

Report on the state of the telecommunications market in 2016

Telecommunications market

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We present to you a report showing data from 2016 on:

- the telecommunications market,
- the telecommunications infrastructure.

Over the past twelve months, trends in the telecommunications market in Poland have not changed significantly. We should talk about their continuation rather than the fundamental transformations or the reversal of the previous tendencies. The total value of the Polish telecommunications market in 2016 amounted to PLN 39.47 billion and was slightly lower than a year earlier.

The penetration of Internet access services in Poland in terms of households amounted to over 106% in 2016. This was about 5 percentage points higher than last year. Decline in revenue is seen with most access technologies. The exception is fibre, where the operators earned in total over 65% more than in 2015. In 2016, 14.5 million people used the Internet in Poland. This represented an increase of approximately 5% compared to 2015.

In 2016, 7.86 million people used bundled services, the number of users increased by 34% compared to the previous year. The most popular bundled service is still the “Mobile telephony + mobile Internet” package. Users of this service accounted for 54% of all subscribers, which represented an increase of more than 12.5 percentage points compared to 2015.

At the end of 2016, the operators recorded 55.5 million SIM cards, which translated into service penetration at 144.2%, 2% lower compared to the end of 2015.

The decreasing penetration of mobile telephony services is driven by the law requiring registration of prepaid cards. Almost all operators have been affected by the legal regulations imposing the obligation to register prepaid cards. Mobile operators’ revenues have been declining for several years, and this trend was also confirmed in 2016.

The number of fixed-line subscribers is decreasing year by year and in 2016 the fixed-line market recorded a recurring decline both in terms of number of subscribers and revenue. In 2016, such services were used by 5.2 million users. A downward trend was also seen with respect to the duration of calls made on landlines.

The number of users of the VoIP service provided within the operators' own network was 1.05 million in 2016, i.e. 6.1% more than in the previous year. In the same period, the number of users using services provided based on another operator's network decreased by 24.1%, from 540,000 to 410,000.

The duration of calls decreased both in the case of services provided within the operators' own network and other operators' network.

In October 2016 Marcin Cichy became the new President of UKE. The following important events for the Polish telecommunications market were also noted:

- issuance of licences for frequency auction winners in the 800 MHz and 2,600 MHz bands,
- the obligation to register pre-paid cards. On July 2, 2016, a new anti-terrorist law was introduced in Poland, which imposed an obligation to register pre-paid cards,
- the announcement of the acquisition of Multimedia Polska by UPC Polska.

Currently, we are witnessing changes that will strongly affect the telecommunications market in the coming years. Increasingly frequent conversations and text messaging over the Internet have led to increased demand for data transmission. We are also more willing to use a phone abroad, which is an effect of the annual changes in roaming charges. There is also a growing number of devices that can be connected to the network, which means an increase in the number of Machine2Machine SIM cards.

The following chapters of Part I of this report provide detailed information on the development of particular segments of the telecommunications market: Internet access, mobile telephony and fixed-line telephony. The report was prepared on the basis of the information contained in the telecommunications activity reports for 2016 (databases as of 5 June 2017), submitted in accordance with Article 7 of the Telecommunications Act by telecommunications operators as well as using the analytical resources held by the Office of Electronic Communications.

The second part of the report presents the state of the infrastructure on the basis of data collected as of 31 December 2016. The Act on supporting the development of telecommunications services and networks was amended in 2016. One of the changes was to establish a catalogue of information that is not subject to business secret. Information, i.a. about operators who can provide services at a given address (that is, coverage), at what maximum bandwidth and in which technology, is publicly available.

Retail data is not annexed to the report but is available in the form of a search engine at <http://uke.gov.pl/wyszukiwarka/> and in the form of an API on the Central Repository of Public Information website (<https://dane-publiczne.gov.pl/>).

During this year's inventory, UKE did not call on the operators to provide information on fibre lines and access networks realised in 2016 and planned for 2017. The reason was that the Ministry of Digital Affairs was planning a consultation on white areas for NGA networks – that is, areas where no NGA network that would allow access at min. 30 Mbps exists, and most likely no such network will be developed on market terms within three years. The main purpose of the planned consultations is to identify sites that will be potential areas of intervention within the I Digital Poland Operational Programme Axis.

In 2016, a 16% increase in fibre was recorded, at the end of last year the length of Poland's own fibre network amounted to nearly 430,000 km. Compared to the previous inventory, there were more than 46,000 new fibre nodes, which means an increase of 43%.

The report shows that in more than 32% of buildings there is a possibility to access the Internet at min. 30 Mbps. The number of towns and villages where no operator has declared the coverage of fixed and wireless networks has fallen by 28%, with 99% of the towns and villages being the smallest, consisting of several buildings, often in heavily wooded areas.





Telecommunications market



1.

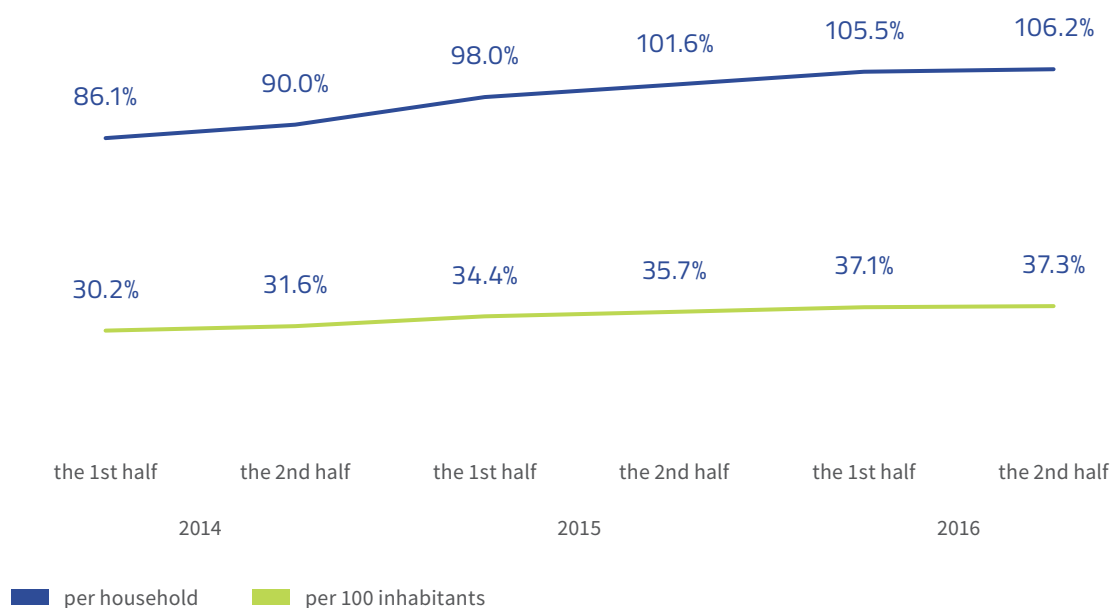
Internet
access

1.1. General information

The penetration of Internet access services in Poland in terms of households amounted to over 106% in 2016. This was about 5 percentage points higher than last year. On the other hand, the value of the Internet access market decreased by approximately 3% compared to 2015 and totalled PLN 4.9 billion.

Chart 1.

Broadband services penetration rate



Source: UKE

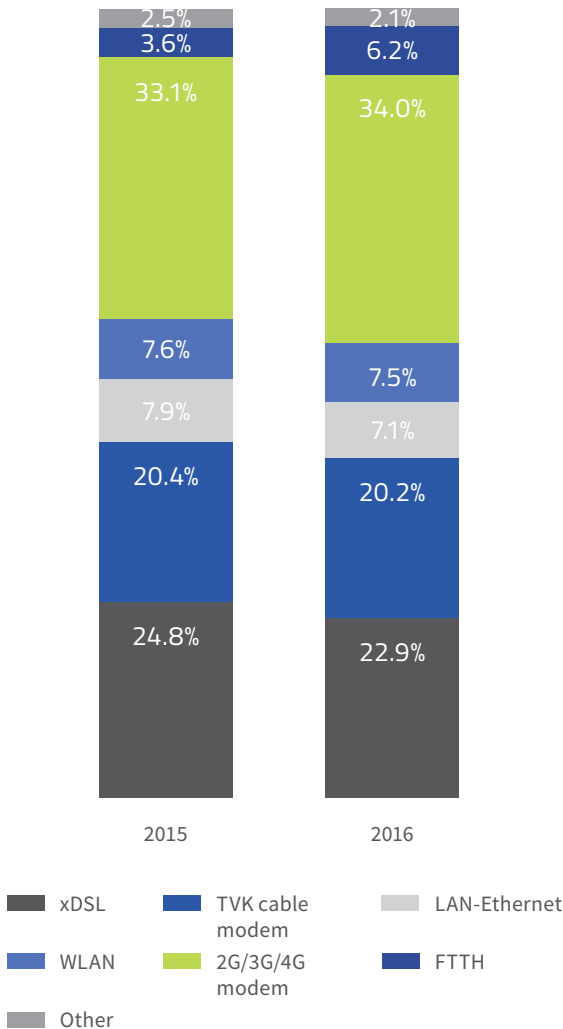
1.2. Revenues

Decline in revenue is seen with most access technologies. The exception is fibre where the operators earned in total 65% more than in 2015. The highest revenue was generated by mobile Internet services (2G/3G/4G modems). Their market share amounted to about 34% in 2016.

In the area of average monthly revenue earned by the operators from one subscriber, the downward trend continued in 2016. Monthly revenue was by more than PLN 2 lower than in 2015 and amounted to PLN 28.2.

Chart 2.

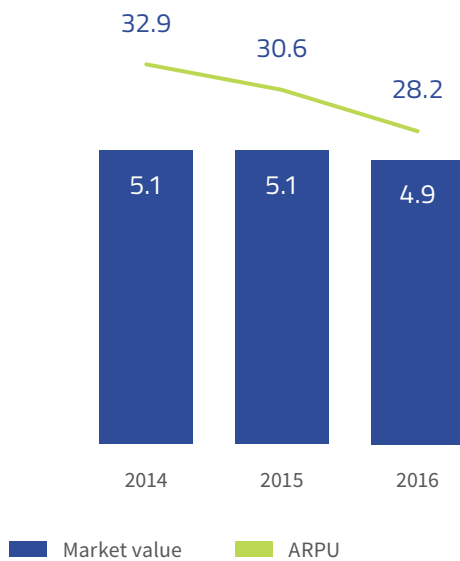
Revenue structure in terms of technology used



Source: UKE

Chart 3.

Value of the Internet access market (PLN billion) and average monthly subscriber revenue (ARPU)



Source: UKE

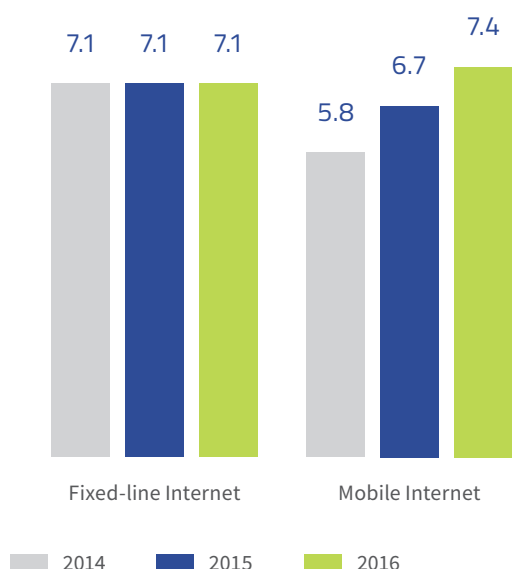
1.3. Subscribers

In the year 2016, 14.5 million people used the Internet in Poland. This represents an increase of approximately 5% compared to 2015. In addition, in 2016, for the first time, the number of mobile Internet users was higher than the number of Internet users connecting to the network by means of fixed-line access. Mobile technology was used by a total of 7.4 million people.

In total, over 51% of users connected to the Internet via 2G/3G/4G modems. This means an increase of about 2 percentage points. The second most popular access points technology was cable television (about 19%) and the third most popular access technology was xDSL (about 17%).

Chart 4.

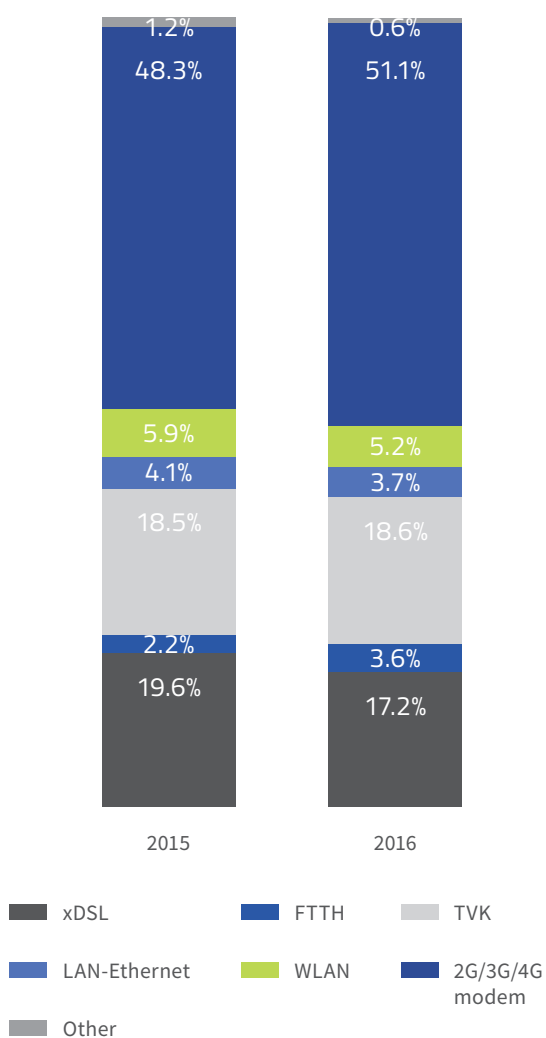
Number of fixed-line and mobile Internet subscribers (in million)



Source: UKE

Chart 5.

Structure of subscribers in terms of access technology used



Source: UKE

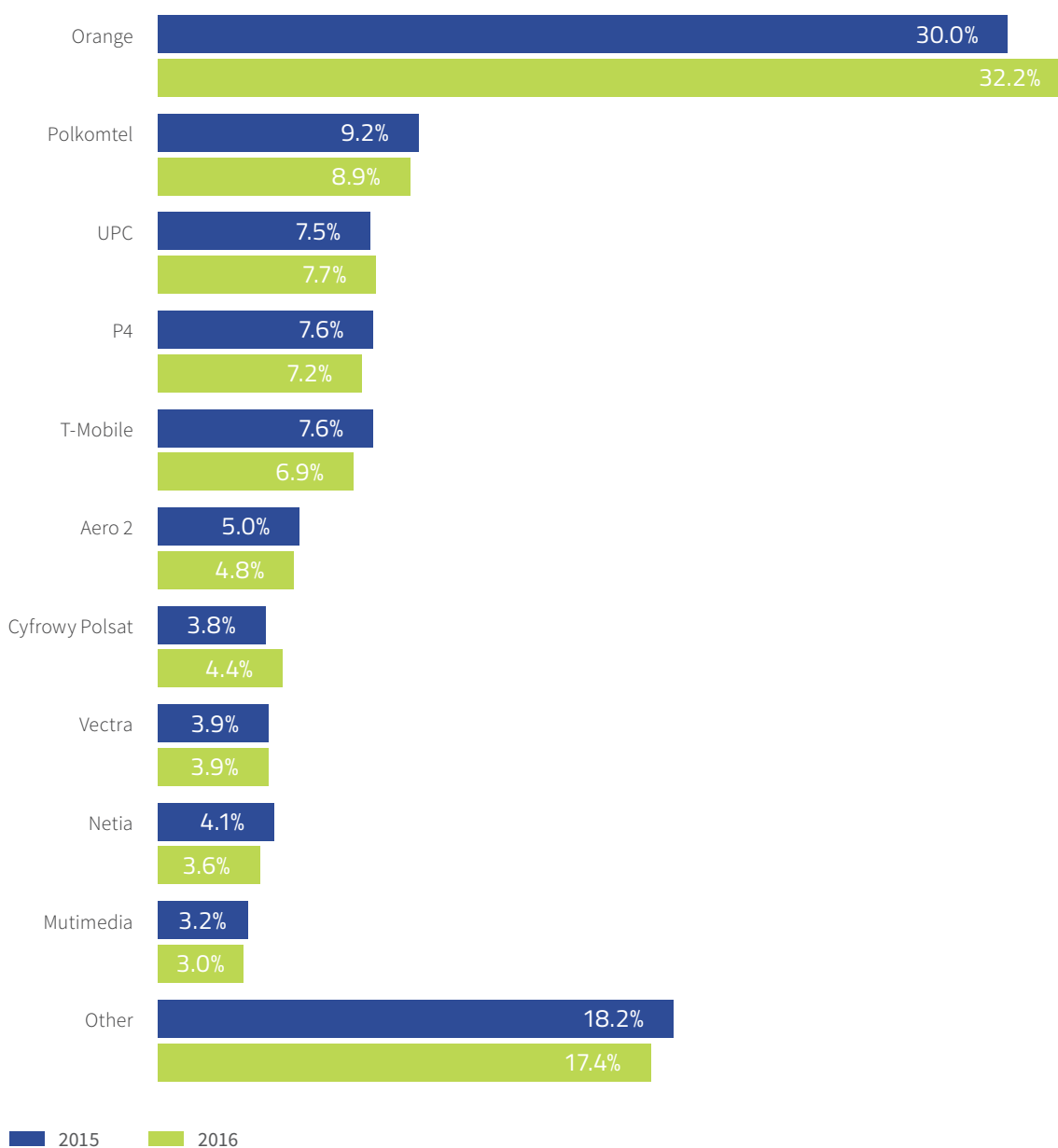
1.4. Market structure

In 2016, Orange had the largest share in the number of Internet users. More than 32% of all Internet users

used the services provided by this company. Polkomtel ranked second, with about 9% of subscribers. Other operators, UPC and P4, achieved a market share of over 7%.

Chart 6.

Operators' shares in terms of the number of Internet users



Source: UKE

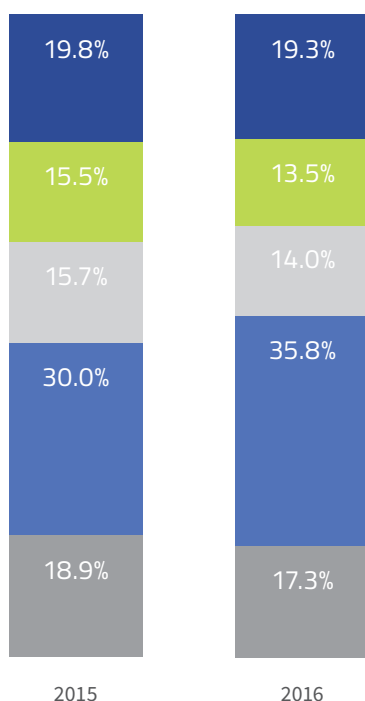
1.5. Internet access technologies

Mobile modems

Compared to 2015, the share of Orange in the market of modem Internet access grew. The services of this operator in this particular technology were used by a total of about 36% of users, which means an increase of about 6 percentage points year to year. More than 17% of Internet users connected to the network using Polkomtel's modems. P4 and T-Mobile achieved a market share of around 14%. Revenues from these services amounted to approximately PLN 1.7 billion.

Chart 7.

Operators' shares in the total number of users using modems



Polkomtel
 Orange
 P4
 T-Mobile
 Other

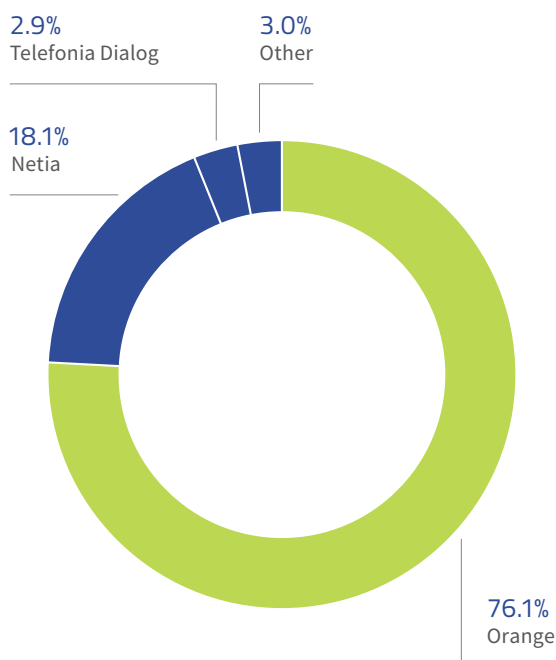
Source: UKE

xDSL

Orange remained a clear leader in terms of the number of users using xDSL technology. More than 76% of users of this technology purchased the services of this provider. In total, revenues from that type of lines amounted to PLN 1.1 billion in 2016.

Chart 8.

Operators' shares in the total number of users using xDSL-based Internet access services



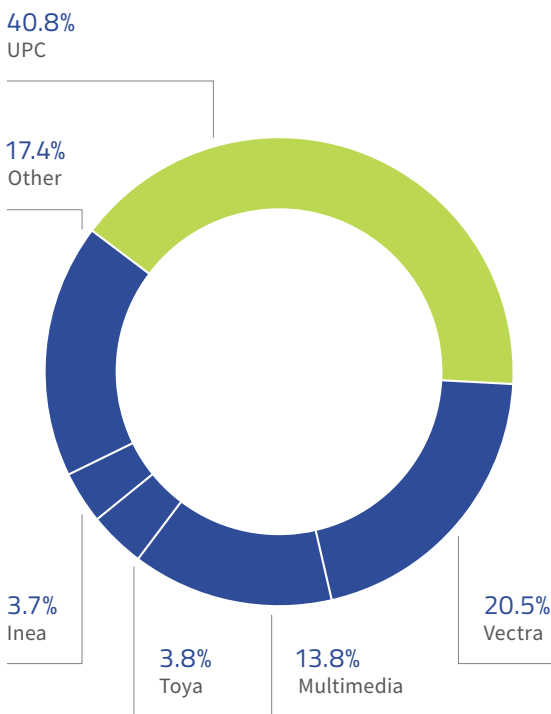
Source: UKE

Cable television modems

The most popular cable operator in 2016 in Poland in terms of the number of customers was UPC. Nearly 41% of cable modem users connected to the network using this operator's services. Vectra ranked second, with a cable television market share of around 20%. Revenue from Internet services provided by cable modems was around PLN 1 billion.

Chart 9.

Operators' shares in the total number of users using Internet access services via cable television modems



Source: UKE

WLAN and LAN-Ethernet

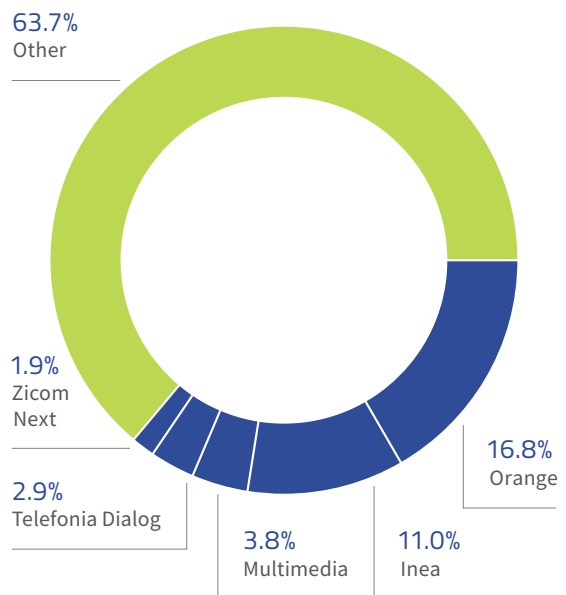
As in the previous years, the markets for WLAN and LAN access were very fragmented. A large group of service providers using such lines had fewer than 1000 users. As for WLAN, the operators with low number of users constituted approximately 87% of all operators providing services in this technology. This percentage was even higher for LANs, where almost 90% were the operators who had fewer than 100 customers in their database. Overall, WLAN and LAN services generated revenues of PLN 0.7 billion for the operators.

FTTH

High competition is also visible in the fibre market. In 2016, Orange had the largest market share in this area, which reached 17%. The second operator, Inea, gathered around 11% of FTTH users. In 2016, the operators earned about PLN 0.3 billion on fibre services.

Chart 10.

Operators' shares in the number of users using Internet access services via FTTH technology



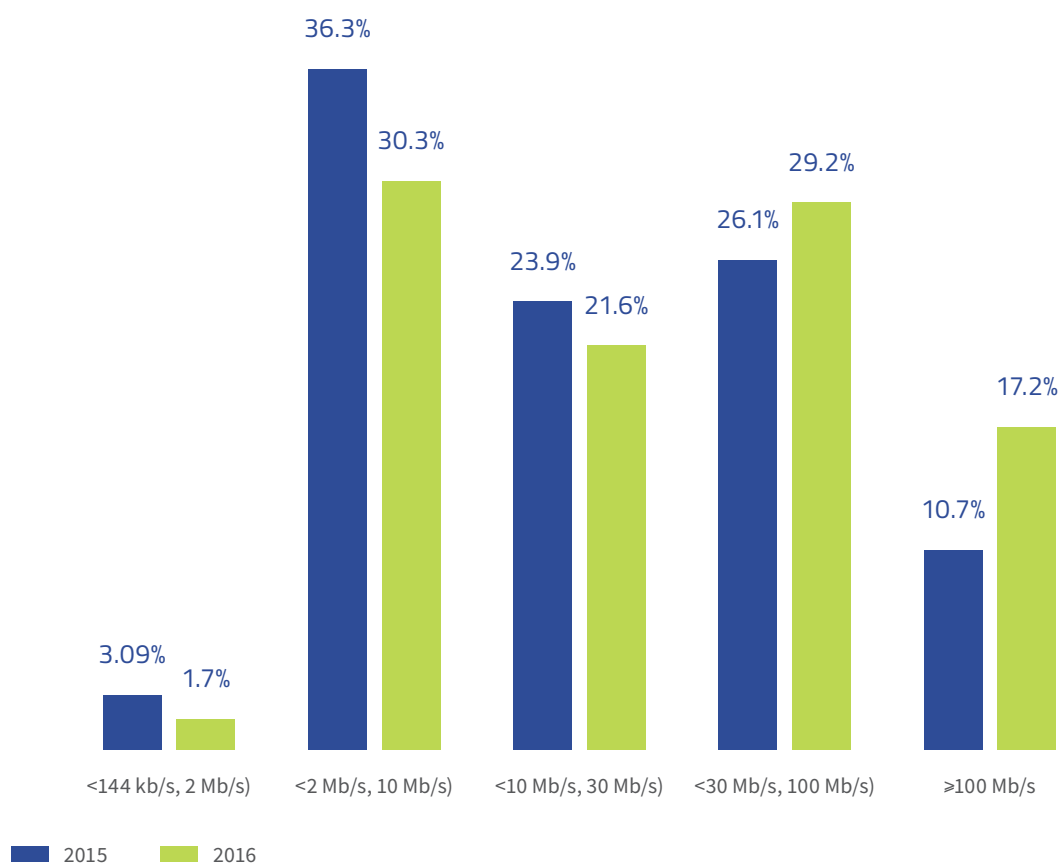
Source: UKE

1.6. Capacity

Year to year, the number of high-speed and super fast lines is growing, with a significant decrease in the share of low-speed lines. In 2016, the number of 100 Mbps lines grew by as many as 63%. The number of users using fixed-line Internet connections of less than 2 Mbps significantly dropped. The drop in this area amounted to nearly 42%. Users of such lines accounted for less than 2% of all Internet users.

