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Evaluation of Former Yugoslav Republic of Macedonia's Wi-Fi Kiosk Program

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Evaluation of Former Yugoslav Republic of Macedonia's Wi-Fi Kiosk Program

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EXECUTIVE SUMMARY

Former Yugoslav Republic of Macedonia is home to a fast-growing electronic communications market. As a result of the opening up of the telecommunications sector to competition, and of the considerable progress achieved in the area of regulatory reform and harmonization with EU Acquis, the country now, for example, boasts the highest fixed broadband Internet household penetration in the region.

Yet not all Macedonians have an equal access to broadband Internet and the benefits it has borne over the years of rapid rollout. Residents of the rural and remote areas constitute the most vulnerable user group, with fewer Internet access options at their disposal and higher financial barriers to broadband access services. Fixed and mobile Internet operators are currently prioritizing networks deployment in or around the urban areas not finding a compelling business case to move inside the areas with poor backbone connectivity. Similarly, fixed and mobile broadband prices, although fairly affordable for the average household in FYR Macedonia, remain far too high for the population with lower incomes, which is concentrated in the rural areas as compared to urban households. Mobile broadband, commonly considered to be a realistic alternative for reaching the most remote and isolated areas, is particularly unaffordable: the country has one of the highest-priced mobile broadband packages in the region. Since lower incomes go hand in hand with geography, the rural poor are mostly disadvantaged in the context of the broadband diffusion.

In stimulating broadband uptake and information society development the Ministry of Information Society and Administration (MIOA) has rightly focused on subsidizing the rural and remote areas under the auspices of its flagship project "Wi-Fi covering the Republic of Macedonia". The project has been in operation since 2009 provisioning free Internet connectivity to 680 localities through Internet access point (Wi-Fi) kiosks. The remit behind the project was to stimulate the local demand for the Internet access services, which the kiosks should potentially satisfy after the end of the project (2014-2016). It was envisioned that after the project ends the private operators could start selling access to connectivity through the kiosks on a commercial basis. Apart from this vision, the project has pursued the following objectives:

(i) increasing the percentage of Internet users;
(ii) improving business climate;
(iii) retaining its position as a country-innovator on a regional scale and increasing attractiveness as a destination for foreign direct investments;
(iv) stimulating democracy;
(v) increasing benefits offered by ICTs in education; and
(vi) increasing users' mobility.

While no key performance indicators (KPIs) have been set out by the project strategists to measure the above objectives, World Bank's research team has drawn conclusions on the project successfulness based on the multiple observations and opinion survey results. **First**, Wi-Fi Kiosk Project did bring Internet connectivity to many locations for the first time and this can be considered as one of the biggest

achievements of the project. **Second**, the benefits that arose thanks to the Wi-Fi Kiosk Project go beyond those initially foreseen. It was found that a portion of the rural schools which would remain without central Internet connectivity provided by the project of the Ministry of Education and Science are receiving and using free connectivity through the Wi-Fi kiosks. **Third**, the Wi-Fi Kiosk Project implementation went without major issues, which means that MIOA has put in place a workable project operation framework. At the same time, a more clear outline of the project objectives, KPIs, monitoring, reporting, and evaluation framework as well as timely project awareness building could have enabled more robust results. **Fourth**, the fixed and mobile coverage data received from several telecom operators helps to conclude that the generally low broadband coverage has remained stable in selected 680 localities for a number of years. Moreover, the evidence suggests that the situation is unlikely to drastically improve in the short to medium term. At the moment of writing this current White Paper, there are fewer than two Internet service providers (ISPs) in 69% (or 470) of all of the selected localities and there is no commercial Internet access coverage in ~8% (or 52) of them. **Fifth**, it was identified that the private sector would unlikely subsidize Internet access in the selected 680 localities and the already installed Wi-Fi kiosks would not be commercialized. Finding no business case in the localities with poor or no backbone connectivity the operators expect the government to intervene.

In view of the aforementioned, World Bank's research team outlines a set of the following main recommendations.

1. Important achievements of the project, such as the newly-deployed connectivity in the most remote and rural communities, need to be preserved and leveraged after the project closing date. In view of the operators' unwillingness to leverage existing Wi-Fi Internet Access Kiosks to develop business activities, it is recommended that the project should be subsidized further, but in a more limited scope, benefiting primarily selected localities with no or only one ISP.
2. In order to address the digital divide in line with the EU State aid rules, we advocate for the government intervention in the ~77% (or 522) localities in which the Wi-Fi kiosks were initially installed. Beyond the broadband availability issue such intervention should also address the affordability of the Internet access for the rural population with lower incomes.
3. Broadband demand should be supported by introduction of further e-government services and applications specifically benefitting the rural population, while taking into account the state of Internet access development in the rural areas and peculiar needs of the local population. It is also recommended that a capacity building program intended to increase the Internet usage and digital literacy in rural areas should be initiated.
4. It is recommended to establish a framework under which a set of indicators to collect and monitor the broadband coverage, pricing, and Internet usage development in the rural areas will be outlined.

INTRODUCTION AND METHODOLOGY

This White Paper has been prepared by World Bank's Transport and Information and Communication Technologies (ICT) Global Practice at the request of the MIOA[1]. Delivery of the White Paper is part of a wider package of technical assistance by the World Bank to the Government of FYR Macedonia.

The aim of the White paper is to perform a high-level assessment of the project "Wi-Fi covering the Republic of Macedonia" (hereinafter Wi-Fi Kiosk Project) under the auspices of which 680 remote and rural locations across the country have received free-of-charge connectivity through Wi-Fi Internet access kiosks. In the process of carrying out the assessment, the authors have found it important to present a number of recommendations on how the Government could capitalize on the project to improve existing and / or design future similar interventions.

No impact assessments or evaluations of the Wi-Fi Kiosk Project have been performed to date, thus this current White Paper is the first attempt to evaluate the project. It should be noted that the detailed project impact assessment and considerations on how to make the recommendations outlined in the White Paper operational are not in the scope of this current assignment; they can be elaborated in the future at the request of the Government of FYR Macedonia.

The methodology used to assess the Wi-Fi Kiosk Project presents a mixture of qualitative and quantitative research techniques encompassing desk research, field work, focused interviews, and a survey. The desk research was carried out in the English and Macedonian languages in October-December, 2013: the authors have studied the project documentation provided by MIOA, Ministry of Education and Science (MoES), Wi-Fi kiosk operators, broadband operators as well as publicly available online materials. The field work was carried out on October 7-9th, 2013 and November 27-29th, 2013, and included kiosk site visits to five villages in Staro Nagoričane, Aerodrom, and Ohrid municipalities. A series of focused interviews with the relevant stakeholders from the government, private sector, and civil society were conducted in November-December 2013. The research team has conducted interviews by e-mail, video conferences, and during in-person meetings. The government stakeholders included representatives of MIOA, MoES, and Agency for Electronic Communications (AEC). The private sector was represented by Wi-Fi kiosk backbone network operator, Wi-Fi kiosk operators, and other fixed and mobile Internet operators operating on the territory of FYR Macedonia. The civil society interviewees comprised USAID representatives and World Bank specialists from Social Development, Development Economics, and Education sectors. Finally, an opinion survey was designed and distributed in the period of December 24, 2013 – February 4, 2014 in 66 villages which roughly represent 10% of the total number of localities where Wi-Fi kiosks have been installed. The survey was compiled with an aim to garner personal feedback on the experiences of the kiosk use from

[1] The remit for preparing this White Paper was formulated in the Aide-mémoire from the World Bank to the Government of FYR Macedonia on August 26, 2013, stating: *"The World Bank team will work closely with the staff of the Ministry of Information Society and Public Administration in developing a simple White Paper to assess the experience of Wi-Fi centres in schools".* The official name of the project in English is "Wi-Fi covering the Republic of Macedonia", but for the purposes of this assessment a short version will be used - Wi-Fi Kiosk Project.

the sample of end-users who are likely to be using kiosks to satisfy their connectivity needs in lieu of other options. Through a competitive bidding procedure a Skopje-based polling company Publik CTS was selected to collect and process the survey data. The survey methodology, composition of the sample, and the survey itself can be found in Annex D, the survey findings are featured in Annex G.

The paper starts off by giving an overview of the state of telecom development in rural FYR Macedonia from the standpoint of affordability and availability of the commercial broadband[2] Internet access services for the less advantaged groups of the population. The next section describes the Wi-Fi Kiosk Project outlining its scope, aim, and implementation process while bringing forward publics' experiences with respect to the Wi-Fi kiosk use. This section also examines technical parameters related to the Internet usage and demonstrates the problematic of the kiosk maintenance in the remote and rural areas. Section 5 references specific policy and regulatory measures designed by different government stakeholders with a goal to analyse the approach which has been chosen to ensure availability of the fixed and (or) mobile broadband Internet in the rural areas of the country. The White Paper concludes with a set of observations and recommendations aiming to address the sustainability of the results achieved by the Wi-Fi Kiosk Project and to offer next steps to increase rural connectivity in FYR Macedonia.

1. AFFORDABILITY AND AVAILABILITY OF COMMERCIAL BROADBAND INTERNET ACCESS SERVICES IN RURAL AREAS OF FORMER YUGOSLAV REPUBLIC OF MACEDONIA

Broadband connectivity is of strategic importance to the growth and innovation in all sectors of the economy as well as for social and territorial cohesion. Meeting the challenge of financing a good-quality affordable ubiquitous broadband infrastructure is a crucial factor for increasing competitiveness and innovation, providing job opportunities, preventing relocation of economic activity, and attracting inward investments.

Global experience has demonstrated that private investors alone are not capable of providing adequate broadband coverage to all citizens or users, thus leaving a significant part of the population unconnected and the digital divide growing. Socioeconomic inequalities (e.g. in terms of income) and (or) existence of the geographically remote and/or isolated territories translate into inadequately high connection costs, which present the main obstacle to the broadband infrastructure rollout (or) extension by the private sector.

[2] The commonly accepted definition of bandwidth rates for broadband, according to the International Telecommunications Union (ITU), is at least 256 kbps. This definition of broadband ("always on", download speed rates higher than 256 kbps) will be used throughout this paper. Source: *Core ICT Indicators 2010*. Geneva, Switzerland: Partnership on Measuring ICT4D, ITU. http://www.itu.int/dms_pub/itu-d/opb/ind/D-IND-ICT_CORE-2010-PDF-E.pdf; *Telecommunication Indicators Handbook*. 2011, Geneva, Switzerland: ITU. http://www.itu.int/dms_pub/itu-d/opb/ind/D-IND-ITC_IND_HBK-2011-PDF-E.pdf

Depending on the peculiarities of the region or country, one or the other reason may have a bigger impact on the development of the digital divide. In the case of FYR Macedonia, both territorial and socioeconomic circumstances are likely to be impacting the development of broadband connectivity. The below two sections will address these circumstances, as they are of particular importance in the context of the Wi-Fi Kiosk Project, specifically initiated to narrow the digital divide.

1.1 Affordability of Broadband Internet Access for the Poor and At-risk Populations

Former Yugoslav Republic of Macedonia belongs to a range of upper middle income countries in Europe and Central Asia[3]. In 2012, FYR Macedonia's gross domestic product (GDP) totalled US$9.576 bln, with GDP per capita at US$4,634.1[4]. Yet, despite the recently elevated income group[5], 27.3% of the population is at-risk-of-poverty[6] and 38.7% of the households have "great difficulty" to make ends meet.[7]

The unemployment and poverty in FYR Macedonia are intimately connected. Though decreasing, the unemployment rate has been stubbornly high at over 30% for the last five years[8] having a particularly negative effect on women, the elderly, long-term unemployed, under-qualified workers, and minority groups.[9] Without well-paying and secure jobs, Macedonians seek better opportunities abroad, thus adding to a growing shortage of labour and skills which presents an impediment to FYR Macedonia's economic development in the long term.

The work migration translates into a higher income received from private transfers, which is twice as high in rural areas as in urban areas[10]. In general, the percentage of the net transfers constitutes 21.9% of total GDP (2012), out of which workers' remittances officially constitute 2.5% of the GDP[11]. Active migration from the rural areas into the cities and abroad translates into an elevated demand for

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[3] Per GNI per capita income group classification using the World Bank Atlas method http://data.worldbank.org/about/country-classifications

[4] Balance of Payments. National Bank of the Republic of FYR Macedonia 1998-2012. http://www.nbrm.mk/default-en.asp?ItemID=16C5679A8986CE4391D1F76413410999

[5] FYR Macedonia has recently become an upper middle income country, per income group classification laid out in footnote 3.

[6] This is equivalent to 60% of the median national equivalised income of the persons living in households. Republic of Macedonia State Statistical Office. "Survey on income and living, 2010." http://www.stat.gov.mk/PrikaziPoslednaPublikacija_en.aspx?id=68. Note: "Survey on income and living, 2010" cited in this paper is based on EU-SILC methodology which examines poverty in relative and NOT absolute terms. Relative poverty is defined in relation to the average level of prosperity in a given country and point in time. As an indicator of relative poverty, the proportion of individuals living in households where equivalised income is below the threshold of 60% of the national equivalised median income is taken. http://ec.europa.eu/employment_social/soc-prot/soc incl/final_joint_inclusion_report_2003_en.pdf

[7] See supra note 6

[8] Unemployment (% of population). World Development Indicators. World Bank. http://data.worldbank.org/indicator/SL.UEM.TOTL.ZS

[9] Republic of Macedonia State Statistical Office. "Macedonia in Figures 2012." http://www.stat.gov.mk/Publikacii/Mak_Brojki_2012_A.pdf

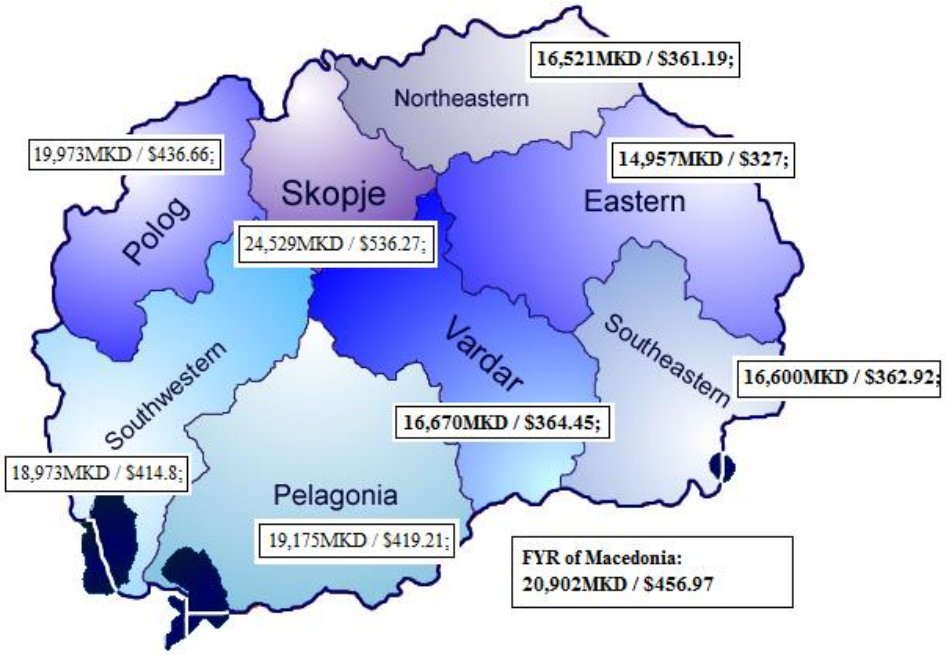
[10] See supra note 6

[11] See supra note 4

communications between rural inhabitants and their family members, as noticed by Wi-Fi kiosk operators[12].

