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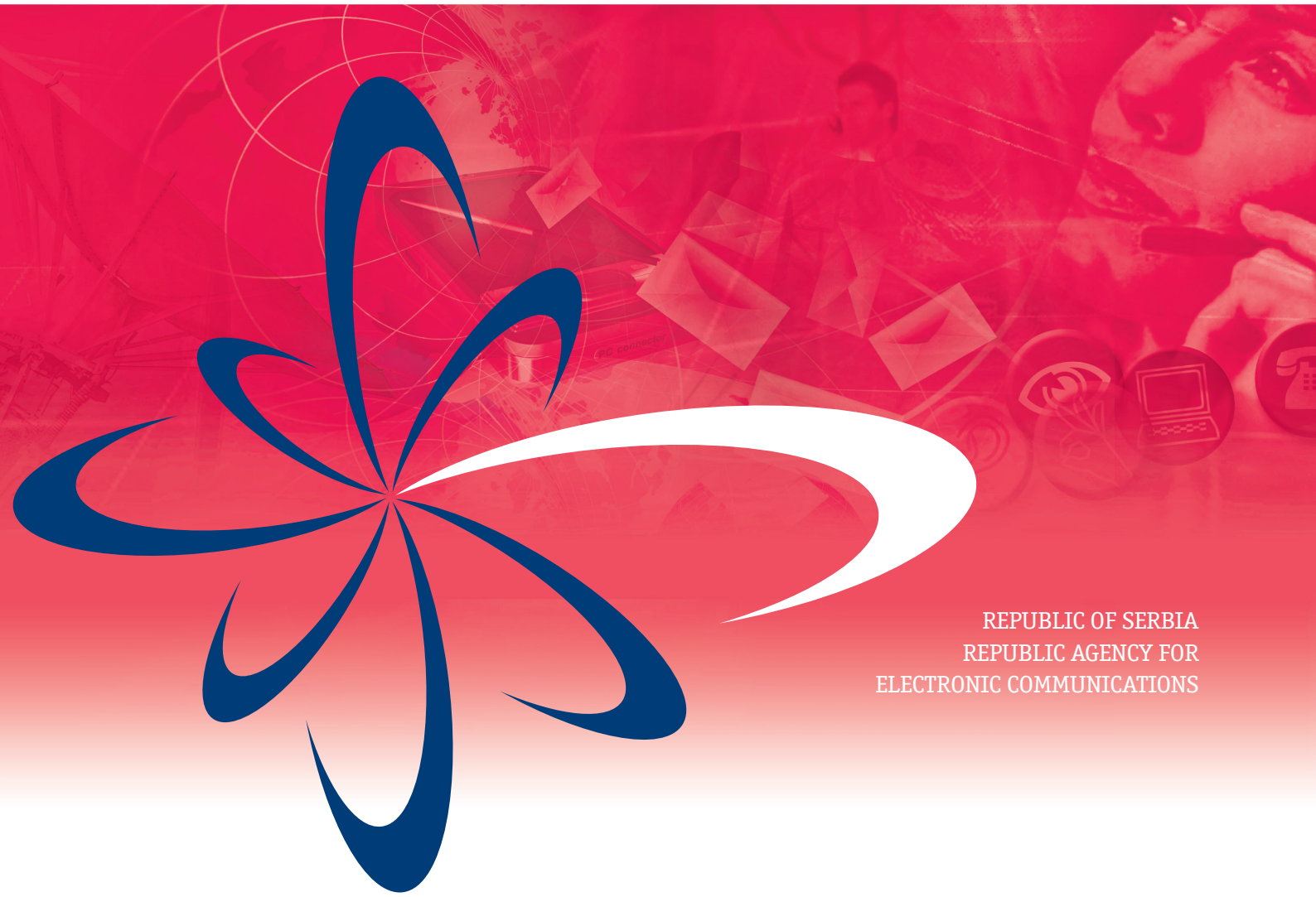

REPUBLIC OF SERBIA
REPUBLIC AGENCY FOR
ELECTRONIC COMMUNICATIONS

# AN OVERVIEW

## OF TELECOM MARKET IN THE REPUBLIC OF SERBIA IN 2012

Republic of Serbia
RATEL
Republic Agency for Electronic Communications


# AN OVERVIEW OF TELECOM MARKET IN THE REPUBLIC OF SERBIA IN 2012

Belgrade, 2013


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An Overview of Telecom Market in the Republic of Serbia in 2012

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8th year

Published by:
Republic Agency for Electronic Communications (RATEL)
Višnjićeva 8, 11000 Belgrade
Telephone: +381 11 3242-673
Fax: +381 11 3232-537
www.ratel.rs

Design and prepress:
MaxNova d.o.o.
Takovska 45/6, 11000 Belgrade

Printed by:
PARAGON
Zlatiborska 32b, 11080 Zemun

ISSN:
1820-8738



Print run:
500 copies


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# A WORD OF INTRODUCTION



The Republic Agency for Electronic Communications (RATEL) is a national, independent regulatory body performing the regulatory role since 2005. RATEL is regulating the telecom market of the Republic of Serbia in line with the provisions of the Law on Electronic Communications based on the 2002 EU Regulatory Framework and, partly, on the 2007 EU Regulatory Framework, taking in consideration the Strategy for the Development of Telecommunications in the Republic of Serbia from 2010 until 2020and the Strategy for the Development of the Information Society in the Republic of Serbia until 2020.

- RATEL's Managing Board adopted the 2012 Business Plan laying down the following strategic tasks and activities:
- Specify and ensure the regulatory conditions necessary for the construction and the development of the National Broadband Network (NBN), such as to ensure broadband access to all the people living in the Republic of Serbia, in line with the 2010 UN Declaration. This would lead to a considerable enhancement of teh efficiency, productivity and the overall development of the society.
- Increase broadband penetration rate, by providing necessary levels of low, medium and high data transmission rates, based on fixed and wireless access infrastructure, according to the relevant strategic documents.
- Increase investments in fixed-line infrastructure, by stimulating competition and by applying the general authorization regime to electronic communication activities on fixed networks.
- Increase investments in wireless infrastructure, by initiating tender procedures for frequency assignment in order to introduce new operators in the frequency bands available this year and to create conditions for further investments to be made next year.




- **Ensure level-playing field for all market players, both in terms of net-neutrality and economic business conditions.**
- **Ensure further development of the electronic communication market by applying pro-competitive *ex-ante* remedies and, if necessary, *ex-post* regulatory measures.**
- **Carry out the analysis of the relevant markets and, if necessary, designate SMP operators in order to create a favourable business climate. Monitor the compliance of the SMP operators with the regulatory obligations.**
- **Implement Universal Service.**
- **overall protection of interests of all market stakeholders: operators, service providers and end-users.**

As part of the regulatory activities concerning the rational usage of scarce resources, in March 2012 RATEL adopted Draft Radio Frequency Allocation Plan and submitted it to the relevant ministry. In October 2012 by the Regulation of the Government of the Republic of Serbia the Radio Frequency Allocation Plan was stipulated and published in the *Official Gazette of the Republic of Serbia*.

In 2012 RATEL also monitored the implementation of the imposed regulatory measures, in particular the application of the standard offers and the regulate pricing in nine markets susceptible to *ex-ante* regulation where the total of five SMP operators had been identified.

Furthermore, RATEL passed two general bylaws within its competence and 9 drafts of general bylaws adopted by the relevant ministry.

*An Overview of Telecom Market in the Republic of Serbia in 2012* presents the achieved results. There are two results accounting for the successful work of RATEL in the past year that deserve particular attention. First, according to the 2012 data of the International Telecommunications Union (ITU), ICT Development Index (IDI) placed the Republic of Serbia

between 40th and 50th place on the list of 159 countries. Second, the observer status in the Body of European Regulators for Electronic Communications (BEREC) which enabled a constant access to the relevant issues and a direct exchange of experience with other European regulators.



Chair of the Managing Board

Professor Dr Jovan Radunović




# 1. RATEL'S ACTIVITIES IN 2012

The Republic Agency for Electronic Communications (RATEL) is a national, independent regulatory authority for electronic communication, performing the regulatory function since August 2005. Pursuant to the Law on Electronic Communications (*Official Gazette of RS*, no. 44/10, hereinafter: Law), harmonized with the 2002 EU Regulatory Framework, RATEL's work is, *inter alia*, based on the following principles:

- **ensuring conditions for unhindered development of electronic communications in the Republic of Serbia;**
- **ensuring stable business environment and level playing field for the operators;**
- **ensuring interconnection of the electronic communication networks and services and/or operators, under equal and mutually acceptable conditions;**
- **promoting competition as a prerequisite for increased investments in the electronic communication sector;**
- **ensuring conditions for the implementation and development of the new technologies, providing a rational usage of the number resources and RF spectrum;**
- **constant enhancing of the QoS of electronic communication services, ensuring protection of user interest.**

The process of liberalization and opening of the telecom market in the Republic of Serbia continued in 2012, mainly through creation of a stable and predictable regulatory environment, in order to stimulate the sector development, investments, innovative services, new market entrants, promotion of competition and protection of users' interests.

In keeping with the competencies stipulated under the Law, the principles and objectives of the market regulation, as well as in the strategic documents and provisions regulating the sector, in 2012 RATEL focused its activities on the adoption of bylaws, follow-up of the relevant market analysis and the adoption of decisions significant for the market regulation and electronic communications sector development. RATEL's activities are mainly aimed at



ensuring the conditions for a balanced and stable development of the electronic communications in the territory of the Republic of Serbia, business predictability and equal treatment of the operators, as well as the maximum benefit for the users of electronic communications services, in terms of choice, price and quality of the services offered.

RATEL's activities accomplished in the period from 1 January to 31 December 2012, which were the result of activities and tasks defined under the regulations pertinent to the telecom or electronic communications sector and under the 2012 Framework Business Plan, are presented below.

## REGULATORY ACTIVITY

In performing its regulatory activity, in 2012 RATEL passed the following bylaws:

- Rules on the amount of fees for the provision of services within the competence of the Republic Agency for Electronic Communications (*Official Gazette of RS*, no. 41/12) and
- Amendments to the Numbering Plan (*Official Gazette of RS*, no. 35/12).

Pursuant to the Law, RATEL also drafted the proposals of bylaws to be adopted by the responsible ministry, as follows:

- Rules on the radio and telecommunications terminal equipment (*Official Gazette of RS*, no. 11/12),
- Rules on electromagnetic compatibility for electronic communication network, associated facilities, electronic communication equipment and terminal equipment
- Rules on Universal Service (*Official Gazette of RS*, no. 24/12),
- Rules on analogue to digital TV programme broadcasting switchover and access to multiplex in digital terrestrial broadcasting (*Official Gazette of RS*, no. 55/12),
- Rules on requirements concerning human resources, equipment and facilities to be




fulfilled by a business, company or other legal entity in order to perform measuring and testing of the operation of electronic communication networks and services, associated facilities, electronic communication equipment and terminal equipment (*Official Gazette of RS*, no. 13/12),

- Rules on requirements for determining protection belt for electronic communication networks and associated facilities, radio corridors and protection area and the manner of work realization when constructing buildings (*Official Gazette of RS*, no. 16/12) and
- Rules on technical and other requirements when building associated infrastructure necessary for installing electronic communication networks, associated facilities and electronic communication equipment when constructing commercial and residential buildings (*Official Gazette of RS*, no. 123/12).

RATEL also drafted the final proposal for the Radio Frequency Allocation Plan and submitted it, in March 2012, to the responsible ministry for adoption.

In the last quarter of 2012, Draft rules on amendments to the Rules on the manner of monitoring the radio frequency spectrum usage, technical inspection procedure and protection from harmful interference and Draft rules on the manner of radio frequency usage under general authorization regime. Both bylaws were open for public consultations, pursuant to the Law, and are expected to be adopted in 2013. In late 2012 RATEL began working on the proposal for the RF Allotment plan for pubic electronic communications services – broadband wireless access systems (BWA), MFCN in 3400-3600 MHz and 3600-3800 radio frequency bands. On 19 November 2012, the Questionnaire on the 3400 - 3600 MHz and 3600 - 3800 MHz radio frequency bands usage was posted on RATEL's website, inviting all parties interested in using these radio frequency bands to provide information on their needs and requirements and on the conditions that would be applied to the usage of the aforesaid bands, to the end of preparing a new Allotment Plan, pursuant to the provision of Article 84, paragraph 2 of the Law.

A series of individual enactments were also adopted, within the scope of legally stipulated competences, with the purpose of regulating electronic communication market.



## ELECTRONIC COMMUNICATIONS NETWORKS AND SERVICES

During 2011, RATEL continued with the activities aimed at creation of a free and open market, ensuring equal treatment for all participants. In keeping with the adopted regulations and procedures for the introduction of new technologies and services, which were finalized in the previous period, RATEL undertook a series of activities concerning the sector regulation, in order to stimulate competition in the Serbian telecom market.

A comparative overview of the number of users, public fixed communication network penetration rate, public mobile communication network penetration rate, Internet and cable systems for 2010, 2011 and 2012 is given in Table 1.

Tabela 1. A comparative overview of the number of users of teh basic electronic communication services in the last 3 years Source: RATEL

| | 2010 | | 2011 | | 2012 | |
|---|---|---|---|---|---|---|
| | Number (thousands) | Penetration (%) | Number (thousands) | Penetration (%) | Number (thousands) | Penetration (%) |
| **Fixed - lines** | 3,110.3 | 41.48 | 3,030.4 | 42.56 | 2,990.1 | 41.29 |
| **Mobile - users** | 9,915.3 | 132.24 | 10.182 | 142.99 | 9,137.9 | 126.19 |
| **Internet - subscribers** | 2,407.4 | 32.11 | 3,828.7 | 53 | 5,038.9 | 69.26 |
| **KDS - subscribers** | 1,247.2 | 16.63 | 1,331.3 | 18.7 | 1,442.2 | 19.92 |

Competition has been introduced in the area of fixed and mobile telephony in the last years, by passing necessary regulations and issuing relevant licences. Also, these markets were subject to market analysis in 2011, which resulted in relevant decisions. In 2012, RATEL continued monitoring operators' compliance with the conditions under the issued licences, and kept on following the situation in the markets and the fulfilment of the decisions, pursuant with the market analysis related competencies stipulated under the Law.

The EU Roaming Regulation on roaming on public mobile telecom networks entered into force in June 2001, setting a cap for both wholesale and retail roaming charges in the EU member countries and the countries of the European Economic Area – EEA. An




initiative was made by the countries with observer status in BEREC to extend roaming charges limit to these counties. The European Commission suggested that the EU candidate countries could regulate roaming charges between member and candidate countries through integration procedure, in particular as part of the Stabilization and Association Agreement - SAA. Since the formal procedure requires a bilateral communication to be made by a member country government to the European Commission, requesting that the EU Roaming Regulation be included in the SAA, in November 2012 RATEL made the initiative for the Roaming Regulation to be included in the negotiations on Serbia's accession to the EU.

Also the Principal Basis for the price regulation of services provided by operators with SMP were drafted and published in 2012.

Two annual and one semi-annual analysis of the 2011 regulatory reports on cost-based principle implementation have been made for Telecommunications Company „Telekom Srbija" Joint Stock Co. (Telekom Srbija) and Serbia Broadband – Srpske kablovske mreže Ltd. (SBB), as well as the analysis of the regulatory report for the first 6 months of 2012 for SBB. Also, SBB's request to change the price of radio and TV programme distribution service was analyzed and approved. A financial analysis of the leading operators for 2007-2011 was also carried out. SBB's MIX packages and DTH and D3 packages were analysed, as well as the services packages offered by Orion and BOX package offered by Telekoma Srbija. A draft plan was prepared for reduction of charges of call termination on mobile network and the talks between the three SMP operators were held, followed by plans for further steps to be taken by RATEL concerning this matter. A continual analysis of termination, collocation, leased lines and broadband access prices, and the update of prices for cable distribution services of all operators, as well as the overview of roaming charges of the national mobile operators for 50 selected countries continued.

Since the Law stipulates the obligation of RATEL to keep appropriate registers of the operators, in February 2011, the Managing Board passed the decision on the manner in which the registers, records, data bases and other information within the competence of the Re-



public Agency for Electronic Communications are to be kept and published on the Agency website. In addition to updating the existing registers and creating new ones, in 2012 there were 174 changes made in the register of operators performing electronic communications activity (151 new entries and 23 erasures) as follows:

- 10 new entries and 3 erasures for media content distribution service operators
- 2 new entries for media contents broadcasters and multiplex operators
- 1 new entry and 3 erasures for VoIP operators
- 23 new entries and 7 erasures for broadband network access
- 5 new entries and 1 erasure for VPN operator
- 4 new entries for data transmission
- 2 new entries for leased lines
- 2 new entries for capacity leasing
- 3 new entries for infrastructure leasing
- 2 new entries for dark fibre leasing
- 1 new entries for closed user group
- 2 new entries for public telephone service
- 2 new entries for VoIP via personal network
- 27 new entries for VAS voice transmission
- 32 new entries for VAS SMS and MMS transmission
- 15 new entries for SMS, MMS transmission
- 4 new entries and 2 erasures for passive infrastructure
- 3 new entries and 3 erasures for optical networks
- 9 new entries and 3 erasures for other wire networks (hybrid, coaxial)
- 1 new entry for broadband R-LAN
- 1 new entry for other services
- 1 erasure for microwave network operator.

During 2012, 3 authorizations for international interconnection with the telecommunications




network operators in the neighbouring countries were issued. Pursuant with the Law, 70 decisions on permits to use numbering resources were issued upon operators' requests.

Number portability on public mobile networks, which had been made available in July 2011, was successfully operated during 2012 in line with RATEL's bylaw regulating number portability. By the end of 2012, over 100 000 numbers have been ported.

Also, pursuant to the regulation in force until 31 May 2012 and, subsequently, in line with the Rules on radio and telecommunications terminal equipment (*Official Gazette of RS*, no. 11/12, in force as of 1 June 2012) the following permits were issued:

- **322 technical permits - certificates of conformity for the technical characteristics of the telecommunications networks, systems and facilities with the relevant standards;**
- **2702 technical permits - certificates of conformity for the design and project documentation with the relevant standards and norms for the telecommunications networks and systems;**
- **2702 technical permits - certificates of conformity for the construction of telecommunications communication networks, systems and facilities, with the relevant standards and norms;**
- **11 technical permits - certificates of conformity with relevant standards and norms for the purpose of putting telecommunications systems and facilities into circulation and**
- **2749 approvals for import of goods.**

Pursuant with Art. 44 of the Law and the Rules on radio equipment and telecommunications terminal equipment (R&TT) (*Official Gazette of RS*, no. 11/12), RATEL was designated as the body in charge of R&TT equipment conformity assessment, by the decision of 29 May 2012 issued by the relevant Minister. Consequently, since 1 June 2012, when the Rules entered into force, until the end of 2012, RATEL has issued:

- **412 certificates of conformity and**
- **91 excerpts from the register.**



Also, the Instructions on optical cables marking were drafted and adopted.

In 2012 RATEL continued with spectrum monitoring, control of quality parameters for publicly available electronic communication services and networks and control of electronic communication business performance.

## RADIOCOMMUNICATIONS

The activities related to the joint work of the Ministry of Culture, Media and Information Society, the Republic Broadcasting Agency (RRA) and RATEL on the creation of conditions necessary for analogue to digital switchover in radio and television programme broadcasting, continued in 2012.

In addition, during 2012, the following activates related to RF spectrum management took place:

- as part of the broadcasting activities, the data from 25 BRIFICs (BR International Frequency Information Circular) of the International Telecommunication Union, of relevance for the broadcasting service of the Republic of Serbia, were analyzed. Answers were prepared for all cases where the new frequency assignments were affecting our broadcasting service, and they were delivered to the Radiocommunication Bureau in timely manner;
- a large number of compatibility analyses were carried out related to requests for new frequency assignments, using the appropriate software;
- a large number of coordination requests for new frequency assignments or modification of the existing, made by the neighbouring or other administrations, were solved;
- Draft Rules on analogue to digital switchover and access to multiplex in digital terrestrial TV broadcasting were prepared;
- Draft Rules on radio frequency usage under general authorization regime were prepared and made available for public consultations on 7 December 2012.




- **The preparation of Draft Allotment Plan for digital TV signal broadcasting in UHF frequency area and Draft Allotment Plan in 3400-3800 MHz frequency bands began.**

During 2012 three closing meetings were held with the representatives from the Serbian Armed Forces, Ministry of Interior and the relevant sector-ministry, as part of the preparation procedure for drafting Radio Frequency Allocation Plan. The Allocation Plan was submitted to the relevant ministry in March 2012 for further procedure. The Government of the Republic of Serbia passed the Regulation stipulating the Radio Frequency Allocation Plan, which was published in the *Official Gazette of the Republic of Serbia*, no. 99/12 of 16 October 2012 and entered into force on 24 October 2012.

In addition, RF spectrum management also included the following activities related to the issuance of radio station licences, radio frequency coordination and notification and RF spectrum monitoring:

- **individual permits for radio frequency usage were issued at operators' requests according to provision of Art. 86 of the Law, 60 individual permits for radio-stations on aircrafts, 70 of individual permits for radio-frequency usage for radio-stations on board of ships or other vessels, 102 individual permits for radio-frequency usage to diplomatic-consular offices and foreign legal entities in accordance with the provisions of Arts. 87 and 88 of the Law, as well as 118 amateur radio-station permits were also issued.**
- **417 decisions on revoking the assigned radio-frequencies were adopted, according to Art. 95 of the Law.**

Also, continual spectrum monitoring was performed during 2012.

## USER PROTECTION

Just like in the previous years, RATEL continued with the user support services with the aim of resolving the problem of complaints concerning the work of some operators, which involved the analysis of the number of user complaints according to the type of services, preparation



of specific enactments and daily communication with the users by e-mail and telephone. In 2012, 869 user complaints were received. Operators responded to 782 complaints, of which 318 complaints were resolved with the positive outcome for the users. The majority of complaints in 2012 concerned the amount bill for mobile telephony services.

## MONITORING AND ANALYSIS OF THE MARKETS SUSCEPTIBLE TO EX-ANTE REGULATION

Pursuant to the Law, RATEL has the task to carry out market analysis, collect and publish statistical data and to provide the National Parliament of the Republic of Serbia with the data on the situation in the Serbian electronic communication market in the form of annual report on the activities. In order to make available the data concerning the situation in the Serbian electronic communication market, RATEL publishes every year the *An Overview of the Telecom Market in the Republic of Serbia*, providing the necessary information on operators, relevant public authorities, scientific institutions, investors, users and NRAs in the region and in the EU. Furthermore, information was collected and submitted to the International Telecommunication Union (ITU) in form of the questionnaire with indicators, reports on the annual analysis of the telecommunication traffic were prepared and quarterly data were submitted to the Statistical Office of the Republic of Serbia, and also information on telecommunications market, service prices and regulatory measures was provided to the Cullen International for the purpose of the annual report.

Regarding the control of regulated prices of the SMP operators Rules on the application of the cost-accounting principle, separate accounts and reporting of an operator with significant market power in the electronic communications sector (*Official Gazette of RS*, no. 52/11) were fully applied.

In 2012, RATEL monitored the implementation of regulatory measures, in particular those concerning standard offers and regulated prices, in nine markets susceptible to *ex-ante* regulation where the total of five operators had been designated SMP operators. Standard offers were imposed as a regulatory remedy on four operators with SMP in six wholesale markets (Telekom Srbija, Orion telekom, Telenor and Vip mobile). Nine standard offers were submitted




and verified by RATEL, after requiring additional amendments and/or harmonization with the Law and RATEL's general bylaws to be made for some of the standard offers. Five standard offers are valid as of 1 April 2012 and another four as of 1 June 2012. In this way predictable and non-discriminatory conditions were created for all operators in the wholesale markets susceptible to *ex-ante* regulation.

Since the Law stipulates for RATEL to carry out, at least once every three years, the analysis of relevant and, if necessary, any additional markets, by applying the relevant EU recommendations on market analysis and identification of single and/or joint significant market power, in the second half of 2012, a follow-up analysis was carried out for 2 markets: Wholesale broadband access (M5) and Retail media content distribution (M8). Following a public consultation procedure, complaints received from the SMP operator were processed and the cooperation took place with the Competition Commission. On 28 December 2012 decisions designating SMP operators in markets M5 and M8 were passed and the relevant obligations were imposed thereon. Both the decisions and the relevant analysis reports were made available on RATEL's website.

## RATEL'S ORGANIZATION AND DEVELOPMENT

RATEL was founded pursuant to the Law, as an autonomous organization with the status of a legal entity which exercises public authorities in order to effectively implement the established electronic communications policy, promote competition in the sphere of electronic communications networks and services, enhance their capacity and/or quality, contribute to the development of electronic communications market and protect the interests of users of electronic communications services, in accordance with the Law and the bylaws adopted pursuant to this Law. RATEL is functionally and financially independent of government authorities, organizations and entities engaged in the electronic communications sector. The Agency operates pursuant to the provisions pertinent to public agencies, and the responsible ministry supervises the lawfulness and appropriateness of functioning of the Agency in performing the entrusted duties.

In 2012 the Managing Board worked with the same members as in 2011: Chairperson Prof. Dr Jovan Radunović, Deputy Chairperson Dr Zdravko Stanimirović and the members of the



Managing Board Prof. Dr Miroslav Dukić, Prof. Dr Vlade Milićević and Vuk Vujović, MBA.

The following organization units were formed for performing the work within RATEL's competence:

- **Regulation Sector** (with the following departments: Bylaws Department, Technical Regulations Department and Radiocommunications Department),
- **Economic Affairs and Market Analysis Sector** (with the following departments: Market Analysis and Cost-Accounting Department, Accounting and Finance Department and Procurement Division),
- **Logistics Sector** with the following departments: General Affairs Department, e-RATEL Department and Monitoring Department).

The financial assets are provided by RATEL's revenues from the numbering fees, radio-frequency fees, fees for performing electronic communication activities, and revenues from the provision of services within RATEL's competence. RATEL's annual financial report is approved by the Managing Board and revised by an independent chartered auditor.

The difference between the revenues and expenditures laid down in RATEL's annual financial report is paid into public revenues account of the Treasury of the Republic of Serbia and used by the responsible ministry for the promotion and development of electronic communications and information society. A part of these revenues, proportional to the revenues made by the electronic communication network and services operators in the territory of the Autonomous Province of Vojvodina, is paid into the account of the Province Treasury and used by the province authority in charge of electronic communication for the promotion and development of electronic communication and information society in the territory of AP Vojvodina. It should be noted that the National Parliament of the Republic of Serbia approved the 2011 Work Report of the Republic Agency for Electronic Communications, submitted thereto in timely manner through the Board for Space Planning, Traffic, Infrastructure and Telecommunications.

During 2012, RATEL's total revenues amounted to approximately 1 405 million dinars, with the total expenditures of 721 million dinars. Pursuant to Article 27, paragraph 6 of the Law,




once the financial reports had been audited, the surplus of 628 million dinars was paid into the Treasury of the Republic of Serbia and the Autonomous Province of Vojvodina, in the amount of 587 million dinars and 15 million dinars, respectively.

Furthermore, the Republic Agency for Electronic Communications paid RSD40.5 million into a special account of the Serbian Film Centre intended for the promotion of the national cinematography, pursuant to provisions of Arts. 19 and 20 of the Law on Cinematography (*Official Gazette of RS*, nos. 99/11, 2/12-corr.) in force as of 3 July 2012. The impact exercised by the Law amending the Law on Budgetary System (*Official Gazette of RS*, no. 93/12) and the Law Setting a Salary Cap in the Public Sector (*Official Gazette of RS*, no. 93/12) in force as of 29 September 2012 on the functional and financial independence of the Agency needs to be underlined.

On 31 December 2012, RATEL had 106 employees. RATEL is located in rented business premises in Višnjićeva 8 in Belgrade. The spectrum monitoring centres are located in Dobanovci and Niš.

Further upgrade of the existing ICT systems within RATEL continued in 2012:

- **new was radio station licence data base was launched and integrated with RATEL's internal document management system,**
- **the software was modified for the Central base of the ported mobile numbers, which was upgraded to support the fixed number portability,**
- **The internal document management system was upgraded and the work with electronic documents and electronic signature was enabled**
- **New Agency portal was implemented on the Agency website and the communication with the Agency via electronic forms was enabled along with user authentication via electronic certificates.**

During 2012, regular sessions of the Managing Board were held. They involved the preparation of 72 items of the agenda and the adoption of a number of general bylaws (rules, draft rules, instructions), the Financial Plan and Procurement Plan for 2013. The director



of the Agency passed 1200 separate legal acts (decisions, conclusions, approvals, certificates, criminal charges and acts related to public procurement procedures). Furthermore, a large number of memoranda were addressed to the Government of Republic of Serbia, the responsible ministries, operators and many other institutions and organizations, both in the country and abroad.

Observing the principles of transparency in the work and provision of information to all participants of the telecom market, two regular press conferences were held in RATEL's premises:

- ***Presentation of the annual publication - Overview of the Telecom Market in the Republic of Serbia 2011**, held on 26 April 2012 and*
- ***Presentation of RATEL's results achieved in the area of telecom market analysis and regulation, changes concerning a voice message on ported numbers and measurements performed by the Monitoring Department**, held on 4 September 2012 .*

In 2012 RATEL continued publishing the professional-scientific magazine *Telekomunikacije*.

In the second half of 2012 a campaign was launched with the purpose of informing the public with the modified telephone numbers of the emergency services. In order to efficiently create the public awareness concerning the new numbers, TV and radio clips were made, featuring the representatives from the Ministry of Interior and the Ambulance Emergency Service. Republic Broadcasting Agency (RBA) supported the campaign by recommending all broadcasters to keep broadcasting the clips by the end of 2012. The broadcasters responded to the RBA's recommendation and broadcast the clip titled "When in Need Dial 1 First" in prime times, following an appropriate dynamics.

With the purpose of providing transparency in RATEL's work and offering an opportunity to the public to take part in the process of decision-making in the telecommunications sector, in 2012, pursuant to the provision Arts. 34-36 of the Law and the Instructions on the Public Consultations Procedure, RATEL organized 18 public consultations prior to the adoption of all general bylaws by the Managing Board.




## COOPERATION WITH OTHER ORGANIZATIONS AND INSTITUTIONS

In performing its main role under the Law to create the necessary conditions for an unhindered development of the electronic communication market in the Republic of Serbia, RATEL has established close cooperation with the relevant state and judicial authorities and other entities.

The open and direct cooperation between RATEL and the responsible ministry (by July 2012 the Ministry of Culture, Media and Information Society and as of July 2012 the Ministry of External and Internal Trade and Telecommunications). Pursuant to the Law, the cooperation also involved a joint work on the creation of bylaws adopted by the responsible ministry at RATEL's proposal.

With the aim of ensuring an efficient radio frequency spectrum management and the protection of operation of priority radio services, RATEL has established the cooperation with the Ministry of Culture and Media, the Republic Broadcasting Agency, the Ministry of Defence, Serbian Armed Forces, the Ministry of Interior and the Serbia and Montenegro Air Traffic Service Agency.

Also, a good cooperation was established with the Competition Commission in the area of market analysis, in particular concerning the retail media content distribution and the wholesale broadband market.

During 2011, RATEL participated in the following work groups, commissions and activities:

- National Programme for Integration of the Republic of Serbia in the EU (NPI), the preparation of answers to the European Commission Questionnaire followed by the meetings with the EC representatives, along with the input of RATEL's bylaws in the joint database and data collecting for the electronic communication section of the EC annual Progress Report.
- cooperation with the Competition Commission,
- accession of the Republic of Serbia to the World Trade Organization,



- sector meetings between the European Commission and the Republic of Serbia,
- preparation of the materials for the European Communication Monitoring Report 3 - Serbia and Cullen International.

We would like to point out RATEL's participation in drafting the National Programme for Integration of the Republic of Serbia in the European Union (NPI), through its activities within Information Society and Media Sub-group 10, and also Competition Sub-group 8, the Free Movement of Goods Sub-group 1 and Foreign Economic Relations Sub-group 30. In 2012, the cooperation with the EU Integration Office involved, in particular, drafting monthly and quarterly reports on the activities related to the European integrations, update of the NPI electronic base of legal documents, participation in the activities related to the 2013-2016 National Programme for the Adoption of *Acquis* (NPAA), drafting materials for the Enhanced Permanent Dialogue (EPD) with the EC representatives and providing information concerning electronic communication sector for the annual EC Progress Report.

The dynamic development of ICTs, i.e. services and equipment, requires continuous monitoring and introduction of new regulations. This requires intensive and direct international cooperation with the national regulatory authorities (NRAs) and other international institutions in the region and in the EU. For the purposes of the harmonization of regulations, technical provisions, and standards, in 2012 RATEL's experts took an active part in the meetings of several international organizations:

- participation in the international meetings organized by the ITU – as part of the state delegation in WCIT 2012 and WRC 2012) and in the meetings of ITU-T work groups (SG2, SG3, SG9, SG12, SG13,SG15 i SG17) and ITU-R work groups (SG1, SG4, SG5 i SG6);
- participation in CEPT meetings – Radio Frequency Spectrum Management World Group (WGFM), Spectrum Engineering Work Group (WGSE) and Numnering and Network Work Group (WGNaN);
- participation in the COMMITTEE RAINWAT meeting – Regional Arrangement on the Radiocommunication Service for Inland Waterways (signed on 18 April 2012 in Buc-




harest, whereby the Regional Arrangement on the Radiotelephone Service for Inland Waterways – Basel 2000 ceased to be valid).

- participation in the European Communications Office (ECO) meetings –WGRA meetings.

Since it had been granted the observer status in the ***Body of European regulators for Electronic Communications – BEREC*** as of 1 March 2012, RATEL representatives have participated in Board of Regulators – BoR and Contact Network – CN meetings, and in 2013 RATEL will also participate in Expert Working Group – EWG meetings.

Also, in September 2012 RATEL became a member of **Indipendent Regulators Group – IRG**, which is a network of independent European telecom regulators. IRG was established in 1997 as a group of European National Telecommunications Regulatory Authorities (NRAs) to share experiences and points of views among its members on important issues relating to the regulation and development of the European telecommunications market.

Constant contacts with all participants in the market were maintained through the official institutional participation of RATEL in the meetings and roundtables and through presentation in the national and international conferences and papers in the national and international magazines. In 2012, there were two international meetings:

- TAIEX Workshop on Telecom regulation in the EU was held on 12-13 June 2012,
- 19th RAINWAT Committee Meeting was held on 17-18 October 2012, where the guidelines for the future work of RAINWAT Committee and further enhancement of the Regional Agreement were discussed. The meeting was attended by the members of the RAINWAT Committee, representatives of the Danube Commission, Serbian Ministry of Transport and Directorate for Inland Waterways of the Republic of Serbia.