Chart 11.

The share of lines by capacity



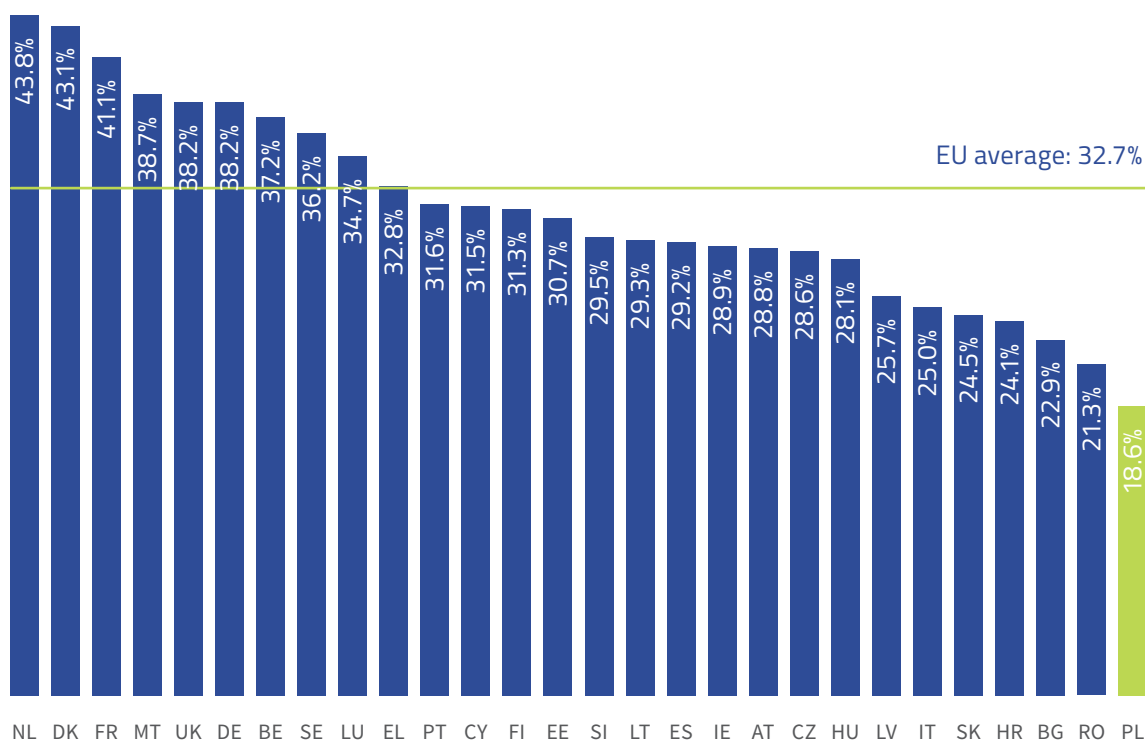
Source: UKE

1.7. Comparison with the European Union countries

On average, one in three Europeans in 2016 used fixed-line Internet access. This service is most popular in the Netherlands, where nearly 44% of the population used access to the network at a fixed location. In Poland, penetration of these services was 14 percentage points lower in 2016 than the European average.

Chart 12.

Penetration of fixed-line broadband in the EU

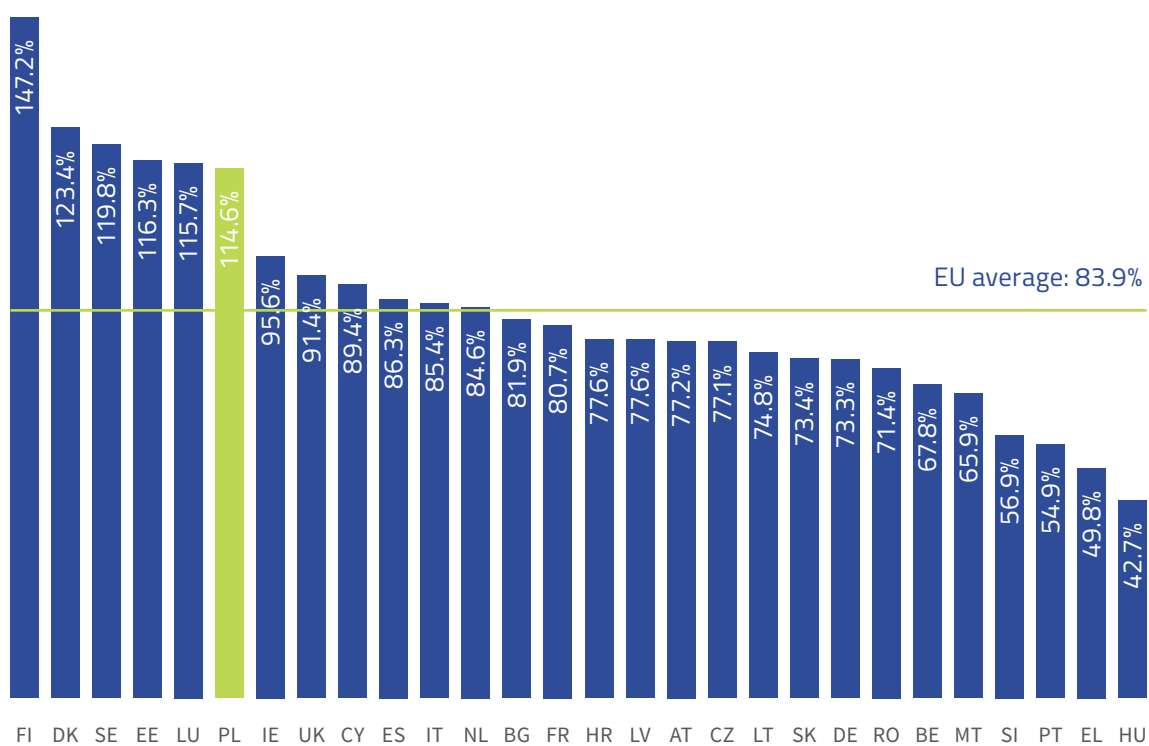


Source: Digital Agenda Scoreboard, June 2016

Poland was among the six countries where penetration of mobile access networks exceeded 100%. The highest level of penetration in this segment was reached by Finland, where it was over 147%. Poland achieved a score by almost 31 percentage points higher than the European average. The penetration in our country was around 115%.

Chart 13.

Penetration of mobile Internet services in the EU



Source: Digital Agenda Scoreboard, June 2016

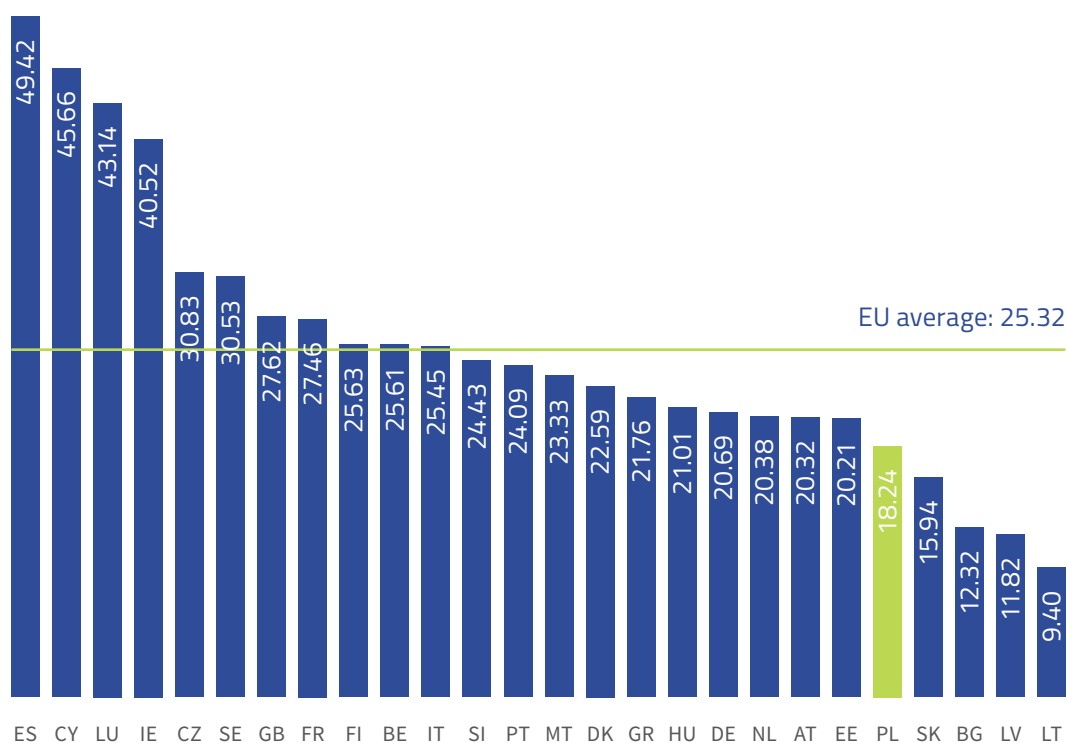
1.8. Prices of fixed-line Internet access services

Price analysis is based on the Fixed Price Broadband database, developed by Strategy Analytics. Costs of using the service were determined on the basis of the OECD Medium 4 basket: 50H / 50 GB. Offers from two speed ranges were presented: from 10 Mbps to 30 Mbps and from 30 Mbps to 100 Mbps. In each of these ranges, the cheapest offer was chosen for the analysis.

In both speed ranges, the Lithuanians paid the lowest costs. In this country prices were at the level of EUR 9.40. The most expensive services were offered by the operators from Luxembourg, Cyprus and Spain. In these countries prices ranged from about EUR 40 to over EUR 70. The costs borne by Poles in both speed ranges were about EUR 7 lower than the European average.

Chart 14.

Average monthly service cost in the EU for the speed range from 10 Mbps to 30 Mbps (EUR, including VAT)

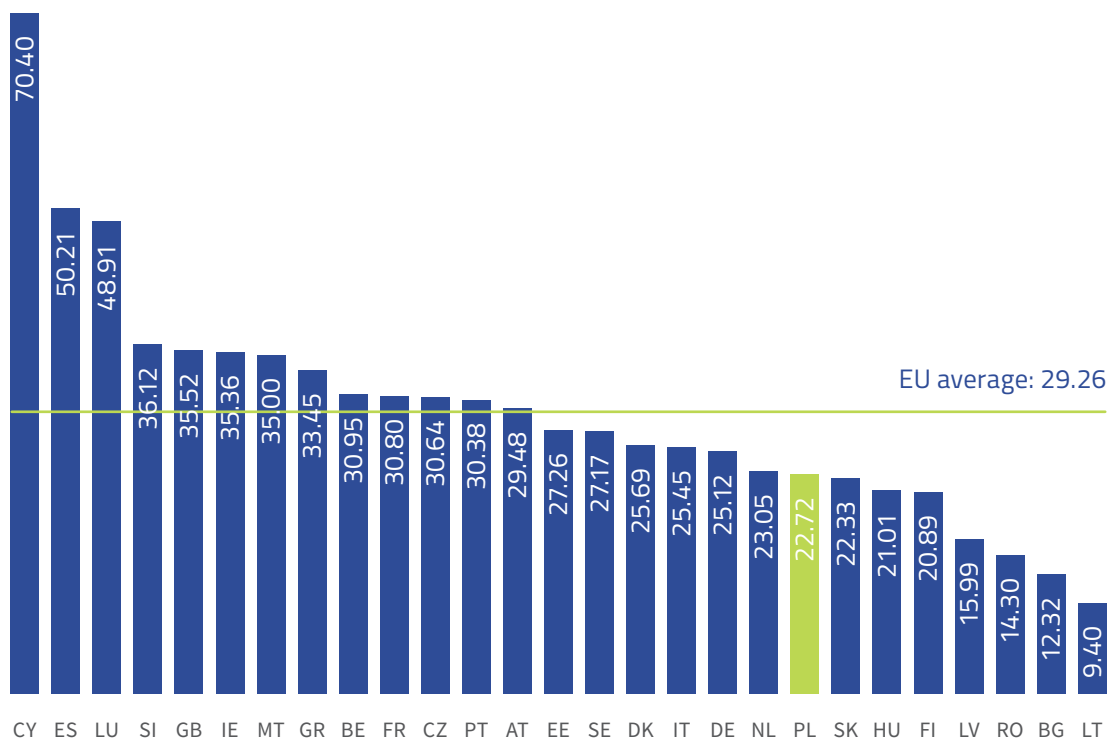


Source: UKE based on Fixed Broadband Price Benchmarking, Strategy Analytics

Note: tariffs for residential and business clients purchasing only Internet access service are included (packages are excluded from the analysis). For Poland UPC, Fiber Power 10 Mbps offer was chosen. Service cost as of June 2016.

Chart 15.

Average monthly service cost in the EU for the speed range from 30 Mbps to 100 Mbps (EUR, including VAT)



Source: UKE based on Fixed Broadband Price Benchmarking, Strategy Analytics

Note: tariffs for residential and business clients purchasing only Internet access service are included (packages are excluded from the analysis). For Poland UPC, Fibre Power 30 Mbps offer was chosen. Service cost as of June 2016.



2.

Mobile
telephony

2.1. Characteristics of the market

Every year the number of mobile operators active on the Polish market changes. In the last year, 29 entities were registered, 5 of which had their own infrastructure (MNO operators), and 24 used the network of a selected technology partner (MVNO operators). Compared to 2015, the number of operators increased by 4 entities.

Table 1.

Operators reporting to UKE as of 31 December 2016

No.	Operator	MNO/MVNO
1	Orange Polska S.A.	MNO
2	Polkomtel Sp. z o.o.	MNO
3	T-Mobile Polska S.A.	MNO
4	Netia S.A.	MVNO
5	Sferia S.A.	MVNO
6	Telefonia Dialog Sp. z o.o.	MVNO
7	Multimedia Polska – Południe S.A.	MVNO
8	Cyfrowy Polsat S.A.	MVNO
9	P4 Sp. z o.o.	MNO
10	UPC Polska Sp. z o.o.	MVNO
11	TOYA Sp. z o.o.	MVNO
12	Gawex Media Sp. z o.o.	MVNO
13	INEA S.A.	MVNO
14	Telewizja Kablowa Chopin Sp. z o.o.	MVNO
15	Internetia Sp. z o.o.	MVNO
16	Telestrada S.A.	MVNO
17	Vectra S.A.	MVNO
18	ITI Neovision S.A.	MVNO
19	FM Group Mobile Sp. z o.o.	MVNO
20	Voice Net Sp. z o.o.	MVNO
21	Aero 2 Sp. z o.o.	MNO
22	Sat-Film Sp. z o.o. i Wspólnicy S.K.	MVNO
23	Novum S.A.	MVNO
24	Lycamobile Sp. z o.o.	MVNO
25	Truphone Poland Sp. z o.o.	MVNO
26	Ahmes Sp. z o.o.	MVNO
27	Virgin Mobile Polska Sp. z o.o.	MVNO
28	Klucz Telekomunikacja Sp. z o.o.	MVNO
29	Premium Mobile SA	MVNO

Source: UKE

The number of active SIM cards in nominal terms has been declining since 2014. At the end of 2016, the operators recorded 55.5 million SIM cards, which translated into service penetration at 144.2%, which was lower by 2% as of the end of 2015. The operators also recorded 2.5 million M2M cards in their databases, which constituted 4.4% of the total number of SIM cards. Compared to the previous year, the number of M2M cards increased by 671,000.

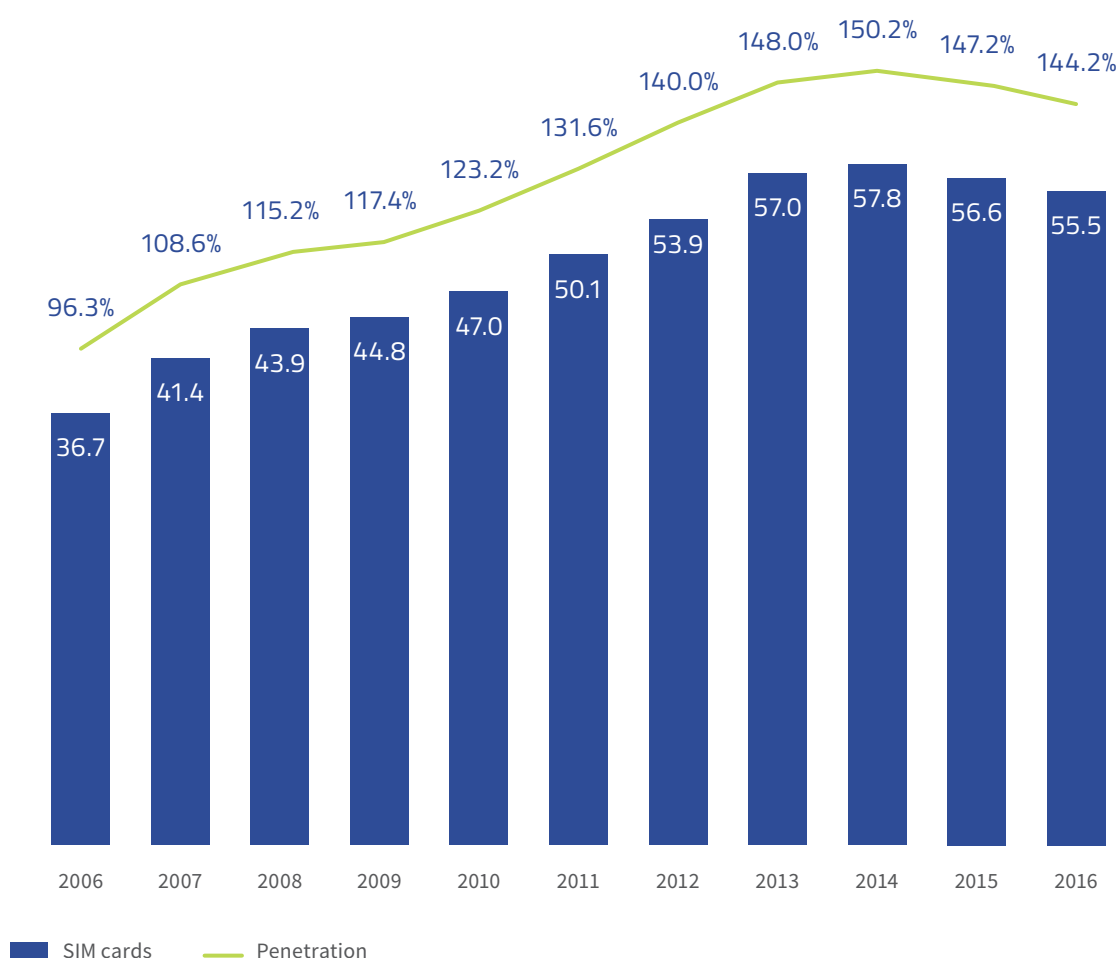
The decreasing penetration index of mobile telephony services is attributed to the laws imposing the obligation to register prepaid cards. In 2017 this trend is likely to continue and the number of SIM cards will decrease,

but the advantage will be that the vast majority of registered cards will be active SIM cards, without the so called “dead souls”, that is cards registered in the operator’s database that were not actually used.

Mobile penetration, according to the Telecom Market Matrix database, also decreased in selected European countries. Average value decreased by 0.8 percentage points. Poland however, with a decrease of 0.3 percentage points, was still above the average, with penetration at 137.7% compared to the EU average of 130.6%.

Chart 16.

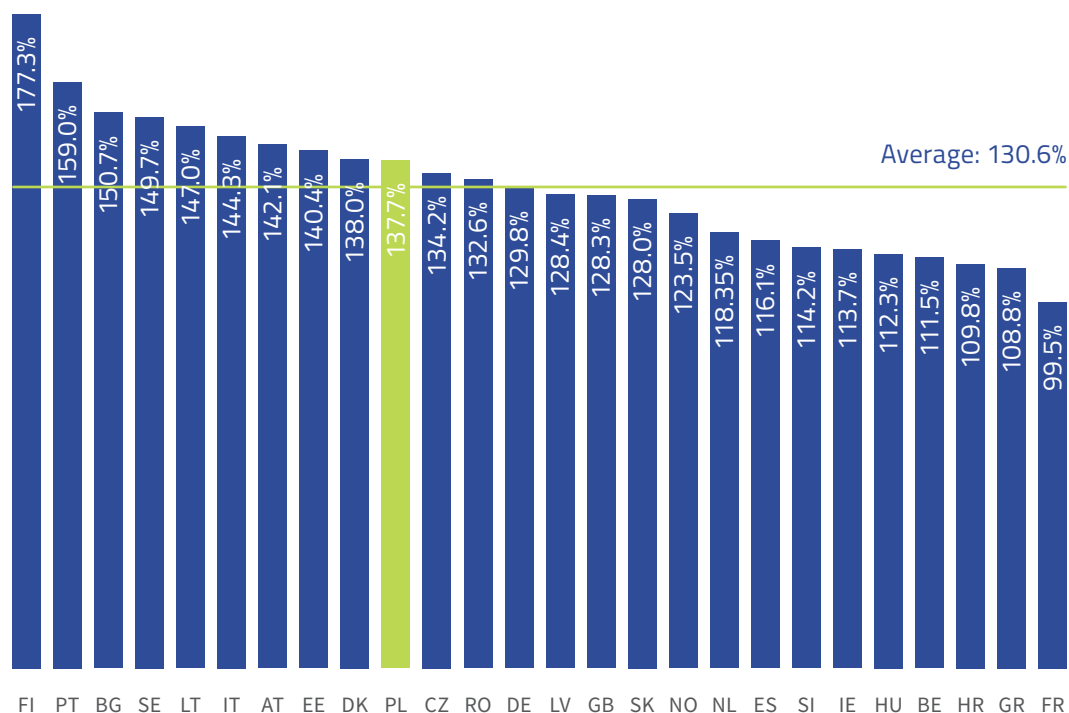
Nominal number of users (million) and mobile penetration in Poland



Source: UKE

Chart 17.

Mobile penetration in selected European countries in 2016



Source: UKE based on Telecom Market Matrix, Analysis Mason

2.2. Revenues

Mobile operators' revenues have been declining for several years. The trend was also confirmed in 2016. The operators achieved a total revenue of PLN 16.7 billion, 2.7% lower than a year earlier. Still, this is a key area in the context of the entire telecommunications market, accounting for 42.4% of total revenues from this sector of the economy.

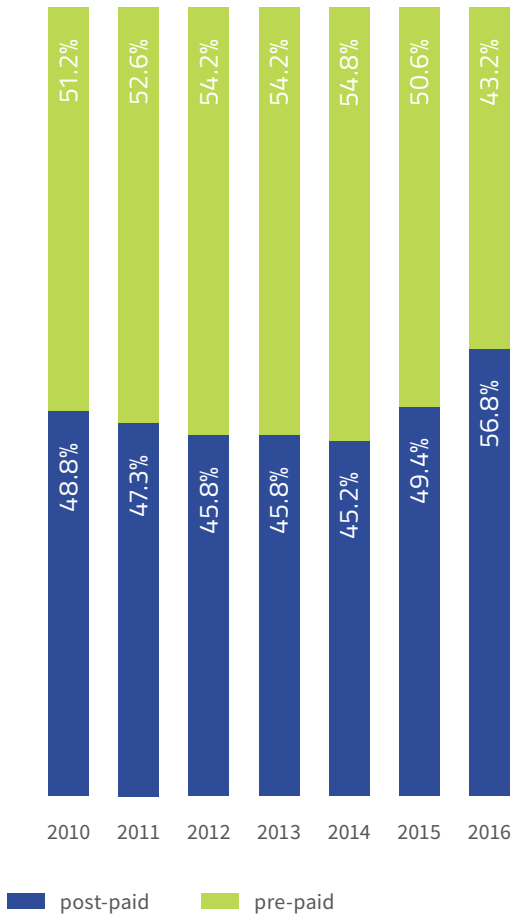
Owing to the increase in the number of contract clients, subscription revenues increased by 2.5% compared to the end of 2015 and reached the level of 12 billion. Revenues from voice calls, thanks to the popularization of no limit offers, decreased by 12.5% to PLN 5.2 billion. The lower popularity of SMS also contributed to the decline in this area – from 2 billion in 2015 to 1.8 billion at the end of 2016. The services that were characterized by a decline in value in relation to 2015 also included outbound roaming, whose value of revenue decreased by 10.1%.

The service that generated higher revenue as compared to the last year was inbound roaming (increase by 60.7%). MMS (increase by 26.5%) and data transmission (increase by 8.5%) ranked next.

The above-mentioned dependence on increasing the number of post-paid subscribers is reflected in absolute values. At the end of 2016, 56.8% of all clients were contract service subscribers. The number of prepaid SIM cards decreased by 7.4 percentage points, to 43.2%.

Chart 18.

Share of pre-paid and post-paid clients in the total number of subscribers



Source: UKE

2.3. Shares of the operators

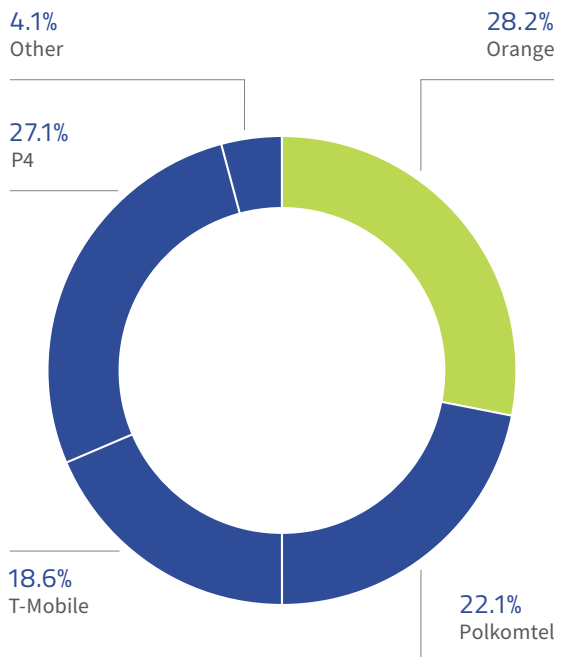
The total number of subscribers decreased in 2016 compared to the end of 2015 by 2.1%, to the level of 55.5 million. At the same time, the operators reported an increase in the number of cards for M2M communication by 18.3%, to 2.5 million.

Almost all operators were affected by the legal regulations imposing the obligation to register pre-paid cards. T-Mobile lost most users – 13%. The only operator that gained in this period was P4 whose database increased by 1.7%.

Orange maintained the leading position in terms of subscribers, with a 28.2% share. The second place in the ranking was held by P4 which reached 27.1% of the total number of SIM cards. As of the end of 2016, Polkomtel's share was 22.1% and T-Mobile had a 18.6% share of the total number of SIM cards. The share of other operators increased by 0.9 percentage points over the last year – from 3.2% at the end of 2015 to 4.1% in 2016.

Chart 19.

