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Spain's FTTH wholesale market

CLOSING THE DIGITAL GAP

The aim of this report is to provide a clear understanding of Spanish vibrant FTTH industry differentiating between urban and rural areas and assess the existence of a digital gap in Spain

This report offers analysis, statistics and out thoughts about the fibre panorama in Spain. Access to broadband infrastructure is key to go beyond as a leader country and society.

The FTTH wholesale model is described, quantified and the players categorized in roles, providing a unique functional overview of the fixed broadband Industry.

The report covers the performance ISPs at urban and rural areas. The goal is to seek differences in performance and provide conclusions for the digital gap in Spain.

Onivia's position in the fibre optic market fosters competition by providing access to a greater number of local and regional operators.
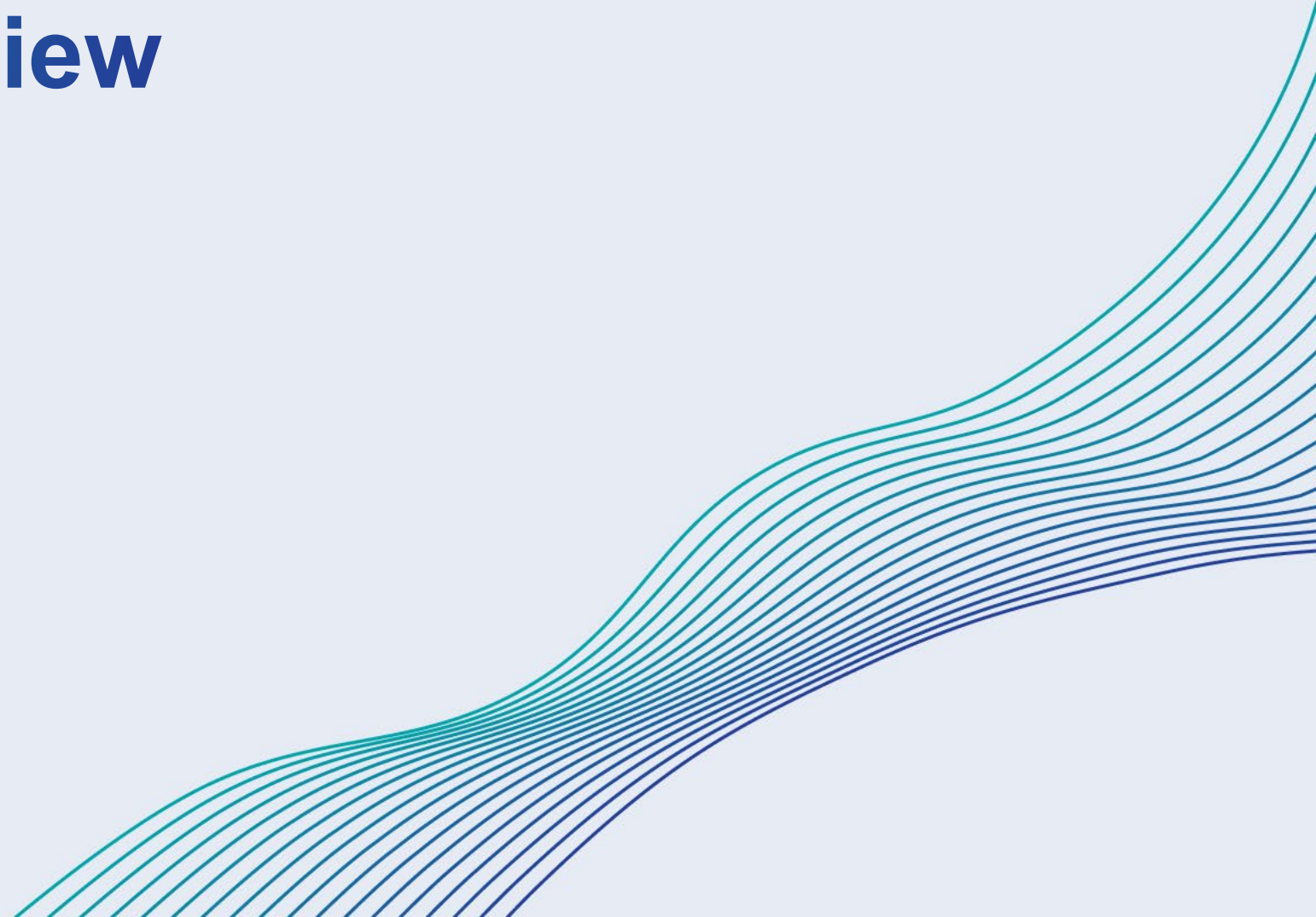
Table of contents

