



eEurope Advisory Group

**Work Group No.1:
Digital Divide and Broadband Territorial Coverage**

WRITTEN RECOMMENDATIONS

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Objective of Working Group No.1:

The main objective of Working Group No.1 of the eEurope Advisory Group's Expert Chamber has been to prepare recommendations for public authorities at European, Member State and Regional level on: How to bridge the digital divide in terms of broadband territorial coverage in rural areas across the European Union.

The working group has analysed the subject based on four key issues:

1. What are the broadband services which will be essential to ensure that Europe meets the Lisbon 2010 objectives? What is therefore the definition of broadband? Is it appropriate to establish targets to ensure minimal coverage of services?
2. What are the current technologies available for completing broadband coverage; what are their benefits and handicaps for different geographical scenarios?
3. Which other elements are making investment or service development in certain areas unattractive?
4. What is the role of the public and private sectors; what are the group's recommendations to public authorities?

Introduction

Lisbon Objective for 2010 and the Role of ICT:

It was in March 2000 when European leaders gathered at the Lisbon Council and agreed on a new strategic goal of making the European Union "the most competitive and dynamic knowledge-based society in the world by 2010." One of the key tools to achieve the so-called "Lisbon Objective" was a strong Information Society and R&D.

Today, as Europe stands at the mid-term point of the Lisbon agenda, it has become apparent that the EU faces two major challenges: slow economic growth as compared to other regions of the world, and an ageing problem reducing the "active population age bracket" by about 20% in the next 40 years. In order to overcome these two challenges, Europe will need to increase its own productivity, especially through Information Communications Technologies (ICT) and especially broadband.

It has been generally recognized by a number of studies that productivity growth is strongly linked to ICT usage and that broadband is essential in this context. This is true for both the private and the public sector services. For instance, in the private sector, this is especially relevant for Small Medium Sized Enterprises (SMEs) where ICT and broadband are essential tools. For the public sector, governments today must become more efficient in public services through eGovernment, eHealth and eLearning, and ICT based on broadband is indispensable.

In view of the above, attaining the “Lisbon Objective” by 2010 remains conditional on strong use of ICT, especially through ubiquitous broadband access for all European citizens, businesses and public administrations.

Issue No.1

Broadband in Rural Areas:

Broadband can have a much larger impact on the development of rural areas than any other communications infrastructure (roads, railways, telephone).

For instance, it gives a young family a chance to provide equal learning conditions for their children, medical assistance for those that need instant advice or long term care, it allows innovative job opportunities for creative minds, it allow an access to all entertainment virtual means from the latest movies to the global internet games, and at the same time, it allows the pleasure of fresh air, beautiful nature and low crime surroundings. Broadband also allows powerful virtual communities to exist in a real time in different professions, due to the option of video and audio features that are rich in graphics and details.

With broadband, the countryside and remote locations get a totally new meaning. In essence, rural areas suddenly seem to be attractive not only for the retired people, but also for entrepreneurs, business people, artists, families with small children and all others that share a common value - love for countryside, nature and outdoor lifestyle. With broadband any business can actively participate in clustering business model, individuals can become better citizens via eDemocracy services and tools.

Therefore, it makes sense to give remote places a chance to build the social capital of the area, to allow the devoted ones to use the core competences of geographical locations, and for individuals to act equally in the global market.

How to Define Broadband; What are the Benefits of Broadband?

As a first step, it is logical to define broadband today in terms of service demand, in a seamless environment from fixed to mobile focusing on three basic service segments: business services, public services and residential services including entertainment.¹

Business Services and SMEs:

Large enterprises today already use all major means of communication and have been the first to adopt broadband, quite often as the only method of communication for certain tasks (buying, client/supplier relations, video telephony, unified messaging, conferencing). The same is starting to happen for SMEs, especially in metropolitan areas.

¹ It must be noted that entertainment services have not been included in the scope of this analysis which focuses on “eEurope-type” services including both public services such as eGovernment, eHealth, eLearning and eBusiness services. Without a doubt, the inclusion of entertainment services will influence some of the recommendations, largely those relating to minimum bit rates and interactivity.

Instead, the main concern for public authorities today has to lie with SMEs outside of metropolitan areas which find themselves moving from a local market to an enlarged Europe. Being based in a rural area can be advantageous from a cost point of view, but requires more than ever, access to a high performance communications network. As more and more high definition graphics and video content will need to be exchanged, broadband via the internet will be essential for these SMEs. In particular, for certain industries such as the travel industry, this will be absolutely critical.

Public Services:

Public services such as government, health, education today face an important challenge, not only in terms of contributing productivity gains, but also in reducing costs. In the case of health services, tele-monitoring, tele-consultation of patients, tele-radiology and intelligent call centres for patients require innovative ICT solutions. Such solutions will enable public authorities to contain service costs and improve prevention. eLearning is also becoming essential especially as people need to work longer, require continuous learning and be more mobile for employment purposes. Broadband based learning offers many benefits including costs and timing. Finally, in an environment characterized by a decreasing active population and increased costs, public authorities will have to find new ways of reducing administrative costs and increasing efficiency. eGovernment is an ideal solution for this and its economic benefits have been measured in terms of annual global savings in a Canadian province amounting to 0.7% of GDP.

Residential Services:

Residential services can become extremely rich. eBusiness and especially B2C is definitely growing, in particular for all products and services which do not require physical delivery (travel, financial services, etc.) including also entertainment services such as on-line music, gaming and peer-to-peer information exchange.