Shares of the operators in terms of number of users



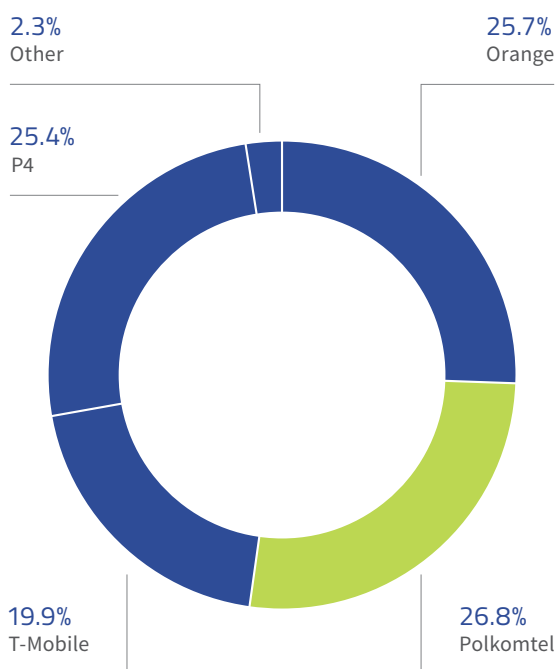
Source: UKE

Orange’s leadership position in terms of number of users did not translate into revenue. Polkomtel scored 26.8%, giving it the first place in this category. Orange ranked second with 25.7% of total operators’ revenue. P4 with a score of 25.4% was in the third place. The next one was T-Mobile, which accounted for 19.9% of total operators’ revenue. The group of other entities totalled 2.3%.

Data transmission, which becomes a key telecoms service, generates different levels of revenue for the operators. Orange’s share reaches almost 42% of the total revenue. P4 recorded a 25.4% share, the third in the ranking T-Mobile reached 23.8% and Polkomtel 8.7%. The share of the remaining groups was negligible, at 0.2%.

Chart 20.

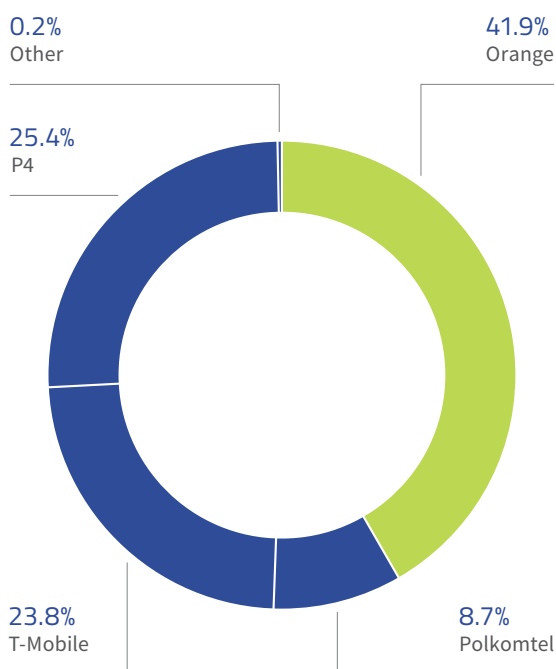
Shares of the operators in terms of revenue



Source: UKE

Chart 21.

Shares of the operators in terms of revenue from data transmission services



Source: UKE

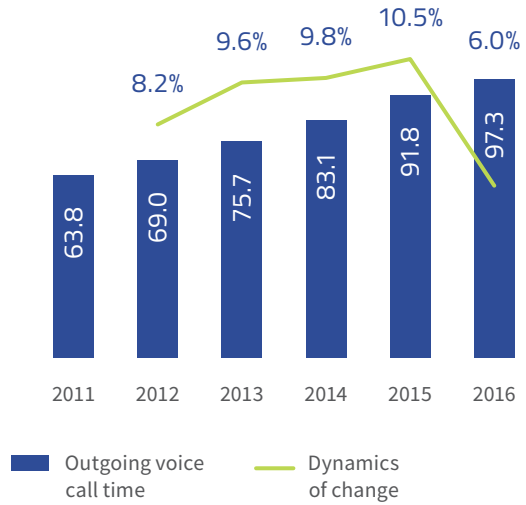
2.4. Volume of provided services

The duration of voice calls is constantly increasing, although the growth rate in this area in the last year decreased from 10.5% to 6%. Telecommunications services clients in 2016 made calls of a total duration of 97.3 billion minutes. This means that, statistically, in 2016 every one of the inhabitants of Poland made calls lasting 2530 minutes, that is 385 minutes longer than a year ago. On average, however, the call duration was 2.12 minutes and was 1 minute shorter than in 2015.

Comparison of Poland with selected European countries in terms of monthly usage of voice services also puts our country in a favourable light. With an average of 154 minutes, subscribers of Polish networks talk for 166 minutes a month, that is on average 12 minutes longer, making it the ninth place in the list.

Chart 22.

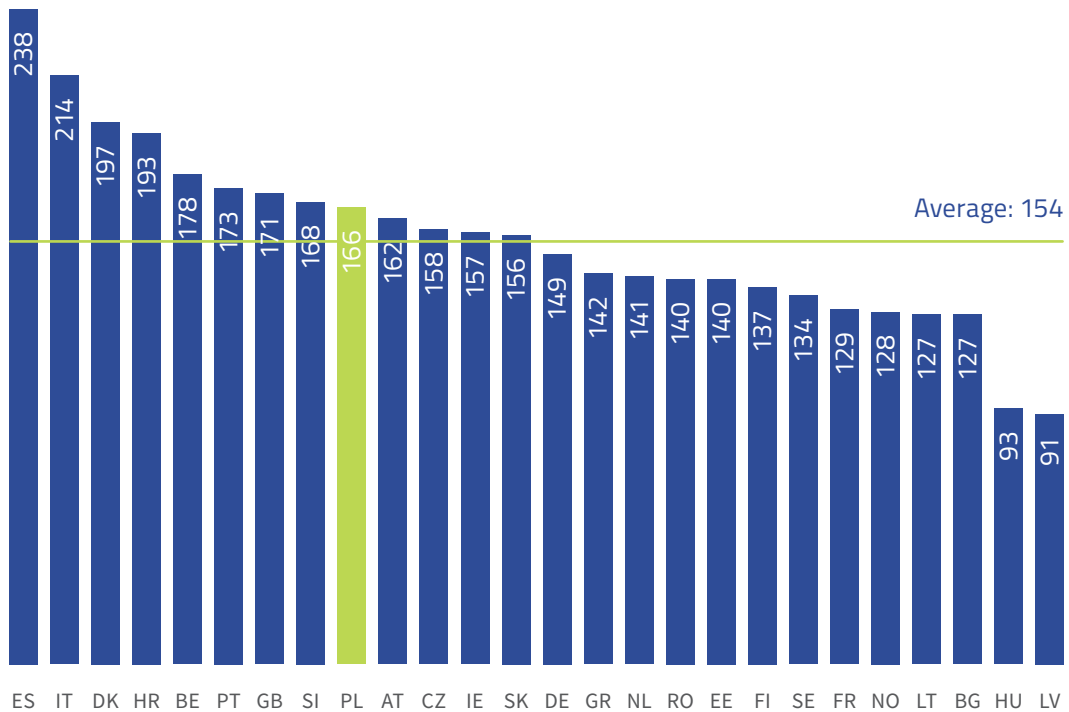
Total voice call time (billion minutes) and the dynamics of change



Source: UKE

Chart 23.

Average time of voice calls per active user in the year in selected EU countries



Source: UKE based on Telecom Market Matrix, Analysys Mason

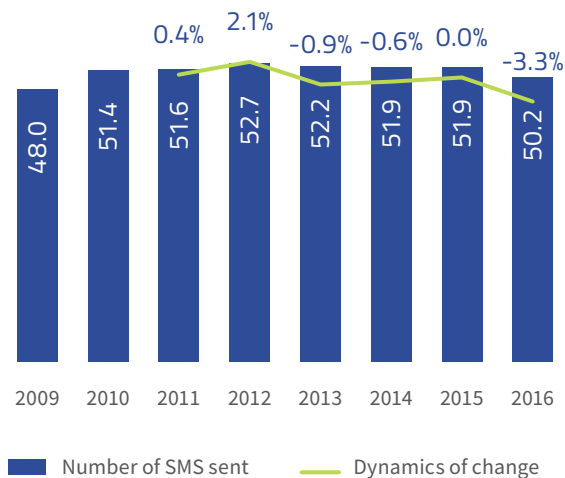
Monthly

SMS service was less popular than last year. Customers sent 50.2 billion messages, that is 3.3% less than a year ago. Penetration of this service may indicate that this form of communication is replaced by other messaging possibilities, such as instant messaging, social networking, email and others, sent over the Internet.

External sources, like the compilation of an independent analytical body, show that Poland is above the average for selected EU countries, with the usage at the level of 83 messages per month. The average for selected European countries is lower by 19 messages and amounts to 64 SMS per active user.

Chart 24.

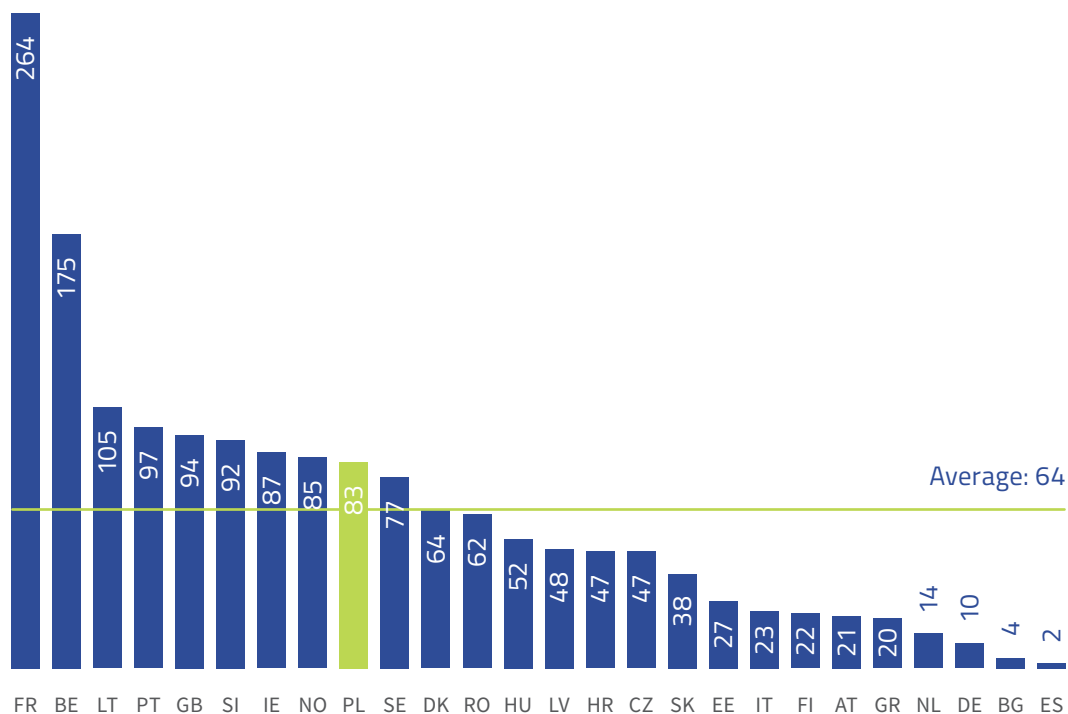
Total number of SMS sent (billion) and the dynamics of change



Source: UKE

Chart 25.

Average number of SMS sent per active user in selected EU countries

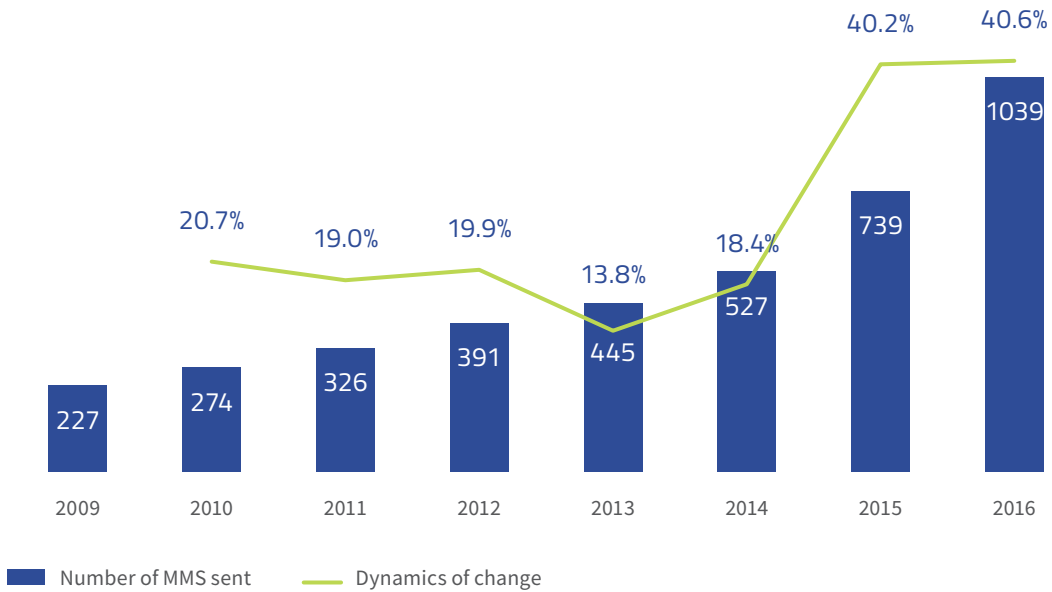


Source: UKE based on Telecom Market Matrix, Analysys Mason

Monthly

Chart 26.

Number of MMS sent (million) and the dynamics of change



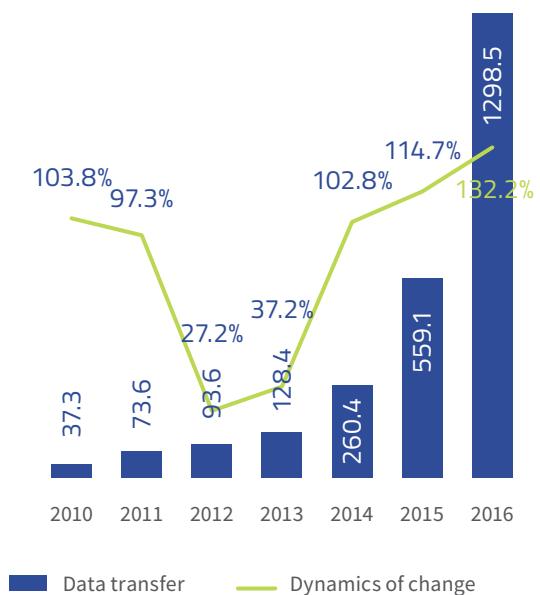
Source: UKE

Sending MMS is gaining popularity each year, mainly because of their frequent inclusion in a package of unlimited services included in the fixed monthly fee. In 2016, subscribers sent 1.039 billion messages, an increase by 40.6% in comparison to the previous year. On average, there were 27 messages per inhabitant of Poland compared to 19 a year ago.

The service that develops most dynamically is the data transmission on mobile networks. The ever-increasing data packets offered by the operators, as well as the improved coverage of the fastest networks, contribute to significant annual increases in the service usage. In 2016, customers transferred 12092.83 petabytes of data, which in turn means that the size of data transfer per capita in Poland averaged 33.8 GB of data per year, against 14.5 GB a year earlier.

Chart 27.

Data transfer (billion MB) and the dynamics of change



Source: UKE

2.5. 3G and 4G/LTE coverage

The operators are constantly developing their networks, expanding their coverage and reaching more and more subscribers. 3G services are provided by all infrastructure operators, of which operator 5 reaches 92.1% of the population and operator 1 declares that its coverage reaches 100% of the population.

Table 2.

Percentage of population within 3G coverage

Operator	% of population within 3G coverage
Operator 1	100.0%
Operator 2	99.7%
Operator 3	99.6%
Operator 4	99.6%
Operator 5	92.1%

Source: UKE

Note: The operators are in descending order

Also in the case of LTE coverage the results improved over the previous year. Operator 5 can provide services to 88.4% of the population and this is the lowest indicator, while operator 1 covers 99.9% of the country's population.

Table 3.

Percentage of population within 4G/LTE coverage

Operator	% of population within 4G/LTE coverage
Operator 1	99.9%
Operator 2	99.1%
Operator 3	99.0%
Operator 4	92.2%
Operator 5	88.4%

Source: UKE

Note: The operators are in descending order.

The order in Table 2 does not need to be equivalent to the order in Table 3.

2.6. Cost of using mobile telephony

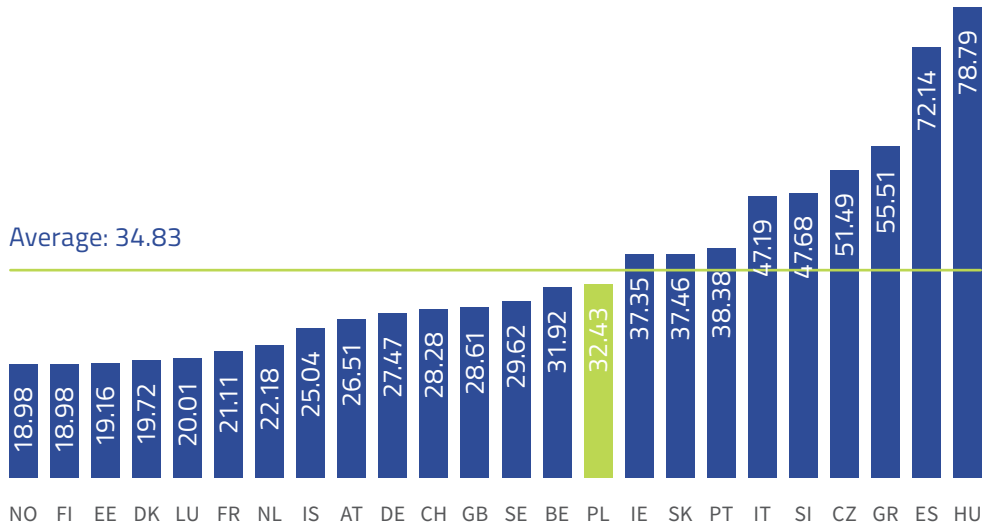
In order to analyse prices in Poland and other European Union countries, data from the OECD Mobile Voice Price Benchmarking database developed by Strategy Analytics was used.

The base design allows calculation of the average monthly cost of using the service for users who are characterised by low, moderate and high usage of the service. For each basket and country the cheapest offer had been chosen.

In the case of occasional use of services, the customer of the Polish network will pay PLN 32.43 per month. The moderate usage will cost PLN 55.37 and the intensive use may be covered by the amount of PLN 59. In the case of low and intensive use of the services, the offer selected for Poland was below the average for selected countries. Only in the case of moderate usage of mobile services, the subscriber incurred a cost higher by PLN 7.46 than the average for selected countries.

Chart 28.

Average monthly cost of using mobile services with low usage of individual volumes

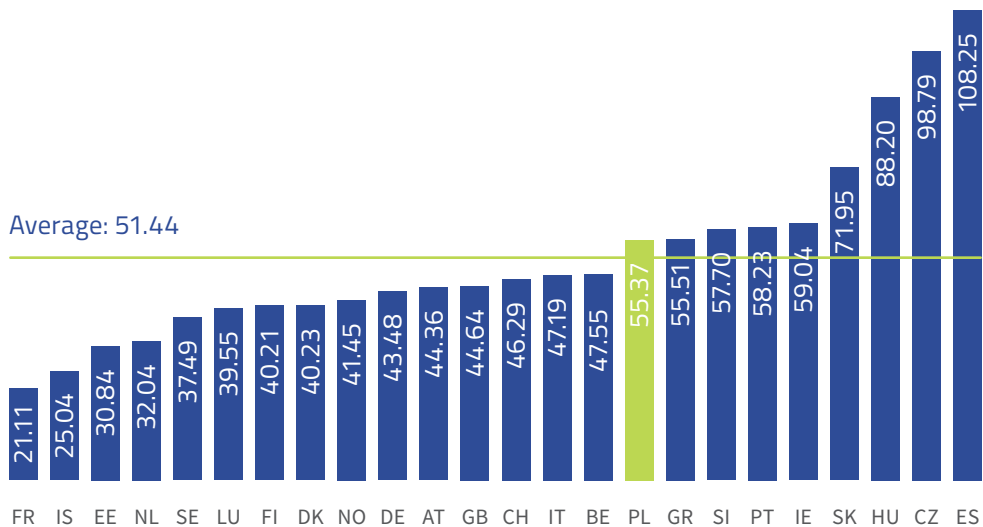


Source: UKE based on OECD Mobile Voice Price Benchmarking.
 Note: For Poland „Orange Go 50” was selected.

■ Cost in PLN

Chart 29.

Average monthly cost of using mobile services with moderate usage of individual volumes

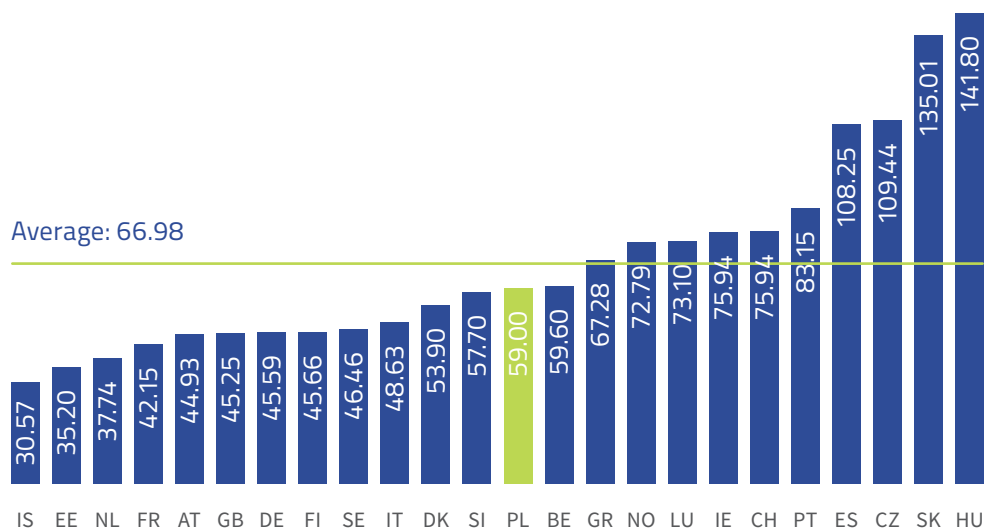


Source: UKE based on OECD Mobile Voice Price Benchmarking.
 Note: For Poland „Orange Go 100” was selected.

■ Cost in PLN

Chart 30.

Average monthly cost of using mobile services with high usage of individual volumes



Source: UKE based on OECD Mobile Voice Price Benchmarking.

Note: For Poland „MIX Plus 30 zł” was selected.

■ Cost in PLN

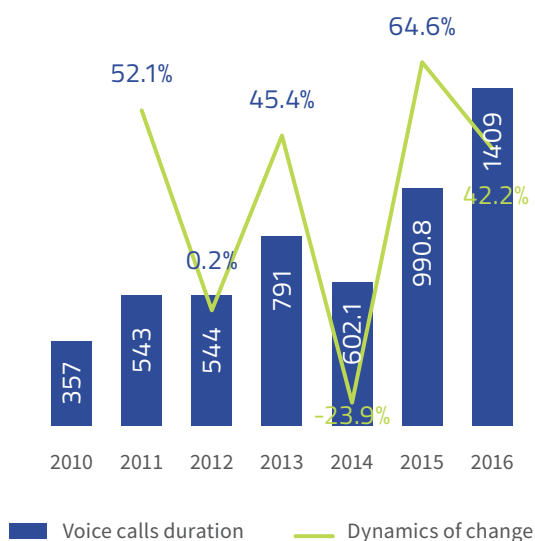
2.7. Roaming

International roaming services enjoy unflagging popularity. The systematic reduction of fees for voice calls, SMS and data causes the volumes of these services to grow while demonstrating high dynamics of change.

In 2016 subscribers made voice calls of a total duration of 1.4 billion minutes, compared to 990 million a year earlier. This represents an increase of 42.2% year on year.

Chart 31.

Total duration of voice calls (million minutes) in outbound roaming



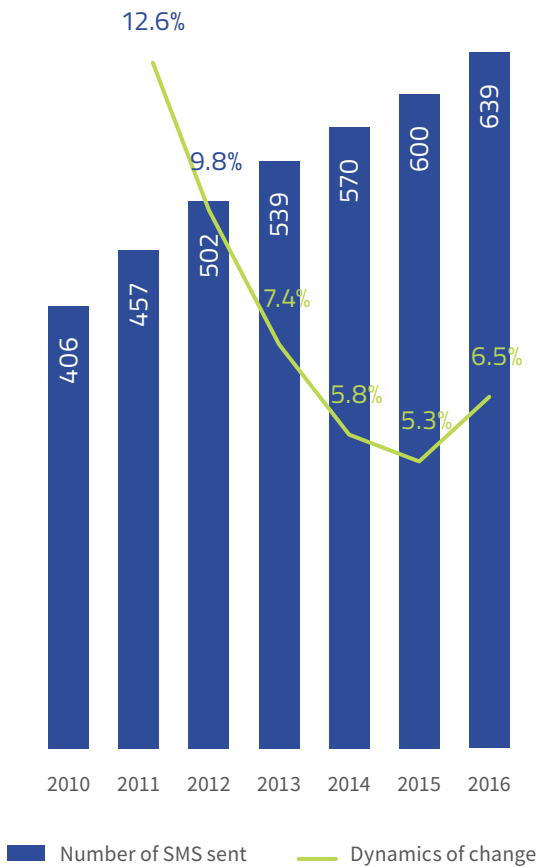
Source: UKE

The number of SMS is increasing systematically. Subscribers of Polish networks using roaming abroad sent 639 million SMS in 2016, 6.5% more than in the previous year.

Data transmission is a service whose volume is growing the most dynamically. In 2016 subscribers transferred 986.7 million MB of data compared to 552.8 million a year earlier. This represents an increase of 78.5% year to year.

Chart 32.

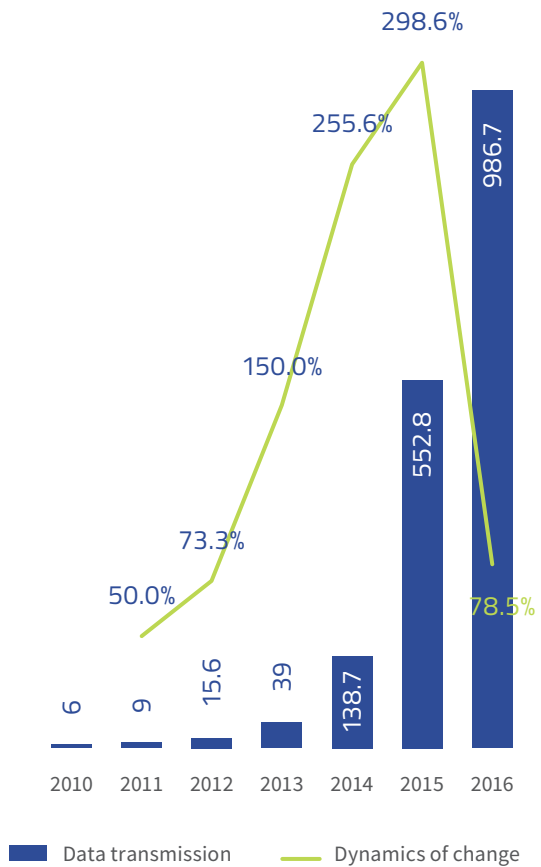
Total number of sent SMS (million) in outbound roaming



Source: UKE

Chart 33.