How Wholesalers and local operators are making decisive contributions to closing the digital gap
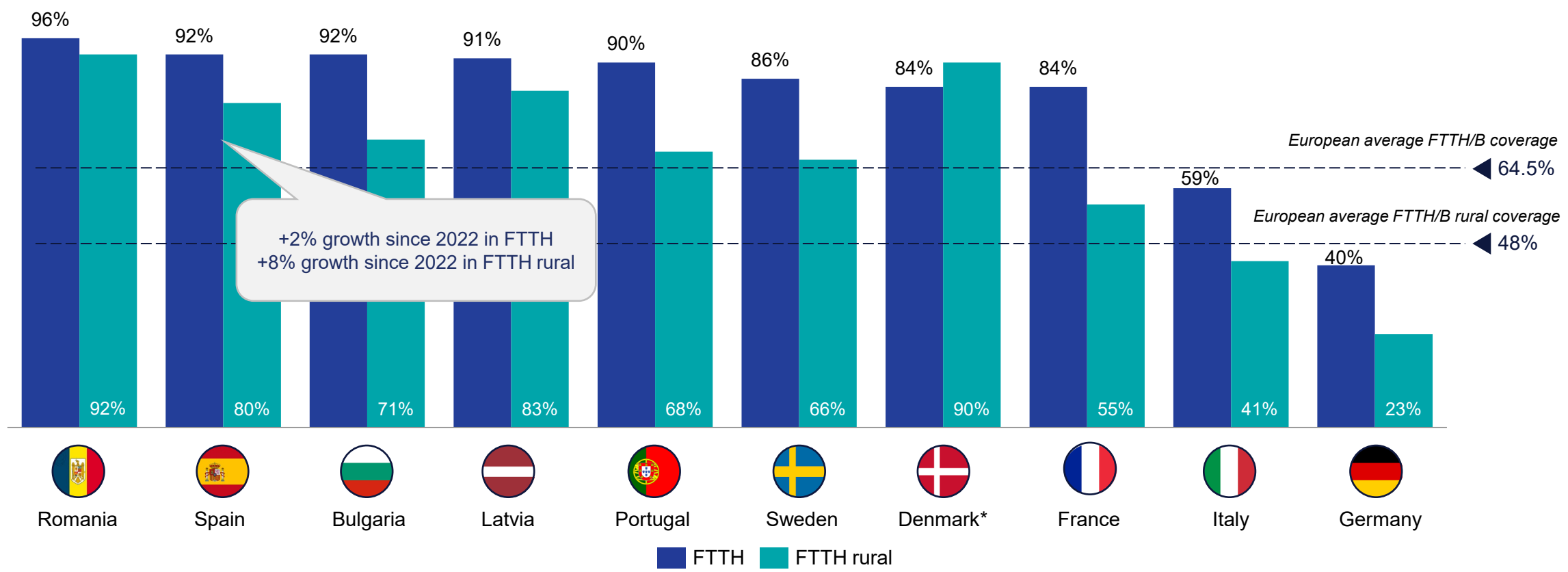
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European overview

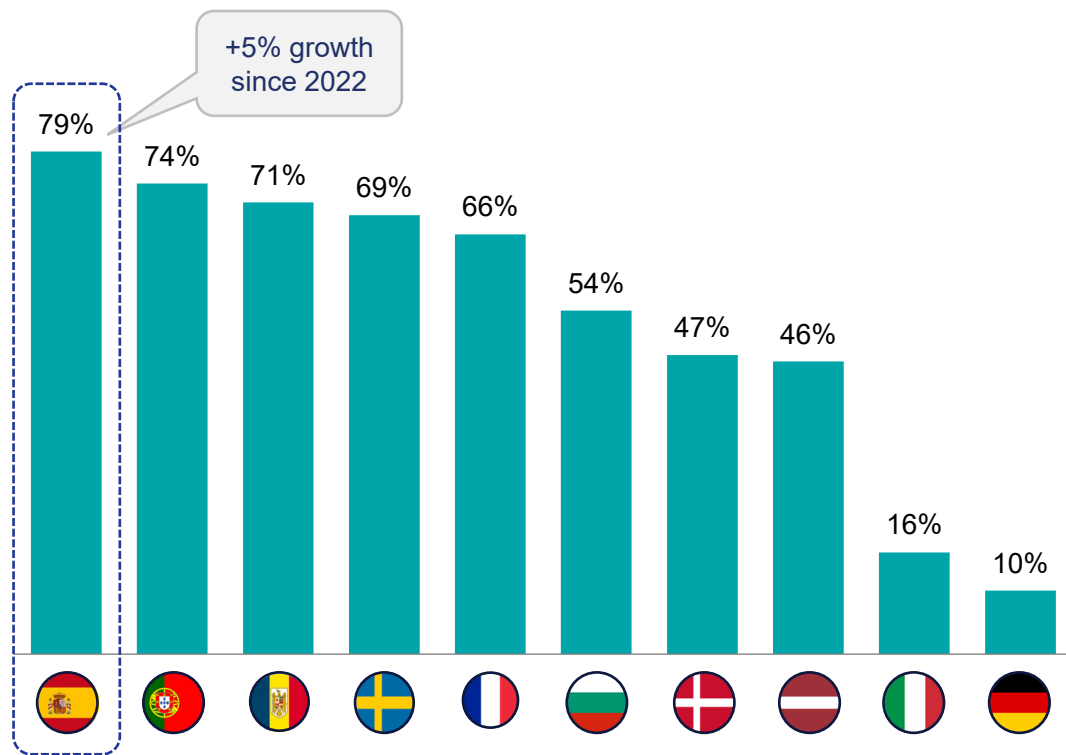**Spain as a European and Global leader in FTTH deployment and adoption**