The rural population of FYR Macedonia (40,6% of the total population[13] or about 876,000 people) is considered to be poorer than urban, even though there is no official data available over the last five years on the poverty headcount or poverty gap at rural poverty line[14]. The higher incidence rate of poverty in rural areas can be attributed to the lower wages and salaries in the rural areas, higher levels of self-employment yielding lower incomes, and a higher number of inhabitants living off subsidies for agricultural production[15]. A high incidence of poverty in the rural areas offers additional economic explanation of why Internet service providers (ISPs) are moving slowly with the infrastructure development in the rural areas being hindered by more costly investments (in comparison with the urban areas) and potentially lower returns on their investments.

Figure 1 Average net wage paid per employee in MKD and US$ in statistical regions, 2012[16]



Source: Republic of Macedonia State Statistical Office; "Regions of the Republic of Macedonia, 2012"; original map could be found at: http://en.wikipedia.org/wiki/File:MSR.png

[12] Interviews with broadband operators and AEC; November-December, 2013.
[13] Rural population (% of total). World Development Indicators. World Bank. http://data.worldbank.org/indicator/SP.RUR.TOTL.ZS
[14] According to the Rural Poverty Headcount and Gap Indicators in World Development Indicators. World Bank
[15] See supra note 6
[16] Republic of Macedonia State Statistical Office; "Regions of the Republic of Macedonia, 2012"; P. 39. http://www.stat.gov.mk/PrikaziPoslednaPublikacija_en.aspx?id=32.

In terms of the differences in wages and salaries, an average rural household annually earns MKD77,256 or US$1,689[17] less than a comparable urban household,[18] and average net wage paid per employee in the region constitutes from 60.9% (lowest) to 81.4% (highest) of the wage paid in Skopje region (see Figure 1). Similarly, the difference in income[19] from self-employment in rural areas versus a similar type of income in the urban areas makes up MKD 74,494 or US$1,628[20] per household. The self-employment mainly centres on agricultural activities, which contribute much less to country's GDP than industry or services sectors[21].

Taking into account the above analysis it is plausible to suggest that socioeconomic inequalities between urban and rural populations and across different income groups within these two populations make the uptake of broadband services less affordable for FYR Macedonia's rural inhabitants, as compared with urban.

The price of broadband Internet access service plays a critical role in broadband diffusion. According to the International Telecommunication Union (ITU), broadband penetration grows rapidly after the level of retail broadband price falls below 3–5% of average monthly income[22]. The rates of broadband diffusion in FYR Macedonia are reflective of the wider broadband development in the former Yugoslav states. As Table 1 posits, FYR Macedonia is no outlier in terms of affordability of fixed broadband: the former constitutes 10.84% of the average disposable monthly income in FYR Macedonia. Only Slovenia, Croatia, and Bosnia and Herzegovina show better indicators, according to the ITU standard. In terms of mobile broadband, prices in FYR Macedonia may be considered relatively high when compared to regional peers (although more affordable than fixed broadband): 7.21% of the average disposable monthly income.

[17] USD1-45.74 MKD. UN Operational Rate from 12/1/2013,. http://treasury.un.org/operationalrates/OperationalRates.aspx
[18] See supra note 6.
[19] Income is understood as gross income which includes income from market sources and cash benefits. For a more precise definition what constitutes income and total household disposable income please see p. 20 of "Survey on income and living conditions, 2010." http://www.stat.gov.mk/Publikacii/2.4.13.03.pdf.
[20] See supra note 17.
[21] The World Factbook; "Europe: Macedonia" https://www.cia.gov/library/publications/the-world-factbook/geos/mk.html.
[22] Broadband targets for 2015 established by the Broadband Commission for Digital Development: http://www.broadbandcommission.org/Documents/Broadband_Targets.pdf

Table 1 Comparison of the cheapest fixed and mobile broadband offerings on the market in selected Balkan countries. Fixed and mobile broadband price as percentage of the average disposable monthly income for the entire population, December 2013

Country	Fixed broadband price, PPP	Mobile broadband price, PPP	Average monthly disposable income, PPP	Fixed broadband price as % of average disposable monthly income	Mobile broadband price as % of average disposable monthly income
Albania	22.69	12.73	173.84	13.05%	7.32%
Bosnia and Herzegovina	22.9	16.96	474.56	4.83%	3.57%
Croatia	38.2	36.31	766.78	4.98%	4.74%
Macedonia, FYR	**31.93**	**21.25**	**294.4**	**10.84%**	**7.21%**
Montenegro	41.08	19.03	316.25	12.99%	6.02%
Serbia	35.2	17.86	303.08	17.86%	11.61%
Slovenia	25.41	12.09	686.71	3.70%	1.76%

Note: World Bank Data: Population, Total[23], PovCal.net (2007-2010)[24] TeleGeography Globalcomms Database 2012[25], official websites of the national telecom operators with the market share of over 10% for fixed operators and 20% - for mobile. The simple average of the lowest-priced fixed and mobile broadband packages per country has been calculated, excluding any discounts or special offers. 2012 PPP conversion factor, GDP[26] per each country has been applied to the prices in local currency. The consumption data from PovCal.net, upon which this affordability analysis is based, may have certain inaccuracies.

Source: Authors

When examining more closely the price of the lowest fixed broadband package on the Macedonian market constitutes 10.84% of the average monthly income per capita, while mobile broadband prices stand, on average, at ~7.21%. Using statistics and current market data it can be further deduced that a representative of the poorest average household in FYR Macedonia (bottom 40% of the total population by income) needs to pay 20.49% of their monthly disposable income to afford mobile broadband and 30.79% - for fixed broadband. A member of the at-risk-of-poverty household (bottom 60% of the total population by income) needs to pay 15.14% and 22.75% for mobile and fixed broadband, respectively (Table 2).

Ability to possess durable goods is also cited as an important indicator of living conditions. In the case of FYR Macedonia, there are no profound geographical differences between the owners of TVs or telephones, yet when it comes to possessing a mobile phone or computer / laptop, the unequal distribution of goods in the urban versus rural areas is becoming more pronounced. Only 37.1% of the

[23] World Bank Data: Population, Total. 2009-2013. http://data.worldbank.org/indicator/SP.POP.TOTL
[24] PovcalNet: the on-line tool for poverty measurement developed by the Development Research Group of the World Bank http://iresearch.worldbank.org/PovcalNet/index.htm
[25] TeleGeography Globalcomms Database. 2012. www.TeleGeography.com
[26] PPP Conversion Factor, GPD (LCU per international $). http://data.worldbank.org/indicator/PA.NUS.PPP

rural households possess a computer or laptop, as compared to 58.6% in the urban areas. Even though more rural households own a mobile phone (88.6% v. 93.7% of comparable urban households), inequality does exist on the urban-rural nexus[27].

Table 2 Fixed and mobile broadband price as % of monthly income, December 2013

Service / Providers	Price as % of disposable monthly income	Price as % of disposable monthly income for lowest 40% of the population	Price as % of disposable monthly income for lowest 60% of the population
Fixed broadband *Simple average of the single cheapest offers of three biggest operators* ***MakTel, ONE, and Telekabel***	10.84%	30.79%	22.75%
Mobile broadband *Simple average of the single cheapest offers of three biggest operators* ***T-Mobile, Mobilkom, and One***	7.21%	20.49%	15.14%

Source: World Bank Data: Population (Total)[28], PovCal.net (2008)[29], World Bank Data: Income Share by quintiles (2010)[30]. The lowest-priced mobile broadband packages by the providers with the largest market share have been selected and the simple average of the single lowest-priced offering per provider has been calculated. The lowest-priced fixed broadband packages by the operators with the largest market share were selected and the simple average of the single lowest-priced offering per provider has been calculated. The lowest priced mobile or fixed broadband packages selected did not include any discounts or special offers[31.] 2012 PPP conversion factor, GDP[32] per each country has been applied to the prices in local currency. Given the scarcity of the official statistical data on the rural poverty and an ostensibly high amount of undeclared remittances in the rural areas, the consumption data, upon which this affordability analysis is based, may have certain inaccuracies.

Source: Authors

To conclude, there are certain socioeconomic conditions that have a direct or indirect impact on the broadband uptake in the rural areas of FYR Macedonia. These conditions include poverty and low incomes, coupled with the relatively high broadband prices, especially for the fixed Internet packages. Poverty is driven, among other factors, by chronic un- and underemployment and is somewhat mitigated through private transfers from migrant workers. At the same time, a high number of mobile phones on the household level (88.6%) are indicative of the existence of preconditions for the rapid mobile broadband uptake, while a big number of private transfers infer the need for ICTs that would enable funds transfer and communication with the migrant labour.

[27] See supra note 6, p. 8.
[28] See supra note 24, p. 11.
[29] See supra note 24, p. 11.
[30] World Bank Data: Income share by quintiles. 2010. http://data.worldbank.org/indicator/SI.DST.FRST.20
[31] The lowest-priced packages, excluding discounts, were chosen: (i) 1GB, 4GB and 5GB mobile broadband packages by MakTel, One, and Mobilkom, respectively; and (ii) MaxADSL MakTel package (4Mbps/768Kbps) and ADSL One Net (6144/768Kbps).
[32] See supra note 26, p. 11.

1.2. Availability of Broadband Internet Access in Rural Areas

The broadband operators operating in FYR Macedonia do not segment their customers along the urban or rural lines arguing that the country is fairly small for this type of telecom marketing.[33] Operators point that a definition of "rural" in the context of Internet connectivity provision has not been cemented, either. The gradation of "rural" ranges from suburban to remote rural and (or) is based on the population density, which ultimately complicates the assessment of the existing coverage.

Rural broadband coverage data, including pricing data are neither systematically collected, nor analysed by any government institution, which makes it challenging to determine the precise coverage and the dynamics behind the coverage development. The research team made an attempt to collect the data on the availability of the commercial Internet access offers (both fixed and mobile) in Wi-Fi kiosk locations relying on the following sources: (i) commercial ISPs[34]; (ii) Wi-Fi kiosk operators[35]; (iii) MoES[36]; and (iv) survey[37]. The aggregated information about the number of commercial operators per Wi-Fi kiosk location may be found in the Annex F of this paper.

At the moment of writing this paper the research team has determined that 7.6% of the Wi-Fi kiosk locations (or 52 locations out of 680) have no commercial fixed broadband Internet access coverage and have no 3G coverage. In terms of the rural coverage, incumbent fixed line operator MakTel, and private operator ONE have similarly wide broadband coverage[38], thus these two operators have been repeatedly winning MoES tenders for the Internet access provision in the schools across the entire country, including those located in the remote and rural areas[39]. The information on the wide coverage of MakTel and ONE in rural areas is also consistent with the survey results showing that 50% of all the respondents (680) has fixed or mobile Internet access at home with MakTel and ONE being among the most common service providers.

However, existing broadband coverage of either ISP is deemed to be insufficient and incapable of covering all 680 Wi-Fi kiosk locations. The research team has also established that above 69% (or 470) of the locations have no more than one commercial ISP. According to European Union (EU) guidelines for the application of state aid rules in relation to the rapid deployment of broadband networks, the state

[33] See supra note 12, p. 8.
[34] Information requests were sent to the companies having the greatest subscribers market and (or) coverage (MakTel, T-Mobile, Mobilkom VIP, ONE). For greater accuracy, the coverage information from smaller peripheral ISPs should also be taken into account.
[35] While operating in the area ISPs are usually aware of the presence of other commercial operators.
[36] MoES.
[37] The survey respondents who are rural inhabitants of the selected 68 locations where Wi-Fi kiosks have been installed were asked if they have purchased Internet access from local ISP(s), which denotes service availability. See Annex D for more details on survey questionnaire and sample and Annex G for survey findings.
[38] Although it is worth pointing that the coverage maps do not match, which becomes evident from the list of Internet connections (not) provided to the schools in the rural areas by both companies.
[39] MoES.

aid intervention may be justified when a geographic area is served by fewer than two operators[40]. In other words, where market forces are not addressing the connectivity issue to a sufficient extent, the state aid should follow. As is likely the case in 522 locations where broadband provision is non-existent or is limited to only one ISP[41].

Development of the mobile broadband Internet access

As a rule, mobile broadband is considered to be a realistic alternative for reaching the most remote and isolated areas, yet in the case of FYR Macedonia, the mobile broadband take-up is relatively low at 16.65% when compared to other countries in the region (Table 3). In the rural areas the penetration rate is likely to be even lower, because the field data shows that only 12.7% of the surveyed respondents living in the villages with installed Wi-Fi kiosks receive connectivity via mobile broadband[42]. Mobile operators believe that expansion of the mobile broadband coverage to the rural areas is not reasonable from the economic standpoint for at least five years from now, and even then the expansion should remain selective.

Table 3 Mobile broadband penetration in Western Balkan region, 1Q 2013

Country	***Mobile Broadband Penetration (%, Population)***
Macedonia, FYR	**16.65**
Bosnia & Herzegovina	28.85
Albania	12.81
Montenegro	19.31
Serbia	39.61
Kosovo	n.a.

Source: Fixed and Mobile Broadband subscribers: *www.TeleGeography.com*, data as of March, 2013; Households and Population: Word Bank.