In the case of entertainment services, broadband can either provide additional interactive services where cable penetration is already very high, or can enlarge the television service offering where cable is not available. The required bit rates will depend on the number of simultaneous channels which are required.

How to Determine a Minimum Bit Rate Across Europe:

The required broadband “bit rate” has been a matter of considerable debate. One of the benchmarks that has been used to measure the minimum bit rate required is that of eEducation or eHealth. In the case of eHealth, it requires the transmission of medical images without compression (to avoid the risk of any minimal information loss) and supervision from a distance. In the case of eLearning, or quality eEducation, there will be the need to transmit high resolution images instantaneously. In both cases, 2 Mbps is probably the minimum speed for achieving good usage of these services.

Minimum Service Targets For Lisbon 2010:

Access to the above mentioned eGovernment, eHealth, eLearning, eBusiness services will be essential and must become ubiquitous across Europe. Ubiquitous broadband access will require a minimum bit rate that must be high enough to allow all citizens to benefit from these services. This **minimum bit rate should be at least 2 Mbps** with the need to evolve to speeds which will be two to four times higher as new applications and usage develop over the next five to ten years. In some cases, 512

Kbps may be sufficient as a starting speed to reach isolated users, but the main expectation is that most citizens will have access to 2 Mbps or more. Entertainment services can also be offered at this bit rate. In fact, it is likely that entertainment services will be the main driver for moving to higher bit rates, particularly where multiple, simultaneous video channels will need to be made available.

In this context, the European Union must therefore aim to achieve **at least 95% broadband territorial coverage by 2008**. This target should be considered as an absolute minimum requirement, especially as Europe today is already lagging behind most of North America and parts of Asia in terms of economic growth and broadband penetration. It would be extremely difficult to bring the benefits of broadband development and ICT to European citizens by 2010 without ensuring near complete broadband territorial coverage by at least 2008. Moreover by 2010, Europe's ageing problem will be a reality as a large portion of the post war "babyboom" generation will have retired and rely increasingly on public services such as healthcare.

Recommendations on Minimum Service Targets for Lisbon 2010:

In line with the Lisbon Objective:

- 1- Europe must aim to have the most advanced communications networks and capacities and the highest ratios of connectivity and usage.
- 2- Europe must implement higher bandwidth services which will have a real macroeconomic impact: eGovernment, eHealth, eEducation, eBusiness...
- 3- By 2008, Europe should aim to offer bit rates ranging from a minimum of 2 Mbps upwards with an evolution of up to four times higher as new applications, services and usage develop. In some cases, 512 Kbps may be sufficient as a starting speed to reach isolated users .
- 4- Europe should aim to achieve at least 95% broadband territorial coverage by 2008 .

Issue No. 2:

Technologies for Reaching Complete Broadband Coverage:

Objectives:

The group's end objective has been to establish **some guidelines on the strengths and weaknesses of different broadband technologies**, with a particular focus on territorial coverage in rural areas and medium density villages across Europe.

It must be noted that technology neutrality is a concept which relates to services and regulation. While it is clear that both services and regulation need to be technologically neutral, it is equally clear that the actual implementation of networks requires technology choices. The technological analysis contained in the report does not have as an objective to favour one technology over another, but instead to show

how large the handicap for investment is in rural areas, even with the best technologies available.

It must also be stated from the outset that in metropolitan areas, where a host of competitive technological solutions are currently available, there is no need for public action to assure coverage. If there are more than 100 users in a given village and the distance from the village to the metropolitan area is less than 5 km, quite obviously a large selection of competing broadband technologies including DSL, fibre and cable (where available) exist and there is no need for public intervention.

In the case of rural areas with less than 100 users per village, there are two key factors: the number of users per village, and the distance from the village to the metropolitan area.

Below are the key findings from the technology analysis for three given geographical cases where public intervention maybe needed (please refer to annex for complete technological analysis):

Key Findings on Technological Merits: 3 Cases

1- Low Density Rural Areas With less than 20 Users: Satellite Technology

In a village with less than 20 users, satellites are an ideal technological solution with service costs dependent on the average bit rate usage, and investment costs dependent on peak bit rates. The typical market segment for satellites is businesses which are remote. However, satellites are equally suitable for residential applications excluding interactive video services, and can be even more attractive when satellite TV broadcast is bundled with a satellite internet service or supplemented by other complementary technologies such as BWA, WLAN, DSL etc...

2- Medium Density Rural Areas with 20 to 50 Users: WiMax, WiMax + DSL, Fibre + DSL

In the case of a medium density village, various technologies can be economical depending on the particular situation. For example, WiMax or a combination of WiMAX with DSL or fibre and DSL are good solutions for SMEs with reasonable investment costs (2-3 times that of urban DSL). WiMax is also a good residential solution but with limited interactive video services.

3- High Density Rural Areas and Urban Areas with More than 50 Users: ADSL/VDSL + Fibre, Cable

In a village with more than 50 users, various solutions are available including fibre, DSL and cable. ADSL is still the most competitive solution based on costs and average user bit rate. Cable, where available is a good solution. The driver towards fibre is either distance or a large need for high interactivity or high definition television. In most cases, the natural evolution will be from ADSL to ADSL+ or VDSL combined with “fibre to the cabinet”, and then eventually, “fibre to the home” as needed. This will permit a gradual evolution achieving 8 Mbps and more according to user needs. It must be noted that fibre is economical in “Greenfield” situations or where there is the right business case based on high bit rate services and foreseeable operational savings.

