



# The Evaluation of ICT Development Consultation Program: the Republic of Serbia 2018

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# The Evaluation of ICT Development Consultation Program: The Republic of Serbia 2018



**KISDI**

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# FOREWORD

## The Evaluation of ICT Development Consultation Program: The Republic of Serbia

Information and Communications Technology (ICT) has advanced rapidly in recent decades. Among other things, massive diffusion of mobile technology for the past 30 years represents the rapid development of ICT in these days. According to the MIS (Measuring the Information Society) report published by ITU (International Telecommunications Union) in January 2019, 90% of the voice traffic of the world is carried through mobile phones and 80% of the broadband connections are mobile, while fixed broadband connections are only 20%. Mobile broadband connections and traffic are expected to increase more rapidly with the introduction of 5G technology and the accelerated digitalization processes. However, the mobile broadband gap is still large among developed (more than 90%), developing (45~50%), and the least developed (20~25%) countries in 2017.

Such broadband gaps among countries are one of the most important factors that widen the digital gap among North and South countries as societies and economies are more digitalized based on the internet connectivity. As new ICTs such as artificial intelligence, IoT, big data, cloud computing, autonomous vehicle, drone, robotics, VR, AR and block chains are spreading all over the industries and communities, the ICT gap will deepen the gap between rich and poor within a country and between countries. The international community, including the United Nations recognizes the importance of ICT and it emphasizes the worldwide spread of ICT and the global connectivity to achieve SDGs (Sustainable Development Goals) in 2015. ICT is expected to play a key role as a means to promote inclusive and sustainable economic and social development.



Korea is one of the most successful examples of how desirable outcomes can be achieved through the development of the ICT sector. The ICT development experience and achievements of Korea have been highly regarded internationally; in particular, there is increasing interest from developing countries seeking a benchmark. The Korea Information Society Development Institute (KISDI) frequently has been involved with ICT policy making process in Korea and has worked with various stakeholders to check whether best ICT policy practices of Korea can be emulated in developing countries. KISDI has conducted a total of 79 ICT cooperation projects in 27 countries during 2002~2018. This report is the result of “Evaluation of the ICT Development Consultation Program: The Republic of Serbia” for the year 2018. Based on the analysis of the ICT status in Serbia and past consultation projects, evaluations have been made.

On behalf of KISDI, I would like to extend my deepest gratitude to the Ministry of Trade, Tourism and Telecommunications (MTT) of Serbia and the KISDI Consulting Group for actively supporting our mission of achieving co-prosperity with partner countries. KISDI looks forward to the results of this evaluation contributing to the advancement of ICT as well as the socio-economic development in Serbia. KISDI also thanks the Ministry of Science and ICT (MSIT) of Korea for funding the Consultation Project and providing insightful advice leading to the best possible outcomes.

**Dae-Hee Kim**

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# ● Table of Contents

FOREWORD	2
List of Figures	6
List of Tables	7
Glossary of Terms	8
Executive Summary	10

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## **Chapter I.**

Introduction and Summary of KISDI Policy Consultation Programs in the Republic of Serbia	12
1. Broadband Infrastructure Development in the Republic of Serbia (2011)	12
2. Consultation on Spectrum Management Policy for Mobile Broadband Promotion in Serbia (2014)	15
3. Consultation on Fixed Broadband Development in Serbia (2017)	19
4. Consultation on PKI Development in Serbia (2017)	23

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## **Chapter II.**

Status of the ICT Market and Regulatory Framework in Serbia	26
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## **Chapter III.**

Evaluation Framework: Logic Model	40
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## **Chapter IV.**

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Explaining the Output of Policy Consultation Projects	43
1. Broadband Infrastructure Development in the Republic of Serbia (2011)	43
2. Consultation on Spectrum Management Policy for Mobile Broadband Promotion in Serbia (2014)	44
3. Consultation on Fixed Broadband Development in Serbia (2017)	45
4. Consultation on PKI Development in Serbia (2017)	48
5. Summary	50

## **Chapter V.**

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Conclusion and Implication	52
References	54

## ● List of Figures

Figure 1	Market Share in Terms of the Number of Fixed Broadband Subscribers (Q4 2016)	21
Figure 2	Republic of Serbia: Economic Relations with the World	27
Figure 3	Structure of Revenues by Service (2011, 2014, 2017)	30
Figure 4	Structure of Investment by Service (2011, 2014, 2017)	31
Figure 5	ICT Development Index of Serbia	32
Figure 6	ITU IDI Scores (2017)	33
Figure 7	Organizational Chart of MTT	37
Figure 8	RATEL's Organizational Structure	39
Figure 9	The Basic Logic Model	40
Figure 10	How to Read a Logic Model	41
Figure 11	Strategy for Development of New Generation Networks by 2023 in the Republic of Serbia	49

## ● List of Tables

Table 1	Spectrum Management Policy Procedure	18
Table 2	ICT Development Indices	20
Table 3	Expansion Plan Summary	23
Table 4	Bylaws Output	25
Table 5	Number of Electronic Communications Service Users in the Republic of Serbia (2012–2017)	29
Table 6	ITU IDI Comparison (2016, 2017)	34
Table 7	Responsibilities of MTT in the ICT Sector	35
Table 8	Regulatory Functions and Authorities in Telecommunications Markets	38
Table 9	Summary of the Expansion Plan	46
Table 10	Total Cost Estimation per Year	47
Table 11	Broadband Expansion Policy Recommendation	47
Table 12	Summary of Project Evaluation Based on the Logic Model	50

## ● Glossary of Terms

4G	Fourth-generation of wireless technologies
5G	Fifth-generation of wireless technologies
ACMA	Australian Communications and Media Authority (Australia)
AP	Access Point
B2B	Business to Business
B2C	Business to Consumer
CRMO	Central Radio Management Service (South Korea)
DBCDE	Department of Broadband, Communications and the Digital Economy (Australia)
EGDI	E-Government Development Index
eIDAS	electronic Identification, Authentication and trust Services
ERDS	Electronic Registered Delivery Service
EU	European Union
EUR	Euro
FCC	Federal Communications Commission (US)
FDI	Foreign Direct Investment
FTTB	Fiber To The Building
FTTC	Fiber To The Curb
FTTH	Fiber To The Home
GDP	Gross Domestic Product
HH	Household
ICT	Information and Communications Technology
IDI	ICT Development Index
IMS	IP Multimedia Subsystem
IP	Internet Protocol
ITU	International Telecommunication Union
KISDI	Korea Information Society Development Institute
KT	Korea Telecom
LTE	Long Term Evolution
LTE-A	Long Term Evolution Advanced

MDU	Multi-Dwelling Unit
MHz	Megahertz
MSIP	Ministry of Science and ICT (South Korea)
MTT	Ministry of Trade, Tourism, and Telecommunications (Serbia)
NGN	Next Generation Networks
NRI	Networked Readiness Index
ODA	Official Development Assistance
Ofcom	Office of Communications (UK)
PKI	Public Key Infrastructure
RAPUS	Republic Agency for Postal Services
RATEL	Regulatory Agency for Electronic Communications and Postal Services
RSD	Serbian Dinar
SBB	Serbia Broadband
SCV	Smart City and Village
SFU	Single Family Unit
SWOT	Strengths, Weaknesses, Opportunities, and Threats
TLS	Trusted List Service
UNR	Uninhabited Region
USD	US Dollar
VR	Virtual Reality
WiFi	Wireless Fidelity
WRC (ITU)	World Radiocommunication Conference



## The Evaluation of ICT Development Consultation Program: The Republic of Serbia

In this report, we reviewed and evaluated four projects implemented by KISDI for the Republic of Serbia. The four projects are as follows:

1. Broadband Infrastructure Development in the Republic of Serbia (2011)
2. Consultation on Spectrum Management Policy for Mobile Broadband Promotion in Serbia (2014)
3. Consultation on Fixed Broadband Development in Serbia (2017)
4. Consultation on PKI Development in Serbia (2017)

For the evaluation, we reviewed each project and analyzed the status of the telecommunication market in the Republic of Serbia. We used a logic model for the evaluation. We especially focused on the output and the outcome of each project. We adopted the perspective of the customers for the evaluation and mainly used the interviews of Serbian officials to assess the outcome.

Overall, four projects are evaluated as successful and effective. The main reasons for the assessment are as follows.

First, most of the projects' policy recommendations were adopted as formal policies, which was confirmed by the Serbian officials. Second, the policy recommendation on spectrum policy was actually implemented and resulted in increased revenue for the Serbian government. Third, a significant portion of the policy recommendations were reflected in the long-term telecommunication policy in Serbia according to Serbian officials.

Considering the fact that most consulting papers tend to be kept just as references and fail to reach formalization and implementation, the results of the policy consultation can be assessed as practical and effective.

The strengths of the policy consulting projects include the following aspects. First, there was good communication between the Serbian government and KISDI teams. Based on the clear communication, the Serbian officials were able to convey their demands clearly and effectively, and the KISDI teams were able to understand the demands and situations in Serbia. Second, the content of the projects correctly reflected the demands of the Serbian government, which led to extensive adoption of the policy recommendations made in the consulting reports and increased the relevance of the policy recommendations. Third, the Serbian officials emphasized the benefit of visiting Korea since it gave them the opportunity to experience the advanced ICT-based business and life that can be realized in Serbia in the future, which meant they experienced the future in the present.

# Introduction and Summary of KISDI Policy Consultation Programs in the Republic of Serbia

KISDI has been cooperating with the Ministry of Trade, Tourism and Telecommunication (MTT) and other related agencies of the Republic of Serbia (hereinafter, referred as to Serbia) since 2011 under the ICT Policy Consultation Program in order to support ICT development in Serbia. KISDI has worked with Serbia on four projects between 2011 and 2018. In order to evaluate the impact of the four projects, the KISDI team visited Serbia from December 5 to 9, 2018. The KISDI evaluation team consisted of Dr. Jonghwa Lee (Project Manager, KISDI), Ms. Youngmin Song (Researcher, KISDI), Dr. Sam Youl Lee (Professor, Yonsei University), and Dr. Heon Joo Jung (Professor, Yonsei University). The KISDI evaluation team visited and interviewed government officials and experts from MTT and the Regulatory Agency for Electronic Communications and Postal Services (RATEL).

In this chapter, brief summaries of the four projects are provided for a better understanding of the impact analysis.