Speaking about mobile broadband development in the wider Balkan region, as of 2012, Slovenia has leads in terms of mobile broadband penetration (3G and 4G) at 50% of the population and has exhibited the greatest affordability in the market by having the lowest price per mobile broadband package at a

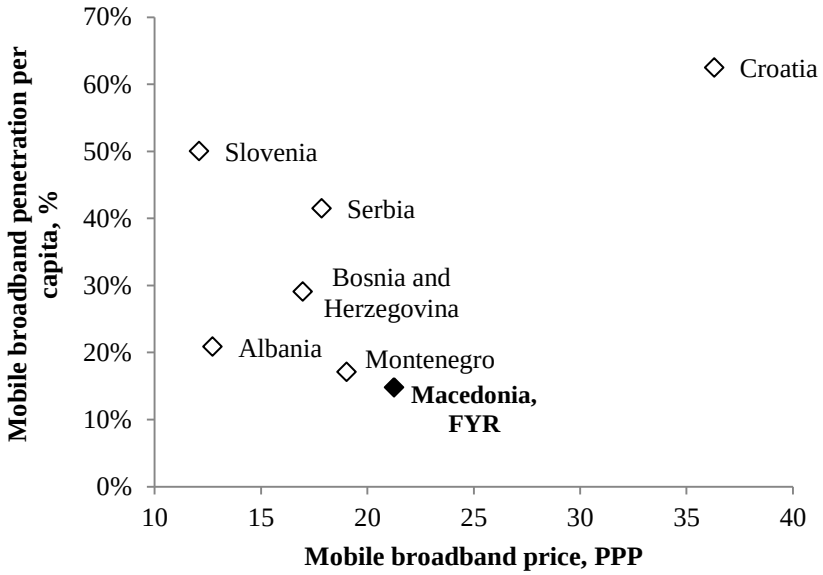
[40] EU guidelines for the application of state aid rules in relation to the rapid deployment of broadband networks Section 3.2. "The distinction between white, grey and black areas for basic broadband networks" Paragraph 72. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2013:025:0001:0026:EN:PDF

[41] In a coverage analysis, T-Mobile and T-Home were considered as one undertaking.

[42] See Annex G, Questions 11.

little over than US$12 (Figure 2). Former Yugoslav Republic of Macedonia, on the contrary, has the lowest 3G mobile broadband penetration with the highest-priced package at over US$21. (Without taking into account Croatia, an outlier with the highest-priced mobile broadband package at over US$36.) This finding shows that current mobile broadband subscribers constitute 1/7 of the total number of wireless subscribers, which, subsequently, means that there is significant room for growth of FYR Macedonia's mobile broadband market that is far from saturation. The data on mobile ownership on the rural household level standing at 88.6%[43] also confirms that an important precondition is in place for the mobile broadband market development.

Figure 2 Mobile broadband penetration per capita and the lowest average price in USD, PPP, for mobile broadband packages in selected Balkan countries, Q3 2012



Note: Calculations are based on World Bank Data: Population (Total)[44],TeleGeography Globalcomms Database 2012[45], and official websites of the national telecom operators with the market share of over 20%. The simple average of the lowest-priced mobile broadband packages per country has been calculated excluding any discounts or special offers. 2012 PPP conversion factor, GDP[46] per each country has been applied to the prices in local currency.

Source: Authors

The mobile broadband market development is driven by three mobile broadband providers (T-Mobile, Mobilkom, and ONE), and T-Mobile Macedonia (the mobile arm of MakTel) is leading in terms of the market share with 50.9% of subscribers (the closest competitor is ONE with 22%[47]). All three operators are operating 3G networks (T-Mobile was granted 3G license in 2008; ONE – 2008 and VIP – 2010) and were granted 4G licenses in June, 2013. 3G licenses are carrying obligations to roll out a network

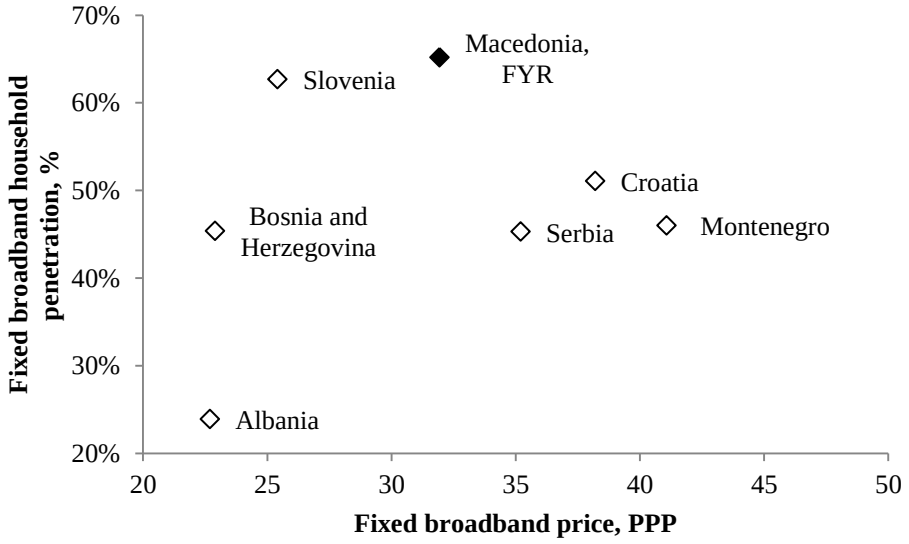
[43] See supra note 6, p. 8
[44] See supra note 23, p. 11.
[45] See supra note 25, p. 11.
[46] See supra note 26, p. 11.
[47] The data for Q4, 2013, was retrieved from Globalcomms Database, TeleGeography. See supra note 25, p. 11.

covering 50% of the population within a year, rising to 80% in three years. Under the 4G licence requirements, the operators are obliged to offer mobile service to 20% of the population in two years after the licence issue date; in four years the coverage should reach 40%, and in six years – 70% of the population. Therefore, the license requirements suggest that up to 20% of the population may still not be covered by 3G and up to 30% - by 4G networks, even in the longer term.

Development of the fixed broadband Internet access

Former Yugoslav Republic of Macedonia is home to a small, but vibrant fixed broadband Internet market with 111 active ISPs. A range of access technologies (fixed and wireless) for residential and business users are represented on the market, and inter-platform competition is unrestrained. In the regional context, FYR Macedonia outperforms all other countries with 65.2%[48] of the broadband household penetration and performs reasonably well when it comes to the affordability of fixed broadband Internet offerings (Figure 3). At the same time, market players admit that since 2008 the fixed broadband sales have significantly decreased and there has been no substantial difference in the uptake of fixed broadband Internet services between the urban and rural areas, though the demand for broadband by the latter is real[49].

Figure 3 Fixed broadband household penetration and the lowest average price in USD, PPP, for fixed broadband packages in selected Balkan countries, Q3 2012



Note*:* World Bank Data: Population, Total[50],TeleGeography Globalcomms Database 2012[51], official websites of the national telecom operators which have the market share of over 10%. The simple average of the lowest-priced fixed broadband packages has

[48] See supra note 25, p. 11
[49] See supra note 12, p. 8.
[50] See supra note 23, p. 11.
[51] See supra note 25, p. 11.

been calculated excluding any discounts or special offers. 2012 PPP conversion factor, GDP[52] per each country has been applied to the prices in local currency.

Source: Authors

The survey of the rural population living in the areas where Wi-Fi kiosks have been installed[53] demonstrates that fixed Internet is the number one connectivity option for 32% of 680 respondents who, in their majority, pay for monthly unbundled Internet access packages from MKD100 (US$5.32[54]) to MKD500 (~US$27[55]), with MKD100 and MKD500 being the two most popular options. The operators with the largest share of the users who purchase unbundled Internet access packages (70 respondents) are T-Mobile (over 40%) and ONE (14%), although it should be mentioned that a myriad of small private ISPs provide connectivity to a significant portion of the remaining users[56]. At the same time, the field data shows that the bundles are getting embraced by part of the rural Internet users. According to the survey, the most frequent Internet access option among the rural residents is "triple play" (Internet + TV + telephone) package, the cost of which ranges from MKD350 (~US$19[57]) to MKD2,200 (US$117[58]), with the most popular bundle with a price tag of MKD1200 (~US$64[59]). Around 68% of 110 users paying for this bundle spend MKD1200 or less on a monthly basis. The most popular service providers are T-Home (MakTel) (38%) and ONE (30%)[60] which is consistent with the wide coverage that enjoy both network operators. Normally each location is served by one operator only. Absence of alternative offerings and (or) government subsidies make it difficult to lower the broadband prices which as it was concluded in the section 1.1 of the present paper are quite high for the rural households.

When it comes to the issue of infrastructure upgrade and (or) development, ISPs are actively deploying fibre-to-the-x (FTTx) in the urban areas anticipating a good uptake rate. 15% of all of the households have already been passed by FTTx[61]. Similarly, the demand for mobile broadband and bundled TV services is rapidly growing in the urban areas where the infrastructure is in place and the prices for broadband tend to be lower. To increase the take-up of bundled TV services in the rural areas, the operators would need to make an additional investment to have the existing broadband coverage upgraded to at least 6 Mbps, which, as industry experts argue, is unlikely to be accomplished any time soon[62].

Low broadband penetration in selected 680 villages is therefore poised to remain stable as it was before: for example, the number of schools which MoES has difficulty connecting (apparently due to the lack of

[52] See supra note 26, p. 11
[53] Note that in some of the villages the Wi-Fi kiosks initially installed were eventually moved to a different location. Therefore, the survey included the villages in which there are functioning kiosks as well as those where the kiosks used to be.
[54] 2012 PPP conversion factor, GDP for FYR Macedonia (18.7) has been applied to the price in MKD.
[55] Ibid.
[56] See Annex G questions 13, 14a, 14b and 15.
[57] 2012 PPP conversion factor, GDP for FYR Macedonia (18.7) has been applied to the price in MKD.
[58] Ibid.
[59] Ibid.
[60] See Annex G questions 14a, 14b and 15.
[61] See supra note 12, p. 8.
[62] See supra note 12, p. 8.

coverage) on an annual basis to the arising technical requirements[63] continues to be in the range of 138-150 for the last four years[64].

2. DESCRIPTION OF THE WI-FI KIOSK PROJECT

2.1 Project Mission, Goals, and Objectives

The project was launched by MIOA in 2010 through installation of 680 free-of-charge Wi-Fi Internet access kiosks in the rural and remote parts of the country. The installation started in April 2010 and ended in September 2012. Each of the Wi-Fi kiosks provides Internet access through the installed facility enabling free wireless Wi-Fi coverage around the kiosk in the radius of around 100 m (Figure 4). Modalities and technical details of the project are discussed in more detail in sections 2.2-2.7.

The project description states that the primary motive for this undertaking is to stimulate development of the information society in the rural and remote areas by subsidizing the work of the private Internet operators in those localities, which are considered to be less commercially attractive than the urban areas[65]. The main goal of the project is defined as "*to prepare Macedonian citizens for the modern IT economic market and global competitive economy*"[66].With this project, MIOA expects FYR Macedonia to set an example for other states in bridging the digital divide and reaching e-inclusion, one of the prerequisites for the entry into the EU[67]. Furthermore, this project is intended to stimulate the local demand for the Internet access services, which the kiosks should potentially satisfy after the end of the project (2014-2016). It is envisaged that after the project closing date Wi-Fi kiosk operators will be able to start selling access to Internet connectivity through the kiosks on a commercial basis.[68]

Figure 4 The Wi-Fi kiosks in the schools of Algunja and Pelince in Staro Nagoričane municipality (left and right).

[63] The most important requirement is sufficient Internet speed capacity which is expected to increase in line with users' expectations. For example, for the school year of 2009/2010 MoES set the speed requirement for primary schools in rural areas at 1/0.25 Mbps, while in year 2013/2014 this parameter has been raised to 3/1 Mbps.
[64] MoES requirements for Internet access service for schools
[65] MIOA
[66] Ibid.
[67] "И чист воздух и бесплатен Интернет." Утрински Весник / Utrinski Vesnik. Jan. 25, 2010. http://www.utrinski.mk/default.asp?ItemID=C2E532F8DD585D4BA51282413D3B4488
[68] Blazhevska, Svetlana. "Македонија со најголем раст во користење на широкопојасен интернет." Vecer, 7 July 2010. <http://www.vecer.com.mk/?ItemID=6D04B84127052D4A9CE3A75F06E3CB0F>.

Source: Authors

To reach the aforementioned MIOA has outlined a number of broad objectives[69] (Table 4). In the project documentation, however, the research team did not locate any measurable Key Performance Indicators (KPIs) and (or) intermediary KPIs allowing the research team to measure the progress of the project and to benchmark its results against other similar government or private initiatives. Similarly, the project documentation does not outline any procedures for the mid-term and (or) final review.

Table 4 Objectives of the Wi-Fi Kiosk Project

Nr.	**Objectives of the Wi-Fi Kiosk Project**
1.	to increase the percentage of Internet users in FYR Macedonia
2.	to improve business climate
3.	to retain its position as a country-innovator on a regional scale and increase attractiveness as a destination for foreign direct investments
4.	to stimulate democracy
5.	to increase benefits offered by ICTs in education
6.	to increase users' mobility

Source: MIOA.

2.2 Project Planning and Implementation Conditions

The project documentation posits that prior to the project launch MIOA had conducted an assessment of the level of Internet technology access and development in the country focusing on the rural areas. In this assessment MIOA came to the conclusion that the rural areas of FYR Macedonia are "*significantly underdeveloped compared to the rest of the country*", with the main obstacles to development being an "*insufficient economic interest*" of ISPs and the hardly accessible mountainous terrain[70]. While the assessment itself was not shared with the World Bank, the researchers presume that its findings have laid the basis for the designing of the Wi-Fi Kiosk Project in the present form and that the conclusions

[69] See supra note 65,
[70] See supra note 65.

drawn in the assessment have objectively reflected the state of the telecom sector development in FYR Macedonia.

The main criteria for the kiosk placement have been defined as their proximity to the "*peripheral schools all across the country*" and their accessibility to everyone[71]. The Ministry of Information and Science (MoES) has been consulted on the project: in its formal opinion MoES has outlined a set of concerns with respect to the kiosk placement arguing for the need of installing the kiosks selectively and primarily in the rural areas[72]. Not all of the kiosks have been eventually placed on the school premises, since in the course of the kiosk installation and during the initial maintenance period, due to the safety reasons and (or) the need to ensure ubiquitous electricity supply, Wi-Fi kiosk operators were forced to move some kiosks inside the school buildings or even to other locations[73].