Total data transmission volume (million MB) in outbound roaming



Source: UKE

According to the European Union law, roaming charges were reduced also in 2016. In the period from January 1 to April 29 the charges were determined by the maximum retail rate that the operators could not exceed while charging subscribers for using the service. Starting from April 30, 2016, the so-called transitional period in roaming charges came into force, i.e. determining the maximum additional charge that the operator could charge from its subscriber in addition to the standard domestic rate.

Table 4.

Maximum rates for roaming services and maximum roaming surcharges

		January 1 – April 29			April 30 – December 31	
		In EUR excluding VAT	In PLN excluding VAT	In PLN incl. VAT	In EUR excluding VAT	In PLN incl. VAT
RETAIL LEVEL (maximum rate)	Outgoing calls (min)	0.24	0.99	1.22	0.05	0.25
	Incoming calls (min)	0.07	0.29	0.36	0.01	0.05
	SMS sent	0.08	0.33	0.41	0.02	0.10
	Data transmission (MB)	0.45	1.87	2.30	0.05	0.25

Source: UKE



3.

**Bundled
services**



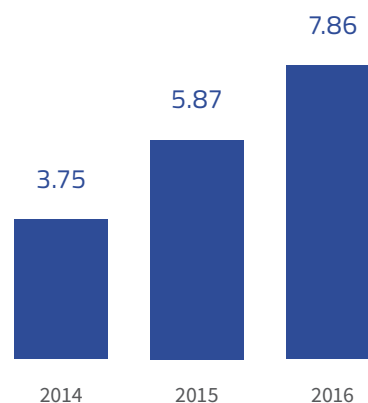
3.1. General information

In 2016, 7.86 million people used bundled services. This represented an increase of approximately 34% compared to 2015.

The most popular bundled service is still the “Mobile telephony + mobile Internet” package. Users of this service accounted for almost 54% of all subscribers, which represented an increase of more than 12.5 percentage points compared to 2015. The second most popular package was the “Fixed-line Internet + Television” service (14%) and the third “Fixed-line telephony + Fixed-line Internet + Television” (10%).

Chart 34.

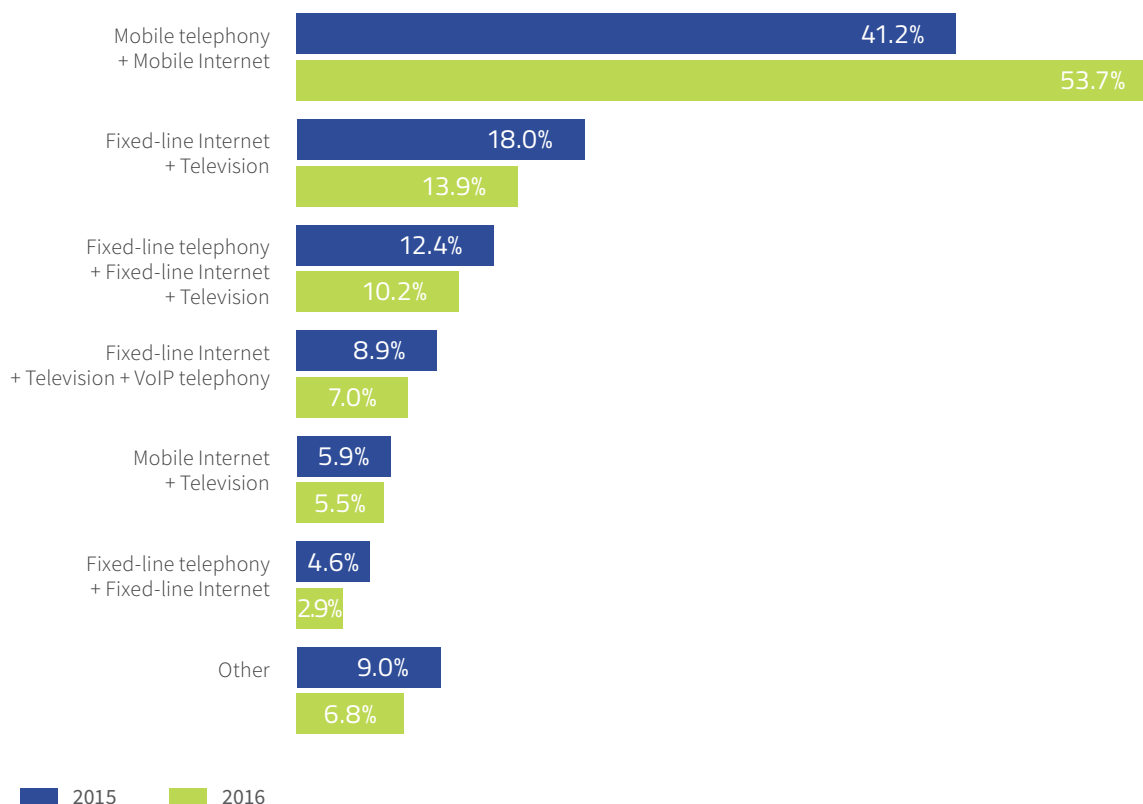
Number of users of bundled services (million)



Source: UKE

Chart 35.

The most popular packages



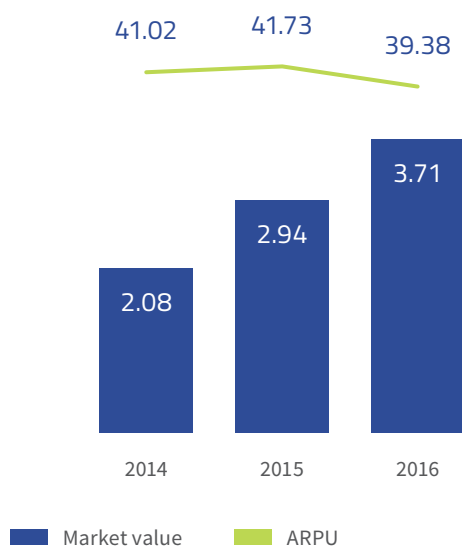
Source: UKE

3.2. Revenues

Revenue from bundled services increased by 26% in 2016 compared to 2015 and amounted to a total of PLN 3.71 billion. In turn, the average monthly revenue per user was PLN 39.38 and was over PLN 2 lower than in 2015.

Chart 36.

Market value (PLN billion) and average monthly revenue per user (ARPU)



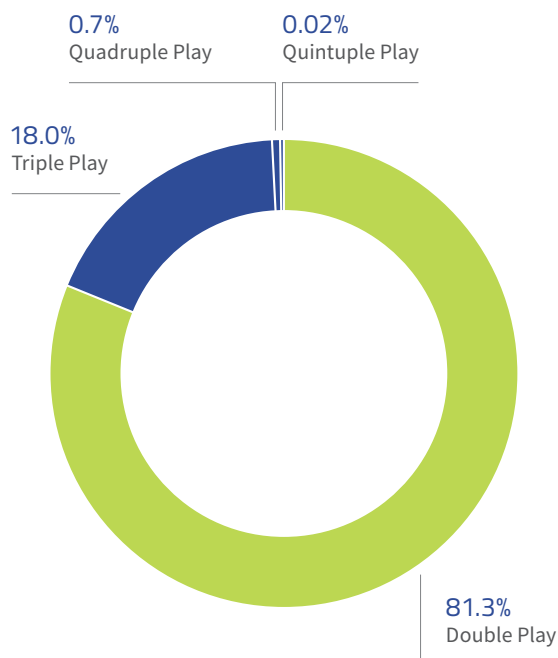
Source: UKE

3.3. Subscribers

In 2016, the share of Double Play users increased from 77% to 81% compared to the previous year. The second most popular type of packages in 2016 were the Triple Play sets (18%). Relatively few users used packages consisting of four (Quadruple Play) (0.7%) and five services (Quintuple Play) (0.02%).

Chart 37.

Packages share in terms of number of users

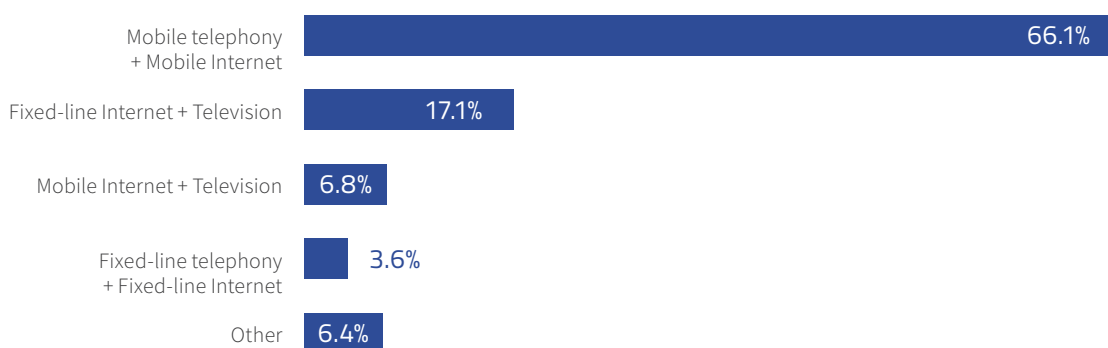


Source: UKE

Among packages consisting of two services, the “Mobile telephony + Mobile internet” combination was the most commonly used by subscribers. 66% of Double Play users used this type of service. The second most popular was a package made up of fixed-line Internet and television (17%). Approximately 7% of Double Play users used the “Mobile Internet + Television” package.

Chart 38.

Share of individual Double Play packages in terms of number of users



Source: UKE

The users mainly used two Triple Play packages. The most subscribers – over 56% – chose the “Fixed-line telephony + Fixed-line Internet + Television” bundle. In turn, the “Fixed-line Internet + Telephony + VoIP telephony” package was used by about 39% of people with Triple Play service.

Chart 39.

Shares of individual Triple Play packages in terms of number of users



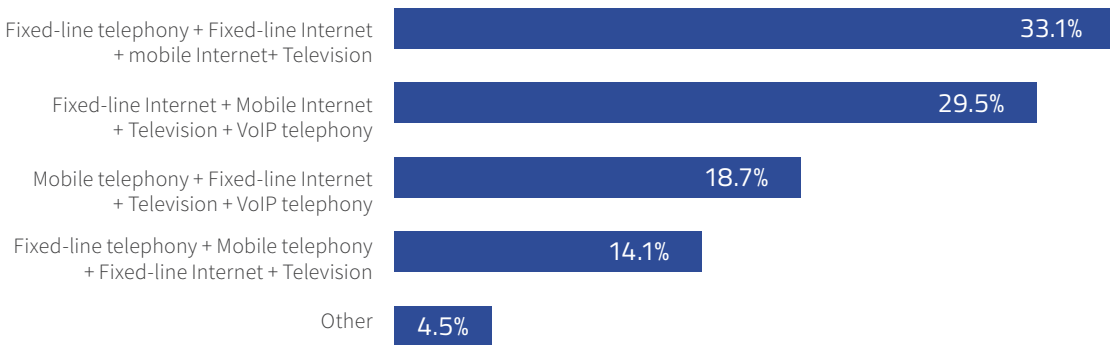
Source: UKE

The most popular Quadruple Play package was a package of fixed-line telephony, fixed-line Internet, mobile Internet and television. Approximately 33% of the subscribers of bundles containing four services were using the package. The second most popular package was the “Fixed-line Internet + Mobile Internet + Television + VoIP telephony” service (30%) and the third “Mobile telephony + Fixed-line Internet + Television + VoIP telephony” (19%).

Those who chose among the five-service packages most often used the “Fixed-line telephony + Mobile telephony + Fixed-line Internet + Mobile Internet + Television” package. In total, more than 93% of Quintuple Play users purchased that particular package.

Chart 40.

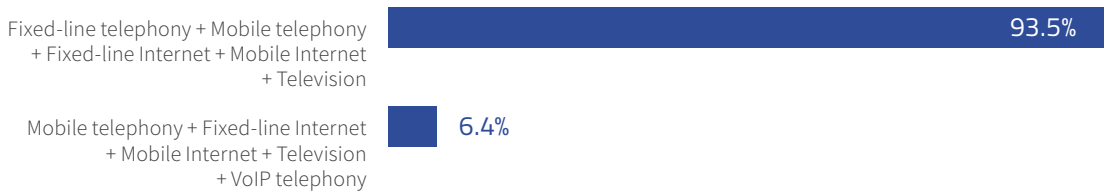
Share of individual Quadruple Play packages in terms of number of users



Source: UKE

Chart 41.

Share of individual Quintuple Play packages in terms of number of users



Source: UKE

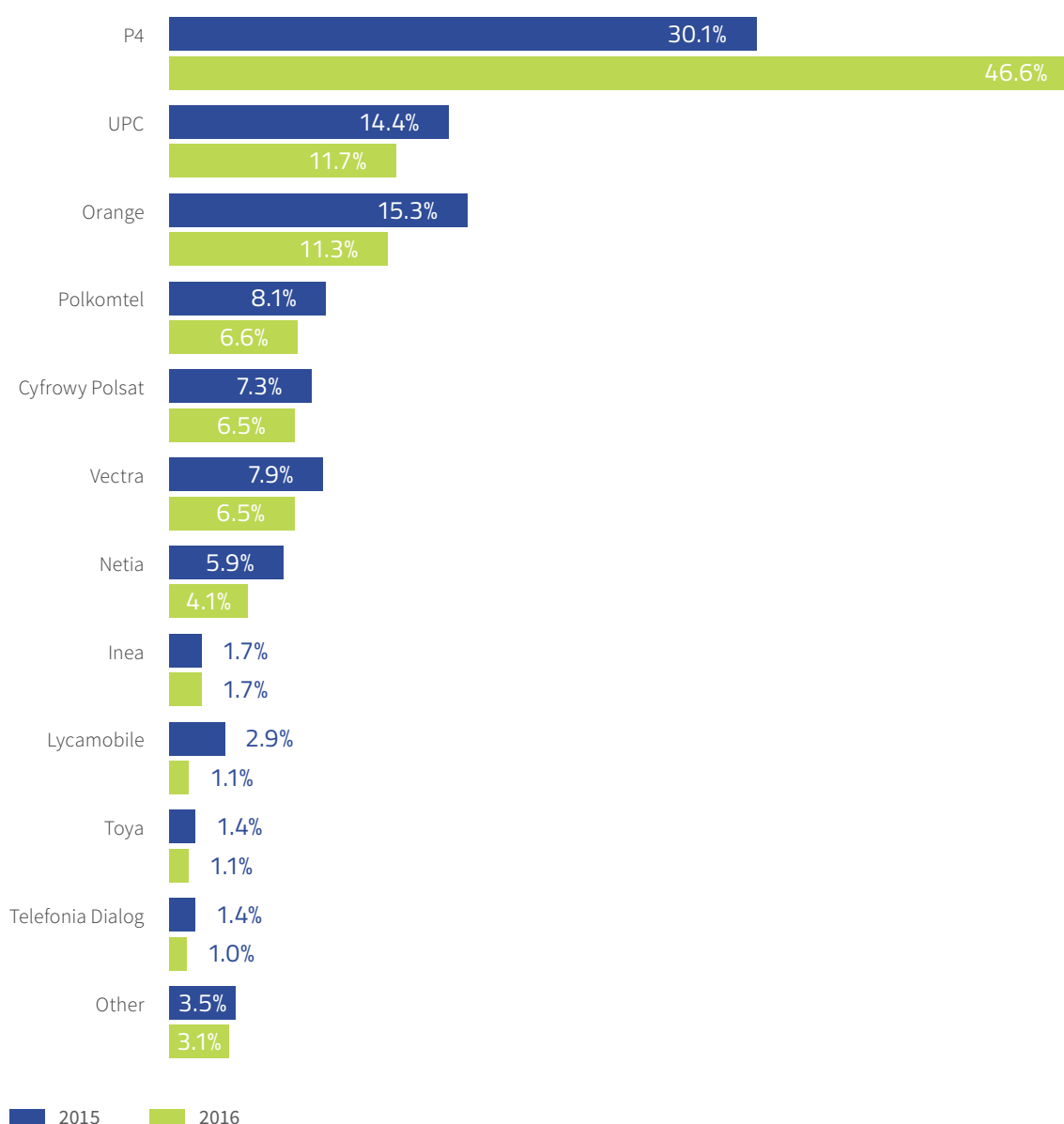
3.4. Market structure

In 2016 P4 had the largest share in the number of customers. Their service was used by nearly 47% of users of bundled services, which meant an increase by over 16

percentage points compared to 2015. The next two operators had a similar number of customers. UPC reached a market share of 11.7%. Orange in turn registered 11.3% of users of bundled services in their customer base.

Chart 42.

Shares of the operators in terms of number of bundled services' users



Source: UKE



4.

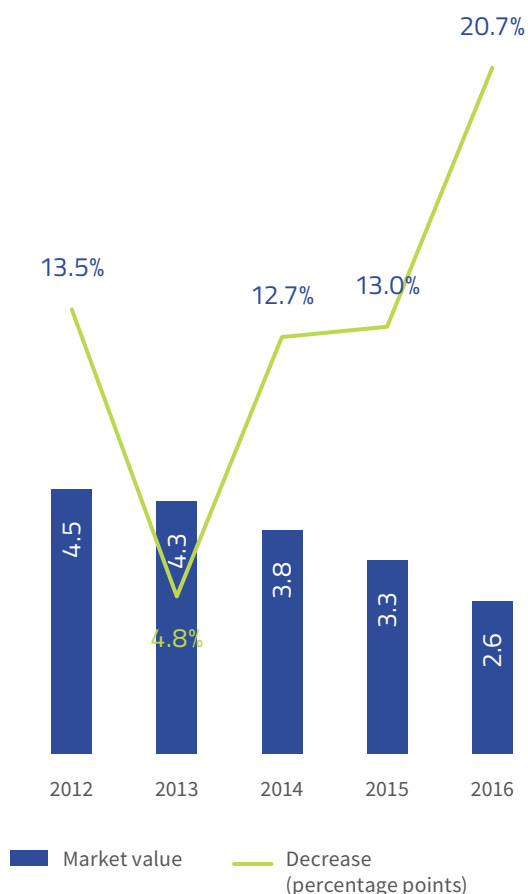
**Fixed-line
telephony**

4.1. General information

In 2016 fixed-line telephony market experienced a subsequent decline both in terms of the number of subscribers and revenues. In total, operators earned PLN 2.6 billion from these services, i.e. almost 21% less than last year. In 2016 there were 5.2 million users of fixed-line telephony.

Chart 43.

Value of fixed-line telephony market (PLN billion) and the dynamics of change



Source: UKE

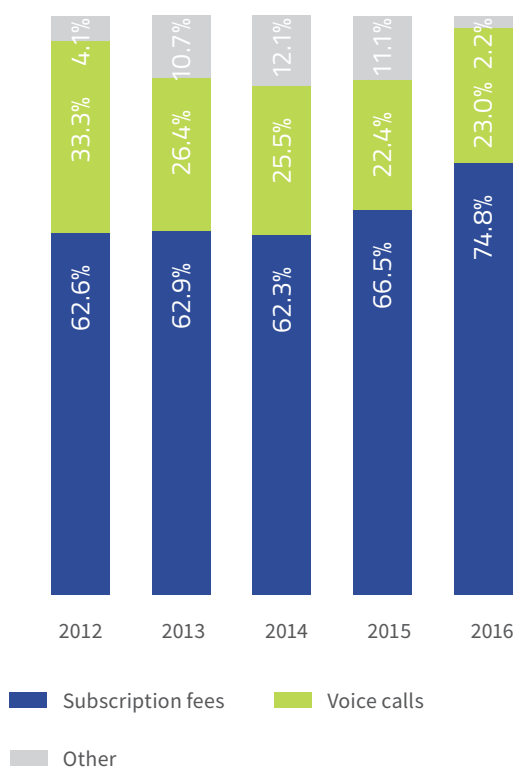
Fixed-line telephony services were mostly provided through POTS lines. They constituted around 56% of all lines. The second most popular technology was CATV, with a share of 16%.

4.2. Revenues

As in the previous years, also in 2016 operators gained the most revenue from subscriptions. In total, almost 75% of revenues from fixed-line telephony were generated by subscriptions. Charges for outgoing calls constituted 23% of revenues.

Chart 44.

Structure of revenues by elements of service



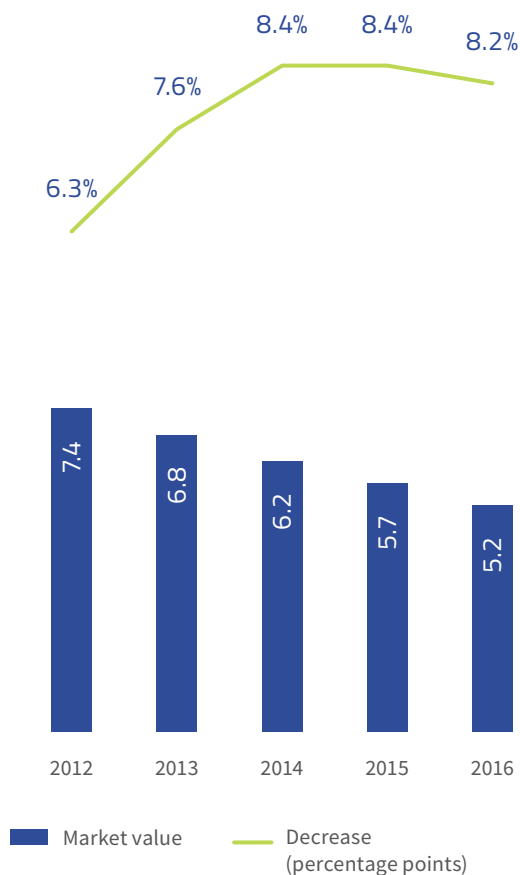
Source: UKE

4.3. Subscribers

The number of fixed-line telephony subscribers decreases each year. In 2016 there were 5.2 million users of such services. This means a 8.2% decrease in comparison with 2015. Over the past two years, the number of users of fixed-line telephony decreased by approximately 1 million.

Chart 45.

Number of subscribers (million) and the dynamics of change



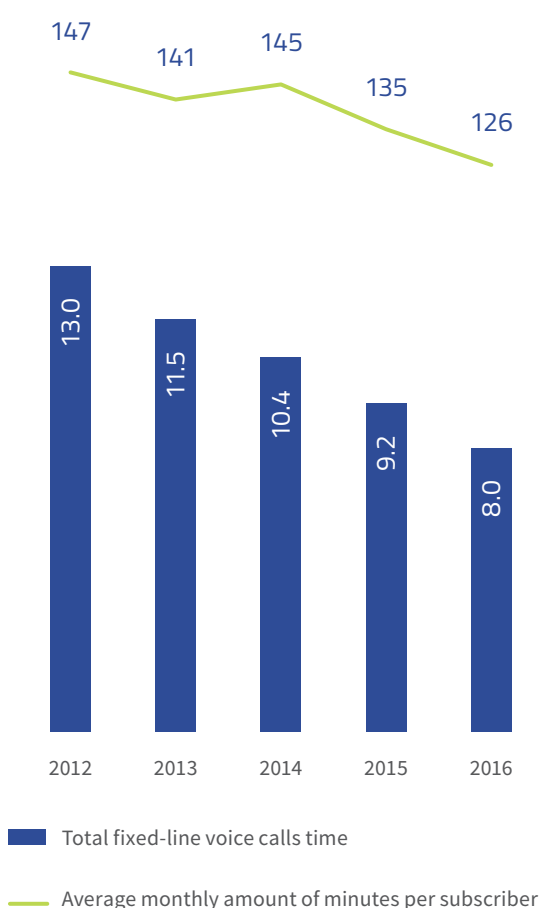
Source: UKE

4.4. Traffic volume

A downward trend was also noticeable with regard to the duration of fixed-line telephony calls. In 2016 subscribers made 8 billion minutes of calls that is approximately 1.2 billion less than in the previous year. Fixed-line phone was mostly used for domestic calls. International calls generated only 7.6% of the total traffic volume.

Chart 46.

Traffic volume (billion) and the average monthly amount of minutes per subscriber



Source: UKE

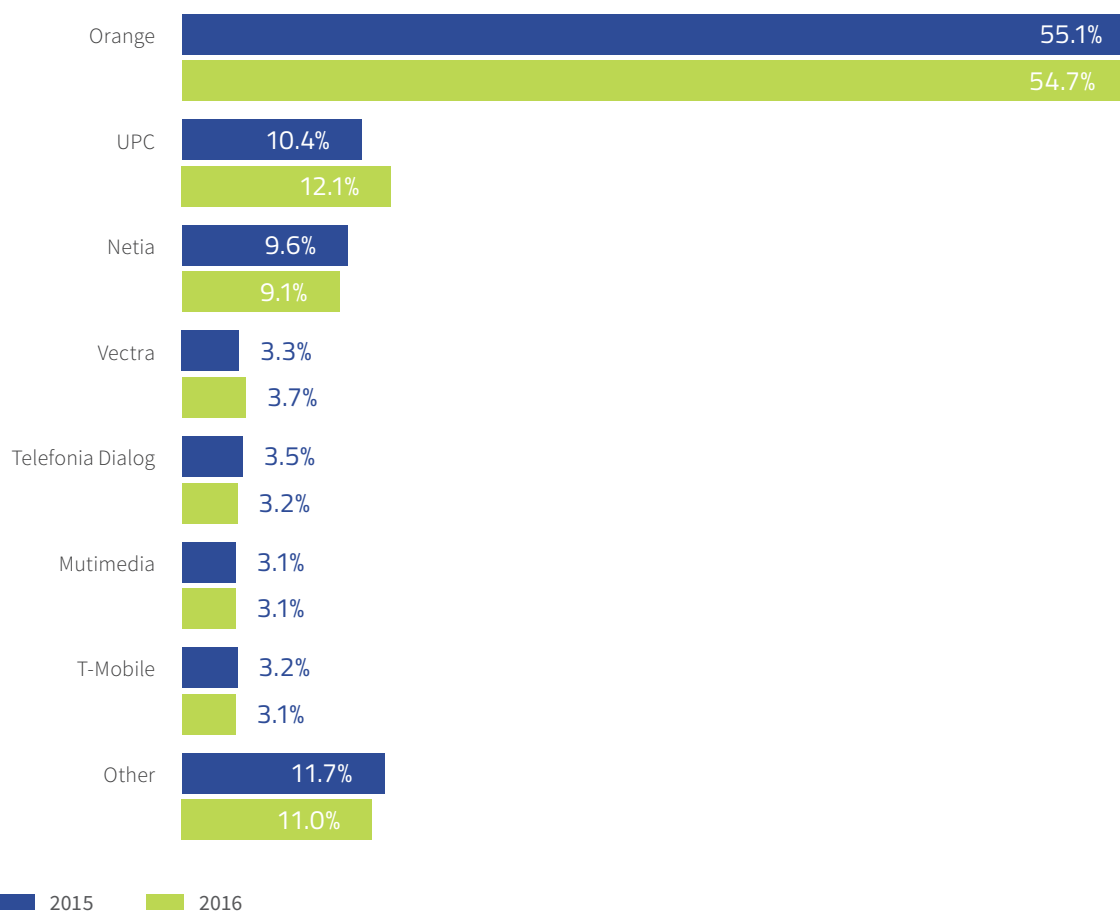
In comparison to the last year, average monthly revenue per subscriber was also reduced. In 2015 ARPU amounted to PLN 47.7. In 2016 this indicator was lower by PLN 6.5 and amounted to PLN 41.2.