Spain is one of the European leaders in FTTH coverage, in particular it outperforms fibre European averages in both rural and urban areas

European benchmark of FTTH coverage, 2023

+2% growth since 2022 in FTTH
+8% growth since 2022 in FTTH rural

European average FTTH/B coverage ◀ 64.5%

European average FTTH/B rural coverage ◀ 48%

	Romania	Spain	Bulgaria	Latvia	Portugal	Sweden	Denmark*	France	Italy	Germany
FTTH	96%	92%	92%	91%	90%	86%	84%	84%	59%	40%
FTTH rural	92%	80%	71%	83%	68%	66%	90%	55%	41%	23%

■ FTTH   ■ FTTH rural
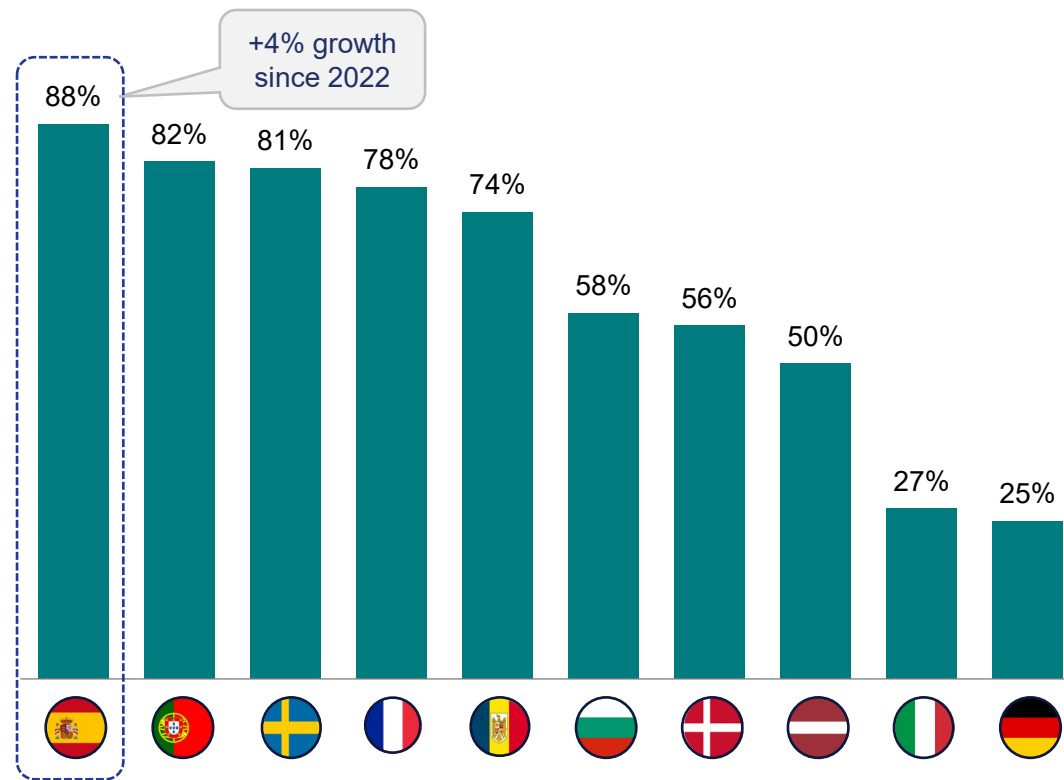
Spain has almost done its FTTH migration process: xDSL central offices are in regulatory closing and HFC migration has already started. It's a radically different situation with bigger European countries