In general, the placement of the kiosks was mapped to 13 regions covering the entire territory of the country, with the number of kiosks ranging per region from 13 (North of FYR Macedonia, close to Skopje) to 84 (South East). The average distribution of kiosks per region has been 52, with more kiosks concentrated in the country's Pelagonia, Vardar, Southeastern, Eastern, and Northeastern regions (Figure 5).

The public procurement of kiosks and Internet services was announced on July 3, 2009, the call for submission was open until August 11, 2009, and the time-limit for contract completion was set to be 6 months from the award of the contract. The right to submit an offer, on a single offer principle, was given to "*every interested domestic or foreign legal and physical entity – economic operator, registered for an activity related to the subject of procurement*.[74]" Each bidder was evaluated on the basis of the information accompanying the offer related to the bidder's personal standing, capacity to pursue professional activity, economic and financial standing, technical or professional capacity to implement the contract[75]. In total, 9 of companies from 3 countries have submitted their bids and all of them have been allowed to take part in the online auction[76]. According to MIOA, the online auction has reached a very low price, resulting in savings per region from 10 to 36 percent. MIOA was initially ready to allocate EUR4.72 mln for the project, but the auction results have shown much lower bids than initially expected, thus bringing the costs down to EUR 2.5 mln.[77]

Figure 5 Distribution of the Wi-Fi kiosks per region and operator

[71] See supra note 65
[72] MoES
[73] See supra note 12, p. 8.
[74] Tender documentation. MIOA. 2009.
[75] See supra note 74. More information on the technical, financial, personal standing and the capacity to pursue professional activity is in Annex B.
[76] MIOA.
[77] See supra note 67, p. 17.

№ of region	№ of kiosks	Operator
1	16	Neokom
2	41	Telelink
3	13	Neokom
4	83	Neokom
5	77	Telelink
6	54	Telelink
7	84	Telelink
8	60	Telelink
9	72	Telelink
10	51	Emmetron
11	36	Emmetron
12	37	Neokom
13	56	Neokom

Source: MIOA.

Ultimately, three companies have been selected to operate the kiosks: Telelink MK DOOEL (FYR Macedonia) won the bid to operate 388 kiosks, Neocom AD Skopje (FYR Macedonia) – 205, and Helektron S.A.[78] (Greece) - 87. The distribution of the regions per operator shows that Telelink was designated to maintain the kiosks in the landlocked Center as well as South, South Eastern, and Eastern parts of the country, bordering on Greece and Bulgaria; Neocom - in the Northern part of the country bordering on Kosovo, Serbia, and Bulgaria; and Emmetron – in the country's West, bordering on Albania (Figure 6).

The lowest price was determined to be the main criterion for awarding the public procurement contract. The potential supplier (Wi-Fi kiosk operator) was bound to purchase, set up, install, and maintain Internet kiosks with wireless access, according to the instructions detailed in the technical specification[79] and in line with the conditions set out in the public procurement contract. Among such conditions, for example, has been the obligation to pay a fixed fee every six months to each of the schools where Internet kiosks have been located for the use of space[80].

In terms of the payment amount, the Contracting Authority (MIOA) offered Wi-Fi kiosk providers a fixed amount per kiosk to cover for the costs incurred by the operators. The single monthly price per Internet kiosk has been calculated as follows: X = A / (B * C), where *A* is value of the contract for the specific region, *B* is a total number of kiosks in the specific region, and *C* represents the duration of the contract (48 months). The total value of the monthly invoice, however, varies based on the number of kiosks in operation in a specific region. In this vein, the regions with a higher number of kiosks, like #4, #7, #5, and #9, with 83, 84, 77, and 72 kiosks, respectively, have had higher monetary value, whereas regions with a lower number of kiosks installed, for instance regions #3 (13 kiosks) or #1 (16 kiosks),

[78] After the merger the company is known in FYR Macedonia as Emmetron S.A. Emmetron Ltd. Skopje is part of Emmetron group of companies from Athens, Greece.
[79] Tender technical specifications are outlined in the Annex C.
[80] See supra note 74., p. 20.

have lower funds allocation. In result, region #11 (36 kiosks) is the most costly and region #7 (84 kiosks) is the least expensive[81] (Table 5). The funds' distribution per kiosk shows that three regions #11, #13, and #12 have had the highest kiosk cost which is between 16% and over 33% higher than the average monthly price per kiosk estimated at over EUR79.01[82]. The three most expensive regions, with 129 kiosks cumulatively, geographically belong to the mountainous Polog and the far Western part of the South Western regions of FYR Macedonia. The same analysis shows that the lowest monthly kiosk price is in the regions #6 (54 kiosks) and #7 (84 kiosks) where prices drop 12 and 21% lower than the average. Region #6 (Vardar) is considered to be flatter than the rest of the territory of FYR Macedonia.

Table 5 Estimations of the kiosk cost per region and operator

*Nr.**	*Region***	*Costs per kiosk, EUR per month****	*Operator*
1	Region 11	105.64	Emmetron
2	Region 13	95.61	Neocom
3	Region 12	91.76	Neocom
4	Region 1	79.17	Neocom
5	Region 10	79.15	Emmetron
6	Region 5	78.09	Telelink
7	Region 4	75.70	Neocom
8	Region 8	74.88	Telelink
9	Region 9	73.71	Telelink
10	Region 2	71.60	Telelink
11	Region 3	70.04	Neocom
12	Region 6	69.44	Telelink
13	Region 7	62.33	Telelink
	Average:	**79.01**	

Note: *Regions are grouped according to the costs starting from the most expensive; **Regions are numbered as they are presented in the Figure 7; ***Costs are estimated based on the government expenditure per region in EUR, (exchange rate of 1EUR=MKD61.67, per National Bank of Macedonia for Dec. 16, 2013); population density per sq. km[83].

Source: Authors

MIOA is paying, on average, EUR79.01 per kiosk per month, which includes kiosk purchase, installation, and maintenance. The amount of investment the operators have allocated for the purchase and installation of kiosks has reached 74% of the entire contract award[84].

[81] See supra note 74., p. 20.
[82] Funds allocation per regions serviced by Telelink and Neocom is found in "Dovoror in Wi Fi Tele-Link" (2010) and in "Wi-Fi-dogovor-Neocom" (2010) files, MIOA. Information on funds allocation for Emmetron has not been received and the monthly price per kiosks for this provider has been calculated using the data available. Inaccuracies are possible.
[83] Geographic area from Discovering Macedonia at http://makedonija.name/, population data from municipalities' websites or, if data is unavailable, from Discovering Macedonia. Note: the demographic data featured on the majority of municipalities' websites is from Census, 2002.
[84] Wi-Fi kiosk operators; Tender documentation, MIOA.

Instalment of the kiosks and launch of the wireless service had to be completed within a 180-day deadline after signing the contract, with a penalty in the amount of 0,5% of the total price of the offer for each day of delay. The installation of the kiosks was divided into three phases: 30% of installation completed within 120 days (phase I), 60% - within 150 days (phase II), and 100% - within 180 days (phase III)[85]. Kiosk installation was largely performed on time, with minor delay in some regions[86].

The contract duration is set to be 48 months per each Internet kiosk starting from the day when kiosk was formally put into operation. The first kiosk started operation on April 19, 2010 (Telelink), and the last – on September 3, 2012 (Emmetron)[87]. Subsequently, the first kiosk will discontinue provision of services in April, 2014, and the last one – in September, 2016. The full list of kiosks per municipality and their operation date is provided in Annex A.

Responsibility for the kiosks, their operation and functionality (incl. all unexpected costs), during the installation, transportation, setting up, and maintenance lies with the Wi-Fi kiosk operators, although it is noted in the tender documentation that the provider(s) cannot be held accountable for the damages caused by the third parties (such as vandalism, theft, fire or *force majeure*). After the contract expiry, the Wi-Fi kiosk operators are allowed to retain the ownership right over the Internet kiosks with wireless access and the rest of the equipment used in the project. If the contract is not extended or replaced with a new contract, the Internet kiosks will be returned to the supplier as their owner[88].

2.3 Technical Implementation

Wi-Fi Internet Kiosks are leveraging existing Wi-Fi 802.11b network, accessible on a commercial basis from ONE Telecommunications Services (ONE). This network is serving as the backbone and backhaul for the all three Wi-Fi kiosk operators (Telelink, Neocom, and Emmetron) each of whom has a cable running from ONE telecom Wi-Fi antenna to their respective kiosks. All three kiosk operators explain that at the time of the project launch no other provider than ONE could offer a more ubiquitous network coverage reaching the most remote, often mountainous, areas where the kiosks had to be installed[89]. Wide coverage of the network is result of "Macedonia Connects" project completed by the United States Agency for International Development (USAID) with a purpose to deploy a nationwide Wi-Fi network. On.Net was commissioned by USAID to deploy the network, later the company was purchased by ONE (Box 1).

The technical specifications of the Wi-Fi kiosks installed by the operators correspond to the minimum necessary criteria set out in the tender documentation. A procured kiosk typically consists of a desktop PC running on a Linux platform, a monitor, a metal keyboard with integrated mouse (or trackball), a router with two antennas to repeat the signal, and a USB stick which is used for the maintenance of the

[85] MIOA.
[86] MIOA.
[87] MIOA.
[88] See supra note .74, p. 20.
[89] See supra note 12, p. 8.

kiosk (Figure 7). The metal construction of the kiosk cannot be damaged by chance, unless someone uses physical force and equipment to damage the kiosk or its parts. In addition, the kiosk is typically protected by awning.

The electricity for the kiosk is supplied from the school (if the kiosk is attached to the school) or any other adjacent building: a shop, somebody's yard, local municipal office, etc. According to the contract agreements, Wi-Fi kiosk operators bear no responsibility for the electricity costs consumed by the kiosks, therefore electricity costs have to be borne by the schools[90]. This condition is contrary to

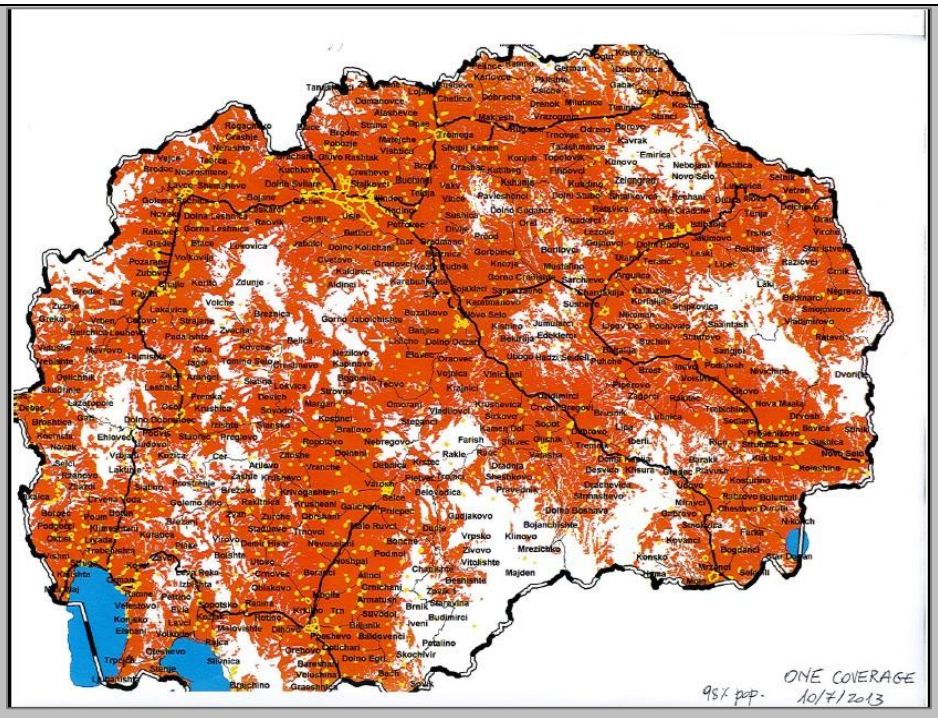
Box 1 USAID Project "Macedonia Connects"

The Macedonia Connects project ("MK Connects") which lasted from 2004 until 2007 is one of USAID's flagship projects in FYR Macedonia which is cited by the donor agency as a model for ICT-focused development initiatives. The project, worth US$3.9 mln, aimed at providing affordable and reliable Internet connectivity and ICT applications to the rural primary and secondary schools of FYR Macedonia. In October 2007, the project connected 545 locations, including 465 schools, 18 secondary school dormitories, 16 Bureau for Development of Education regional offices, 31 NGOs, and 15 university faculties. All of the secondary schools connected through this project (102) showed average monthly Internet traffic at or far above the target – 50 Mb per day. Out of 364 primary schools, all except four had daily traffic at or above the targeted 15 Mb per day.

The deployed technology is a combination of Wi-Fi and Motorola's Canopy technology: the former was chosen for the access part, the latter - as a wireless backhaul solution. Motorola Canopy 2,4 GHz 802.11b has a limited bandwidth of under 11Mbps which itself is maximum only in point to point in the range of up to 500 meters with clear line of sight links. The canopy network was constructed in 2005 by On.Net hired by USAID. Later, the company was acquired by One Telecommunications which now owns the backbone wireless infrastructure (Figure 6).

Figure 6 Motorola canopy backbone wireless infrastructure of One Telecommunications

[90] According to the contract agreements between MIOA and Emmetron, Neocom, and Telelink (article 20).



Source: MIOA

In 2007, USAID commissioned a follow-up Internet penetration and computer usage survey which displayed a 5% increase in Internet usage over the 12-month period before the survey, a 4% increase in the computer usage, and a 3% increase of households with a computer.

Other than providing connectivity, MK Connects developed content for the e-Schools portal, increased capacity of the school teachers through specialized ICT training, sponsored field technical sustainability teams providing technical support to schools and increasing awareness and knowledge promoting ICT sustainability.