Other Technologies:

The eEurope Advisory Group has examined other alternative technologies such as Third Generation Mobile/UMTS, Powerline Communications, Broadband Wireless Access and Digital Terrestrial TV. In most cases, they were found to be more expensive, or offer insufficient bit rates and interactivity compared to other solutions in rural areas, and especially in the time frame under consideration (see annex). It should be noted once again that this technology analysis has been made with the key objective of examining technological solutions for rural areas by 2008, and should not be seen as an absolute judgement on the merits of different technologies and applications especially in urban areas.

Issue No.3

Other Key Obstacles to Investment in Broadband Services:

eEurope Advisory Group members have identified two main obstacles to investment in broadband services: lack of appealing content and services created by the private and public sectors, and consumer confidence and awareness. In particular, public authorities today must provide more valuable on-line content and services including eHealth, eEducation and eGovernment. Furthermore, greater efforts must be made to promote the benefits of broadband and eEurope services. This includes addressing consumer confidence, and promoting greater user awareness of new technologies and solutions, such as “ease of use” between different platforms, especially in the home environment. In essence, broadband must be made easier for the average European residential user or SME!

Below is a list of the important obstacles to investment in broadband services the eEurope Advisory Group has identified for action by public authorities:

- Open & interoperable standards, home networking
- Creation of broadband content and services
- Regulatory uncertainty
- IPR protection/Digital Rights Management
- Consumer confidence and awareness
- ePayments
- Spectrum planning
- Security and trust

Certainly, most of these obstacles are important for both metropolitan access and for rural areas. In the case of rural areas, more effort from public authorities may be required to reach critical mass.

Issue No.4

The Role of Public Authorities- Five Key Recommendations for Broadband Territorial Coverage:

Considering the need for near complete broadband territorial coverage by 2008, with a tentative bit rate of 2 Mbps, and considering the benefits of key broadband technologies for Europe's Lisbon Objective, the eEurope Advisory Group proposes five basic recommendations to public authorities for immediate action.

These recommendations should be used by public authorities at all levels –European, Member State and regional- as guidelines on **how to overcome situations of market failure and ensure rapid broadband territorial coverage**. It should be used in the context of a clear political objective to reinvigorate rural areas and make them economically competitive and attractive from a residential point of view. Logically, in situations where a village has over 100 potential users, there is no immediate need for government action and market forces should prevail. In the cases of less than 50 users and certainly, in sparsely populated areas, there is a clear mandate for government action to ensure these areas do not continue to remain isolated from the benefits of broadband access and ICT.

Recommendations to Public Authorities for Complete Territorial Coverage:

1- A Pan-European Initiative for Very Sparsely Populated Areas:

For very sparsely populated areas with less than 20 users, it is recommended that the European Commission launch a pan-European initiative to assure broadband coverage via satellite. In the short term, this can be based on existing satellites with new satellites later on. The investment in satellites and their operation should remain a private sector activity. The European Commission, in unison with Member State and regional governments can play an important role by aggregating the demand of both services and terminals. This will give a strong positive message to the main private stakeholders who are ready to invest. In particular, terminal costs are very sensitive to the volumes which can be identified and assured.

As a first step, the European Commission should bring all Member State, regional authorities, satellite operators and suppliers together to aggregate the demand. Financial support, both in terms of public funding or financial guarantees, can then be sought at different levels (European structural funds, Member State or regional governments).

Once demand aggregation has been made and a competitive price has been established, the services can be made available via competing telecom operators so that market forces can continue to prevail. (Refer to Annex for specific satellite actions)

2- The Establishment of Public Private Partnerships for Sparsely Populated Areas:

For sparsely populated areas with approximately 20-50 connected homes per site, the group recommends public private partnerships where for instance, the local community invests in civil works necessary to bring a fibre or cable connection point

closer to the community, which is then rented out to competing telecommunications operators for services.

Naturally, many different public private partnerships can be envisaged encompassing both technology and services

3- Encourage the Emergence of New Technologies: The Role of R&D

Public authorities must continue to support the emergence of new technologies by ensuring priority R&D funding for ICT and especially broadband.

European companies are currently playing a critical role in making broadband available. In order to continue this leadership, an important continued effort in R&D is necessary. There is a concern that in future European R&D programmes such as the 7th Framework Programme, the Community's horizontal R&D budgets and Member State EUREKA funding, ICT is not given sufficient importance.

4- Demand Aggregation of Services and Development of Public Access Points

Public authorities should aggregate demand in rural areas by putting into place or ensuring a large network for key eEurope services such as eGovernment, eHealth and eLearning with the help of structural funds. Public authorities could also encourage the creation of Public Access Points (libraries, community centres, schools) in order to extend broadband access as much as possible into rural areas.

A number of less economically developed regions are unlikely to participate in future economic growth unless they have both the right level of connectivity and the right level of services. Demand aggregation, whether at a regional, national or pan-European scale with the support of structural funds, has a key role to play in the development of higher bandwidth services which will have a macroeconomic impact on the European Union. This could also include greater development of Public Access Points.

5- Encourage the Development of eServices and eContent

Public authorities should make structural funds available for eEurope services (eGovernment, eHealth....) and the creation of European eContent. In particular, public authorities should encourage the development and creation of these by financing some of the early stages of development by specialised companies.

6- Ensure ICT and especially Broadband are a Priority for Structural Funds.

Member State and regional governments must ensure that broadband and ICT are clearly designated as priorities for the availability of future Community structural funds.