4.5. Market structure

In 2016 Orange had the biggest share of the market in terms of the number of customers. It amounted to about 55% and was slightly (0.4%) lower than in 2015. UPC took the second (12.1%) and Netia the third place (9.1%).

Chart 47.

Operators' shares in terms of the number of subscribers



Source: UKE

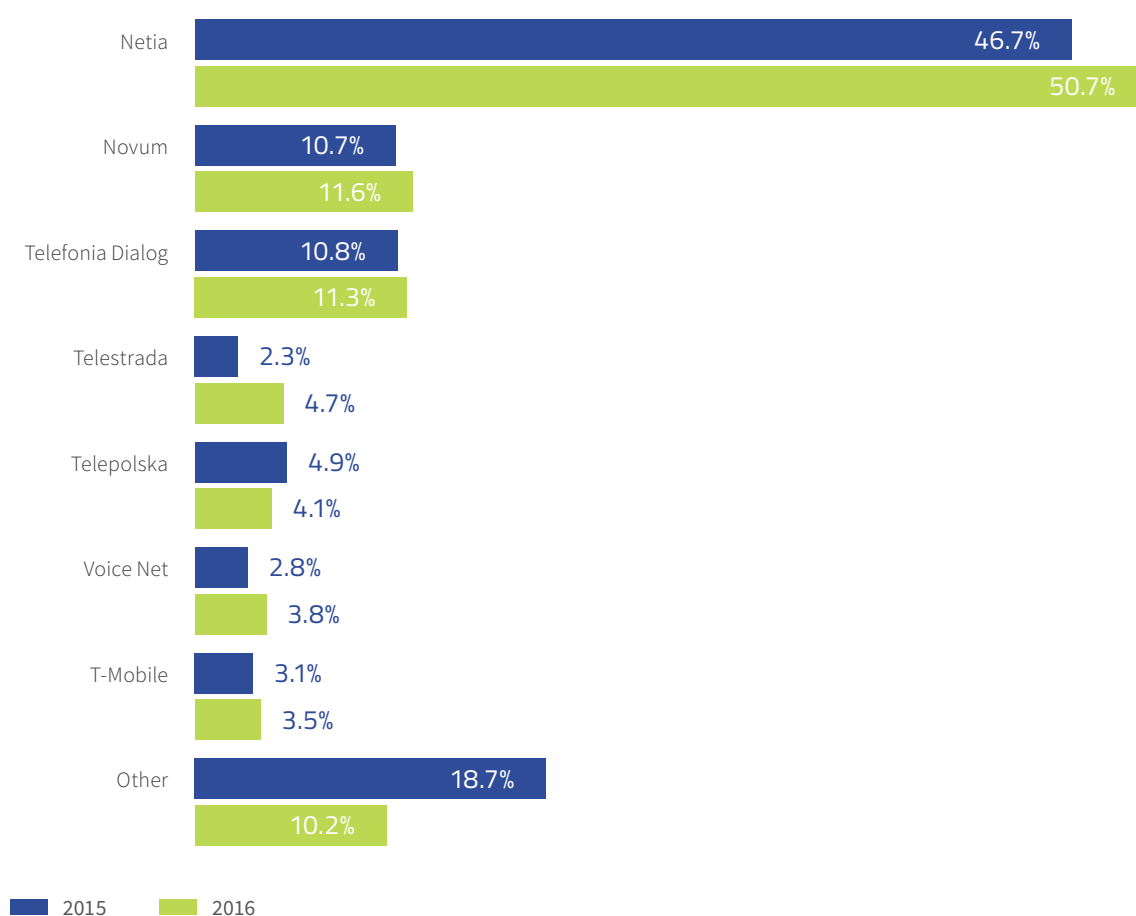
4.6. Wholesale Line Rental (WLR)

Netia had the biggest share of the WLR market in 2016 (about 51%). Novum (about 12%) and Telefonía Dialog (11%) earned a decidedly smaller revenue from this service.

In 2016, the number of people using Wholesale Line Rental (WLR) decreased in comparison with 2015 by around 24% and amounted to 0.6 million. Revenue from this service amounted to 0.36 million PLN.

Chart 48.

Shares in revenue from the provision of WLR services



Source: UKE

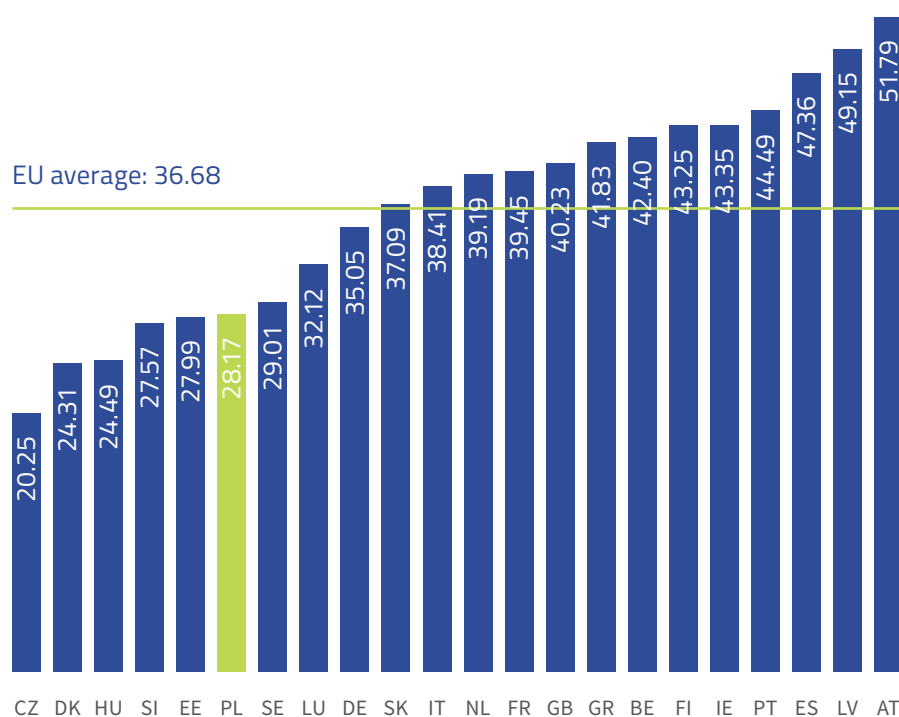
4.7. Prices of fixed-line telephony service

Price analysis was conducted on the basis of the OECD Fixed Voice Price Benchmarking database developed by Strategy Analytics. This database includes fixed-line telephony service offers of the largest operators in chosen European and non-European countries. The analysis of the prices was based on the basket value for a moderately active user.

Prices in EUR as of May 2016 varied between EUR 20.25 to EUR 51.79. The inhabitants of the Czech Republic bore the lowest costs for fixed-line telephony services, and Austrian citizens paid the highest costs. Prices in Poland were significantly lower than European average prices (by EUR 8.51) and were around EUR 28.17.

Chart 49.

Monthly basket values for a moderately active user in chosen EU countries (EUR, including VAT)



Source: UKE based on Fixed Voice Price Benchmarking, Strategy Analytics

Note: database as of May 2016. "Plan na Każdy Dzień" by Orange was chosen for Poland. The basket value includes installation and subscription fees, and the cost of calls.

4.8. VoIP telephony

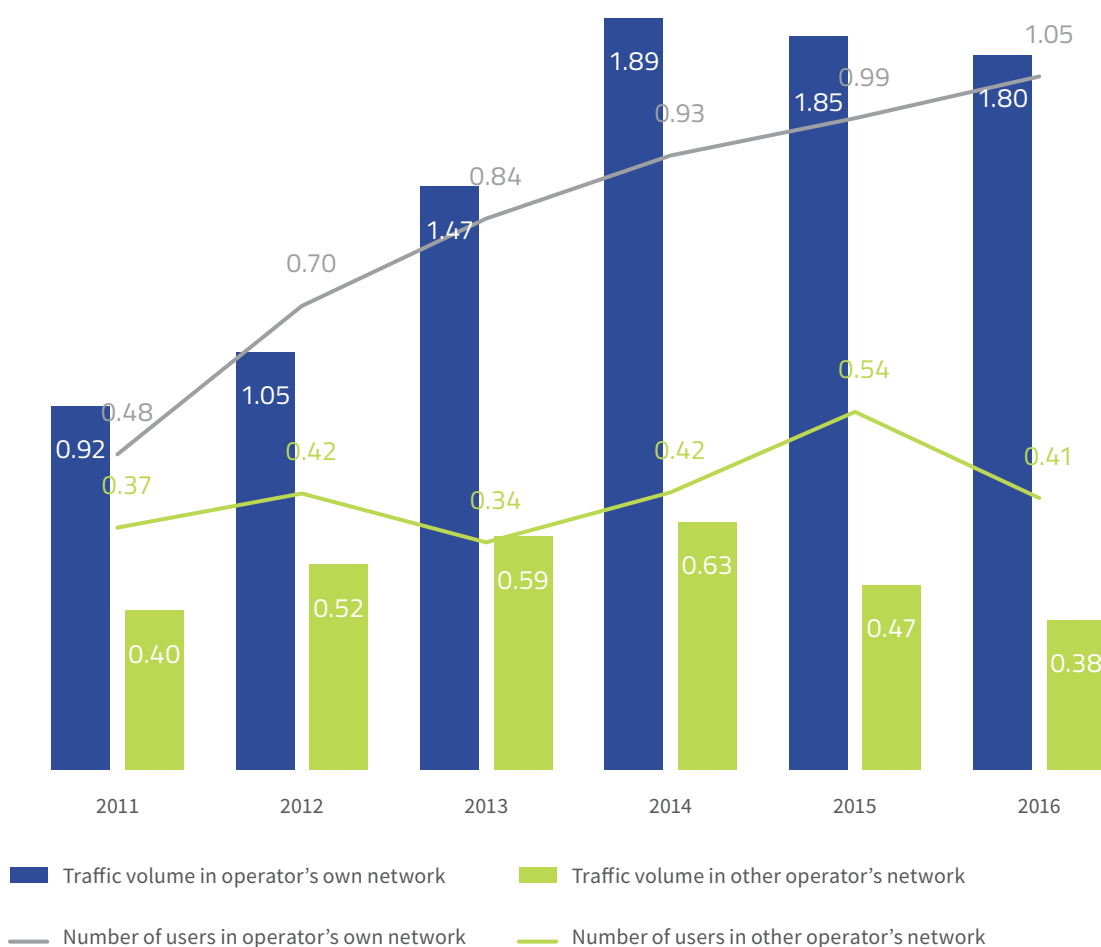
The number of users of VoIP, provided within the operator's own network, stood in 2016 at 1.05 million, that is 6.1% more than a year before. At the same time, the number of customers using the service through another operator's network decreased by 24.1% from 540,000 to 410,000.

Both in the case of services provided within an own network, or using other networks, the duration of calls decreased. In the first case by 2.8% – from 1.85 billion minutes in 2015 to 1.8 billion at the end of 2016. In the second case the decrease was even greater and stood at 18.6% – from 470 million minutes to 380 million year to year.

Orange had the biggest market share in terms of providing this service within its own access network. This operator provided services to above 60% of all users. Netia took the second (14.6%), and Multimedia the third place (12.5%).

Chart 50.

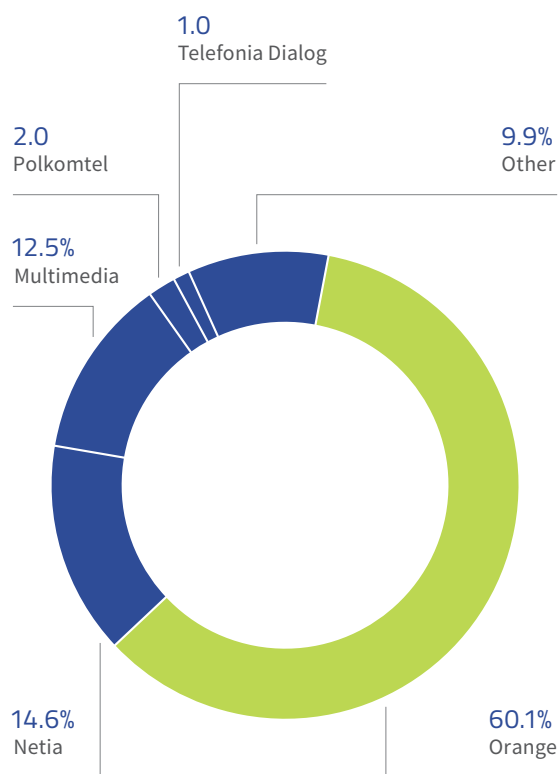
Number of subscribers (million) and traffic volume of VoIP services (in billion minutes)



Source: UKE

Chart 51.

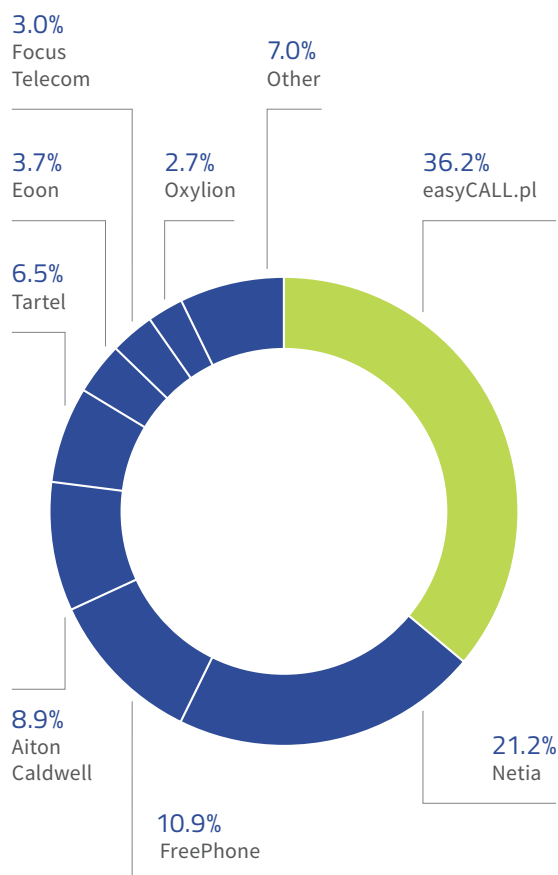
Operators' shares in terms of the number of subscribers of services provided using operators' own network



Source: UKE

Chart 52.

Operators' shares in terms of the number of subscribers of services provided using other operator's access network



Source: UKE

Among operators providing the IP telephony service using networks of other operators, easyCALL.pl had the highest number of customers. Over 36% of users used this operator's services. In 2016, Netia had a 21% share that placed it as the second one in terms of the number of subscribers. Almost 11% of users purchased the service from FreePhone.



The image features a world map where the continents are defined by a complex network of glowing blue lines and dots. The lines represent connections or data paths, while the dots represent nodes or data points. The overall effect is a digital, interconnected globe. The text 'Telecommunications infrastructure' is positioned in the lower-left quadrant of the image, rendered in a bright yellow-green color that stands out against the dark blue background.

**Telecommunications
infrastructure**

In 2016, 9536 entities were listed in the Information System for Broadband Infrastructure (SIIS), that is 254 less than in the previous year. The difference in the number of entities included in SIIS in the previous inventory results from, i.a.:

- deletion from the Register of Telecommunications Undertakings of 289 entities, which have been removed from Central Registration and Information on Business (CEIDG),
- making entries to and removals from the Register (at the request of telecommunications undertakings),
- removal of accounts of certain entities recorded in the database as public utility enterprises, which stated that they do not meet the requirements specified in Art. 2 (3) of the Act of 7 May 2010 on supporting the development of telecommunications services and networks.

Chart 1.

Number of entities in SIIS

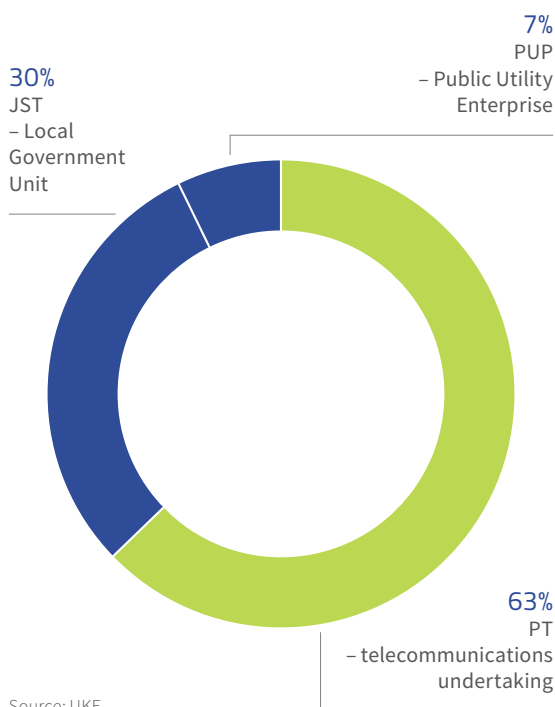
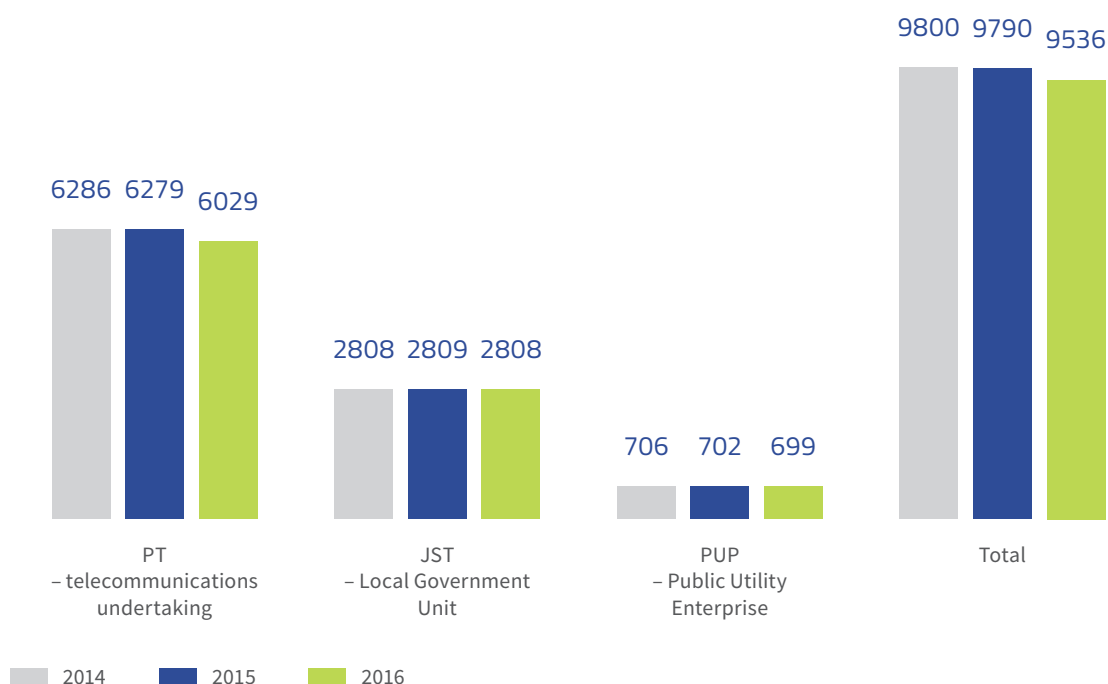


Chart 2.

Number of entities in SIIS during the inventory

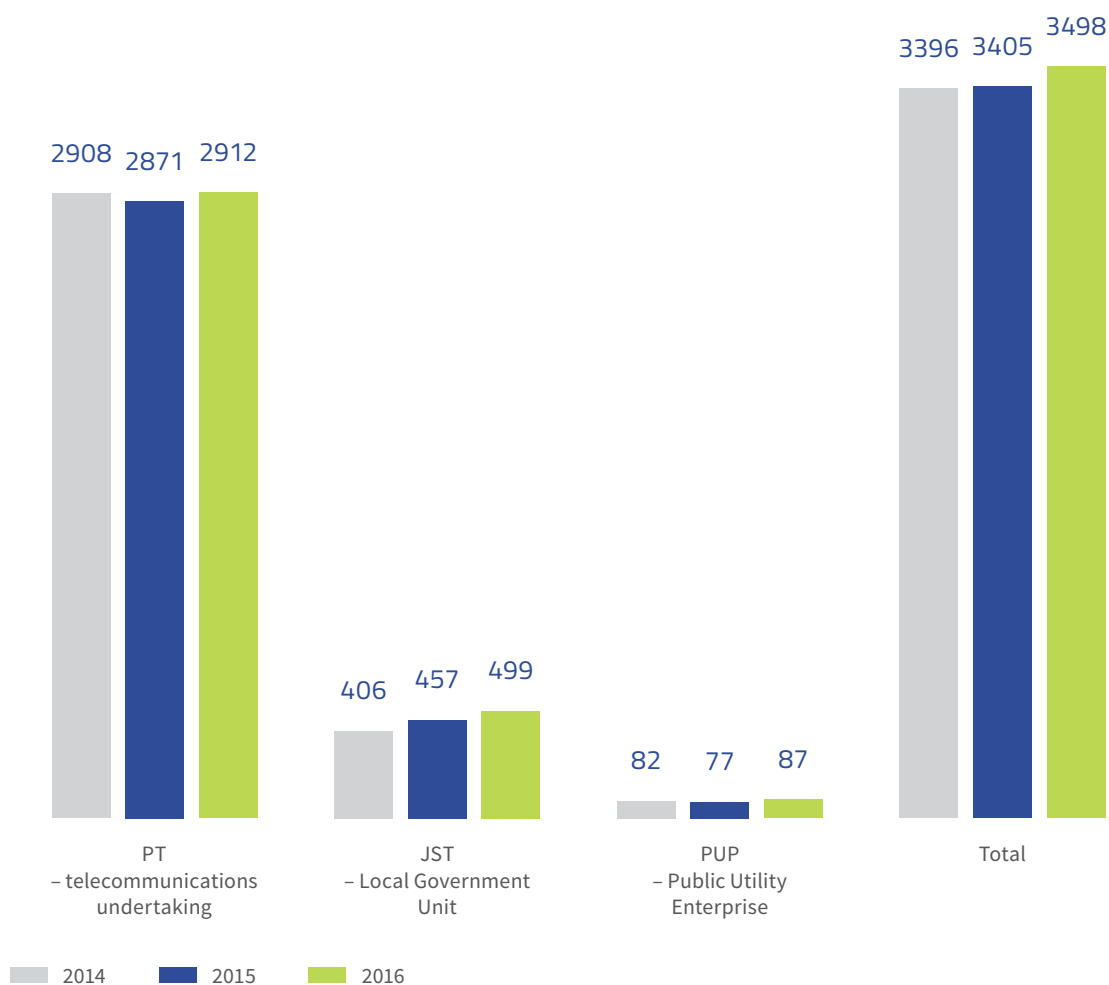


Source: UKE

In total 3498 entities provided data during the 2016 SIIS system inventory. Despite the decrease in the number of undertakings and public utility enterprises participating in this year's inventory, the number of entities whose data were entered into the system has increased.

Chart 3.

Number of entities that provided data for the inventory

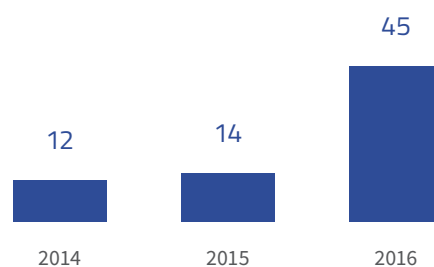


Source: UKE

As a result of providing data by a larger number of entities, the amount of data entered into SIIS has increased. In most categories it is a 10-40% increase. In this year's inventory, it is worth to notice a substantial increase in the number of network termination points (by 320%), most of which are mobile network termination points. This increase results from the change in the method of reporting information. Operators indicated buildings within their coverage, and not address points to which invoices are issued.

Chart 5.

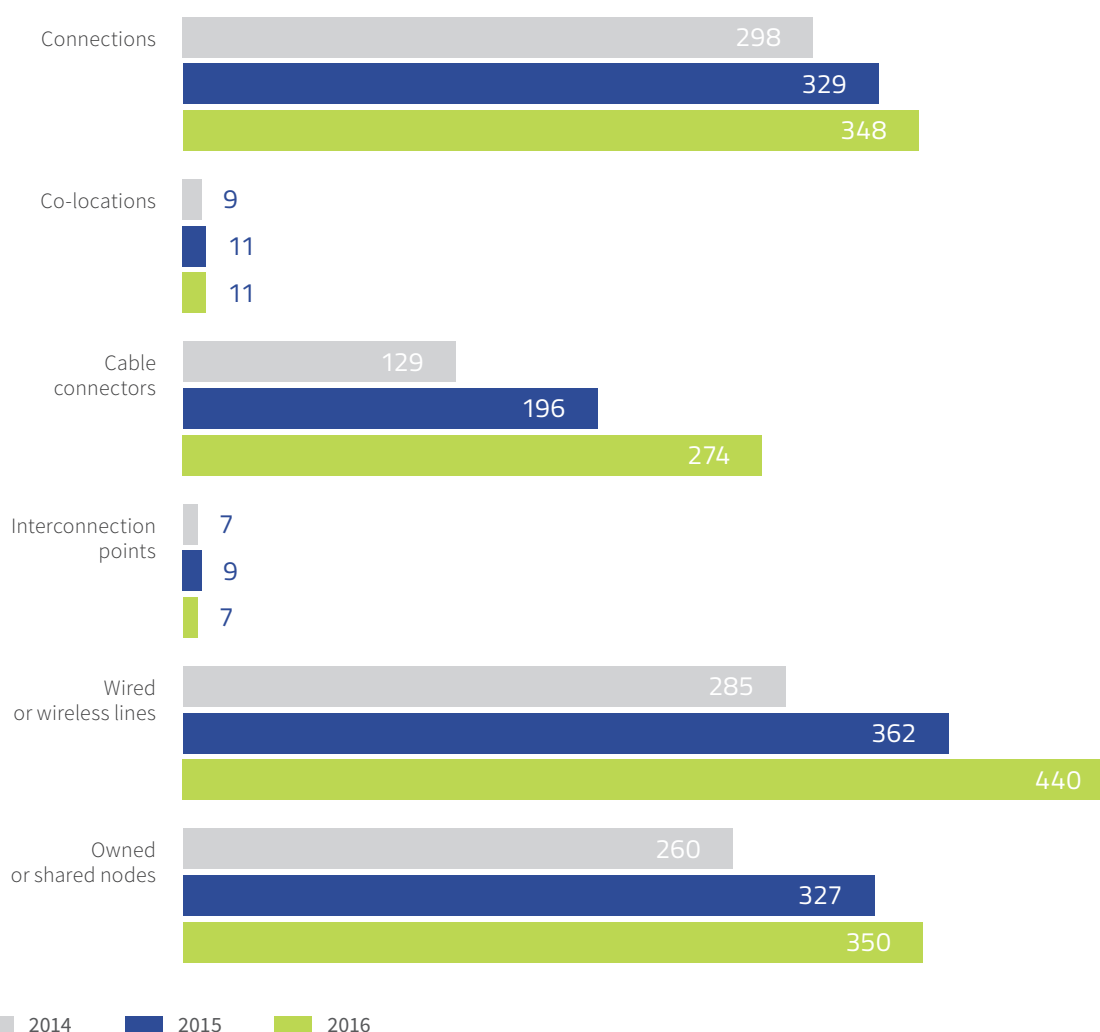
Number of network termination points (million) entered into SIIS



Source: UKE

Chart 4.