Source: "Macedonia Connects Project: Final Program Performance Report", USAID, 2008.

the technical specifications of the tender documentation which posits that „the electricity is to be paid by the economic operator and shall be calculated in the price of the service[91]". Failing electricity is one of the pressing development issues for FYR Macedonia: despite a number of reforms enacted, FYR Macedonia ranked 76th out of 189 economies in terms of getting access to electricity, according to Doing Business 2014 Report. Obtaining a new electricity connection now requires 5 procedures, 107 days and 258.6% of income per capita, whereas in 2010, when Wi-Fi Kiosk Project was launched, the procedure was even more cumbersome with 5 procedures, 151 days and 914.6% of income per capita[92].

The cable from the ONE telecom Wi-Fi antenna goes into the WAN port of the router, the router acts as an Access Point and shares the Internet to wirelessly connected users. All connected wireless users share the maximum of 5.5 Mbps link from the router, which practically means that no user connected to the

[91] See Annex C.
[92] IFC; "Macedonia, FYR; Doing Business 2014; at: http://www.doingbusiness.org/data/exploreeconomies/macedonia-fyr/#getting-electricity.

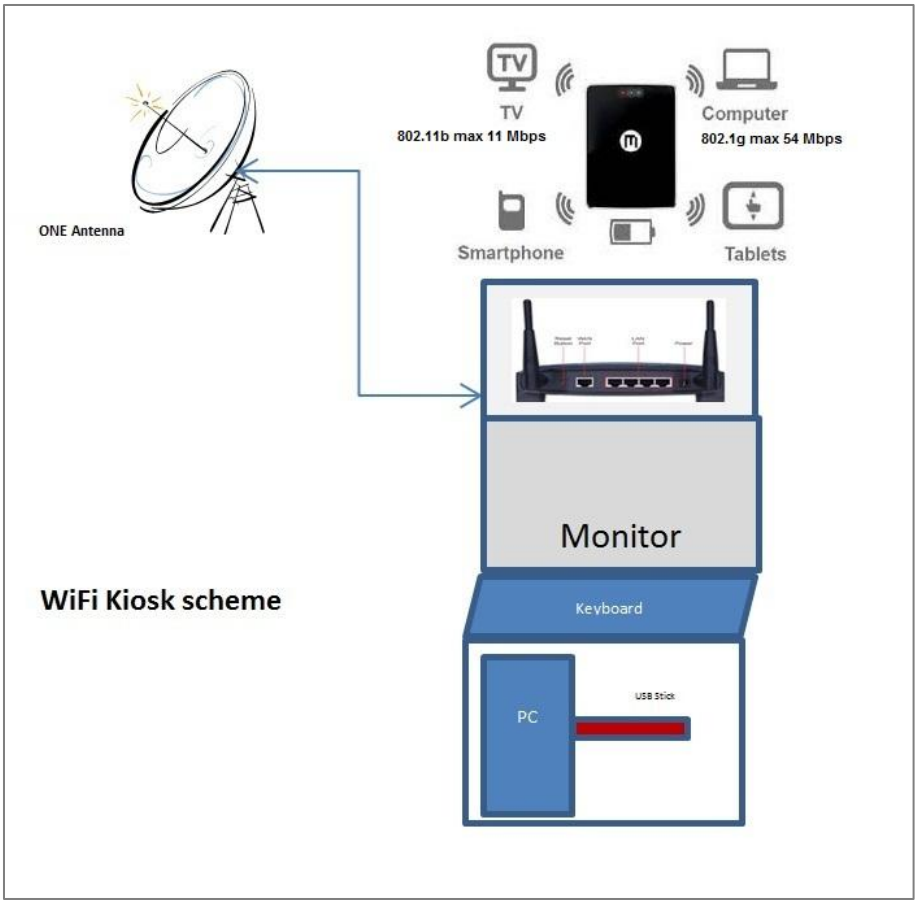
kiosk can achieve the speed higher than 1.1 Mbps, given that 5.5 Mbps has to be shared with the unknown number of connected clients, located in the radius of around 100m (there is no limit on the number of users who can be connected.) Wireless clients connect to the kiosk with open SSID without encryption. The SSID, named "Ostvaruvame," pops up without asking for authentication when one approaches any of the kiosks.

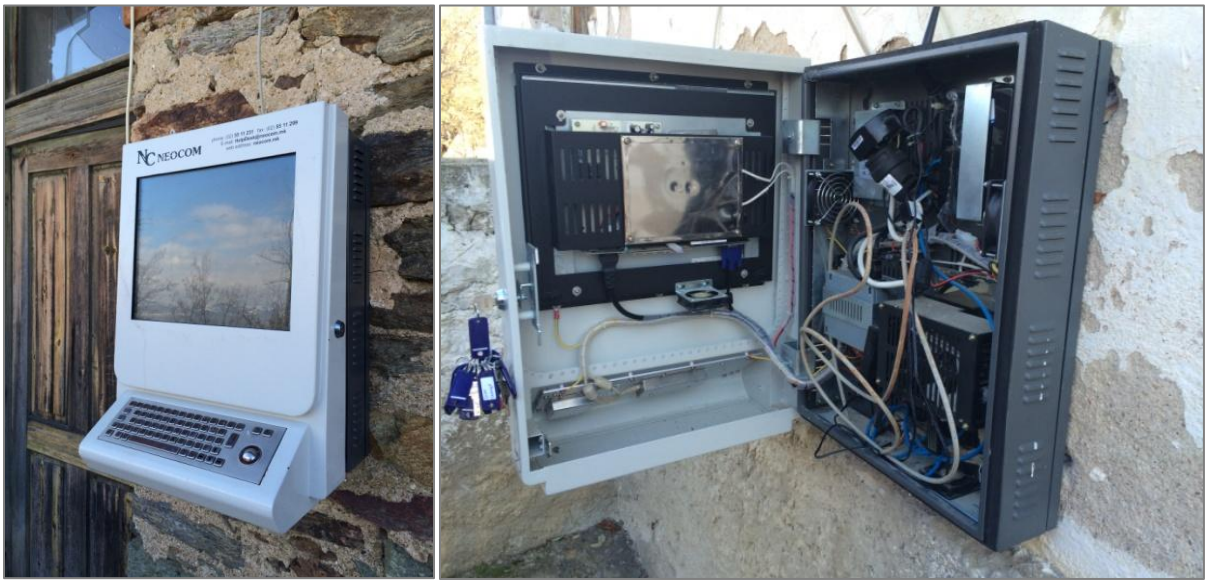
The speed that wireless clients connect to the Wi-Fi router is 802.11b or 802.1g which delivers the maximum of 11 Mbps or 54. This is the possible theoretical maximum bandwidth only from the client machines to the router. There is only one wired PC connected to the router, which is the kiosk itself, therefore one can achieve the highest speed through using the kiosk directly. The technical specifications for procurement stipulate that the minimum speed for the first year of kiosk operation has to be no less than 256Kbps, for the second year – 512Kbps, for the third and fourth – 1 Mbps.[93]

During the site visits the research team has performed a number of measurements to determine the speed of the Internet connection through two independent publicly available online Internet connection speed measurement tools[94]. The measurements were performed both via the kiosks and via the smart phones connected to the Wi-Fi network provided by the kiosks. The results have shown that the average speed of Internet connection reaches 512 Kbps download per location in the case of two end users connected, in the case of more users - the speed of the connection drops significantly and provided Internet access is becoming not functional. A similar observation was made by the majority of 680 survey respondents, whose assessments of the quality of the Internet connection speed vary from "sometimes good, sometimes bad" (16% of all respondents) to "very slow" (around 15%). It is telling that only around 7% of all respondents regard the speed to be "fast" or "very fast"[95].

Figure 7 Principal scheme of the Wi-Fi School Kiosk and functioning Wi-Fi kiosks in the schools of Celopek and Algunja in Staro Nagoričane municipality, 2013 (left and right)

[93] See supra note 74, p. 22.
[94] Internet Speed Test v13 at www.testmy.net; Ookla Speed Test at www.speedtest.net
[95] See Annex G, question 16.





Source: Authors

Taking into account the universally growing demand for the Internet connection speed all three Wi-Fi kiosk operators agree that the quality of the Internet connectivity provided to the kiosks by ONE network, which utilizes Canopy technology, is far from sufficient. However it should be noted that at the

time of deployment the Canopy technology was successfully used in several countries (e.g. Canada[96]), exhibiting a good combination of coverage v. costs.

2.4 Supervision of the Project

The tender documentation established minimum reporting requirements and software parameters for the Wi-Fi kiosk operators. Every two months and at the end of each year the operators are bound to provide several electronic reports which feature (i) average availability time, (ii) average Internet speed, (iii) Internet traffic, (iv) the graph showing the average ping time, (v) actual usage, and (vi) number and description of defects[97]. It should be noted that the information provided by the Wi-Fi kiosk operators to date was used to a limited capacity. From the research team's observation, the information collected from the operators was near solely used to establish the fact of the service delivery in order to take the decisions on the disbursement of monthly payments. The research team has analyzed some of the reports shared by MIOA[98] from the perspective of the Wi-Fi kiosk maintenance and has summarized the main findings below.

2.5 Maintenance issues

Per contract agreement all three Wi-Fi kiosk operators have installed web-based monitoring, reporting, and management software enabling content filtering on each Kiosk (blocking undesirable content such as pornography, transmission of Nazi ideology, etc. on the kiosk and its wireless clients); problem recording, user statistics tracking, etc. For instance, the Helpdesk (24/7) was established for the real-time reporting on the equipment defects, emerging maintenance, and operational issues. Both the Wi-Fi kiosk operators and MIOA have access to the Helpdesk that displays the operational performance of the kiosks. If the operators notice any defect they are obligated to notify MIOA by email stating the number of the kiosk, its locality, date, time, and nature of the defect. Kiosk users, too, can report any issue by contacting Wi-Fi kiosk operators by the phone number which is typically displayed on each kiosk above the kiosk screen. The time frame for remedying the issues varies based on the source of the problem and the location; per contract, it must be no longer than 71 hours. In a number of cases, however, the amount of time needed for fixing the kiosk defects was bigger than 71 hours, given the fact that the kiosks are located in the country's most remote parts which the Wi-Fi kiosk operators cannot easily access, especially in the winter time when the roads become impassable[99]. After the reported defect or functionality issues have been remedied, Wi-Fi kiosk operators are obliged to submit reports to MIOA[100].

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[96] Case Study of Broadband for Rural Nova Scotia Initiative Utilizing Motorola Canopy, "The Role Model For Sustainable Rural Broadband." *Motorola Solutions*. 2011, at: http://www.motorolasolutions.com/web/Business/_Documents/Case%20studies/_Static%20files/WNS_Case%20Study_Utilities_Broadband%20for%20Rural%20Nova%20Scotia%20Initiative.pdf

[97] See supra note 74, ,p. 20.

[98] Note: MIOA did not share with the research team all the reports. Only the reports provided by MIOA were analysed.

[99] See supra note 12, p. 8.

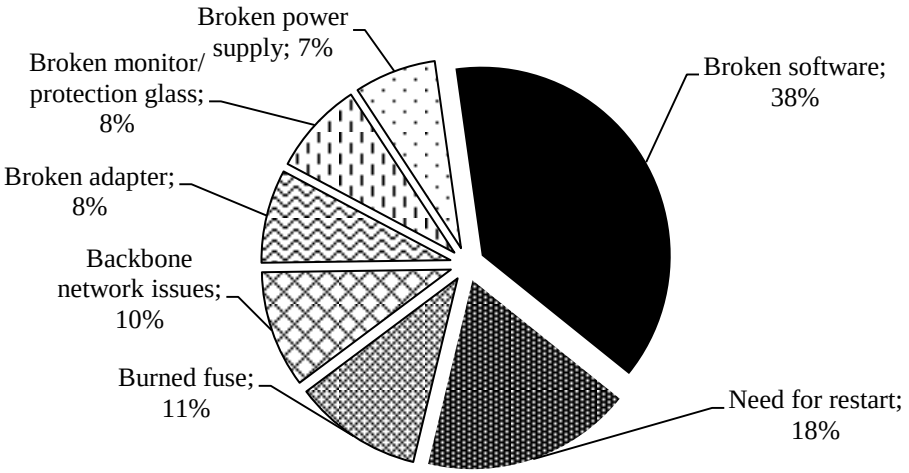
[100] See supra note 74, p. 19.

According to the sample of reports submitted by Wi-Fi kiosk operators to MIOA, the causes behind the majority of defects can be grouped as follows (from the most to the least frequent)[101]:

i) Technical (e.g. interruption in backbone connectivity, broken software or parts of the kiosk);
ii) Human-related (e.g. vandalism, intentional power outage, etc.);
iii) Other (e.g. fire, natural power outage).

Technical issues have been the most diverse and the most frequently encountered by Wi-Fi kiosk operators (Figure 8).

Figure 8 The most frequently encountered technical issues by Wi-Fi kiosk operators, 2010-2012

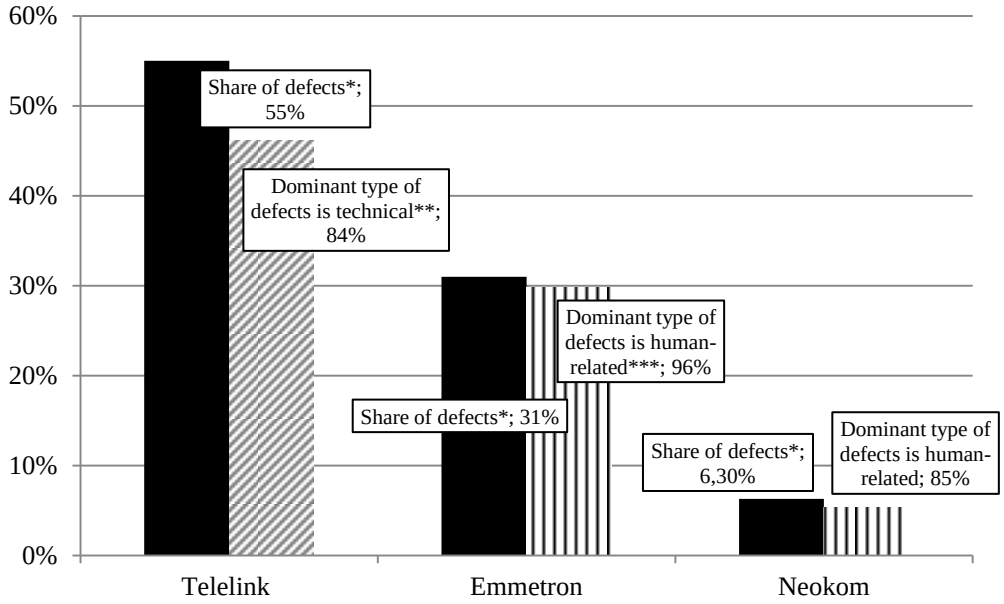


Source: MIOA

In comparison with the other two operators, Telelink seems to be mostly affected by kiosk defects (Figure 9). 55% of Telelink kiosks have been affected since the start of the project, and majority of the defects (84%) have been technological in nature. The operator has shared that backbone network issues (no coverage) and unreliable power supply have presented a major difficulty to the maintenance from the technological perspective[102]. In terms of the scope of defects issues, Emmetron comes second, having a little over one third of its kiosks (31%) affected (96%) by predominantly human-inflicted damages, which the company believes are "deliberate." Neocom has been the least affected by defects, with only 6.3% kiosks damaged by mainly village stakeholders. It should be noted that the operations of Neocom have been affected by frequent intentional cut-offs of the power supply and decrepit school buildings that do not let the Wi-Fi signal through.