Conclusion:

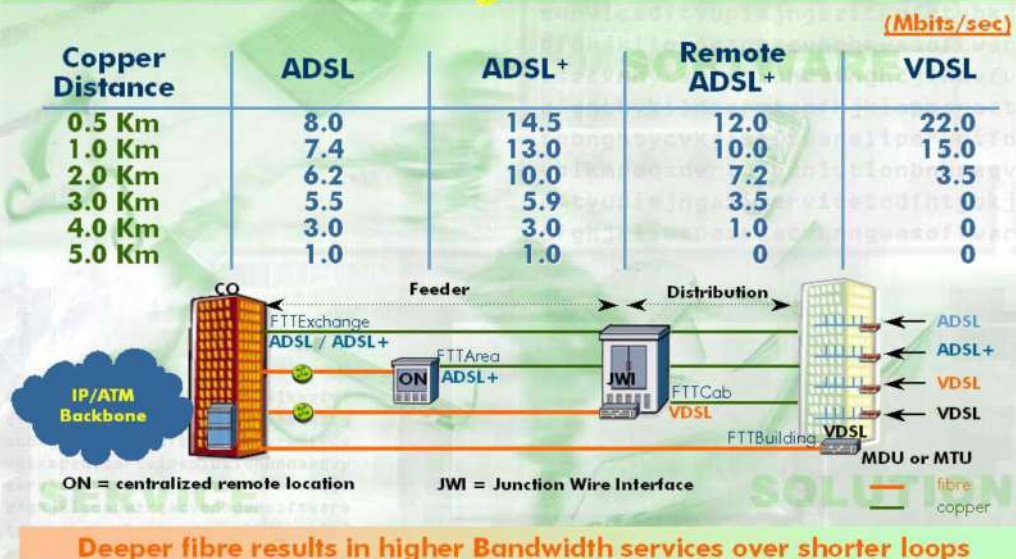
The European Union finds itself at a crucial moment to decide whether it is able to meet the Lisbon Objective of making Europe “the most competitive and dynamic knowledge-based society in the world” by 2010 or not. ICT through broadband has been identified as one of the fundamental tools which will enable Europe to achieve this goal and reap the benefits in terms of productivity gains and increased quality of life. The economic, social and demographic future of rural areas is very dependent on the ability to participate in the competitive knowledge based society.

There is a need for clear political action and leadership at all levels (European, Member State and local) and the time to react is now. Complete broadband territorial coverage in rural areas by 2008 cannot be expected to be achieved with the same competitive pace found in urban areas. And although broadband penetration across the European Union has recently seen extremely positive growth rates, it is unlikely that market forces alone will be able to bridge the European digital divide in sparsely populated areas. Instead, a combination of public private partnerships, coupled with appropriate technology deployment, a favourable regulatory environment for investment in infrastructure, services and content and finally, public funding (provided it does not distort competition) are essential pillars for successful broadband development. Lastly, the public sector aside from public funding, also has a key role to play in promoting the benefits of broadband access to European users, SMEs and businesses.

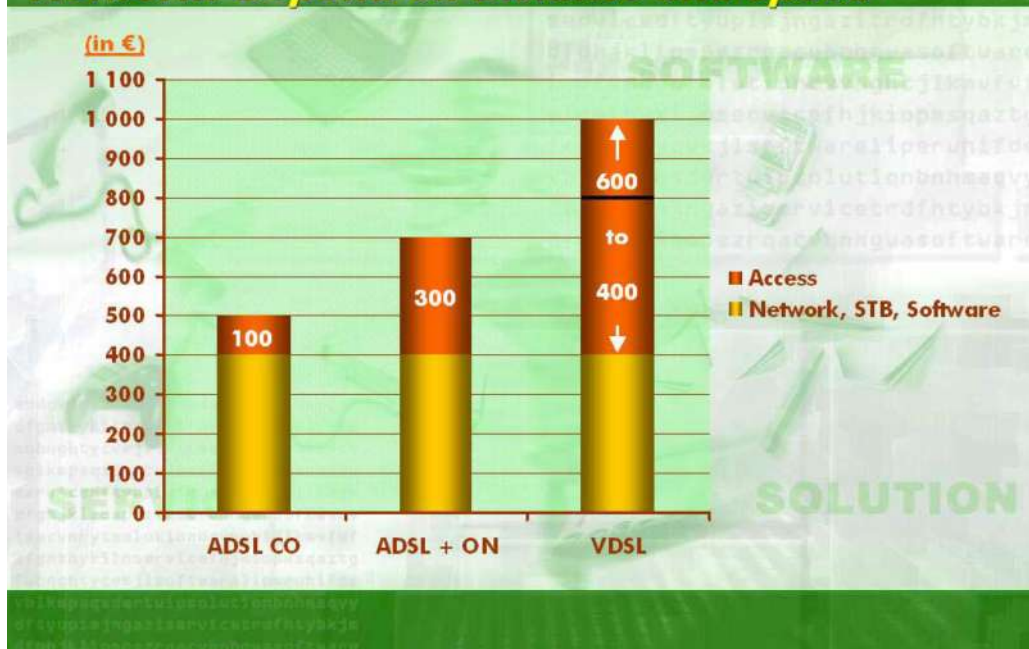
In conclusion, if European citizens and SMEs are to have access to broadband, regardless of their location, especially in rural areas, “distance will no longer be a cost factor in future value creation”.