Also, RATEL representatives attended the meeting organized by the Commissioner for Information of Public Importance and Personal Data Protection with the participation of the EU experts, titled "Improvement of Personal Data Protection", as part of the EU Twinning light project, held on 13 November 2012.



RATEL cooperates with the other NRAs in Europe, in particular with those in the region. In 2012 RATEL signed the memoranda of understanding with the Albanian (AKEP) and the Montenegrin (EKIP) regulatory authorities. The cooperation defined by the memoranda provides for a regular exchange of information concerning the electronic communications policy and strategy making and expert meetings with the purpose of studying and comparing technical, legal, economic and other aspects of the regulatory activities in this sector.

In its work, RATEL continues the cooperation with all participants in the telecom market: operators, providers, distributers, industry, research and educational institutions as well as with consumer associations.

Director

Dr Milan Janković




# 2. ELECTRONIC COMMUNICATIONS MARKET ANALYSIS

In line with the competencies under the Law, in 2012 the Republic Agency for Electronic Communications (RATEL) carried out the analysis of the wholesale broadband market and retail media content distribution market and prepared the relevant reports. The analysis was carried out in order to assess the level of competition in specific relevant markets, for the purpose of continual monitoring of the situation on both wholesale broadband market and retail media content distribution market in the territory of the Republic of Serbia, in order to determine whether any changes have occurred since the last analysis carried out for the period August-November 2011.

The data used in the analysis cover the years 2009, 2010 and 2011. RATEL was thus able to designate operator with significant market power (SMP) by analyzing the relevant market and by considering the criteria for determining significant market power.

Subsequently, in December 2012, decisions were adapted designating the company Serbia Broadband – Srpske kablovske mreže Ltd. (SBB) as SMP operator in relevant markets. The obligations were imposed on the SMP operator in order to remove potential barriers to the development of market competition, to enable the development of the relevant market and competition and to protect end-user interests, while considering to the type and nature of the identified shortcomings, previous and future investments and the possibility for a reasonable rate of return on the investments.

The decision adopted in December 2012 imposed the following obligations on the Telecommunications Company „Telekom Srbija“, Joint Stock Co. (Telekom Srbija) as SMP operator:

1. Publication of relevant data – standard offer;

2. Non-discriminatory actions;

3 Accounting separation;

4 Provision of access and use of parts of the network infrastructure and associated facilities;

5 Price control and cost-based accounting,

the following obligations were imposed on SBB as an SMP operators in retail media content distribution market:

1 Prohibition of excessive pricing,

2 Prohibition of barriers to entry or excessive pricing or underpricing such as to limit the competition,

3 Prohibition of preferential treatment of an end-user,

4 Retail price control,

5 Obligation to obtain a formal approval from NRA for price formulation and price changes for bundled services,

6 Individual tariff control measures,

7 Cost-oriented prices or benchmarked prices.

SMP operators are required to fulfil the imposed obligations under terms and condition set out under the relevant market analysis.

All above-mentioned market analyses and the relevant decisions were published at the Agency website www.ratel.rs/регулатива/анализе_тржишта.538.html




## 2.1. BASIC CHARACTERISTICS OF THE TELECOM MARKET IN THE REPUBLIC OF SERBIA

Figure 1. Republic of Serbia – Basic Facts

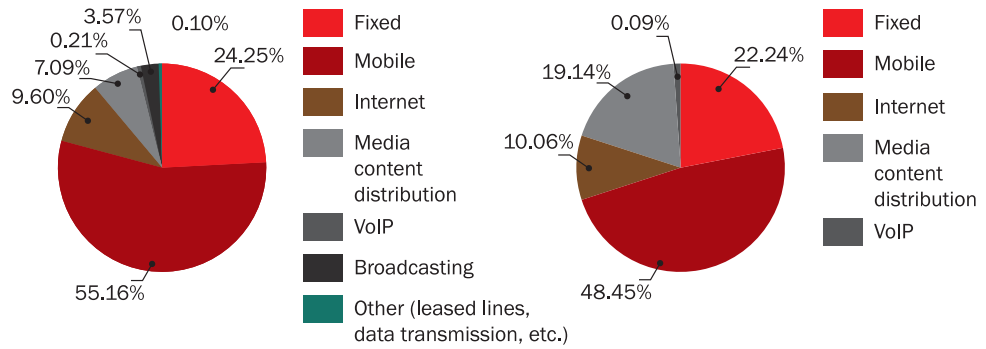

| Basic data | Source: Statistics Office and RATEL |
|---|---|
| Name | Republic of Serbia |
| Capital | Belgrade |
| Area | 88 361 km2 |
| Population (without AP Kosovo and Metohija), estimate by the Statistics Office | 7 241 295 |
| Country code: | +381 |
| Internet domain: | .rs |
| GDP for 2012 | 3 154.07 |
| Average net income in December 2012 | RSD46 923.00 (€415) |
| Fixed penetration: | 41.29 |
| Mobile penetration: | 126.19 |
| ISPs: | 222 |
| Network digitalization rate: | 99.14% |

The revenues from telecom services in 2012 in the Republic of Serbia amounted to 1.54 billion euros, which is approximately 4% less than the previous year. However, the total revenues made on the telecom market expressed in RSD show a 7% growth. In 2012 the total revenues made in the telecom market amounted to RSD174 billion, compared with RDS163 billion in 2011. The share of telecom sector revenues in GDP was around 5.52%, whereas the total investments in the telecom sector in 2012 amounted to 232 million euros.

**The data utilized for the telecom market analysis in the Republic of Serbia were retrieved from the reports submitted by the telecom market participants and refer to the territory of the Republic of Serbia without the Autonomous Province of Kosovo and Metohija which is under UN administration pursuant to 1244 Security Council Resolution temporarily regulating, *inter alia*, the competencies of the international civil mission in this territory.**

In terms market share accounted for by different services in the Serbian electronic communication market in 2012, same as before, the revenues from the mobile services accounted for the largest share in the total revenues, with almost 55%, amounting to 850 million euros. A similar trend may be seen in the total investments made in 2012, since the investments in the mobile telephony in 2012 accounted for over a half of the total investments in the electronic communications market in the Republic of Serbia, with EUR112 million (49%). The structure of the revenues and investments in the telecommunications sector is given below (Figure 2).

Figure 2. Structure and investments by services in 2012 Source: RATEL






Low usage basket shows average monthly expenses of a subscriber/inhabitant for telecommunications services. Tables 3 and 4 illustrate telecom service baskets representing monthly expenditure per subscriber of telecom services in Serbia in 2012 compared with the data retrieved in 2010 and 2011. According to the obtained data and the data received from teh Statistics Office, in 2012, the cost of the basic package equalled 3.5% of the net average monthly salary in December (cf. 4% in 2011), and for the expenses of the high usage basket equalled 10.98% (cf. 11.6% in 2011).

Table 2. Low usage basket (RSD) Source: RATEL

| LOW USAGE BASKET | 2010 | | 2011 | | 2012 | |
|---|---|---|---|---|---|---|
| | Average bill | % of the monthly salary | Average bill | % of the monthly salary | Average bill | % of the monthly salary |
| Fixed | 1,004.30 | 2.60% | 988.99 | 2.25% | 880.86 | 1.88% |
| Mobile (prepaid) | 331.30 | 0.90% | 249.24 | 0.57% | 261.95 | 0.56% |
| TV (national TV subscription) | 500.00 | 1.30% | 500.00 | 1.14% | 500.00 | 1.07% |
| **Total** | **1,835.60** | **4.80%** | **1,738.23** | **3.96%** | **1,642.81** | **3.50%** |
| *Average net salary (in December)* | 39,580.00 | | 43,887.00 | | 46,923.00 | |

Table 3. High usage basket (RSD) Source: RATEL

| HIGH USAGE BASKET | 2010 | | 2011 | | 2012 | |
|---|---|---|---|---|---|---|
| | Average bill | % of the monthly salary | Average bill | % of the monthly salary | Average bill | % of the monthly salary |
| Fixed | 1,004.30 | 2.60% | 988.99 | 2.25% | 880.86 | 1.88% |
| Mobile (postpaid) | 1,948.70 | 5.00% | 1,715.07 | 3.91% | 1,817.72 | 3.87% |
| TV (national TV subscription) | 500.00 | 1.30% | 500.00 | 1.14% | 500.00 | 1.07% |
| Internet | 1,165.00 | 3.00% | 1,289.84 | 2.94% | 1,224.69 | 2.61% |
| CATV | 559.00 | 1.40% | 593.06 | 1.35% | 727.34 | 1.55% |
| **Total** | **5,177.00** | **13.40%** | **5,086.96** | **11.59%** | **5.150.61** | **10.98%** |
| *Average net salary (in December)* | 39,580.00 | | 43,887.00 | | 46,923.00 | |

## 2.2. COMPARATIVE ANALYSIS WITH THE SEE COUNTRIES



Same as the previous years, a comparative analysis of South East Europe countries was carried out in 2012. SEE countries include one EU accession country – Croatia, four EU candidate countries Serbia, Turkey, Montenegro and Macedonia, and also two Stabilization and Accession Agreement (SAA) signatory countries – Bosnia and Herzegovina and Albania.

Compared to 2011, the value of VAT has changed in Serbia from 18% to 20% and in Croatia from 23% to 25%, whereas it remained the same in Albania (20%), Turkey and Macedonia (18%) and Bosnia and Herzegovina and Montenegro (17%).

The Table 4 below shows the population and GDP in each country. The biggest GDP real growth rate was seen in Turkey (8.5%), followed by Albania (3%), Macedonia and Montenegro (2.8%), Serbia (1.6%) and Bosnia and Herzegovina (1.3%), while Croatia showed no significant changes compared with 2010.

Croatia has the biggest GDP per capita, whereas Serbia recorded a considerable growth in GDP per capita year-on-year (10.43%), followed by Montenegro (9.12%), Macedonia (7.66%) and Albania (3.25%). There were no significant changes in this indicator for Croatia, whereas for Turkey there was a slight drop compared with 2010,

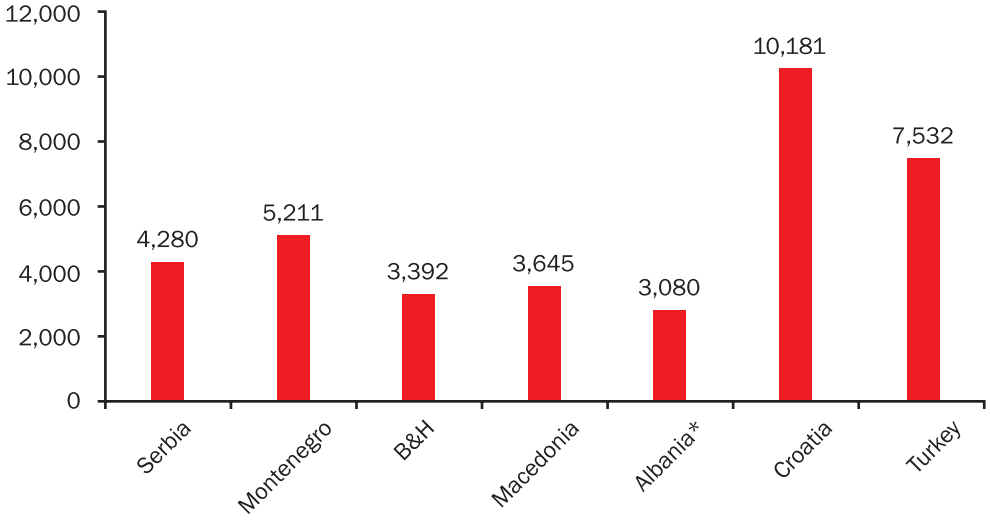
Table 4. Population and GDP in (2011 data)
Source: Eurostat, Enlargement countries Economic developments (2013 edition)

| Country | Population (mn) | GDP (€ bn) |
|---|---|---|
| Albania* | 2.832 | 8.872 |
| Bosnia & Herzegovina | 3.839 | 13.024 |
| Montenegro | 0.619 | 3.234 |
| Croatia | 4.412 | 44.922 |
| Macedonia | 2.057 | 7.504 |
| Serbia | 7.276 | 31.143 |
| Turkey | 73.723 | 555.249 |

* 2010 data




Figure 3. GDP per capita in current prices (in euros , 2011 data)
Source: Eurostat, Enlargement countries Economic developments (2013 edition)




* 2010 data

Serbia had the largest growth in GDP of 10.65% year-on-year, followed by Macedonia (7.71%), Montenegro (7.26%), Albania (3.72%) and Bosnia and Herzegovina (1.42%). In GDP for Croatia and Turkey there were only slight changes.

GDP per capita in current prices, as a valuable indicator which also reflects the population size is shown in Figure 3. It can be observed that in 2011 Croatia had the largest growth in GDP per capita of 10 181euros, followed by Turkey with 7 532 euros and Montenegro with 5 211 euros, and the indicator for Serbia was 4 280 euros.

The total telecommunications market revenue in these countries is estimated to nearly 16.39 billion euros, as shown in Table 5, which is an increase of 5.8% compared with 2011, unlike 2009 when a minor decrease had been perceived or 2010 when the market showed stagnation in terms of revenues. A particular increase was observed within the market segments of CATV (33.4%) and the Internet (28.1%) in all countries. There was an increase of 5.6% in

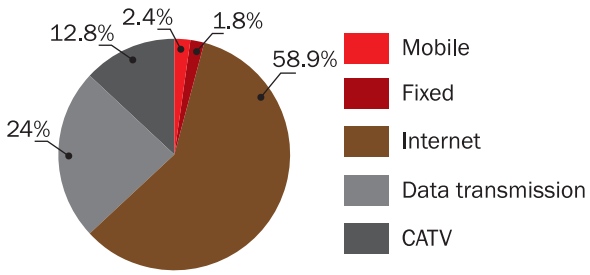
mobile market. On the other hand, fixed telephony has been characterized by stagnation or drop in most of the countries year after year, the total decrease in 2011 being 3.4%. An even higher decrease was seen in the data transmission segment (4.8%).

Table 5. SEE electronic communication market
Source: Enlargement countries monitoring report 3 - Annex - April 2013 (Cullen International)

| | 2008 | 2009 | 2010 | 2011 | Sector growth 2010-2011 |
|---|---|---|---|---|---|
| Fixed-line telephony | 4,565,475,200 | 4,183,524,600 | 4,076,763,763 | 3,937,420,260 | -3.4% |
| Internet services | 1,272,911,900 | 1,531,031,400 | 1,639,126,245 | 2,099,959,325 | 28.1% |
| Mobile telephony | 9,964,334,200 | 9,126,823,000 | 9,142,852,083 | 9,658,360,328 | 5.6% |
| Data transmission | 440,934,500 | 448,902,100 | 409,233,079 | 389,697,792 | -4.8% |
| Cable (cable Internet services excluded) | 144,899,500 | 181,364,900 | 225,346,894 | 300,687,575 | 33.4% |
| **Total** | **16,388,555,300** | **15,471,646,000** | **15,493,322,063** | **16,386,125,281** | **5.8%** |

As shown in Figure 4, the largest share in terms of investments in the telecom market in SEE went once again to mobile telephony with 58.9%, keeping the last year's level. The share of the fixed telephony in total investments was 24% (cf. 26.5% in 2011). The share of the Internet showed considerable growth from 10.8% to 12,8%. The share of CATV was marked by a stable growth from 1.5% to 1.8%, whereas the share of data transmission service remained practically unchanged with 2.4% (cf. 2.3% in 2011).

Figure 4. Market share of electronic communication services in 2011
S ource: Enlargement countries monitoring report 3 - Annex - April 2013 (Cullen International)






The total investments in the electronic communication sector of the SEE countries in 2011 amounted to approximately 2.52 billion euros, which is a 4.6% growth compared with 2010. In terms of investments, Turkey is leading the way with 1.747 billion euros. The total investments amounted to 250.92 million euros in Serbia and 210.8 million euros in Croatia, while in other countries they were significantly lower. Figure 5 shows investments as percentage of revenue in electronic communications sector for each country.

Figure 5. Investments as percentage of revenue in electronic communications sector (2011 data)
Source: Enlargement countries monitoring report 3 –April 2013 (Cullen International)

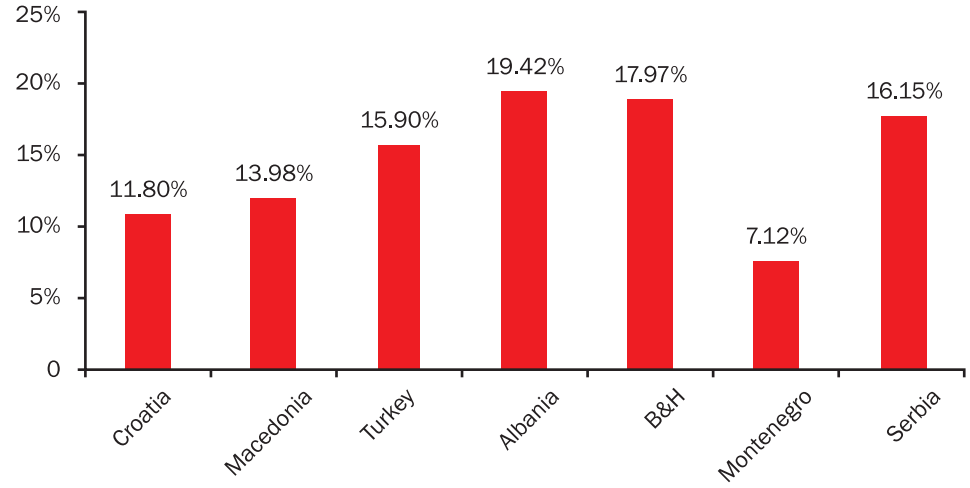
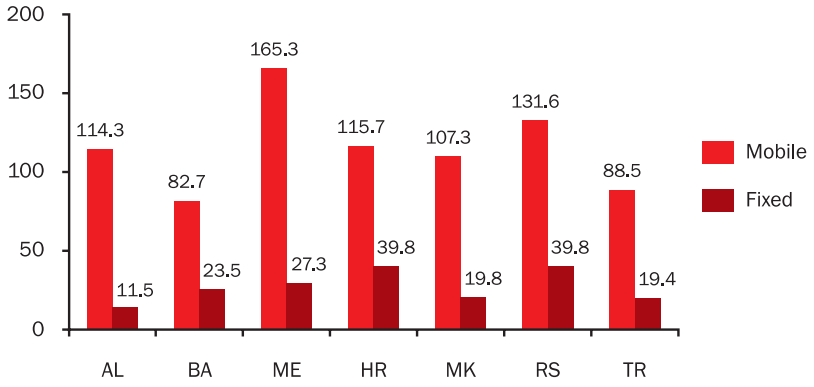



Figure 6 compares the mobile and fixed-line penetration rates of the SEE countries. Compared to the previous year, the indicators showed a slight growth in the mobile penetration rate only in Turkey and Bosnia and Herzegovina, the rates remained virtually unchanged in Croatia and Macedonia, whereas a drop was seen in Serbia (5.93%), Montenegro (11.89%) and, a drastic one, in Albania (38.18%). Fixed-line penetration rate, which had been characterised by a downtrend for years, had the biggest drop in Turkey (5.83%), Albania (4.17%) and Macedonia (3.41%). In Bosnia and Herzegovina fixed-line penetration rate was by 1.26% lower compared with the previous year, in Montenegro by 1.09%, whereas in Serbia and Croatia there were now significant changes in this indicator compared with 2010.

Figure 6. Mobile and fixed penetration rate in 2012
Source: Enlargement countries monitoring report 3 - Annex - April 2013 (Cullen International)




The prices of specific fixed network services provided by the operators in the region, as well as the leased line services are given in Figures 7, 8 9 and 10. The lowest monthly subscription charge is in Albania and the highest in Croatia (Figure 7) whereas the lowest local and national call tariff is in the Republic of Serbia (Figure 8). The highest annual charges for 2km of 2Mb/s leased lines were observed in Croatia (€7 258) and the lowest in Albania (1 599€), whereas charges for 2km of 34Mb/s leased lines are the lowest in Turkey (€12 218).

Figure 7. Standard monthly subscription for residential users (€) (VAT included)
Source: Enlargement countries monitoring report 3 - Annex - April 2013(Cullen International)

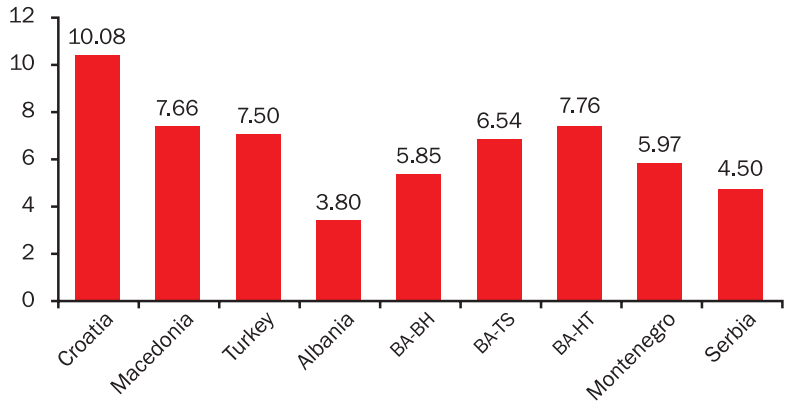





Figure 8. Price of a 10-minute local and national call (€) (VAT included)
Source: Enlargement countries monitoring report 3 - Annex - April 2013(Cullen International)

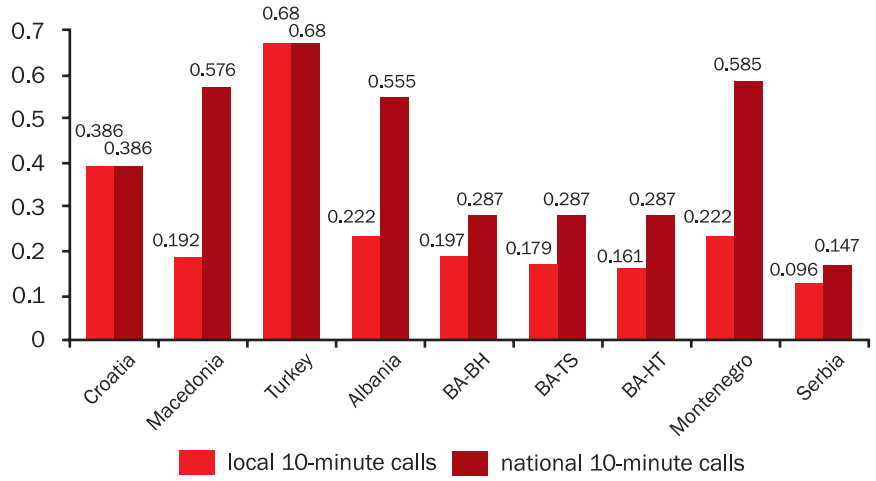



Figure 9. Annual charges for 2 Mbit/s 2 km national leased lines (€ )
Source: Enlargement countries monitoring report 3 - Annex - April 2013 (Cullen International)

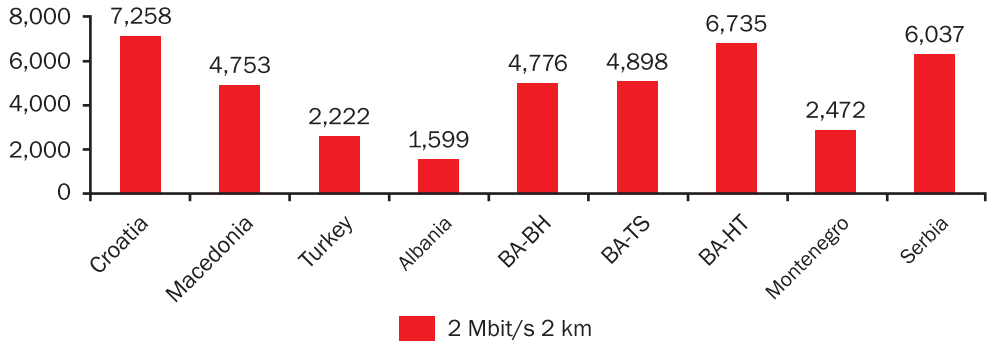
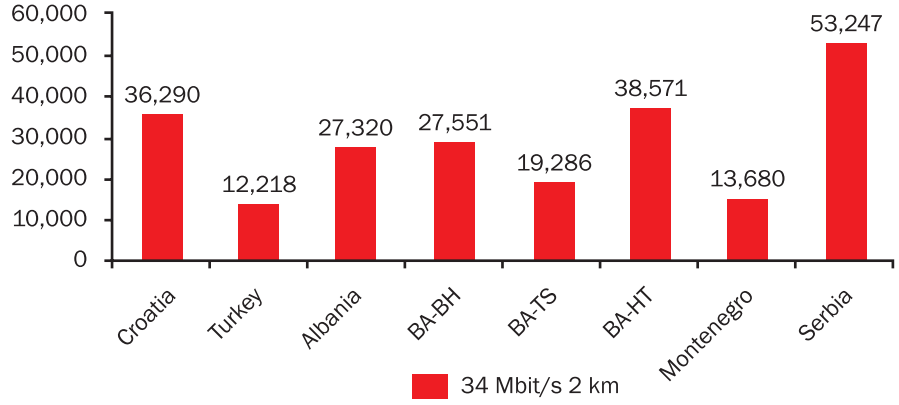
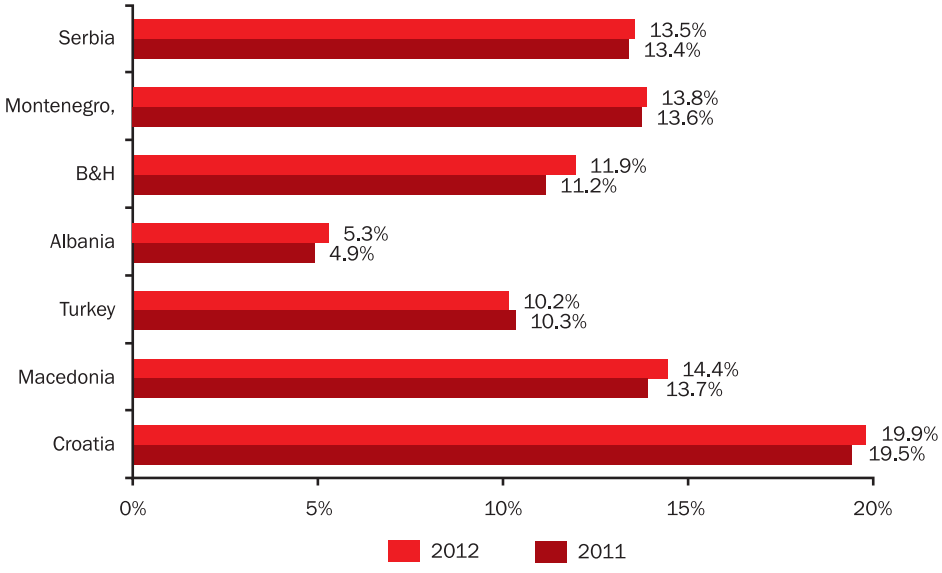


Figure 10. Annual Charges for 34 Mbit/s 2 km National Leased Lines (€ )
Source: Enlargement countries monitoring report 3 - Annex - April 2013 (Cullen International)




The upward trend in the number of Internet users went on in 2012 when, amounting to 5 038 924 together with 3G subscribers, which is a 31.6% increase compared with 3 828

Figure 11. Fixed broadband penetration rate
Source: Enlargement countries monitoring report 3 - Annex - April 2013 (Cullen International)

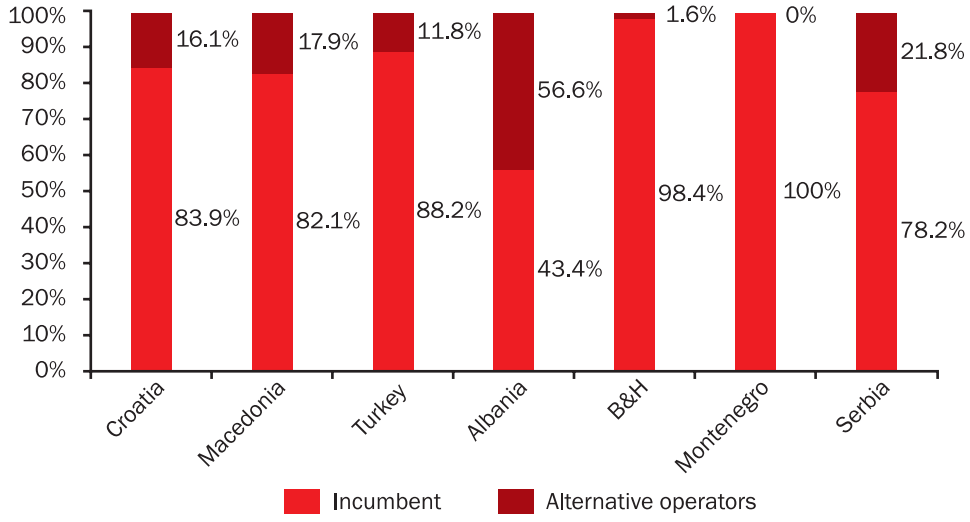





721 users in 2011. Due to the ongoing development of the broadband Internet access, the number of broadband users grew compared with 2011, whereas the number of dial-up users continued to drop sharply, which is a trend recorded in both the EU countries and countries in the region.

Figure 12 illustrates competition on the retail ADSL market between incumbent operators and other (alternative) operators. As clearly shown, the incumbent operator had absolute ADSL access market share (100%) only in Montenegro, followed by the incumbent operators in Bosnia and Herzegovina with 98.4% and Turkey with 88.2% of shares. The incumbent operator had the least share in Albania (43.4%) and Serbia (78.2%).

Figure 12. Retail ADSL Copmetition
Source: Enlargement countries monitoring report 3 - Annex - April 2013 (Cullen International)




## 2.3 ICT DEVELOPMENT INDEX

With the aim of measuring and monitoring the development of information society and determining the digital divide among UN Member States, the International Telecommu-



nication Union (ITU) publishes the indicators of ICT development on a regular basis. In comparison with the previous methodology, when data was usually obtained from the undertakings present in the ICT industry, recent approaches of data collection focus on obtaining relevant indicators on the basis of a representative sample of the telecommunications services users. The following indicators are presented according to the ITU Manual for Measuring ICT Access and Use by Households and Individuals, published in 2009, which provides a description of the core indicators and methodology for data collection and analysis. The list of the core indicators on the use of ICTs by households and individuals is given below in Table 6. The list comprises 11 out of 12 core indicators with relevant values for the Republic of Serbia in 2012, and an additional, reference indicator HHR1, which is a general indicator. RATEL obtained the results given in Table 6, in cooperation with the Statistical Office of the Republic of Serbia.