## 1. Broadband Infrastructure Development in the Republic of Serbia (2011)

The 2011 program titled “Broadband Infrastructure Development in the Republic of Serbia” was the first ICT Policy Consultation Program in Serbia for the purpose of the strategic development of telecommunication

infrastructure to support digital convergence in Serbia. The three major tasks of this 2011 program were to (1) assess the status of telecommunication infrastructure, (2) explore development models of telecommunication infrastructure with possible services scenarios and development strategies for evolution from today to the digital convergence envisioned for Serbia's future ICT, and (3) prepare a list of recommendations for facilitating a smooth but necessary evolution from the existing telecommunication infrastructure to digital convergence by "all-IP" infrastructures such as NGN, IMS, and others.

The Telecommunication Advisory Mission was established to conduct this project with four members: a project management team of three KISDI researchers (Dr. Insoo Kang, Senior Researcher, Dr. Jungmin Kim, Research Fellow, and Mr. Younghoon Ham, Researcher) and one dispatched expert (Mr. Chae Sub Lee, Hispot Sarl). The fieldwork was conducted by Mr. Lee from August 21 to December 17, 2011. The final report was comprised of an executive summary and nine chapters.

The 2011 program took a close look at the overall socioeconomic context of Serbia's infrastructure and the country's telecommunication markets, followed by a more detailed examination of Serbia's ICT infrastructures such as fixed infrastructure, mobile infrastructure, Internet and broadband infrastructure, ICT industries, as well as the ICT policy and regulatory framework. In the report, it was found that as of 2011, Serbia's telecommunication market was not entirely free and open for fair competition due to the delay of the privatization of Telekom Serbia, and the monopoly-like operation of fundamental telecommunication facilities still existed.

It also specified the issues in each telecommunication area. First, in terms of fixed markets, the business was still monopolized in practice, and some areas of Serbia did not have sufficient fixed services, although voice services were saturated. Second, mobile markets were similar to fixed markets in that both were saturated, although three key players competed with each other in the former. Moreover, more than 60% of mobile service subscribers used prepaid services, which the report found would be a stumbling block to further expansion of more revenue-making and consumer-oriented businesses such as m-commerce and data. Third, the Internet and broadband markets were found to be the most promising, as

less than half of the entire population had access to the Internet, and both had great potential for growth because broadband and Internet services mostly relied on mobile infrastructure.

Based on these analyses of the telecommunication markets in Serbia, the program stressed that Serbia's telecommunication markets could be characterized as depending too much on "mobile" and weak ICT-related industries in most areas. These key features caused underdevelopment of Internet-based businesses such as B2B, B2C, and others, leading to a logical conclusion that there was a great need for the development of fixed broadband. Weakness in ICT-related businesses was partly due to the lack of clear policy and regulatory frameworks that otherwise would have encouraged fair and open competition and collaboration and realized visions for socioeconomic development in Serbia.

The recommendations to develop telecommunications infrastructure and facilitate deployment of broadband in Serbia were clearly presented at the level of policy and project in careful consideration of the short-term and long-term perspectives. The first set of recommendations was related to the general direction for and strategic approach to ICT development in Serbia. Specifically, the program stressed the need for balance between collaboration and competition as well as balance between development and fairness since the socioeconomic impact of each telecommunication network and service would have political implications. Additionally, balanced development between fixed and mobile infrastructures was recommended.

Second, the program recommended that end-user environments such as end-user premises and devices should be enhanced as soon as possible. It pointed out that end-user environments were the starting point, and the end result of the entire ICT ecosystem as new markets and opportunities—business, education, quality of life, and so on—could be created and enlarged with end-users' better and easier access to ICT services. More specifically, it emphasized the significance of the connection point of end-user devices to the networks via WiFi as the best and most common technology for providing an interface to the networks.

The third suggestion focused on the short-term solutions that could improve household access to broadband. In order to achieve this goal without substantial investment, its recommendation was to use already

existing cables with WiFi-enabling devices so that households could share AP with neighborhoods and use WiFi capabilities together. This, however, was admittedly a short-term solution, as it would not fundamentally enhance end-user environments without significant investments in infrastructure, but this initial effort could be a stepping stone.

Fourth, the program's proposal included the provision of affordable telecommunications infrastructure such as deployment of broadband in rural areas in order to squarely tackle the problem of the digital gap in Serbia. From a technical viewpoint, two options—using LTE based (jointly with/without WiFi) and/or pure WiFi based—were suggested in careful consideration of the population and households in the rural areas.

Fifth, policy considerations were recommended that would affect and guide the future development of Serbia's ICT industries and businesses as well as its information society as follows: strategy on balancing collaboration, competition, development, fairness, policy on the value chain both of production and consumption, policy on the fundamentals of infrastructure, and policy on technology neutrality.

In the final section, the program suggested pilot projects such as smart city and village (SCV) with smart health, smart education, and smart farm to help people enjoy the convenience and opportunities provided by smart ICT technologies.

## **2. Consultation on Spectrum Management Policy for Mobile Broadband Promotion in Serbia (2014)**

KISDI's second Policy Consultation Program in Serbia was conducted to provide consultation on a very specific—though broad in scope and substantial in impact—issue: spectrum management policy for mobile broadband promotion. The consulting group was comprised of five experts: Dr. Insoo Kang (Project Manager, Executive Director, KISDI), Ms. Yumi Chung (Researcher, KISDI), Dr. Jongkwan Lee (Director, Media & Future Institute), Dr. Jaemin Ahn (Professor, Chungnam National University), and Dr. Wonjung Kim (Professor, Konkuk University). The consultation team's duties were

to conduct interviews, identify status and requirements, provide policy recommendations, and establish detailed implementation plans. Serbian counterparts (Dr. Irini Reljin, Ms. Sanja Grcic, Ms. Vladana Radisavljevic, and Mr. Nemnja Vukotic) facilitated the program by arranging and participating in interviews, providing information on the status and requirements, reviewing reports, and providing necessary support.

This program began in April 2014 and ended in December 2014. KISDI's consultation team paid three visits to Serbia's MTT, RATEL, and private actors in the telecommunication sector. During the first visit (June 14–21) the team conducted preparatory work by visiting telecommunication operators, discussing and identifying major issues, and defining the work scope for the consultation. The second visit to Serbia (August 2–9) was made to visit RATEL, hold a workshop, conduct interviews, and collect additional data. During these two visits, interviews with three mobile telecommunication operators (Telekom Srbija, Telenor Srbija, and Vip) and two regulators (MTT and RATEL) were conducted to get a better and deeper understanding of the status of Serbia's telecommunication markets and regulations as well as what would be required to promote Serbia's mobile broadband industry. It was followed by a study visit of three Serbian experts to Korea (September 14–20), which consisted of a one-week program of seminars and site visits. The final visit to Serbia (October 26 to November 2) was to give a presentation to the Serbian counterparts with regard to what had done by then and get some feedback so as to finalize the report.

The 2014 program from the beginning had the specific goal of helping Serbia devise spectrum management policy for mobile broadband, for which the consultation team had a very clear mandate to provide tailored recommendations on the issue. The final report was comprised of an executive summary and five chapters: Introduction, Current Status of Mobile Broadband in Serbia, Current Mobile Spectrum Management Policy in Serbia, Case Study, and Suggestions.

The report started with a thorough examination of the status of mobile broadband in Serbia and a SWOT (strengths, weaknesses, opportunities and threats) analysis of the mobile telecommunication market in Serbia. As of 2013, there were 9.2 million active mobile users in Serbia, while the penetration rate was 128%. The consultation group employed various

international comparisons of Serbia, neighboring countries, and South Korea in order to identify what would be required for further development of Serbia's mobile telecommunication markets and industries. More specifically, Serbia was ranked 56<sup>th</sup> in the ICT Development Index (IDI) by ITU in 2012, and it was ranked 80<sup>th</sup> in the Network Readiness Index (NRI) by the World Economic Forum. In addition, the UN's E-Government Index (EGDI) ranked Serbia 69<sup>th</sup>. The weak areas in each index that would need improvement are as follows: "mobile internet bandwidth (bit/s)" and "mobile broadband subscribers" in the "access" category in IDI, "environment" (political/regulatory to facilitate ICT, favorable business/innovation conditions) and "impact" (of ICT on economy and society) in the NRI, and "telecom infrastructure" (wireless broadband subscription is included, 20%) and "online service" (multichannel service delivery and bridging the digital divide category may be relevant to mobile broadband service) in the EGDI.

As for the spectrum assignments for mobile service in Serbia, three frequency bands—900 MHz, 1.8 GHz, and 2.1 GHz—were assigned to three service providers—Telekom Srbija, Telenor, and VIP. Of great importance in the near future, according to the report, was to secure wide spectrum so as to promote the broadband capability and spectrally efficient new mobile technologies such as LTE (long-term evolution) and LTE-A (LTE advanced) that had been adopted by most mobile service providers in the world. However, the mobile spectrum management policy in Serbia was found to have room for improvement, as no specific regulation in revocation or refarming of spectrum was set in place as of 2014. Moreover, a detailed analysis of mobile spectrum management policy formation and implementation showed that close cooperation and coordination would be key to successful policies. The spectrum management policy procedures started with an international allotment of ITU in which RATEL played a coordinating role and domestic allocation performed by MTT with consultation of RATEL, followed by an auction enforced by RATEL by reflecting the reserve price of the spectrum auction of MTT and the assignment criteria. RATEL was in charge of post-assignment regulation such as interference control.

**Table 1**

## Spectrum Management Policy Procedure

Process	Regulatory Body	Foreign Cases	Characteristics
International Allotment	WRC (ITU) & RATEL	WRC (ITU)	Key consideration : Int'l. cooperation
Domestic Allocation	MTT with RATEL	MSIP(Kr), FCC(US), Ofcom(UK), DBCDE(Au)	Key consideration : Harmonization, public interest, Serbian economy and national security
Assignment	MTT with RATEL	MSIP(Kr), FCC(US), Ofcom(UK), ACMA(Au)	Key consideration : Motivate efficient spectrum use (currently, maximize auction fee)
Interference Control	Special Subsidiary/RATEL	CRMO(Kr), FCC(US), Ofcom(UK), ACMA(Au)	Key consideration : Induce proper and safe use of spectrum
Relocation/Refarming	Ministry/Agency N/A	MSIP(Kr), FCC(US), Ofcom(UK), DBCDE(Au)	Key consideration : Promote efficient spectrum use/Deal with tech change

**Source** Kang et al.(2014), p.31

The consultation group identified five issues related to imposing licenses through spectrum allocation and assignment in Serbia, which were required to be squarely addressed by Serbia's regulatory agencies. The first pertained to institutional arrangements for spectrum management that would encourage productive cooperation among the key actors, which would be essential for a sound and effective spectrum management policy regime. Second, the spectrum assignment procedures needed to be more transparent so that more information on the auction procedures and rules would be available for market actors and users. The third issue was to improve the coherence between the spectrum license and service license. Fourth, there would be a need to prepare for a license exemption spectrum management scheme for a specific service (e.g., white space). Finally, the consultation group found it necessary to introduce the revocation and refarming policy of spectrum into the spectrum management in Serbia to prepare for future technological developments such as 4G and 5G that

would require more efficient use of the conventional frequency bandwidth.