Annexes: Technologies for Reaching Complete Broadband Coverage

Issue No.2- Reach of DSL Technologies

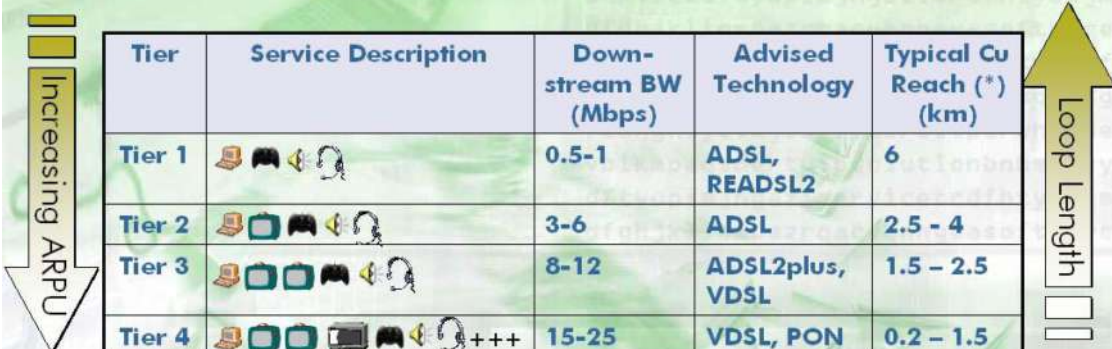


Issue No.2- Investments for Multimedia Networks Depend on Distance and Speed



² The cost data included in the Annex can vary substantially from one country to another depending on the underlying technology and the network structure. It should only be used as an estimate of real costs.

Issue No.2- xDSL + Fibre Optics: Choice Depends on Distance and Required Bandwidth



The diagram illustrates the relationship between service tiers, bandwidth, and distance. On the left, a downward arrow labeled 'Increasing ARPU' points from Tier 1 to Tier 4. On the right, an upward arrow labeled 'Loop Length' points from Tier 4 to Tier 1. The table below details the specifications for each tier.

Tier	Service Description	Down-stream BW (Mbps)	Advised Technology	Typical Cu Reach (*) (km)
Tier 1	Icons: PC, game controller, headphones	0.5-1	ADSL, ADSL2	6
Tier 2	Icons: PC, game controller, headphones, TV	3-6	ADSL	2.5 - 4
Tier 3	Icons: PC, game controller, headphones, TV, printer	8-12	ADSL2plus, VDSL	1.5 - 2.5
Tier 4	Icons: PC, game controller, headphones, TV, printer, server, and three plus signs (+++)	15-25	VDSL, PON	0.2 - 1.5

(*) For typical noise conditions

-ADSL covers most of today's applications and basic multimedia (Tier 1 & 2)

-the targeted services and distance define required "x" in xDSL

Issue No.2- Cable Technology

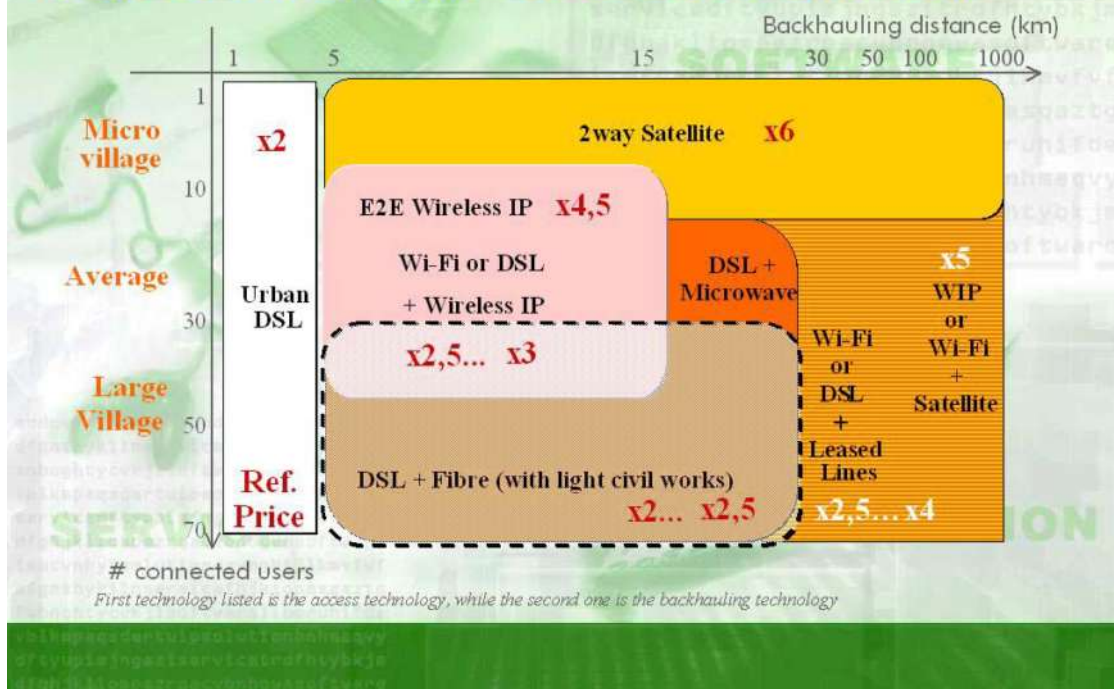
Today, 100 Million homes are passed by cable with about 2/3 connected. One way delivery cable systems need an upgrade to offer broadband data. Costs of the upgrade are about 200 Euros per home passed on average, but certainly higher where population density is low. The investment in broadband equipment comes on top.