FBB technology evolution in EU,
% subscriptions

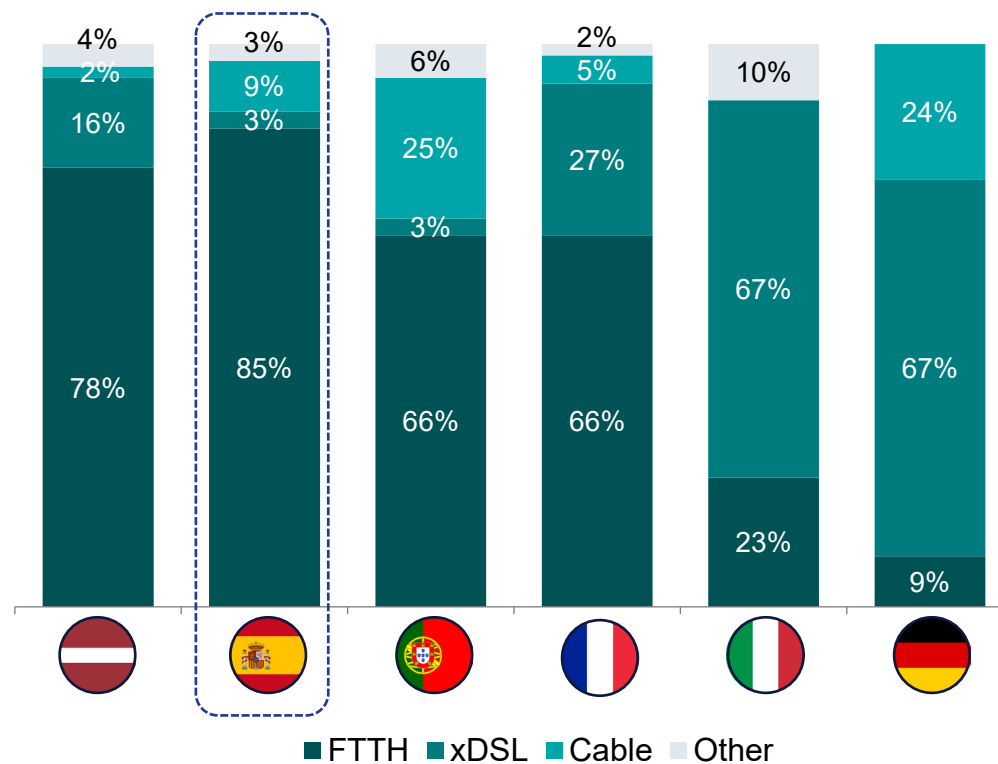|	jun. 19	dec. 19	jun. 20	dec. 20	jun. 21	dec. 21	jun. 22
Other	6%	6%	5%	5%	4%	4%	4%
Cable	20%	19%	18%	17%	16%	15%	14%
xDSL	56%	53%	51%	48%	46%	44%	40%
FTTH	18%	22%	26%	30%	34%	37%	42%

■ FTTH ■ xDSL ■ Cable ■ Other
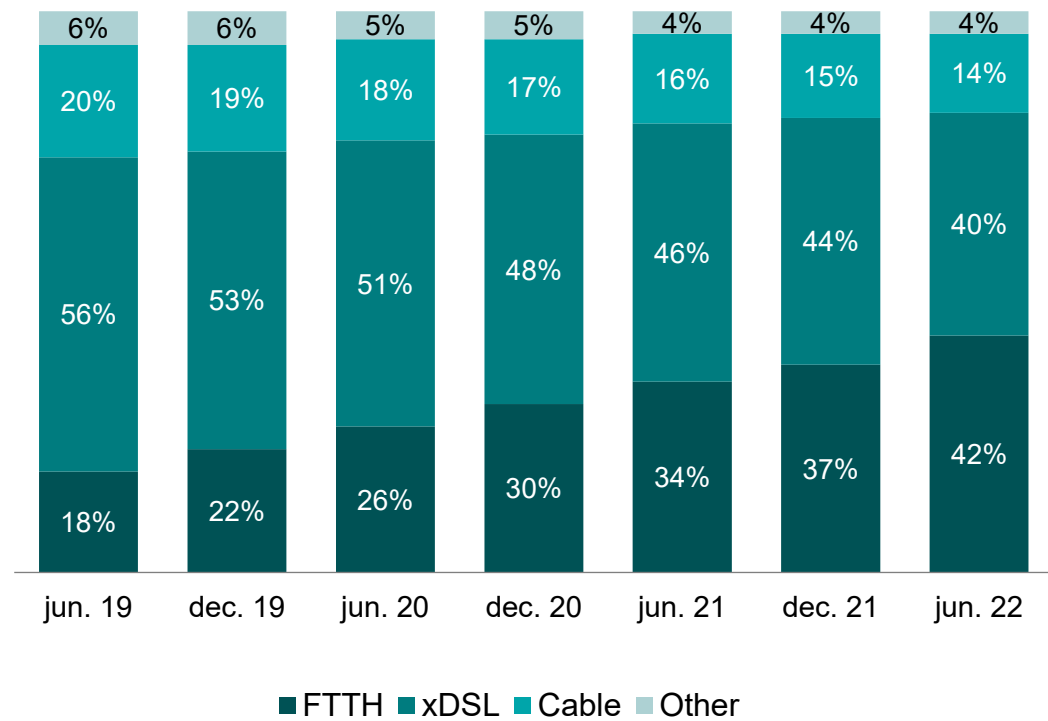
FBB technology allocation by country in the EU,
% subscriptions 2023

|	Latvia	Spain	Portugal	France	Italy	Germany
Other	4%	3%		2%	10%	
Cable	2%	9%	6%	5%		24%
xDSL	16%	3%	25%	27%	67%	67%
			3%			
FTTH	78%	85%	66%	66%	23%	9%

■ FTTH ■ xDSL ■ Cable ■ Other

Spain: a global success case in Wholesale fibre

How the Spanish fibre Wholesale market has evolved in a very sophisticated ecosystem.

