

Kis, Gergely

Conference Paper

Analysis of Hungarian programs for broadband infrastructure development

22nd European Regional Conference of the International Telecommunications Society (ITS): "Innovative ICT Applications - Emerging Regulatory, Economic and Policy Issues", Budapest, Hungary, 18th-21st September, 2011

Provided in Cooperation with:

International Telecommunications Society (ITS)

Suggested Citation: Kis, Gergely (2011) : Analysis of Hungarian programs for broadband infrastructure development, 22nd European Regional Conference of the International Telecommunications Society (ITS): "Innovative ICT Applications - Emerging Regulatory, Economic and Policy Issues", Budapest, Hungary, 18th-21st September, 2011, International Telecommunications Society (ITS), Calgary

This Version is available at:

<https://hdl.handle.net/10419/52205>

Standard-Nutzungsbedingungen:

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

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

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

Terms of use:

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

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

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

**22nd European Regional ITS Conference
Budapest, 18-21 September, 2011**

Gergely Kis

Abstract:

Analysis of Hungarian programs for broadband infrastructure development

In an effort to promote the information society, the Hungarian government adopted a number of strategic concepts and action plans, which formed the basis of many calls for proposals to be funded by the government and the European Union alike to achieve the institutional vision. In this article the author analyzes in evaluating the government's role in Hungarian broadband infrastructure development programs so far. As a supposal in the course of the five government-funded infrastructure development programs implemented in Hungary by 2009, economic policymakers relegated community-based or community-owned digital telecommunication infrastructure to a heavily limited, stopgap role in terms of impact and extent. The basis of the investigation consisted of the RFPs for all of the five programs, as well as the data series showing the results of the projects already completed or yet to be finished under them. By analyzing them, it was possible to investigate the hypothesis.

JEL codes

Keywords: broadband, government-funded infrastructure, development programs

Authors' affiliation and corresponding author's e-mail address

Gergely Kis (gergely.kis@uni-corvinus.hu) is an economist, Ph.D student of the E-Business Research Center in Corvinus University of Budapest. He graduated from the Budapest University of Economic Sciences. He was working for IBM Austria (managing network services), and he is a charter member of GKIE.NET, which is an internet research company (www.gkienet.hu). Mr. Kis field of expertise and research interest is in computer networking and distributed systems, focussing in the areas of mobile devices for differentiated network services.

Analysis of Hungarian programs for broadband infrastructure development

Gergely Kis

Corvinus University of Budapest, E-business Research Centre (H1093 Budapest, Fővám tér 8).

gergely.kis@uni-corvinus.hu

In an effort to promote the information society, the Hungarian government adopted a number of strategic concepts and action plans, which formed the basis of many calls for proposals to be funded by the government and the European Union alike to achieve the institutional vision. In this article the author analyzes in evaluating the government's role in Hungarian broadband infrastructure development programs so far. As a supposal in the course of the five government-funded infrastructure development programs implemented in Hungary by 2009, economic policymakers relegated community-based or community-owned digital telecommunication infrastructure to a heavily limited, stopgap role in terms of impact and extent. The basis of the investigation consisted of the RFPs for all of the five programs, as well as the data series showing the results of the projects already completed or yet to be finished under them. By analyzing them, it was possible to investigate the hypothesis.

The Hungarian Information Society Strategy¹, adopted in 2003, was the first document that contained strategies for the development of this area. Preparations for the first comprehensive program focusing on the development of the basic infrastructure, titled National Broadband Strategy, started in the second half of 2004 at what was then the Ministry of Informatics and Telecommunications. Following intense debates among experts, and after several adjustments, the plans were eventually released in 2005 under the title "National Broadband Strategy 2005"² (Informatikai és Hírközlési Minisztérium, 2005).

Over the years that followed, the government's role had to be repeatedly redefined to ensure the balanced development of the information society and to enhance the effectiveness of the implemented programs. As a result, new strategies were designed

¹ The Hungarian Information Society Strategy, launched in 2003, laid down the fundamental directions of the government's agenda, prioritizing the issue of content and infrastructure development as a condition of progress in broadband digital communications. The (new) Digital Telecommunications Act, which went into effect on January 1, 2004, was an attempt to pave the way to these development goals by providing a favorable environment.

² As part of the eEurope action plan, the European Commission urged all member states to develop their own national broadband strategy in an attempt to coordinate and harmonize the objectives of the entire union and the individual member states. In response to this requirement following the accession on May 1, 2004, Hungary formulated its National Broadband Strategy in 2005.

by the Prime Minister's Office Senior State Secretariat for Infocommunication in 2008, including the Broadband Action Plan, the Digital Literacy Action Plan and the E-Economy Action Plan, which, although updated in 2009, did not materialize before the end of the government's term of office.






The core concept of each and every strategy and accompanying action plan, whether past or future, involves the goal of universal access to information and online services. Hence, the elements of the infrastructure that provides access to the digital telecommunication network and additional services should be viewed as public services (not unlike electricity); all residential areas need to be covered, and it is the government's duty to promote, foster and coordinate this development.

I.1. Broadband infrastructure development projects

There were a total of 62 decisions regarding competition law disputes in the member states of the European Union with respect to broadband infrastructure development projects funded by the EU between December 2003 and May 2010 (European Commission, 2010). This does not only reflect that the member states took advantage of the available broadband infrastructure development funds, but also that in Europe's liberalized telecommunication market there was some kind of competition law hurdle in the course of utilizing community resources in nearly every member country.

In Hungary The Ministry of Informatics and Telecommunications (whose department overseeing infrastructure development proposals was incorporated into the Ministry of Economy and Transport in 2006 and into the Office of the Prime Minister in 2008, only to be transferred to the Ministry of National Development in 2010) defined as its primary objective catching up with the European Union and increasing competitiveness by providing state aid to the ICT sector as early as in the 2003 Hungarian Information Society Strategy already cited, but particularly in its continuation, the 2005 National Broadband Strategy. The development tax incentive that was already available before 2003, the HHÁT 2 and HHÁT 3 programs were the first domestically funded initiatives supporting infrastructure development for which companies could submit proposals. In order for broadband Internet service to be available throughout the country, another three programs were initiated: GVOP 4.4.1, GVOP 4.4.2 and GOP 3.3.1, however, these were already funded by the European Union.

TABLE 1. BROADBAND INFRASTRUCTURE DEVELOPMENT PROGRAMS IN HUNGARY

Program	Year initiated	Number of projects	Total amount disbursed (EUR~HUF)*	Total project value (EUR~HUF)*
 HHÁT 2	2003	27	2,810,674 EUR 737,043,000 HUF	
 HHÁT 3	2003	6	939,455 EUR 246,353,250 HUF	
 GVOP 4.4.1	2004	28	8,215,284 EUR 2,020,384,678 HUF	17,955,863 EUR 4,415,885,493 HUF
 GVOP 4.4.2	2005	59	42,435,027 EUR 10,724,604,270 HUF	58,038,876 EUR 14,668,165,038 HUF
 GOP 3.1.1	2007	37	11,911,908 EUR 3,017,881,784 HUF	25,040,458 EUR 6,344,000,000 HUF

Source: Based on data from the Ministry of Informatics and Telecommunications, the Ministry of Economy and Transport and the Office of the Prime Minister

- * 2003 – 1EUR ≈ 262,23HUF (end-of-year exchange rate)
 2004 – 1EUR ≈ 245,93HUF (end-of-year exchange rate)
 2005 – 1EUR ≈ 252,73HUF (end-of-year exchange rate)
 2007 – 1EUR ≈ 253,35HUF (end-of-year exchange rate)

Light gray figures: the GOP 3.1.1 program is ongoing; the proposals have been adjudicated but the implementation is not complete in every case.

The primary aim of initiating these programs is to bridge the digital divide (as also identified by the EU Commission), which includes mitigating the differences between areas, regions and within regions. Broadband Internet access for rural and low population density areas is a high-priority issue. State aid in these areas is justified by high costs due to large geographical distances and by low demand (low population density, poor financial conditions).

Broadband infrastructure development took place along two directions with separate timeframes and separate sets of recipients:

- Increasing the availability of broadband Internet access at smaller, currently less well served and less lucrative municipalities where, in the absence of state aid, broadband infrastructure would not be built at all, or at least not until later.

The construction of broadband networks is to be aided through subsidizing the telecommunication service provider, with the network becoming the telecommunication service provider's property.