Cable is a shared medium. With present DOCSIS 1.1 technology the average bit rate per user is about 80 Kbps. This increases to about 250 Kbps with DOCSIS 2.0 and to about 800 Kbps with DOCSIS 3.0

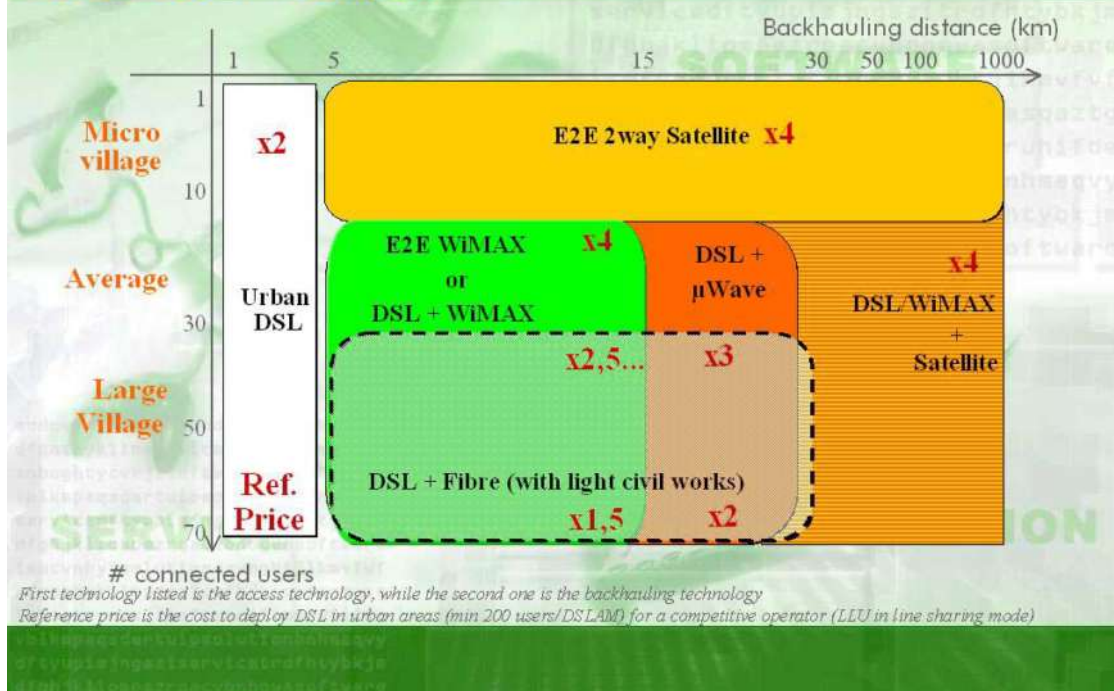
Cable networks with DOCSIS 3 technology are certainly sufficient to cover broadband applications which do not require intensive use of interactive video. When this will be the case, a further upgrade to bring fibre closer to the user will be necessary.

Issue No.2-

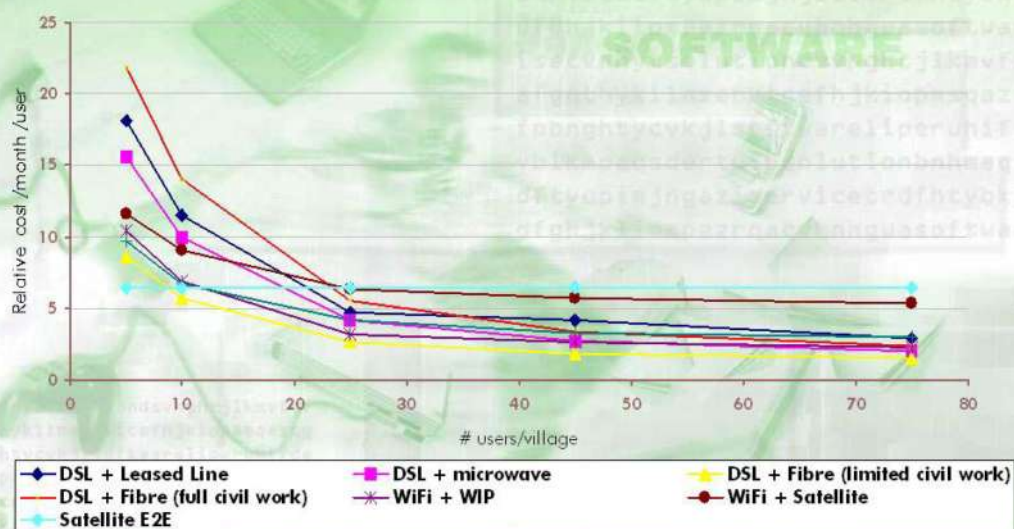
Focus on Rural Case: 2003 End to End Cost



Issue No.2- Focus on Rural Case: 2006 End to End Cost + WiMAX



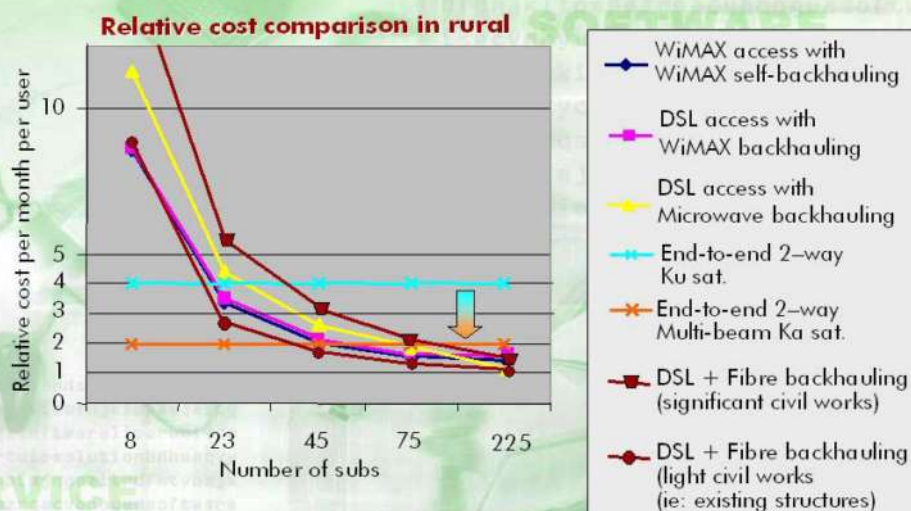
Issue No.2- Cost Comparison Solutions for Rural Areas 2003