The Spanish fibre Wholesale market has evolved in a very sophisticated ecosystem with a very rich and deep mesh of players and agreements

A market with multiple Roles
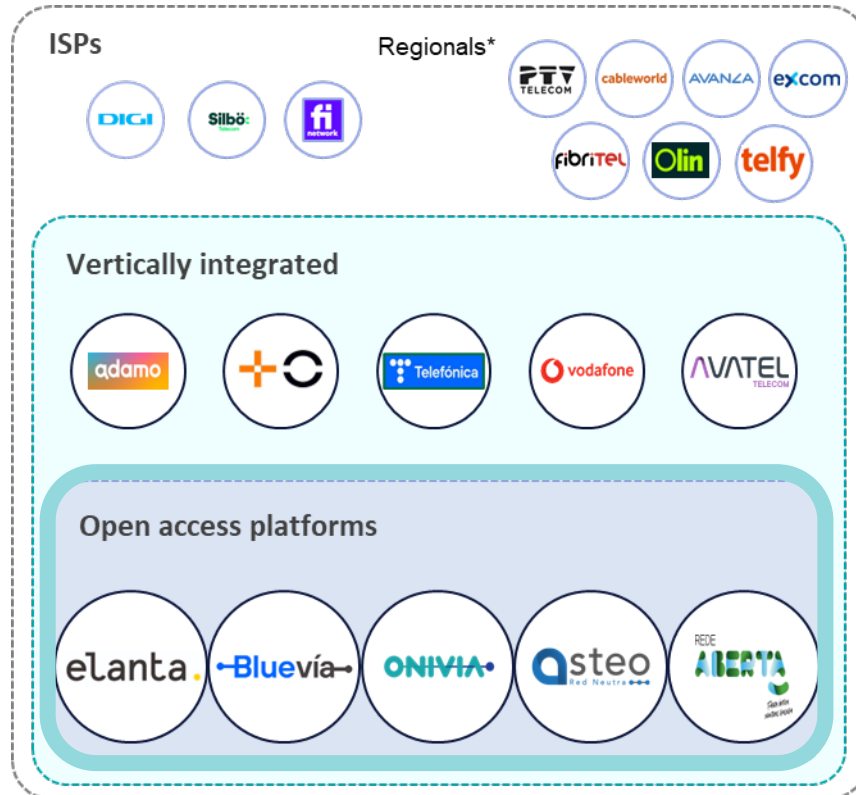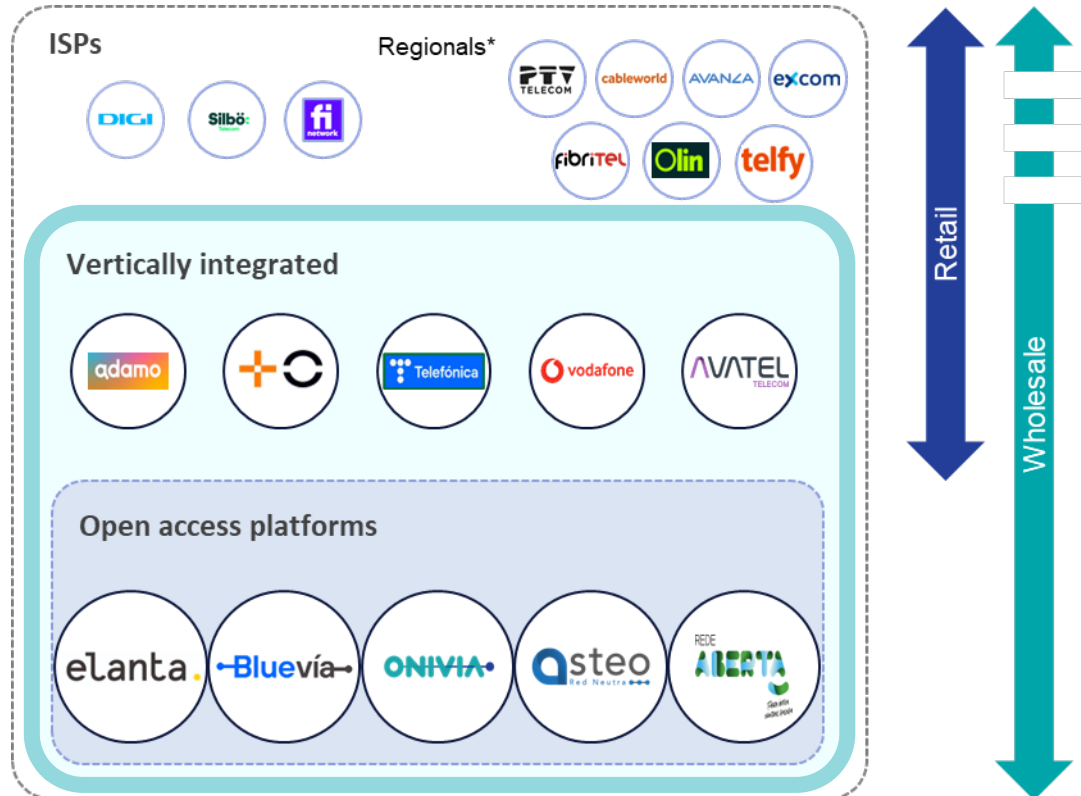
Open access platforms