- Providing state aid for the construction of broadband networks by local governments in Hungary's less lucrative municipalities, with the local governments selecting the service providers in open competition, and the network remaining in local government (community) ownership.

In addition to the programs listed above, the PublicNet program was also aimed at providing access points; this, however, required relatively limited investment by the service providers.

Due to the unavailability of best practices, the utilization of community resources was largely a trial-and-error process. The entities inviting the proposals initially were limited to learning from their own mistakes in formulating new policies, given the scarcity of international examples to be learned from.

I have used the following hypothesis in evaluating the government's role in Hungarian broadband infrastructure development programs so far:

H: In the course of the five government-funded infrastructure development programs implemented in Hungary by 2009, economic policymakers relegated community-based or community-owned digital telecommunication infrastructure to a heavily limited, stopgap role in terms of impact and extent.

The hypothesis assumes that in the period up to 2009, economic policy makers did not spend community resources in the digital telecommunication market they considered fundamentally liberalized unless they perceived a lack of broadband Internet access in a municipality enumerated under NUTS5 (later LAU2). To fill the gaps in coverage, the community-funded investment projects aimed at providing broadband Internet access at municipalities where the necessary infrastructure had not been built on a business basis. However, they had no separate policy goals for expanding wide area networks and access networks, and accordingly, they did not focus on what portions of the digital telecommunication network would be better off being operated on a community basis.³

I.2. Analysis of the hypothesis

I.2.1. Methodology

The basis of my investigation consisted of the RFPs for all of the five programs, as well as the data series showing the results of the projects already completed or yet to be finished under them. By analyzing them, it's possible to investigate the hypothesis.

³ In the course of the investigation the necessity of analyzing the PublicNet program also arose. However, the program, including the Sulinet sub-program serving schools, primarily provides IP-based connectivity for public institutions, the foremost application of which is Internet access. In organizing PublicNet, the government primarily rents IP-based connections. At the same time, the whole system is service-based, i.e., the Hungarian government, as a client, ensures the operation of PublicNet by purchasing packages of various services, without building an infrastructure of its own. Active terminal devices (routers, switches) are the only hardware components owned by the client, but client-side terminal devices such as xDSL modems are also provided by the service provider. Consequently, since the focus of this dissertation is the basic infrastructure, I will not analyze the details of the PublicNet program.

I.2.2. The results of the investigation

HHÁT-2 and HHÁT-3

The differences in the names of the two programs reflect differences in content: the original concept behind HHÁT-2 was the implementation of broadband Internet access, while the HHÁT-3 program was the same, but by aiding innovative solutions only. The aim was to bring broadband infrastructure to areas where service providers would be unlikely to build it using their own resources for a long time (Gál, 2008).

Seeing the success of the HHÁT-2 program, decision makers in the Information and Telecommunications Ministry regrouped further funds to this area, creating the HHÁT-3 program, which had not been part of the original concept. At the same time, the accepted proposals were at the same technological level as the earlier ones.

There were several problems with the proposals. Firstly, the Ministry had no database describing which areas of Hungary had access to broadband Internet service, and it lacked basic data on the network infrastructure throughout the country. As a consequence, it was possible to submit proposals to build coverage in municipalities where coverage had already been provided by private businesses, and such proposals were in fact submitted. To make things worse, it was possible to submit proposals involving cherry-picked groups of municipalities, defeating the initial purpose of state aid being spent only on areas where service providers would not build broadband infrastructure for the foreseeable future by their own volition. At the same time, there was no methodology for comparing proposals, and the RFP was inaccurate in many respects, which led to instances of multiple winners for a single municipality (for example, Apostag).

TABLE 2. HHÁT-2 PROGRAM RESULTS

	Number of proposals	Amount
Proposals	41	
Approved	36*	905 043 000 Ft
Not approved	7	178 000 000 Ft
Total proposal amount		1 083 043 000 Ft
Actual funds spent		737 043 000 Ft
Administrative costs		40 000 000 Ft
Funds/covered households	31 403**	23 470 Ft

**In the end, only 27 proposals were processed completely. **Number of covered households*

Source: Ministry of Informatics and Telecommunications, 2004

TABLE 3. HHÁT-3 PROGRAM RESULTS

	Number of proposals	Amount
Proposals	8	
Approved	6	246 353 250 Ft
Not approved	2	142 066 750 Ft
Administrative costs		40 000 000 Ft
Total		428 420 000 Ft

Source: Ministry of Informatics and Telecommunications, 2004

Under the HHÁT 2 and HHÁT 3 programs, 458 NUTS5-level municipalities received some sort of broadband Internet access, and if municipality levels below NUTS5 (sub-municipalities) are also considered, the tally increases by 16 (to a total of 474).

GVOP-4.4.1

The GVOP 4.4.1 program for expanding broadband infrastructure is the continuation of the HHÁT-2 ("State aid for building broadband Internet infrastructure and initiating service in less lucrative municipalities of Hungary") and HHÁT-3 ("State aid supporting the expansion of broadband Internet access through innovative and technology-intensive infrastructure developments and service models") programs of the Ministry of Informatics and Telecommunications from 2003. The HHÁT-2 and HHÁT-3 programs aimed at attracting a wide range of proposals with relatively small individual grant amounts.

The GVOP program simply declared as its aim to promote the construction of broadband networks while defining who the potential grantees are, and prescribing the way the projects were to be implemented. It clarified the way the project was to be completed without detailing the goals.

The program showed that its target group of 400-500 small and medium-sized telecommunication enterprises (mainly cable TV service providers) are incapable of implementing large-volume broadband infrastructure development projects.

Despite the low propensity and ability to submit proposals, the GVOP 4.4.1 program basically coincided with the requirements of the target group, while improving the competitiveness of the development-oriented but undercapitalized small and medium-sized enterprises active in the gap market. At the same time, the broadband infrastructure thus created has contributed to alleviating the regional differences in competitiveness as well, but larger volumes of broadband development cannot be implemented on the basis of this vehicle in the future. This is part of the reason why the form of state aid offered by GVOP 4.4.2 was moved to the forefront, and the bulk of the funding was channeled here as well.

GVOP-4.4.2

The project in preparation for the GVOP 4.4.2 program examined the international examples and the practice of Hungarian local governments, and formulated the initial assumption that the Hungarian local governments would be unable to undertake independently another task that is new and largely outside of their core competencies, if they are left to their own devices, particularly if they have to finance the initial (preparatory) phase of the activity. Local governments typically lack the appropriate project management capacity to handle projects under market-driven conditions. This statement is particularly true of disadvantaged local governments that are short on funds through no fault of their own, and which form the most important target group for the project from the vantage point of broadband digital communication. Consequently, the theoretical key to a state aid program is forming and forcing a partnership system in order to secure the appropriate professional and financial background for:

- preparing for projects,
- implementing development plans,

- operating the infrastructure and
- providing appropriate services.

The model of the 4.4.2 program allows the local government to involve a partner in planning, building and maintaining a broadband network. The goal, not unlike in 4.4.1, was to provide broadband service in areas where profitable market-based service is not feasible.

The first approximation for a target group of the 4.4.2 program consists of municipal governments and consortia of municipal governments formed voluntarily and under section 10 of act XXI of 1996 about area development and zoning (i.e., consortia that are incorporated legal entities and operate as budgetary organizations). As reflected by the goals of the state aid, the main objective is providing coverage in underdeveloped areas, meaning that the municipalities and consortia of municipalities (regardless of their population size) that are eligible for state aid are the ones lying in statistical/planning regions and subregions defined in section 30, subsection (1) a) of Government Decree 85/2004. (IV.19.). That 4.4.2 program was more successful is shown by the fact that it attracted three times as many proposals as the 4.4.1 program. (The attention of service providers was focused on 4.4.2 by the higher cofinancing ratio and the higher absolute amount to be disbursed.)