(Study for 2003, relative cost Urban DSL = 1)

(Access + backhauling technology)

Issue No.2- Cost evolution Beyond 2007



(Study beyond 2007, relative cost Urban DSL = 1)

(Access + backhauling only)

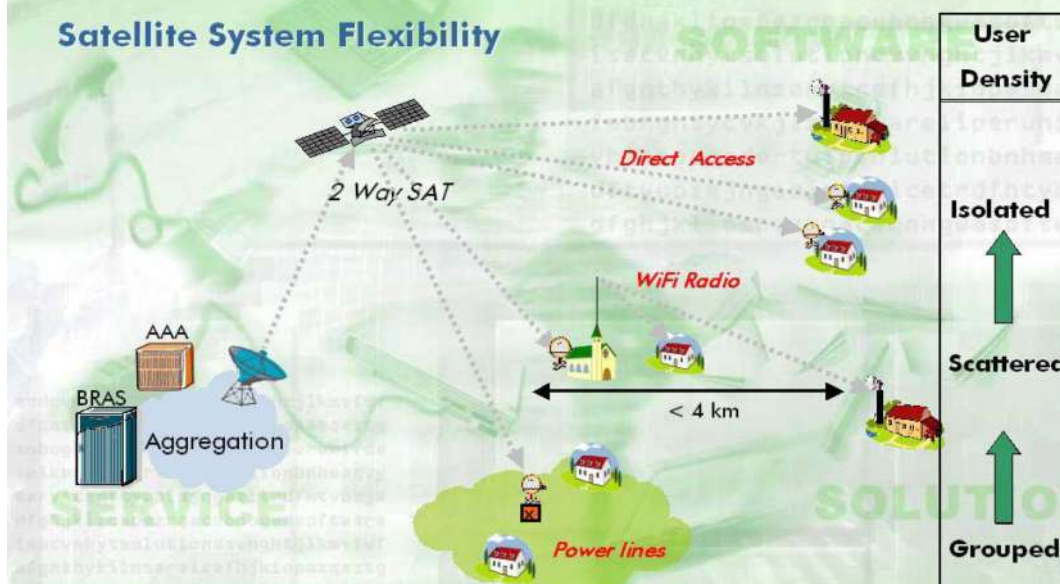
Issue No.2- Main Broadband Access Solutions for Underserved Areas

Satellite DSL offer
Wireless DSL offer
ADSL offer

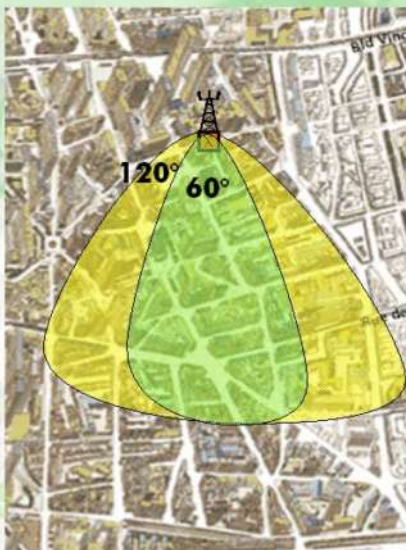


Issue No.2- Individual and Collective Broadband Satellite Connections

Satellite System Flexibility



Issue No.2- WiMAX in Urban Environment (Example)



Typical city with 10000 HH/sqkm
Sectorized BS located at 40 m on tower

- 100 customers per sector
- Within 700 m (1.5 sqkm)
 - ➔ No CPE install
 - ➔ 15000 HH (45000 inh.)

Tri-sectorized

- 120° sectorized antennas
- 300 customers/BS
- Penetration of 2%

6-sectorized

- 60° sectorized antennas
- 600 customers/BS
- Penetration of 4%

Issue No.2- WiMAX in Rural Environment (Example)

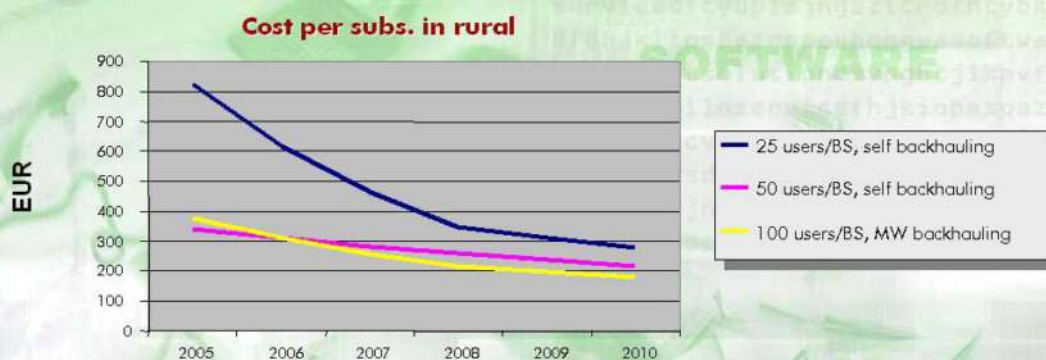


Omni BS located on silo

- Backhaul to the city located at 13 km
- 50/100 customers per BS
- Within 1 km** (No install)
 - 182 HH (455 inh.)
 - 27% penetration is possible
- Within 5 km** (No install/Light install)
 - 762 HH (1904 inh.)
 - 6.6% penetration is possible
- Within 8 km** (All type of install)
 - 1506 HH (3766 inh.)
 - 3.3% penetration is possible
 - 6.6% penetration with backhauling
 - 20% penetration with 3 sectors + backhauling