Companies building their own digital infrastructure to be commercialized in pure wholesale model

This category includes:
- Companies owned by traditional operators
- Independent players with broad coverage areas
- Regional focused players

The Spanish fibre Wholesale market has evolved in a very sophisticated ecosystem with a very rich and deep mesh of players and agreements

A market with multiple Roles

Vertically integrated

These players are active in both retail market and wholesale markets
They usually have agreements both with "Open access platforms" and other "Vertically integrated" to complete their own network

In this category we find:
- big vertical incumbents
- local aggregators
- Rural specialists

As market evolves also local and regional players are progressively offering wholesale

The Spanish fibre Wholesale market has evolved in a very sophisticated ecosystem with a very rich and deep mesh of players and agreements

A market with multiple Roles
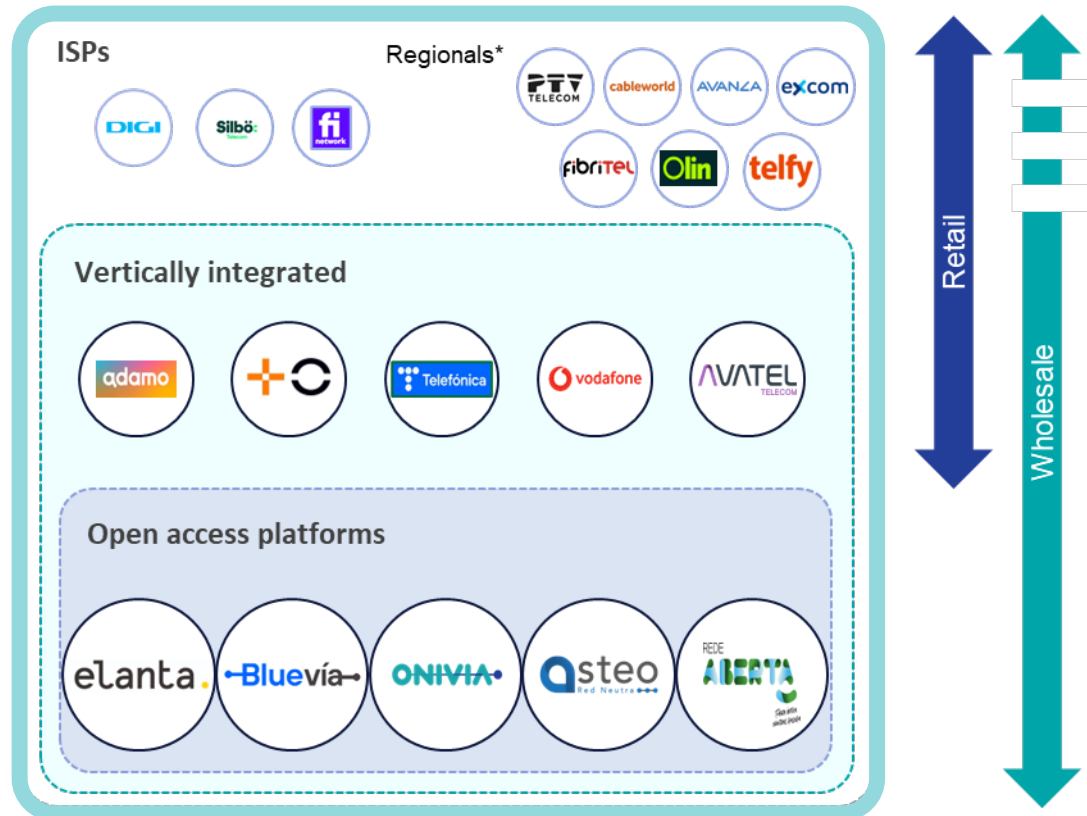
ISPs

In this role, the player is only active in the retail market and do not sale wholesale access to their infrastructure

Again, we find very different type of companies in this category ranging from

- Vertical operators (owning FTTH infrastructure and Spectrum)
- MVNO
- Service resellers

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The Spanish fibre Wholesale market has evolved in a very sophisticated ecosystem with a very rich and deep mesh of players and agreements

A market with multiple Roles

ISPs

In this role, the player is only active in the retail market and do not sale wholesale access to their infrastructure