Number of elements of infrastructure (in thousands) entered into SIIS



Source: UKE



2.

Nodes
of telecommunications
networks

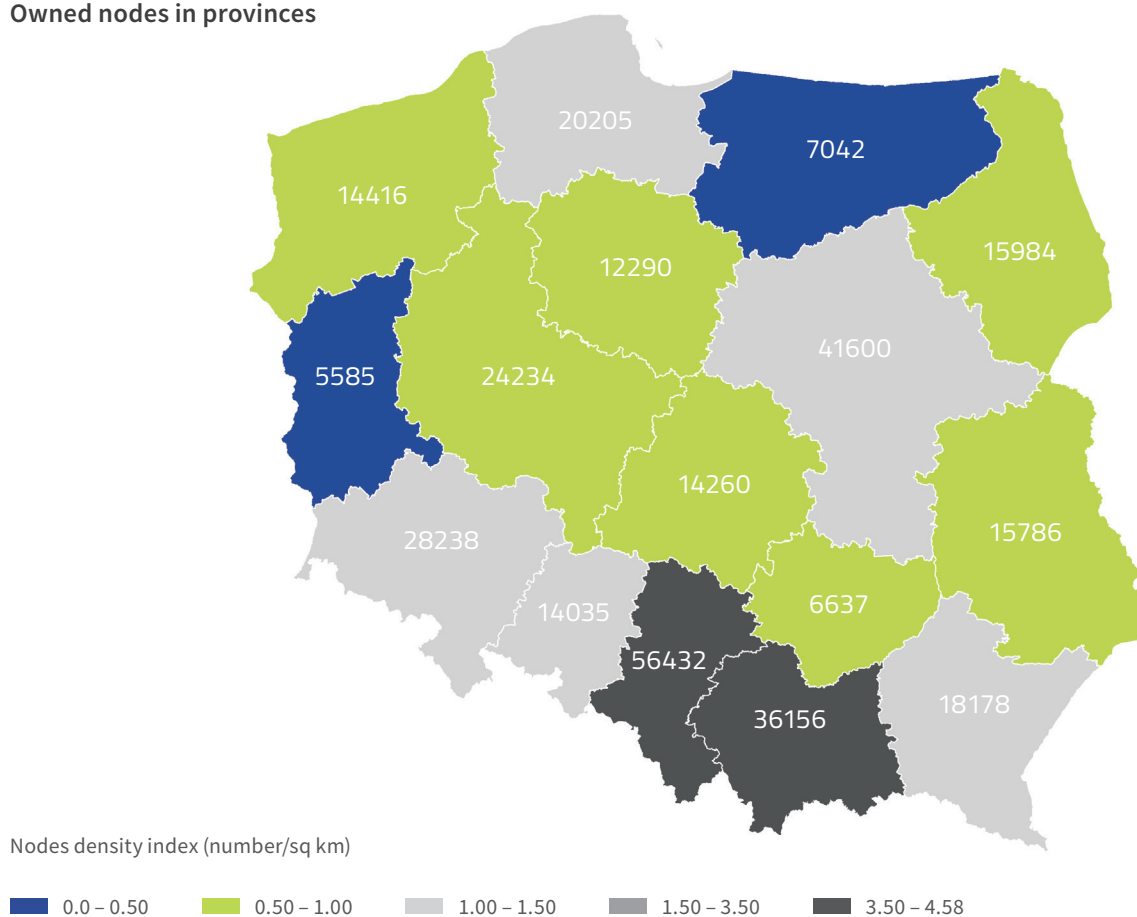
2.1. Owned nodes

In the inventory of telecommunications infrastructure for 2016, the obliged entities reported 331,078 own nodes (without virtual nodes), which is over 20,000 more than last year.

Map 1 illustrates the density and number of own nodes in given voivodeships (provinces). Silesia stands out with the largest number of nodes compared to a relatively small area, which results from a high level of urbanization. A substantial density of nodes is characteristic also of Lesser Poland, Lower Silesia and Masovia voivodeships. In total, about 50% of all nodes is located in the four aforementioned provinces. Warmia-Masuria and Lubusz voivodeships with one telecommunications node per 3 square kilometres on average, are at the other end of the list.

Map 1.

Owned nodes in provinces



Source: UKE

Fact sheet 1.

Number of nodes in particular categories of locality size

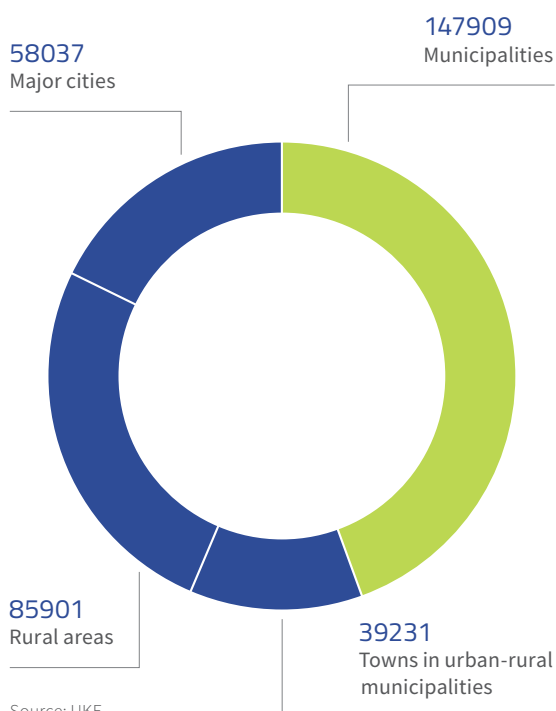
Size of the locality	Number of nodes	Percentage of the number of nodes in the total number of nodes
above 100 000	140 183	42.34
50 001 – 100 000	27 610	8.34
20 001 – 50 000	37 098	11.21
5 001 – 20 000	35 031	10.58
1 001 – 5 000	37 230	11.25
501 – 1 000	19 310	5.83
101 – 500	29 029	8.77
up to 100	5 587	1.69

Source: UKE

According to fact sheet 1, more than a half of nodes is located in large (above 100 000 inhabitants) and medium (50 000-100 000 inhabitants) cities, whereas every fourth node is placed in a rural area (chart 6).

Chart 6.

Number of nodes in SIIS



Source: UKE

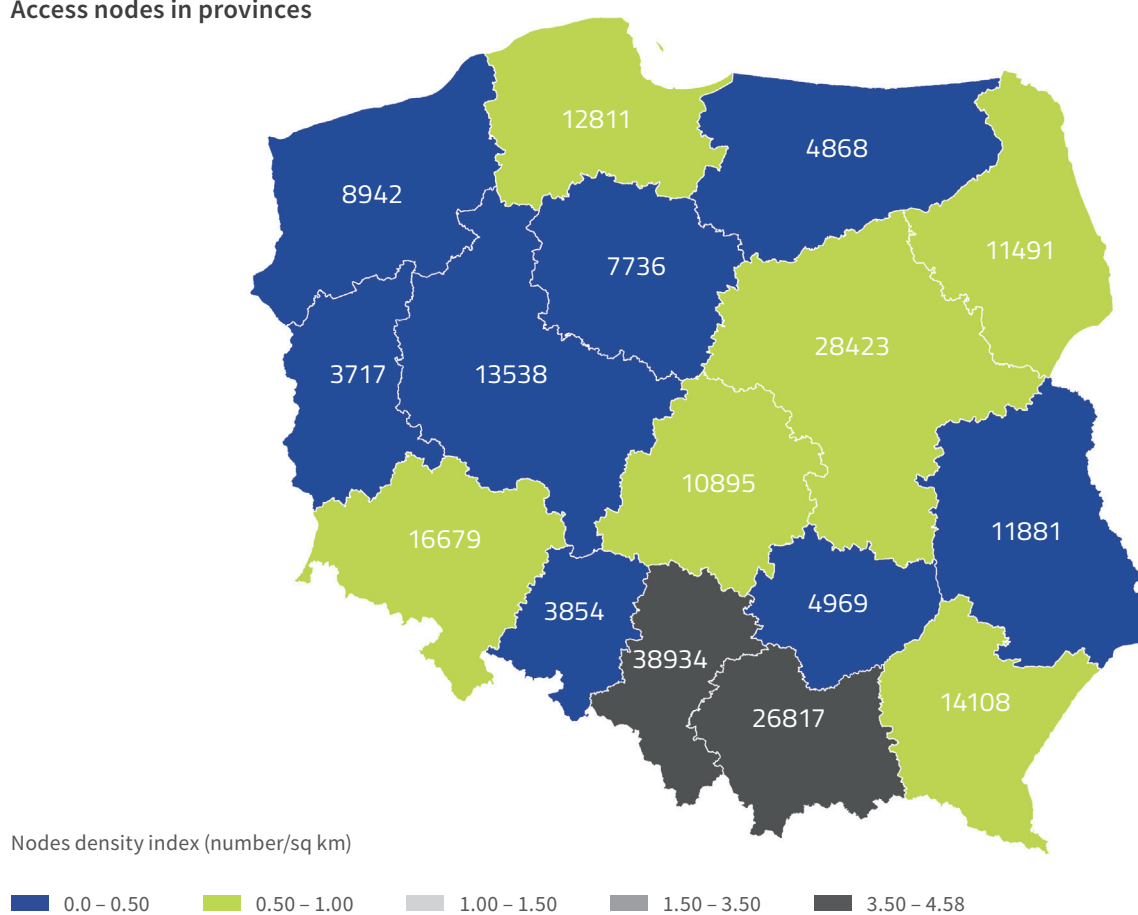
2.2. Access nodes

Map 2 illustrates the density and number of access nodes. As in the case of own nodes, the highest density was observed in Silesia and Lesser Poland voivodeships. Fact sheet 2 illustrates the number of access nodes with regard to size (number of inhabitants) in localities in which they are placed. The comparison of the percent-

age of nodes located in particular size categories with respect to analogous data for own nodes indicates that proportionally fewer nodes are placed in the cities above 100 000 inhabitants (decrease from 42% to 36% in favour of smaller localities).

Map 2.

Access nodes in provinces



Source: UKE

Fact sheet 2.

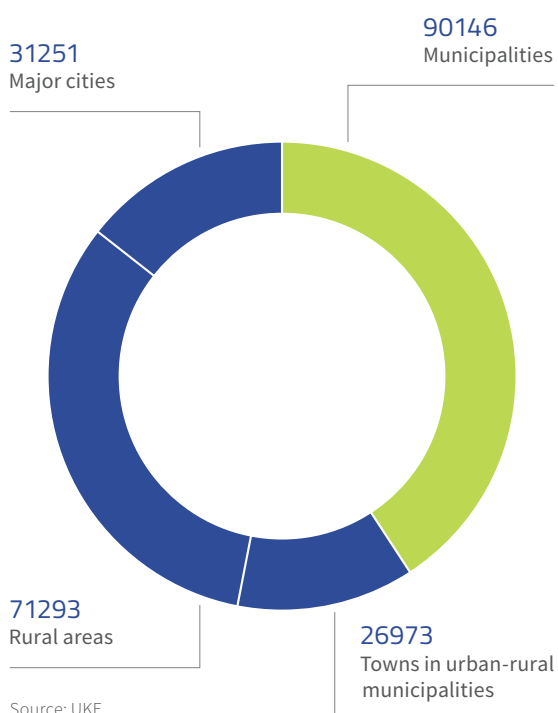
Number of access nodes in particular categories of locality size

Size of the locality	Number of nodes	Percentage of the number of nodes in the total number of nodes
above 100 000	79 519	36.2
50 001 – 100 000	16 930	7.71
20 001 – 50 000	23 052	10.49
5 001 – 20 000	24 337	11.08
1 001 – 5 000	31 073	14.15
501 – 1 000	16 395	7.46
101 – 500	23 837	10.85
up to 100	4 520	2.06

Source: UKE

Chart 7.

Number of access nodes



Source: UKE

Chart number 7 presents spatial distribution of access nodes in areas with different level of urbanisation. Comparison with the values from chart 6 indicates that 83% of own nodes which are located in rural areas are access nodes. Moreover, it can be noted that the more the area is urbanised, the smaller is the percentage of access nodes in the total number of own nodes. It results from the network architecture and the placement of elements of higher network layers in localities with supra-local and regional importance.

The following fact sheet presents the number of localities (regardless of their type and size) in which entities reported their own access nodes (regardless of access technology). Relatively the smallest number of localities deprived of access nodes is found in Lesser Poland, Subcarpathia and Silesia voivodeships. These provinces

are also characterized by the largest number of localities in which there are 3 or more operators. In comparison to the data from the previous year, in almost all provinces the number of localities without their own access nodes has decreased, due to the market development and investments supported by public funds.

Fact sheet 3.

Number of localities in which entities reported their own telecommunications network access nodes, by province

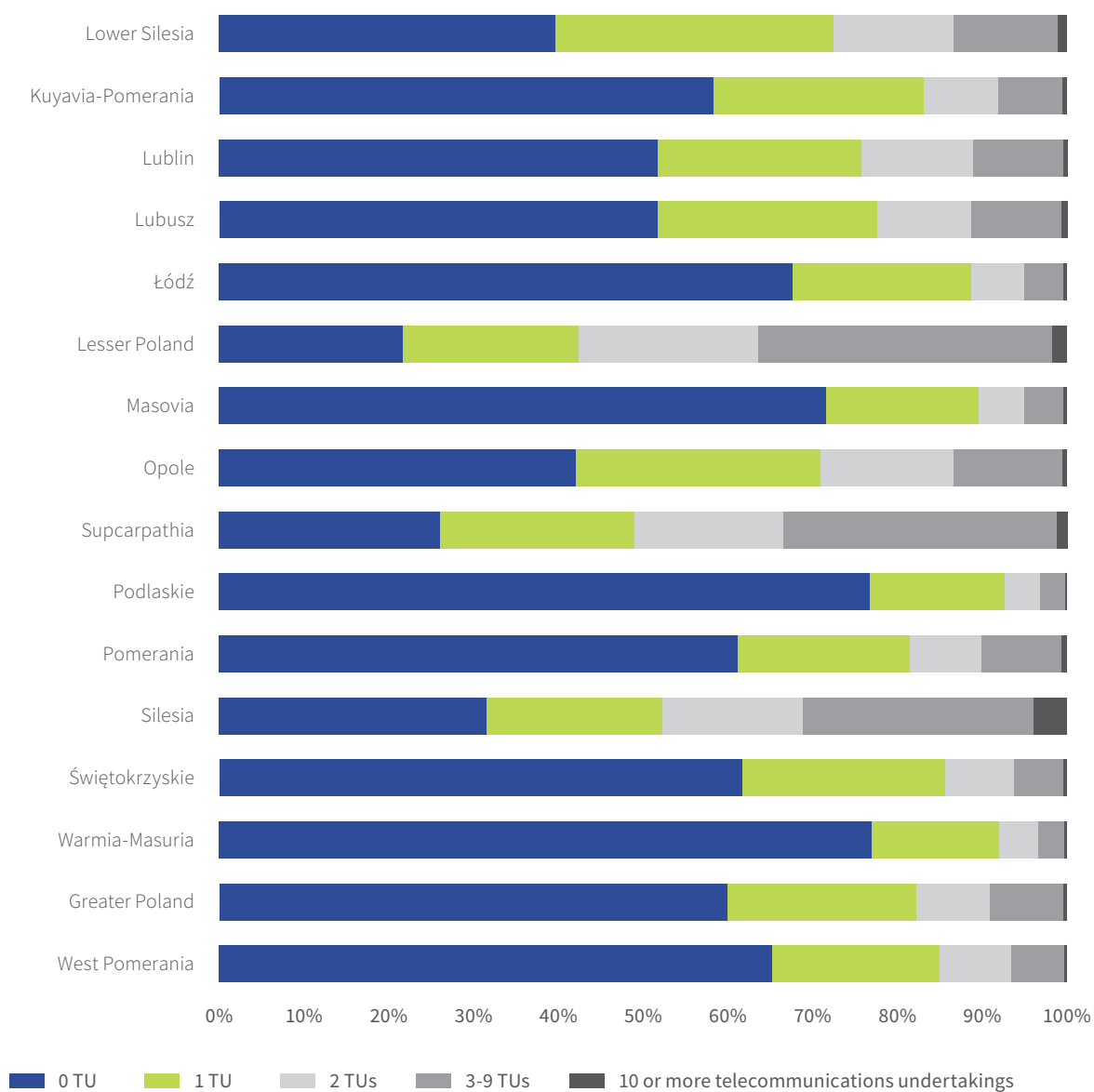
TERC	Province	Total number of localities	0 TU	1 TU	2 TUs	3-9 TUs	10 or more TUs
02	Lower Silesia	2623	1042	859	371	324	27
04	Kuyavia-Pomerania	3635	2121	903	316	277	18
06	Lublin	4091	2119	980	540	434	18
08	Lubusz	1339	693	347	148	142	9
10	Łódź	5053	3417	1066	314	234	22
12	Lesser Poland	2012	436	417	426	699	34
14	Masovia	8620	6168	1551	467	400	34
16	Opole	1208	509	348	189	156	6
18	Subcarpathia	1717	447	394	303	552	21
20	Podlaskie	3799	2918	601	158	115	7
22	Pomerania	2918	1784	592	246	278	18
24	Silesia	1364	430	283	226	372	53
26	Świętokrzyskie	2522	1557	602	207	145	11
28	Warmia-Masuria	3924	3020	591	179	124	10
30	Greater Poland	5569	3341	1242	478	484	24
32	West Pomerania	3083	2013	606	260	195	9

Source: UKE

*TU – telecommunications undertaking

Chart 8.

Localities in which entities reported their own telecommunications network access nodes, by province



Source: UKE

Fact sheet 3 and chart 8 present information about the presence of access nodes in localities of different sizes, by province. In comparison to the data from the 2015 inventory, the major change has occurred in the category of localities from 100 to 500 inhabitants – access nodes were located in more than new 400 localities.

Fact sheet 4.

Number of localities in which entities reported their own telecommunications network access nodes, by the locality size

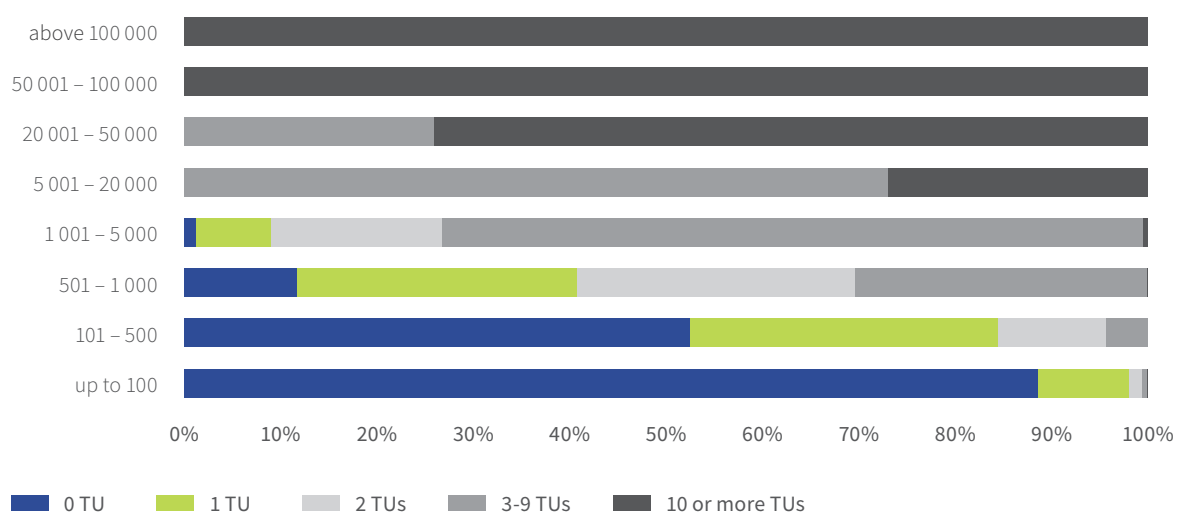
Size of the locality	Total number of localities	0 TU	1 TU	2 TUs	3-9 TUs	10 or more TUs
above 100 000	39	0	0	0	0	39
50 001 – 100 000	48	0	0	0	0	48
20 001 – 50 000	135	0	0	0	35	100
5 001 – 20 000	423	0	0	0	309	114
1 001 – 5 000	2833	36	220	502	2058	17
501 – 1 000	4328	506	1257	1251	1313	1
101 – 500	24920	13084	7954	2801	1081	0
up to 100	20751	18384	1951	274	136	6

Source: UKE

*TU – telecommunications undertaking

Chart 9.

Localities in which entities reported their own telecommunications network access nodes, by the locality size



Source: UKE

2.3. Fibre nodes

As part of the inventory, obliged entities reported 154 665 fibre nodes in the entire country. A 43% increase in the total number of nodes was recorded. Chart 10 presents the changes over recent years.

Fact sheet 5 presents the number of nodes in provinces depending on the transmission medium. The smallest number of fibre nodes in relation to wired nodes is reported in provinces that are not included in RSS (Regional Broadband Networks) – Opole and West Pomerania. Simultaneously the biggest percentage of nodes with radio interfaces is found in rural areas (up to 1000 inhabitants).

Fact sheet 5.

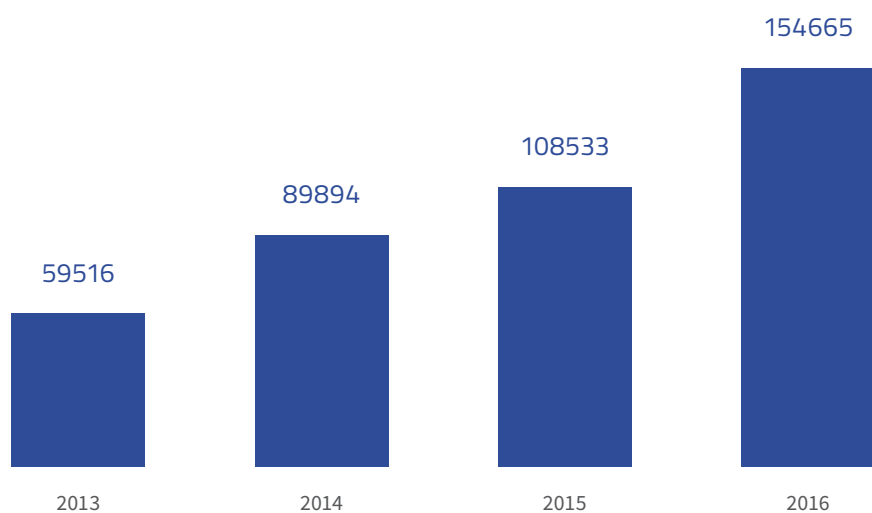
The number of nodes in individual provinces by medium

TERC	Province	Number of nodes	Number of fibre nodes	Number of nodes connected with fibre lines	Number of wired nodes	Number of radio nodes
02	Lower Silesia	28238	13138	10155	20665	6733
04	Kuyavia-Pomerania	12290	5012	4442	9049	4207
06	Lublin	15786	7936	5614	7029	6282
08	Lubusz	5585	2350	1886	3626	1973
10	Łódź	14260	7552	6163	8506	4658
12	Lesser Poland	36156	15769	13032	20629	10558
14	Masovia	41600	23665	19750	29016	8675
16	Opole	14035	3119	2380	12328	2088
18	Supcarpathia	18178	8037	6306	7263	7906
20	Podlaskie	15984	10321	9691	9452	2572
22	Pomerania	20205	8503	7281	14528	5352
24	Silesia	56432	27203	20290	35084	9784
26	Świętokrzyskie	6637	3135	2444	3422	2619
28	Warmia-Masuria	7042	3332	3046	4817	2363
30	Greater Poland	24234	10339	6098	14900	7546
32	West Pomerania	14416	5254	4408	11077	3999

Source: UKE

Chart 10.

Number of fibre nodes in particular years



Source: UKE

Fact sheet 6.

Number of nodes in particular locality size categories, by medium

Size of the locality	Number of nodes	Number of fibre nodes	Number of nodes connected with fibre lines	The number of wired nodes	The number of radio nodes
above 100 000	140183	67056	54413	108792	16579
50 001 – 100 000	27610	12847	11370	20272	3767
20 001 – 50 000	37098	20112	14961	22756	7560
5 001 – 20 000	35031	16726	13227	21121	9859
1 001 – 5 000	37230	17565	13709	15891	17126
501 – 1 000	19310	8920	6762	7605	9800
101 – 500	29029	9689	7211	12735	18758
up to 100	5587	1750	1333	2219	3866

Source: UKE



3.

Network
coverage

3.1. Penetration of wired connections or wireless terminals in buildings

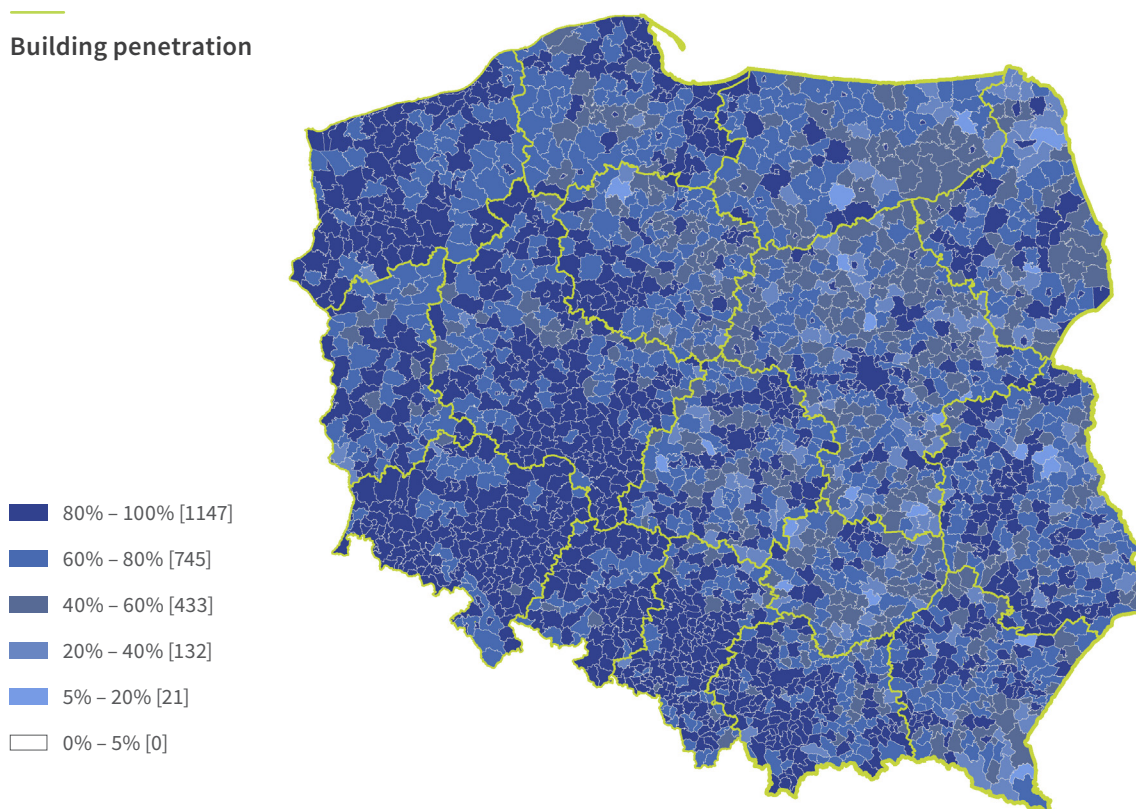
In order to assess availability of the network, the following report uses a building penetration indicator, understood as the ratio of the number of dwellings within network coverage (i.e. buildings in which operators report the ability to provide certain services) to the total number of dwellings in the analysed area.