1999 Census

Issue No.2- WiMAX Market: CAPEX per Subs. in Rural Areas



CAPEX includes HW and installation costs (WiMAX BS & MW)

- **No installation cost for CPE (self installation)**
- **No tower installation costs for MW**

Hypothesis

- **25, 50 subs. Per BS => Self backhauling**
- **100 subs. Per BS => MW backhauling**

Issue No.2- 3G Technology

UMTS in its present form permits a download at about 300 Kbps. The evolution from **UMTS** towards **HSDPA** will permit to reach about 2 Mbps per user.

For **HSDPA** pricing per megabyte at the busy hour is likely to be in the range of one eurocent at first (similar to WiMax hotspots). Mass deployment is foreseen starting in 2006/2007.

With this kind of pricing, video applications via radio may appear too expensive as compared to wireline solutions. It would be used with extensive **UMTS** coverage when no wireline solution is available.

Within the timeframe of this present study, 3G will be more readily deployed in urban areas.

Issue No.2- Terrestrial Digital TV Networks

Terrestrial Digital TV Networks are an emerging solution for rural areas offering broadband internet usage. Some of the benefits of Digital TV include low infrastructure investments which can be shared with DTV service provisioning.

In terms of anticipated bit rates, DTV can offer optimum downstream speeds from 500 kbps up to 1 Mbps and upstream via telecom networks (PSTN or cellular networks).

Available in Finland today, the solution still remains rather expensive as compared to other technological options.

Pan-European digital switchover in each Member State is also another hindering factor for the mass deployment of digital TV solutions across Europe.

Issue No.2- Powerline Communications (PLC)

Powerline Communications (PLC) have better possibilities for in-house communication than for public access in rural areas.

PLC is a shared medium: in most cases it offers less than 1Mbps per house.

The investment costs are above 1000 Euros per user.

There are significant interference problems which have not been resolved at pan-European level. This is affecting both the costs and Mass deployment of this technology.

In conclusion, PLC is unlikely to be a factor in the period up to 2008.

Issue No.2

Key Findings on Technology Merits: 3 Cases

High Density Rural Areas & Urban Areas (+50 users): ADSL /VDSL + Fibre, and Cable

- ADSL is still the most competitive solution based on cost & average user bit rate
- Cable, where available is a good solution. Upgrade costs in rural areas are clearly higher than the average €200/homes passed in metropolitan areas
- The driver towards fibre is either distance or a large need for high interactivity or high definition television
- In most cases, the natural evolution will be from ADSL to ADSL+ or VDSL combined with "fibre to the cabinet", and then eventually, "fibre to the home" as needed. This will permit a gradual evolution achieving 8 Mbps and more according to user needs
- Fibre is economical in "greenfield" situations or where there is the right business case based on high bit rate services and foreseeable operations savings

Issue No.2

Key Findings on Technology Merits: 3 Cases

Medium Density Rural Areas (20-50 users): WiMAX, WiMAX +DSL, Fibre + DSL

- Good solutions for SMEs
- Reasonable investment costs (2-3 times that of urban ADSL)
- Good residential solution but limited interactive video services with WiMAX

Low Density Rural Areas (less 20 users): Satellites

- Ideal for areas with less than 20 users but costs depend on average bitrate
- Typical market segment is businesses which are remote
- Satellite good for residential applications
- For interactivity, need bundled offer with broadcast TV via satellite + internet

Issue No.2

Key Findings: Other technologies

3G: Within the timeframe of this present study, 3G will be more readily deployed in *urban areas*. Given other mass technologies available for BB in rural areas, 3G is unlikely to offer sufficient capacity to be a real contender for providing fixed broadband services, especially for sparsely populated areas.

Powerline Communications (PLC): PLC deployment across Europe has been unsuccessful due to interference and cost issues. Although it is emerging in countries such as Spain, PLC is unlikely to see mass deployment across Europe in the period up to 2008.

Broadband Wireless Access (BWA): BWA technologies include FWA/LMDS, WLAN, WiMAX. The latter two technologies have been addressed in this study. "Fixed Wireless Access" (FWA) or LMDS is another alternative access technology which has seen a slow start in Europe with some deployment in Portugal and Spain.

Digital TV: Terrestrial DTV is an emerging option for internet access, however it offers lower bit rates and weak interactivity compared to other solutions.

Recommendations to Public Authorities:

1- Key Steps for a Satellite Initiative

Step 1: EU must launch initiative to bring Member States and satellite stakeholders (operators, suppliers) together

- *Key objective is to identify and aggregate demand on a pan-European scale and ensure sufficient volumes are guaranteed to lower costs*

Step 2: Industry needs to work on a common satellite standard

- *DVB- RCS standard?*

Step 3: Must Identify the role of EC regions

- *Are regions service providers or promoters?*
- *PPP actions for antenna installation?*

Step 4: Tendering Procedure for Operators

- *A structure must be created to handle call for bids across Europe*

Step 5: What can be Done for the Future?

- *Public and private sectors need to discuss technologies and solutions to bring satellite prices down*