[101] MIOA
[102] See supra note 12, p.8.

Figure 9 The share of kiosk defects and a dominant type of defect per operator, 2010-2012



Note: *Within the total number of defects per all the kiosks installed per operator; **Refers to the type of defects with the highest share within the total number of defects per all the kiosks per operator: "technical" refers to interruption in backbone connectivity, broken software, broken parts of the kiosk, etc. ***Refers to the type of defects with the highest share within the total number of defects per all the kiosks per operator: "human-related" refers to vandalism, intentional power outage, etc.

Source: MIOA

In terms of demolitions (or vandalism), 54 complete demolitions have occurred to date, with a larger incidence rate occurring in the West of the country, judging from the fact that operators Emmetron has been mostly affected: 33% of its kiosks have been demolished. Telelink had 5.6 % of its kiosks demolished, and Neocom – under 2%[103]. The exact causes for these demolitions have not been known, however, Wi-Fi kiosk operators have voiced an assumption, based on their interactions with the local stakeholders, that political motivations could have triggered the demolitions. The starting webpage of all kiosks is a government webpage, and each kiosk has a label denoting that the kiosk is functioning under the auspices of the government-sponsored project. The local villagers could regard the kiosks to be a source of government propaganda[104].

Per contract agreement, the kiosks should be protected by the insurance against the damages inflicted by the third parties (not associated with the operators), fire or force majeure, for which Wi-Fi kiosk operators are not responsible and therefore carry no penalty.[105] Though not responsible for the third-party inflicted damages, some operators were forced to cover for the vandalism losses (e.g. broken

[103] MIOA
[104] See supra note 12, p. 8.
[105] See supra note 74, p. 20.

router), which the insurance company refused to pay.[106] Such expenditure increased the variable costs associated with the damages.[107]

2.6 Usage of the Wi-Fi kiosks[108]

The service availability initially set by MIOA was 85%, but it was later revised due to the power supply and backbone network issues[109]. The average Internet speed as measured by the field tests (and which is supported by Wi-Fi kiosk operators' observations) rarely reaches 1 Mbps and fails to go beyond it. The survey findings affirm this finding: the survey respondents regard the quality of speed to be the most oft-cited source for complaints from Wi-Fi kiosk users, and their #1 recommendation is to increase the Internet speed[110]. The most credible reason behind the lower average Internet speed has been the placement of the kiosks in the schoolyards or inside of the schools, contrary to the placement in the highest point of the village which would have enabled the higher speeds. Moreover, Motorola Canopy has a limited speed upgrade available (2Mbps) which, though, recently executed translates into a maximum of 1 only Mbps on the ground.[111]

The analysis of the content accessed in May-June 2013 through Neocom kiosks has shown that the most popular websites browsed by the kiosk users belong to the Government of FYR Macedonia (above 60% of all of the opened websites in January-June 2013), while the second preferred destination is social networking websites such as Facebook or Twitter. The analysis of the most accessed domains of Telelink from July 27th until August 9th, 2013, has shown that the social networking domains and their subdomains (e.g. Facebook) have prevailed over any other type of accessed content and constitute 25% of all the domains visited[112] (Figure 10).

The survey results reflect the desk research findings: the Wi-Fi kiosks are most often used for educational and professional purposes, followed by entertainment (or leisure). It is also not uncommon to find the users who are driven by both professional and educational motives or out of desire for both education and leisure[113]. 38% of 251 respondents who have used the kiosks state that since they have started to use the kiosk their usage patterns have shifted toward accessing more content for leisure, while 30% have been using them more frequently for educational purposes. Around 22% of respondents have not noticed any change in terms of the content accessed: they continue to access kiosks for education and leisure[114].

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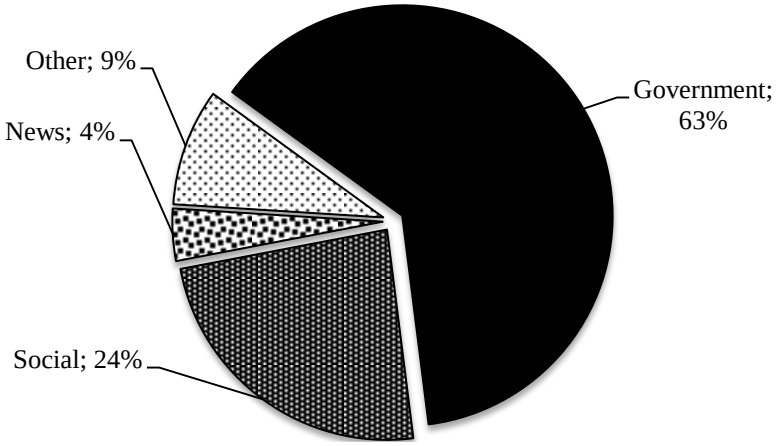
[106] See supra note 12, p. 8.
[107] See supra note 12, p. 8.
[108] Usage reports of two operators (out of three) have been shared by MIOA. The reports submitted by Telelink are "Interface"and "Ping" and by Neocom - "Availability Report for August (Sept. 17, 2013)" and "Availability Report for July (Aug. 29, 2013)".
[109] See supra note 12, p. 8.
[110] See Annex G, questions 16 & 31.
[111] See supra note 12, p. 8.
[112] Because of the large number of content-delivery network domains it is rather difficult to provide a more precise evaluation.
[113] See Annex G, question 8.
[114] See Annex G, question 10.

Figure 10 Average distribution of the websites per category visited by Neocom kiosk users in January-June, 2013



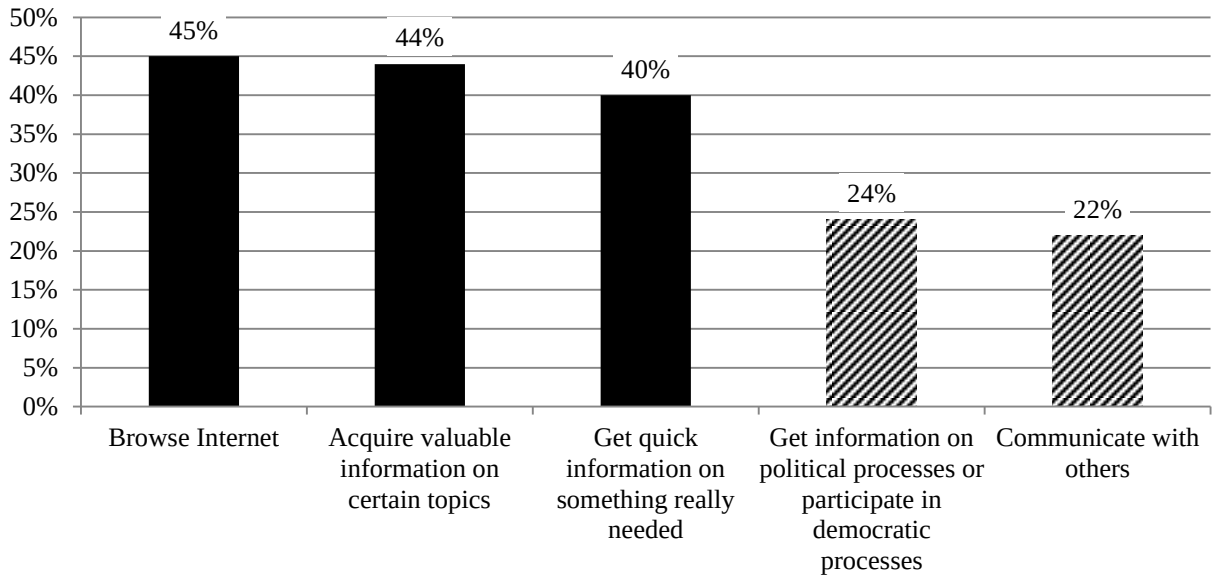
Source: Wi-Fi kiosk operators reports, MIOA

Out of 680 respondents almost 35% have been using the kiosks for over one year, with the exception of those who have started to use the kiosks in 2013[115]. Almost 36% of the respondents have been using the kiosks since the kiosks' installation[116]. The users agree that the Wi-Fi kiosks help them fully or to some extent browse the Internet (~45%), get quick information on something they really need (40%), acquire valuable information on certain topics (44%), get information on political processes or participate in democratic processes (24%), and communicate with others (22%)[117] (Figure 11).

Speaking about the frequency of the kiosk use, almost 32% of the survey respondents use the Wi-Fi kiosks at least once a week or more often. Almost 5% of them use the kiosks once or several times per month, but not as frequently as once a week or several times per week[118]. Around 21% of the respondents noticed that the amount they spend on the kiosks has increased with time, whereas almost 9% said that there has been no change and 7% have their time spent on the kiosks actually decreased. However, almost 82% of those who have stated that the amount they spend on the kiosk has remained the same use the kiosks as frequently as every day, once a week or several times per week, while almost 17% of them use the kiosk once per month or several times per month[119].

Figure 11 Frequency of different activities performed using the Wi-Fi kiosks (a multiple choice question)

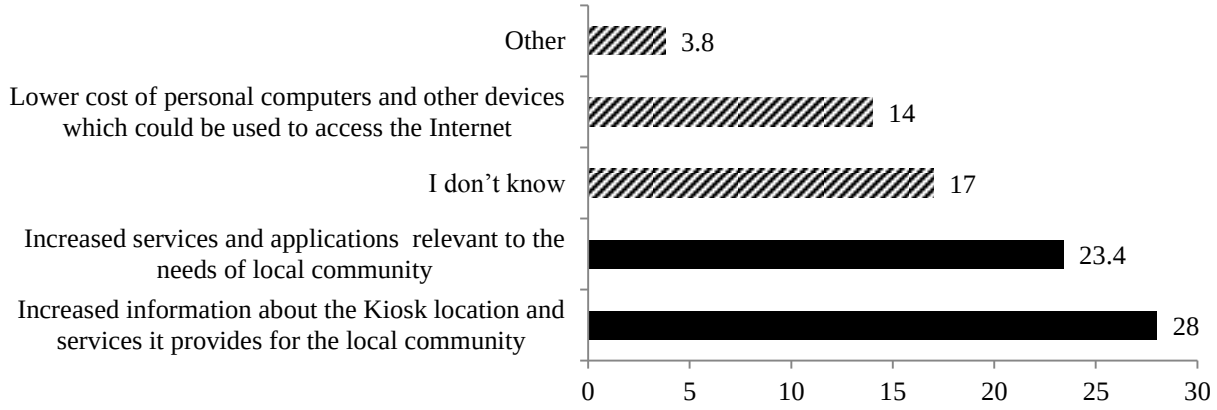
[115] Note that the total number of respondents is 680, out of whom 415 have not provided any answer.
[116] See Annex G, question 6.
[117] See Annex G, questions 17, 19, 20, 21, and 24, respectively. Note that percentages have been calculated using the total number of respondents (680) accounting for a non-response rate, mainly by non-kiosk users.
[118] See Annex G, question 7.
[119] See Annex G, question 9.



Source: Survey Findings (Annex G)

The most oft-cited reasons that can make users utilize the Wi-Fi kiosks more frequently encompass: (i) better education on how to use Internet and how it can be useful (digital literacy); (ii) increased information about the kiosk location and the services it provides for the local community; (iii) increased services and applications relevant to the needs of the local community (Figure 12).

Figure 12 Responses to the multiple-choice survey question #33: "What could make you or other users utilize the Kiosk more frequently?"



Source: Survey Findings (Annex G)

Only 39.6% of 680 survey respondents use the Wi-Fi kiosks, yet two times more respondents (82.7%) believe that there is a demand (need) for the Wi-Fi kiosks. By contrast, fewer than 5% of respondents believe there is none[120]. Such a seeming paradox can be easily explained by the poor Internet coverage

[120] See Annex G, questions 5 & 27.

in the surveyed villages and the arising need for connectivity: around 1/3 of respondents who don't have Internet at home live in the localities with an installed Wi-Fi kiosk.[121] Subsequently, if the Wi-Fi kiosks were de-installed around 30% of respondents said that the residents of their village would be disappointed, as they would not be able otherwise to access the Internet. Nearly 22% said there would be a minor reaction. Around 9% said there would be no reaction as no one would notice de-installation[122]. While the survey sample majority may not be using Wi-Fi kiosks, these respondents realize the local need for connectivity and the possible outcry when the kiosks are taken away.

According to the observations of the Wi-Fi kiosk operators, the kiosk locations with the higher demand for the Wi-Fi kiosks have certain characteristics. First, these are villages with poor Internet coverage. Second, these areas tend to be populated with migrant labour. Third, these villages have a higher share of children and youth in the local demographic structure[123]. The data received from the fixed and mobile operators support the first argument (see Annex F), while the survey findings corroborate the third argument, for the main user base of the kiosks is indeed comprised of the children and youth under 35 years of age.

2.7 Project Beneficiaries

While performing this assessment the research team has learned that a primary group of the project beneficiaries constitutes rural schools' administrators, teachers, and students who were not initially intended to be the direct beneficiaries of the project[124]. According to the survey findings, almost 81% of 270 Wi-Fi kiosk users are connected with the local schools: they are either representatives of the school administration (6%) or teachers (29%) or students (46% of the surveyed). Only nearly 2% of users are farmers[125]. The most represented user age group is comprised of children and adolescents aged 10-14 (34%), followed by young people aged 25-34 (~21%). Cumulatively, young people (under 35 years old) constitute the most represented age group (73% of the total number of users). Users aged 35-44 make up ~11% of the user base and so does population aged 45-54 years old. The elderly, aged 65 or older, do not use the kiosks[126].