TABLE 4. RESULTS OF THE 4.4.2 PROGRAM

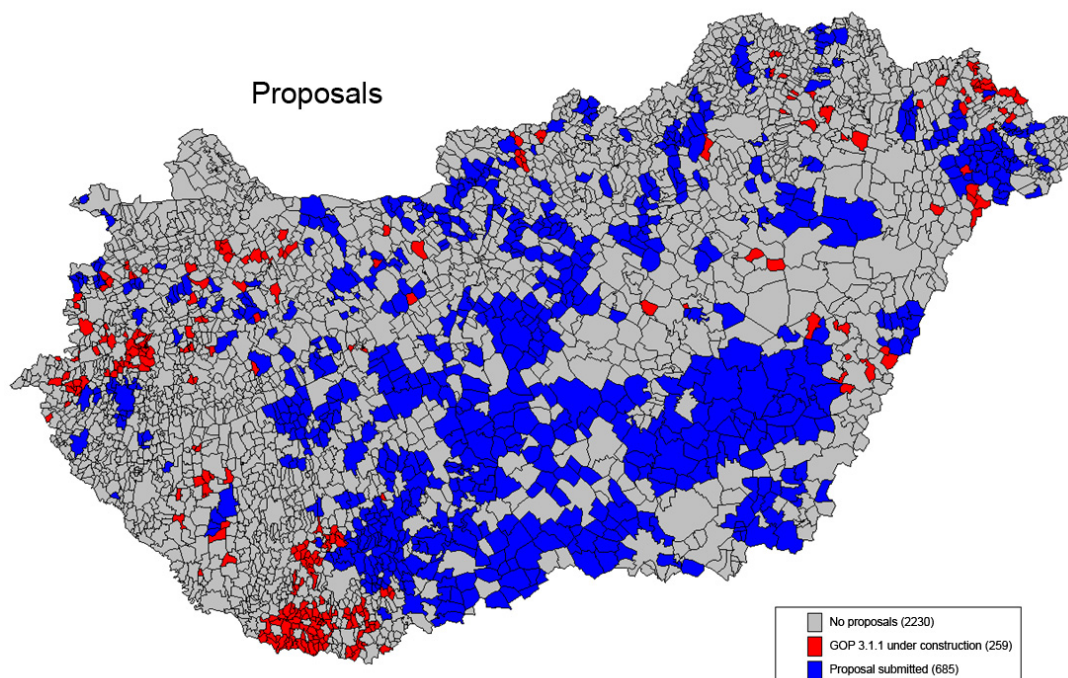
	Not approved	Approved	Total
Municipalities covered	458	378	836
Households covered	224 317	241 409	465 726
Population covered	581 884	636 078	1 217 962
Amount requested (millions of forints)	9 667	10 541	20 208
Amount awarded (millions of forints)	-	10 040	10 040

Source: Based on data from the Ministry of Informatics and Telecommunications, the Ministry of Economy and Transport and the Office of the Prime Minister

Monitoring coverage data

The following map, showing municipality boundaries, clearly indicates the location within Hungary of municipalities with networks constructed (or modernized) under the program. At the same time, differences between regions are not shown clearly owing to the differences in municipality sizes (larger and fewer municipalities in the Great Plains region, and smaller but more numerous ones in the mountain areas).

FIGURE 1. GEOGRAPHICAL LOCATION OF THE MUNICIPALITIES INVOLVED IN THE PROGRAMS



Source: Based on data from the Ministry of Informatics and Telecommunications, the Ministry of Economy and Transport and the Office of the Prime Minister

In terms of coverage (independently of the area of the municipalities), the southern part of the Great Plains region is very highly impacted. The numerical data (see graph below) show that the 62% area coverage ratio of the Southern Great Plains region is extremely high.

Municipalities of the Southern Great Plains region also had the most successful proposals in terms of municipality structure (number of municipalities – population). The low participation of the Western Hungary region is perhaps expected, while in Northern Hungary, where penetration values are low, there is a danger of falling behind. It makes sense to compare the municipalities impacted by the program with a comprehensive ICT availability index.

The ICT development index

It is necessary to investigate the ICT-related development of individual subregions. This involves a complex ICT development index which demonstrates the different development rates. In setting up the index, I used the most feasible method rather than the theoretically soundest approach.

An accurate account of the development of the digital telecommunication network in Hungary over the period between 2003-2008⁴ would only be possible if comprehensive data sets had been collected on network infrastructure investments on an annual basis. However, creating databases that contain data like this is a

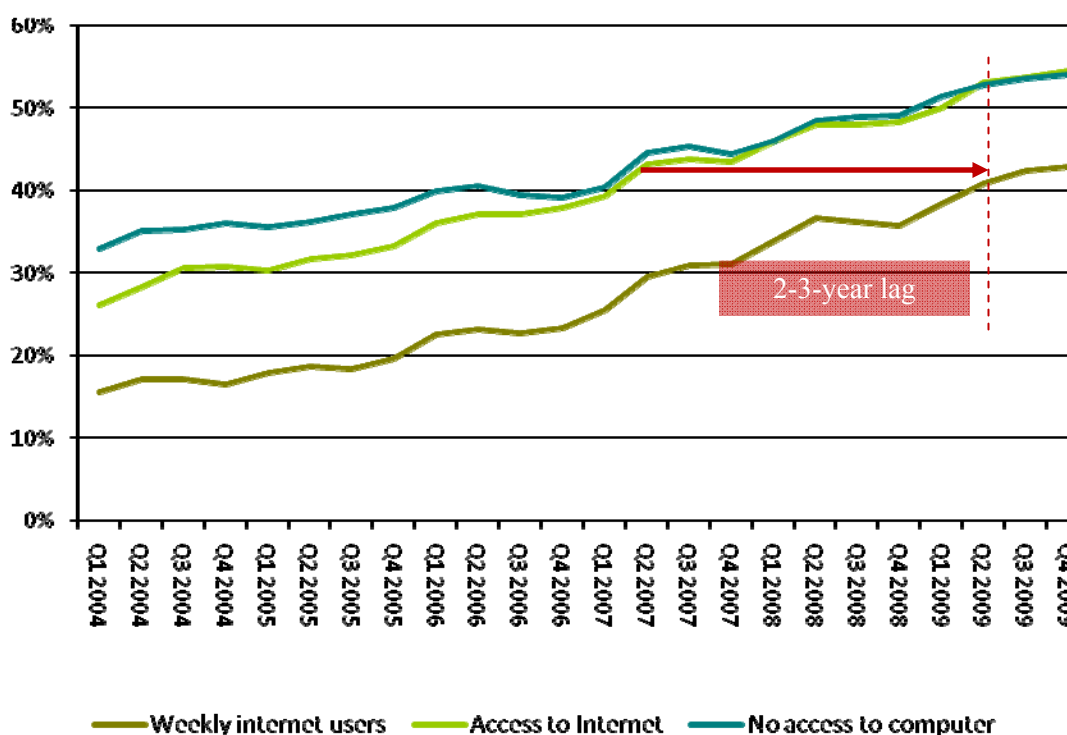
⁴ There are no data sets available for the period prior to 2003 that could be used to derive the data necessary for the investigation at least at the level of subregions.

costly endeavor, and it would not always be a reasonable expectation towards surveyees (this rules out the theoretically best possible analysis). There are indices, though, that provide a good overview of the development of the ICT infrastructure over the period under investigation:

- A. Number of Internet subscriptions per 100 residents;
- B. Number of cable TV subscriptions per 100 residents;
- C. Number of mobile phone subscriptions per 100 residents;
- D. Number of PCs per 100 residents.

The indices themselves do not represent the development level of the infrastructure, but they are indicative of the volume of consumer demand for selected elements of the infrastructure (the number of PCs is particularly significant in this respect). However, it is a key question whether the demand can be met on the side of the telecommunication infrastructure. This is particularly true in the case of Internet and cable TV subscriptions (the latter always involves modernization of the basic infrastructure for the 'last mile'). Basic infrastructure developments are also necessary to meet the demand for mobile service subscriptions (increasing bandwidth to cell towers). PC use does not require broadband infrastructure, but computer and Internet use are closely related in the household segment: the rate of households with computers projects the changes in the rate of residential Internet subscriptions. As a rule of thumb, it is generally true of the domestic Internet penetration that the rate of regular Internet users (weekly or more) mirrors the rate of PC access with a two-to-three-year lag.

FIGURE 2. CORRELATION BETWEEN PC PENETRATION AND INTERNET USE



Source: GKIeNET, 2010

Over the past three years (2007-2009) the percentage of people with Internet access has been approximately equal to the percentage of those who have access to a computer, which can be attributed to the fact that computer use at work or at school increased the demand at home, too. As a result, as low as 1-2% of all computer users are without Internet access.

By synthesizing the individual sets of precise data, we can create an indicator which reflects the development of the domestic ICT infrastructure. Ideally, indices should be available to represent the development level of micro-regions, however, neither the Hungarian research institutes nor the Central Statistical Office collected detailed data during that time period. GKIE NET, on the other hand, has relevant data on the regions under study, which, with the help of model estimates, can be used to generate data sets for subregions or even municipalities with a relatively low error rate. Data from 2003, 2005, 2007, 2008 should be sufficient to study the development, because, provided that the assumption is correct, they clearly demonstrate the regional imbalances. The complex ICT development indicator – ICT availability index – is an appropriate tool to indicate differences in development patterns.