Table 6. ICT development indicators

Source: Statistical Office of the Republic of Serbia

| | Indicator | Definitions and notes | 2012. |
|---|---|---|---|
| HH1 | Proportion of households with a radio | The *proportion of households with a radio* is calculated by dividing the number of in-scope households with a radio by the total number of in-scope households.<br>A *radio* is a device capable of receiving broadcast radio signals, using popular frequencies, such as FM, AM, LW and SW. It includes a radio set integrated in a car or an alarm clock but excludes radios integrated with a mobile phone, a digital audio player (MP3 player) or in a computer. | 72 % |
| HH2 | Proportion of households with a TV | *The proportion of households with a* TV is calculated by dividing the number of in-scope households with a TV by the total number of in-scope households.<br>A *TV* (television) is a stand-alone device capable of receiving broadcast television signals, using popular access means such as over-the-air, cable and satellite. It excludes TV functionality integrated with another device, such as a computer or a mobile phone. | 98.2 % |
| HH3 | Proportion of households with telephone | The *proportion of households with telephone* (fixed or mobile) is calculated by dividing the number of in-scope households with a telephone (fixed or mobile) by the total number of in-scope households. | |




| | | | |
|---|---|---|---|
| | Proportion of households with fixed telephone | The *proportion of households with fixed telephone only* is calculated by dividing the number of in-scope households with a fixed telephone only by the total number of in-scope households.<br><br>A *fixed telephone line* refers to a telephone line connecting a customer's terminal equipment (e.g. telephone set, facsimile machine) to the public switched telephone network (PSTN) and which has a dedicated port on a telephone exchange. It may not be the same as an access line or a subscriber. | 86.9 % |
| | Proportion of households with mobile cellular telephone | The *proportion of households with mobile cellular* telephone only is calculated by dividing the number of in-scope households with a mobile cellular telephone only by the total number of in-scope households.<br><br>A *mobile cellular telephone* refers to a portable telephone subscribing to a public mobile telephone service using cellular technology, which provides access to the PSTN. This includes analogue and digital cellular systems, as well as IMT-2000 (3G). Users of both post-paid subscriptions and pre-paid accounts are included. | 83.9 % |
| | Proportion of households with both fixed and mobile cellular telephone | | |
| HH4 | Proportion of households with a computer | The *proportion of households with a computer* is calculated by dividing the number of in-scope households with a computer by the total number of in-scope households.<br><br>A *computer* refers to a desktop or a laptop computer. It does not include equipment with some embedded computing abilities such as mobile cellular phones, personal digital assistants (PDAs) or TV sets. | 55.2 % |
| HH5 | Proportion of individuals who used a computer (from any location) in the last 12 months | The *proportion of individuals who used a computer* is calculated by dividing the total number of in-scope individuals who used a computer from any location in the last 12 months by the total number of in-scope individuals.<br><br>A *computer* refers to a desktop or a laptop computer. It does not include equipment with some embedded computing abilities such as mobile cellular phones, personal digital assistants or TV sets. | 57 % |



| | | | |
|---|---|---|---|
| HH6 | Proportion of households with Internet access at home | The *proportion of households with Internet access* at home is calculated by dividing the number of in-scope households with Internet access by the total number of in-scope households.<br><br>The *Internet* is a world-wide public computer network. It provides access to a number of communication services including the World Wide Web and carries e-mail, news, entertainment and data files, irrespective of the device used (not assumed to be only via a computer – it may also be by mobile phone, PDA, games machine, digital TV etc.). Access can be via a fixed or mobile network. | 47.5 % |
| HH7 | Proportion of individuals who used the Internet (from any location) in the last 12 months | The *proportion of individuals who used the Internet* is calculated by dividing the total number of in-scope individuals who used the Internet (from any location) in the last 12 months by the total number of in-scope individuals.<br><br>The *Internet* is a world-wide public computer network. It provides access to a number of communication services including the World Wide Web and carries e-mail, news, entertainment and data files, irrespective of the device used (not assumed to be only via a computer – it may also be by mobile phone, PDA, games machine, digital TV etc.). Access can be via a fixed or mobile network | 50% |
| HH8 | Location of individual use of the Internet in the last 12 months | The proportion of individuals who used the Internet at each location can be calculated as either: the proportion of in-scope individuals or the proportion of Internet users, using the Internet at each location.<br><br>Access to the Internet is not assumed to be only via a computer – it may also be by mobile phone, PDA, games machine, digital TV etc.<br><br>Individuals should be asked about all locations of Internet use (that is, the survey question used by countries should specify multiple responses). Note that, except for mobile access, the locations are associated with the equipment used e.g. a PC installed at work or at an Internet café. | |
| | Home | | Not covered by the questionnaire |
| | Work | Where a person's workplace is located at his/her home, then he/she would answer yes to the home category only. | Not covered by the questionnaire |
| | Place of education | For students. Teachers (and others who work at a place of education) would report 'work' as the place of Internet use. | Not covered by the questionnaire |
| | Another person's home | The home of a friend, relative or neighbour. | Not covered by the questionnaire |




| | | | |
|---|---|---|---|
| | Community Internet access facility | Internet use at community facilities such as public libraries, publicly provided Internet kiosks, non-commercial telecentres, digital community centres, post offices and other government agencies; access is typically free and is available to the general public. | Not covered by the questionnaire |
| | Commercial Internet access facility | Internet use at publicly available commercial facilities such as Internet or cyber cafés, hotels, airports etc, where access is typically paid (i.e. not free of charge). | Not covered by the questionnaire |
| | Any place via a mobile cellular telephone | Use of the Internet at any location via a mobile cellular telephone (including handheld devices with mobile phone functionality). | Not covered by the questionnaire |
| | Any place via other mobile/wireless access devices | Use of the Internet at any location via other mobile access devices, e.g. a laptop computer or handheld device that uses wireless access (at a WiFi 'hotspot') or a laptop computer connected to a mobile telecommunications network. | Not covered by the questionnaire |
| HH9 | Internet activities undertaken by individuals in the last 12 months | The proportion of individuals who undertook each activity can be calculated as either: the proportion of in-scope individuals or the proportion of Internet users who undertook each activity. | |
| | Getting information about goods or services | | 72.5% |
| | Getting information related to health or health services | Includes information on injury, disease, nutrition and improving health generally. | 5.5% |
| | Getting information from general government organizations | *General government organizations* should be consistent with the SNA93 (2008 revision) concept of general government. According to the SNA "… the principal functions of government are to assume responsibility for the provision of goods and services to the community or to individual households and to finance their provision out of taxation or other incomes; to redistribute income and wealth by means of transfers; and to engage in non-market production." (General) government organizations include central, state and local government units. | 92.6 % |
| | Interacting with general government organizations | Includes downloading/requesting forms, completing/lodging forms on line, making on-line payments and purchasing from government organizations. It excludes getting information from government organizations.<br><br>*General government organizations* should be consistent with the SNA93 (2008 revision) concept of general government. According to the SNA "… the principal functions of government are to assume responsibility for the provision of goods and services to the community or to individual households and to finance their provision out of taxation or other incomes; to redistribute income and wealth by means of transfers; and to engage in non-market production." (General) government organizations include central, state and local government units. | 57.7 % |

| | | |
|---|---|---|
| Sending or receiving e-mail | | 71.6 % |
| Telephoning over the Internet/VoIP | The use of Skype, iTalk, etc. Includes video calls (via webcam). | 48.6 % |
| Posting information or instant messaging | Posting messages or other information to chat sites, blogs, newsgroups, on-line discussion forums and similar; use of instant messaging. | 66.2 % |
| Purchasing or ordering goods or services | Refers to purchase orders placed via the Internet whether or not payment was made on line. Orders that were cancelled or not completed are excluded. Includes purchasing of products such as music, travel and accommodation via the Internet. | 31.2 % n/a |
| Internet banking | Includes electronic transactions with a bank for payment, transfers, etc. or for looking up account information. Excludes electronic transactions via the Internet for other types of financial services such as share purchases, financial services and insurance. | 9.3 % |
| Education or learning activities | Refers to formal learning activities such as study associated with school or tertiary education courses as well as distance education involving on-line activities. (A more narrow interpretation is likely to be less meaningful as it could include a range of activities such as using the Internet to search for information.) | 68.2 % |
| Playing or downloading video games of computer games | Includes file sharing games and playing games on line, either paid or free of charge. | 60.7% |
| Downloading movies, images, music, watching TV or video, or listening to radio or music | Includes file sharing and using web radio or web television, either paid or free of charge. | 60.7% |
| Downloading software | Includes the downloading of patches and upgrades, either paid or free of charge. | 60.7% |
| Reading or downloading on-line newspapers or magazines, electronic books | Includes accessing news websites, either paid or free of charge. Includes subscriptions to on-line news services. | 68.2 % |




| | | | |
|---|---|---|---|
| HH10 | Proportion of individuals who use a mobile cellular telephone | The *proportion of individuals with use of a mobile cellular telephone* is calculated by dividing the total number of in-scope individuals with use of a mobile cellular telephone by the total number of in scope individuals.<br><br>A *mobile cellular telephone* refers to a portable telephone subscribing to a public mobile telephone service using cellular technology, which provides access to the PSTN. This includes analogue and digital cellular systems, as well as IMT-2000 (3G). Users of both post-paid subscriptions and pre-paid accounts are included.<br><br>*Use of a mobile cellular telephone* does not mean that the telephone is owned or paid for by the person but should be reasonably available through work, a friend or family member, etc. It excludes occasional use, for instance, borrowing a mobile phone to make a call. | 85.8 % |
| HH11 | Proportion of households with access to the Internet by type of access (narrowband, broadband (fixed, mobile)) | This indicator should be calculated as the proportion of in-scope households with Internet access that use each type of access service, for instance, the proportion of households with Internet access that use a broadband service as their means of access.<br><br>It is expected that countries will collect data at a finer level than shown here.<br><br>The categories chosen by countries should allow aggregation to total narrowband and total broadband, as well as to fixed and mobile broadband, as defined below.<br><br>As households can use more than one type of access service, multiple responses are possible. | |
| | Narrowband | *Narrowband includes analogue modem (dial-up via standard phone line), ISDN (Integrated Services Digital Network), DSL at speeds below 256 kbit/s, and mobile phone and other forms of access with an advertised download speed of less than 256 kbit/s.*<br><br>Note that narrowband mobile phone access services include CDMA 1x (Release 0), GPRS, WAP and *i-mode*. | 1.4 % |
| | Fixed broadband | *Fixed broadband refers to technologies at speeds of at least 256 kbit/s, in one or both directions, such as DSL (Digital Subscriber Line), cable modem, high-speed leased lines, fibre-to-the-home, powerline, satellite, fixed wireless, Wireless Local Area Network and WiMAX.* | 38 % |

| | | | |
|---|---|---|---|
| | Mobile broadband | Mobile broadband refers to technologies at speeds of at least 256 kbit/s in one or both directions, such us Wideband CDMA (W-CDMA), known as Universal Mobile Telecommunications System (UMTS) in Europe; Highspeed Downlink Packet Access (HSDPA), complemented by High-Speed Uplink Packet Access (HSUPA); CDMA2000 1xEV-DO and CDMA 2000 1xEV-DV. Access can be via any device (handheld computer, laptop or mobile cellular telephone etc.). | n/a |
| HH12 | Frequency of individual use of the Internet in the last 12 months (from any location) | The frequency of individual use of the Internet can be calculated as either: the proportion of in-scope individuals or the proportion of Internet users, using the Internet with each frequency.<br><br>It is recommended that countries collect this information in respect of a typical period; therefore, respondents should ignore weekends (if they only use the Internet at work) and breaks from their usual routine, such as holidays.<br><br>Access to the Internet is not assumed to be only via a computer – it may also be by mobile phone, PDA, games machine, digital TV etc. | |
| | *At least once a day* | Once a working day for respondents who only (or most frequently) use the Internet from work | 77.3 % |
| | *At least once a week but not every day* | | 17 % |
| | *Less than once a week* | | 5.7 % |
| Reference indicator | | | |
| HHR1 | Proportion of households with electricity | Electricity is not an ICT commodity, but is an important prerequisite for using many ICTs. It is therefore included in the core list as a reference indicator.<br><br>Electricity access may be enabled by a grid/mains connection, or by power generated locally (including at the dwelling). Local power includes electricity generated by a fuel-powered generator, or from renewable resources such as wind, water or solar. It excludes sole use of energy storage devices, such as batteries (though these may be used to store electricity from other sources). | 99.9 % |




In 2007, the International Telecommunication Union (ITU) initiated the process of creating a single Index which can be utilized in measuring the development of information society, the so-called ICT Development Index (IDI), which serves as a substitute for the previous two, namely the Digital Opportunity Index (DOI) and the ICT Opportunity Index (ICT-OI). This single IDI Index serves as a benchmarking tool for measuring:

- **the development of the ICT market in UN Member States**
- **digital divide between the developed and developing countries**
- **developmental potential of the ICT market**

This Index combines 11 indicators divided into three sub-groups:

1. ICT Readiness (infrastructure and access)
2. ICT use (primarily by individuals, but also households and undertakings) and the intensity of use
3. ICT Capability (skills necessary for the effective use of ICTs)

Given the fact that these three sub-groups of ICT development cannot be monitored by means of a single index, there is a necessity for the establishment of a single composite index for monitoring the development of information society in each country. Infrastructure, developed to meet the needs of end-users as well as an appropriate level of education, act as prerequisites for the use of ICTs and evolution towards an information society (Figure 13).

The list of 11 indicators is given in Table 7, along with reference (normalized) values prescribed by the ITU, sub-indices value and IDI Index value for the Republic of Serbia in 2012. The values of the sub-indices were calculated by normalizing the 11 indicators by means of reference values. The final value of IDI Index is calculated as a sum of sub-indices multiplied by weight coefficients. The ICT Access and ICT use sub-indices are given 40 per cent weight each, whereas the skill sub-index is given 20 per cent weight.

Figure 13. IDI structure Source: Measuring the Information Society - The ICT Development Index, ITU

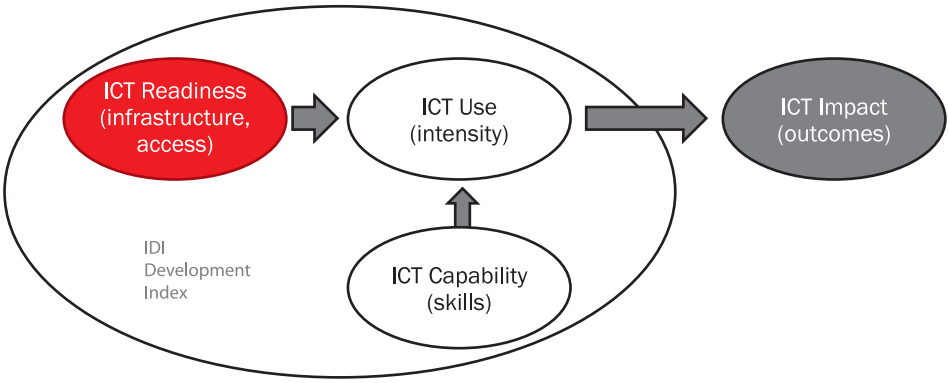



Table 7. 2012 IDI for the Republic of Serbia Izvor: RATEL

| | Indicator | ITU ideal value | Value for Serbia in 2012 |
|---|---|---|---|
| ICT Access | | | |
| a | Fixed telephone lines per 100 inhabitants | 60 | 41.29 |
| b | Mobile cellular telephone subscriptions per 100 inhabitants | 170 | 126.19 |
| c | International Internet bandwidth per Internet user | 280,377 | 121,372 |
| d | Proportion of households with a computer | 100 | 55.20 |
| e | Proportion of households with Internet access at home | 100 | 47.5 |
| ICT Use | | | |
| f | Internet users per 100 inhabitants | 100 | 40.96 |
| g | Fixed broadband Internet subscriptions per 100 inhabitants | 60 | 14.94 |
| h | Mobile broadband subscriptions per 100 inhabitants | 100 | 40.01 |




| | | | |
|---|---|---|---|
| ICT Skills | | | |
| i | Adult literary rate | 100 | 98 |
| j | Secondary gross enrolment ratio | 100 | 89.2 |
| k | Tertiary gross enrolment ratio | 100 | 43.8 |
| ICT Access – Normalized values | | Formula | |
| z1 | Fixed telephone lines per 100 inhabitants | a/60 | 0.69 |
| z2 | Mobile cellular telephone subscriptions per 100 inhabitants | b/170 | 0.75 |
| z3 | International Internet bandwidth per Internet user | log(c)/5.45 | 0.93 |
| z4 | Proportion of households with a computer | d/100 | 0.55 |
| z5 | Proportion of households with Internet access at home | e/100 | 0.48 |
| ICT Use – Normalized values | | Formula | |
| z6 | Internet users per 100 inhabitants | f/100 | 0.41 |
| z7 | Fixed broadband Internet subscriptions per 100 inhabitants | g/60 | 0.23 |
| z8 | Mobile broadband subscriptions per 100 inhabitants | h/100 | 0.40 |
| ICT Skills – Normalized values | | Formula | |
| z9 | Adult literary rate | i/100 | 0.98 |
| z10 | Secondary gross enrolment ratio | j/100 | 0.892 |
| z11 | Tertiary gross enrolment ratio | k/100 | 0.438 |
| L | ICT Access – Sub-index | y1+y2+y3+y4+y5 | 0.681 |
| y1 | Fixed telephone lines per 100 inhabitants | z1*0.2 | 0.14 |
| y2 | Mobile cellular telephone subscriptions per 100 inhabitants | z2*0.2 | 0.15 |
| y3 | International Internet bandwidth per Internet user | z3*0.2 | 0.19 |



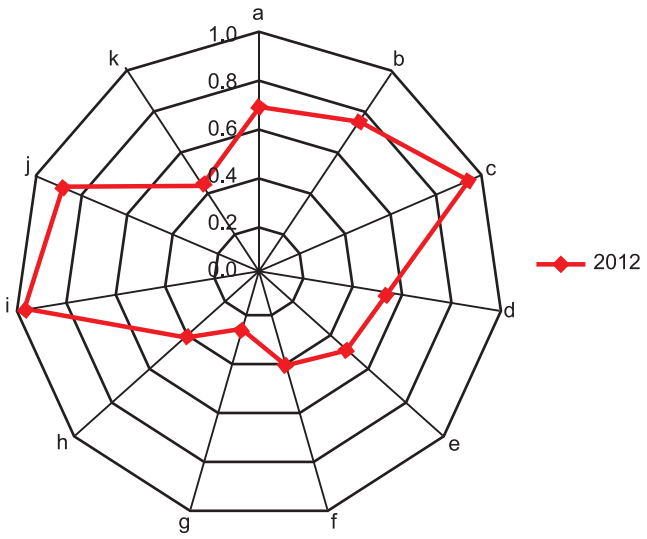
| | | | |
|---|---|---|---|
| y4 | Proportion of households with a computer | z4*0.2 | 0.11 |
| y5 | Proportion of households with Internet access at home | z5*0.2 | 0.10 |
| M | ICT Use – Sub-index | y6+y7+y8 | 0.343 |
| y6 | Internet users per 100 inhabitants | z6*0.33 | 0.12 |
| y7 | Fixed broadband Internet subscriptions per 100 inhabitants | z7*0.33 | 0.07 |
| y8 | Mobile broadband subscriptions per 100 inhabitants | z8*0.33 | 0.13 |
| N | ICT Skills – Sub-index | y9+y10+y11 | 0.762 |
| y9 | Adult literary rate | z9*0.33 | 0.32 |
| y10 | Secondary gross enrolment ratio | z10*0.33 | 0.29 |
| y11 | Tertiary gross enrolment ratio | z11*0.33 | 0.14 |
| IDI | ICT DEVELOPMENT INDEX | ((L*0.4)+(M*0.4)+(N*0.2))*10 | 5.62 |

The value of IDI Index for the Republic of Serbia in 2012 amounted to 5.62, which is a significant grow compared with 4.23 in 2008 and 4.80 in 2009, 5.10 in 2010 and 5.47 in 2011. Considering the ITU data for the previous years, it may be anticipated that Serbia will secure a place among the first 50 countries on the list based on the IDI Index value.

Figure 14 illustrates normalized values of 11 indicators with values ranging from 0 to 1, whereby 1 represents the maximum value of an indicator. The fact that ICT access indicators (a to e) have significantly higher values than ICT use indicators (f to h) is quite apparent and serves as an illustration of the disparity between the existing telecommunications infrastructure capacity and the use of such capacity in terms of telecommunications services transmitted by such infrastructure in Serbia, as is the case with the use of broadband Internet services. The value of ICT skills indicators (i to k) is satisfactory.




Figure 14. Graphical Representation of 11 Indicators (normalized values) Source: RATEL



# 3. PUBLIC FIXED TELECOMMUNICATIONS NETWORKS AND SERVICES



In 2012 the following operators were holders of the licence for public fixed telecommunications network and services:

- Telecommunications Company "Telekom Srbija" Joint Stock. Co. (Telekom Srbija) – licence to build, own and operate a public fixed telecommunications network and provide public fixed telecommunications network services provision – licence replaced in 2006;
- Telecommunications Company "Telekom Srbija" Joint Stock. Co. – licence for public fixed wireless access (FWA) network in 411.875-418.125/ 421.875-428.125 MHz frequency bands and voice services, data transmission services and simultaneous voice and data transmission – Licence issued in 2009;
- Media Works, Ltd. which changed the name in Orion telekom, Ltd. - licence for public fixed wireless access (FWA) network in 411.875-418.125/ 421.875-428.125 MHz frequency bands and voice services, data transmission services and simultaneous voice and data transmission – licence issued in 2009;
- Telenor, Ltd. – licence for public fixed telecommunications network and services. The operator was awarded the licence in January 2010.

Pursuant with Art. 149 of the Law, as of 1 January 2012, the provision of public fixed telecommunications network and services is under the general authorization regime. The service providers are required to ensure the following:

- Public telephone network and publicly available telephone service in compliance with the relevant recommendations of the International Telecommunications Union (ITU) E.164, G.101, G.105, G.107, and other recommendations from this group, the




Law and general bylaws of RATEL stipulating the quality parameters of the public voice service in the public telephone network (***service setup time, number of access line malfunctions, average repair time, unsuccessful call ratio, other services response time, bill correctness, complaints resolution time***, etc.);

- availability of the numbers from the national and international numbering plan and/or necessary geographic numbers;
- interconnection with other national and international operators, enabling the users to make and receive calls to and from the numbers in the national and international numbering plan;
- access to emergency services;
- security and integrity of the public communication network and services;
- QoS;
- end/user protection;
- special technical and organizational requirements (equipment and programme support), necessary for the confidence of electronic communications, lawful interception and data retention.

In addition, any future operator is required to fulfil the requirements stipulated under Articles 112 (*Itemised Billing*), 114 (*Cost Control*), 115 (*Call Identification*) and 116 (*Malicious or Nuisance Calls*) of the Law.

In 2012 two new operators were registered by RATEL for the provision of public telephone service over fixed network:

- Serbia Broadband - Srpske kablovske mreže d.o.o. (SBB) – registered under no. 12, as a public telephone service provider;
- Invest-Inženjering d.o.o. – registered under no. 88, as a public telephone service provider.



In 2012, Telekom Srbija was the biggest active operator of the fixed telecommunications network, its business activities being the most important segment of the fixed telephony market, both in financial and technical terms. In addition to the Serbian market, Telekom Srbija is also present in Republic of Srpska and Montenegro. On 25 January 2012, Telekom Srbija closed the agreement with O.T.E., thereby acquiring the ownership of the 20% of its original capital previously owned by O.T.E. Telekom Srbija remained an SMP operator based on the decisions stipulating the conditions for service provisions that had been adopted in late 2011. Telekom Srbija provided services over public fixed telecommunications network and public fixed wireless (FWA) telecommunications network and the operator Orion telekom provided the services over FWA network. By the end of 2012, in the operators' register kept by RATEL there were 283 FWA stations (99 were Orion telekom's and 184 Telekom Srbija's stations). Telenor provided the services over its own public fixed telecommunications network. SBB began with the service provision in 2012 and Invest-Inženjering is expected to launch the service in 2013.

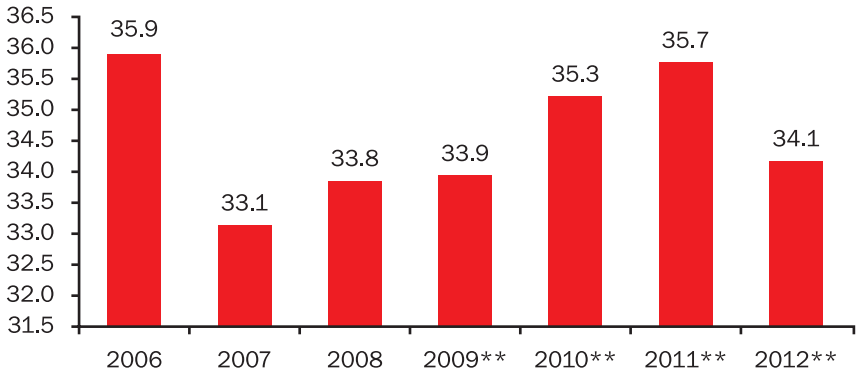
The total revenue from fixed telephone services provided by all operators (Telekom Srbija Orion telekom and Telenor) in the territory of the Republic of Serbia in 2012 amounted to 34.1 billion dinars. The revenues from the international traffic in 2012 amounted to 6.3 billion dinars, making the total revenue 40.4 billion dinars, which is 3.4 billion or 7.7% less compared with the previous year. A downtrend in the revenues from international traffic continued, as a result of more affordable solutions for making international calls.

The investments made in the fixed telephony in 2012 amounted to 5.8 billion dinars, the same as the previous year.

The largest share in the total revenues goes to the subscription charges, amounting to around 15.7 billion dinars and accounting for 39% of total revenues from the fixed telephone services, a share that is higher compared to the 34% in 2011. The share of the national traffic remained practically unchanged, whereas the revenues from the international traffic experienced the biggest drop, from 19% to 16%.

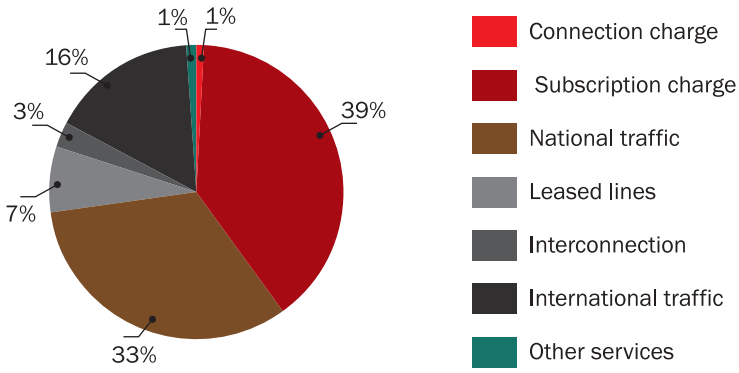



Figure 15. Growth tendency of revenues from fixed telephone services (in billions of RSD)
Source: RATEL




* Revenues from fixed telephone services in the territory of the Republic of Serbia including revenues from CDMA network
** Revenues from wholesale Internet services are illustrated within the chapter titled Internet Services and are therefore excluded from revenues from fixed telephone services

Figure 16. Distribution of revenues from fixed telephone services in 2012 Source: RATEL




Observing the types of services making up the total revenues from the fixed telephone services, the revenues from subscription charge, which increased by 16%, showed the biggest year-on-year growth. The revenues from the national traffic dropped by 13%, from the interna-



tional traffic by 21% and the revenues from the connection charges were reduced by nearly 50%. Other categories of revenues remained more or less the same as in the previous year. A significant cut in revenues from connection charges is a result of a smaller demand for new connections.

Local and national per-minute rates of each operator (VAT excluded) are given in Figure 17. Telekom Srbija's per minute call tariffs remained unchanged: local RSD0.92, national RSD1.41. The above rates apply to peak traffic, whereas off-peak traffic rates are 50% lower. The charges for calls made to mobile network. The prices of international calls remained unchanged for peak traffic (RSD9.1), whereas for off-peak traffic they are 33% lower. Per-minute local call charge was again among the lowest in Europe. Orion telekom's call charges remained unchanged, for local, national and calls made to mobile networks. Telenor raised the per-minute charges for calls to fixed network from 0.84 to 0.9 dinars, and reduced the charges for calls made to mobile networks of other operators 6.77 from to 6 dinars. The per-minute charge for calls made to Telenor's mobile network was 5 dinars. SBB offered calls within the same network free of charge, whereas the calls made to other fixed networks are charged RSD0.83 per minute, and calls made to mobile networks RSD7.5 per minute.

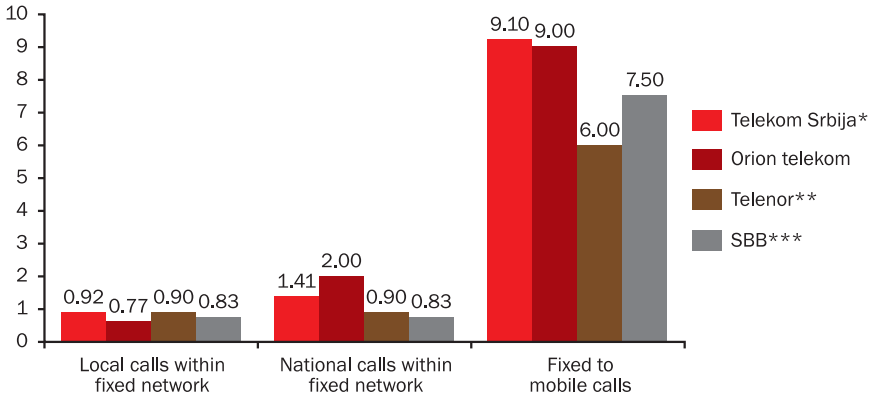
As of 1 October 2012, VAT was increased from 18% to 20%, which had impact on the operators' service rates charged to the users.

Telekom Srbija's international call charges remained unchanged and are given in Figure 18 along with SBB's charges.

The connection charge of Telekom Srbija Joint Stock Co. remained unchanged, in the amount of 5 000 dinars for residential and 10 000 dinars for business users, excluding VAT and the CDMA connection charge was 12 000 dinars. As for Orion telekom, the connection charge was reduced from 7 000 dinars to 4 165.83 for residential users and remained 70 euros for business users, excluding VAT. In 2011 Telenor reported the charge for residential users of 50 847 dinars, without VAT, whereas in 2012 there was no connection charge. SBB had a single price for both legal and natural entities and the connection charge was 3 325 dinars, excluding VAT.

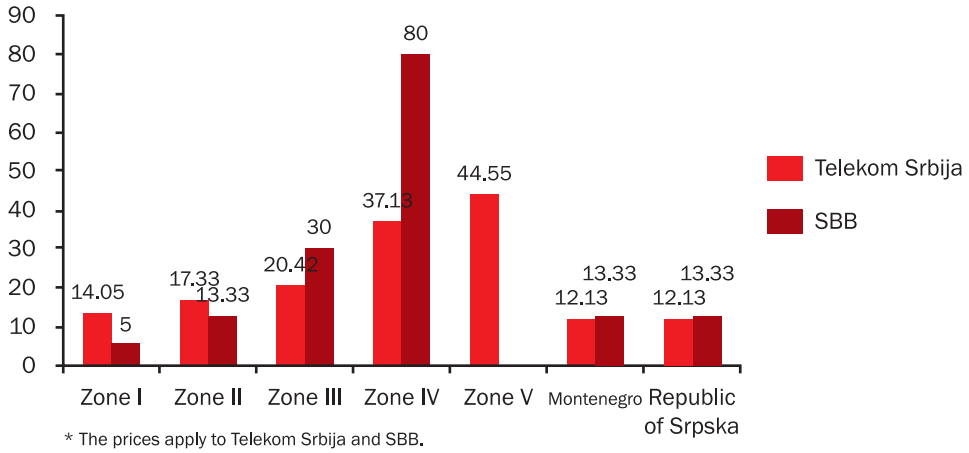



Figure 17. Prices of local, national and fixed-to-mobile telephone services, VAT excluded (RSD/min) in 201 2
Source: RATEL




* Telekom Srbija's rates apply to peak traffic, whereas off-peak traffic rates are 50% lower.
**Charges for calls to other mobile networks are given, except for Telenor
*** Local calls within home network are not charged.

Figure 18. Prices of International Telephone Services in 2012*, VAT Excluded (RSD/min)
Source: RATEL

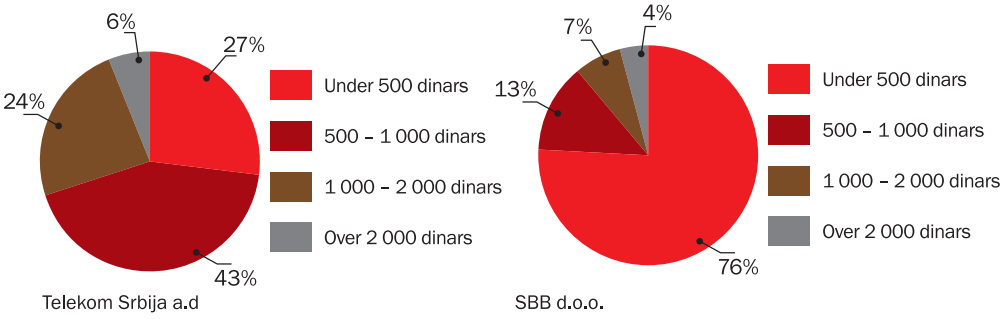



* The prices apply to Telekom Srbija and SBB.
**Note: Countries within the zones are different with the two operators.**
**List of countries categorized by zones is given at the following website:**
Telkom Srbija http://www.open.telekom.rs/home/Content.aspx?temp=0&sid=126&id=694
and SBB http://www.sbb.rs/Telefonija/5371/Medjunarodne+destinacije.shtml
Operator Orion telekom has not provided data on international traffic rates and Telenor provided price ranges for different packages.

The highest number of Telekom Srbija's residential users (around 53%) had monthly bills for fixed-line services ranging between 500 and 1,000 dinars, whereas the number of residential users paying less than 500 dinars makes 27% of the total number of subscribers. This means that the number of users with 500-1,000 dinars bill range was significantly reduced, whereas the number of users with bills under 500 dinars increased. There were 24% of residential users with monthly bills ranging between 1000 and 2000 dinars and only 6% with bills over 2000 dinars, the same as in 2011 (Figure 18).

SBB too had the highest number of users (76%) with bills under 500 dinars, around 7% had bills ranging from 1000 to 2000 dinars and less than 4% had monthly bills of over 2.000 dinars. Such distribution of subscribers is probably a result of the tariff policy of this operator, however an increased number of users will provide a real picture of the SBB users structure, in terms of monthly bills.

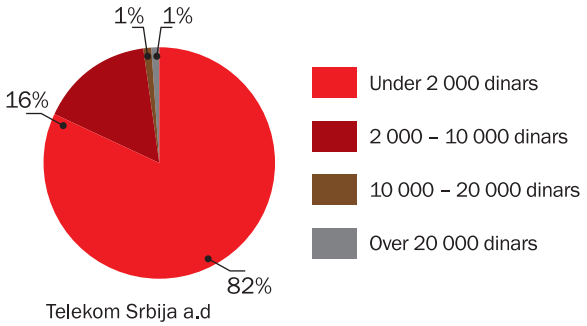
Figure 19. Distribution of residential subscribers according to monthly bills in 2012 Source: RATEL




As for business users, 82% of Telekom Srbija's subscribers had monthly bills under 2 000 dinars for fixed-line services, keeping the last year's level. The other business users were paying 2 000-10 000 dinars, while the number of users with higher bills is rather insignificant (Figure 20). The number of business users of other operators is considerably smaller and has no significant impact on the big picture of the distribution of business users according to bill amount.




Figure 20. Distribution of business subscribers according to monthly bills in 2012 Source: RATEL




Telekom Srbija a.d

The average monthly bill of Telekom Srbija's residential users in 2012 was reduced by 5% dropping from RSD989 to RSD942, mainly due to reduces traffic volume. The average monthly bill of Telekom Srbija for business users in 2012 was reduced by 9% dropping from RSD1996 to RSD1814, due to more affordable communication solutions available to this user category. Average bills of Telekom Srbija's CDMA network users were by 10% lower for residential users and by 35% lower for business users compared with the average bills of the Telekom Srbija's fixed-line users.

The average monthly bill of SBB's residential users was RSD820. The average monthly bill of Telenor's business users was RSD54 860, which is by 35% less than the previous year.

The number of main lines decreased compared with 2011, amounting to 2.99 million. Residential users still prevail with a 90% share in the total number of users, whereas the number of party-lines was reduced by 16%. The digitalization rate rose to 99.14% in 2012.

Fixed-line penetration rate was 41.29%.

In 2012 the number of public pay-phones dropped by 1111, amounting to 9051.