Other that through the Wi-Fi kiosks, the above beneficiary group benefits from the Internet connectivity provided through a different government project commissioned by MoES. Since 2009, MoES has committed to connecting all primary (central and satellite) and secondary schools, as well as student dormitories (almost 1200 locations). Yet, the Ministry has faced difficulties in providing connectivity to some 10 percent of the access points, as it could not provide connectivity to the most remote and isolated schools due to the lack of adequate infrastructure by the fixed ISP selected to provide connectivity under MoES tender. For instance, MoES has estimated that the connectivity in 138 rural

[121] See Annex G, questions 4 & 13.
[122] See Annex G, question 30.
[123] See supra note 12, p. 8.
[124] The project documentation does not segment the project beneficiaries. The main beneficiaries are identified as a general public.
[125] See Annex G, question 1. Only those who have stated that they have used the Wi-Fi kiosks are accounted.
[126] See Annex G, question 2. Only those who have stated that they have used the Wi-Fi kiosks are accounted.

schools has been in question for the school year of 2013-2014[127], out of which 7 could not be connected at all.[128] At the same time, Wi-Fi Internet kiosks have been installed in 115 out of these 138 schools (Box 2).

Even though the Wi-Fi Kiosk Program was not designed to serve the connectivity needs of the schools (e.g. Wi-Fi Internet Access is usually weak or not available inside the school buildings, thus the teachers have to go outside to connect to the electronic systems of the MoES, etc.), the feedback provided by the school personnel is highly positive: teachers seem to be satisfied with the kiosks, as they provide a much better alternative to nothing. This feedback is confirmed by the survey results showing that the teachers frequently use the kiosks for professional reasons (see Section 2.6).

According to the tender requirements of the MoES project which stipulates provision of the Internet connectivity to the schools, the Ministry does not provide any subsidy for the installation or deployment of the infrastructure (where the latter is not present): broadband services are purchased by MoES on the basis of a pre-established monthly fee and the contract is signed for one year. Every year the minimum technical requirements are gradually increasing while reflecting the market developments and growing user needs (Box 2). In the localities where the selected ISP cannot provide the connectivity at a level determined by MoES tender requirements, the schools remain unconnected.

The connectivity is essential for meeting the educational standards set by the Government: for instance, all of the teachers are obliged to comply with the requirements foreseeing the use of Education Management Information System (EMIS)[129], e-Gradebook, Electronic External testing, and other web services[130]. The connectivity is no less essential for students who are required to take computer classes from the second grade onwards, with the school load being two hours per week or 72 hours a year[131]. Out of 115 schools with uneven Internet access, which benefit from the connectivity provided by the Wi-Fi kiosks, the biggest part will be disconnected in 2014. At the same time, there is no evidence allowing the researchers to conclude that fixed Internet infrastructure will be extended in the upcoming years to the areas where schools with poor connectivity are located[132] (Section 3.2.). This implies that these schools will likely remain disconnected with no clear prospects for change.

Box 2 Connecting Schools in FYR Macedonia to the Internet (MoES)

Provision of the Internet connectivity to schools is one of the pillars of the Computer for Every Child project,

[127] The connectivity in these schools is considered as unrealized because the connectivity is provided by the ISP with lower speeds than defined by MoES standards (the ISP only reaches a minimum number of uncovered access points for any Internet access). Provision of connectivity in these areas was stipulated in the Annex to the procurement award contract.

[128] MoES. ***Note***: the actual number of the unconnected schools or schools with constrained connectivity can be higher, as there are schools which MoES has not yet contacted inquiring about the quality of the Internet connection.

[129] World Bank financed project.

[130] All of these requirements are legally institutionalized in the Law on Primary Education and Law on Secondary Education.

[131] Informatics Curriculum, MoES http://www.bro.gov.mk/docs/nastavni-programi/np-informatika-strucno-2-godina.pdf

[132] Even though some of the selected 115 localities have some fixed coverage and, in some cases, the possibility for development of mobile broadband, it should be noted that MoES project selects only one ISP to provide coverage to all of the schools and student dormitories. The evidence does not allow to conclude that the coverage will be extended in selected by 115 areas by one ISP (either MakTel or ONE), thus allowing for ubiquitous school connectivity.

through which, over the last five years, MoES has supplied schools all over the country with computers, student tablets, electricity and structural cabling (internal wiring). Since 2008, MoES has started to provide Internet connectivity for educational purposes on an annual basis, complementing other project activities. At first, only central primary and secondary schools were included in the project, but starting from 2009, primary satellite schools and student dormitories were added to the list of beneficiaries.

In providing connectivity, MoES does not favour any technology. However, broadband service provision in schools relies on asymmetric DSL which, in its turn, is either dependent on the existing cooper infrastructure constructed decades ago by the former Postal Telephone and Telegraph Service (PTT) Macedonia and later transferred into the ownership of Makedonski Telekom, or on the use of infrastructure provided by USAID's Macedonia Connects Project (Box 1). In urban areas, the copper infrastructure has better quality than in rural and distant areas. MoES believes that in the long term the fiber optic coverage needs to be increased in the urban areas and modern wireless technologies in the most remote areas in order to keep up with arising bandwidth and speed requirements.

Every year the minimum technical requirements are gradually increasing, reflecting the market developments and growing user needs (See Table 6). The highest charge paid by MoES for provision of the Internet (ADSL) per student dormitory in 2013 has been 30EUR.

Table 6 Internet speed requirements for schools, student dormitories and number of unconnected schools, per academic year, 2009-2014

Academic Year	Central primary schools		Primary schools in rural areas		Secondary schools		Student dormitories		# of unconnected satellite and central schools***
	Upload, Mbps	Download, Mbps	Upload, Mbps	Download, Mbps	Upload, Mbps	Download, Mbps*	Upload, Mbps	Download, Mbps**	
2009-2010	4	0.5	1	0.25	4-8	0.5	4-20	0.5	n.a.
2011-2012	6	1	1	0.5	10	1	12	1	138
2012-2013	6	1	1	0.5	10	1	12	1	198****
2013-2014	10	1	3	1	16	1	16	1	138

*Note: *for secondary schools (the download speed depended on the number of students in the school); ** student dormitories (the download speed depended on the number of students in the dormitory); *** an approximate number of the schools in which at least one telecom operator could not technically provide Internet service; ****In addition to schools which could not be technically connected by at least one telecom operator, there were schools with no functional IT equipment which prevented Internet provision.*

Source: MoES

Until 2013, ISPs who have provided connectivity to the schools have been MakTel (2008-2011, 2013) and ONE (2012). The number of schools, which neither Internet provider is technically capable of linking to the network reaches around 150 per year (some 10 percent of the access points). The schools that face difficulties getting connected have neither phone lines nor radio links and the cost of a government intervention to connect them through the ISP selected in the tender is estimated by MoES as „exceptionally high."

MoES has set out certain technical requirements for the ISPs bidding for the project (e.g. availability, web based traffic monitoring, content filtering, etc.) some of which are similar to those defined for the Wi-Fi kiosk operators (eg. content filtering).

To prepare school administration and staff MoES distributes special user guides on how to operate the equipment. Additionally, MoES instructs school directors to appoint at least two teachers per school who will be responsible for

the successful implementation of the program. Finally, MoES obliges a designated ISP to issue a monthly report outlining existing / emerging maintenance issues.

Source: Interviews and correspondence with MoES, November-December, 2013

2.8 Future Plans

In the beginning of the project MIOA expected that the government subsidy for rural connectivity provided by the Wi-Fi Kiosk Project will be growing the local demand for Internet services, thus allowing three private Wi-Fi kiosk operators to commercialize Internet access services provided through the Wi-Fi kiosks after the project discontinuation[133]. The interviews with the Wi-Fi kiosk operators have revealed that none of them plans to commercialize the kiosks for a number of reasons: (i) high maintenance costs; (ii) insufficient demand resulting from the low population density in the remote rural areas; (iii) outdated hardware which would need to be replaced in order to meet the growing user expectations regarding the Internet speeds; and (iv) poor network capacity. In fact, Wi-Fi kiosk operators consider reselling the kiosks if there is no other government project for which the kiosks can be leveraged. Variable costs of the operators range from 38.4% to 65% of the total costs per kiosk per month and tend to grow (Table 7). The maintenance costs per kiosk may constitute as high as 70% of the total costs per kiosk per month in the most remote areas, which makes provision of the commercial services in those areas prohibitive from the economic standpoint[134].

Table 7 Reported fixed and variable costs for the Internet access provision for the Wi-Fi Kiosk Project

Wi-Fi Kiosk Project provider	*Fixed costs (administration)*	*Variable costs (fault management, maintenance and support, electricity cost, insurance, Internet access)*
Emmetron	61.6%	38.4%
Neocom	60%	40%
Telelink	35%	65%
Average:	**52.2%**	**47.8%**

Source: Interviews with Wi-Fi kiosk operators and AEC, November-December, 2013.

Wi-Fi kiosk operators, together with other broadband providers interviewed by the research team, agree that the only possibility to continue (or launch) the provision of the Internet access services using (or not) the Wi-Fi kiosks in the whole range of the geographical locations is not possible on a commercial basis, unless there is a targeted government intervention. After operating the kiosks for nearly four years, all three Wi-Fi kiosk operators would consider (if at all) further provision of the connectivity through the Wi-Fi kiosks only under the auspices of the new government program subsidizing Internet

[133] See supra note 68, p. 18.
[134] See supra note 12, p. 8.

access. As the provision of connectivity, particularly in some regions, is both challenging and costly, the amount of current subsidy may not be sufficient to trigger the commercial interest to engage. Furthermore, all three operators are unanimous that the backhaul infrastructure emerged as a bottleneck for Internet access provision to the Wi-Fi kiosk locations and should be considerably upgraded to provide higher capacity. Each of the operators has also expressed an opinion that the Wi-Fi coverage and the speeds should be increased in order to provide better functionality for a greater number of simultaneous users[135].

In case the project is not extended beyond its initially planned four years life circle, the first of the kiosks will cease to operate in April, 2014, and the last - in September, 2016[136]. In this vein, it is important to determine whether the locations served with the Internet access today (through the kiosks) will continue to be connected to the Internet in the near future or whether they are doomed to receive the "Internet blackout."

3. PUBLIC POLICY AND INITIATIVES ADDRESSING CONNECTIVITY IN RURAL AREAS

From the policy standpoint, there are at least several policy initiatives aiming to address the connectivity gap between the rural and urban areas. It should be noted, however, that research team did not locate any initiatives addressing connectivity of those specific Wi-Fi locations beyond the project lifecycle.

National Strategy for the Development of the Next Generation of Broadband Internet

In April 2009 FYR Macedonia has adopted the 'National Strategy for the Development of the Next Generation of Broadband Internet' (hereinafter - Broadband strategy), together with an action plan for its implementation.[137] The Ministry of Transport and Communications[138] announced the plans which also set out a series of initiatives aimed at resolving a number of key connectivity issues such as the broadband access provision in the rural areas. Despite the fact that FYR Macedonia does not specify any specific broadband coverage targets (Box 3) the country has established a set of initiatives aiming to put in place a basis for the broadband infrastructure development in the rural areas, with municipalities playing the pivotal role.

For instance, Section II.8 of the strategy posits that the local governments shall within one and a half year adopt local ICT strategies (Measure 2.8.a), Campaign on the advantages and benefits from constructing and development of municipal electronic communications networks as a basis for an information society (Measure 2.8.b). However, to date only near 1/4 of 84 municipalities have adopted

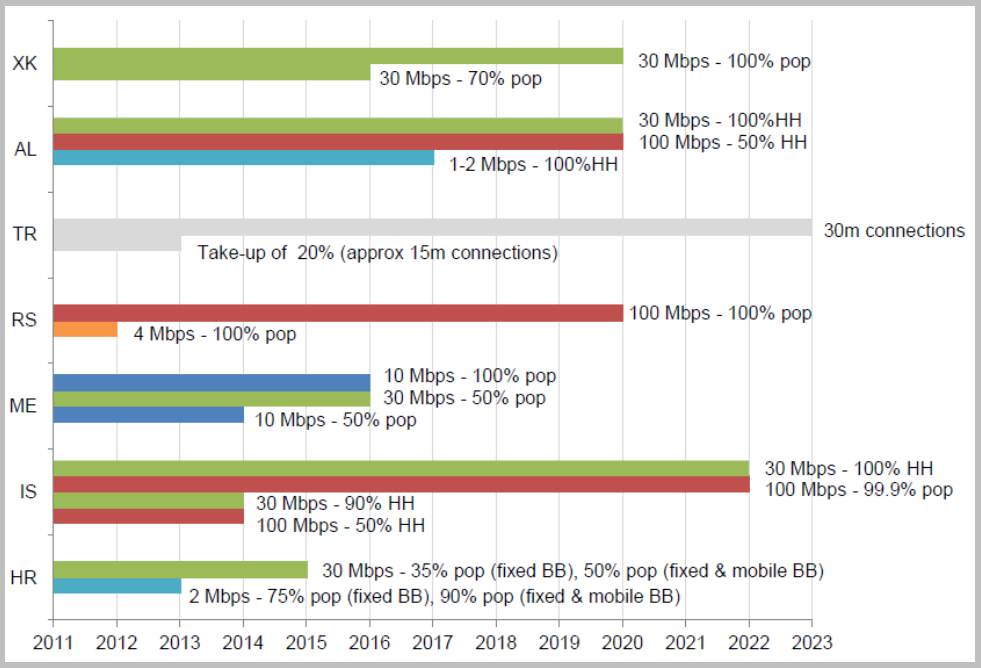
[135] See supra note 12, p. 8.
[136] Ibid.
[137] "Parliament adopts next generation of broadband development plan." 2009. TeleGeography. http://www.TeleGeography.com/products/commsupdate/articles/2009/04/23/parliament-adopts-next-generation-of-broadband-development-plan/
[138] Eventually restructured into MIOA.

local ICT strategies; out of which only few are in the locations where Wi-Fi kiosks are located or where there are fewer than two ISPs per Wi-Fi location. It is also uncertain if there is a sufficient capacity and enough financial resources available to the municipalities allowing them to lead the deployment of the broadband infrastructure on their territory, e.g. dedicated financial resources; capacity and resources to perform technical and economic analyses, capacity to structure PPPs, etc. From the review of the ICT strategies adopted by the municipalities where Wi-Fi kiosks are located it may be concluded that the main focus of the policy document has been placed on the development of ICT capacity of municipality administrations while the Internet connectivity on the territory of municipality has not been specifically addressed.