A closer examination of the case studies on South Korea (especially spectrum auction in 2011 and 2013), Germany, and Australia was presented in the report before suggesting what needed to be done in Serbia. The recommendations were divided into two parts: (1) spectrum assignment policy and (2) spectrum management policy. The report delineated the possible scenarios of mobile spectrum assignment to clarify what would happen in each policy choice and illustrated step-by-step processes to reallocate 1.8 GHz spectrum that would need to be done in the near future. As for spectrum management policy, four key policy changes were suggested: (a) enhance transparency of the auction process, (b) establish a carrier selection measurement, (c) establish refarming policy, and (d) enhance predictability of spectrum policy.

### **3. Consultation on Fixed Broadband Development in Serbia (2017)**

In 2017, at the request of MTT of Serbia, KISDI initiated an ICT Policy Consultation on fixed broadband development in Serbia. The consultation group was to provide the necessary technical and policy recommendations and consisted of eight members: Dr. Jong Hwa Lee (Project Manager, Director of Department of International Cooperation Research, KISDI), Dr. Hoon Jung (Associate Fellow, Department of Telecommunications & Spectrum Research, KISDI), Ms. Saewon Lee (Researcher, Department of International Cooperation Research, KISDI), Mr. Damon Lee (Director of Global Network Consulting Unit, KT), Mr. Dongju Kim and Mr. Sunmoo Lee (Senior Consultant, Global Network Consulting Unit, KT), Mr. Jihun Na (Consultant, Global Network Consulting Unit, KT), and Mr. Hanbyul Jang (Manager, Global Business Group, KT). The period of this program was from March 2017 to December 2017, during which, three visits to Serbia by Korean experts and one study visit to South Korea by two MTT officials were made to share information, thoughts and ideas, enhance mutual understanding, and make

policy recommendations that were more appropriate to the Serbian politico-economic context and institutional arrangements.

Each visit was scheduled in advance to maximize its effectiveness with clear aims in each phase of the program. The first visit to Serbia (May 21–27) was primarily to specify the work scope and get prepared for the program through data collection, interviews, and surveys via multiple meetings with key actors: a kick-off meeting with MTT, site visits to Telekom Srbija, and meetings with RATEL, SBB, and MTT. From September 3–9, two MTT officials visited South Korea for a one-week program of seminars and site visits (e.g., the TV White Space System in Jecheon, Incheon Free Economic Zone U-City, Klive & VR Experience in Incheon, KT Olleh Future On and KT Innovation Center in Seoul, and Samsung Innovation Museum in Suwon). As will be discussed later, these experiences helped MTT officials better understand South Korea’s experiences and success in the IT industries and prepare for a more concrete future vision of telecommunication development in Serbia. The second visit to Serbia (September 18–24) was to host the 1<sup>st</sup> Serbia-Korea Fixed Broadband Development Workshop (September 20) and discuss the final report. The final visit to Serbia (November 6–11) was to present the final paper.

**Table 2**  
ICT Development Indices

Category	IDI	NRI	EGDI
Value (Rank)	6.61 (55/176)	4.0 (75/139)	0.71 (39/193)

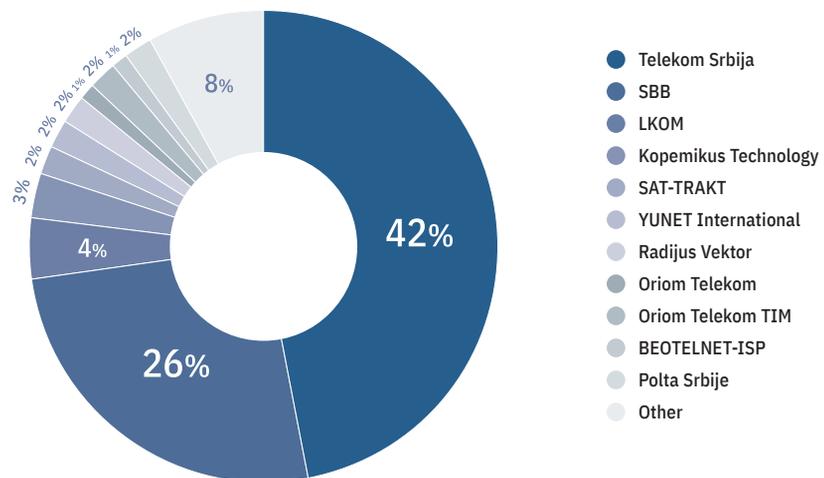
**Source** Lee et al.(2017), p.33

The consultation group found that despite an improvement in terms of Serbia’s ICT development indices, Serbia still needed to enhance its global competitiveness, political/regulatory environments, ICT use, impact of ICT on the economy and society, and telecommunication infrastructure. Among others, the report stressed that only 18.95% of the population had fixed broadband subscriptions, while 120.62% had mobile-cellular subscriptions. Although increases in fixed broadband subscribers from 15.57% of the

population in 2014 to 17.38% in 2015 and 18.95% in 2016 were observed, thanks to more market players and therefore competition and investments, this disparity was what MTT strove to address with more investments because fixed broadband developments can have positive externalities on the broader economy and society.

**Figure 1**

Market Share in Terms of the Number of Fixed Broadband Subscribers (Q4 2016)



**Source** Lee et al. (2017), p.38

In-depth analyses of the current fixed broadband network infrastructure in Serbia, such as a geography analysis and network analysis, were presented for tailored technical and policy recommendations. First, according to the geography analysis, the report classified the rural and urban areas (the latter as having over 1,500 households and over 100 household density) and set the ratio of single-family units to multi-dwelling units as approximately 3:7 because these (number of households, household density, and house types in urban areas) were closely related to fixed broadband access technology. In addition to the geography analysis, a network analysis including the fixed broadband penetration rate by access technology and the number of households without infrastructures provided a basis for the fixed broadband expansion plan.

In an effort to suggest Serbia's fixed broadband development strategy, which would fit in the context of intensifying competition, technical developments, and shifting demands, the national broadband plans of six countries—France, Australia, Canada, Spain, Japan, and South Korea—as well as global policy/technical trends were investigated. A more intensive investigation of South Korea's case and KT was presented as well.

Based on these analyses of Serbia's fixed broadband infrastructure and global trends, four sets of technical and policy recommendations were provided in the report. First, the report recommended classifying more than 4,500 areas by their settlement characteristics into five types (two in urban areas and three in rural areas), each of which would require differentiated network capacities. Second, the report suggested that each of the five types should have tailored fixed broadband infrastructure: central office coverage, active/passive network design for target speed, and the calculation of a list of materials. The third recommendation was to make a network expansion plan for a pilot project in 2018, increase coverage to 67% by 2021, 91% by 2023, and 100% by the end of 2025. As for the final recommendation with regard to cost estimation, the report estimated the total cost would be approximately USD 1.6 billion for about 2 million subscribers based on a global reference. As a final recommendation regarding government policies, the report emphasized that fixed broadband policies should be competition neutral and technology neutral so that government intervention would not distort market incentives, undermine competition and investments, or inhibit technological progress.

**Table 3**

Summary of the Expansion Plan

Type	2017	2018	2019	2020	2021	2022	2023	2024	2025.12
A	167,357	191,020	274,601	358,183	441,764				
	38%	43%	62%	81%	100%				
B/C	243,247	249,484	436,345	623,206	810,067	996,928	1,183,789		
	21%	21%	37%	53%	68%	84%	100%		
D	81,327	83,201	173,539	263,876	354,213	444,550	534,888	625,225	715,562
	11%	12%	24%	37%	50%	62%	75%	87%	100%
E		1,637	20,042	38,446	56,851	75,256	93,661	112,065	130,470
	0%	1%	15%	29%	44%	58%	72%	86%	100%
Total	491,932	525,343	904,527	1,283,711	1,662,895	1,958,498	2,254,101	2,362,843	2,471,585
	20%	21%	37%	52%	67%	79%	91%	96%	100%
		Pilot		Stage 1			Stage 2		Stage 3

Source Lee et al. (2017), p.112

#### 4. Consultation on PKI Development in Serbia (2017)

KISDI's international cooperation program titled "Consultation on PKI Development in Serbia" was intended to support Serbia's MTT in its preparation to harmonize its electronic transaction laws and regulations with EU standards. The consultation group consisted of Dr. Jong Hwa Lee (Project Manager, Director, Department of International Cooperation Research, KISDI), Ms. Saewon Lee (Researcher, Department of International Cooperation Research, KISDI), and Mr. Hyeungjun Lee (dispatched expert, July 1, 2017 to November 30, 2017, ICT Senior Consultant).

As electronic transactions among various private and public actors are increasingly significant for the national economy and society, the infrastructure that supports these transactions needs to be secure and reliable. Among the infrastructure for electronic transactions is the Public Key Infrastructure (PKI) that plays a crucial role in providing authentication,

confidentiality, integrity, and non-repudiation of transactions. As of 2017, several independent certification authorities issued electronic certificates and/or qualified certificates in Serbia, although the lack of connection or interoperability between the PKI architectures of these authorities and between them and other countries remained a major problem in ICT development. Therefore, the MTT needed to repeal the existing laws on electronic transactions and prepare for new laws as well as subordinate laws/regulations in accordance with EU standards, aiming for interoperability among these authorities in Serbia as well as conforming to EU legislation.

It was against this backdrop that KISDI, at the request of MTT for technical support, dispatched Mr. Hyeungjun Lee from July to November 2017. After KISDI searched for two months for a technical expert, Mr. Lee, the most experienced expert, was sent to Serbia, as he had worked for more than 37 years in the field of information technology with more than 12 years of experience in foreign countries, including developing countries such as Bangladesh, Afghanistan, and Lao PDR, among others to support ICT development. The objectives of this program were as follows: (1) assist in the preparation of 16 regulations in accordance with the EU regulations, (2) prepare the technical specification for the Trusted Service List (TSL), and (3) prepare the technical specification for the central point of information exchange among the electronic registered delivery service provider information systems. Mr. Lee mainly worked with the MTT's Department for Regulation Analysis, Planning in the Field of Information Society under the Sector for Information Society. As only two persons—Ms. Natalija Radoja and Mr. Milan Vojvodic, both of whom were legal experts—were in charge of these works, Mr. Lee's technical expertise and cooperation turned out to be critical to the program's output.