The breakdown of the number of ISDN connections in the period from 2005 to 2012 is given in Figure 24 below. The number of ISDN subscribers in 2012 was 75.1 thousand. Around 97% of ISDN subscribers have a basic rate access, whereas other users have primary rate

Figure 21. Number of main lines in fixed network (millions) Source: RATEL

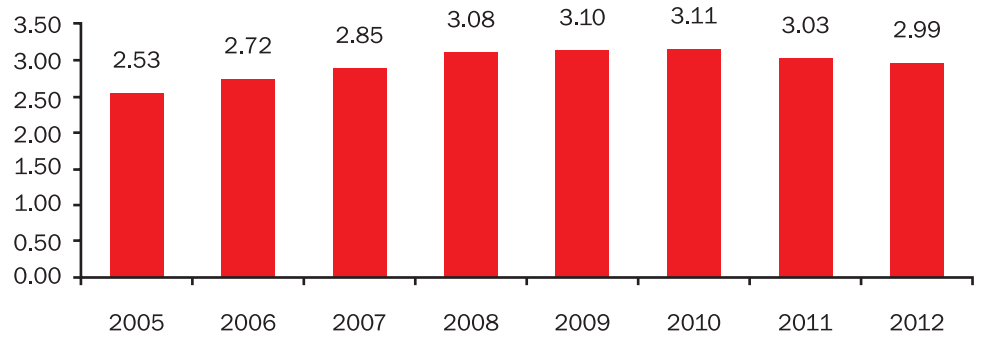



Figure 22. Fixed-line penetration rate Source: RATEL

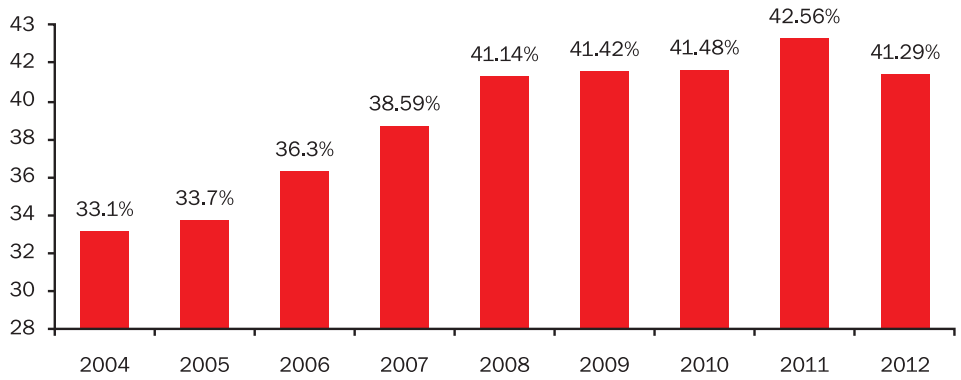
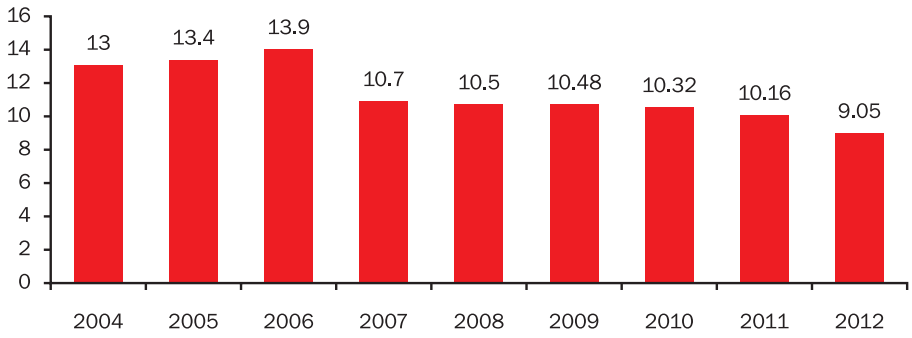


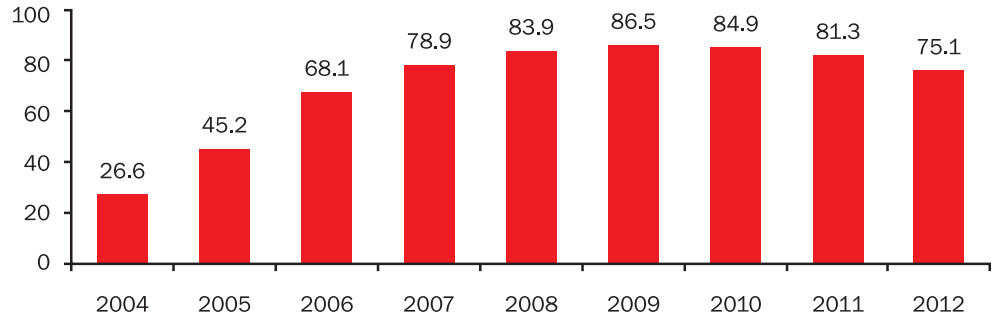

Figure 23. Number of public payphones (thousands) Source: RATEL





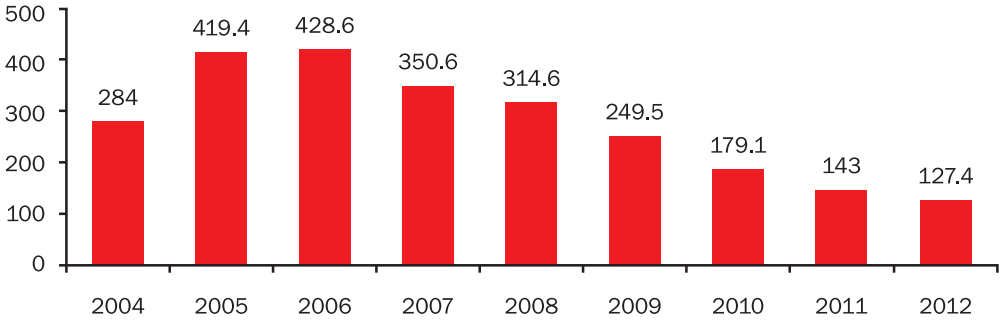

access. Residential users made up 61% of basic rate subscribers, whereas the rest were business users. Primary rate access was almost entirely used by business users. With the development of modern technologies and ADSL connections, ISDN connections are following a downtrend, as is reflected by the drop in the number of ISDN users.

Figure 24. Total number of ISDN subscribers (thousands) Source: RATEL



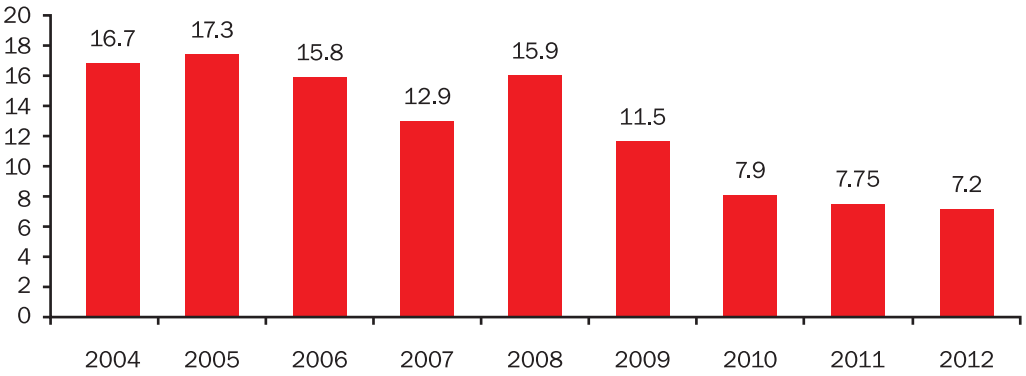

In 2011, the number of unmet requests for new fixed-line connections was around 127 thousand, this being a decrease of 1% compared with 2011. The number of malfunctions per 100 lines in 2012 was 15, compared with 25 recorded in 2011. The percentage of malfunctions repaired within 24 hours was 60%, which is an increase in respect to 81% in the previous year. Since other operators have a considerably smaller number of users, their data is incompatible with the data received from Telekom Srbija.

Figure 25. Number of requests for new fixed-line connections (thousands) Source: RATEL



The total fixed network traffic in 2012 was estimated to 7.2 billion minutes of national traffic and 800 million minutes of international traffic, which is an overall decrease of 7% compared with 2011. As shown in Figure 26, the traffic volume varied considerably in the observed period, following a downtrend, primarily due to other types of services being offered, such as mobile network, electronic messaging or VoIP, etc.

Figure 26. Total fixed network traffic (in billions of minutes) Source: RATEL




The average call duration of 3.06 minutes.

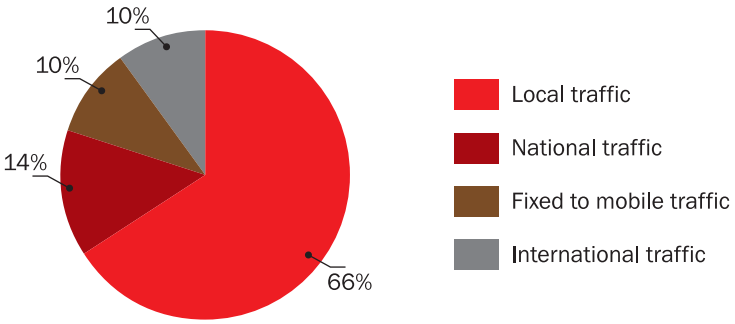
The total number of minutes of fixed network traffic is estimated on the basis of data from the exchanges where it is possible to register the consumed call-units or minutes. Such data are extrapolated according to the total number of users in the network. Out of the total fixed network traffic, 73% was local traffic, which is an almost identical to the 2011 data.

Compared with the previous year, the share of local traffic was 66%, the share of long-distance traffic remained 14%. The share of fixed-to-mobile traffic was 10% and the share of the total traffic in the total traffic was 10%.

International traffic makes up around 10% of the total fixed network traffic and it was decreased both in volume and share in the total traffic. This is a direct result of the advent of new technologies and operators providing services at an international level.




Figure 27. Distribution of fixed network traffic in 2012 Source: RATEL




There were no significant changes in the number of VoIP operators in 2010. There were 80 000 registered users and 23.03 million of minutes of traffic, where a 50% share goes to international outgoing traffic and 50% to the international transit. The volume of the outgoing international traffic realized through VoIP operators was 100 times smaller than outgoing international traffic realized through the capacities of Telekom Srbija.

There were around 66 000 users of VoIP operators registered 2012, which is a decrease of 24% compared with the previous year. Of the 18.5 million minutes of traffic, a 30% share went to the international transit. The traffic volume decreased considerably, mainly due to reduced international transit.

# 4. PUBLIC MOBILE TELECOMMUNICATIONS NETWORKS AND SERVICES



There were three mobile operators in 2012 in the mobile market in the Republic of Serbia:

- **Telecommunications Company Telekom Srbija Joint Stock Co. - Mobilna telefonija Srbije MTS, 58.11% owned by the Republic of Serbia – the Government of the Republic of Serbia, 20% owned by Telekom Srbija, 14.95% owned by the citizens of the Republic of Serbia and 6.94% owned by the current and former employees of Telekom Srbija and its predecessor[1] (licence replaced on 01. 08. 2006)**
- **Telenor Ltd., Belgrade, 100% owned by Telenor A/S, Denmark, (licence issued on 01. 09. 2006)**
- **Vip mobile Ltd., 100% in the ownership of Mobilkom CEE Beteiligungsverwaltung GmbH, Austria (licence issued on 01. 12. 2006)**

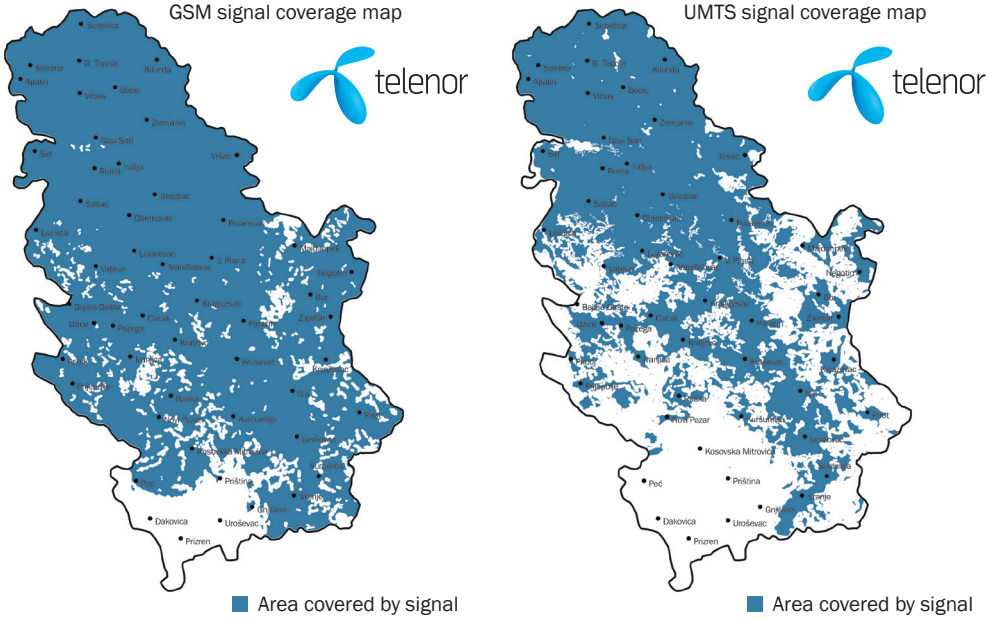
All three operators were granted licences for public mobile telecommunications networks and public mobile telecommunications network services in accordance with GSM/GSM1800 and UMTS/IMT-2000 standards, issued by RATEL. The licences were issued for the territory of the Republic of Serbia, for a period of 10 years, which, upon expiration, may be extended for another 10 years without a special request from the operator, provided the requirements under the licence are fulfilled.

The Norwegian company Telenor has been present in the Serbian telecom market since 31 July 2006, when they bought the company Mobi63, through a bidding procedure, making the biggest direct foreign investment in Serbia so far. Telenor Ltd. is a part of Telenor Group, present in 11 countries across Europe and Asia and another 19 countries through ownership in VimpelCom. The mobile operators from Telenor Group present in the neighbouring countries are Telenor Hungary (ex Panon) and Telenor Montenegro (ex Promonte). In 2007 Telenor began with the commercial use of the UMTS network, enabling video calls and additional services based on high-speed data transmission. In 2012, Telenor built 463 new base stations.

[1] Source: www.telekom.rs



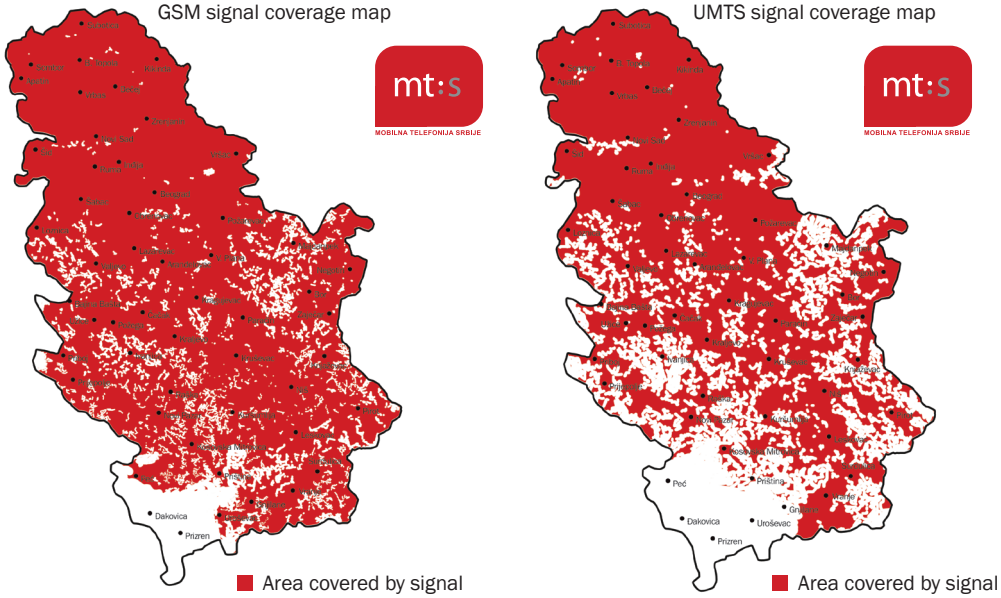

Figure 28. Mobile operator – Telenor — Source: Telenor d.o.o.




| Official data | |
|---|---|
| Name | **Telenor Ltd.** |
| Head office | Belgrade |
| Ownership | 100% Telenor A/S, Denmark |
| Percentage of territory covered by GSM network signal | 90.11% |
| Percentage of population covered by GSM network signal | 99.02% |
| Percentage of territory covered by UMTS network signal | 58.22% |
| Percentage of population covered by UMTS network signal | 80.04% |
| Number of base stations | 2,686 |

MTS - Mobilna telefonija Srbije, as a branch of the Telecommunications Company Telekom Srbija Joint Stock Co., was founded in June 1997 and it began to operate through a GSM standard

Figure 29. Mobile operator – Telekom Srbija, Joint Stock Co. Source: Telekom Srbija




| Official Data | |
|---|---|
| Name | **Telecommunications company "Telekom Srbija" Joint Stock Co.** |
| Head office | Belgrade |
| Ownership | 58.11% the Republic of Serbia – the Government of the Republic of Serbia, 20% Telekom Srbija, 14.95% the citizens of the Republic of Serbia and 6.94% current and former employees of Telekom Srbija and its predecessor |
| Percentage of territory covered by GSM network signal | 88.45% |
| Percentage of population covered by GSM network signal | 99.7% |
| Percentage of territory covered by UMTS network signal | 74.94% |
| Percentage of population covered by UMTS network signal | 90.4% |
| Number of base stations | 3.414 |



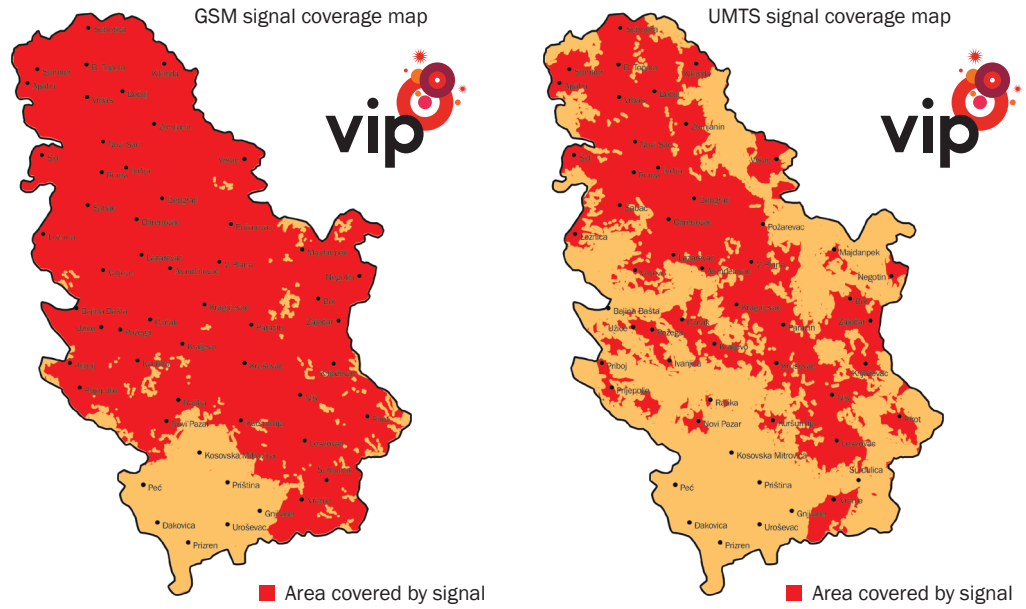

based network in August 1998. In addition to Serbian market, Telekom Srbija is also present as a mobile operator through daughter companies in Republic of Srpska and Montenegro.

In December 2006, MTS began with the commercial operation of a 3G network with the latest HSDPA technology. During 2008, the operation of the 3G network was intensified.
In 2012, Telekom Srbija built 351 new base stations.

Vip mobile Ltd., the holder of the third mobile network licence, is a member of the obilkom Austria Group/Telekom Austria Group, present in eight European countries, including the following countries in the region: Croatia, Bulgaria and Macedonia.

In addition to 320 million and 1 euros paid for the licence, Mobilkom Austria made considerable investments in the development of infrastructure and hired a great number of professionals. In 2012, Vip mobile Ltd. built 205 new base stations.

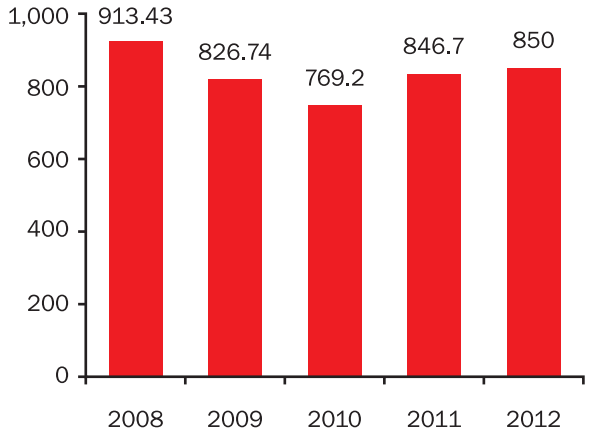
Figure 30. Mobile operator – Vip mobile Source: Vip mobile



| Official data | |
|---|---|
| Head office | **Vip mobile Ltd.** |
| Ownership | Belgrade |
| Percentage of territory covered by GSM network signal | 100% Mobilkom CEE Beteiligungsverwaltungs GmbH Austria |
| Percentage of population covered by GSM network signal | 83.50% |
| Percentage of territory covered by UMTS network signal | 98.42% |
| Percentage of population covered by UMTS network signal | 31.70% |
| Number of base stations | 71.81% |
| Head office | 2,365 |

The revenues from mobile networks in 2012 were RSD96 billion or 850 million euros. In the national currency (RSD), the revenues were increased by 11% in respect to the previous year when the total revenues from mobile telephony service amounted to 86.5 billion dinars, whereas the revenues observed in euros showed a minor growth. However, it should be noted that the difference in the revenues in the two currencies is a consequence of the decrease in the average exchange rates for euro in 2012, compared with the previous year. The total investments in the mobile market were lower in respect to the previous year amounting to 12.7 billion dinars.

Figure 31. Total revenues from mobile telephony (million euros) Source: RATEL

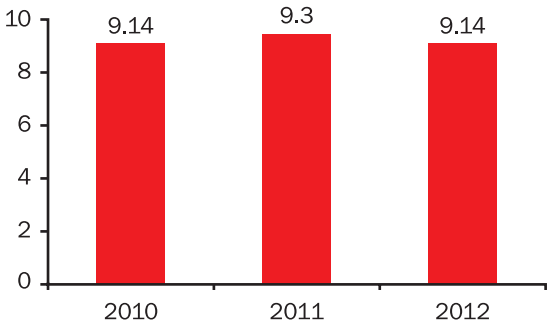





***9.14 million users***

The total number of mobile users in the end of 2012 amounted to 9 137 890. The number of users includes postpaid and active prepaid users, with registered incoming or outgoing traffic in the last 3 months in 2012 (pursuant to the ITU definitions).

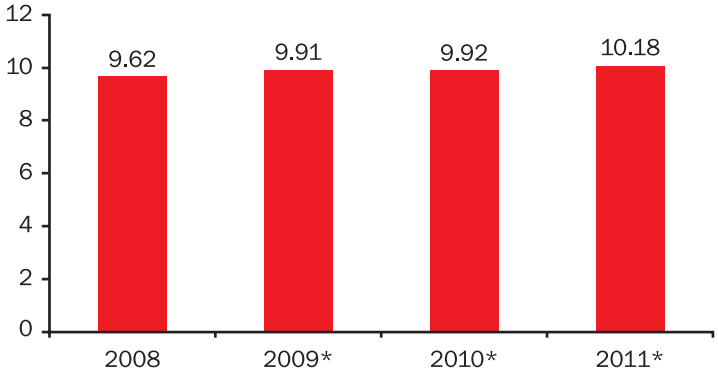
Figure 32. Total number of active mobile users (millions)




* Total number of prepaid and postpaid users active in the last 3 months of 2012

Total number of mobile users is given in Figure 33.

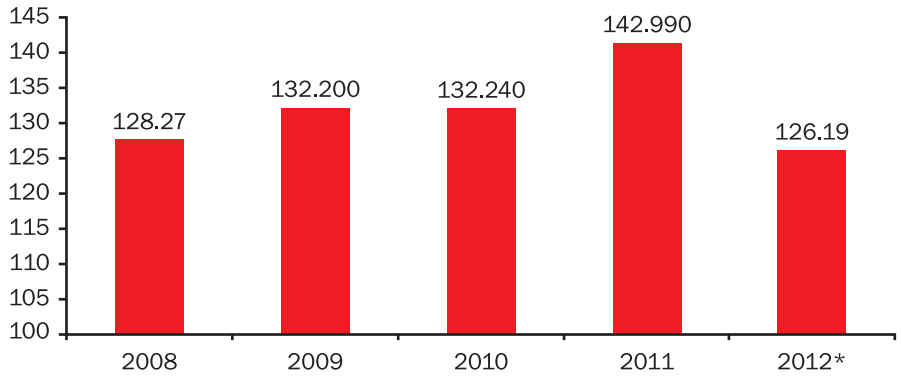
Figure 33. Total number of mobile users (millions) Source: RATEL




* Total number of prepaid users is indicated for Telekom Srbija

The number of mobile users was again higher than the number of inhabitants with 126.19% penetration rate.

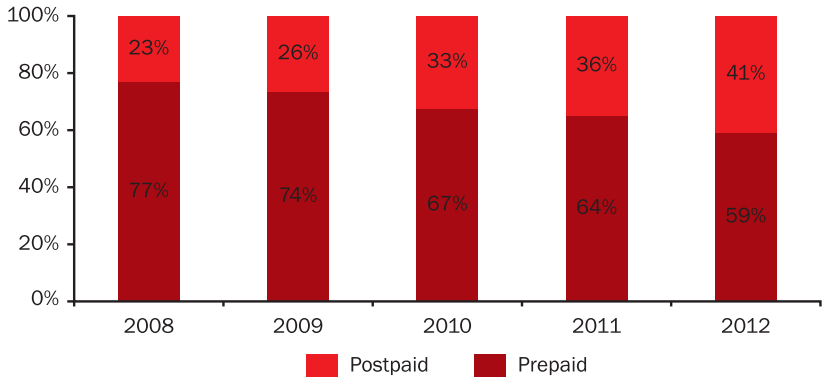
Figure 34. Mobile penetration rate Source: RATEL




* Prepaid and postpaid users active in the last 3 months of 2012 for all three operators

If we observe the prepaid/postpaid users ratio, the advantage goes to the prepaid users, yet the share of the postpaid users is growing year after year, amounting to 41% in 2012 (Figure 35). Since 2010, the calculation includes only those prepaid the users active in the last 90 days, pursuant to the revised ITU indicators definitions.

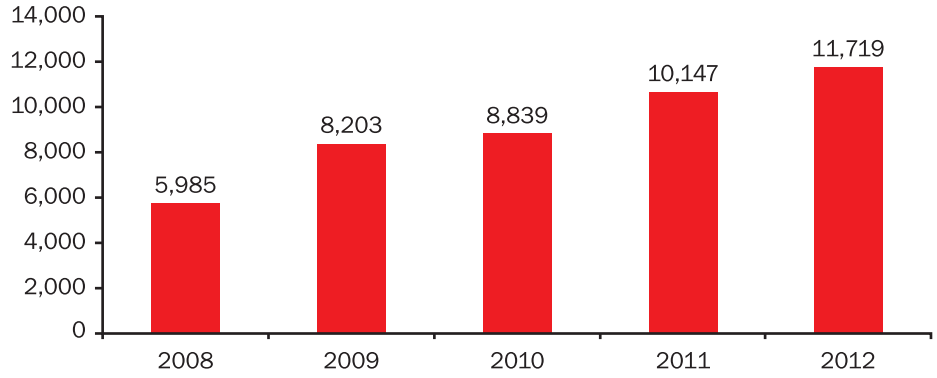
Figure 35. Prepaid/postpaid ratio Source: RATEL





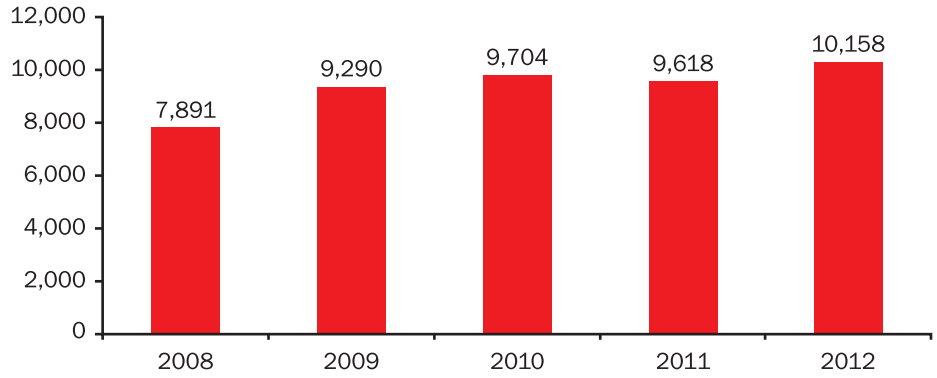

In 2012 the total outgoing traffic on the mobile network amounted to 11.72 billion minutes of calls, which is an increase of approximately 15.5% compared with the previous year. The annual average of traffic per user in 2012 was 1 282 minutes or approximately 3 minutes and 30 seconds daily.

Figure 36. Total outgoing traffic (millions of minutes) Source: RATEL



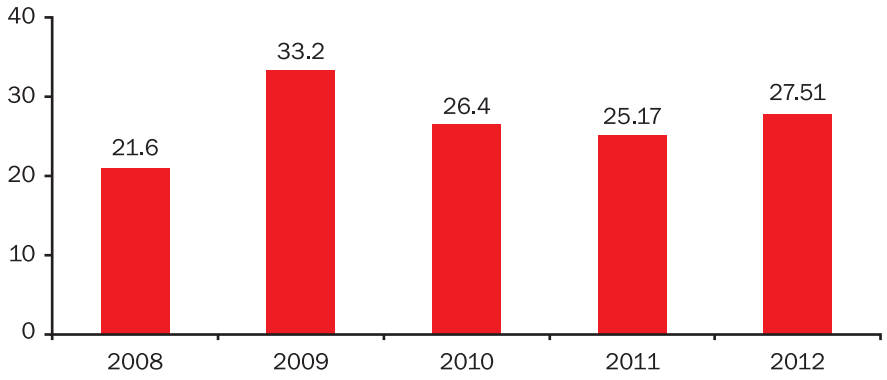

In 2012 there was an increase in the number of sent SMSs and MMSs. The total of 10.16 billion SMSs were sent in 2012, which is a 5.6% growth compared with 2010 when 9.6 SMSs were sent. The average per user in 2012 was 1 111 SMSs a year or 3

Figure 37. Number of SMS messages sent (millions) Source: RATEL



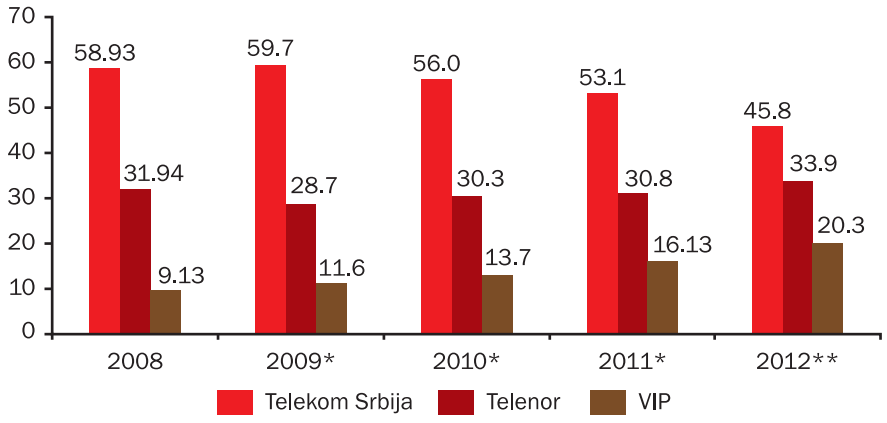
SMSs a day. In 2012, there were 27.51 million MMSs sent, which is an increase of 9.3% in respect to 2011.

Figure 38. The number of MMS messages sent (millions) Source: RATEL




Figures 39. to 43. show the market share of mobile operators in terms of the number of users, share of each operator in the total mobile telephony revenues and share in the total outgoing traffic and the number of sent massages - SMS and MMS.

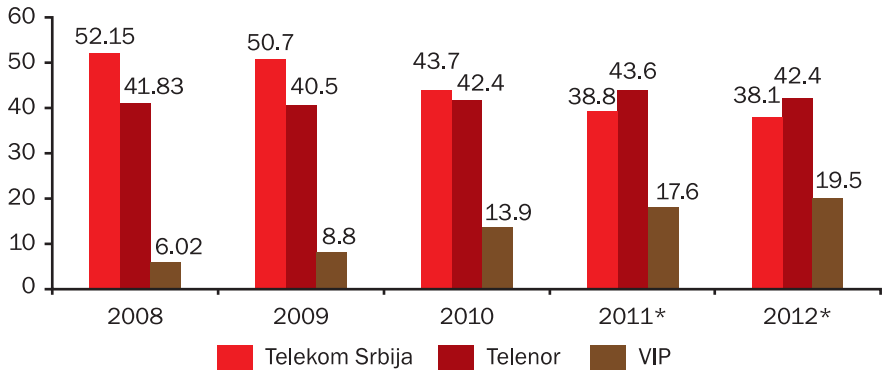
Figure 39. Market share in terms of the number of users (%) Source: RATEL




* The data for Telekom Srbija comprises the total number of prepaid users
** Market share for all three operators shows concerns prepaid and postpaid users active in the last 3 months of 2012




Figure 40. Share in the total revenue from mobile services (%) Source: RATEL




* If the internal calculation between business segments of Telekom Srbija were taken into account, their share in the total revenues from mobile telephony would amount to 41.35% in 2011 or 39.4% in 2012.