For comparison purposes, I determined the values of all four indices on the basis of 100 people, where the population means the total number of residents in a given subregion. I examined data between 2003 and 2008 to explore the differences in development rates among subregions (while data sets created for 2005 and 2007 served as control). The study period was determined on the basis of the following considerations:

- 2008 is the final year for which comprehensive databases are available with respect to all four indices (by the time of the study, the Hungarian Central Statistical Office had not published data relevant for the model estimate past 2008);
- this time frame covers the entire period when broadband-related government-subsidized grants were awarded and (with the exception of GOP 3.1.1) implemented.

In light of the above considerations, it is important to examine the four indices separately. Although there is a close link between computer access and Internet access, changes in one factor cannot fully be attributed to the other. By integrating the four indices, I created an index which shows ICT availability per 100 people. Changes in the compound index indicate the rates of change (increase) in ICT availability against the base value by subregions.

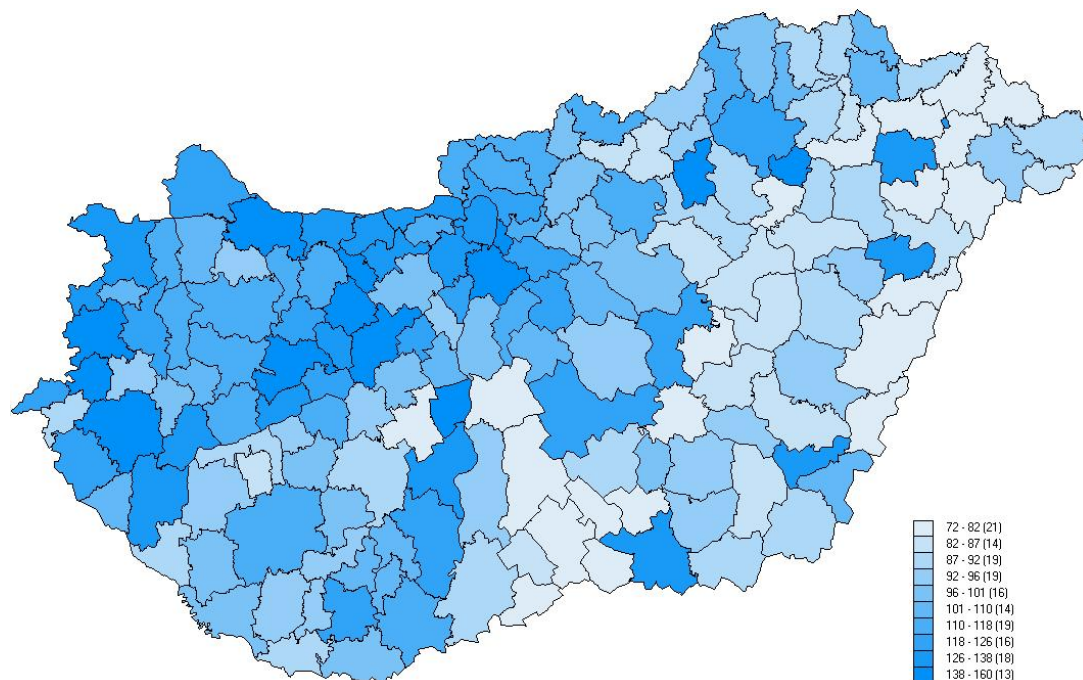
The analysis demonstrates the development level of subregions in 2003 and 2008 based on the index⁵. In addition, this investigation will provide input to map out a possible correlation between the geographic location of government programs in effect and the rate of development.

⁵ There were major changes over the five-year period between 2003 and 2008 in the way Hungary was divided into subregions: for comparison purposes, I am using the division structure that was in effect in 2008, which includes 168 subregions.

Development indices of subregions

For easier comparison, I divided the subregions into ten deciles with equal number of elements. Due to the discreet values, the categorization resulted in groups with some differences in the number of elements, but the discrepancies in development levels are still obvious.

FIGURE 3. DEVELOPMENT LEVEL OF SUBREGIONS BASED ON THE ICT AVAILABILITY INDEX (2003)



Source: Gergely Kis, 2010

The following table summarizes the nationwide averages based on the analysis of the four indices. In terms of the four devices, ICT availability increased 60% per 100 people on average. Internet availability rose at the fastest rate: Internet access surged from 6.6 subscriptions per 100 people in 2003 to 22.7 subscriptions per 100 people in 2008. The choice of 2008 is favorable for another reason: it does not yet include the distorting effects of statistics reflecting the boom of mobile Internet.

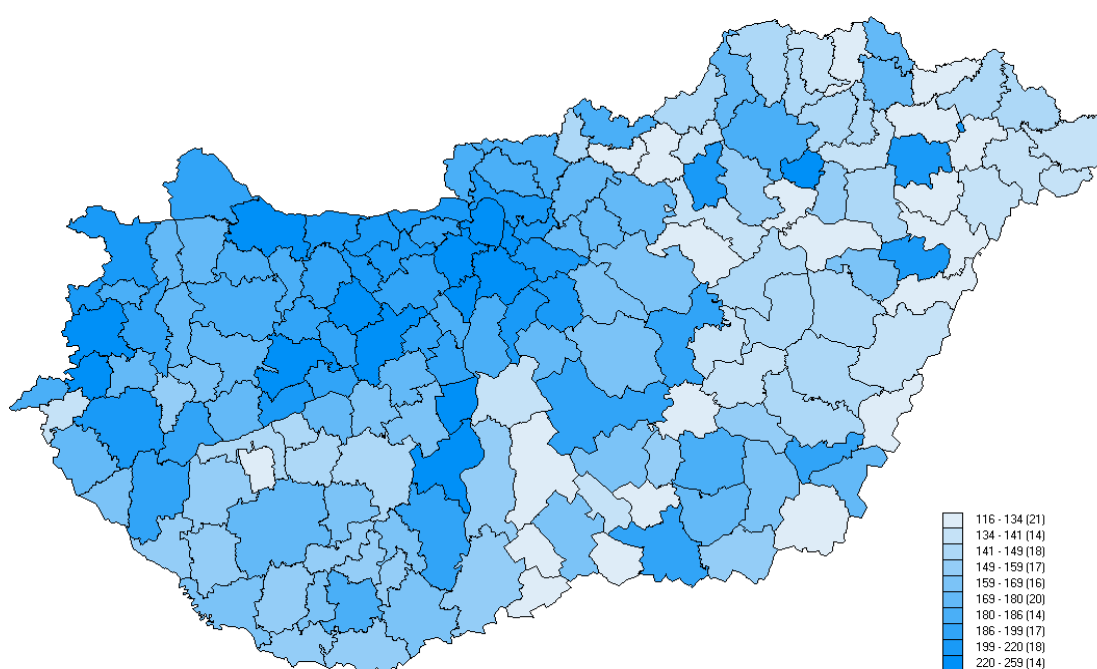
It should be noted that values reflecting the national average were in the 7th decile in 2003 and in the 8th decile in 2008, indicating that subregions with higher population have a higher ICT availability index, raising the average value. Changes in the national average ranking also indicate that although access to technological devices expanded significantly across the board, smaller, less developed subregions fell behind in terms of ICT availability. This fact alone suggests that the implementation of government-funded development programs is indispensable in this field.

TABLE 5. CHANGES IN THE ICT AVAILABILITY INDEX

	2003	2008
Number of Internet subscriptions per 100 residents	6.6	22.7
Number of PCs per 100 residents	14.0	25.8
Number of mobile phone subscriptions 100 per 100 residents	78.0	120.1
Number of cable TV subscriptions per 100 residents	18.7	20.9
Total	117.3	189.4

Source: Gergely Kis, 2010

FIGURE 4. DEVELOPMENT LEVEL OF SUBREGIONS BASED ON THE ICT AVAILABILITY INDEX (2008)



Source: Gergely Kis, 2010

Relative developmental differences

During the five years under investigation, the rankings based on decile positions have not changed significantly. More than 40% of all subregions were in the same decile in both 2003 and 2008. If we consider that the percentage of subregions that remained in the same category or moved no more than one step totaled 80%, it is easy to conclude that the regional characteristics regarding the prevalence of ICT devices and services remained relatively constant. Only 33 out of the 168 subregions saw a change of two or more steps in their rankings, with twelve regions moving down and 21 moving up.