A thorough investigation of PKI development in Serbia revealed that interoperability between existing PKI architecture in Serbia or the PKI architecture of other countries had not been achieved, nor was there a national system in charge of interoperability. There had been two laws—the Electronic Signature Law and the Law on Electronic Document, both of which were published in 2004—with regard to PKI in Serbia, which were replaced by the Law on Electronic Document, Electronic Identification and Trust Services in electronic business in accordance with the EU's regulation on

the electronic Identification, Authentication and Trust Services or eIDAS (EU Regulation No. 910/2014 of July 23, 2014). This law was approved by the government on August 17, 2017 and then ratified by the National Assembly on October 12, 2017. Because this law was connected to four regulations and 12 rulebooks, these 16 subordinate bylaws needed to be published within one year of its ratification.

**Table 4**  
Bylaws Output

Work Scope	Output (Bylaws)
Preparation of 16 Regulations in accordance with the EU Regulations	<ol style="list-style-type: none"> <li>1. Regulation on Detailed Conditions for Electronic Identification Schemes</li> <li>2. Rulebook on Register of Electronic Identification Service Providers</li> <li>3. Regulation on Detailed Conditions for Performing Qualified Trust Services</li> <li>4. Rulebook on The List of Standards which have to Fulfill Conformity Body</li> <li>5. Rulebook on The Register of Qualified Trust Services (not finished)</li> <li>9. Rulebook on Detailed Conditions for Qualified Electronic Signature and Seal Means</li> <li>10. Rulebook on Register of Qualified Means for Creating Electronic Signature and Seal (not finished)</li> </ol>
Preparation of the Technical Specification for the TLS list	TLS Technical Specification
Preparation of the Technical Specification for ERDS	After reviewing the EU standards, this was postponed until the publication of related standards

**Source** Lee, Jong Hwa, Saewon Lee and Hyeungjun Lee (2017), p.78

In consideration of the need for Serbia’s legislation to be aligned with the EU standards, some of which were to be published in February 2019, this program, as its final output, submitted the technical specification of the TSL, three regulations and two rulebooks for the preparation of 16 regulations in accordance with the EU regulations, and several special reports relating to the PKI system.

## Status of the ICT Market and Regulatory Framework in Serbia

Serbia referred to as the crossroad of Europe is located in Central and Southeastern Europe, linking Europe and Asia. Serbia borders Bulgaria and Romania to the east, Croatia and Bosnia-Herzegovina to the west, Hungary to the north, Albania and Macedonia to the south, and Montenegro to the southwest.<sup>1</sup> Serbia, a landlocked country, occupies an area of 88,499 sq. km<sup>2</sup> (87,460 sq. km according to World Bank data), and the length of the border is 2,361.7 km. Serbia's population is estimated as 7,040,272 (without AP Kosovo and Metohija) with diverse ethnic backgrounds. According to the 2002 national census, Serbs make up about 82.86% of the total population, and the remaining population is comprised of Hungarians (3.91%), Bosniaks (1.81%), Roma (1.44%), Yugoslavs (1.08%), Croats (0.94%), Montenegrins (0.92%), Albanians (0.82%), Slovaks (0.79%), and other ethnic groups.<sup>3</sup>

The Serbian economy, which is in the process of transition, is largely driven by market forces, although the state plays a significant role in certain sectors. Since the early 2000s, Serbia has carried out political and economic reforms toward a market-based system with democratic institutions that has facilitated economic and social developments. Accordingly, the integration of Serbia's economy into global markets has increased gradually. Although economic progress slowed down due to the 2008 global financial crisis, continuing market-oriented economic reforms positively affected the Serbian

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Ministry of Foreign Affairs of the Republic of Serbia website (<http://www.mfa.gov.rs/en/republic-of-serbia>).

2

Statistical Office of the Republic of Serbia (2018)

3

Ministry of Foreign Affairs of the Republic of Serbia website (<http://www.mfa.gov.rs/en/republic-of-serbia>).

economy. According to the most recent IMF Country Report published in December 2018,<sup>4</sup> economic growth in Serbia is strong with the support of private consumption, investment, and exports.

More specifically, the economic indicators show that this is the case, although the GDP growth rate has not resumed the pre-2008 crisis level. The average GDP growth rate from 2000 to 2007 was approximately 6.2%, while the average during the period of 2008–2015 decreased to 0.59%. More recently, the average GDP growth rate from 2015 to 2017 increased to 1.8%. As for trade, which is of vital importance to any functioning and successful modern economy, trade as a percentage of GDP in Serbia was reported at a mere 23.2% in 1995, while it increased to 74.3% in 2005 and 103.1% in 2015. Foreign direct investment (FDI) is another vital component of a country's economic development, as it deepens economic integration into world markets not just by the transfer of money but also by that of knowledge. It brings capital into host countries and helps them with jobs, technologies, and management skills although some critics argue that the

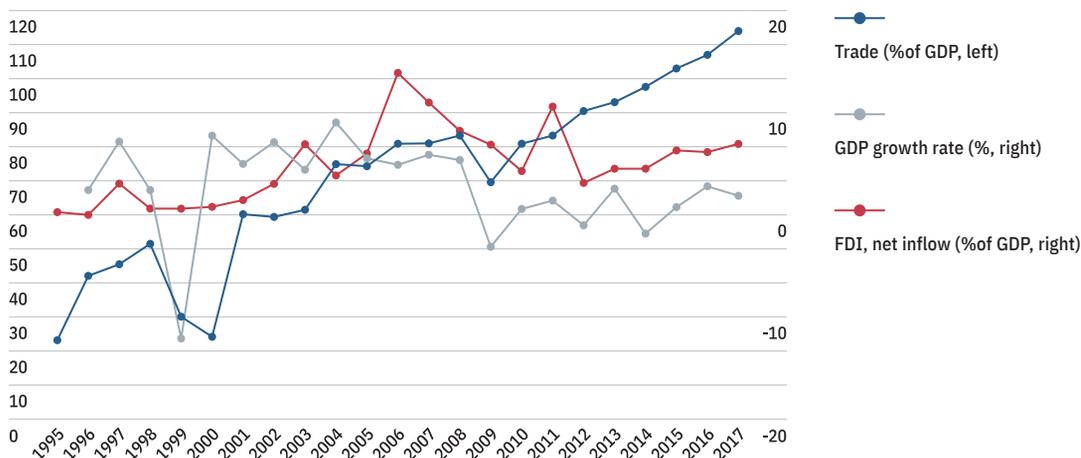
5

The FDI inflows as a percentage of GDP peaked in 2006 (13.9%) and 2007 (10.98%).

positive impact of FDI is exaggerated, and it undermines a country's policy autonomy and capacity to regulate its own economy. FDI net inflow as a percentage of GDP was 0.269% in 1995, while it grew to 6.007% in 2005 and 6.311% in 2015.<sup>5</sup>

**Figure 2**

Republic of Serbia: Economic Relations with the World



**Source** The World Bank website (<https://data.worldbank.org/country/serbia?view=chart>)

It is widely accepted that a country's economic development is closely correlated to the development of telecommunication infrastructure and markets. Investments in the telecommunication sectors and well-functioning telecommunications help economic activities and enhance economic performance by lowering transaction costs and providing more efficient systems for production, marketing, management, and distribution. In particular, as the global economy is shifting from an industrial economy to an economy "based on the production, distribution, and use of knowledge and information"<sup>6</sup> or a knowledge-based economy, telecommunication has become an integral component of national and social development because telecommunication not only helps lower transaction costs, but it also has positive effects on other key components of development such as education, science, finance, health, environmental protection, administration, and so on. Developing countries especially realized the increasing need for an efficient, modern, and cost-effective telecommunication sector, which was taken as essential for economic development in transition economies.

6

OECD (1996), "The Knowledge-based Economy," Paris, OECD/GD(96) 102, p. 7.

It was against this backdrop that the Serbian government tried to develop its telecommunication sectors to deal better with the shifting global environment and social demands. The development of the telecommunication market in Serbia had been slow compared to neighboring EU countries as a result of what had taken place in the late 1990s: sanctions, isolation, and destruction of part of the telecommunication infrastructure. As Serbia entered the transition period in the early 2000s, telecommunication markets showed dynamic growth in the mid-2000s. In particular, it was 2003 when the Telecommunication Law was adopted, which had ushered in a new era of liberalization and competition.

Moreover, the Serbian government adopted the "Strategy for the Development of the Telecommunication Sector in the Republic of Serbia from 2006 until 2010," which aimed to facilitate the development of telecommunication infrastructure and services as well as harmonization of the Serbian regulatory framework with the EU's framework. The telecommunication sector was taken as a primary sector because its development would have positive effects on the efficiency of economic transactions, communication, education, and quality of life, which eventually

could lead to economic and human development in Serbia. Thanks to these efforts to develop the telecommunication sector in Serbia, growing investment in the sector, more competition with the entry of new operators, and introduction of new technologies and services have been obvious.