Vertically integrated

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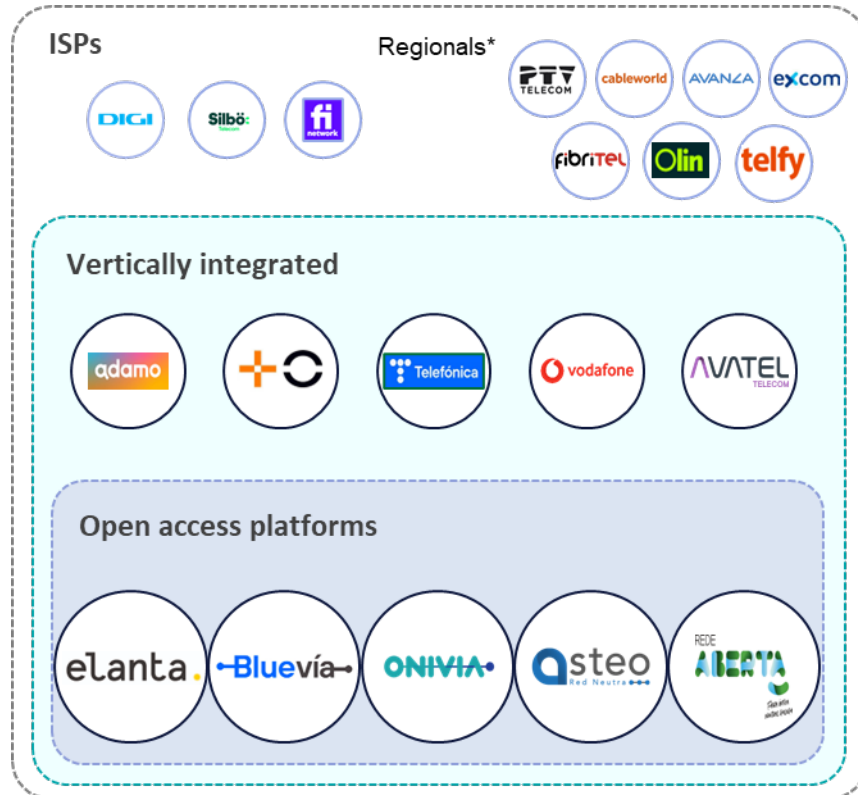**Open access platforms**
Companies building their own digital infrastructure to be commercialized in pure wholesale model

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The complexity and depth of agreements among different players is a key success factor of the Spanish FTTH market

A map of Network agreements

NEBA agreement: Agreement regulated by the CNMC that allows different providers to access the incumbent's broadband network.

Private agreement: Private contract between two Wholesalers that is established on a confidential basis and is not subject to public regulations, allowing the use of FTTH infraestructure.

Fibre sharing agreement: Agreement between two or more Wholesalers that allows them to share or develop FTTH infrastructure.

Infra provider: Agreement under which an open access platform offers its FTTH networks, transmission systems, data centers, or any essential infrastructure that allows other players to offer services to its customers.

Open Access platforms

Vertical integrated

ISP's
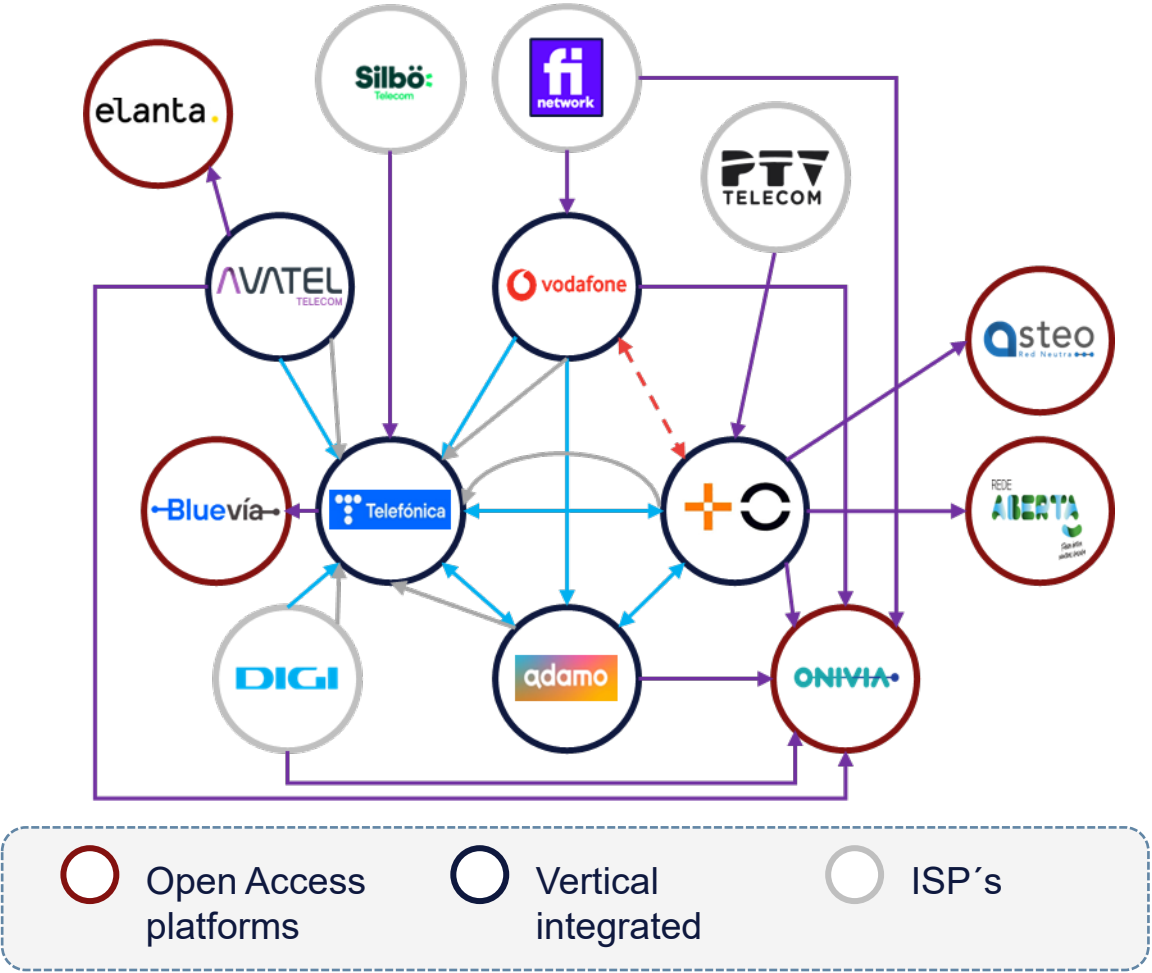
Arrow points in the recurrent payment direction