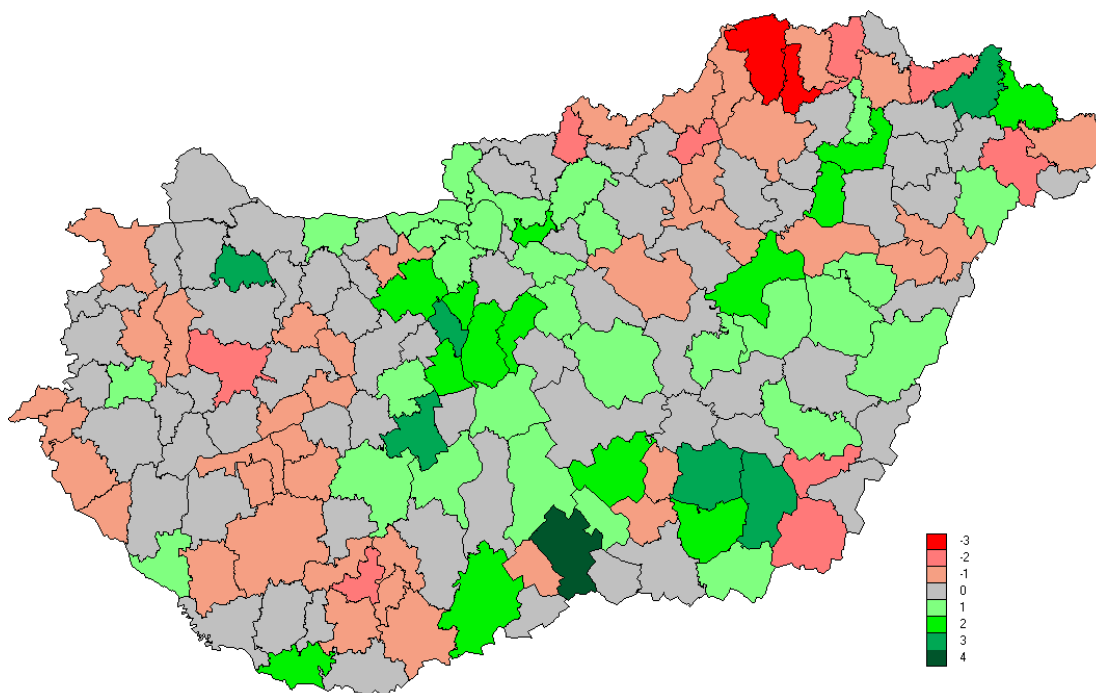
TABLE 6. CHANGES IN RANKINGS BASED ON THE DECILE POSITION (2003-2008)

Degree of change in rankings	Number of subregions	As a percentage of all subregions
-3	2	1%
-2	10	6%
-1	38	23%
0	69	41%
1	28	17%
2	14	8%
3	6	4%
4	1	1%

Source: Gergely Kis, 2010

The following map illustrates the geographic location of subregions that moved 'downward' and 'upward'.

FIGURE 5. CHANGES IN THE RANKINGS OF SUBREGIONS BY DECILE POSITION BASED ON ICT AVAILABILITY BETWEEN 2003 AND 2008



Source: Gergely Kis, 2010

Shades of green on the map show subregions that developed at above-average rates, while shades of red indicate slower-than average development, clearly demonstrating which subregions are facing the problem of digital divide in terms of ICT availability.

The next table includes a summary of subregions that had the fastest and slowest development rates during the five years under study compared with the average.

TABLE 7. FASTEST AND SLOWEST GROWING SUBREGIONS IN TERMS OF ICT ACCESS

Subregion	Change in rankings	Subregion	Change in rankings
Adony	+2	Edelény	-3
Baja	+2	Sziksó	-3
Bicske	+2	Abaúj–Hegyköz	-2
Budaörs	+2	Ajka	-2
Gyál	+2	Békéscsaba	-2
Hódmezővásárhely	+2	Bélapátfalva	-2
Kiskunfélegyháza	+2	Bodrogköz	-2
Polgár	+2	Komló	-2
Ráckeve	+2	Mátészalka	-2
Sellye	+2	Mezőkovácsháza	-2
Tiszafüred	+2	Pacsa	-2
Tiszavasvár	+2	Szécsény	-2
Vásárosnamény	+2		
Veresegyház	+2		
Ercs	+3		
Kisvárd	+3		
Orosháza	+3		
Sárbogárd	+3		
Szentes	+3		
Tét	+3		
Kiskunhalas	+4		

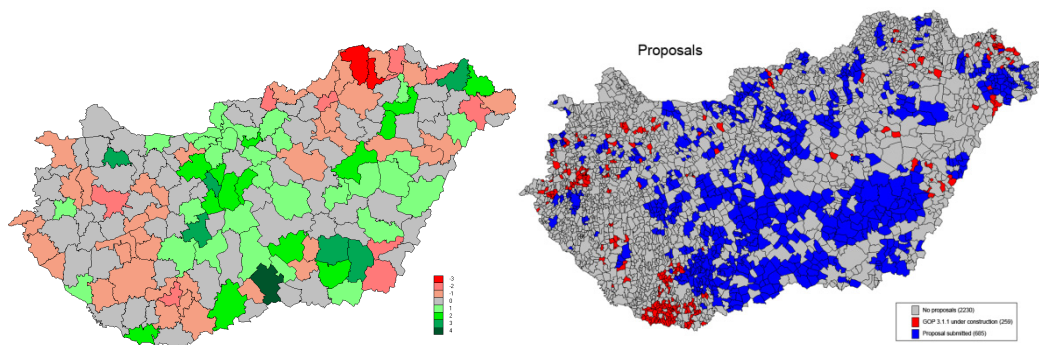
Source: Gergely Kis, 2010

Subregions that grew faster than the average in terms of the compound ICT availability index are generally located in the Great Plains region and in Central Hungary, while slower-growing micro-regions are typically in Northern Hungary and in Southern Transdanubia. The data will be particularly interesting once we add the information on the locations of government-funded infrastructure development projects.

Although not directly addressing the time period or the focus of the present study, the National Communications Authority's report "Broadband Internet Access in Hungary" (published annually between 2004 and 2010) includes interesting facts relevant to the topic. László Horváth, the coordinator of the study, points out a phenomenon with respect to Budapest and the rest of the country: "There was a shift from Q2 2008 to Q2 2009. The 'positive' trend of the earlier period turned into negative (growth in broadband subscriptions in regions outside Budapest outpaced the capital by almost 2 subscribers per 100 people), which lead to a narrowing of the broadband gap" (Horváth, 2010). This is promising news, considering that basically following the investigation period, the extent of the digital divide between Budapest and the rest of the country seemed to have diminished slightly.

Next step, let's see the results of compare the municipalities impacted by the program with a comprehensive ICT availability index.

FIGURE 6. COMPARISON BETWEEN CHANGES IN THE POSITION OF SUBREGIONS IN DECILE GROUPS BY THE ICT AVAILABILITY INDEX IN 2003-2008 AND THE GEOGRAPHICAL LOCATION OF MUNICIPALITIES IMPACTED BY THE PROGRAMS