**Table 5**

Number of Electronic Communications Service Users in the Republic of Serbia (2012–2017)

Number (millions)	2012	2013	2014	2015	2016	2017
Fixed telephone subscribers	2.83	2.79	2.72	2.60	2.55	2.48
Mobile telephone users	9.14	9.20	9.34	9.16	9.09	8.62
Broadband subscribers	1.36	1.17	1.23	1.32	1.45	1.48
Media content distribution subscribers	1.44	1.38	1.50	1.60	1.66	1.70
Per 100 inhabitants						
Fixed telephone subscribers	39.04	38.85	37.99	36.80	36.07	35.25
Mobile telephone users	126.19	128.09	130.76	129.38	128.52	122.46
Broadband subscribers	18.72	16.34	17.16	18.66	20.50	21.03
Media content distribution subscribers	19.92	21.62	20.95	22.55	23.51	24.13

**Source** Adapted from RATEL (2016, 2018)

As the telecommunication sectors developed, the number of telecommunication service users increased accordingly. In 2005, there were 2.53 million fixed telephone subscribers and the penetration rate based on the estimates of the number of subscribers per 100 inhabitants was 33.70 for fixed telephone service. The number of fixed telephone subscribers did not increase substantially as it was 2.60 million subscribers, and the penetration rate increased only to 36.80 in 2015. In contrast, mobile telephone and broadband services grew rapidly in a decade. The number of mobile telephone users, which was 5.5 million in 2005, increased to 9.16 million. Accordingly, the penetration rate grew from 73.50 in 2005 to 129.38 in 2015. In terms of broadband service, subscribers increased from 40,500 in 2005 to 1.32 million in 2015. Its penetration rate grew exponentially from 0.54 in 2005 to 18.66. The most recent data as of December 2018 indicate that the fixed and mobile telephone service markets are saturated,

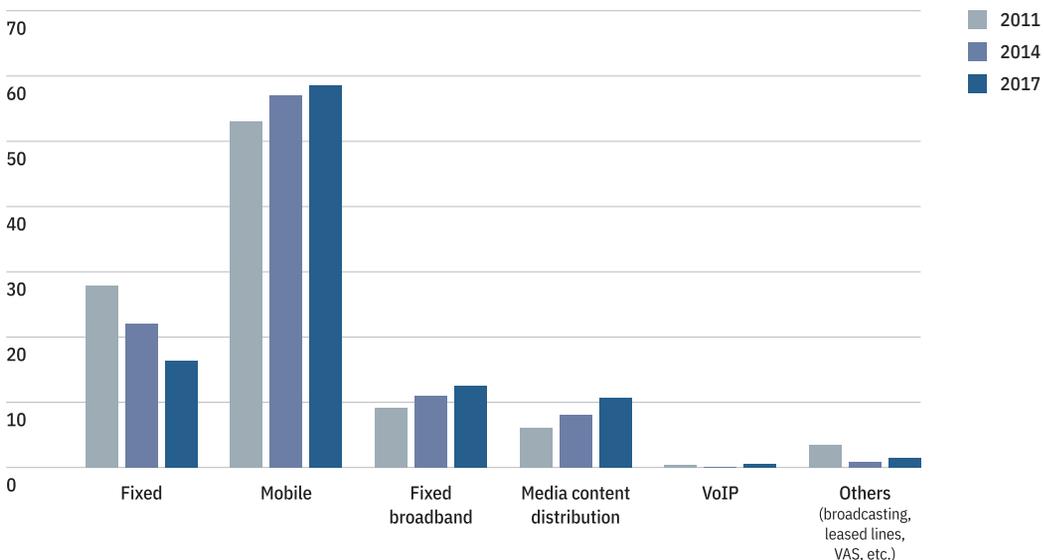
while broadband and media content distribution markets are still growing.

According to RATEL (2018), the total revenues of Serbia’s telecommunication market in 2017 were about RSD 191.2 billion or EUR 1.58 billion.<sup>7</sup> In terms of the share of each service in the telecommunication market, the revenues from mobile service accounted for the growing and largest share, which was 52.99% in 2011 and 58.5% in 2017. The figure below shows clearly that the shares of revenues from mobile, fixed broadband, and media content distribution services increased in recent years, while that of fixed phone service declined substantially.

<sup>7</sup>  
RATEL (2018)

**Figure 3**

Structure of Revenues by Service (2011, 2014, 2017)

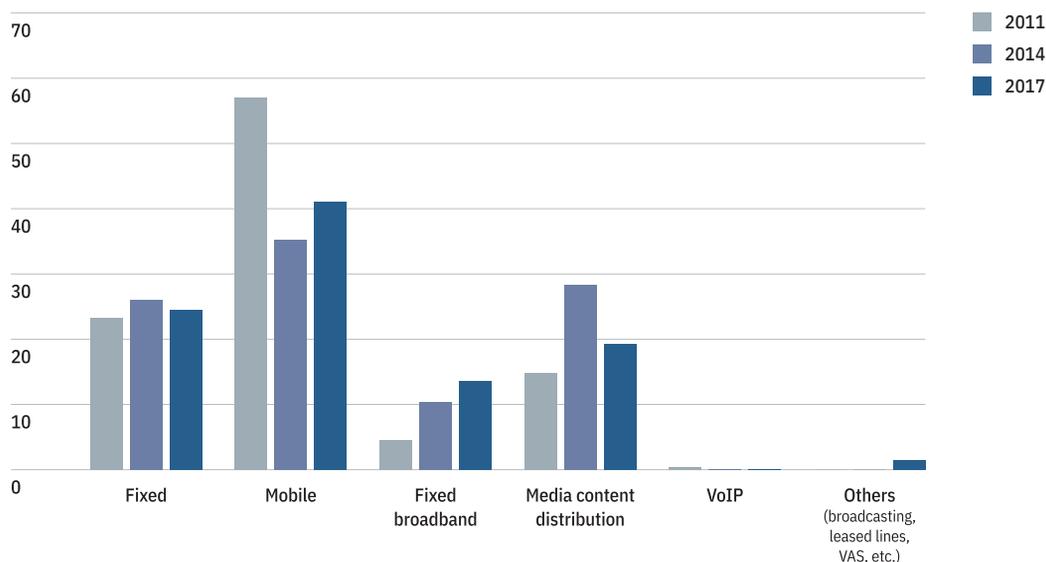


Source RATEL (2011, 2014, 2017a)

The investment in each service, however, differed from the share of revenue from each service. The total investment in telecommunication amounted to EUR 243 million in 2011, EUR 186 million in 2014, and EUR 270.7 million in 2017. Similar to the share of revenue by service, the largest amount was invested in mobile services, although its share declined from 57.03% in 2011 to 41.11% in 2017. The share of investment in fixed broadband, in contrast, increased steadily from 4.47% in 2011 to 13.62% in 2017.

**Figure 4**

Structure of Investment by Service (2011, 2014, 2017)



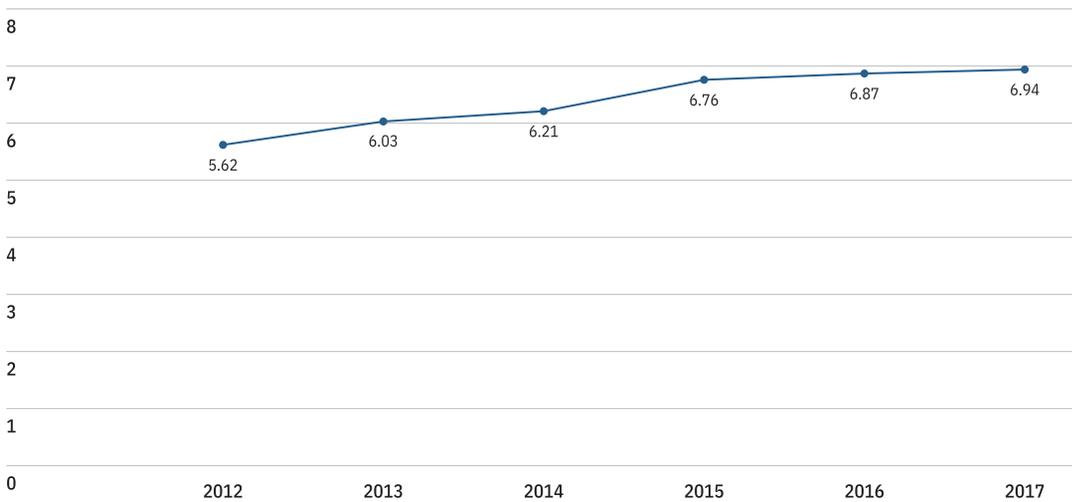
**Source** RATEL (2011, 2014, 2017a)

A better understanding of the telecommunication sector and its development in Serbia requires global and regional comparisons across countries and over time. One of the indicators that is widely used to measure a country's level of information society is the ICT Development Index (IDI) by the International Telecommunication Union (ITU). The IDI is a composite index of 11 indicators of ICT access, use, and skills, which reflects the key aspects of a country's ICT development.<sup>8</sup> According to the ITU, the IDI for Serbia was 6.51 in 2016 and 6.61 in 2017. The IDI based on RATEL's calculation was slightly higher than that of ITU's, which was 5.62 in 2012, 6.87 in 2016, and 6.94 in 2017 (RATEL, 2017a, 2018). In terms of global comparison, Serbia was ranked 55<sup>th</sup> in 2016 and 2017 consecutively among 176 countries whose average IDI was 5.11.

<sup>8</sup> ITU (2016). p 3.

**Figure 5**

ICT Development Index of Serbia



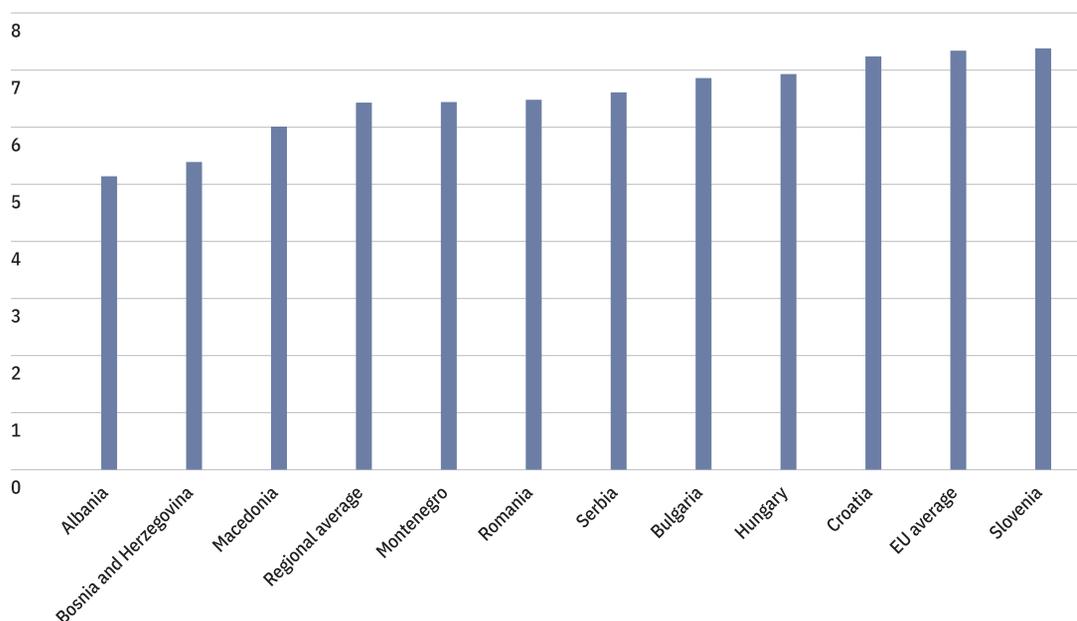
**Source** ITU website (<http://www.itu.int/>)

A regional comparison shows that the level of Serbia’s ICT sector development is between that of the EU and neighboring countries. As of 2017, the average IDI for EU member countries was 7.34. Among IDI’s three sub-indexes (access, use, and skills), the gap between Serbia and EU countries was the biggest for the IDI use sub-index. The average IDI use sub-index score for Europe as a region was 6.94, while that of Serbia was 5.54. This sub-index combines the “percentage of individuals using the Internet,” “fixed (wired)-broadband subscriptions per 100 inhabitants,” and “active mobile-broadband subscriptions per 100 inhabitants.” For each indicator, the averages of the EU countries were 77.90, 30.20, and 80.10, respectively, while the averages for Serbia were 67.06, 18.95, and 67.44, respectively, suggesting a need for enhancing fixed and mobile broadband infrastructure and usage.