Figure 41. Share in the total outgoing traffic (%) Source: RATEL

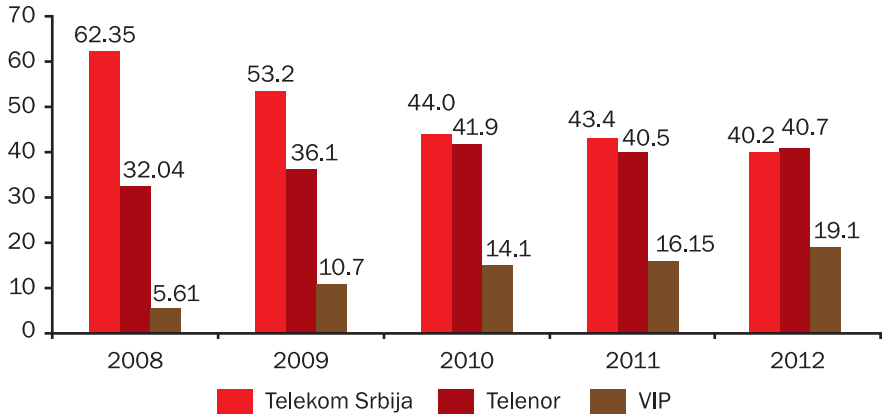


Figure 42. Share in the total number of sent SMSs (%) Source: RATEL

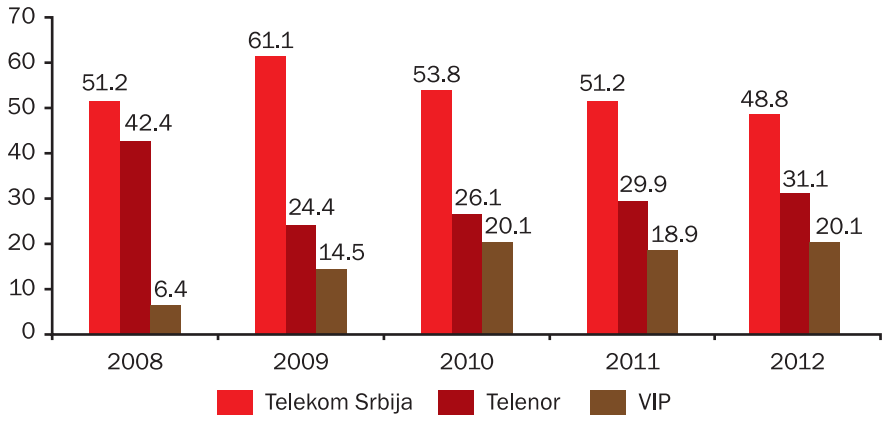
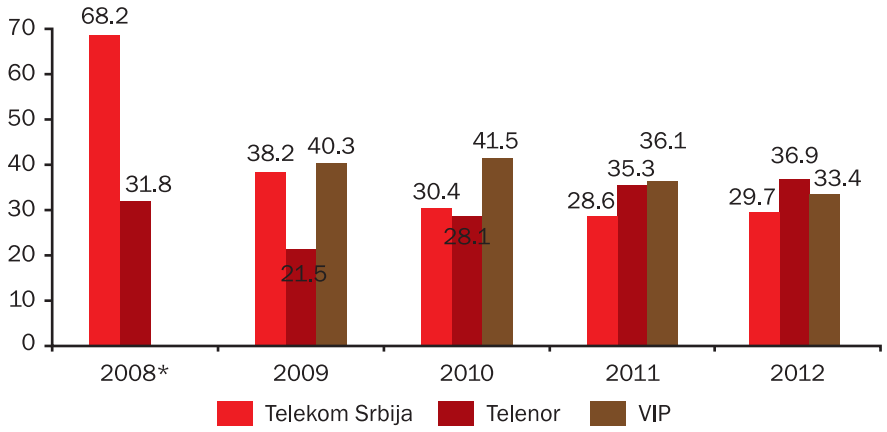



Figure 43. Share in the total number of sent MMSs (%) Source: RATEL




* Data on MMS for 2008 do not include data for Vip mobile

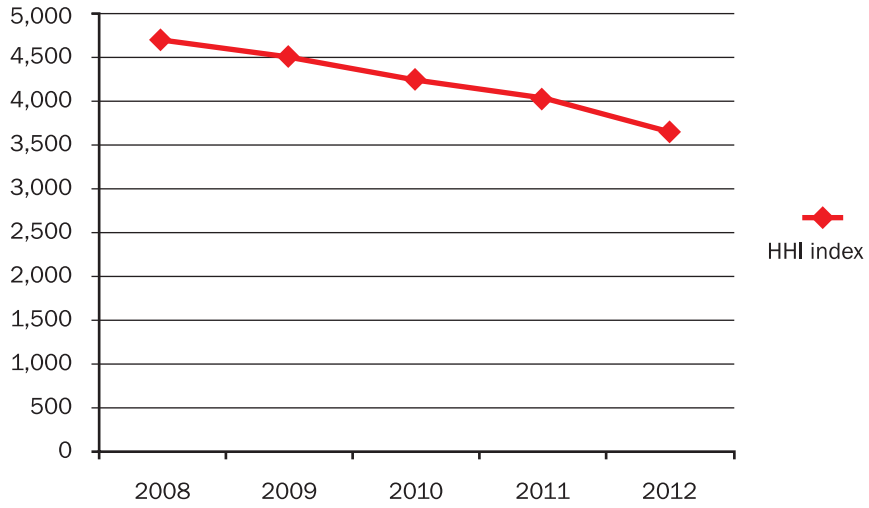



HHI (Herfindahl Hirschman Index) is an indicator used for determining the degree of concentration of a given market and it is defined as the sum of the squares of the market shares of each individual market share. The market share was identified by the number of users.

Table 8. HHI values in the period 2008– 2012

| | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| HHI | 4684 | 4520 | 4239 | 4025 | 3656 |

Figure 44. HHI values in the period 2008-2012

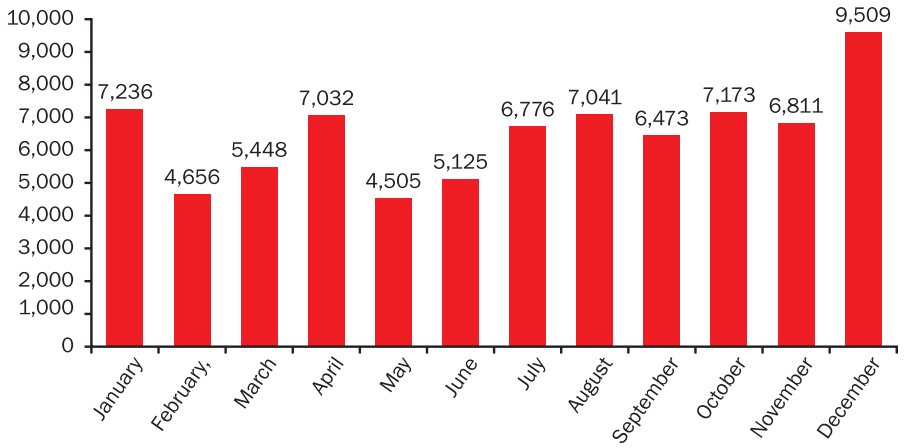



The value of HHI was reduced in the observed period, indicating a decrease in the market concentration and the increase in the competition between operators year after year.

In 2012 the number of ported numbers on mobile networks varied between 4 505 in May and 9 509 in December, with a monthly average of 6 500 of ported numbers.

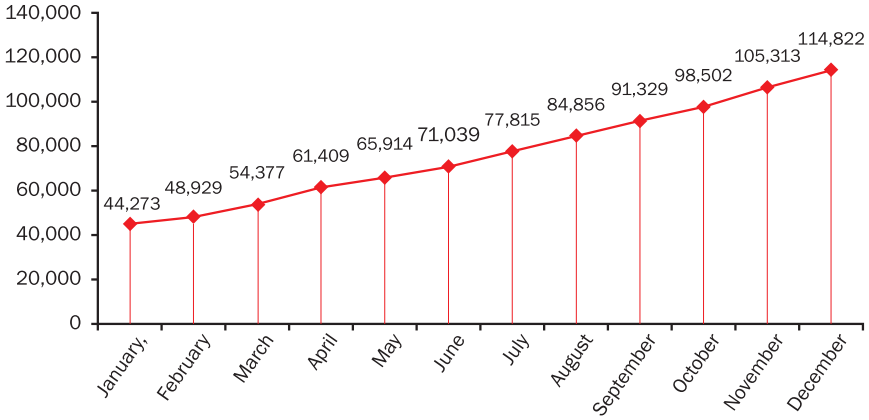
In early 2012, there were 37 037 users who had changed the operator keeping the same telephone number, whereas in the end of the year they amounted to 114 822. The fact that

Figure 45. Number of numbers ported in 2012 by month Source: RATEL




mobile users continued using number portability when switching to another operator with the same intensity, shows that it is an important mechanism for the enhancement of competition, which makes it easier for users to change the operator and provides the possibility to choose more favourable conditions.

Figure 46. Total number of ported numbers over the year 2012 Source: RATEL






# 5. INTERNET SERVICES

Internet technologies of today represent the most efficient support to the development of information society but also an indispensable segment of the modern society. Information technologies are a critical factor for economic growth and development of each country. In order to exploit in full the potential of all digital technology services, particularly those such as e-Economy, e-Commerce and e-Administration, an affordable and easy access to telecommunications infrastructure, particularly to broadband Internet, should be provided to all business enterprises and citizens.

The Internet market in the Republic of Serbia has been experiencing expansion for years. This refers in particular to the number and structure of the Internet connections and the total revenues from the Internet service provision. The structure of the Internet connections was as expected concerning the growing quantity of data exchanged via Internet and the growing demands by the end-users in terms of speed and easy Internet access.

The Internet market in 2012 maintained a positive growth trend from the previous years. This trend began in 2008 when the number of broadband connections exceeded the number of dial-up connections, which continued in 2012. The total number of broadband connections in the Republic of Serbia in 2012 amounted to over 1.3 million (without accounting for 3G network subscribers), which equals 98.5% of all Internet connections (without accounting for 3G network subscribers). Such allocation of Internet connections is a consequence of the growing demands of end-users who use the Internet for business or leisure, which implies an increasing volume of the data exchanged via Internet.

ADSL access represented the dominant Internet connection in 2012 with around 650 thousand connections, accounting for 50% of all broadband connections (without 3G network subscribers). In addition to the ADSL, other means available for the Internet access were cable modem, which is another service provided by the CATV operators, directly, via Ethernet, via optical cable, by means of wireless access in the 2.4 GHz and 5.8 GHz unlicensed frequency bands, less often using the 3.4-3.6 GHz frequency band, as well as by UMTS (3G) network of the mobile operators (either via cell phone, or by means of special 3G modems).

In December 2012, there were 222 Internet service providers (ISPs) registered in Serbia. Table 9 indicates that the number of ISPs according to the Internet access provided to end-users.

Table 9. Number of ISPs according to Type of Access — Source: RATEL

| | 2008 | 2009 | 2010 | 2011. | 2012. |
|---|---|---|---|---|---|
| Dial-up | 48 | 36 | 42 | 29 | 18 |
| Cable modem | 22 | 20 | 22 | 21 | 22 |
| Opticle cabl | / | 3 | 11 | 11 | 12 |
| Ethernet | / | 24 | 25 | 14 | 10 |
| Wireless | 82 | 78 | 115 | 109 | 95 |
| ADSL | 21 | 27 | 23 | 21 | 13 |

Table 10. Total Number of ISPs — Source: RATEL

| | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| ISPs | 197 | 199 | 192 | 232 | 222 |

The continued expansion of the Internet market is reflected, not only by the increase in the number of users (Internet connections), but also by the constant increase in the total revenues from the Internet service provision in the past years. The total revenues in 2012 grew by 20% in respect to 2011, amounting to approximately 18 billion dinars[2]. If the total revenues from the Internet service provision in 2012 are compared with the total revenues in the previous years, a continuous growth trend of the Internet market in Serbia is evident: the total revenues in 2012 were twice higher than in the 2008 revenues.

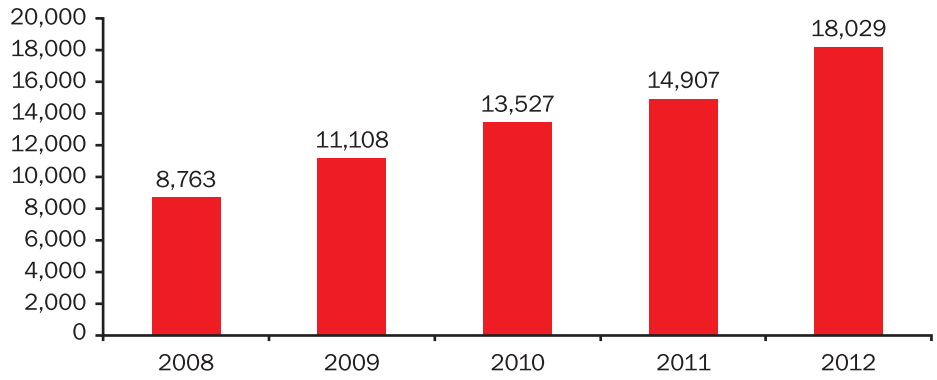
The total number of Internet subscribers in 2012 amounted to approximately 3.8 million. However, if we consider the availability of Internet access using 3G mobile network (via cell phone), the total number of potential subscribers in 2012 amounted to 5 million, which is an increase of 30% year-on-year.

The total number of broadband connections in Serbia in 2012 was 1.35 million (3G mobile network users excluded), which is approximately 10% more than in 2011 (the year-on-year

[2] The total revenues include the revenues from the Internet wholesale



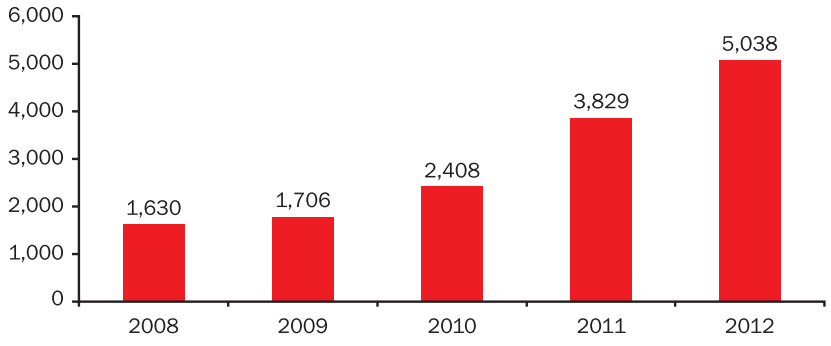

Figure 47. Internet service revenues (millions of RSD) Source: RATEL




growth in 2011 was by 20%). The 5.8% increase in the number of subscribers who accessed the Internet using ADSL modem is moderate compared to 16% increase in 2011. The increase in the number of subscribers accessing the Internet via cable modem by 16%, compared with 2011 when the year-on-year increase was 10%.

A considerable increase was seen in the number of broadband users of mobile 3G modem. The number of subscribers is eleven times higher than in 2008 when this type of access first

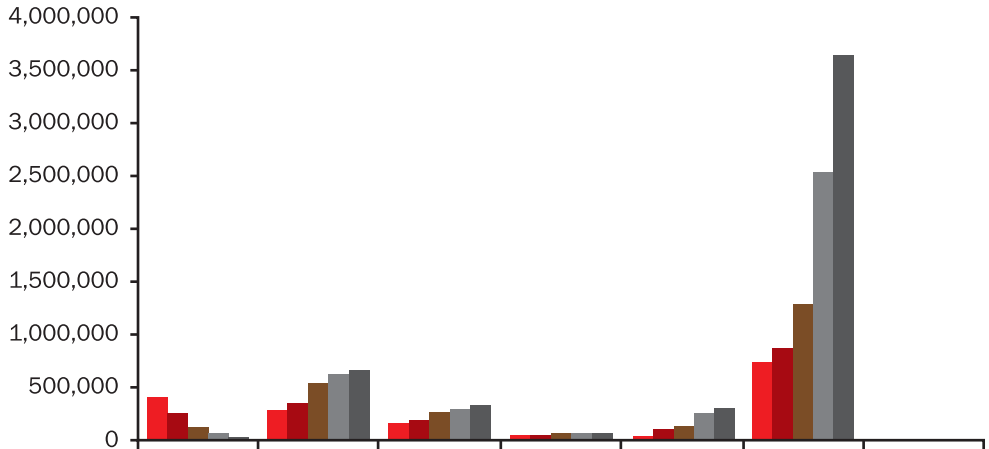
Figure 48. Number of potential Internet users in thousands* Source: RATEL




*3G network subscribers included.

became available in the Republic of Serbia, amounting to 290 thousand in 2012, with the share in the total number of broadband users of 21% (excluding 3Gnetwork subscribers).

Figure 49. Internet useres according to the access technology Source: RATEL



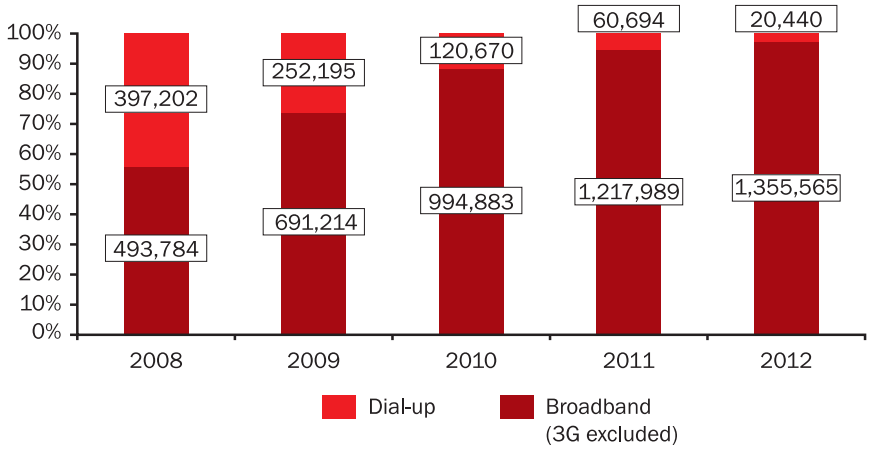

| | Dial-up | ADSL | Cable modem | Wireless access | Mobile Internet | 3G network subscribers* | Other |
|---|---|---|---|---|---|---|---|
| 2008 | 397,202 | 267,876 | 151,154 | 48,130 | 25,489 | 738,401 | 1,135 |
| 2009 | 252,195 | 351,252 | 187,923 | 45,864 | 100,628 | 762,307 | 5,547 |
| 2010 | 120,670 | 536,796 | 260,474 | 58,305 | 131,475 | 1,291,887 | 7,783 |
| 2011 | 60,694 | 623,611 | 285,413 | 53,754 | 249,542 | 2,550,038 | 5,669 |
| 2012 | 20,440 | 659,878 | 331,281 | 62,013 | 291,588 | 3,662,919 | 10,805 |

*3G network subscribers without mobile Internet

In view of the growing demand for high bit-rate data transmission, the number of dial-up connections has been dropping significantly year after year. In 2006 the total number of dial-up subscribers amounted to 882 thousand accounting for 88% of the total number of Internet subscribers, whereas in 2012 the number dropped to 20 thousand, or 1.5% of the total number of Internet connections.

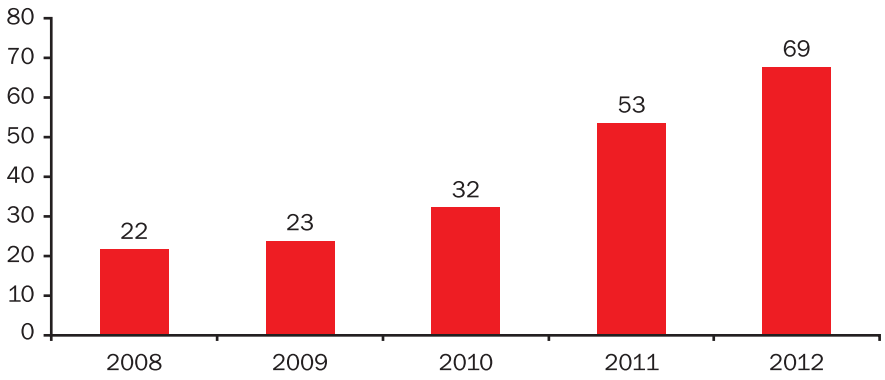



Figure 50 . Share of the Internet connections (3G mobile network subscribers excluded ) Source: RATEL




In 2012, the number of Internet connections per 100 inhabitants was approximately 69, which roughly corresponds to the number of broadband Internet connections per 100 inhabitants, in view of the rather low share of narrowband connections. However, if the 3G mobile network subscribers are excluded from the total number of broadband subscribers, broadband penetration amounts to nearly 17%. Fixed broadband penetration was around 15%,

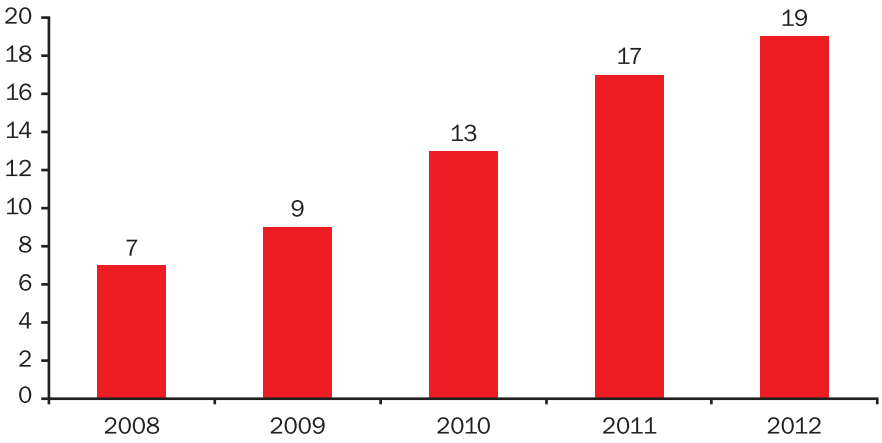
Figure 51. Internet Penetration Rate * Source: RATEL




* 3G mobile network subscribers included.

which is a decent percentage compared with the countries in the region, but still below EU average (according to the available data for 2011, the average for EU candidate and potential candidate countries was 11% and the EU average was 28.2%)[3].

Figure 52. Broadband penetration rate Source: RATEL




The above facts lead to the conclusion that the Internet sector growth in Serbia is constant, both in terms of total revenues and the number of broadband users. The choice of access technology revealed a step-up towards broadband services usage, reflected in the constant increase of ADSL, cable and mobile Internet access users as well as in the continuous decrease in the number of dial-up users.

The increased competition in the broadband market and the growing user demands led to an improved quality of Internet service provision, reflected in the constant growth of high bitrate connections. Table 11 illustrates the tariffs of some packages available in the market.

Table 11. Monthly supscription fees for permanent internet connection in 2009, 2010, 2011 and 2012

| 2009 | | |
|---|---|---|
| **Access bitrate** | Access Technology | Amount of monthly subscription fee for permanent Internet access (VAT included) in RSD |
| **1024/128 Kbps** | ADSL | 1,425.44 |

[3] Source: Supply of services in monitoring regulatory and market developments for electronic communications and information society services in Enlargement Countries 2011-2013 – April 2013, Cullen International.




| | | |
|---|---|---|
| **1536/128 Kbps** | Cable | 1,390.00 |
| **1024/256 Kbps** | Wireless (2.4 GHz) | 1,299.00 |
| **5 GB free of charge, and RSD3.84 for every additional MB** | Mobile Network | 1,480.00 |
| **2010** | | |
| **Access bitrate** | Access Technology | Amount of monthly subscription fee for permanent Internet access (VAT included) in RSD |
| **1536/256Kbps** | ADSL | 1,532.82 |
| **4096/256 Kbps** | Cable | 1,390.00 |
| **1536/256Kbps** | Wireless (2.4 GHz) | 1,186.00 |
| **5 GB free of charge, and RSD3.00 for every additional MB** | Mobile Network | 1,050.00 –1,364.00 |
| **2011** | | |
| **Access bitrate** | Access Technology | Amount of monthly subscription fee for permanent Internet access (VAT included) in RSD |
| **1536/256Kbps** | ADSL | 1,532.82 |
| **6144/512Kbps** | Cable | 1,540 |
| **2048/256 Kbps** | Wireless (2.4 GHz) | 1,000 |
| **6 GB free of charge, and RSD1.00 for every additional MB** | Mobile Network | 1,050.00 |
| **2012** | | |
| **Access bitrate** | Access Technology | Amount of monthly subscription fee for permanent Internet access (VAT included) in RSD |
| **5120/1024Kbps** | ADSL | 1,549 |
| **10240/1024Kbps** | Cable | 1,566 |
| **3072/512 Kbps** | Wireless (2.4 GHz) | 1,599 |
| **3 GB with full access bitrate included in the price** | Mobile Network | 690 |

Note: the price lists were taken from the websites of the undertakings and apply to residential users; each package has additional costs and technical requirements pertinent to the closing of subscription contracts and establishment of connection; some of the packages require subscription contracts that entail specific obligations over a specified period of time.

# 6. USAGE OF ICTs IN SERBIA



The development and usage of ICTs have transformed the modern society into “information society”. The main feature of this society is that ICTs have the main role in both economy and manufacturing, as well as in all segments of the life of an individual and the society as a whole.

Surveys on the use of information-communication technologies by individuals, households and companies in Serbia are regularly conducted by the Statistical Office of the Republic of Serbia. The survey was carried out according to the Eurostat methodology in the territory of the Republic of Serbia. However, the data do not include the data for AP Kosovo and Metohija.

In 2012, the survey was conducted by telephone on the sample of 2,400 individuals, 2,400 households and 1,200 companies.

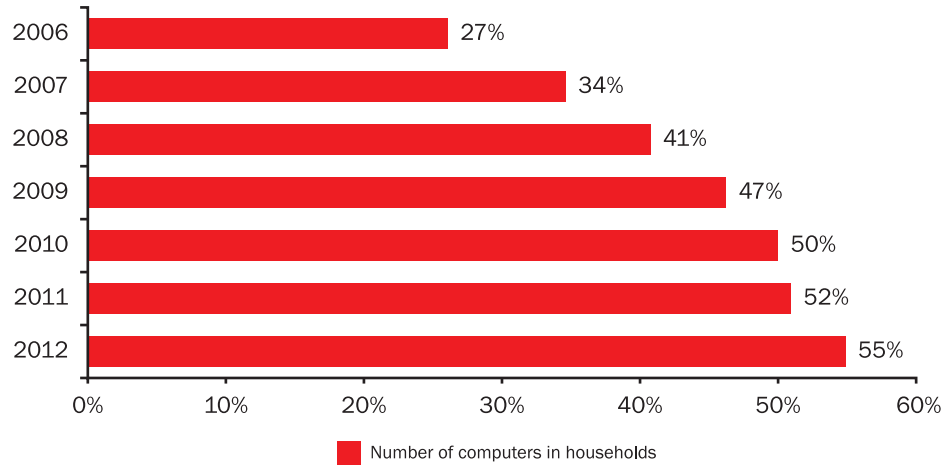
As expected, the growth trend of households with a computer continued in 2012. There were 55.20% of the households that owned a computer, which is an increase of 3.10% in respect to 2011 and 4.8 compared with 2010. The incidence of computers in households varies depending on different territorial areas: Belgrade 66.2%, Vojvodina 56.3% and Central Serbia 49.5%.

The incidence of computers in households also varies between urban areas (63%) and rural areas (43.9%) in Serbia. The gap is slightly larger compared to the previous year, since the number of households with computer in urban areas grew by 2.2%, while in rural areas the increase was 4.2%.

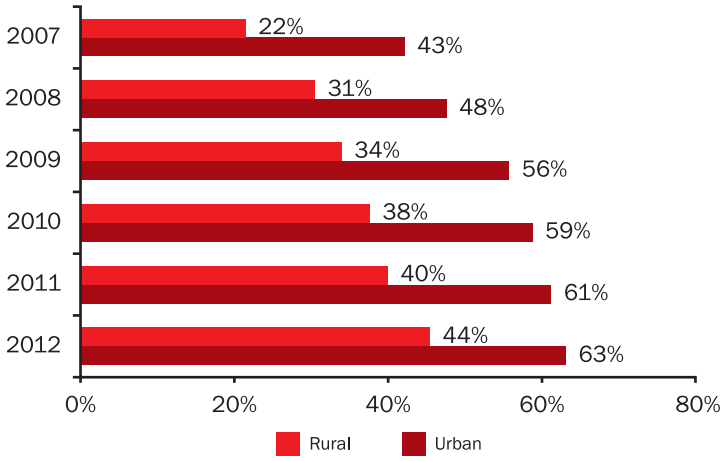
In 2012, there were 47.5% of households in the Republic of Serbia with the Internet connection, this being an increase of 15.3% in respect to 2011, or a 21.8% increase in respect to 2010. Once again, significant discrepancies may be observed if we compare the number of households with Internet connection in urban and rural areas in Serbia. While in urban areas of the Republic of Serbia the number of households with Internet connection amounts to 57.5% (cf. 51% in 2011), in rural areas there are 33.3% (cf. 27.2% in 2011)




Figure 53. Percentage of households with a computer Source: Statistical Office of the Republic of Serbia

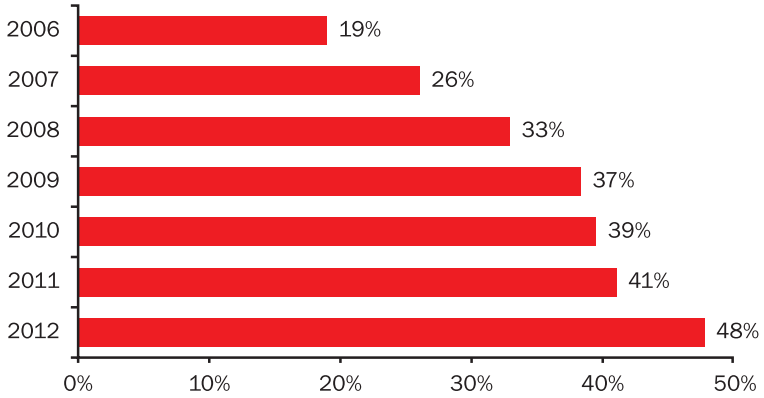



Slika 54. Percentage of Households with a Computer according to the Type of Area (Rural or Urban) Source: Statistical Office of the Republic of Serbia



of households with Internet connection. It should be noted that the growth rate of Internet connections in respect to 2011 was seen in both urban and rural areas.

Figure 55. Households with Internet connection Source: Statistical Office of the Republic of Serbia



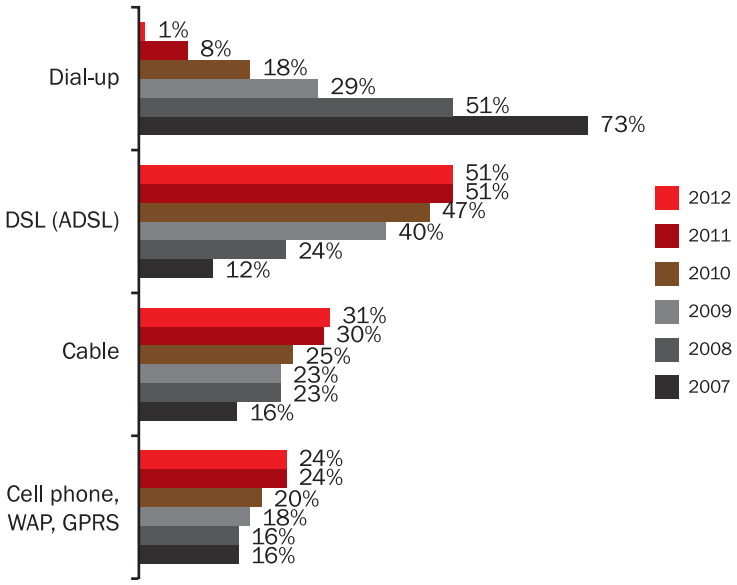

It should be noted that the gap is also related to the household income, as Internet connection was mainly used by the households with the monthly income of over 600 euros (83.8%), while the share of households with the income of 300 euros was only 29.8%.

One of the main indicators of ICT development in the EU is the percentage of households with broadband Internet. With the broadband diffusion, the downtrend of modem connection was continued dropping by 6.4% in respect to 2011 and 16.1% in respect to 2010. In 2012, 51% of households with Internet had DSL (ADSL), 31% cable and 24.4% had WAP and GPRS connection. In 2012, only 1.4% of households were using dial up connection.

Figure 57 shows the usage of computers by individuals. The survey revealed that 55% of the respondents had used the computer in the past 3 months, and 38.9% (cf. 40.1% in 2011) who participated in the poll had never used the computer, whereas 2.0% participants had used the computer over 3 months earlier and 4.1% over a year before.

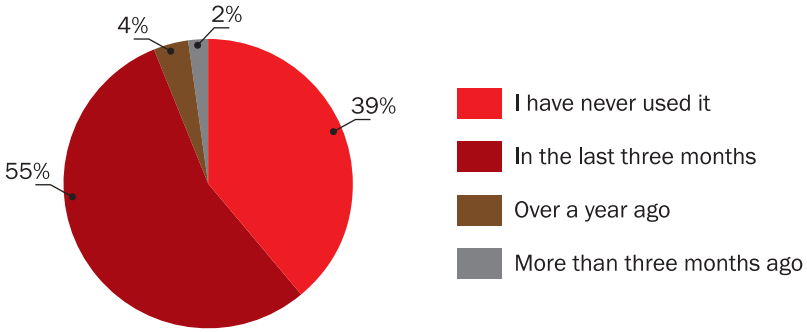



Figure 56. Household Internet use according to the type of connection
Source: Statistical Office of the Republic of Serbia




The number of computer users in the past 3 months increased by over 50 000 in respect to 2011.

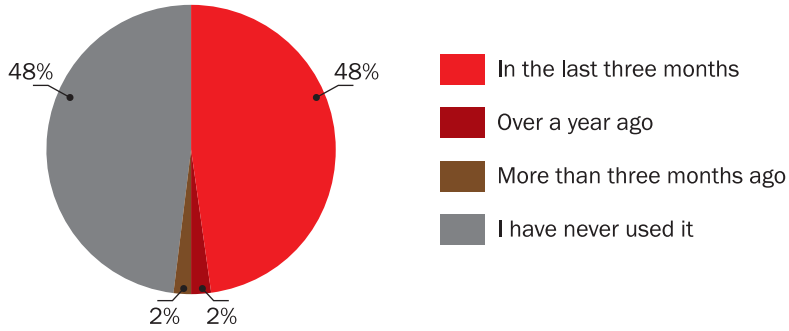
Figure 57. Computer usage by individuals Source: Statistical Office of the Republic of Serbia



In the Republic of Serbia 48.4% (cf. 42.2% in 2011) of people used the Internet in the last three months, 1.6% of the respondents used the Internet more than three months ago and 1.6% of them over a year ago. The percentage of the respondents who said that they had never used the Internet is 48.4% (cf. 53% in 2011), which is still rather high.

The number of Internet users in 2012 increased by 4.6% in respect to 2011 or by 5.7% in respect to 2010 and 8% in respect to 2009. The survey showed that the number of persons who had used the Internet in the past three months increased by over 300 000 compared with 2011.

Slika 58. Internet usage by individuals Source: Statistical Office of the Republic of Serbia




The survey showed that 30.9% (cf. 17.3% in 2011) of respondents among the Internet users, used public administration services instead of personal contact.

Over 840 000 individuals used the electronic services of the public administration in 2012 (cf. 680 000 in 2011).

77.3% of the respondents reported that they had been using the Internet every day or almost every day in the past three months.

Over 2 100 000 persons used the Internet (almost) every day, which is an increase of over 200 000 compared with 2011.