Average building penetration for fixed-line Internet is at the level of about 80% in relation to 75% in the previous year, which means a 5 percent increase. Lower Silesia (91.31%), Opole, Greater Poland, Silesia and West Pomerania voivodeships have the highest level of penetration, whereas the so-called Eastern provinces – Świętokrzyskie, Warmia-Masuria, Podlaskie, Subcarpathia, as well

as Kuyavia-Pomerania and Łódź have the lowest level of penetration. The highest increase was reported in provinces: Lesser Poland (12 percent), Subcarpathia (11 percent), Greater Poland (9 percent) and Świętokrzyskie (8 percent). The lowest increase was noted in Pomerania, Masovia, West Pomerania and Warmia-Masuria provinces. The map below presents the distribution of service availability in buildings in individual municipalities. In comparison with the previous years, a decrease is noted in the number of municipalities in which fewer than 40% of the buildings have potential access to fixed-line Internet service. Differences in availability occur due to location. Location in the Western part of the country, in highly urbanised areas and in their vicinity is a factor that positively affects the availability of services. A clear distinction can be noticed in Subcarpathia province, where rural municipalities with small percentage of buildings in which operators reported the possibility of providing services are located next to areas (municipalities) with high penetration level.

Map 3.

Building penetration



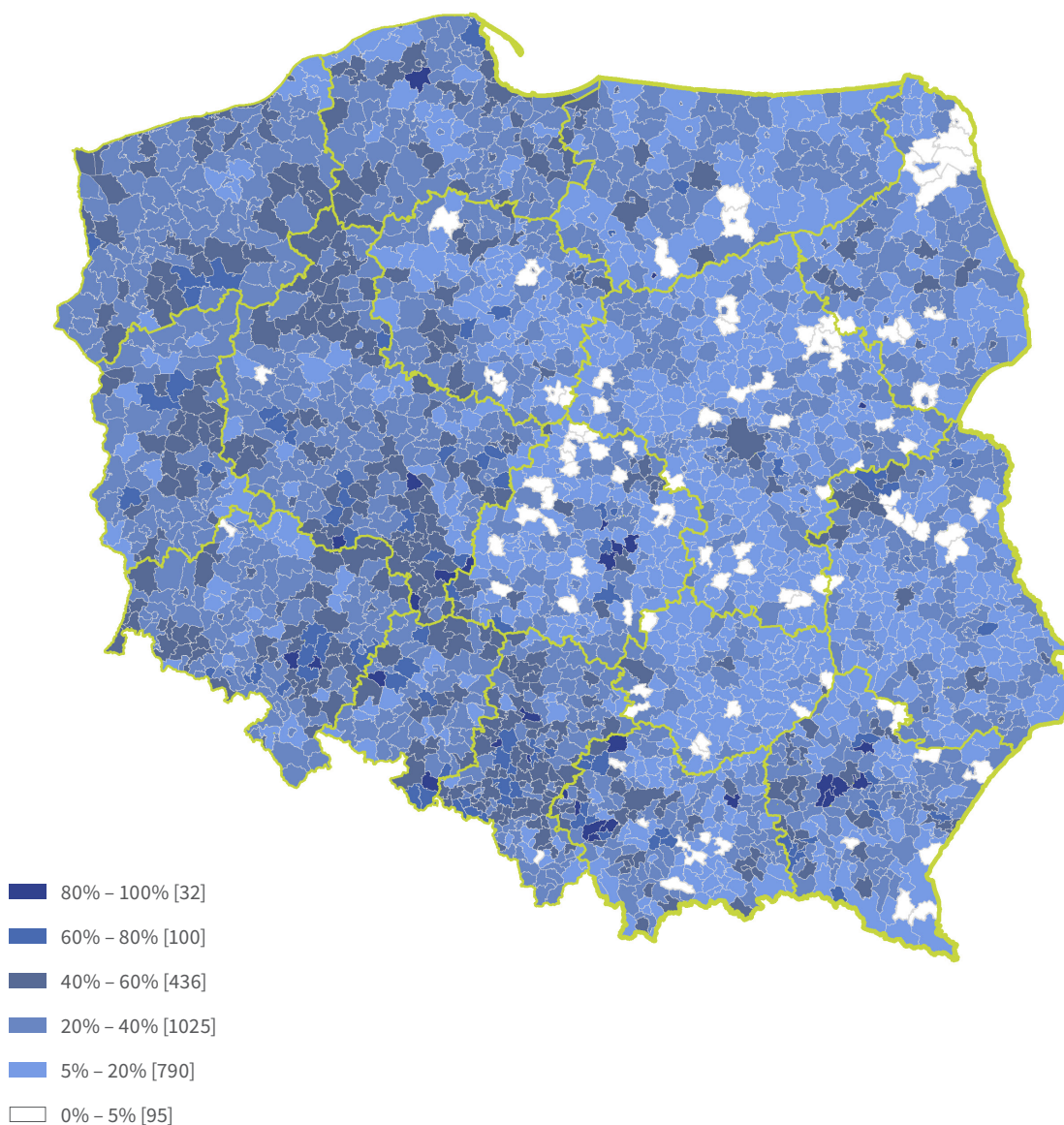
Source: UKE

Average building penetration for fixed-line Internet access of at least 30 Mbps capacity is now at the level of 32% compared with nearly 30% last year, which means an over 2 percent increase. The characteristics of individual provinces tends to resemble the overall fixed-line Internet indicator – provinces Masovia and Lublin joined

the group of provinces with the lowest parameters. Areas with an extremely low service penetration rate (below 5%) are located in Podlaskie province (especially its northern part) and in rural municipalities in the aforementioned provinces (e.g. Masovia, Lublin and Warmia-Masuria).

Map 4.

Building penetration – 30 Mbps coverage



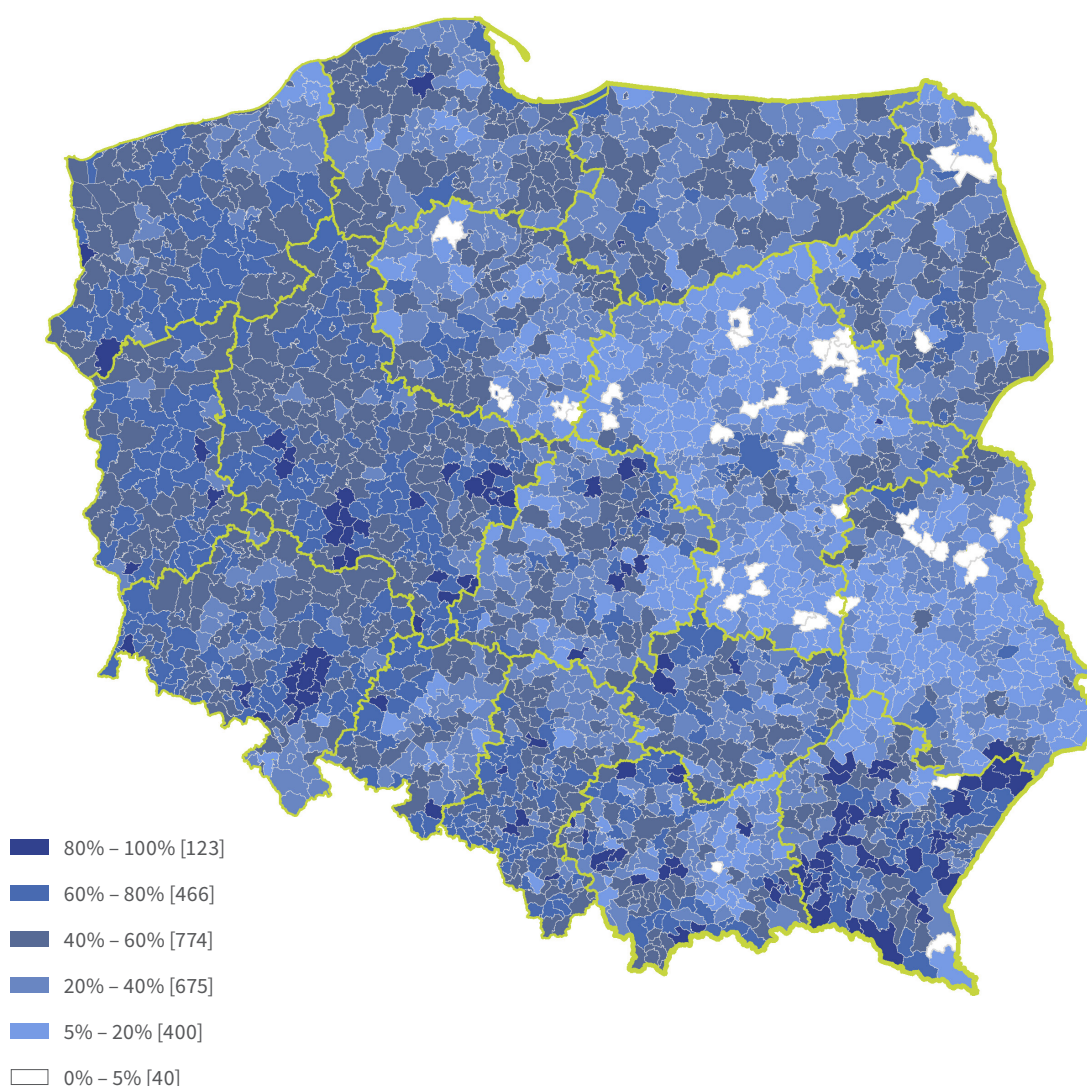
Source: UKE

Completion of investment projects resulting from the two competitions concluded within Digital Poland Operational Programme ought to result in a significant increase in building penetration – from 32% to nearly 45%. The best results are to be observed in the provinces of Świętokrzyskie (28.82 %, almost a double increase in the number of covered buildings, from 14.46% to 46.27%), Subcarpathia (22.32%), Greater Poland (19.16%) and Lubusz (21.06%). Inhabitants of Masovia and Kuyavia-Pomerania voivodeships will probably benefit to the small-

est extent (below 8%). Also Lublin voivodeship belongs to this group, as due to the entrepreneurs' lack of interest in public funds and the negative assessment of applications in the second competition the predicted increase in the number of buildings within network coverage will be about 7500, that is only 1.2% of the total number. The above will result in a building penetration increase from 26.1% to 27.3%. Unfortunately, the lack of activity is often associated with areas which are characterised by low availability indicators for services of at least 30 Mbps.

Map 5.

**Predicted building penetration – 30 Mbps coverage
– after completion of Digital Poland Operational Programme competitions**



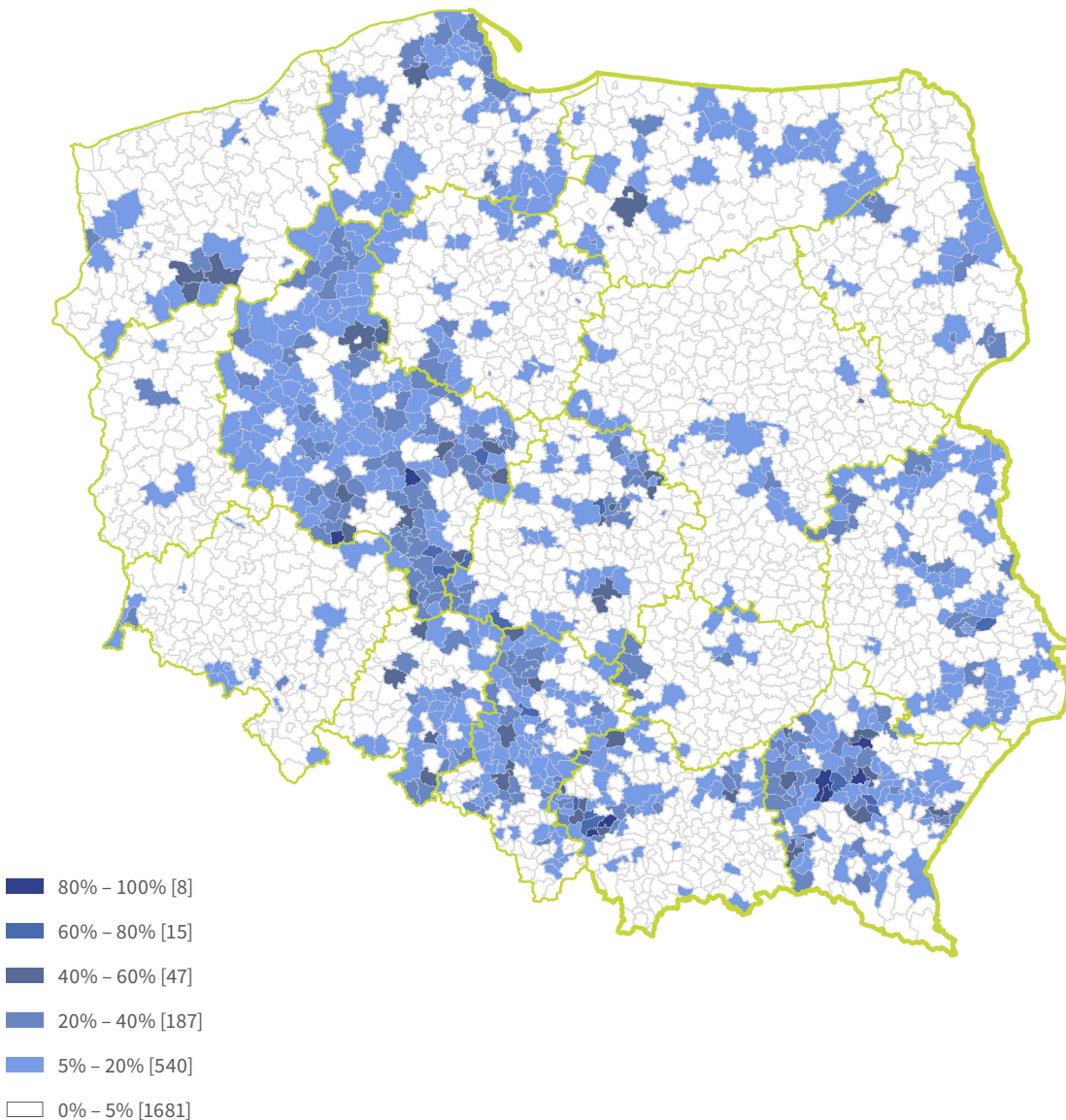
Source: UKE

Today, inhabitants of every twelfth building have access to services with the speed of 100 Mbps or more. These are usually inhabitants of multifamily residential buildings in large cities. Availability of such services in rural areas is generally at the level below 5%. Subcarpathia and Greater Poland provinces are an exception, as the distribution of availability in rural areas is relatively high

compared to the rest of the country. These provinces are characterised by the highest percentage of buildings covered by such services, 15.30% and 13.72% respectively. The worst situation is in the voivodeships of Lublin, Świętokrzyskie, Lower Silesia, Masovia and Kuyavia-Pomerania, where less than one in twenty dwellings has access to fixed-line Internet of at least 100 Mbps capacity.

Map 6.

Building penetration – 100 Mbps coverage



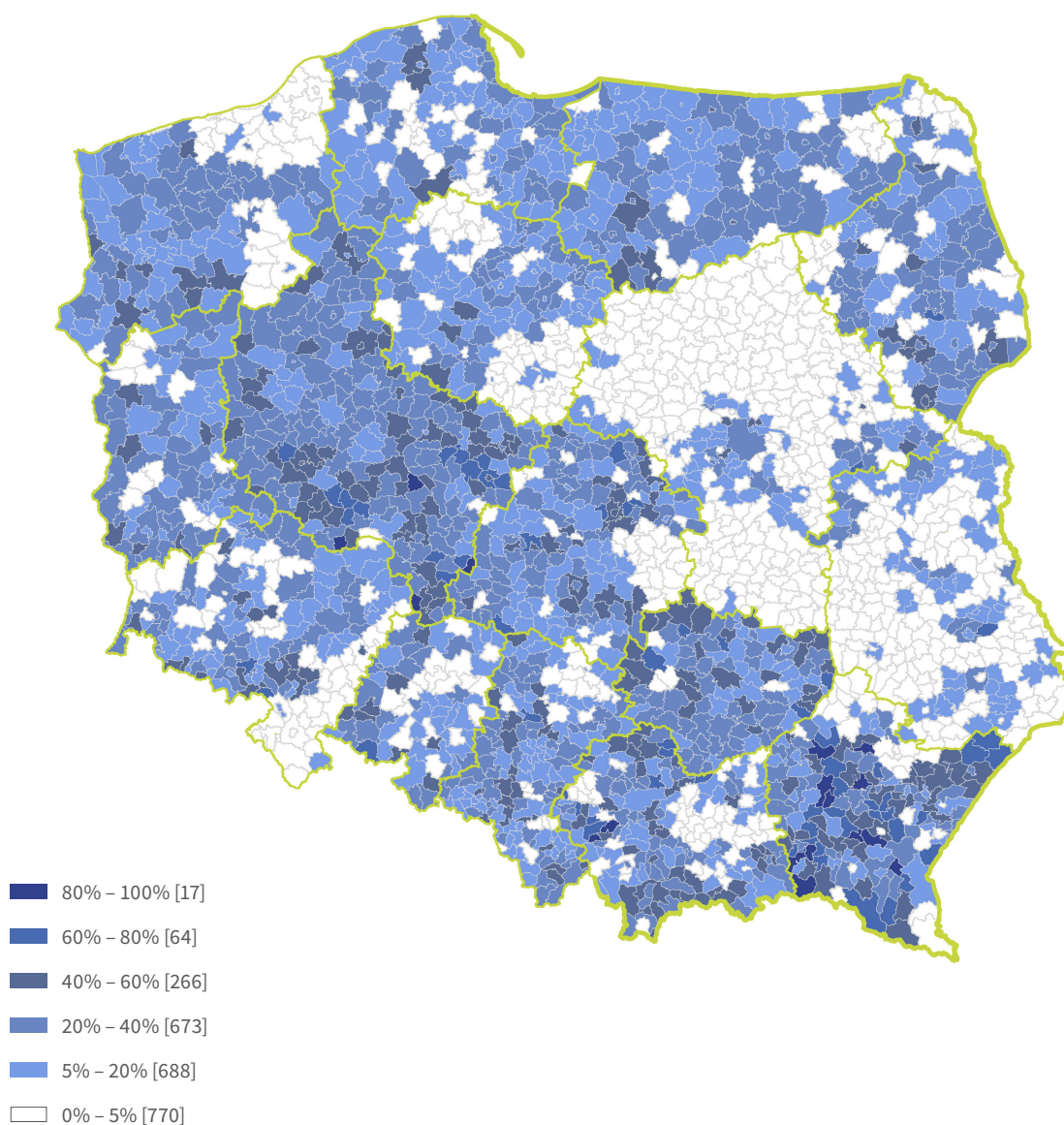
Source: UKE

The increase in availability of such services, resulting from completion of investment projects within Digital Poland Operational Programme is similar to that concerning the 30 Mbps service. The majority of new technology investments supported by public funds will provide the inhabitants of areas covered by those projects with the possi-

bility to use 30 Mbps and 100 Mbps service. It results both from the technologies used and premiums (i.e. a higher score in application assessment) granted to undertakings for implementation of higher-standard investments, provided in objectives of Digital Poland Operational Programme competitions, the second one in particular.

Map 7.

Predicted building penetration – 100 Mbps coverage – after conclusion of Digital Poland Operational Programme competitions



Source: UKE

3.2. Housing-unit penetration in buildings within network coverage

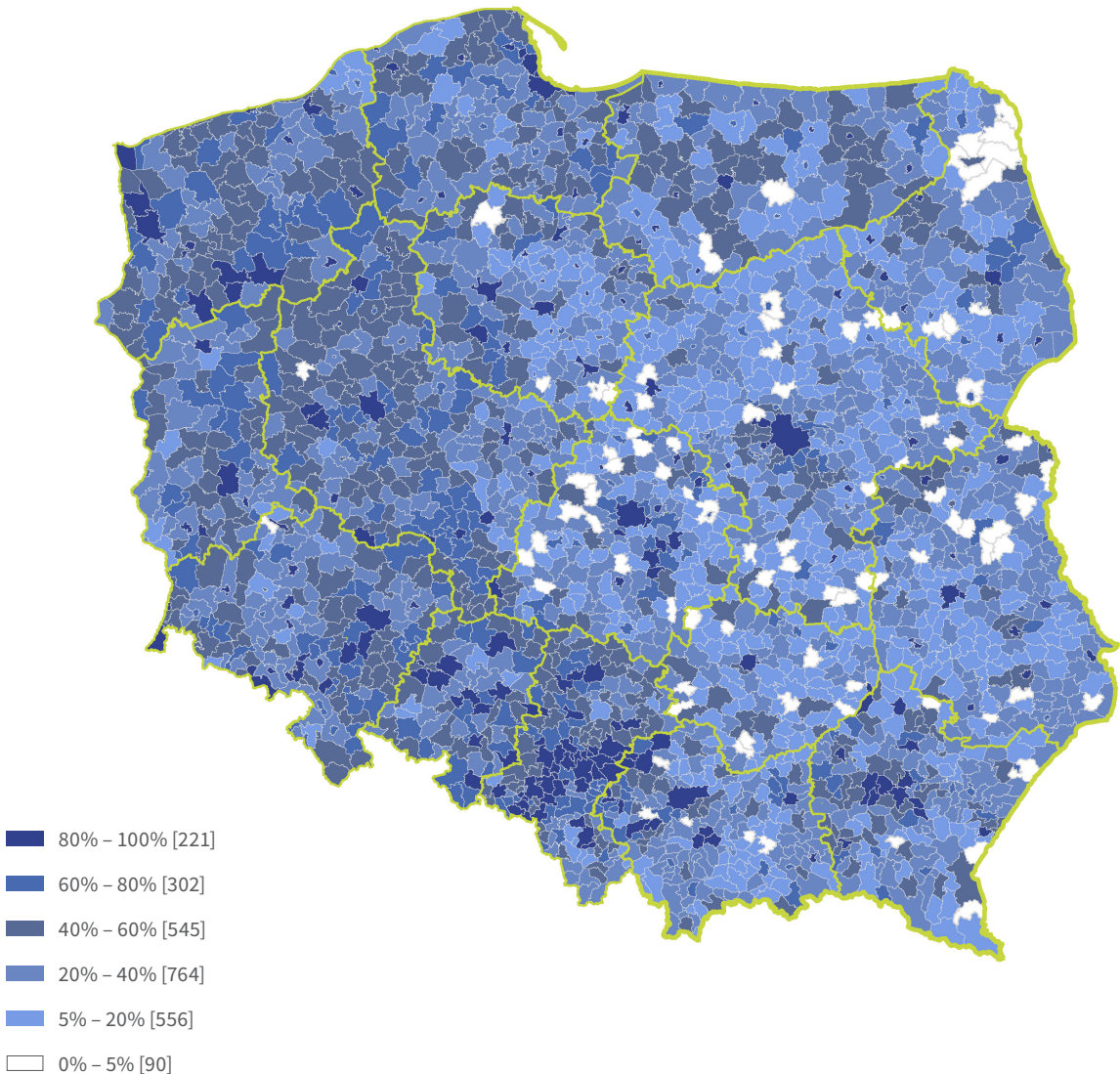
To assess the level of implementation of the Digital Agenda for Europe (DAE) provisions, the following report uses a housing-unit penetration indicator understood as the ratio of the number of housing units in buildings

within coverage of the network of at least 30 Mbps capacity (buildings, in which operators report the ability to provide certain services) to the total number of housing units in the analysed area.

Average housing-unit penetration of fixed-line Internet of at least 30 Mbps capacity is about 66% in comparison with 63% last year, which means an about 3 percent increase. Silesia has the highest indicator of penetration (79%), and Świętokrzyskie voivodeship the lowest one (44%).

Map 8.

Housing-unit penetration – 30 Mbps coverage

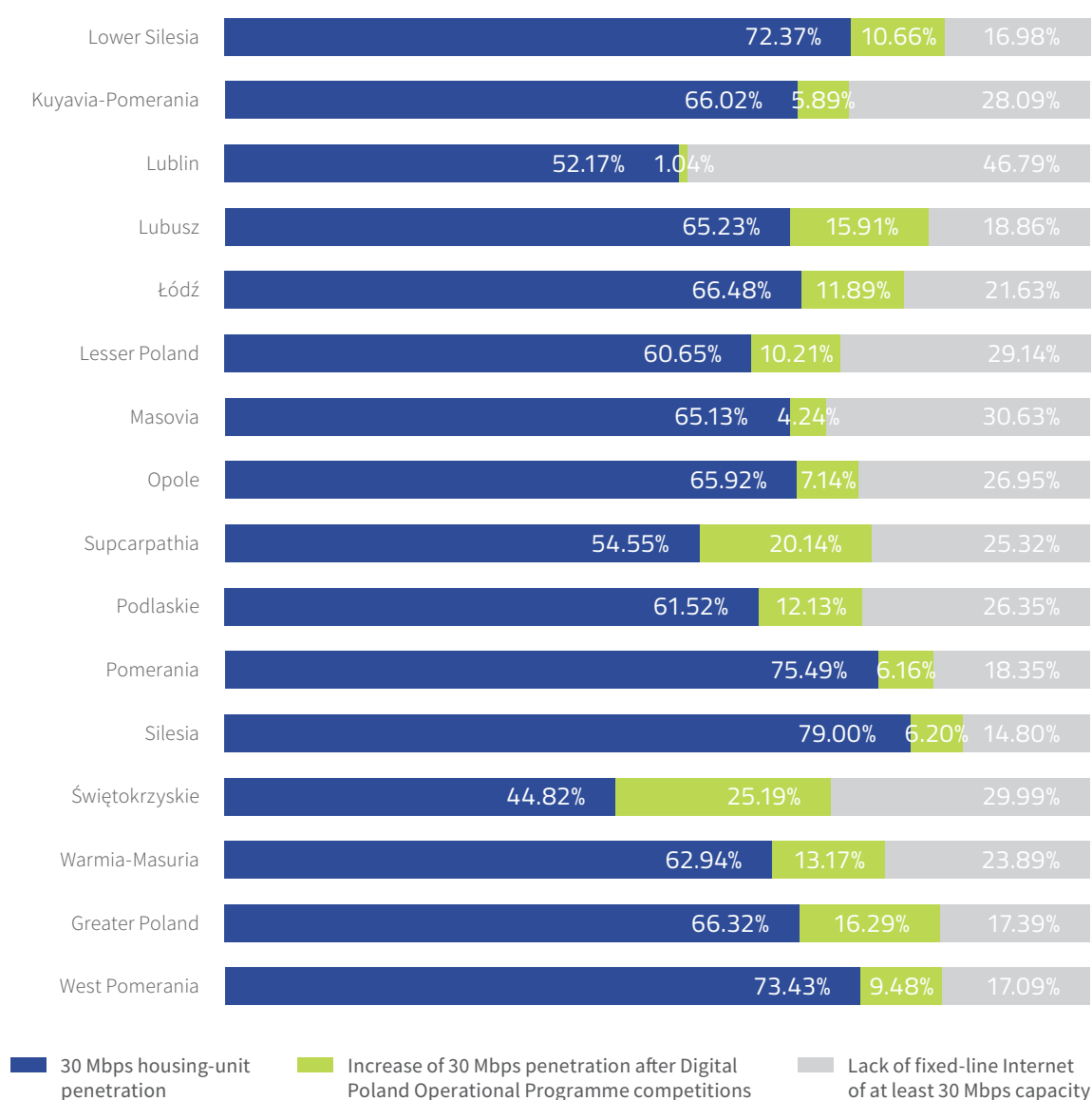


Source: UKE

Completion of investment projects resulting from the competitions concluded within Digital Poland Operational Programme (two competitions) ought to result in a significant increase of housing-unit penetration – from 66% to nearly 76%. The best results are to be observed in the provinces of Świętokrzyskie (25%) and Subcarpathia (20%).