In comparison with its neighbors, the level of ICT development in Serbia is higher according to ITU’s IDI. The neighboring southeast European countries considered for comparison include Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Hungary, Macedonia, Romania, and Slovenia. The average IDI for these nine countries was 6.23 in 2016 and 6.43 in 2017. Four countries—Slovenia, Croatia, Hungary, and Bulgaria—

had higher IDI scores than Serbia, while five countries—Romania, Montenegro, Macedonia, Bosnia and Herzegovina, and Albania—had lower scores. In comparison with Bulgaria’s ICT development, Serbia’s ICT sector had a higher IDI access sub-index (Bulgaria 6.83, Serbia 7.20), although Bulgaria’s IDI use sub-index (Bulgaria 6.23, Serbia 5.54) and IDI skills sub-index (Bulgaria 8.17, Serbia 7.57) were higher than Serbia’s. Croatia’s scores for each sub-index were 7.60, 6.45, and 8.11, respectively. Regional comparisons reveal that ICT intensity (the level of use of ICTs in society) and ICT impact (the results/outcomes of more efficient and effective ICT use) need to be further emphasized and enhanced, while the need to keep up with ICT readiness (the level of networked infrastructure and access to ICTs) with regional frontrunners. In particular, Croatia was ranked 36<sup>th</sup> in 2017 in terms of IDI scores, a leap forward from 42<sup>nd</sup> a year ago, suggesting the need to investigate the factors behind this development.

**Figure 6**  
ITU IDI Scores (2017)



**Source** ITU website (<http://www.itu.int/>)

**Table 6**

ITU IDI Comparison (2016, 2017)

	2016	2017
Serbia	6.51	6.61
EU average		7.34
Regional average	6.233333	6.43
Albania	4.9	5.14
Bosnia and Herzegovina	5.23	5.39
Bulgaria	6.66	6.86
Croatia	6.96	7.24
Hungary	6.74	6.93
Macedonia	5.88	6.01
Montenegro	6.3	6.44
Romania	6.23	6.48
Slovenia	7.2	7.38

Source ITU website (<http://www.itu.int/>)

Given the increasingly important role that ICT technologies and industries play in a country's economy and society, governments—in developed and developing countries alike—strive to create a favorable environment for private actors to invest in the sector, compete with others fairly, and provide better services for customers by privatizing state-owned enterprises in ICT, making rules and regulations, establishing new ministries and regulatory agencies, and so forth. The Serbian government also tried hard to create an enabling environment for ICT development. In particular, since Serbia officially applied for EU membership in 2009 and was granted the status of a candidate country in 2012 by the European Council, the Serbian government has tried to improve its legislation and regulatory frameworks for telecommunications in line with EU standards.

The main policymaking body in charge of telecommunications in Serbia is the Ministry of Trade, Tourism, and Telecommunications (MTT). MTT has various missions that are divided into seven sectors: bilateral economic

cooperation; foreign trade policy, multilateral and regional economic and trade cooperation; trade, services, prices and consumer protection; market surveillance; electronic communications and postal services; normative affairs and administration; information society. Among these seven sectors, the sector for electronic communications and postal services and the sector for information society directly relate to the telecommunications markets in Serbia. More specifically, MTT's responsibilities in the areas of telecommunications and information society are as follows.

**Table 7**

Responsibilities of MTT in the ICT Sector

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In the area of telecommunications, the ministry's responsibilities are as follows:

- the area of telecommunications, i.e., electronic communications and postal services
  - regulation and safety in the area of telecommunications, i.e., electronic communications and postal services
  - inspection supervision
  - determining a strategy and development policy for electronic communications and postal services
  - organizing financial and technical control
  - international businesses in the area of electronic communications and postal services
  - measures to stimulate research and development in the field of electronic communications and postal services
  - determining proposals of the plan of the use of radio-frequency bands and making a plan of division of radio frequencies
  - determining conditions for issuing individual permits for the use of radio frequencies
  - making a list of basic services of electronic communications (universal service) that operators should provide
  - other statutory duties
-

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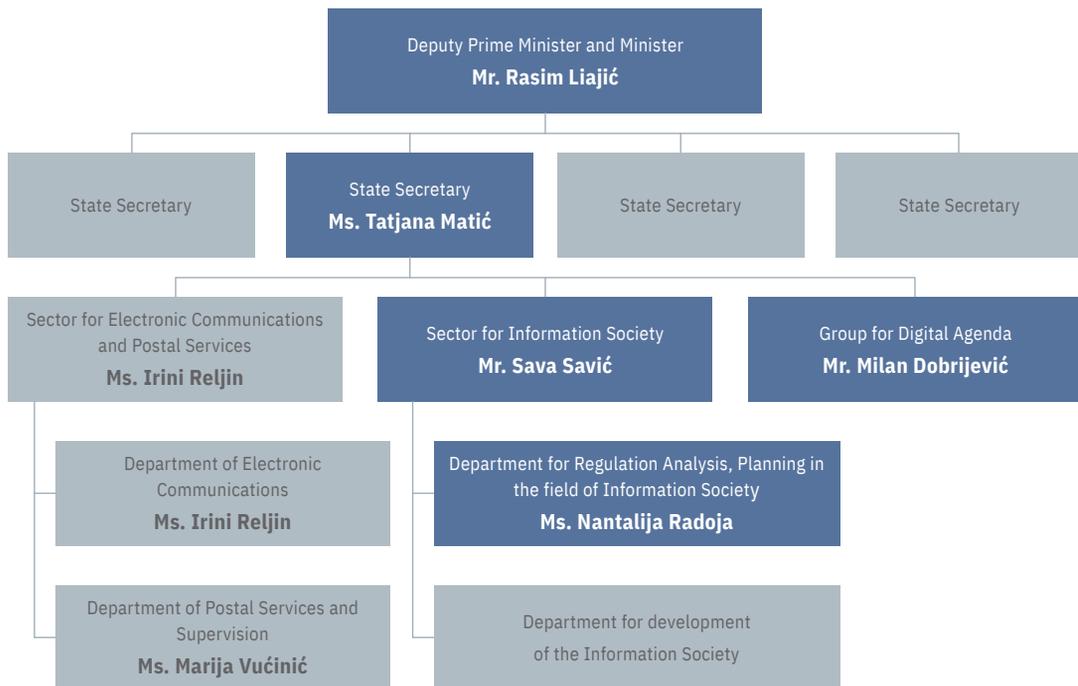
In the area of information society, the ministry's responsibilities are as follows:

- determining the policy and strategy of development of information society
- preparation of laws, other regulations, standards, and measures in the area of electronic business
- preparation of laws, other regulations, standards, and measures in the area of information society and ICT
- application of information and communication technologies
- development and functioning of information and communications infrastructure
- development and promotion of academic, i.e., educational and scientific research computer network
- protection of data and information security
- international businesses in the area of information society
- provision of information services
- creating conditions for the realization of projects financed by EU preaccession funds, donations, and other forms of development help in the areas covered by the ministry
- other statutory duties

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**Source** MTT website (<http://mtt.gov.rs/en/ministry/responsibilities-of-the-ministry/>)

**Figure 7**  
Organizational Chart of MTT



**Source** Lee et al. (2017), p.17

As for the regulatory body for telecommunications in Serbia, RATEL, an autonomous national regulatory body, was established in 2005 under the name of the Republic Telecommunications Agency in line with the Law on Telecommunications. RATEL continued to perform its functions with the Law on Electronic Communications entered into force in 2010 and became the current RATEL in 2014 after merging with the Republic Agency for Postal Services (RAPUS) in line with the amendments to the Law of Electronic Communications and the Law on Postal Services of 2014. The sources of RATEL's budget come from license fees, numbering fees, and spectrum fees. RATEL reports to the National Assembly and publishes annual overviews of the telecommunications and postal services market in Serbia. The regulatory functions and entities in charge of these functions in telecommunications markets are as follows.