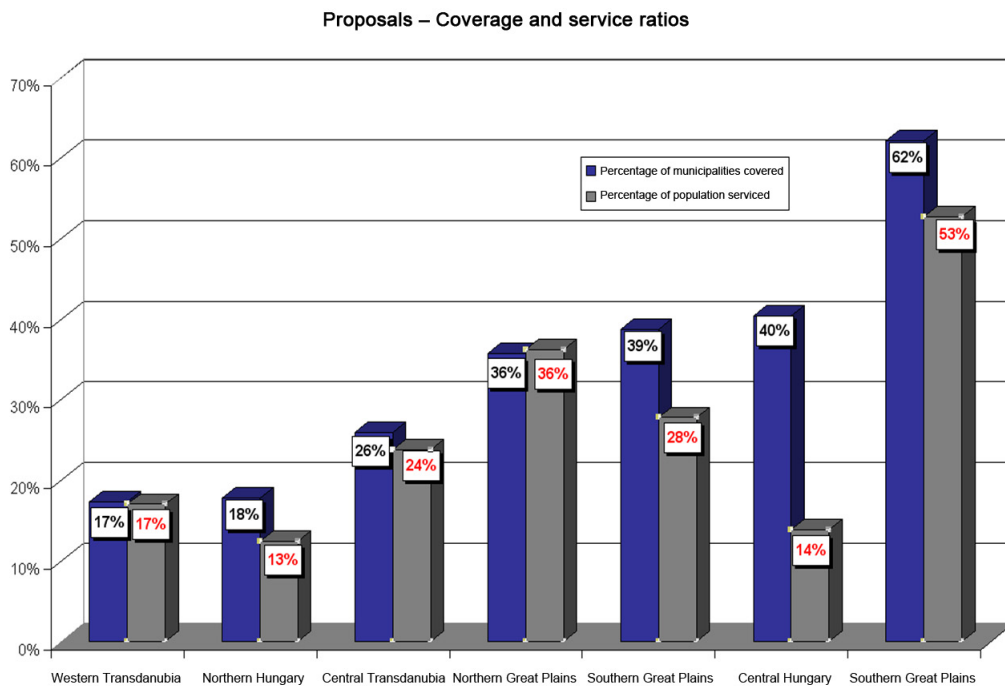
Source: Gergely Kis, 2010

The map on the left could not yet reflect the impact of the GOP 3.1.1 projects shown in red on the right-hand-side map. The subregions marked in blue, however, have a clearly visible overlap with the gray and green subregions on the left-side map. What this shows is that the state-aided basic infrastructure investments are not only able to counteract the slower development in the ICT availability in the relatively more slowly developing subregions (and their utilization) but they can even catalyze them, resulting in faster development than the rest.

However, there is another vantage point from which the locations where these proposals are implemented deserve a look. If we superimposed a terrain layer over the two maps above, it would be readily apparent that the proposals are mostly implemented in flat areas, where the terrain is easy. In these locations implementation was possible in a more economical way (in wooded, hilly areas construction is more difficult and hence costlier). For example, areas in the Zala hill country, where the basic ICT infrastructure is quite poor, have remained underserved precisely for this reason.

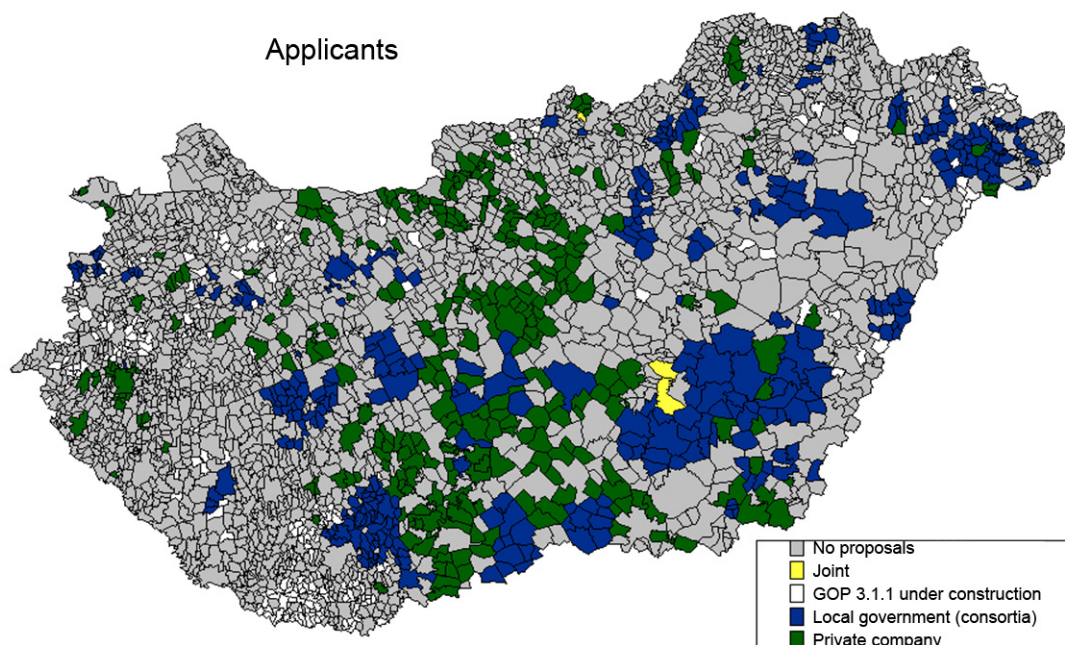
The coverage and service ratios in the proposals also reflect conspicuous differences between various parts of the country.

FIGURE 7. PROPOSALS – COVERAGE AND SERVICE RATIOS



Source: Based on data from the Ministry of Informatics and Telecommunications, the Ministry of Economy and Transport and the Office of the Prime Minister

FIGURE 8. GEOGRAPHICAL LOCATION BASED ON APPLICANT TYPES



Source: Based on data from the Ministry of Informatics and Telecommunications, the Ministry of Economy and Transport and the Office of the Prime Minister

The only aspect of the original RFP that is clearly reflected in the network development (modernization) efforts of the business sector is the increase in the

number of households serviced. The intent of increasing coverage by lowering the number of underdeveloped, less lucrative municipalities was not part of the main focus. Most of the development projects are clustered along the Danube in the central part of Hungary, an area of the country that is not underdeveloped.

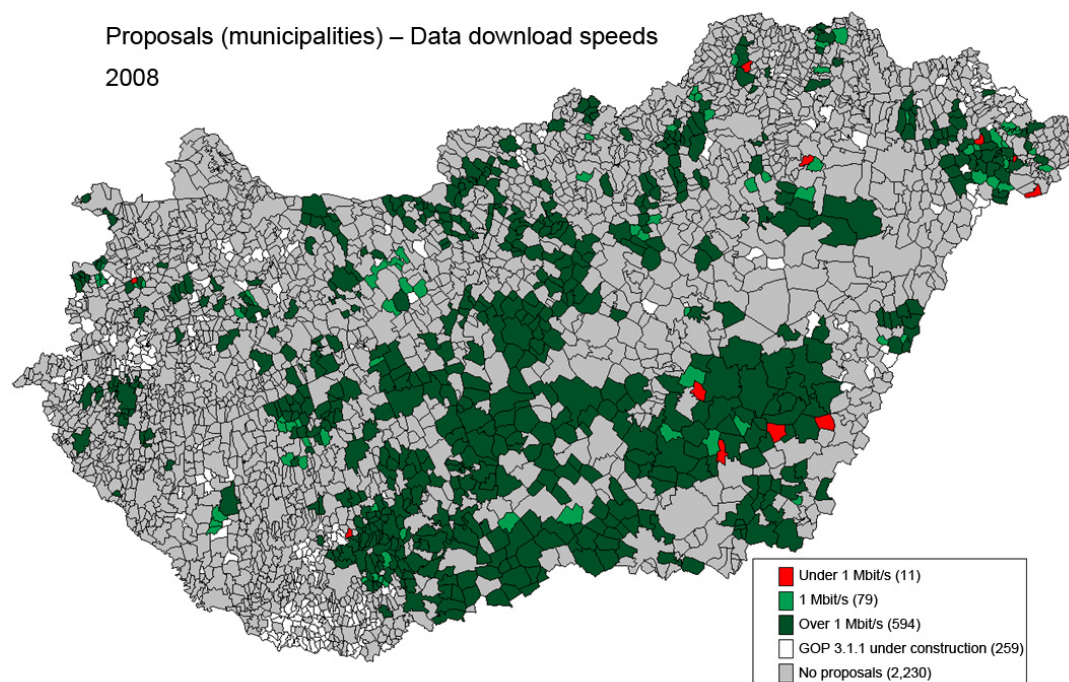
Local governments (and their consortia), including the municipalities in the scope of the GOP 3.1.1 program under construction, however, are clearly targeting municipalities or clusters thereof which fulfill the requirements of the program's RFP.

Data download speed

In the majority of the networks built or modernized under the programs (594), the nominal data download speed reflects an actual service level of over 1 Mb/s. Only 11 municipalities have access speeds under 1 Mb/s. The broadband access speeds under 1 Mb/s are features of networks in local government ownership, with one exception.

The majority of local government-owned networks are examples of wired broadband (HFC or purely coaxial) infrastructure. The network no longer limits data transfer speeds, but the capacity of the wide area network can be a significant limiting factor. This fact underscores the conclusion I described in chapter V.1. as a paradoxical situation.