Chart 11.

Housing-unit penetration – 30 Mbps coverage

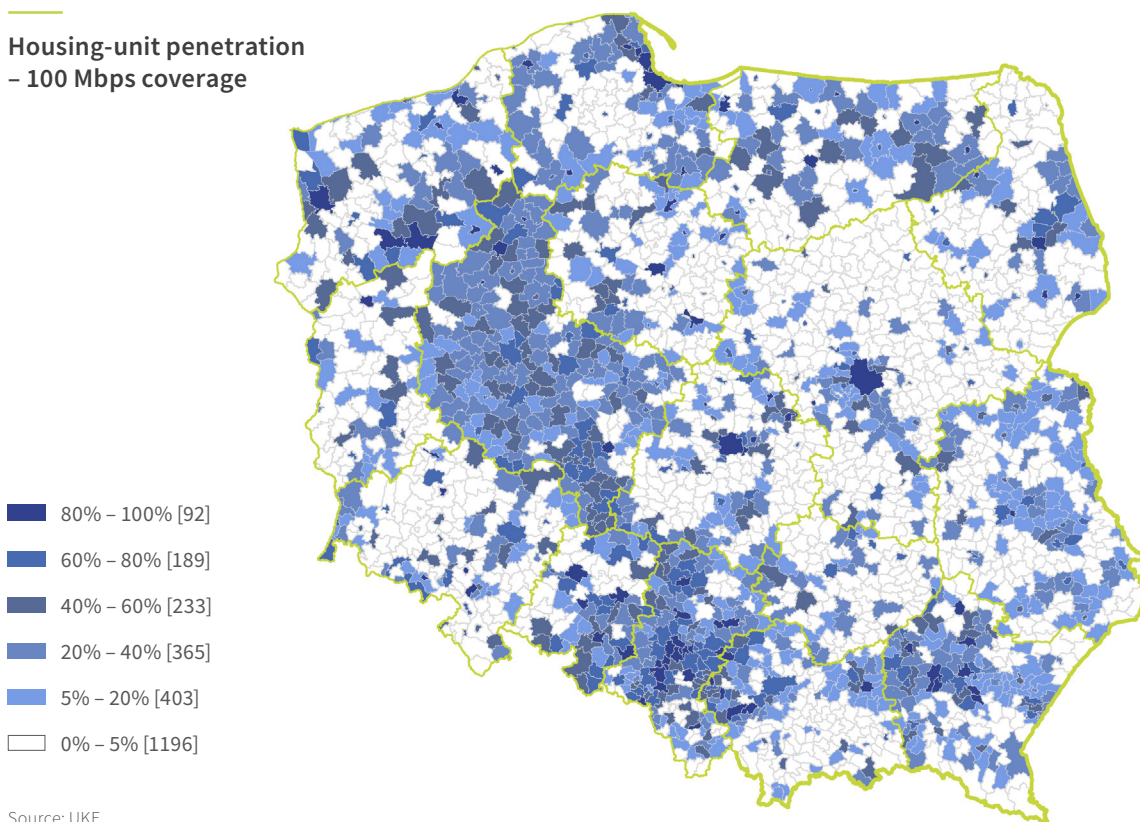


Source: UKE

Above 50% of households (housing units) have access to the highest speed services of at least 100 Mbps. Inhabitants of Pomerania and Silesia have the best access to high capacity services. The worst situation is observed in the provinces of Lubusz, Świętokrzyskie and Subcarpathia.

Map 9.

Housing-unit penetration – 100 Mbps coverage



Source: UKE

In conclusion, Poland is approaching the goal of DAE – provision of universal Internet access of at least 30 Mbps speed by the end of 2020. At the end of 2016, almost 66% of households had Internet access, and due to implementation of approved projects under Digital Poland Operational Programme, another 10% of households will have broadband access.

As far as the second goal – provision of at least 100 Mbps speed access service to 50% of households by the end of 2020 – is concerned, in 2016 above 50% of households had the possibility to access services of at least 100 Mbps speed, which means that if all these households used the service, the DAE goal in question would have been reached in Poland.

3.3. Mobile network coverage

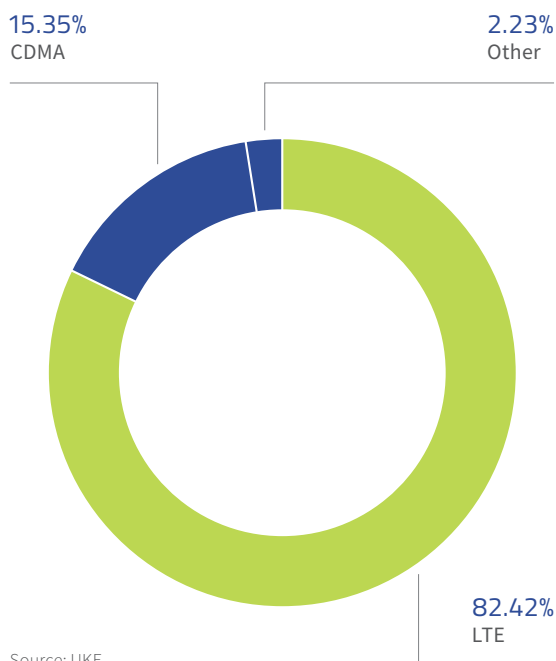
It is worth pointing out that in cooperation with operators, the mobile Internet coverage reporting rules have changed. This year, operators reported their coverage by analysing spatial location of address points. Among mobile technologies, LTE is the most popular, as it constitutes a 82% share in mobile network coverage.

Chart 12 illustrates the share of this technology in reported coverage.

The reported data indicates that 3259 localities in Poland are not covered by LTE network. 3080 localities do not have Internet access. They are illustrated on the map below. In the previous year, there were 4299 localities without Internet access, thus it is a significant improvement. It has to be underlined that 99% of these localities are clusters of several buildings.

Chart 12.

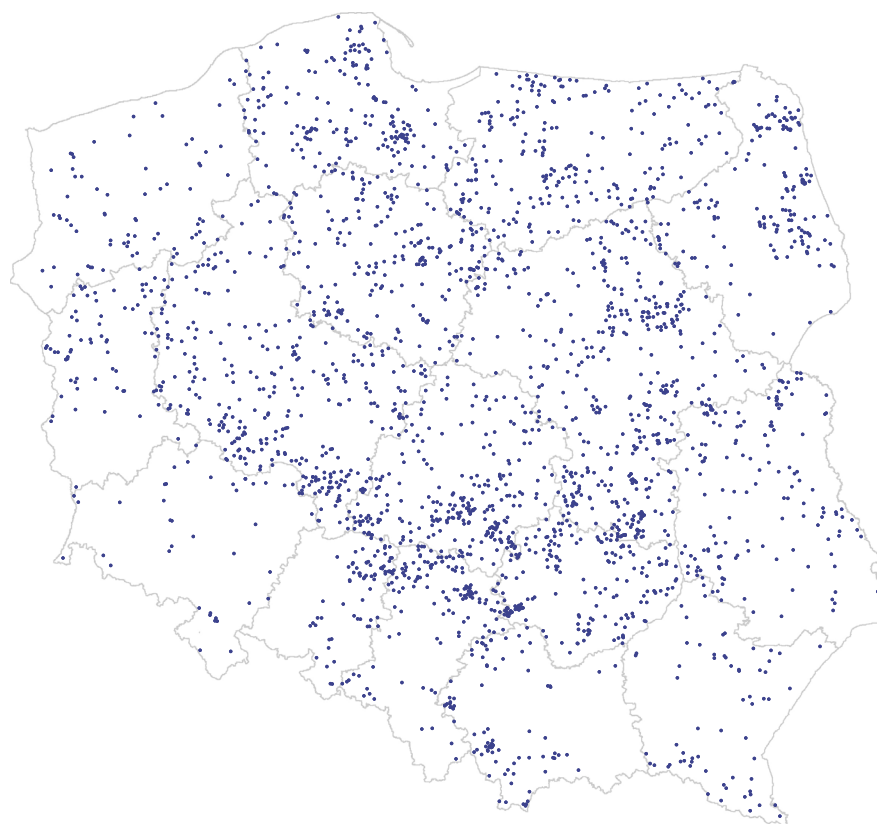
Share of technologies in mobile Internet coverage



Source: UKE

Map 10.

Localities without Internet access



Source: UKE



4.

**Wired
network routes**

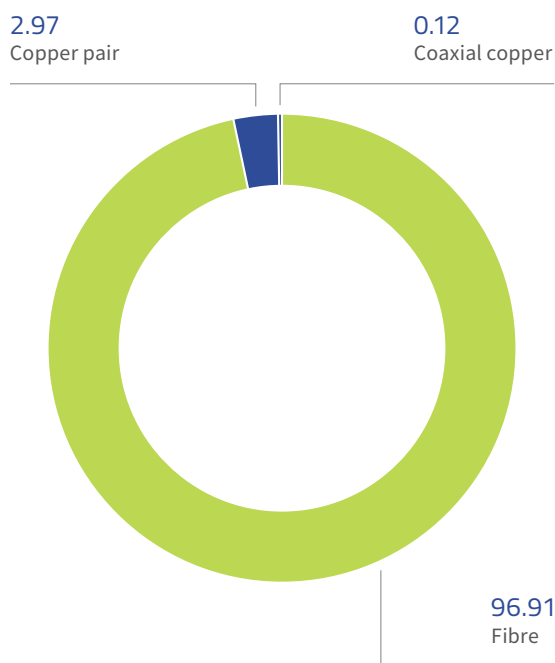
The length of wired telecommunications lines, estimated on the basis of information provided by obliged entities, was 492,000 km at the end of 2016. The increase in total infrastructure length is about 52,000 kilometres.

Chart 13 illustrates the increase of fibre network's share in wired infrastructure – from 95% to almost 97%. It demonstrates gradual replacement of conventional networks with fibre medium and significant prevalence of fibre in new telecommunications investments. It is worth mentioning that the inventory of telecommunications infrastructure does not include information about the length of intra-building sections and between access nodes and network termination points.

Chart 14 presents the change of length of the owned fibre network in particular years. The length of network compared with the previous year indicates a 16% growth in fibre infrastructure and reflects the tendency observed from 2013 to 2016.

Chart 13.

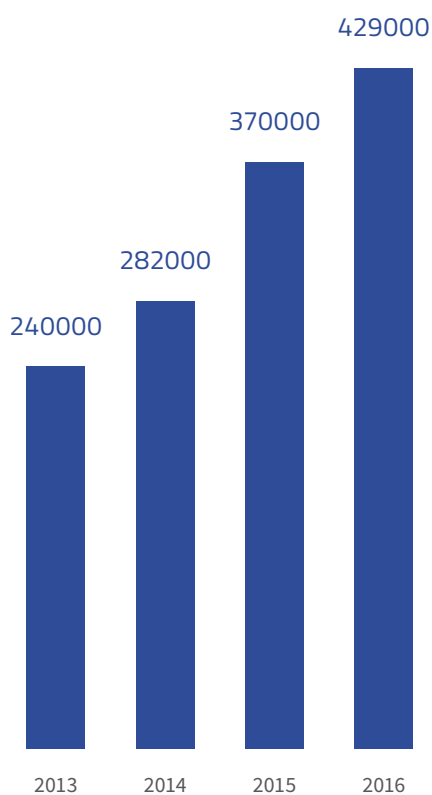
Share of medium in wired infrastructure



Source: UKE

Chart 14.

Length of owned fibre network in particular years



Source: UKE

Map 11 illustrates the routes of fibre networks in Poland (sections connecting network nodes). A significant density of fibre lines is observed in highly urbanised areas (Silesian conurbation, Tricity, Warsaw, Poznan, Wroclaw, etc.) and in connections between main urban centres along transregional communication routes.

Map 12 presents differences in telecommunications line infrastructure density index throughout the country. It ought to be noticed that the inventory of telecommunications infrastructure includes information about routes between nodes, and not the actual network routes, which can affect the precision of estimated density index for given areas, in particular those that are located on routes between large cities.

Map 11.

Fibre networks in Poland

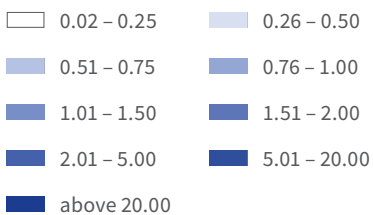
— Fibre lines

Source: UKE

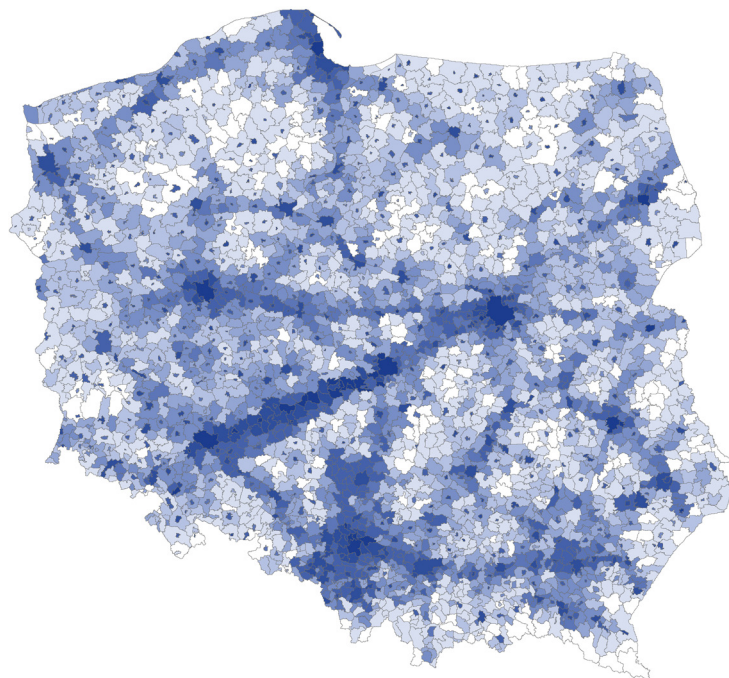


Map 12.

Line infrastructure density index (km/sq km) in municipalities



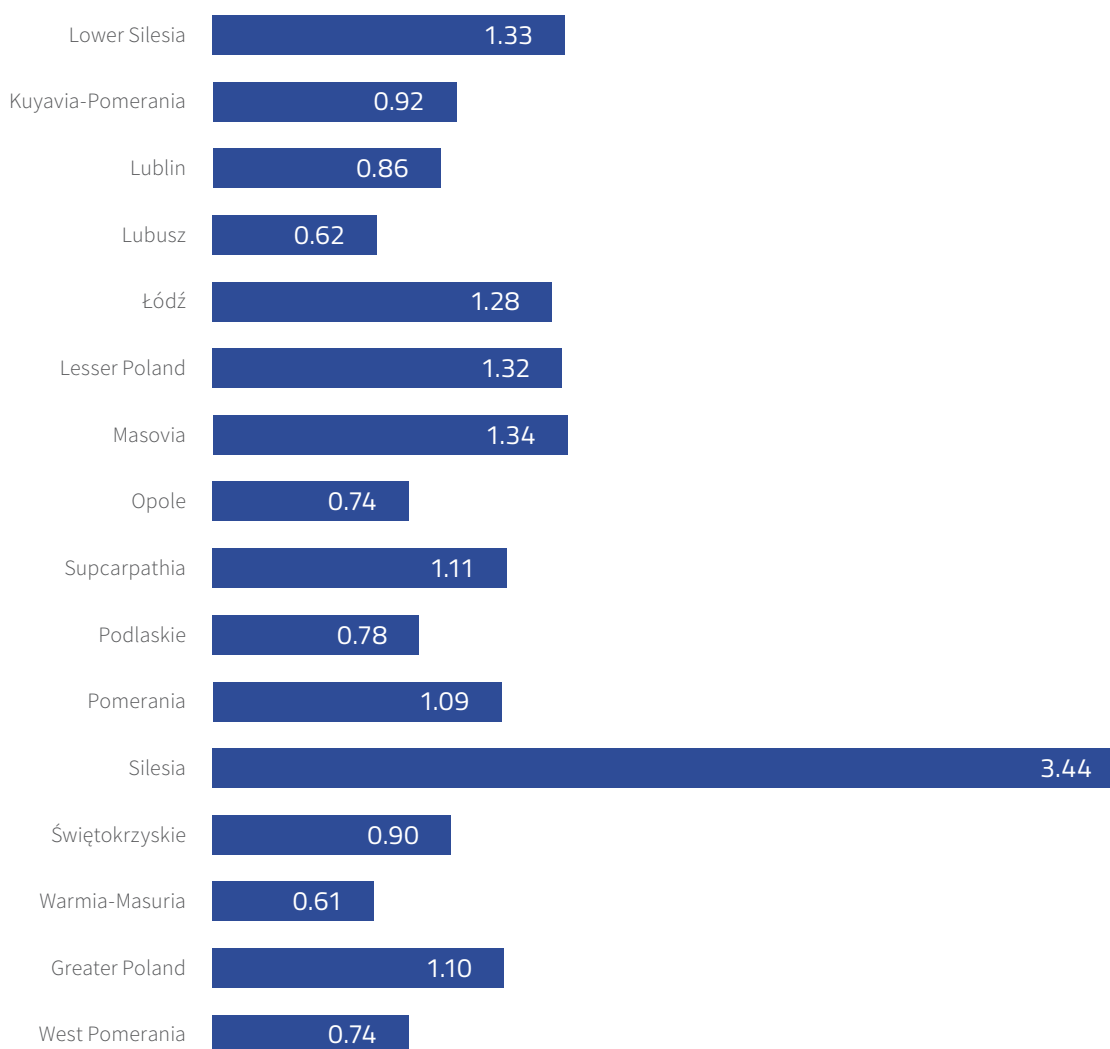
Source: UKE



Average density of line infrastructure in Poland is 1.57 km per sq km, in comparison to base value 1.41 km per sq km last year. In line with chart 15, Silesia, Łódź and Lower Silesia have the highest line infrastructure density index (over 2 km per sq km). Simultaneously, the aforementioned provinces hold one third of the countries' line infrastructure length in total.

Chart 15.

Density of line infrastructure in provinces



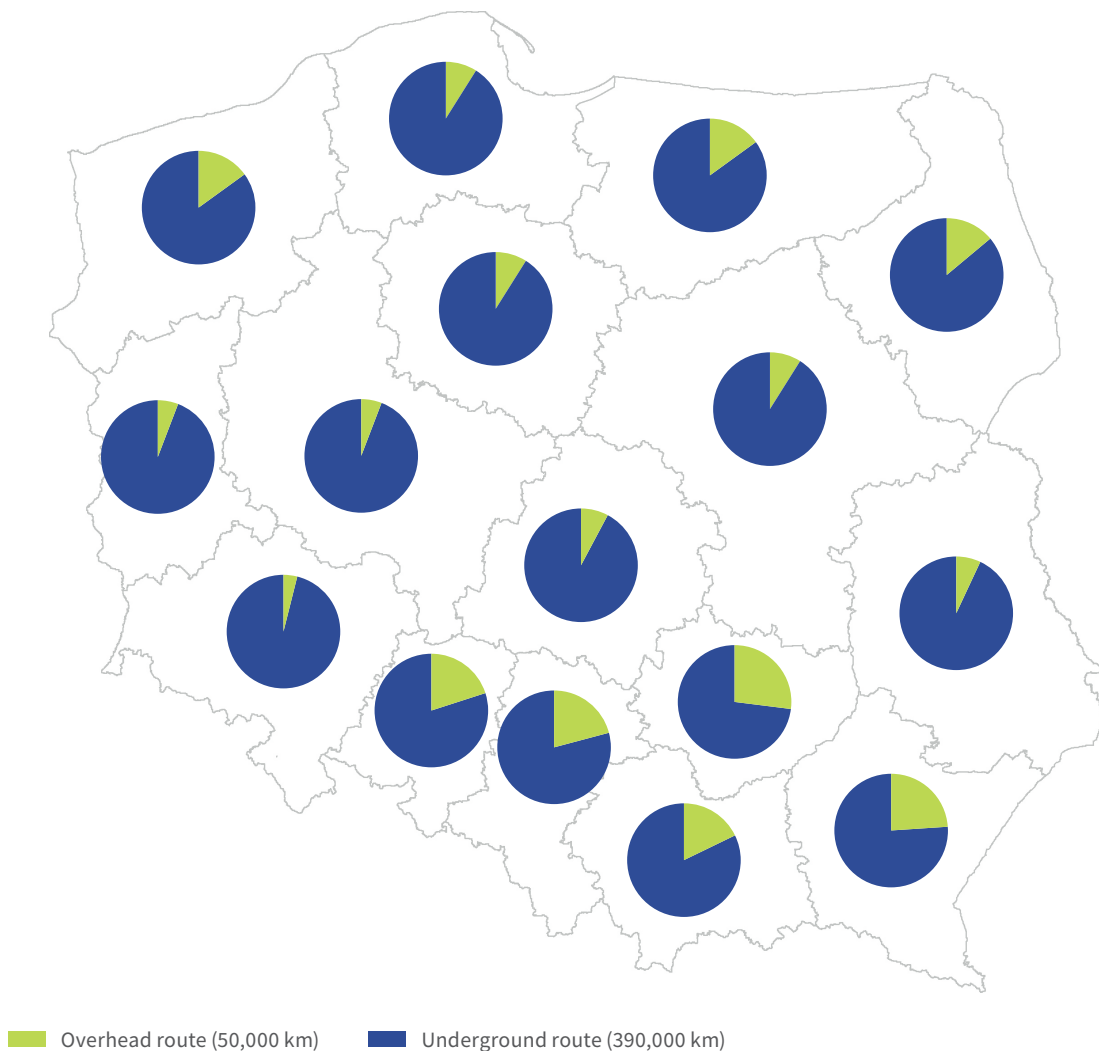
Source: UKE

On the thematic map 13, the pie charts for individual provinces present the ratio of the length of own underground fibre network to the overhead one. The share of overhead network varies from 4 to 27 percent, depending on the province. The map above shows a spatial link

– southern provinces are characterised by higher percentage of overhead network, due to natural conditions (e.g. topography). A similar link is observed in eastern Poland, probably due to minor urbanisation of these areas and, as a result, lower profitability of duct investments.

Map 13.

Length of owned fibre network by route

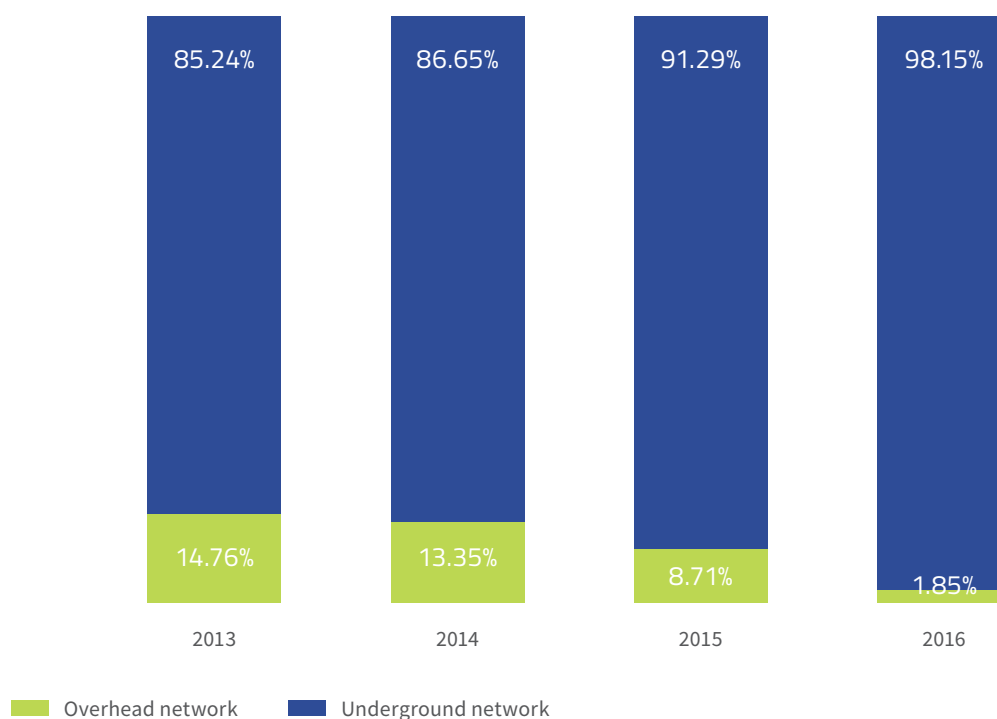


Source: UKE

As in the previous years, there is a continuing relationship between the ratio of overhead to underground routes and the level of urbanisation. Still, overhead routes are more prevalent in rural areas (about 14.17%) than in the urbanised ones (7.3%). However, compared to the last year's data, the share of underground network has increased in all categories in relation to overhead network. Furthermore, rural areas are no longer much different from small towns in this respect. The impact of the new type of investment where underground routes are part of public right-of-way is also evident.

Chart 16.

Relation of overhead network to in-duct network by type of locality



Source: UKE

The most important trend in the coming years will still be convergence and blurring borders between different market segments. The introduction of 5G mobile networks expected in the next few years will also have an impact on the market. At present, intensive works on 5G standardization are carried out. 5G network means high bitrate, low latency and universal coverage. The European Commission plans have one city in each EU Member State within 5G network coverage by 2020. By 2025, all city areas and main transportation routes will be covered by the 5G network.

Competition and pressure of Internet giants and OTT providers is a crucial issue, especially in a long-term perspective.

Operators will search for new revenue sources and diversify portfolio of offered services. They will be interested in providing ICT services (from the border of IT and telecommunications), developing own commercial data centres, television and financial services (insurances, credit cards, micro-payments) and selling electricity and gas.

There are many indications that further inventories will show even more impressive results, as in the next years the projects implemented within Digital Poland Operational Programme action 1.1. Universal access to high speed Internet, will be concluded. Analysis of data from statements included in applications for co-financing suggests that after the conclusion of these projects, broadband access will be gained by over 1.3 million households.

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