**Table 8**

Regulatory Functions and Authorities in Telecommunications Markets

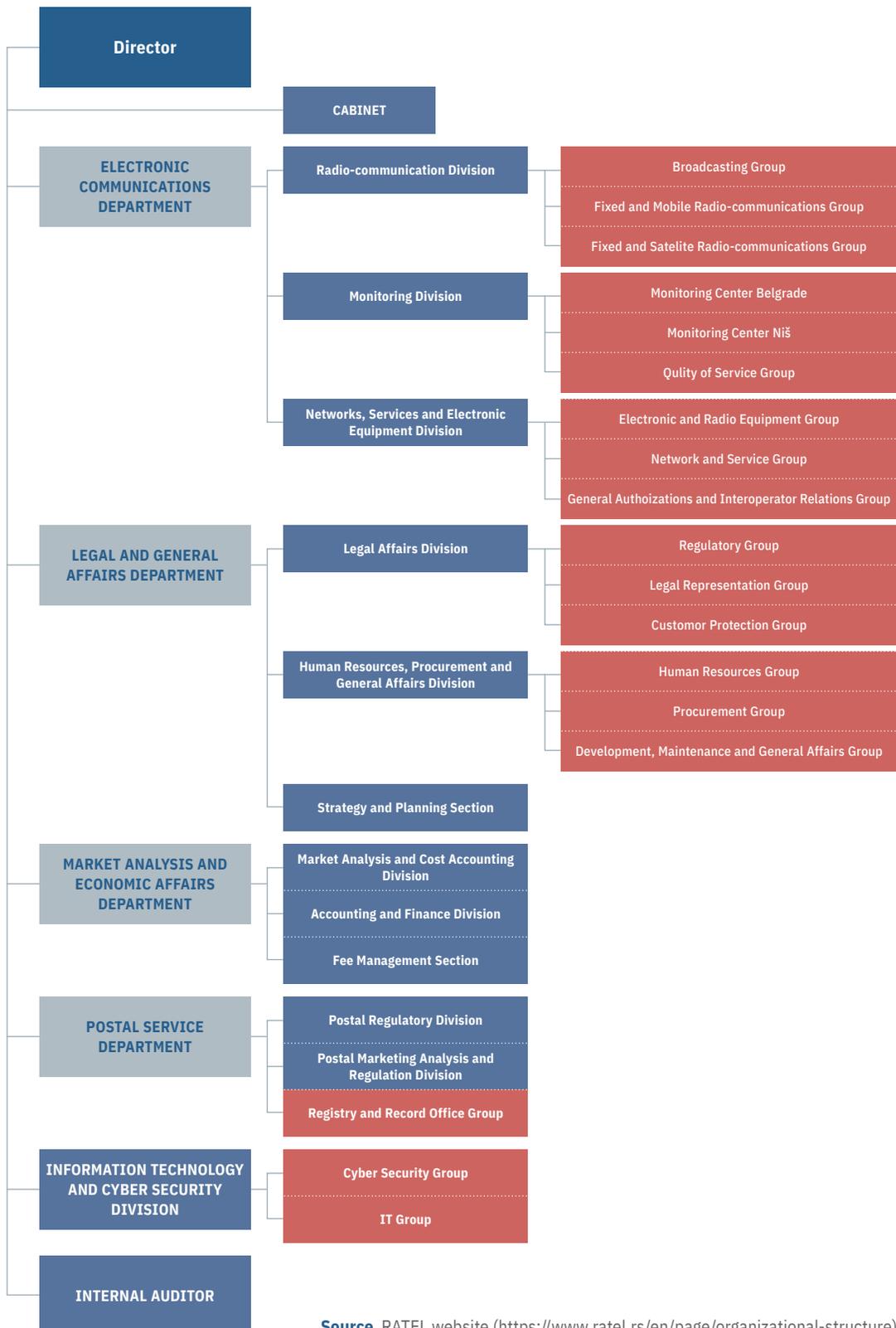
Regulatory functions	Entities in charge
Licensing	MTT, RATEL
Interconnection rates	RATEL, operators
Price regulation	RATEL
Technical standards setting	MTT, RATEL
Radio-frequency allocation and assignment	MTT, RATEL
Spectrum monitoring and enforcement	MTT, RATEL
Numbering	RATEL
Type approval	RATEL
Service quality monitoring	MTT, RATEL
Universal service/access	RATEL
Quality of service standards setting	Institute for Standardization of Serbia
Enforcement of quality of service obligations	MTT, RATEL
Broadcasting (sound transmission)	RATEL
Broadcasting content	RATEL
Information technology	MTT
Internet content	Special Prosecution Office for High Tech Crime of the Republic of Serbia

**Source** ITU Serbia Profile (2018b)<sup>9</sup>

**9**

Available at ITU website  
 (<https://www.itu.int/net4/itu-d/icteye/CountryProfileReport.aspx?countryID=256>).

**Figure 8**  
RATEL's Organizational Structure



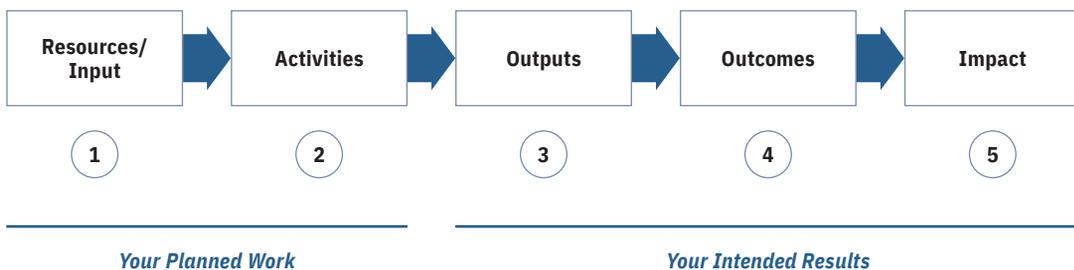
Source RATEL website (<https://www.ratel.rs/en/page/organizational-structure>)

## Evaluation Framework: Logic Model

There are various methods and models for project evaluation. We selected the proper model based on the nature of projects to be evaluated. It is a tough task to evaluate four projects within a limited time and with limited resources. Considering the nature of the projects, we selected the logic model. “The program logic model is defined as a picture of how your organization does its work,” and it contains the theory and assumptions underlying the program (W.K. Kellogg Foundation, 2004).

We will briefly explain the basic logic model and apply the model to evaluate the projects.

**Figure 9**  
The Basic Logic Model



**Source** W.K. Kellogg Foundation (2004)



the nature of the project is policy recommendations that can be implemented only when enough resources are secured. In other words, it is not plausible to set a comparison group for measuring the impact.

The output of policy consultation is a policy recommendation. When a report is published, it can be evaluated as output. In addition, the qualitative aspect of a report is quite important. However, the real value of a report can be judged by a customer of the policy report as well as by experts. Since the limited scope of this project did not allow for extensive involvement of experts in the evaluation process, rather we focus on the perspective of the customers to the policy projects, the counterpart of Serbia.

When we visited Serbia, we interviewed the policymakers from ICT-related bureaus. Luckily, there was a director general who has held the position for the entire length of the policy projects. We were also able to secure access to various government plans and documents that contain the information related to the possible outcomes of policy consultation projects.

## Explaining the Output of Policy Consultation Projects

### 1. Broadband Infrastructure Development in the Republic of Serbia (2011)

The 2011 program titled “Broadband Infrastructure Development in the Republic of Serbia” was the first ICT Policy Consultation program in Serbia for the purpose of the strategic development of telecommunication infrastructure to support digital convergence in Serbia. The three major tasks of this 2011 program were to (1) assess the status of telecommunication infrastructure, (2) explore development models of telecommunication infrastructure with possible services scenarios and development strategies for evolution from today to the digital convergence envisioned for Serbia’s future ICT, and (3) prepare a list of recommendations for facilitating a smooth but necessary evolution from the existing telecommunication infrastructure to digital convergence by “all-IP” infrastructures such as NGN, IMS, and others.

The consulting dispatched an expert, Mr. Chaesub Lee, and he did the fieldwork from August 21 to December 17, 2011. The consulting team produced a comprehensive plan for developing broadband infrastructure in Serbia.

The recommendations of the report consist of five sections. The first set of recommendations is related to the general direction for and strategic approach to ICT development in Serbia. Second, the program recommended that end-user environments such as end-user premises

and devices should be enhanced as soon as possible. The third suggestion focused on short-term solutions that could improve household access to broadband. Fourth, the program’s proposal included a provision of affordable telecommunications infrastructure such as deployment of broadband in rural areas in order to squarely tackle the problem of the digital gap in Serbia. Fifth, it included a recommendation on policy considerations that would affect and guide the future development of Serbia’s ICT industries and businesses as well as its information society. In addition, the report suggested pilot projects such as SCV with smart health, smart education, and smart farm.

Based on the interviews with the officials from MTT, the report was well received, and the interaction with the consulting team was excellent. They pointed out that the report was essential for developing a plan for the telecommunication industry in Serbia. In addition, since the dispatched consultant, Dr. Chaesub Lee was elected as the director of ITU’s Telecommunication Standardization Bureau in 2014, they have kept a good relationship with him, which helped the Serbian officials in the global organizations.

## **2. Consultation on Spectrum Management Policy for Mobile Broadband Promotion in Serbia (2014)**

KISDI’s second Policy Consultation Program in Serbia was conducted to provide consultation on a very specific—though broad in scope and substantial in impact—issue; spectrum management policy for mobile broadband promotion. Different from other projects, the policy recommendation was quite specific. The first part of the recommendation was about a spectrum assignment policy, and the second part was about a spectrum management policy, which was the output of the project (Kang et al., 2014). The key was to investigate how the output was translated into outcome. As mentioned before, the connection between the output and the outcome can be measured by looking at how the policy recommendation in the report was adopted as policy.

The recommendation has been well received and adopted by the Serbian government. According to the senior advisor from MTT who participated in the consulting procedure, Ms. Irini Reljin, the policy consultation was quite successful. Based on the policy suggestion, the recommendations were adopted as relevant rulebooks, and they will be adopted in the coming policymaking procedure for frequency band allocation. She pointed out that after the adaptation of the relevant rulebooks, the public bidding procedures were conducted for the available frequency bands allocated for the development of mobile broadband. According to the survey by KISDI, MTT adopted the rulebook on the minimal conditions for the issuance of the individual license for the use of radio frequencies upon the completion of the public bidding procedure for the frequency bands 791–821/832–862

MHz (“Official Gazette of RS,” no. 70/15).<sup>10</sup> MTT also adopted the rulebook on the minimal conditions for the issuance of the individual license for the use of radio frequencies upon the completion of the public bidding procedure for the frequency bands 1710–178/1805–1880 MHz (“Official Gazette of RS,” no. 136/14).<sup>11</sup>

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[http://ratel.rs/upload/documents/Javno\\_nadmetanje\\_za\\_RF\\_opseg\\_800/Pravilnik%20o%20minimalnim%20uslovima%20za%20800%20MHz.pdf](http://ratel.rs/upload/documents/Javno_nadmetanje_za_RF_opseg_800/Pravilnik%20o%20minimalnim%20uslovima%20za%20800%20MHz.pdf).

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[http://www.ratel.rs/upload/documents/Regulativa/Pravilnici/Pravilnici\\_koje\\_donosi\\_MTID/PRAVILNIK%20o%20minimalnim%20uslovima%20za%201800MHz.pdf](http://www.ratel.rs/upload/documents/Regulativa/Pravilnici/Pravilnici_koje_donosi_MTID/PRAVILNIK%20o%20minimalnim%20uslovima%20za%201800MHz.pdf)).

With the spectrum auction, Serbia was able to increase the revenue from telephone companies remarkably, which was direct evidence of a positive outcome. They reported that EUR 1.5 million was made after the auction. During the interview with MTT, we found that MTT is planning a new spectrum auction and will apply the recommended auction rules to an incoming auction, which is supporting evidence of a positive impact on the spectrum management policy in Serbia.

### 3. Consultation on Fixed Broadband Development in Serbia (2017)

In 2017, at the request of MTT of Serbia, KISDI initiated an ICT Policy Consultation on fixed broadband development in Serbia. The consulting team, consisted of eight members of experts, provided the necessary technical and

policy recommendations. The period of this program was from March 2017 to December 2017, during which, three visits to Serbia by Korean consulting team and one study visit to Korea by two MTT officials were made to share information, thoughts and ideas, enhance mutual understanding, and make policy recommendations that were more appropriate to the Serbian politico-economic context and institutional arrangements.