FIGURE 9. PROPOSALS (MUNICIPALITIES) – DATA DOWNLOAD SPEEDS (2008)



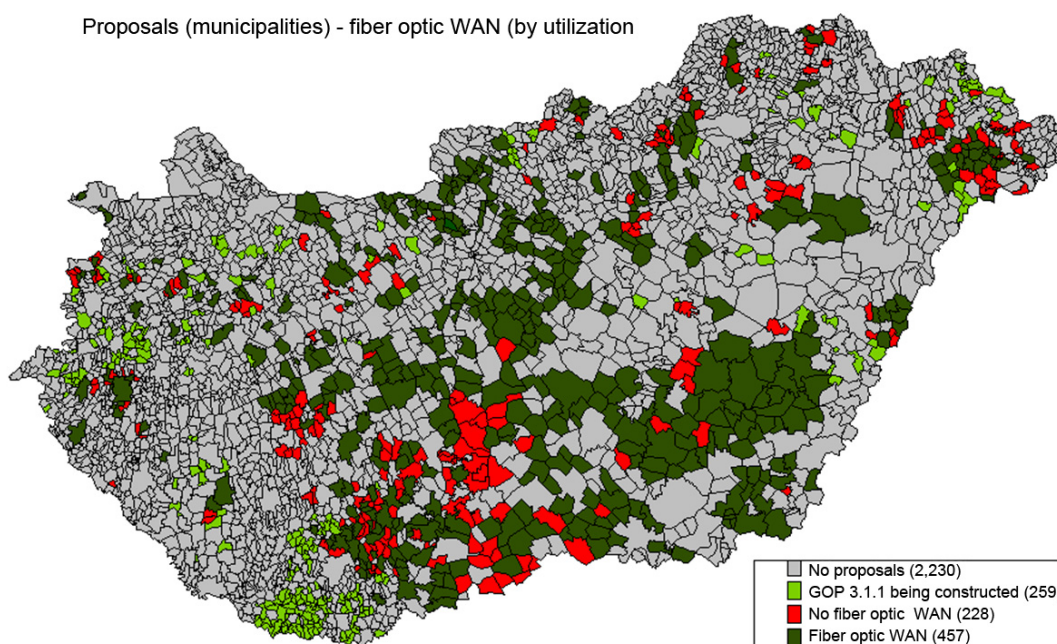
Source: Based on data from the Ministry of Informatics and Telecommunications, the Ministry of Economy and Transport and the Office of the Prime Minister

Wide area network on a fiber optic medium

The subject of the next map is not fiber optic coverage, but the geographic location of fiber optic connections aggregating the traffic of access networks and used for broadband Internet access. The map does not reflect network connections that

have access points at the given municipality, but are not used for broadband access (not purposed for telecommunication). In addition, fiber optic connective capacities accessed through coaxial connections in HFC (broadband CATV) networks are also excluded. In these areas fiber optic coverage may be somewhat more favorable as fiber optics are not necessary between municipalities within switch network distance (quality service is still possible). Needless to say, demand for higher bandwidth dictated by technological development (e.g., VOD services) may force the restructuring of the networks sooner or later, meaning that the fiber optic cable will have to get closer to the subscriber. But in this sense the map is a good indicator of the municipalities where a next step of development is unavoidable. In the absence of a high-bandwidth, high-capacity wide area network, the access networks built under the programs can easily end up becoming isolated. Conversely, the utilization of the existing capacities can be limited by the high prices of aggregated access.

FIGURE 10. PROPOSALS (MUNICIPALITIES) – FIBER OPTIC WIDE AREA NETWORK



Source: Based on data from the Ministry of Informatics and Telecommunications, the Ministry of Economy and Transport and the Office of the Prime Minister

Based on the above (as of May 2009) 48% of Hungary's municipalities has access to a fiber optic wide area network. (As GOP 3.1.1 is completed, another 150-200 municipalities are expected to be connected.)

Technology-based competition between service providers

Technology-based competition between service providers expresses the relationship in a given municipality among service providers with a network infrastructure of their own (and/or network owners). In Hungary, technology-based competition is led by xDSL, which has nearly 100% PSTN network coverage but only 82% broadband coverage, at 85% (which exceeds the national average).

Some 50% of all municipalities have cable modem and WLAN access, while 28.6% offer all three technologies (May 2009).

TABLE 8. USED TECHNOLOGIES IN ACCESS NETWORKS

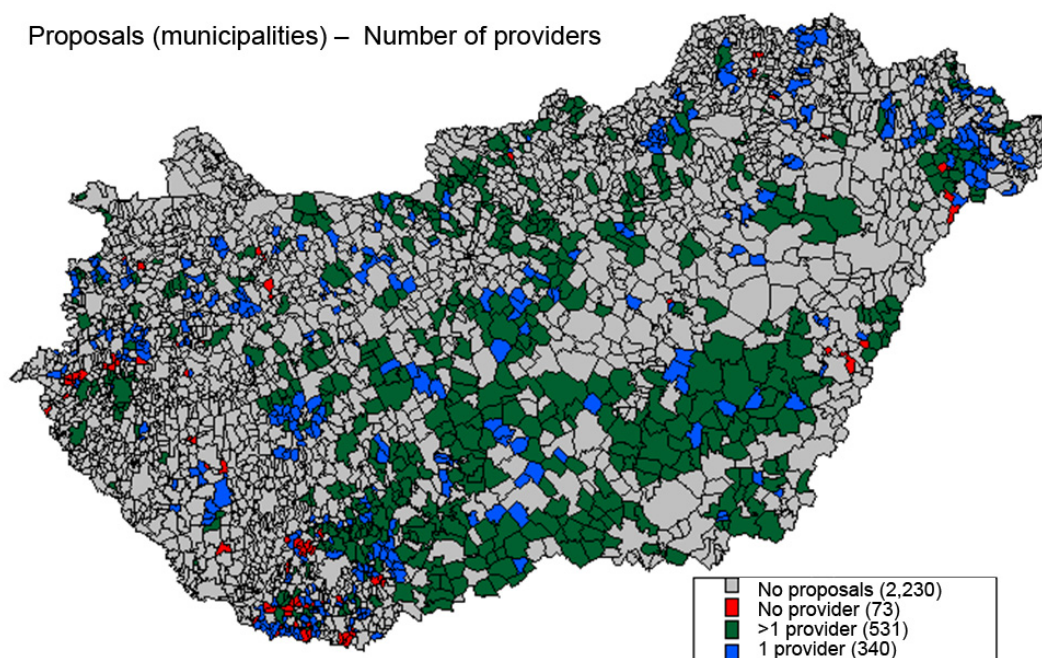
Technology	xDSL	Cable modem	WLAN	Cable modem+WLAN+xDSL
Municipalities	740	432	441	249
Percentage	85.0%	49.6%	50.6%	28.6%

Source: Based on data from the Ministry of Informatics and Telecommunications, the Ministry of Economy and Transport and the Office of the Prime Minister

This ratio is reflected by the following map, which shows the competition between service providers on a territorial level. There is actual competition in more than half (56%) of all municipalities (including those with ongoing GOP 3.1.1 development projects).

FIGURE 11. PROPOSALS (MUNICIPALITIES) – NUMBER OF PROVIDERS

Proposals (municipalities) – Number of providers



Source: Based on data from the Ministry of Informatics and Telecommunications, the Ministry of Economy and Transport and the Office of the Prime Minister

However, I must point out one aspect of infrastructure-based competition in the analysis: unfortunately, the HFC networks of the GVOP programs will not really be suitable to be used by other service providers, should this demand be raised in the wake of eventual new regulations aimed at boosting competition. This is because the new fiber optic networks are laid in 12-fiber layouts. Most of the time, the signal carried by the fibers is analogous (i.e., radio frequency signals are modulated with light – which is not compatible on an IP basis), and typically one pair of fiber

strands is used in each municipality. That means that even if 12 optical fiber strands enter a municipality (and this is the least unfavorable situation), then a pair of fibers is separated in the internal network, with the remaining 10 continuing on to the next municipality, and so on. This is clearly a tree structure, meaning that if the fiber optics laid down were to be used for other purposes as well, then a significant technological shift would also be necessary. As a consequence, although the affected municipalities have seen a high quality access network constructed using community resources, when unbundled, this network is unsuitable for the one purpose it was constructed for: broadband Internet access. The prices of aggregate access are high, and the local governments are finding it hard to find providers willing to provide services in the financially unattractive areas.