Figure 59. Frequency of the individual Internet use Source: Statistical Office of the Republic of Serbia

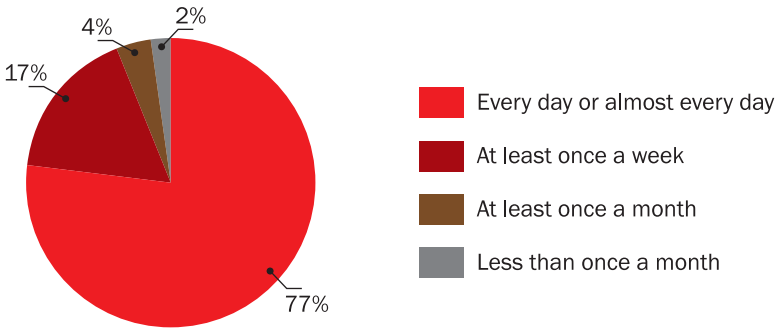



Figure 60 illustrates the structure of the Internet users by the level of education. The Internet is mainly used by the individuals with secondary education (59.1%), followed by the users with less than secondary education (21.1%), whereas the remaining 19.7% are users with higher education or university degree.

In 2012 there was a greater percentage of male users in respect to female users in 25-54 and 55-75 age groups, with the biggest discrepancy in 25-54 age group, whereas in 16-24 age group there were slightly more female users. The survey showed that in the past 3 months there had been 50.4% of male and 46.6% of female users of the Internet.

Figure 60. Internet users by level of education Source: Statistical Office of the Republic of Serbia

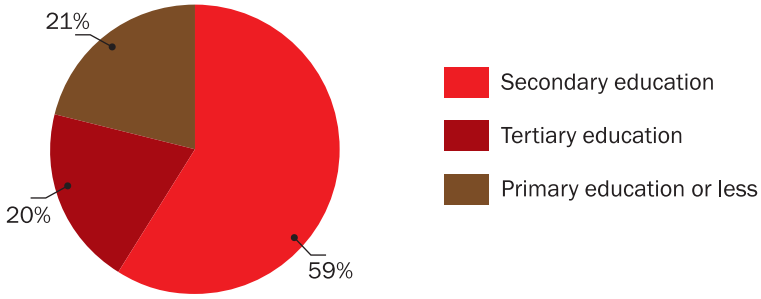
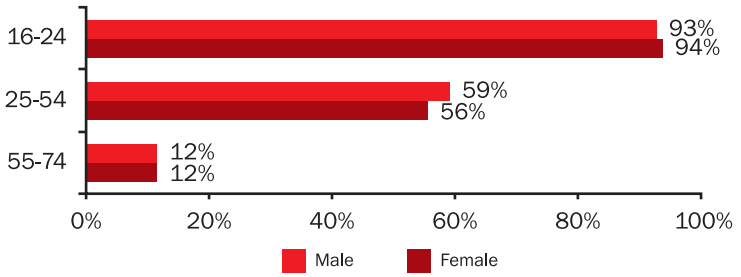


Figure 61. Internet usage in last 3 months according to gender/age
Source: Statistical Office of the Republic of Serbia




In 2012 the Internet was mostly used for information on goods and services (72.5%), followed by e-mailing (71.6%), reading or downloading online newspapers/magazines (68.2%), taking part in social networks (Twitter, Facebook, blogs) 66.2%, gaming and downloading games, images, music and films 60.7%. Also, many users listened to the Internet radio or watched TV via web services (50%), VoIP and video calls 48.6%. Travelling and accommodation related Internet services were used by 31.2%, online interactive games 28.5%, online selling of goods and services (e.g. auctions) 24.4%.

The survey showed that as much as 92.1% of population in the 16-24 age group has a profile in a social network (Twitter and Facebook).

Figure 63 illustrates the use of mobile devices for Internet access. Most users of this type of Internet access use a laptop (21.5). Most of the respondents used laptops for privet purposes (70.4%) and only 29.6% for business. Cell phone or Smartphone were used for mobile Internet access by the majority of respondents (38.5%).

The share of the Internet users according to their employment status showed that the Internet is mainly used by students (99.5%), while the number of employed users grew from 61.7% in 2011 to 71.5% in 2012. As regards the unemployed users, the number was increased from 32.7% in 2011 to 40.6% in 2012.




Figure 62 Private Internet use (in the last 3 months)
Source: Statistical Office of the Republic of Serbia

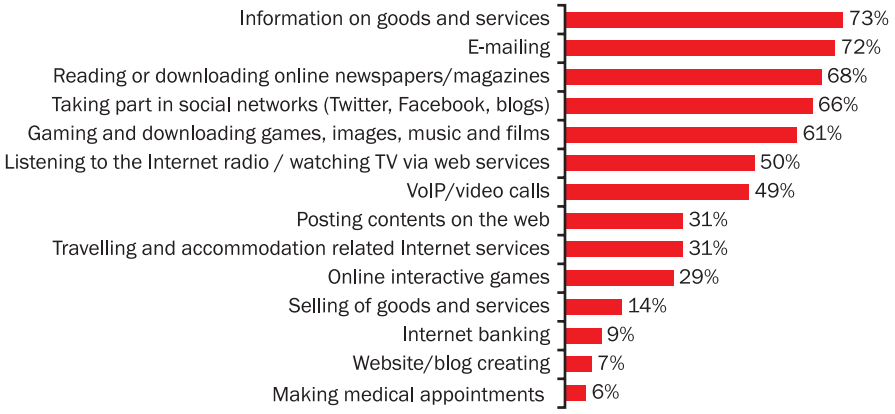



Figure 63. The Use of mobile devices for Internet access
Source: Statistical Office of the Republic of Serbia

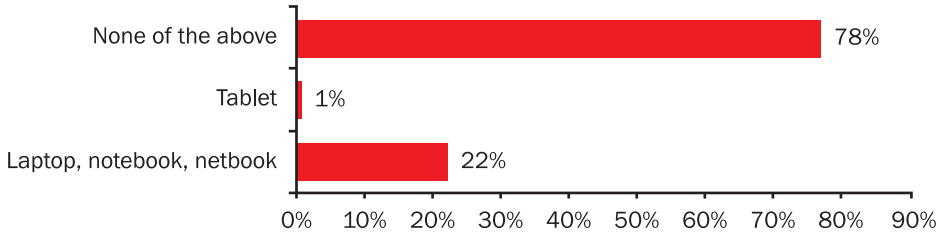


Figure 64. Use of mobile devices for Internet access outside home/work
Source: Statistical Office of the Republic of Serbia

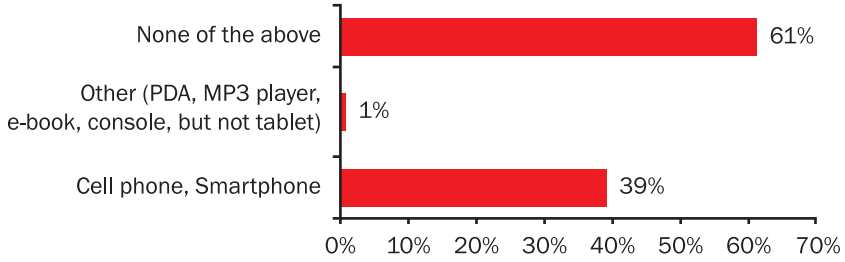
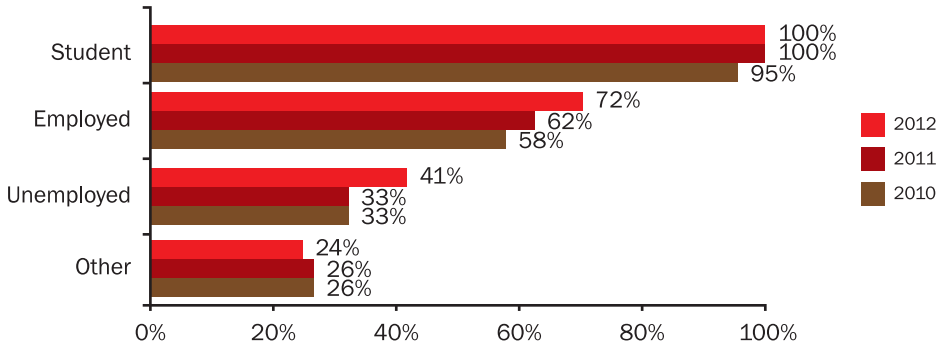



Figure 65. Share of Internet users according to their employment status
Source: Statistical Office of the Republic of Serbia

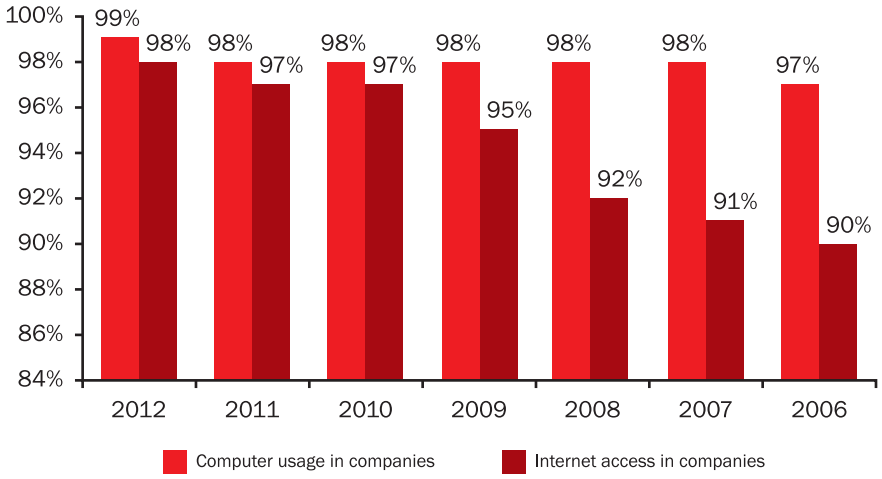



The survey showed a slight growth in the number of enterprises using the computer for business, since 98.7% of them used the computer in 2012 (cf. 98.1% in 2011).

97.7% companies in the Republic of Serbia have Internet connection. Among the companies with Internet connection, 77.2% used DSL connection, followed by cable Internet (33%), whereas the percentage of companies using mobile connections increased from 18% in 2011 to 31.2% in 2012. As expected, the smallest number of companies was using dial-up connections (4.8%).




Figure 66. Internet and computer usage by companies
Source: Statistical Office of the Republic of Serbia




The survey showed that 87.4% of companies with Internet connection had used public administration electronic services, which is an increase of 7.6% since 2011.

Figure 67. Usage of online public administration services by companies
Source: Statistical Office of the Republic of Serbia

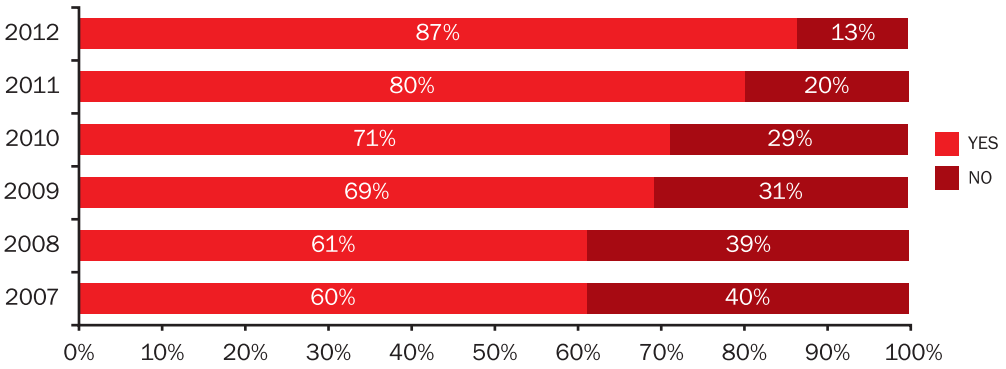
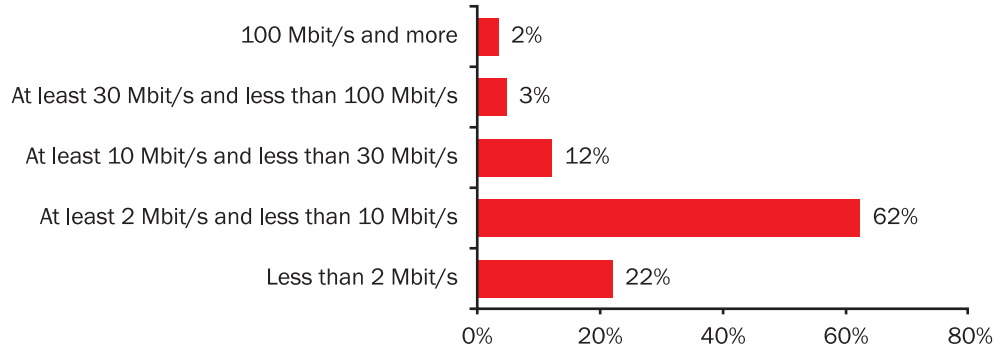


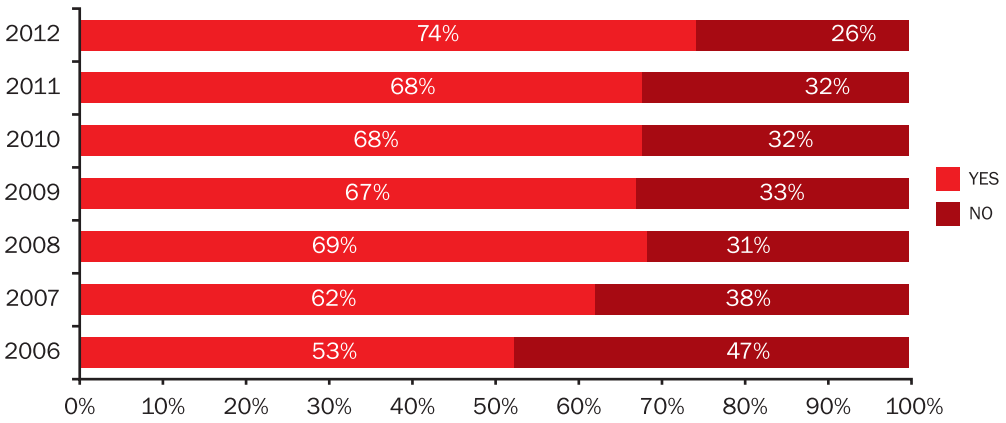
Figure 68. shows the Internet connection bitrate in the companies, defined by the contract with ISPs, where the majority (61.5%) of the companies had 2-10 Mbit/s.

Figure 68. Internet bitrate in companies (as defined by the agreement with ISP)
Source: Statistical Office of the Republic of Serbia




In 2012, 73.8% of the companies with Internet connection (cf. 67.6% in 2011) had their own website.

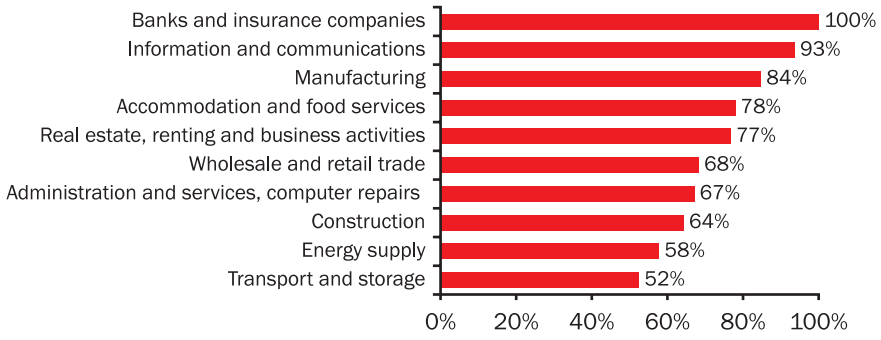
Figure 69. Number of companies with website Source: Statistical Office of the Republic of Serbia






The number of companies with website depends on the territorial area, since in 2012 in Belgrade 85.9% of companies had website, in Vojvodina 75.4% and in Central Serbia 59%.

Figure 70. Number of companies with website according to business activity
Source: Statistical Office of the Republic of Serbia



# 7. MEDIA CONTENT DISTRIBUTION



In 2012 there were 94 operators registered for media content distribution provided via: cable distribution networks (coaxial, hybrid and optical) – CATV, public fixed telephone network– IPTV and satellite distribution network– DTH (Direct to Home).

Concerning the circumstances and the structure of the media content distribution market, RATEL carried out the analysis of the retail media content distribution market in October 2012 and made the *Report on the Analysis of the Retail Media Content Distribution Market*, October 2012. The analysis was carried out to assess the competition level in the relevant market, as part of the continual monitoring of the situation in the retail media content distribution market in the territory of the republic of Serbia in order to determine if any changes had taken place since the last market analysis performed August-November 2011.

Following the analysis, in December 2012 RATEL passed the decision designating company Serbia Broadband – Srpske kablovske mreže Ltd. (SBB) as an SMP operator in the retail market for media content distribution. The decision imposed the obligations to provide retail services under specific terms and conditions, the main objective being price control by applying cost-accounting, as stipulated under the Agency bylaw regulating cost-accounting application, separate accounts and reporting by SMP operators.

In 2012, there were 1.44 million users of the media content distribution services, which is by 8.3% more than the previous year. The penetration rate was 19.9%, entailing 58% of the households.

The largest media content distribution operator was once again SBB with over 50% market share, followed by Public Enterprise PTT, Telekom Srbija Joint Stock Co., Kopernikus tehnology Ltd., I.KOM Ltd., Digi SAT Ltd., Radijus vektor Ltd. and KDS Novi Sad. In terms of the number of subscribers, these operators had a joint market share of around 91%.




Figure 71. Market share of the leading operators in 2012 Source: RATEL

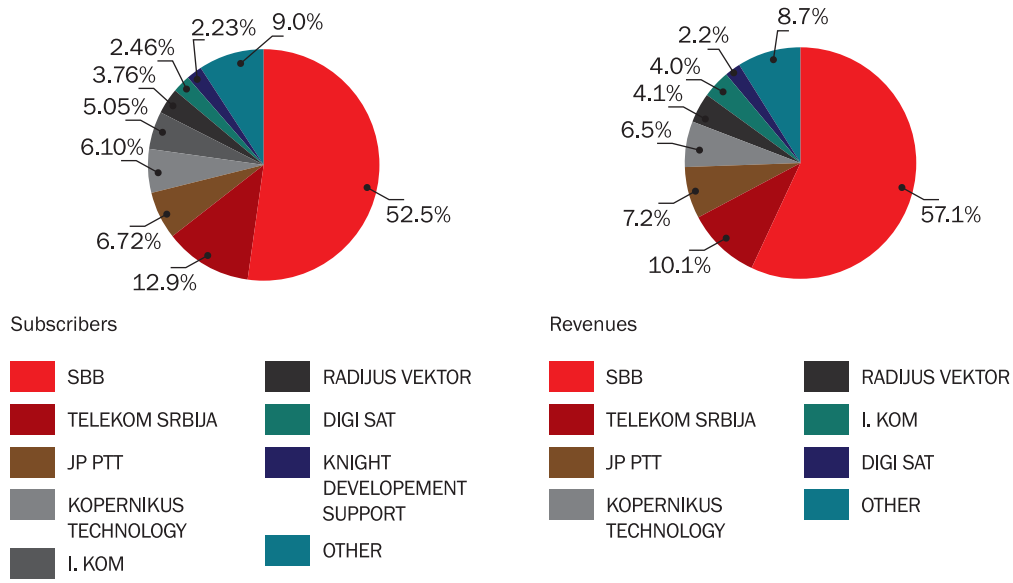
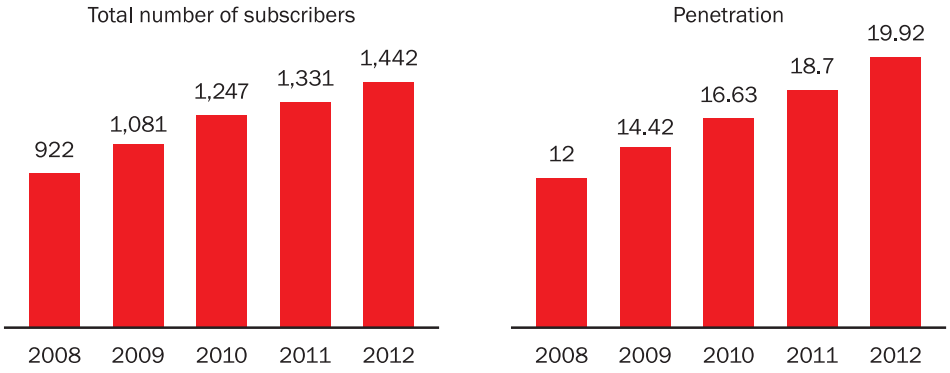



Figure 72. Total number of media content distribution subscribers (thousands)/Penetration rate Source: RATEL



Media content distribution via cable had over one million subscribers in 2012.

Figure 73. Media content distribution user share by technilogies (thousands) Source: RATEL

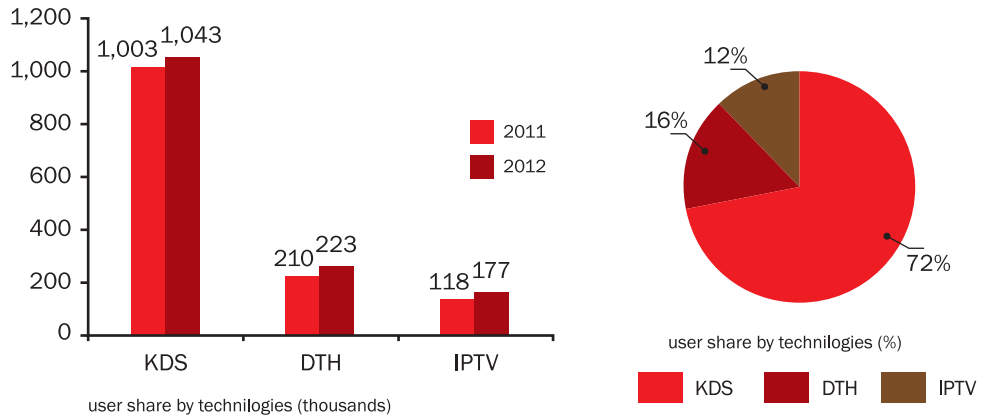
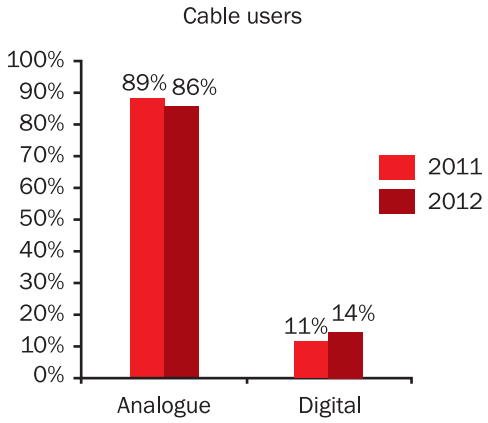



Figure 74. Cable users Source: RATEL

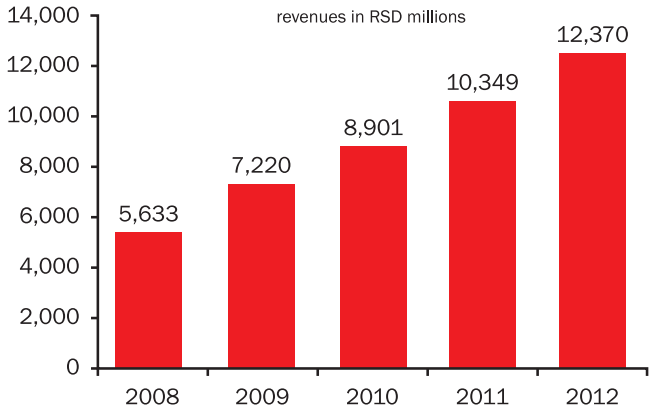



In 2012, the total revenues from media contents distribution increased by 19.5% year-on-year, amounting to approximately 12.4 billion dinars. This increase was mainly the result of



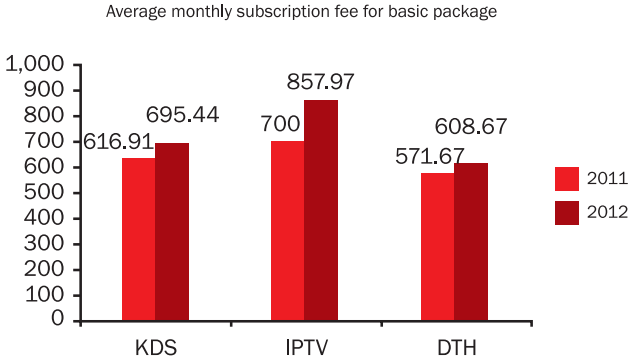

the increase in the number of users and higher quality, additional services, but also of the higher monthly subscription fee (figure 75).

Figure 75. Increase in the revenues from the media content distribution (RSD millions) Source: RATEL



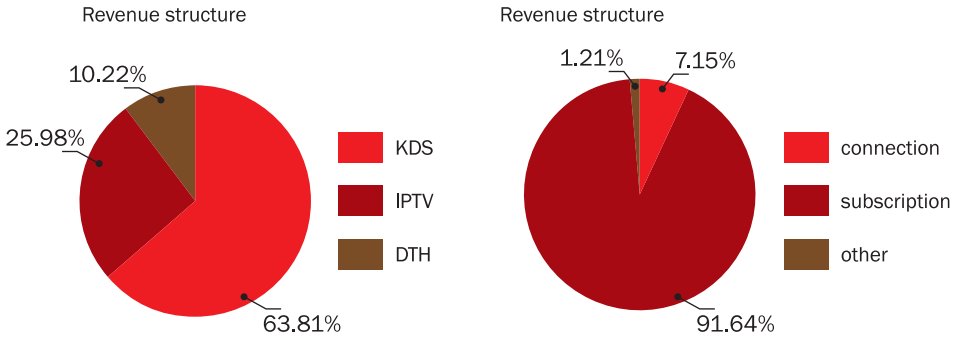

In 2012 the share IPTV in the total revenues was 26% (cf. 22% in 2011), whereas DTH had a share of 10% (cf. 8% in 2011). The biggest share in the revenues from the media contents distribution service provision went to CATV services 64% (cf. 70%).

Figure 76. Average monthly subscription fee for basic package Source: RATEL



The revenues from the monthly subscription accounted for 916% of the revenues, 7.2% went to connection charges, whereas the revenues from Pay TV and other services make up 1.2% of the revenues observed.

Figure 77. Revenue structure in 2012 Source: RATEL




As shown in Figure 78, in 2012 DTH service subscribers paid an average of 723.33 dinars for the basic service package, while IPTV services amounted to an average of 703.79 dinars on a monthly basis. CATV subscribers paid on average 727.34 dinars a months.

Figure 78. Average bill in 2012 (RSD) Source: RATEL

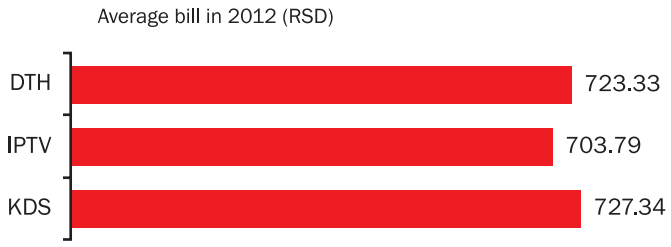
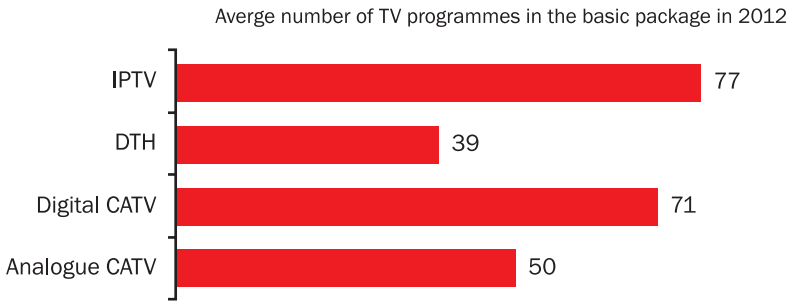



Figure 79 provides an overview of the the number of TV programmes offered in the basic package, for different media content distribution technologies.




Figure 79. Averge number of TV programmes in the basic package in 2012 Source: RATEL



# 8. BROADCASTING



Based upon users' requests, public tenders as well as decisions made by the Council of the Republic Broadcasting Agency regarding the permit issuance for television and radio programme broadcasting, RATEL issued the broadcasting station permits to the following broadcasters:

| Initial network for digital TV signal broadcast testing | | | |
|---|---|---|---|
| Ord. no. | Name and seat of the radio station owner | Number of issued broadcasting station licences | Number of issued microwave station licences |
| 1. | Javno preduzeće emisiona tehnika i veze, Beograd | 15 | 0 |

| For TV signal coverage – commercial service – national coverage | | | |
|---|---|---|---|
| Ord. no. | Name and seat of the radio station owner | Number of issued broadcasting station licences | Number of issued microwave station licences |
| 1. | Preduzeće za informisanje i marketing "PINK INTERNATIONAL COMPANY" d.o.o., Beograd | 0 | 46 |

| For radio signal coverage – commercial service – national coverage | | | |
|---|---|---|---|
| Ord. no. | Name and seat of the radio station owner | Number of issued broadcasting station licences | Number of issued microwave station licences |
| 1. | Radio-difuzno preduzeće "B 92" akcionarsko društvo, Beograd | 4 | 0 |
| 2. | Privredno društvo za proizvodnju i emitovanje RTV programa "INDEX" DOO, Beograd | 0 | 8 |

| For TV signal coverage – commercial service – regional coverage | | | |
|---|---|---|---|
| Ord. no. | Name and seat of the radio station owner | Number of issued broadcasting station licences | Number of issued microwave station licences |
| 1. | Javno preduzeće "RADIO-TELEVIZIJA KRAGUJEVAC", Kragujevac | 4 | 0 |
| 2. | Akcionarsko društvo "TIMOČKA TELEVIZIJA I RADIO", Zaječar | 2 | 0 |
| 3. | Akcionarsko društvo "RADIO TV PODRINJE", Loznica | 5 | 2 |




| For radio signal coverage – commercial service – regional coverage | | | |
|---|---|---|---|
| Ord. no. | Name and seat of the radio station owner | Number of issued broadcasting station licences | Number of issued microwave station licences |
| 1. | Radio-difuzno društvo "Radio-Televizija AS" D.O.O., Šabac | 2 | 0 |
| 2. | "BETA PRESS" D.O.O. PJ BETA RADIO, Novi Pazar | 1 | 0 |
| 3. | Radio-difuzno preduzeće "STUDIO M" D.O.O., Čačak | 1 | 0 |
| 4. | Javno preduzeće "RADIO LESKOVAC", Leskovac | 1 | 0 |
| 5. | Zoran Nikolić PR, agencija za proizvodnju radio i televizijskih programa"STUDIO 101", Zaječar | 1 | 0 |

| For TV signal coverage – commercial service – local coverage | | | |
|---|---|---|---|
| Ord. no. | Name and seat of the radio station owner | Number of issued broadcasting station licences | Number of issued microwave station licences |
| 1. | Privredno društvo "RITAM" DOO, Vranjska Banja | 1 | 2 |
| 2. | Društvo ljubitelja rumunske muzike i kulture "VICTORIA", Vršac | 1 | 0 |
| 3. | RADIO TELEVIZIJA RUBIN KRUŠEVAC DOO - OGRANAK TV RUBIN KIKINDA, Kikinda | 1 | 0 |
| 4. | Informativno javno preduzeće "PREŠEVO", Preševo | 1 | 2 |
| 5. | DOO "KRALJEVAČKA TELEVIZIJA", Kraljevo | 1 | 2 |
| 6. | Ortačko društvo radio i televizijske delatnosti Petrović Branislav i ortak MLAVA-MEDIJA, Petrovac | 1 | 0 |
| 7. | Javno preduzeće za radio televizijsku delatnost "TELEVIZIJA BAČKA PALANKA", Bačka Palanka | 1 | 0 |
| 8. | "LOTEL PLUS" D.O.O., Loznica | 1 | 0 |
| 9. | TELEVIZIJA "S" D.O.O., Beograd | 1 | 2 |
| 10. | Javno preduzeće "TV SMEDEREVO", Smederevo | 1 | 0 |
| 11. | "TELEVIZIJA JERINA" ortačko društvo, Smederevo | 1 | 0 |
| 12. | Privredno društvo za radio i televizijske aktivnosti"DUGA-SKY"radio televizija DUGA DOO, Požarevac | 1 | 0 |
| 13. | Preduzeće "TV - 5" D.O.O. Užice, Užice | 1 | 0 |

| | | | |
|---|---|---|---|
| 14. | Javno preduzeće radio televizija "ĆUPRIJA", Ćuprija | 1 | 0 |
| 15. | D.O.O. STUDIO, Leskovac | 1 | 0 |
| 16. | Javno preduzeće "Radio i televizije Trstenik" sa PO, Trstenik | 1 | 0 |
| 17. | Društvo za radio i televizijske aktivnosti "KOPERNIKUS CABLE NETWORK" d.o.o., Niš | 1 | 0 |
| 18. | Radio televizija "MLADENOVAC" DOO, Mladenovac | 1 | 0 |
| 19. | Radio-difuzno preduzeće "SPEKTRI" JETON ISMAILI I ORTACI, O.D., Bujanovac | 1 | 0 |
| 20. | DOO "ISTOK COMPANY", Salaš | 1 | 4 |
| 21. | Ustanova "CENTAR KULTURE BOSILEGRAD" sa P.O., Bosilegrad | 0 | 2 |
| 22. | Privredno društvo "RADIO TELEVIZIJA KRALJEVO I IBARSKE NOVOSTI" DOO, Kraljevo | 0 | 6 |
| 23. | Radio-difuzno društvo "Radio-Televizija AS" D.O.O., Šabac | 0 | 2 |

For radio signal coverage – commercial service – local coverage

| Ord. no. | Name and seat of the radio station owner | Number of issued broadcasting station licences | Number of issued micro-wave station licences |
|---|---|---|---|
| 1. | "AKORD" D.O.O. Preduzeće za trgovinu i posredovanje, Subotica | 1 | 0 |
| 2. | Radio-difuzno preduzeće "RADIO OBRENOVAC" DOO, Obrenovac | 1 | 0 |
| 3. | DOO "RADIO SAJAM", Novi Sad | 1 | 0 |
| 4. | DOO "LEWIS TAXI" Čačak, Čačak | 1 | 0 |
| 5. | SRPSKA PRAVOSLAVNA CRKVA - EPARHIJA SREMSKA, Sremski Karlovci | 1 | 0 |
| 6. | BEOGRADSKA NADBISKUPIJA, RIMOKATOLIČKI ŽUPNI URED "PRESVETOG SRCA ISUSOVA", Niš | 1 | 0 |
| 7. | Preduzeće za proizvodnju, trgovinu i usluge "SOFTIĆ" doo, Tutin | 1 | 0 |
| 8. | Radio televizija "MLADENOVAC" DOO, Mladenovac | 1 | 0 |
| 9. | DOO "ISTOK COMPANY", Salaš | 1 | 0 |
| 10. | SRPSKA PRAVOSLAVNA CRKVA - EPARHIJA VRANJSKA, Vranje | 1 | 2 |




| | | | |
|---|---|---|---|
| 11. | Radio-difuzno preduzeće "OK RADIO" DOO, Vranje | 1 | 0 |
| 12. | "DAK" preduzeće za radio-televiziju i druge delatnosti DOO, Ćuprija | 1 | 0 |
| 13. | Preduzeće "CITY RADIO" OD Kocić Dragan, Niš | 1 | 0 |
| 14. | "BUBA MARA RADIO XXX" D.O.O., Kaluđerica | 2 | 0 |
| 15. | "RADIO 5" DOO za radio-difuznu delatnost, Novi Sad | 1 | 0 |
| 16. | "BALTAZAR" D.O.O., Niš | 1 | 0 |
| 17. | Boban Gvozdenović preduzetnik, radio i reklamne aktivnosti i autoprevoznik "TAŠA", Kruševac | 1 | 0 |
| 18. | Preduzeće za radio-difuziju, marketing i usluge "BROADCAST MEDIA GROUP" DOO, Bajina Bašta | 1 | 0 |
| 19. | RTV "CARIČIN GRAD" DOO LEBANE, Lebane | 1 | 0 |
| 20. | Radio i televizija "KANAL-M" d.o.o., Paraćin | 1 | 0 |
| 21. | Privredno društvo "SREMSKI RADIO" DOO, Šid | 1 | 0 |
| 22. | Privredno društvo "RADIO TELEVIZIJA KRALJEVO I IBARSKE NOVOSTI" DOO, Kraljevo | 0 | 2 |
| 23. | Javno preduzeće "RADIO LESKOVAC", Leskovac | 0 | 2 |
| 24. | "PLANETA 21000"DOO za proizvodnju i emitovanje radio i TV programa eksport-import i usluge, Novi Sad | 0 | 2 |
| 25. | Preduzeće za informisanje "RADIO BARAJEVO" DOO, Barajevo | 0 | 2 |
| 26. | CENTAR ZA TRENING I EDUKACIJU, Novi Sad | 0 | 2 |

**For radio signal coverage – commercial service – Belgrade region**

| Ord. no. | Name and seat of the radio station owner | Number of issued broadcasting station licences | Number of issued microwave station licences |
|---|---|---|---|
| 1. | Preduzeće za vizuelne i poslovne komunikacije "SPIRIT SOUND MFM" DOO, Beograd | 1 | 0 |
| 2. | "SPORT RADIO FM" d.o.o., Beograd | 1 | 0 |



# 9. RF SPECTRUM USAGE AND QUALITY OF SERVICE MONITORING

As part of the RF spectrum management, RATEL performs permanent monitoring of the RF spectrum usage, monitors technical inspection implementation and controls the quality parameters of the publicly available electronic communication services and the electronic communication business activities.