The Korean experts were from the Korea Telecommunication Corporation with practical knowledge of fixed broadband installation and operation. After three visits to Serbia, the consulting team made policy recommendations for fixed broadband expansion according to the regional characteristics.

**Table 9**

Summary of the Expansion Plan

Type	2017	2018	2019	2020	2021	2022	2023	2024	2025.12
A	167,357	191,020	274,601	358,183	441,764				
	38%	43%	62%	81%	100%				
B/C	243,247	249,484	436,345	623,206	810,067	996,928	1,183,789		
	21%	21%	37%	53%	68%	84%	100%		
D	81,327	83,201	173,539	263,876	354,213	444,550	534,888	625,225	715,562
	11%	12%	24%	37%	50%	62%	75%	87%	100%
E		1,637	20,042	38,446	56,851	75,256	93,661	112,065	130,470
	0%	1%	15%	29%	44%	58%	72%	86%	100%
Total	491,932	525,343	904,527	1,283,711	1,662,895	1,958,498	2,254,101	2,362,843	2,471,585
	20%	21%	37%	52%	67%	79%	91%	96%	100%
		← Pilot →	← Stage 1 →			← Stage 2 →		← Stage 3 →	

Source Lee et al. (2017)

The consulting team categorized the entire service area in Serbia into five types and set up an expansion plan to take place between 2017 and 2025. They set a plan for pilot projects in 2018, stage 1 between 2019 and 2021, stage 2 between 2022 and 2023, and the stage 3 between 2024 and 2025. They planned to reach 100% penetration of fixed broadband by 2025.

**Table 10**

Total Cost Estimation per Year

Unit: Million USD

Type	2018	2019	2020	2021	2022	2023	2024	2025.12	Subtotal
A	14	49	49	49	-	-	-	-	160
B/C	5	138	138	138	138	138	-	-	696
D	2	100	100	100	100	100	100	100	701
E	-	9	9	9	9	9	9	9	63
<b>Total</b>	<b>20</b>	<b>296</b>	<b>296</b>	<b>296</b>	<b>247</b>	<b>247</b>	<b>109</b>	<b>109</b>	<b>1,620</b>

\* Civil work cost is not included

**Source** Lee et al. (2017)

When a plan is solid, what matters most is the financial availability. According to the consulting team, the estimated cost for 2018 was USD 20 million and USD 296 million for 2019. The total cost of the expansion plan is estimated as USD 1.62 billion. Considering the fact that the budget of Serbia was USD 6.59 billion in 2017, the estimated project cost is very high unless the Serbian government receives foreign direct investment or loans.

**Table 11**

Broadband Expansion Policy Recommendation

Region	Definition	Type	HH Density & Technology	Policy Recommendation
Urban	HH*: over and 1,500 UNR**: below and 100%	A	HH density: High (SFU, MDU) Technology: FTTH/C/B	Competition Promotion
		B	HH density: Middle (SFU) Technology: FTTH/C	Competition Promotion
		C	HH density: Low but many HH (SFU) Technology: FTTH/C	Competition Promotion
Rural	HH*: below 1,500 UNR**: over 100%	D	HH density: Low (SFU) Technology: FTTH/C	Matching Fund
		E	HH density: Very low (SFU) Technology: Fixed wireless	Universal Service

\* The number of household \*\* The ration of uninhabited region

**Source** Lee et al. (2017)

Since the policy recommendation was suggested in 2017, there was not enough time to implement the recommendation. More importantly, as mentioned above, fixed broadband expansion requires considerable financial resources.

The main suggestion has been reflected in the “Strategy for Development of New Generation Networks by 2023,” which is the official government policy of the Serbian government. Serbian officials confirmed that they referred to the KSIDI report in preparing the strategy. Therefore, although it is still in the planning stage before the implementation, the production of such a strategy can be considered as a positive outcome.

#### **4. Consultation on PKI Development in Serbia (2017)**

KISDI’s international cooperation program titled “Consultation on PKI Development in Serbia” was intended to support Serbia’s MTT in its preparation to harmonize its electronic transaction laws and regulations with EU standards. Serbia is not a member of the European Union yet, but it is in the process of joining the EU. In the process, MTT wanted to prepare for the EU rules and guidelines on PKI. The scope of the project included the following (Lee et al., 2017):

- Assistance in preparation of 16 regulations in accordance with the EU regulations
- Preparation for technical specification for TSL
- Preparation for technical specification for central point of information exchange among electronic registered delivery service provider information systems

Different from other consultation projects that usually make expert visits to the hosting countries three times and invite the government officials from the hosting countries to Korea, KISDI dispatched a policy expert to Serbia from July to November in 2017 and the expert, Mr. Hyeungjun Lee, worked with MTT to establish regulations and specifications since MTT preferred this option. During the interview visit to MTT, we found out that

MTT suffers from a shortage of personnel.

Since the market for ICT experts is growing, it becomes much harder for MTT to recruit and keep key personnel due to the wage gap. Therefore, MTT sometimes welcomes foreign experts to join their team and work with them on significant and urgent policy issues, which also applies to the situation in various developing countries. Since the government capacity is relatively weak, it is often demanding for developing countries to mobilize teams to work with foreign consultants. It would be more helpful to dispatch an expert to help the hosting government, depending on the situation of each hosting country and policy.

Serbia is still in the process of joining the EU; therefore, the impact of the projects has yet to be determined. However, the output of the projects was well taken, adopted, and reflected in official documents, which is evidence of a positive outcome.

**Figure 11**

Strategy for Development of New Generation Networks by 2023 in the Republic of Serbia

Pursuant to Article 5, paragraph 1, point 2) of the Law on Electronic Communications (“Official Gazette of the RS”, No. 44/10, 60/13 - CC and 62/14) and Article 45, paragraph 1 of the Law on Government (“Official Gazette of the RS”, No. 55/05, 71/05 - corrigendum, 101/07, 65/08, 16/11, 68/12 - CC, 72/12, 7/14 - CC and 44/14),

The Government has adopted the following

**STRATEGY FOR DEVELOPMENT OF NEW GENERATION NETWORKS BY 2023**

## 5. Summary

**Table 12**

Summary of Project Evaluation Based on the Logic Model

Project title		
<b>Broadband Infrastructure (2011)</b>	<b>Input</b>	– Three experts from KISDI and one expert dispatched (four months)
	<b>Activities</b>	– Interviews with policymakers and experts – Field study – Government documents analyses
	<b>Output</b>	– Developmental and evolutionary model of Serbian ICT infrastructure
	<b>Outcome</b>	– Adopted as government strategy
<b>Spectrum Management (2014)</b>	<b>Input</b>	– Two experts from KISDI and three external experts
	<b>Activities</b>	– Three visits to Serbia – One study visit to Korea – Interviews and government document analysis – Field study
	<b>Output</b>	– Policy recommendation for spectrum management in Serbia
	<b>Outcome</b>	– Adopted and implemented as a formal policy – Resulted in revenue after auctions (EUR 1.5 million) – Planning to auction again

<Table 12> shows the project evaluation summary based on the logic model. Since no impacts were found, that column was omitted from the analysis. Overall, the policy consultation projects were evaluated as successful and effective. The future issues will be discussed in Chapter V.

Project title		
<b>Fixed Broadband (2017)</b>	<b>Input</b>	– Three experts from KISDI and five external experts
	<b>Activities</b>	– Three visits to Serbia – One study visit to Korea – Interviews and government document analysis – Field study
	<b>Output</b>	– Plan for fixed broadband expansion for urban and rural areas – Suggestion for specification for broadband service of various types – Cost estimation and annual plan for expansion
	<b>Outcome</b>	– Reflected in “Strategy for Development of New Generation Networks By 2023 in the Republic of Serbia”
<b>PKI Development (2017)</b>	<b>Input</b>	– Two experts from KISDI and one expert dispatched (four and a half months)
	<b>Activities</b>	– Interviews with policymakers and experts – Field study – Government documents analyses
	<b>Output</b>	– Technical specification of the Trusted Service List (TSL) – Three regulations and two rulebooks for the preparation of 16 regulations – Several special reports relating to the PKI system
	<b>Outcome</b>	– Adopted as official specification and rulebooks – Reflected in “Strategy for Development of New Generation Networks By 2023 in the Republic of Serbia”

## Conclusion and Implication

In this report, we reviewed and evaluated the four projects implemented by KISDI for Serbia. The four projects are as follows:

1. Broadband Infrastructure Development in the Republic of Serbia (2011)
2. Consultation on Spectrum Management Policy for Mobile Broadband Promotion in Serbia (2014)
3. Consultation on Fixed Broadband Development in Serbia (2017)
4. Consultation on PKI Development in Serbia (2017)

For the evaluation, we reviewed each project and analyzed the status of the telecommunication market in Serbia. For the evaluation, we used a logic model. We especially focused on the output and the outcome of each project. We adopted the perspective of the customers for the evaluation and mainly used the interviews of Serbian officials to assess the outcome.

Overall, the four projects were evaluated as successful and effective. The main reasons for the assessment are as follows.

First, most of the projects' policy recommendations were adopted as formal policies, which was confirmed by the Serbian officials. Second, the policy recommendation on spectrum policy was actually implemented and resulted in increased revenue for the Serbian government. Third, a significant portion of the policy recommendations were reflected in the long-term telecommunication policy in Serbia according to the Serbian officials.

Considering the fact that most consulting papers tend to be kept just as references and fail to reach formalization and implementation, the results of the policy consultations can be assessed as practical and effective.

The strengths of the policy consulting projects include the following aspects. First, there was good communication between the Serbian government and KISDI consulting team. Based on the clear communication, the Serbian officials were able to convey their demands clearly and effectively, and the KISDI consulting team was able to understand the demands and situations in Serbia. Second, the contents of the projects correctly reflected the demands of the Serbian government, which led to extensive adoption of the policy recommendations made in the consulting reports and increased the relevance of the policy recommendations. Third, the Serbian officials emphasized the benefit of visiting Korea since it gave them the opportunity to experience the advanced ICT-based business and life that can be realized in Serbia in the future, which meant they experienced the future in the present.

Finally, it should be emphasized that ICT in Serbia has been developing very fast, and various technologies have been introduced simultaneously in a short time. However, the lack of financial resources may slow down the effort of the Serbian government when it tries to invest in ICT infrastructure, which is crucial for the development of the ICT industry. In addition, it will be crucial to establish effective Serbian governance to develop the ICT industry consistently. At the same time, the lack of personnel is a critical factor that may hamper the development if the current situation persists. Future ODA policies need to consider the factors mentioned above.

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