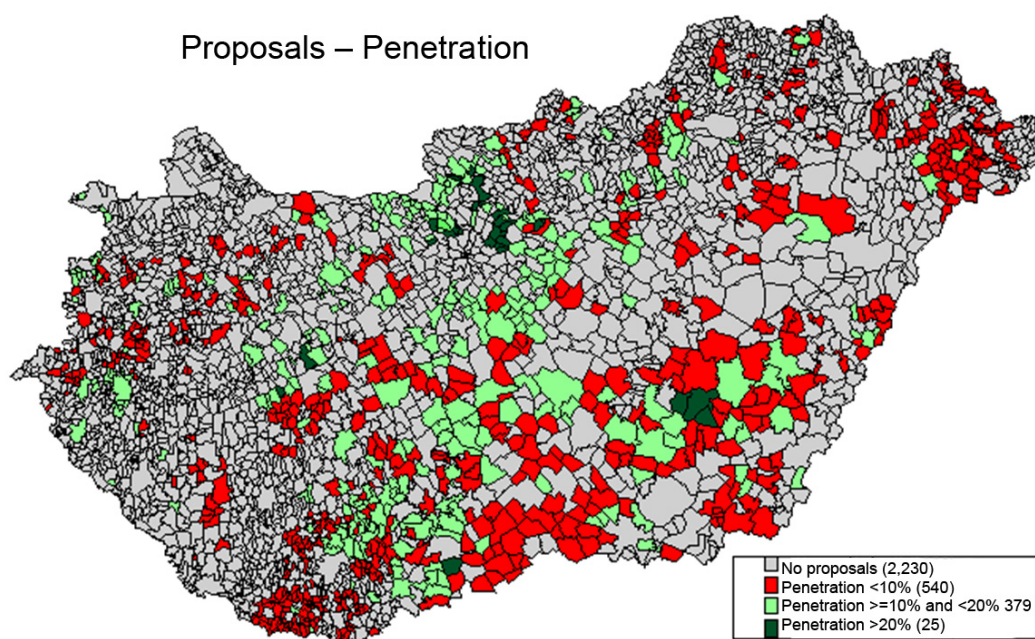
Of course, the HFC networks have been developed since 2007 (using their own funds), and most are now two-way, and therefore capable of offering Internet service, but the problem illustrates how the original community program meant to boost broadband Internet access has morphed into a privately owned cable television network development project.

Penetration (meeting commitments)

The most obvious difference between winning and losing proposals is in the penetration commitment data. Proposals forecast average penetration rates of 14% and 37% in one and five years, respectively. Rejected proposals planned to have 10% penetration within a year on average, while accepted ones averaged 18%. In a five-year timeframe, rejected proposals projected 34% penetration while approved ones showed 39%. Considering domestic and international data, it seems difficult to meet even the more modest 10% penetration rate proposed for the first year by those rejected. From an analytical perspective, the 18% average penetration target of the winning bids appears *ambitious*. The available data show that the more successful proposals were those which projected higher penetration indicators both in the short and the medium term. This is a clear consequence of the point system used to evaluate proposals. At the same time, there was no mechanism to check unrealistically high commitments (e.g., by looking at effective demand or existing service provider experience). Successful proposals made commitments between 18% and 39%.

The data clearly indicate that the penetration commitments in the winning bids were not based on realistic calculations. Given that the majority of municipalities have not just one, but two or three competing broadband technologies, as few as 25 municipalities registered penetration rates above 20% in 2008. This would reflect a meager 3.6% fulfillment rate for the commitments made in the proposals.

FIGURE 12. PROPOSALS – PENETRATION



Source: Based on data from the Ministry of Informatics and Telecommunications, the Ministry of Economy and Transport and the Office of the Prime Minister

A number of shortcomings were unearthed during the follow-up evaluation of the proposals. I have alluded to this earlier, but I will emphasize it again: there were no exact data about Hungary's broadband infrastructure for the programs prior to GOP 3.1.1, and no best practices were available regarding the way to introduce state aid. The first such survey⁶ was completed just before the GOP 3.1.1 program was launched. It targeted terminal points (purposely forgoing reports by service providers) in order to see which of the 3,152 NUTS5-level municipalities had available broadband access (defined as 256 Kb/s in the download direction and 64 Kb/s for upload). The survey provided a good background for setting up the GOP 3.1.1 program, but it became clear that providing broadband coverage and maintaining competition would likely be hampered by a very significant problem: the substantial shortcomings of the wide area network will substantially limit future infrastructure development projects. This research result was the first to lead to preparations for the planned, but ultimately unrealized GOP 3.1.2 program, and the birth of the National Digital Utility concept, whose implementation was also beyond the reach of the political leadership at the time. At the same time, resolving the problem is also a task for the new government formed in 2010, which will likely attempt to manage it in the framework of a program called National Network.

Summary of the investigations of the hypothesis

The results of the government interventions indicate that the programs failed to separate efforts to develop wide area networks and access networks, instead

⁶ Done by GKleNET, with me as a participant in the research.

mostly attempting to answer political calls for "finally, broadband Internet access for all." The infrastructure development program with the greatest impact was GVOP 4.4.2. It led to broadband coverage in some form for 378 municipalities, and this was the only program where the infrastructure created theoretically remained in community ownership. However, vendors employed tricks under this program as well: sections constructed with public funds were connected to privately owned segments (rendering them inoperable on their own), and in many cases the local governments have made secret agreements with the vendors ensuring that the network would become the property of the operator in some form, once the maintenance period mandated by the state aid program expires.

GVOP 4.4.2 was the only program with the objective of keeping network segments built with community funds in community ownership, but owing to the reasons above, most of them can practically be considered privately owned networks as well. Considering the number of municipalities in Hungary, all publicly funded programs had a small impact on the entirety of Hungary's digital telecommunication network. At the same time, some Hungarian-owned businesses (such as PR Telekom, Tarr, Opticon) were able to increase their customer base and expand their infrastructure substantially.

Based on the above I consider it proven that in the course of the five state-aided infrastructure development programs implemented in Hungary by 2009, economic policymakers relegated community-based or community-owned digital telecommunication infrastructure to a heavily limited, stopgap role in impact and extent– and consequently I declare the hypothesis proven and accepted.

II. REFERENCES

- Begonha, D. – Gryseels, M. – Sandoval, S. – Torfs, W. [2010]:** *Creating a Fiber Future*. McKinsey & Company, Inc. White paper, 2010.
- European Commission. [2010]:** *Commission decisions on State aid to broadband (2003-2009)*. Retrieved September 2, 2010 from http://ec.europa.eu/competition/sectors/telecommunications/broadband_decisions.pdf.
- Informatikai és Hírközlési Minisztérium [2005]:** *Nemzeti Szélessávú Stratégia*. [National Broadband Strategy]. IHM, Budapest, 2005.
- Gál, A. [2008]:** *Szélessávú infrastruktúrafejlesztési pályázatok magyarországi tapasztalatai*. [Broadband infrastructure development proposals: Experiences in Hungary]. Budapest, HTE, 2008, Vol. 16. Távközlési Szeminárium conference publication.
- Gergely Kis [2010]:** Az állami beavatkozás értékelése a magyarországi szélessávú infrastruktúrafejlesztések kapcsán. [Evaluation of government involvement in infrastructure development in Hungary]. Infokom 2010 – 17. HTE infokommunikációs hálózatok és alkalmazások konferencia kiadvány [HTE ICT networks and applications conference publication (edited), October, 2010., pp.25-35.
- Höffler, F. [2005]:** Cost and Benefits from Infrastructure Competition. Estimating Welfare Effects from Broadband Access Competition. Preprints of the Max Planck Institute for Research on Collective Goods. Vol. 2005/1. Bonn.
- Horváth, L. [2010]:** *Szélessávú internet elérés helyzete Magyarországon 2004Q2-2009Q2*. [Broadband Internet access in Hungary 2004Q2-2009Q2]. Retrieved August 1, 2010 from <http://www.nhh.hu/index.php?id=dokumentumtar&mid=1059&lang=hu>.
- Koppenjan, J.F.M. – Enserink, B. [2009]:** *Public-Private Partnerships in Urban Infrastructures: Reconciling Private Sector Participation and Sustainability*. Public Administration Review. 2009, Vol. 69(2), pp. 284-296.

Scaramuzzi, E. [2009]: *Next Generation Access Networks: the European approach.*

Cullen International, Cancun, 2009.09.25.

Techatassanasoontorna, A.A. – Tapia A.H. – Powell, A. [2010] *Learning processes in municipal broadband projects: An absorptive capacity perspective.*

Telecommunication Policy. 2010, Volume 34, Issue 7.

Zhen-Wei Qiang, C. – Rossotto, C.M. [2009]: *Economic Impacts of Broadband.*

Washington, DC. World Bank, 2009, pp. 35-50.