Box 3 Broadband coverage targets in selected countries in case of EU accession

According to the latest report measuring electronic communications and information society sectors in the nine countries that are currently taking part in an ongoing process of the enlargement of the European Union, governments of six of the nine enlargement countries (Croatia, Iceland, Montenegro, Serbia, Kosovo and Turkey) have set political targets for broadband coverage or broadband take-up at specified minimum speeds to be reached in the coming years (Figure 13). In Albania, the national policy document stipulating broadband coverage targets is currently being drafted. The Government of Croatia has specified a number of targets for fixed broadband penetration, whereas in other countries the targets are technology and service-neutral. No national broadband targets have been specified for FYR Macedonia and Bosnia & Herzegovina.

Figure 13 Broadband coverage targets in countries taking part in an ongoing process of the EU enlargement



Source: Supply of services in monitoring regulatory and market developments for electronic communications and information society services in Enlargement Countries, Cullen International, 2013

e-Inclusion Strategy

In May 2011, the Government of FYR Macedonia has adopted e-Inclusion Strategy (2011-2014)[139] reflecting European policies and legislation in the area of digital inclusion and information society. The strategy defines a list of priorities, goals, and measures needed to create an inclusive information society in view of socioeconomic and demographic peculiarities of FYR Macedonia. The main goal of the Strategy is to reduce the digital divide and create an inclusive information society, which is responsive to the needs of all citizens by providing better quality and increased use of ICTs in everyday life, creating conditions for easier access to ICTs, and increasing ICT skills of the population. Several projects were realized prior to the Strategy adoption in 2007-2008, including provision of free basic IT courses for 40,000 residents of selected municipalities, allocation of connectivity subsidy which allowed all citizens to enjoy a total of four months of free Internet in the year of 2008, direct financial assistance to full-time students who were assigned value vouchers for purchasing personal computers, and provision of Internet connectivity through computer clubs in 15 different cities. Fifteen computer clubs were opened for free use for all interested citizens under the auspices of "The world at your fingertips" project in 2007 and 2008. In 2009 and 2010, there were 22 cyber cafes. On the basis of these facilities the government was able to subsidize specialized advanced IT course training for 80 unemployed.

As a whole, e-Inclusion strategy makes a strong focus on the educational aspects and puts together actions aiming to create enabling environment for ICT skills development, e.g. free Internet clubs, etc. However this strategy does not specifically address the sustainability of the Wi-Fi Kiosk Project; neither it foresees how the digital divide will be addressed in the locations that are today served with free Wi-Fi Internet access.

Five year regulatory strategy of AEC

As implementation of the requirements laid out in the Broadband strategy AEC has adopted its Five year regulatory strategy (AEC's strategy) in 2012.[140] In addition to outlining certain regulatory issues AEC's strategy explains the regulator's approach towards Broadband Universal Service Obligation (USO), which, as a matter of fact, may be used to address the universality of broadband coverage across the country, including its rural and remote areas. For instance, in Croatia and Montenegro the basic broadband coverage targets have been included in the USO: Montenegro – 144 kbps (since January 2011); Croatia – 144 kbps (since March 2013); 1 Mbps (since January 2015).

At the moment, MIOA is preparing amendments to the draft law which will include provisions on the addition of the broadband service into the set of USO which currently include directory inquiries and telephony. The draft law is expected to be adopted in spring 2014. At the moment of writing of this

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[139] "National e-Inclusion Strategy 2011-2014". 2011. MIOA. http://www.mio.gov.mk/files/pdf/dokumenti/Strategija_za_e-vklucuvanje.pdf

[140] "Five years regulatory strategy of AEK". 2012. AEC. http://www.aec.mk/index.php?option=com_content&view=article&id=580&Itemid=103&lang=en

paper the implementation details of the USO reform were not determined. It also remains unclear if and how exactly these funds may support the development of the connectivity in Wi-Fi kiosk locations.

4. OBSERVATIONS AND RECOMMENDATIONS

Observations

1. **Wi-Fi Kiosk Project brought Internet connectivity to nearly all of the locations for the first time**. This was named among the biggest achievements of the project and supported by all the interviewees. It is also evident that the Internet connectivity brought into the most remote communities is moderately but also increasingly used by local inhabitants. Better education on how to use Internet (digital literacy), increased information about the kiosk location and services it provides for the local community and increased amount of services and applications relevant for the needs of the local community could foster higher usage and user penetration.

2. **The benefits provided by the Wi-Fi Kiosk Project go beyond those initially foreseen**. It was found that satellite schools, which would remain unconnected under MoES project, are receiving Wi-Fi connectivity from the kiosks. For example, 115 schools with unrealized connectivity under the MoES initiative in the school year 2013-2014 are benefiting from the Internet connectivity provided by the Wi-Fi kiosks. School administration, teachers, and students constitute one stakeholder group that most often uses the Wi-Fi kiosks to satisfy certain professional and educational needs, some of which are stipulated in the Law on Primary Education and Law on Secondary Education;

3. **Implementation of the Wi-Fi Kiosk Project may be considered fairly effective**. MIOA put in place a workable framework for operation of the kiosks. No major issues related to the implementation and (or) operation of the project were identified.

4. **Key survey factoids**: A primary group of the project beneficiaries constitutes rural schools' administrators, teachers, and students: **almost 81% of 270 Wi-Fi kiosk users are connected with the local schools. Young people (under 35 years old) constitute the most represented age group (73%).**

   Over time, Wi-Fi kiosks have been most often used for educational, professional purposes, and leisure. Majority of kiosk users acknowledge that the amount they spend on the kiosks has increased with time. The reasons that can make users utilize the kiosks more frequently include: **(i) improved digital literacy; (ii) increased information about the kiosk location and the services it provides for the local community; and (iii) increased services and applications relevant to the needs of the local community**. Most often, Wi-Fi kiosk users complain about the **kiosk speed**, and to a lesser extent – about the kiosk model, location, and setup.

Wi-Fi kiosks help users fully or to some extent browse the Internet (~45%), get quick information on something they really need (40%), acquire valuable information on certain topics (44%), get information on political processes or participate in democratic processes (24%), and communicate with others (22%). **If the Wi-Fi kiosks were de-installed the majority of villagers would be somewhat or really disappointed, as there is a real demand for the kiosks.**

5. Although there is not enough information to draw definitive conclusions upon the development of the Internet coverage in Wi-Fi kiosk locations since the project launch, **at the moment of writing this Paper, in ~69% (470) of all of the Wi-Fi kiosk locations there have been fewer than two ISPs and in ~8% (52) of all of the Wi-Fi kiosk locations commercial Internet access is not available at all**.

6. **Broadband prices, although fairly affordable for the average household in FYR Macedonia, remain far too high for the population with lower incomes**. The price for the cheapest available broadband package, in case of a representative of the poorest average household in FYR Macedonia, is likely to range from 7.21% of the monthly disposable income (mobile broadband) to 10.84% or higher (fixed broadband). An at-risk-of-poverty household is likely to need from 15.14% to 22.75% of its average disposable income per month to afford mobile and fixed broadband, respectively. Broadband is even more expensive for the lowest 40% of the total population by income who will need to pay 20.49% of their monthly disposable income to afford mobile broadband and 30.79% - for fixed broadband;

7. **Low broadband coverage in 680 villages where the Wi-Fi kiosks are located has remained stable for a number of years and the evidence suggests that the situation is unlikely to improve in the short to medium term**. According to MoES, the number of the rural schools that face connectivity issues or cannot be connected at all remains in the range of 138-150 starting from 2009. The survey commissioned in 66 localities where the Wi-Fi kiosks have been installed has shown that around 1/3 of respondents who don't have Internet at home happen to live in the localities with an installed Wi-Fi kiosk, and **82.7% of respondents believe that there is a demand (need) for the Wi-Fi kiosks**;

8. **According to the EU State aid rules, the government support is potentially required in remaining ~77% locations (out 522 of 680) in order to address the digital divide**. In over 69% (470) of all the locations where the Wi-Fi kiosk are currently operating there are no more than one commercial Internet access provider and in ~8% (52) of all the locations commercial internet access is not available making the Wi-Fi kiosks the only remaining alternative;

9. **National policy framework in a way that it addresses the rural connectivity puts a significant emphasis on the role of the local municipalities**. It is uncertain if there is a sufficient capacity and financial resources available to the municipalities allowing them to lead

the deployment of the broadband infrastructure on their territory, e.g., to perform technical and economic analysis, to structure PPPs, etc.;

10. **There is a risk that the locations served with the Internet access today (through the Wi-Fi Kiosk Project) will be doomed to receive the "Internet blackout" after the project discontinuation**. Low coverage of commercial ISP networks in rural areas, low population density, and relatively high prices for broadband Internet access services provide the basis to presume that despite the growing local demand for Internet services, as of today there is an insufficient business case to have the Wi-Fi kiosks commercialized after the project discontinuation either by three operators or other ISPs. This presumption is consistent with the opinion of the Wi-Fi kiosk operators who all have confirmed their lack of intention to continue providing the service on a commercial basis after the project closing date. High maintenance costs, a low number of potential users, and the need for further investments to upgrade / deploy the backbone and backhaul infrastructure, replace the outdated hardware, increase the low Internet access speeds have been cited as the rationale.

Recommendations

1. **It is recommended that MIOA ensure that important achievements of the project, such as the newly-deployed connectivity in the most remote and rural communities, are preserved and leveraged after the project closing date.** Closing kiosks without offering an alternative source of connectivity may potentially have a negative social impact and will contribute to increasing the digital divide. It is also worth pointing that the areas with fewer than two operators are unlikely to be covered with additional ISPs in the foreseeable future;
2. **Alternative program (project) needs to be designed to specifically address the connectivity in the areas with zero or only one ISP, thus ensuring that the efforts to bridge the digital divide will continue**. In this regard, for instance, local ICT strategies' development and implementation could be accelerated to have higher capacity networks deployed in order to sustain the growing demand coming from the local community. Existing backhaul / backbone infrastructure connecting the remote areas may be not sufficient to sustain high speed internet connectivity. Thus, existing backhaul / backbone infrastructure needs to be upgraded and (or) new infrastructure should be deployed;
3. **In the alternative program (project) or any other future endeavours MIOA should clearly identify project / program objectives, set key performance indicators, design a robust monitoring, reporting, and evaluation framework**. As objectives and KPIs should be measurable and systematically measured, so should the oversight framework be robust and action-oriented. Lessons learnt from one project ought to be proactively incorporated into the next, thus creating the repository of good government ICT practice.
4. **MIOA may consider establishing a framework and outlining a set of indicators to collect and monitor the broadband coverage, pricing and Internet usage development in the rural**

areas (e.g. interactive maps, provision of information about the coverage, services, operators, level of ownership and usage of smart phones, tablets, laptops and desk computers, etc.). This approach will allow to better adjust state policy and regulatory measures to the realities on the ground. It will also help identify which, where, and for how long the government interventions are needed. As of today, the data related to the broadband coverage (as well as pricing[141]) are neither systematically collected nor analysed by any government institution, which makes it challenging to determine the precise broadband coverage and its development dynamics. At the same time, it is worth emphasizing that the rural population in FYR Macedonia is sizeable (40.6% of the total population) and its information and communication needs should be properly addressed.

5. **Development of e-government services and applications should take into account the state of Internet access development in the rural areas and peculiar needs of the local population.** The former includes Internet access issues such as lower average speeds and failing backbone connectivity as well as specific factors directly affecting Internet development (e.g. the fairly high rate of mobile phones in households (88.6%). The latter include the needs arising from lower wages and salaries, higher levels of self-employment in agriculture, and local work migration flows.

   A good example of an application designed to meet the needs of the country's rural population while heeding local consumer behaviour and purchasing power is the recently-launched mobile wallet service "MobiPay", a brainchild of T-Mobile. In view of the low penetration of smart phones in the country, this service has been designed using Data over Voice technology to be accessible on all mobile phones. "MobiPay" allows users to make payments in cafes, supermarkets, gas stations, taxis, etc. suing a mobile handset[142]. Even without resorting to commissioning creation of certain services or apps to the private sector **MIOA can consider organizing a civic apps hackathon(s) or similar contest(s) intended to spur innovation for the benefit of rural un- and underserved populations**.

6. **Along with development of e-government services and applications, it is recommended that MIOA should initiate a capacity building program intended to increase the Internet usage and digital literacy in rural areas**. To reach better results, their sustainability and local project ownership, it is suggested that MIOA consider conducting / commissioning a study looking into specific social and economic issues faced by the rural population which can be tackled through ICTs (eg. A study on how unemployment can be tackled or how agricultural productivity can be raised).

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[141] The level of laptop ownership can be tracked to a certain extent through the outcomes of MIOA's Laptop Program targeting university graduates. World Bank's team has requested certain data on this project, but has not received it by the deadline.

[142] "T-Mobile launches m-wallet service in Macedonia". 2013. Telecompaper. http://www.telecompaper.com/news/t-mobile-launches-m-wallet-service-in-macedonia--952007 and "T-Mobile to launch m-wallet service in Macedonia". 2013. Telecompaper. http://www.telecompaper.com/news/t-mobile-to-launch-m-payment-service-in-macedonia--926957

7. **When introducing e-government services and applications (or any other similar ICT program) it is vital that MIOA clearly communicate to the beneficiaries the remit of e-government and how specific services and applications function**. The rate of vandalism and several news reports covering the Wi-Fi Kiosk Project (see Annex E) have demonstrated a certain lack of understanding, acceptance, and ownership of the project, which could have been averted through a carefully designed and timely implemented communications campaign explaining the benefits of the government intervention. The survey findings also point to the need of increasing digital literacy and the amount of services and applications relevant to the needs of the local community.

8. **In view of the operators' unwillingness to leverage existing Wi-Fi Internet Access Kiosks to develop business activities, MIOA should consider subsidizing the project further but in a more limited scope, benefiting primarily select localities with no or only one ISP**. As an alternative, MIOA and MoES can join forces in providing connectivity to the general public as well as schools whereby the WiFi kiosks in select localities can be maintained and upgraded under the annual MoES procurement[143]. The projects of both ministries are complementary and could be united under one framework.

[143] MoES procurement would need to be amended to become more inclusive of the smaller ISPs operating in certain rural areas.