## 9.1. RF SPECTRUM USAGE MONITORING

RF spectrum usage monitoring in 2012 was performed from fixed monitoring centres either from suitable fixed locations or from selected locations in specific campaigns or in motion. Table 12 shows the number of monitoring records made from the fixed centres or on field.

Table 12. Number of monitoring records made from the fixed centres or on field in 2012

| Number of monitoring records made from the fixed centres | Number of monitoring records made on field |
|---|---|
| 3196 | 7956 |

The tendencies in RF spectrum usage according to bands/services are given below.

### 9.1.1. BANDS ALLOCATED TO SO-CALLED PUBLIC COMMUNICATION SYSTEMS (4 m. 2 m. 0.7 m)

The usage of these bands has further decreased. It has been noted that many insolvent business failed to return the licence, although the need for their using radio networks no longer exists. The operation of a number of radio stations without licence was also registered, mainly in 0.7 m frequency band, and the appropriate measures under the Law were taken.

### 9.1.2. BROADCASTING (FM/TV)

Nearly 5 years since the commercial broadcasting stations had begun with operation, many irregularities have been registered in radio frequency usage. In particular, a number of broad-




casting stations working without licence was again registered. Table 13 provides an overview of the radio stations working without licence registered in late 2012.

Table 13. Overview of the radio stations working without licence registered in late 2012

| R. br. | Identification, location | Frequency (MHz) / Channel (C) |
|---|---|---|
| 1. | Radio Kult, Požarevac | 102.7 |
| 2. | Internet Radio Ruski Krstur | 96.9 |
| 3. | Radio Rez, Zrenjanin | 106.3 |
| 4. | Radio Grom, Zrenjanin | 99.8 |
| 5. | Radio Kosmos, Lazarevac | 101.0 |
| 6. | Radio Vaki, Zemun | 103.7 |
| 7. | TV AS, Krepoljin | 34th C |
| 8. | Radio Zavičaj, Lazarevac | 90.3 |
| 9. | Radio Zavičaj, Lazarevac | 92.2 |
| 10. | Radio Zec, Novi Sad | 104.8 |
| 11. | Radio Horizont, Novi Sad | 98.2 |
| 12. | Radio Srpska Krajina, Novi Sad | 99.1 |
| 13. | Radio Guess FM, Novi Sad | 105.6 |
| 14. | Radio bez identifikacije, Novi Sad | 102.9 |
| 15. | Radio NN, Novi Sad | 102.2 |
| 16. | Radio bez identifikacije, Novi Sad | 103.5 |
| 17. | Radio bez identifikacije, Novi Sad | 89.0 |
| 18. | Radio Suton, Kula | 91.7 |
| 19. | Radio 90, Hajdukovo | 93.6 |
| 20. | Radop D-65, Deronje | 100.5 |
| 21. | Radio Skala, Novi Sad | 96.9 |
| 22. | Radio Padina, Padina | 88.2 |
| 23. | Radio Ibis, Melenci | 96.7 |
| 24. | Radio Fantom, Melenci | 106.6 |
| 25. | Radio Busije, Ugrinovci | 105.8 |



| | | |
|---|---|---|
| 26. | Radio Čantavir, Čantavir | 92.0 |
| 27. | Radio Narodni, Beograd | 87.5 |
| 28. | Radio Duga, Trgovište | 92.3 |
| 29. | TV Duga, Trgovište | 27th C |
| 30. | Radio Minić, Kuršumlija | 94.9 |
| 31. | Bošnjačka TV, Novi Pazar | 31st C |
| 32. | Radio Enigma, Prijepolje | 104.3 |
| 33. | Radio Zavičaj, Kraljevo | 104.7 |
| 34. | Radio bez identifikacije, Beograd | 93.8 |
| 35. | Radio Suton, Novi Sad | 104.2 |
| 36. | Radio Antena, Vršac | 98.2 |
| 37. | Radio Mladost, Apatin | 101.0 |
| 38. | Radio Zene, Čantavir | 90.9 |
| 39. | KTV Zrenjanin | 32nd C |
| **Radio Balkan (Radio Fokus)** | | |
| 1. | Vranje | 107.1 |
| 2. | Fruška Gora | 107.0 |
| 3. | Kruševac | 94.8 |
| 4. | Vršac | 93.0 |
| 5. | Subotica | 87.5 |
| 6. | Novi Beograd | 97.9 |
| 7. | Valjevo | 106.6 |
| 8. | Zaječar | 95.5 |
| 9. | Cer | 101.1 |
| 10. | Požarevac | 91.6 |
| 11. | okolina Trstenika | 105.0 |
| 12. | Sombor | 94.7 |




Administrative and legal procedures were initiated against all owners of the radio stations working without licence and 11 such radio stations were closed by the law enforcement administration, based on warrant issued by the prosecution, with RATEL-s technical assistance. The number of radio station working without licence decreased in 2012, mainly owing to the actions taken by the law enforcement administrations of Belgrade, Novi Sad and Valjevo.

Other irregularities registered in the frequency bands are given below:

- increased broadcasting parameters;
- additional transmitters without licence, national broadcasters included;
- disregard of the parameters from the licence, consisting of increased broadcasting parameters or change of the assigned location ;
- increased deviation with FM modulated transmissions, both with radio and TV stations.

It should be noted that the number of interferences affecting air navigation services, caused by irregular work of radio stations, was reduced.

## 9.1.3. MOBILE TELEPHONY

Mobile telephony as one of the biggest RF spectrum users is constantly increasing the number of base stations, resulting in two principle problems:

- interference to base stations caused by different illegal equipment, such as wireless video cameras, jammers, baby monitors, DECT 6.0 cordless phones intended for non-European markets, etc.
- growing complaints from individuals reporting harmful radiation caused by base stations and placing base stations on/in delicate buildings/locations such as hospitals, schools or universities.



## 9.1.4. WIRELESS INTERNET

An increase in the irregularities in the 2.4/5.7 GHz frequency band was found, in particular concerning the following:

- usages detected outside the limits of the band approved for wireless Internet;
- increased transmitting parameters or misuse of the band
- usage of unauthorized transmissions, in particular "super a".

Also there was increasing number of users that fail to report the work to RATEL.

## 9.2. TECHNICAL INSPECTION

Pursuant to the Rules on the manner of monitoring the radio frequency spectrum usage, technical inspection procedure and protection from harmful interference, RATEL continued to work on the implementation of a new method concerning the technical inspection and the results of the measured parameters registered via web portal. In 2012 RATEL carried out the technical inspection for DVBT2 transmitters of the pilot network[1] of ETV, Public Enterprise.

In 2012 the total of 5500 radio-station technical inspections were performed.

Table 14 shows five users with the biggest number of technical inspection performed in 2012.

Table 14. RF spectrum users with the biggest number of technical inspection performed in 2012

| RF spectrum user | Number of technical inspection performed in 2012 |
|---|---|
| TELENOR d.o.o | 2860 |
| Telecommunications Company TELEKOM Srbija, Joint Stock Co. | 1100 |
| VIP mobile d.o.o. | 650 |
| Electric Power Supply Company "Elektrosrbija", Ltd. | 118 |
| TAXI Petrol | 63 |

[1] Initial network for digital TV signal broadcast testing.




## 9.3. ELECTRONIC COMMUNICATION SERVICES AND NETWORKS QUALITY PARAMETERS MONITORING

Pursuant to the Law, RATEL stipulated in greater detail the electronic communication services and networks quality parameters in the Rules on quality parameters for publicly available electronic communication services and monitoring of electronic communication activity.

In 2012 RATEL performed the verification of the received reports on the quality parameters for publicly available electronic communication services control performed with the operators in 2011. The operators were selected according to the following criteria:

- **operator's size in terms of the number of users and the size of the territory covered by the service provision,**
- **type of electronic communication service provided by the operator,**
- **operator's head office and the territory of service provision.**

In addition the control of the quality parameters was performed with several operators that had failed to submit the report on the quality parameters values. The verification/control was performed with the following operators:

1. JP PTT saobraćaja Srbija,
2. BEOTELNET-ISP,
3. Serbia broadband - Srpske kablovske mreže d.o.o.,
4. Su Online d.o.o., Subotica
5. Truf d.o.o.,
6. JOTEL d.o.o., Niš.



7 NINET Company d.o.o., Niš

8 Gama Elektronics d.o.o.,

9 Telenor d.o.o.,

10 VIP mobile d.o.o.,

11 Preduzeće za telekomunikacije „Telekom Srbija“ a.d.,

12 KINGSNET, Ruma.

Upon the performed control it was concluded that, expect for the operators of the public mobile network services, most of the operators had not been ready for preparing the report on the values of the services and networks quality parameters. Thanks to the monitoring and management systems applied by the mobile communication network operators, they had developed a regular monitoring of the parameters in compliance with RATEL's request, unlike other operators. The operators failed to understand both the obligation to provide the parameter values and the meaning of the parameters. Therefore, 2011 may be regarded as the transitional period during which the operators were getting acquainted with the quality parameters monitored and collected by RATEL. Operators with few users and operators with small service area usually failed to get acquainted and to comply with the electronic communication regulation and to maintain the necessary user register.

RATEL maintains an up-to-date database on the quality of the public communication networks and services. Indeed, the operators are required, pursuant with the Law, to make the agreement terms and conditions, including the minimum quality of service provision, publicly available in a suitable manner, so as to inform the users on the values of the quality parameters used for measuring the QoS of the electronic communication.

An early analysis of the 2012 reports on the quality parameters for the publicly available electronic communication services and networks showed an improvement of the quality pa-




rameter values for mobile electronic communication network. Three operators provided the reports on the quality parameter values for public voice services on the public telephone network at a fixed location in 2012: Telekom Srbija, SBB and Telenor, unlike the previous year when only Telekom Srbija had provided valid data. However, the time of response by the operators was unsatisfactory.

In 2013 RATEL will perform a detailed analysis of the received reports on the services and networks quality parameter values for 2012.

# 10. TELECOMMUNICATIONS NETWORKS OF PUBLIC ENTERPRISES



## 10.1. ELECTRIC POWER INDUSTRY OF SERBIA, PUBLIC ENTERPRISE

The efficient operation of the electrical power system of our country, comprised of the public enterprises Electric Power Industry of Serbia (EPS) and Electric Networks of Serbia (ENS), is entirely dependent on the existence of a modern telecommunications system for relaying technical and business data. The construction of a new telecommunications system for the electrical power companies in our country started several years ago, and is now drawing to a close. All of the planned top-level networks are either completed or nearing completion.

### 10.1.1. OPTICAL CABLE NETWORK

The optical cable network is increasingly similar in appearance to the high-voltage electrical power transmission network. As regards power lines with a voltage level of 400 kV and 220 kV, it could be said that the cables were fully replaced by installing lines with built-in optical cables. This type of replacement was completed in a large number of power lines with a voltage level of 110 kV and several lines of 35 kV.

The project of installing optical cables at the top network layer has largely been completed and, due to a clear need for new telecommunications connections in lower layers, both regional and local, the network is currently expanding in this direction. Thus current implementation and immediate plans are focused on covering the entire 110 kV power transmission network.

In this way, optical cables connect all important power supply facilities in Serbia. In 2011, the already rolled out network reached the total length of 6,000 km of OPGW (Optical Ground Wire), ADSS (All Dielectric Self-Supporting) and connecting underground optical cables.

The new optical network was mostly built using OPGW cables with 48 fibres, of those 24 G.652 type fibres and 24 G.655 type fibres. Only the initial construction line from Belgrade to




Bajina Bašta utilized a total of 24 fibres of the G.652 type. In some sections, where the state of power-transmission lines was such as to require extremely thin and light OPGW cables, the 24 fibre-cable, with 12 G.652 and 12 G.655 fibres was also used.

The state of the optical network is regularly monitored by measuring losses, chromatic dispersion and polarization mode dispersion (PMD). The quality is very good thus far, remaining within the prescribed margins.

By installing terminal devices and deploying the monitoring system, the fibres in use are automatically under constant control, while the free fibres will still need to be controlled by occasional measurements or special systems.

The optical network built thus far is shown in Figure 80. The network reaches nearly all important facilities in the power supply system of the Republic of Serbia. With further development, it will practically cover all significant points in the country, which is very important, both in terms of the power supply and telecommunications. Further development towards regional and local layers will surely make it the most widely distributed optical transfer medium on this territory with multiple usage capabilities.

Since the need for utilising new telecommunications capacities was ever present and increasing, the usage started before the completion and full deployment of the network. This is especially true of the interconnection routes with neighbouring countries during the process of connecting to the UCTE.

## 10.1.2. EPS TRANSPORT NETWORKS

The new optical telecommunications network contains 80 nodes at trunk level, where adequate terminal equipment was installed. These nodes represent the key facilities in the power supply system of the country, i.e. all hydro and thermal power plants, all mines and all important transformer stations, as well as facilities wherefrom electrical power connectivity with neighbouring countries is established. The entire system is connected to two command centres, the main centre and the backup (Disaster Recovery Centre). The main TC centre is located in the Dispatch Centre.

Figure 80. “Electric Power Industry of Serbia” Optical Network Source: EPS




For the purpose of business, technical and voice data transmission, priority was given to SDH technology (Synchronous Digital Hierarchy), since it is dominant for these types of uses worldwide. The capacities on all major routes are of an STM-16 level, on minor routes they are of STM-4, while certain peripheral and antenna routes are of an STM-1 level. All those points have adequate flexible multiplexers installed to receive various user interfaces utilising the 64 kbit/s channel, comprising the network providing channel transfer in dedicated telecommunications networks.

All planned devices were installed, tested and deployed. Since the topology of an SDH network is of a mesh type, this means that the security systems need to be adequate. Since there are no classical rings in the network, traffic security in an SDH mesh network uses SNCP (Sub Network Connection Protection) systems. They provide security for the traffic on a point-point basis, i.e. between the entry and exit node in an SDH network. The LCAS (Link Capacity Adjustment Scheme) protocol is used for transmitting business traffic and route traffic along various routes.

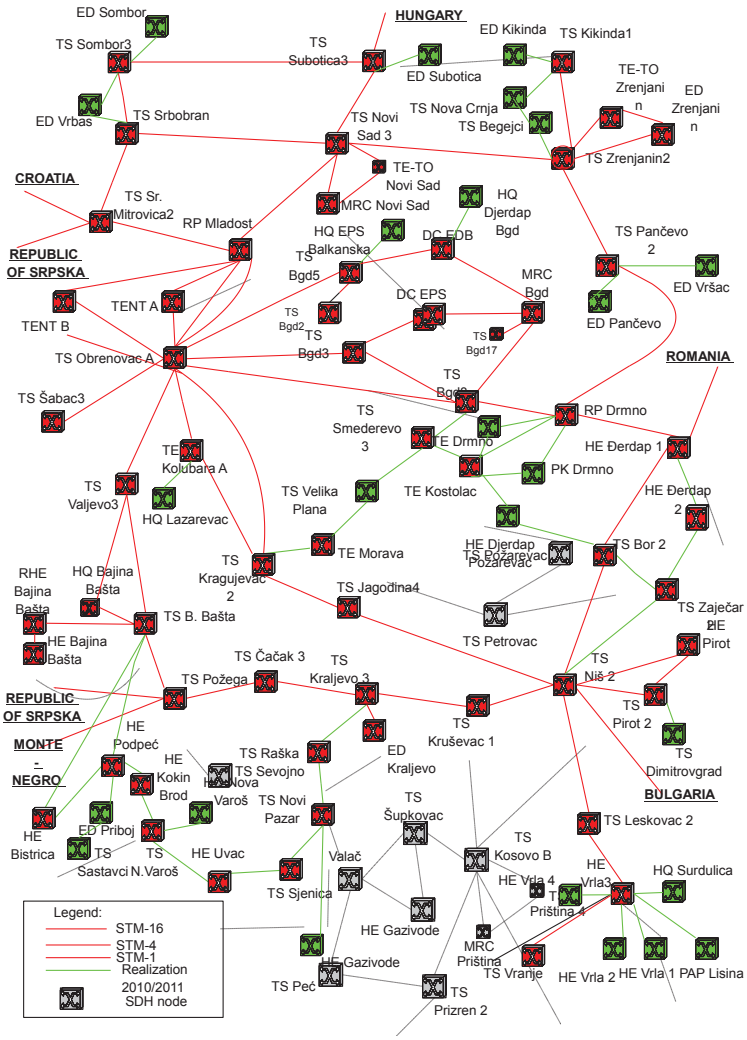
The control and monitoring systems, as well as the synchronization systems, were implemented and became operational. The control and monitoring system is comprised of three independent subsystems: the system for the control and monitoring of the SDH network, the system for the control and monitoring of the FMUX network and the system for the control and monitoring of the synchronisation devices. The control and monitoring system is a centralised, redundant system with high capacities enabling the remote control of all network elements, SDH and FMUX devices, as well as synchronisation devices.

Figure 81. shows all of the nodes with terminal equipment installed and their telecommunications capacities for adequate routes.

### 10.1.3. EPS PACKET-SWITCHED NETWORK

The deployment of the new telecom system of the Electric Power Industry of Serbia, based on OPGW and SDH technology, provided for a modern infrastructural telecom transport network, which serves a s a base for building a packet-switched network throughout the territory of the Republic of Serbia. The backbone consists of five core routers within electric power facilities on five locations, connected on full-mesh structure through STM-4 interface on SDH devices.

Figure 81. New Telecommunication Network Locations and Capacities Source: EPS






MPLS (*Multi Protocol Label Switching*) technology is applied to the backbone in order to cater to specific network functions, such as VPN (*Virtual Private Network*), clear-cut separation of electric power services, traffic management, improved recovery time and QoS.

As for access routers, the so-called lite VPN model was applied, with VRF (Virtual Routing and Forwarding) created for the needs of some services and VRF Voice for telephone service, and entire traffic in this VRF is propagated through MPLS network via BGP (Border Gateway Protocol). New VRFs will be created for electric power services provided over packet-switched network, and the business data transmission is underway.

There are 27 locations currently connected in the access segment, with two routers on each location connected to different routers in the packet-switched network backbone, due to high level of availability required.

The first service launched through packed-switched network was telephone service.

The technical concept of the EPS telephone network based on IP technology is founded on the centralized call management in the network with two softswitches on two separate locations in cluster architecture.

Access routers in 16 out of 27 locations became IP voice gateways, through integrated cards enabling connection with the existing TDM exchanges and public network.

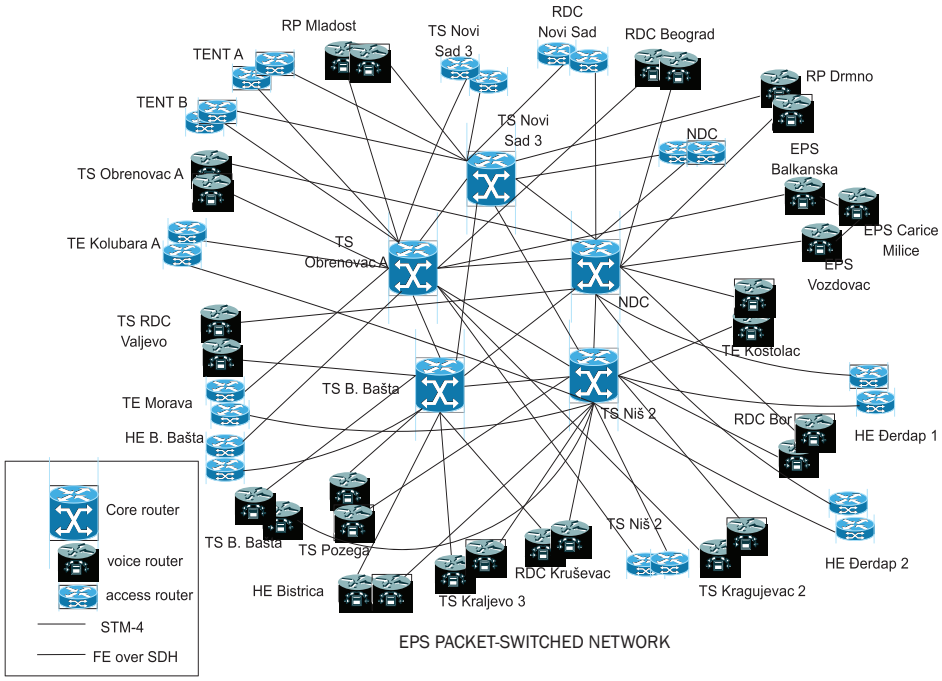
There are another six facilities connected to IP telephone network via access routers, mainly large production or governing/administrative centres, where new IP-TDM exchanges had been installed, and also five locations with fairly advanced TDM exchanges. Other locations with telephone exchanges that had been previously procured and installed, have been connected to a single telephone network via SDH devices, through E1 with 4-wire channels.

The implementation of IP telephony in the electric power system entailed the roll out of a high-availability corporate packet-switched network and strict requirements regarding QoS, thereby creating an infrastructural network which supports the transmission of a greater

number of services required by electric power system (data transmission for electric power system, business data transmission, video signal transmission for videoconferencing, etc.), leading to a more efficient an rational usage of telecom infrastructure.

Figure 82. shows EPS IP telephone network.

Figure 82. EPS IP Telephone Network — Source: EPS




## 10.2. ELECTRIC ENERGY TRANSMISSION AND TRANSMISSION SYSTEM CONTROL (EMS), PUBLIC ENTERPRISE

Telecommunications system of the Electric Energy Transmission and Transmission System Control (EMS), Public Enterprise represents the backbone of the closed functional system




which covers the territory of the Republic of Serbia and is used for the purposes of the electrical power sector. More than 90% of traffic in the electric energy sector transmitted over OPGW (Optical Ground Wire) covers the needs of the EMS, Public Enterprise, which is in charge of maintaining, monitoring and managing its resources.

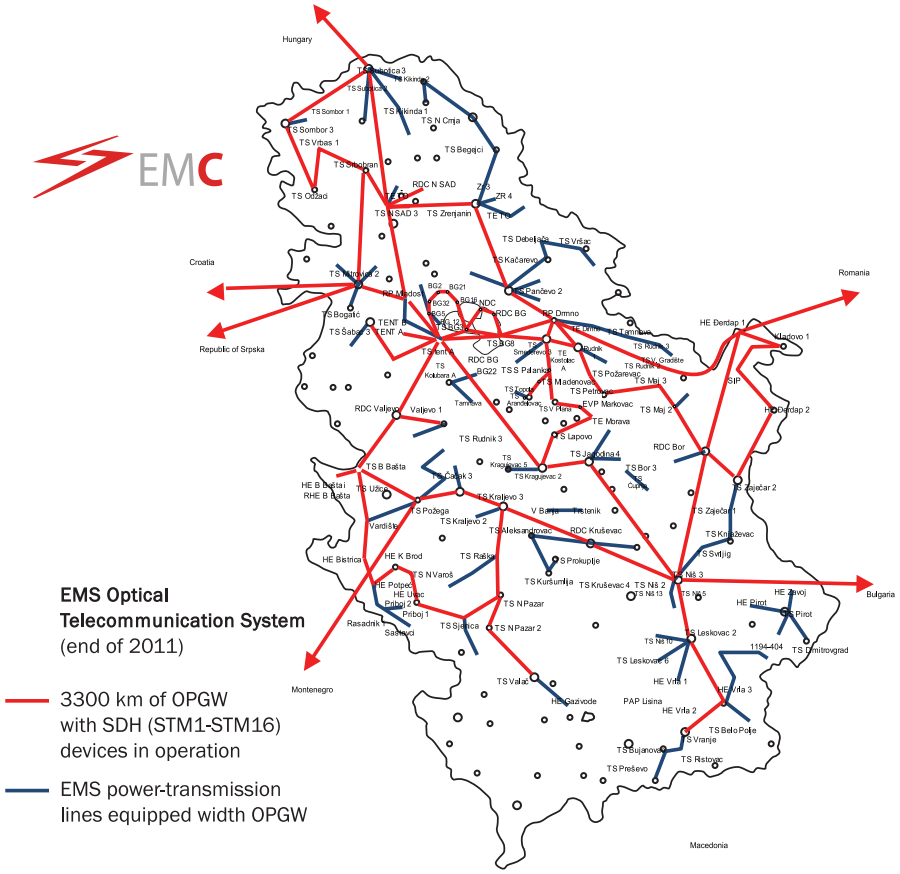
Due to the requirements of technological processes pertinent to the electrical power transmission system management, this telecommunications system enables a higher level of information transmission reliability and security, with lower transmission speed and capacity requirements as opposed to public telecommunications networks. Such a concept originates from the rules defined by the UCTE/ENTSO-E (*Union for the Coordination of Transmission of Electricity /European Network of Transmission System Operators for Electricity - Operational handbook*). Several types of services are supported: telephony (operational, business), the transmission of the technical control system EMS SCADA (*Supervisory Control and Data Acquisition*) signal, Electric Power Industry of Serbia (EPS) and EMS business data transmission, SRAAMD (System for Remote Acquisition and Accounting of Metering Data) meter reading, signal transmission for EMS power line protection as well as monitoring and managing the telecommunications system. For the purpose of information transmission, EMS uses several networks of different technologies.

The basis of the EMS telecommunications network is the optical network realized by OPGW cables and optical SDH (*Synchronous Digital Hierarchy*) terminal equipment. The OPGW network of cables is an integral part of EMS power lines (since the power line protection is the basic power function). OPWG network illustration is given by EPS. Both telecommunications systems are used by EPS and EMS for the same OPGW cable network.

In 2011, there were approximately 4135 kilometres of OPGW cables installed. EMS optical terminal devices are installed along 3300 kilometres. These devices are in function in 47 nodes. The speed levels are STM-1 (155 Mbps) and STM-2 (2.5 Gbps). Figure 83 illustrates the EMS telecommunications system.

The necessary path redundancy was achieved through 4 STM-16 and 5 STM-1 optical loops: both SDH and PDH (*Plesiochronous Digital Hierarchy*) links have been in operation incessantly, whereby the exceptional availability was achieved. Monitoring, management, configuration

Figure 83. EMS Optical Telecommunications System Source: EPS



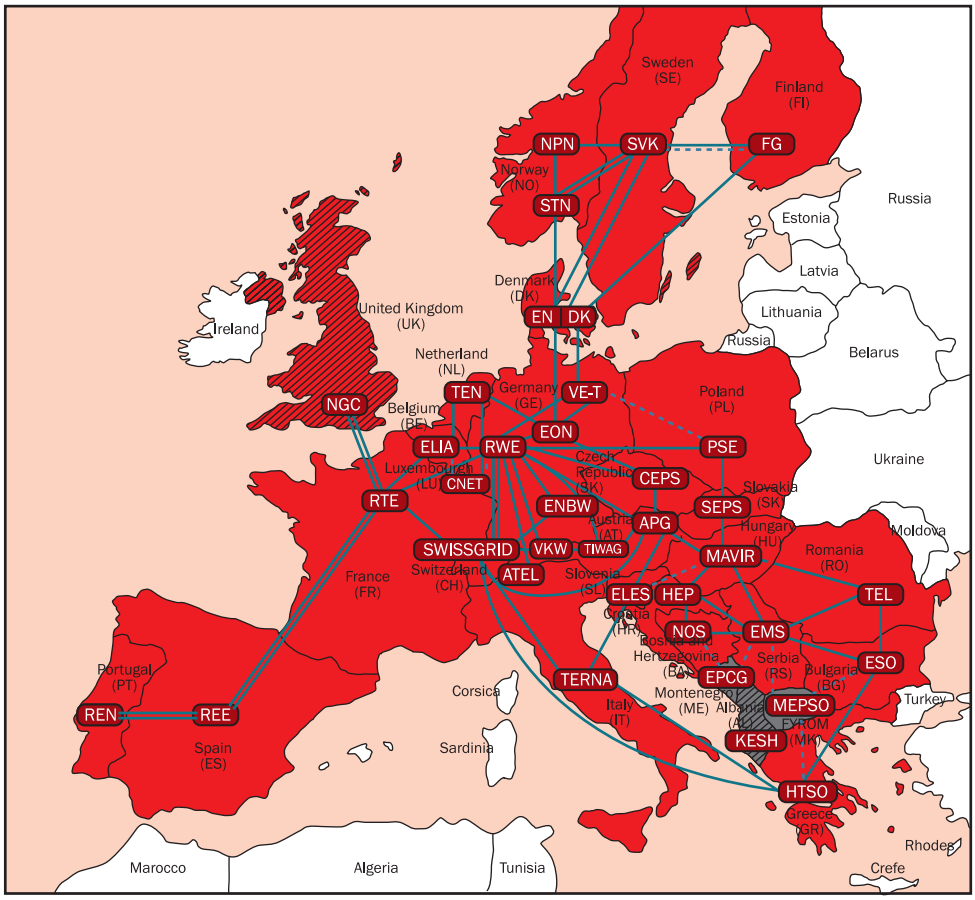

and the maintenance of the built-in optical equipment, is conducted, in real time, from the operational room of the EMS Telecommunications Centre.

With the use of optics, and in accordance with the UCTE (ENTSO-E) recommendations, EMS is connected with electrical power industries of Hungary, Bosnia and Herzegovina, Croatia, Romania and Bulgaria. Connections are enabled by means of STM-1 links, whereas devices support links up to




STM-16. In this way, EMS is linked to the European Energy Network (Electronic Highway - EH). This network is used for the exchange of data on the electrical power systems of European countries in real time, with the aim of ensuring the security of the European electrical power sector. The connection with Montenegro is secured by STM-1 link, but the electrical power industry of Montenegro still

Figure 84. European Electronic Highway — Source: EPS




Note: Montenegro (EPCG) and Macedonia (MEPSO) are not linked to EH.
Albania is not a member of UCTE/ENTSO-E



lacks the telecommunications resources necessary for the Electronic Highway. Figure 84 illustrates the abovementioned international links, with EMS having a considerably higher number of interconnections in relation to the number of links of most of the other countries.

The network of very high (VH) frequency links consists of sections realized along high-voltage lines. These sections are mainly analogue, with few channels, and connected into the single network via automatic telephone exchanges of the electric power. In terms of percentages, a rather small portion of voice and telemeasuring data are transmitted over VF connections. VF network, although technically obsolete, has maintained its functionality during 2009 and fulfilled the basic implemented technical requirements. With the development of telecommunications systems, VF links are becoming obsolete and will most likely be used for securing alternative paths.

The telephone exchanges are in the process of gradual replacement and migration towards the use of IP technology (out of the 32 existing exchanges, only 16 have satisfactory characteristics). Within the 15/08/PT project for the realization of packet telephone network, 18 packet telephone exchanges were installed within the single EMS and EPS telephone network.

Mobile links, which include base stations, appropriate repeaters and terminal stations of various types, provide efficient operation of fieldwork teams, particularly in rural areas. These mobile links cover most of the territory of the Republic of Serbia. Further development of the mobile network is currently in stagnation. EMS uses 5 radio-relay links in the 7.8 and 23 GHz bands. Digital links with STM-1 and 34 Mbps capacity are integrated into the telecommunications system.

