historic Preservation Act, the Endangered Species Act affect whether ROW permits can be granted or may require that specific conditions or limitations be included in the grants of a particular right of way. For more information, see: http://www.ntia.doc.gov/reports/fedrow/FROWReport_4-23-2004.pdf.

37 See: http://www.stokab.se/templates/StandardPage.aspx?id=306.

38 Of course, multi-agency projects may also provide opportunities for overcoming barriers faced by one or more of the parties. See: http://www.ntia.doc.gov/reports/fedrow/FROWReport_4-23-2004.pdf.

39 For more information, see: http://europa.eu/scadplus/leg/en/lvb/l24217.htm.

40 See: http://www.ntia.doc.gov/reports/fedrow/FROWReport_4-23-2004.pdf.

41 Ibid., p19.

42 See: http://www.t-regs.com/component/option,com_docman/task,doc_download/gid,4/Itemid,84/.

43 For more information about ORAC, see: http://ptwholesale.telecom.pt/GSW/PT/Canais/ProdutosServicos/OfertasReferencia/ORAC/ORAC.htm.

44 Carriers seeking to install low-impact facilities must comply with certain rules of conduct that are set out in a Schedule to the Act and in the Telecommunications Code of Practice 1999.

45 See: http://europa.eu.int/ISPO/infosoc/telecompolicy/5th-en.pdf.

46 Ibid.

47 See Samuel Nunn and Joseph B. Rubleske, "Pricing the Use of Public Rights-of-way," *Public Works Management & Policy*, Vol. 3 No. 4, April 1999 p304-316.

48 See: http://www.crtc.gc.ca/archive/ENG/Decisions/2001/DT2001-23.htm.

49 See: http://www.arcep.fr/uploads/tx_gspublication/guide-juridique-crip2007.pdf .

50 The MFRW shall be determined on the basis of the application of a percentage on each bill issued by the communications companies, at a fixed location, to all final clients of the corresponding municipality. This percentage shall be approved annually by each municipality prior to the end of December of the year preceding that of its enforcement, and shall not exceed 0.25% (LCE article 106, nr. 2).

51 See: http://www.apwa.net/documents/organization/98engr1.pdf.

52 See: http://www.legifrance.gouv.fr/WAspad/UnTexteDeJorf?numjo=INDI0506405D# .

53 See: http://www.ida.gov.sg/Policies%20and%20Regulation/20060424150821.aspx.

54 See Sanjiv Gokhale, "Deployment of Fibre Optic Network through Underground Sewers in North America," *Journal of Transportation Engineering*, August 2006. Available at: http://scitation.aip.org/getabs/servlet/GetabsServlet?prog=normal&id=JTPEDI000132000008000672000001&idtype=cvips&gifs=yes.

55 For more information about fibre optics in live gas lines, see: http://www.gastechnology.org/webroot/app/xn/xd.aspx?it=enweb&xd=4reportspubs\4_5gtijournal\summer_2002\summr02hlfiberoptcinlivelines.xm.

56 See: http://www.vifom.org/Tutorials%20lectures%20education/FTTHMay2.pdf.

57 See: http://www.europeftthcouncil.com/extra/PDF/181_FTTH_Regulatory_Barriers_24-06__fin_3.pdf.

58 See: http://www.corning.com/docs/opticalfiber/municipalities__broadband.pdf.

59 See: http://www.corning.com/docs/opticalfiber/municipalities__broadband.pdf