By using own telecommunications system enabled the availability and information security necessary for the real-time operation of the electric energy system and the functioning of the overall electric energy sector. The amount of savings has exceeded the value of the active equipment built in. By building and exploiting the modern telecommunications system, the EMS personnel gained new skills necessary for the activities of operational management, monitoring, as well as maintenance of the EMS telecommunications system. In retrospect, the increasing usage of the optical transmission system can be regarded as one of the main characteristics of the previous period.




The unused capacity is mostly evident in the part pertinent to OPGW cable fibres. In taking this matter into consideration, one should note that EMS power lines (with OPGW cables) end in transformer stations. The abovementioned transformer stations are located outside urban areas. Since the active equipment provides unused capacities as well, one of the existing telecommunications systems (EMS, EPS) may partially be used for the needs of other entities apart from those within electrical power industry. Within such use, the security of operational data related to the technological process of managing the electrical power system in real time (SCADA and SRAAMD) should be of highest importance.

## 10.3. SERBIAN RAILWAYS, PUBLIC ENTERPRISE

### 10.3.1. CURRENT STATE OF TELECOMMUNICATION SYSTEM

The telecommunications networks of the Serbian Railways, PE utilize the following types of transfer media:

- transfer along ground cables and
- radio transfer.

The transfer of telecommunications, signals and stable electric traction facility information along electrified railroads is mostly conducted through STA (with no coaxial tube) and STKA (with coaxial tube) railroad signals-telecommunications cables. The purpose and construction of signal-telecommunications cables is determined by massage type and frequency band required by the above systems.

Optical cables were laid down within the Belgrade railroad junctions (the business facilities at Nemanjina 6 – Belgrade Passenger – Belgrade Centre) and along the sections Belgrade Centre – Pančevo Main, in the total length of 21 km. Optical cables laid along Požega – Kraljevo route in the total length of 65.7 km. The abovementioned optical cables have the capacity of 8 (Pančevo most-Pančevo glavna), 10 (Požega-Čačak), 12 (Beograd Centar-Pančevo most), 24 (Beograd Nemanjina 6-Beograd Centar) i 36 (Čačak-Kraljevo) fibres.



HF transmission along main railroads is realized via 300-channel systems, alongside railroads via 12-channel systems and along non-electrified railroads via 12-channel systems for operation on air-lines and three-channel systems. All transmission systems are realized in analogue technique with electronic pipes and transistor as basic components.

The SDH transfer system at the STM-1 level is used within the Belgrade Railroad Junction (business facilities Nemanjina 6 – Belgrade Passenger – Belgrade Centre), as well as along the sections Belgrade Centre - Pančevo Main where optical cables were laid down.

Radio link systems are a single technical and technological unity in terms of operation and usage. Radio links are increasingly being employed in the railway system due to their flexibility, availability and quality of service, which is of great importance for the operation of railways.

The Serbian Railways PE uses the following frequency bands:

- 147.775-148.300 MHz band paired with 152.275-152.800 MHz for radio networks for communication in traffic control along non-electrified railroads (Zrenjanin-Kikinda, Subotica-Banatsko Miloševo, Crveni Krst-Zaječar, Lapovo-Kraljevo);,
- 167.250-167.375 MHz band paired with 171.750-171.875 MHz reserved for the ZGOP radio networks (in the Serbian Railways network);
- 444.450-445.625 MHz band paired with 454.450-455.625 MHz for local radio networks in larger classification yards and sorting stations, as well as maintenance services,
- 457.450-458.300 MHz band paired with 467.450-468.300 MHz for the locomotive radio dispatch system enabling communication between dispatchers and engine drivers, in use along all major routes (Beograd-Mladenovac-Lapovo-Niš-Preševo, Beograd-Mala Krsna-Velika Plana, Batajnica-Šid, Indija-Subotica-state borderline, Resnik-Požega, Beograd node rails – cargo and passenger traffic).

A vast array of devices is in use in the radio-systems currently operating on the railroads, from the earliest generation of devices manufactured using transistor components, up to modern microprocessor-based radio devices.




## 10.3.2. INVESTMENT DEVELOPMENT PLAN

The investment development plan takes into consideration only main railroads. Side railroads the continuity of the telecommunication system will be established on certain routes, according to the technical requirements of the Traffic Department and financial assets, by installing free-standing cable, radio stations at important official sites or partial calibration.

### *10.3.2.1. CABLES*

The plans for the investment works for main routes where no copper cables have been laid down (Niš – Dimitrovgrad and Belgrade – Vršac) envisage the laying of copper STA¬PV1 4x4x1,2NF+12x4x0,9NF and optical cables, mostly with 144 optical fibres, into the ground, whereas along other main routes where railroad copper signals-telecommunications cables of the STKA and STA types are in use (Belgrade-Bar, Belgrade -Šid, Belgrade -Niš-Preševo, Inđija-Subotica, Belgrade - Mala Krsna-Velika Plana) either pylon contact networks or 144 fibre optical cables will be laid into the ground.

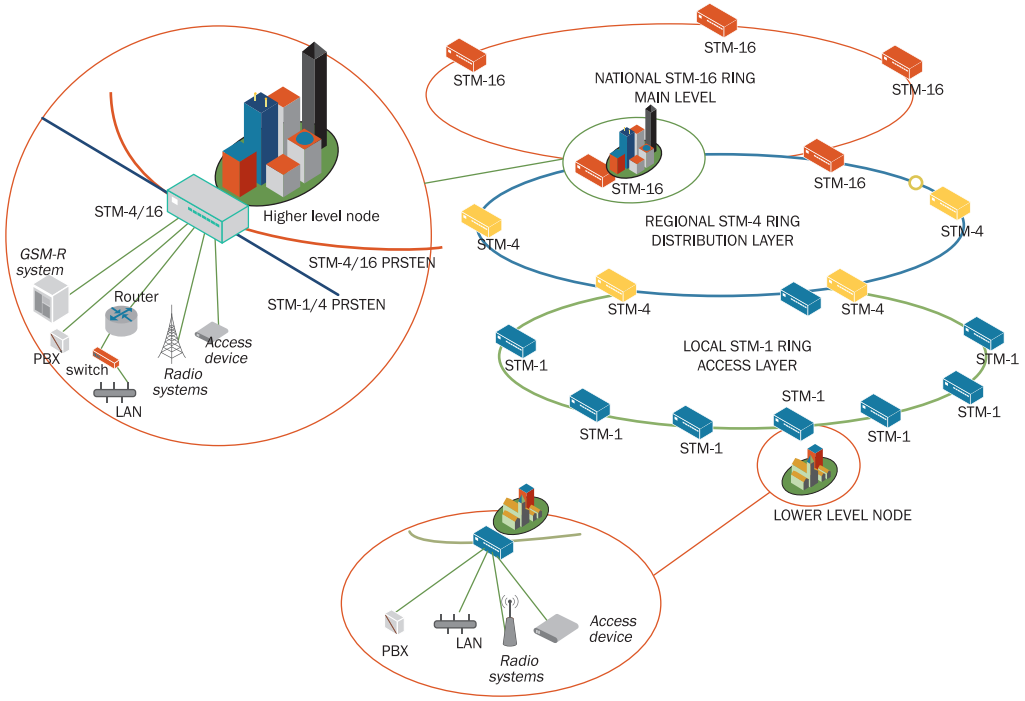
In late 2010 an agreement was signed with PTT on building optical infrastructure along corridor X rails. The public tender for construction of the first phase of the optical infrastructure of 461 km along the railway tracks of the Belgrade railway node and railway tracks Belgrade– Šid and Belgrade – Niš, is planned for May 2012

### 10.3.2.2. TRANSMISSION SYSTEMS

The transfer system network architecture consists of three layers:

- Main
- Distribution
- Access

Figure 85. Telecommunication Transmission System Source: EPS




The following total capacities were planned for the main routes on the territory of Serbian Railways:

- STM-1 (Subotica-Sombor, Subotica-Horgoš, Novi Sad-Sombor, Šid-S.Rača, Ruma-Šabac-Zvornik, Prahovo-Zaječar);
- STM-4 (Belgrade-Prijepolje, Niš-Dimitrovgrad, Belgrade.C-Mala Krsna-Velika Plana, Niš-Preševo, Novi Sad-Subotica, Subotica-Kikinda, Subotica-Zrenjanin, Stalać-Kraljevo-Požega, Lapovo-Kraljevo, Kraljevo-Lešak, Beograd-Pančevo-Vršac, Inđija-Šid, etc.);
- STM-16 (Belgrade -Niš, Belgrade - Inđija-Novi Sad, Belgrade C.- Belgrade -Nemanjina);




- **Mid-range radio links were envisaged for redundancy, enabling the closure of the ring structures in the transport network.**

Based on individual user concentration, applications in use, as well as the service they require, the nodes were divided into higher and lower level nodes.

Higher level nodes belong to the transport or distribution layer.

Lower level nodes mostly belong to the distribution or access layer.

### *10.3.3.3 CIRCUIT-SWITCHING NETWORK*

The telephone network would operate as a three-tiered network. It would be comprised of the transit, regional and local layer.

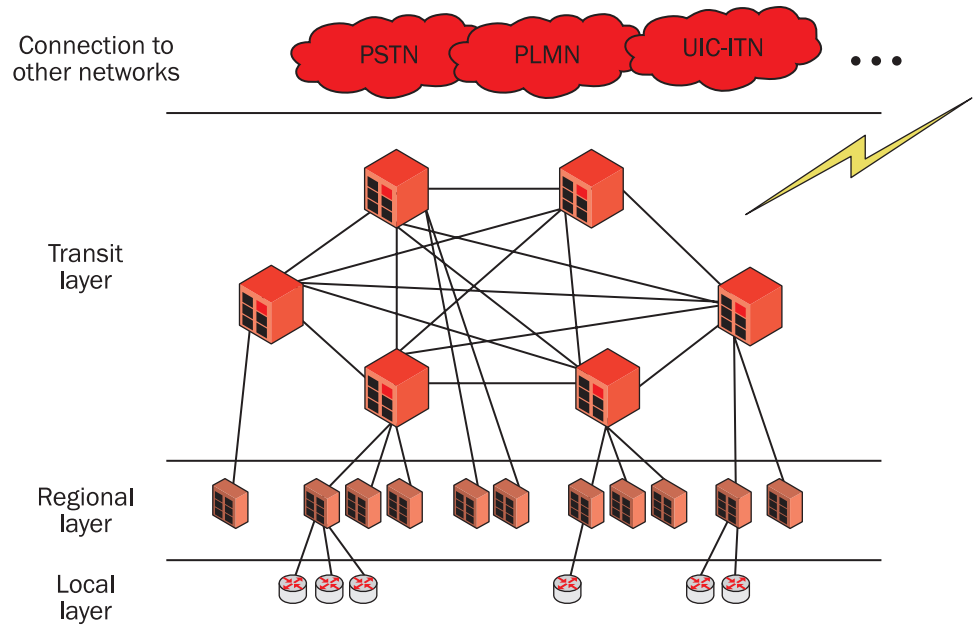
Nodes in the transit layer are mutually partially networked and are mostly located in the headquarters of the railroad organizational units. All calls are routed according to non-hierarchic alternative principle. Transit nodes are equipped with necessary hardware and software modules which are in charge of the system monitoring and maintenance and where the system backup is located.

Each regional node contains local software enabling autonomous control and complete call processing for all its users.
Local layer nodes would be located mainly along the railway and in smaller official sites. They would be realized as remote stages, concentrators or LAN.

Only transit centre Belgrade would be connected to the networks of other railway administrations.

The connection to the public network would probably be realized through transit layer although there some regional nodes should also be able to realize the connection.

Figure 86. Circuit-Switching Network Source: EPS




The network should have an open numbering system. Each transit node has a code and each user within the exchange can be reached directly by dialling a user number. The numbering of each regional node is an integral part of the relevant transit exchange numbering.

## 10.3.4. RAILWAY DEVICES

The investment works envisage the setup of modern railroad telephony systems manufactured using digital integrated technologies.

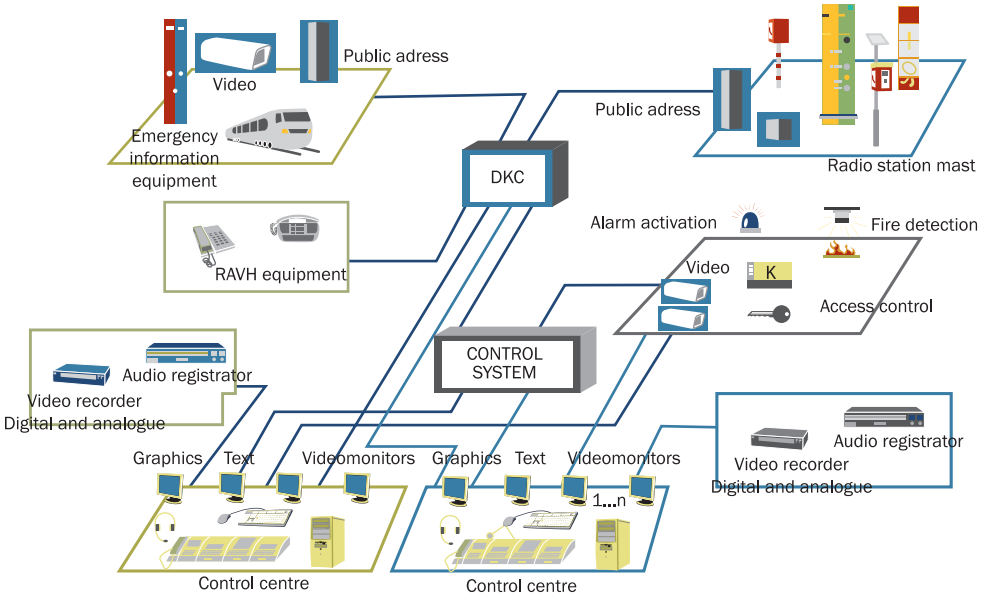
New systems with digital communication nodes (DCN) will be used along electrified international corridor railroads. The installation of a new generation of railroad telephony systems includes changes to current rulebooks and manuals.




New integrated digital systems of railroad telephony will be implemented along the international Corridor X following the completion of the construction of optical infrastructure.

Figure 87 shows the systems that can be integrated within the DCN nodes and the dispatcher centres of the Dispatcher Systems of Traffic and Electrical Traction.

Figure 87. Digital Integrated Railroad Telephony Systems Source: EPS




DCC - Digital communication centre

This solution provides for the traffic and electrical traction dispatchers to communicate with traffic and driving personnel in stations and along the railroad in order to regulate railroad traffic along a dispatcher section and provide for infrastructure maintenance. The system enables selective connections with call identification between nodes and the dispatcher centre.

The main DCN would be located in the dispatcher centre, whereas first-level digital switching nodes would be installed along the railroad in most stations. Communication between the main DCN in the



dispatcher centre with nodes along the railroad is established through first-level DCNs. Other, smaller stations would house station and railroad connection concentrators connected to first-level DCNs by multiplexers on copper cables. The main DCN and the first-level DCNs are to be connected by optical cables, while communication will be conducted along a digital transfer system where a 2Mbit-access should be planned for at each node and for mutual communication. The input and output signals, road crossings and railroad telephones should be fitted with intercom-style telephones.

### 10.3.5. RADIO SYSTEMS

Further choices for integrated mobile communications are digital radio based on the GSM-R networks and bands within the designation of allocated bands were reserved to this end.

As for migration routes, the choice for the mobile segment is to equip the entire pool of vehicles with locomotive radio stations, noting that dual-mode stations shall be procured, supporting both analogue operation at 450 MHz and the GSM-R network.

A stable infrastructure migration model will depend on financial resources.

Local networks should meet the requirements of the relevant traffic volume and the complexity of technological processes of equipping larger stations and expending the existing networks in 450 MHz frequency range.

## 10.4. ACADEMIC NETWORK OF THE REPUBLIC OF SERBIA - AMRES

The network infrastructure of the Academic Network of the Republic of Serbia – AMRES connects academic, scientific-research and educational institutions of the Republic of Serbia into a single computing-communications network. AMRES infrastructure network consists of access network, backbone and external links.

Access network connects the end-institutions with AMRES network access points. The access points enable physical access to AMRES network infrastructure and AMRES services to one or more member institutions. In the current active network topology, the access points are located in the following 20 towns: Belgrade, Novi Sad, Niš, Kragujevac, Subotica, Sombor, Zrenjanin,




Šabac, Pančevo, Valjevo, Užice, Čačak, Kraljevo, Kruševac, Leskovac, Vranje, Bor, Pirot, Novi Pazar i Kosovska Mitrovica. The access techology mainly used for connecting the institutions to AMRES network is fibre-optics (FTTB), and xDSL VPN and analogue links to a lesser extent.

The backbone of AMRES network consists of intercity and inner-city optical links, which connect the access points.

External links refer to AMRES network connections with GÉANT (Gigabit European Advanced Network Technology), foreign academic networks, telecom service providers and other partner institutions. In the current network topology, the capacity of the primary connection to GÉANT is 10 Gb/s, and to Internet via GÉANT access point in Budapest 3 Gb/s. The capacity of the secondary connection to GÉANT and Internet is 1 Gb/s, via Hungarian academic network HUNGARNET. Additionally, the Intenet connection can be made via network of the telecom operator Telekom Srbija, via 34 Mb/s link. AMRES network is also connected to the Academic Network of Republika Srpska SARNET, via 1 Gb/s optical link.

The SEELight project (*South-East European Lambda Network Facility for Research and Education*) has enabled further extension and upgrade of AMRES network infrastructure. SEELight project is part of the Hellenic Plan for the Economic Reconstruction of the Balkans, supported by the Greek Government, with the objective to develop and enhance the optical infrastructure of the academic networks in the region, their interconnection and connection to GÉANT through redundant links.

The project consists of three phases. In the first phase, the project management agreement was signed. In the second phase, the contract on leased optical fibres closed in 2010 between the Ministry of Telecommunications of the Republic of Serbia and Telekom Srbija, enabled leasing around 3800 km of optical fibres for the purposes of both backbone and access network. Around 2000 km of optical fibres had already been in place, whereas the rest of the network was completed in 2011 through the implementation of the second phase of SEELight project. The preliminary conditions for connecting academic, scientific-research and educational institutions to AMRES access points were thus created in 53 towns in the Republic of Serbia.

The Ministry of Telecommunications of the Republic of Serbia and Telekom Srbija closed a 15-year contract on leased optical fibres, valid until November 2026.

Figure 88. AMRES Network Backbone Topology Source: EPS




## 10. 5. DIRECTORATE FOR INLAND WATERWAYS INFORMATION SYSTEM

Having in mind the defined network of the European transport corridors, which includes the Danube (corridor VII), the European Union has been taking significant steps in the past years in order to upgrade the European transport corridor network. Using different financing instruments, the EU is investing considerably in providing equal navigation conditions in corridor VII. The development of the River Information Services (RIS) in the last decade was a quality leap in the application of modern technologies in inland navigation, undoubtedly opening a new chapter in both navigation and waterway traffic management and control.

The Republic of Serbia, geographically belonging to the mid-Danube, with 588km of the Danube's course is an important link in the European transport system. In this regard, the EU in cooperation with the Government of the Republic of Serbia has taken important steps in the past three years in order to implement a modern concept of the river information service in the Serbian part, thus ensuring a safer, more efficient and more competitive navigation.

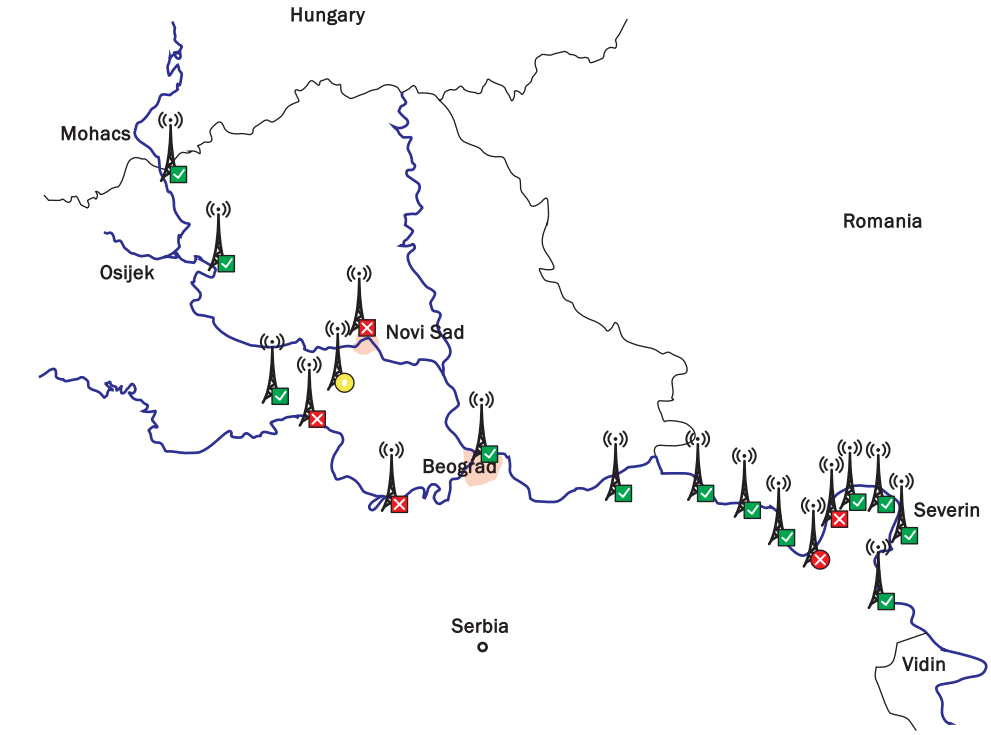
One of the important systems, the core of the river information service, is the vessel tracking system. The vessel tracking system is designed for the stakeholders directly involved in the navigation (ship commanders and captains), and those indirectly involved (e.g. state authorities such as the police, customs authorities, port authorities etc.)

Such radio-communication system is based on the transponder technology or Automatic Identification System (AIS). Vessel data (position, capacity, type of vessel, identification data, number of crew members, etc.) are transmitted in the air every 2 seconds on channels AIS1 and AIS2, by applying the AIS transponder (with integrated radio trans-receiver). AIS transponder enables the receipt of data on channels AIS1 and AIS2, which are transmitted by the vessels in the same area and are appropriately decrypted and interpreted. The received data may be presented by means of textual interpretation or graphic image and may be forwarded to other devices using a suitable interface, such as ECDIS system or radar.

Navigation tracking system consists of the infrastructure installed on the coast (coastal segment) and the devices installed on ships with autonomous propulsion (waterway segment).

The coastal segment consists of 15 base stations located along the Danube course in the way such as to provide full coverage of the Danube (Figure 89). The idea of the coastal segment is to receive information transmitted by the ship AIS transponders and to forward it to the location where the information is processed and further used for navigation tracking and monitoring. Although the principal purpose of the coastal segment is ship tracking and monitoring, it enables a two-way communication and for the information to be forwarded to navigation stakeholders as information received by the ship transponders. The information may be transmitted on the air, as needed or systematically, so as to be distributed to single or all devices within the range of the coastal segment. The coastal segment range is defined by the position and location of the base stations, configuration, system adjustment and antenna type.

Figure 89. Base stations on the revers Danube and Sava






All data collected from the 15 base stations along the Danube are delivered to the central segment of the system, the RIS control centre, located in Belgrade within the Directorate for Inland Waterways. The data are processed, stored and forwarded to system users in adequate form (Figure 90).

Figure 90. The national RIS centre – control room

The users of the national RIS centre can download the data, depending on authorisation and competence, and interpret them as tactical or strategic traffic image on the terminals which provide a graphic image of the ship positions and the data exchanged via AIS transponders on an electronic navigation map.

The main purpose of the ship tracking system is to facilitate safe navigation. Monitoring navigation from land enables improved navigation efficiency due to better planning of related operations. A good illustration of this is vessel tracking by the ship locks employees. The

Figure 91. Tactical traffic image –Istrajni 1 ship sailing downriver near the bridge of Pančevo

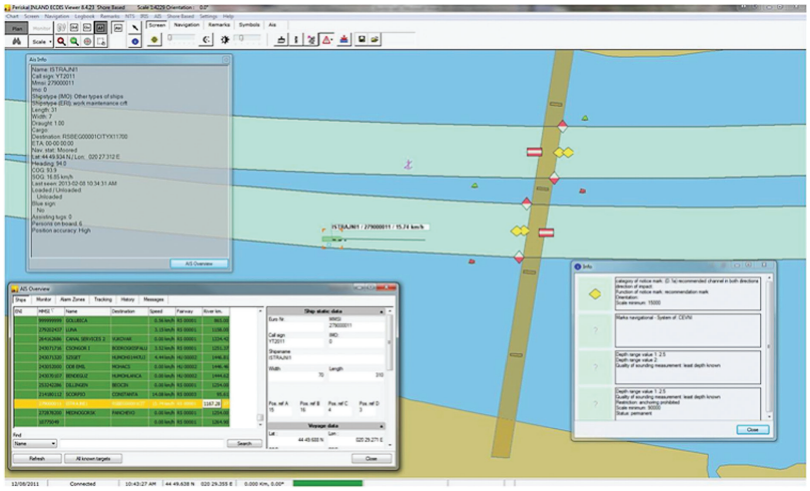
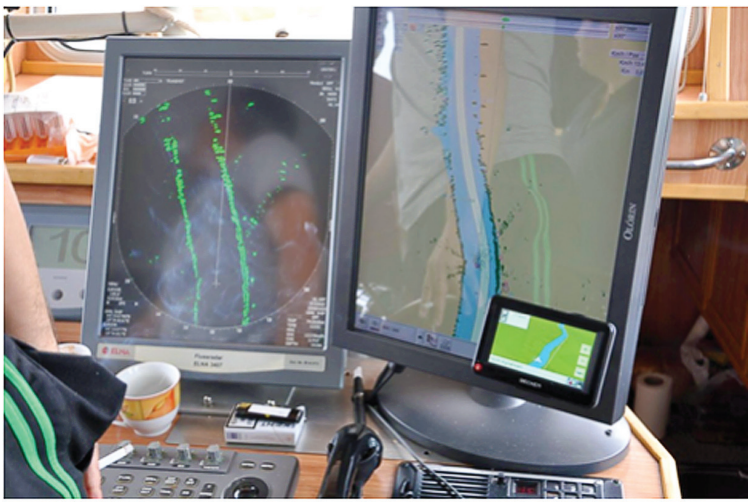


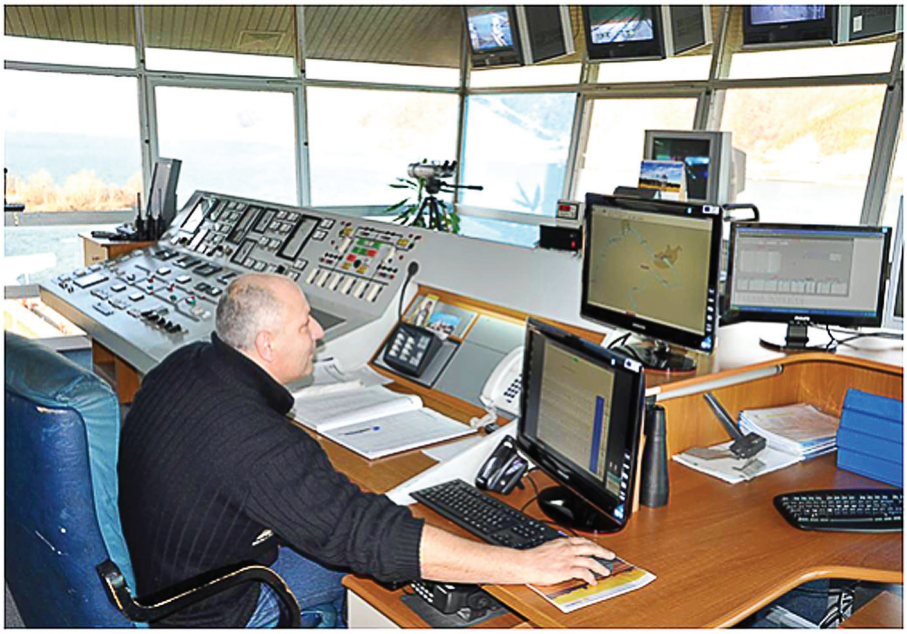
Figure 92: ECDIS display on the command bridge and the position of the vessel on the electronic navigation map






data on exact ship position, capacity, speed, cargo and expected arrival time can significantly improve the work planning of ship locks. Since the operation of the ship lock of the Đerdap 1 hydropower plant takes on average one and a half hours, while waiting in line may take hours, with the optimization of the ship lock operation the total time of cargo transport can be significantly reduced. The employees of the control tower of the Đerdap 1 and Đerdap 2 ship locks are using ship tracking system in the everyday work.

Figure 93. Control tower of the Đerdap 1 hydropower plant



Water segment connected with GPS system and different position correction systems is particularly important for navigation and provide a clear spatial orientation to all stakeholders both concerning their own vessel and other vessels in proximity i.e. within the range of the radio device integrated in the AIS transponder. The range depends on a number of factors (geographic characteristic of the terrain, system and antenna configuration) usually ranging between several and several dozen kilometres. The vessels exchange the data (position,

capacity, type of vessel, identification data, number of crew members) through direct communications between the ship transponders every 2 seconds via AIS1 and AIS2 (87B and 88B) channels. The exchanged data may be interpreted on the transponder display or on ECDIS display in the form of graphic image of the tactical traffic image on the vessel command bridge. Based on the information transmitted via AIS, ship commanders are able to view the position, course, speed and capacity of their own or other vessels on the electronic navigation map, to detect vessel motion not physically visible (e.g. in the turn, in case of reduced visibility or heavy rain affecting radar devices, etc.) and to make decisions directly affecting navigation based on the available information.




# 11. LIST OF BYLAWS

## 11. 1. LIST OF BYLAWS WITHIN RATEL'S COMPETENCE

- Rules on fee calculation for the provision of services within the competence of the Republic Agency for Electronic Communications (*Official Gazette of RS*, no. 34/13)
- Rules on the manner of radio frequency usage under general authorization regime (*Official Gazette of RS*, no. 28/13)
- Rules on the terms and conditions for access to and usage of the data from a public directory (*Official Gazette of RS*, no. 84/11)
- Rules on obligations of value added services provider (*Official Gazette of RS*, nos. 76/11 and 91/11-corr.)
- Rules on quality parameters for publicly available electronic communication services and monitoring of electronic communication activity (*Official Gazette of RS*, no. 73/11)
- Rules on the minimum content, level of detail and manner of publication of standard offers (*Official Gazette of RS*, no. 70/11)
- Rules on the scope and content of the minimum set of leased lines (*Official Gazette of RS*, no. 70/11)
- Rules on the amount of annual fee for the use of numbering (*Official Gazette of RS*, no. 67/11)
- Rules on the manner of radio stations usage on the national and foreign aircrafts, locomotives, ships and other vessels (*Official Gazette of RS*, nos. 60/11 and 68/11-corr.)
- Rules on the manner of monitoring the radio frequency spectrum usage, technical inspection procedure and protection from harmful interference



(*Official Gazette of RS*, no. 60/11 and 35/13)

- Decision on designating relevant markets susceptible to ex-ante regulation (*Official Gazette of RS*, no. 59/11)
- Rules on manner of amateur radio station usage (*Official Gazette of RS*, no. 53/11)
- Rules on the application of the cost-accounting principle, separate accounts and reporting of an operator with significant market power in the electronic communications sector (*Official Gazette of RS*, no. 52/11)
- Rules on number portability on public telephone networks at a fixed location (*Official Gazette of RS*, no. 52/11)
- Rules on general terms and conditions for performing electronic communication activities under general authorization regime (*Official Gazette of RS*, nos. 38/11 and 44/11-corr.)
- Numbering Plan (*Official Gazette of RS*, nos. 32/11 and 35/12)
- Rules on application form for the issuance of licence for the use of numbering (*Official Gazette of RS*, no. 32/11)
- Rules on application forms for the issuance of individual licence for the use of radio-frequencies (*Official Gazette of RS*, no. 08/11)
- Rules on fees for the performance of electronic communications activities (*Official Gazette of RS*, no. 93/10)
- Rules on radio-frequency usage fees (*Official Gazette of RS*, no. 93/10)
- Decision on designating operators with universal service obligation (*Official Gazette of RS*, no. 15/10)
- Rules on number portability in public mobile telecommunications networks (*Official Gazette of RS*, no. 05/10)
- Statutes of the Republic Agency for Electronic Communications (*Official Gazette of RS*, no. 59/10)
- Decision on the manner of keeping the registers, records, data bases and




other information within the competence of the Republic Agency for Electronic Communications and the publication thereof on the Agency website (passed on 11.02.2011 by RATEL's Managing Board, available at www.ratel.rs)

- Rules on terms and conditions and the procedure for the issuance of authorization to a public telecommunications operator for interconnection of a national telecommunications network with a telecommunications network of another country (*Official Gazette of RS*, no. 94/08)

## 11.2. LIST OF BYLAWS PASSED BY THE RESPONSIBLE MINISTRY AND THE GOVERNMENT OF THE REPUBLIC OF SERBIA AT RATEL'S PROPOSAL PURSUANT TO LAW ON ELECTRONIC COMMUNICATIONS

- Regulation stipulating the Radio Frequency Band Allocation Plan (*Official Gazette of RS*, no. 99/12)
- Rules on analogue to digital switchover in TV broadcasting and access to multiplex in terrestrial digital broadcasting (*Official Gazette of RS*, no. 55/12)
- Rules on radio equipment and telecommunications terminal equipment *Official Gazette of RS*, no. 11/12)
- Rules on Universal Service (*Official Gazette of RS* , no. 24/12)
- Rules on requirements in terms of staff, equipment and premises of an undertaking, company or other legal entity authorized for measuring and testing the operation of electronic communications networks and services, associated facilities, electronic communications equipment and terminal equipment (*Official Gazette of RS*, no. 13/12)
- Rules on stipulating Radio Frequency/Location Allotment Plan for Terrestrial Analogue FM and TV Broadcasting Stations for the Territory of the



Republic of Serbia (*Official Gazette of RS*, nos. 9/12 and 30/12)

- Rules on the manner and conditions for the determination of the zone of the electronic communications infrastructure and associated facilities, protected areas and obligations of investors during the construction of buildings and premises (*Official Gazette of RS*, no. 16/12)
- Rules on the technical and other requirements when building associated infrastructure necessary for installing electronic communication network, associated facilities when constructing commercial and residential buildings (*Official Gazette of RS*, no. 123/12)
- Strategy for the development of electronic communication in the Republic of Serbia from 2010 until 2020 (*Official Gazette of RS*, no. 68/10)