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Thanks to the wholesale model Spain has turned FTTH into the country's main NGA technology instead of xDSL; HFC technology has experienced a significant drop in the number of lines, and this trend is expected to continue

FBB technology evolution in Spain,
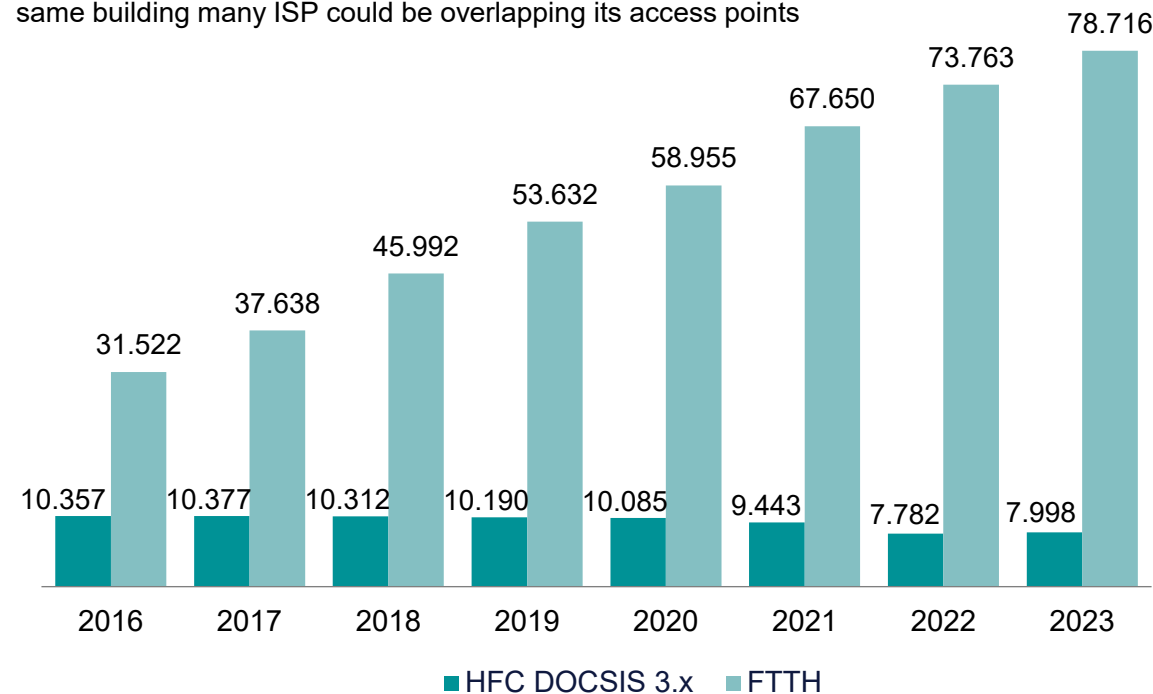**millions lines**

Legend: FTTH, xDSL, HFC, Other

Year	Total	FTTH	xDSL	HFC	Other
2016	13.9	4,9	6,3	2,6	
2017	14.5	6,6	5,1	2,6	
2018	15.0	8,6	3,7	2,4	
2019	15.3	10,2	2,6	2,3	
2020	16.0	11,6	1,8	2,3	
2021	16.4	12,9	1,3	1,9	
2022	16.9	14,1	0,8	1,7	
2023	17.3	14,8	0,4	1,5	
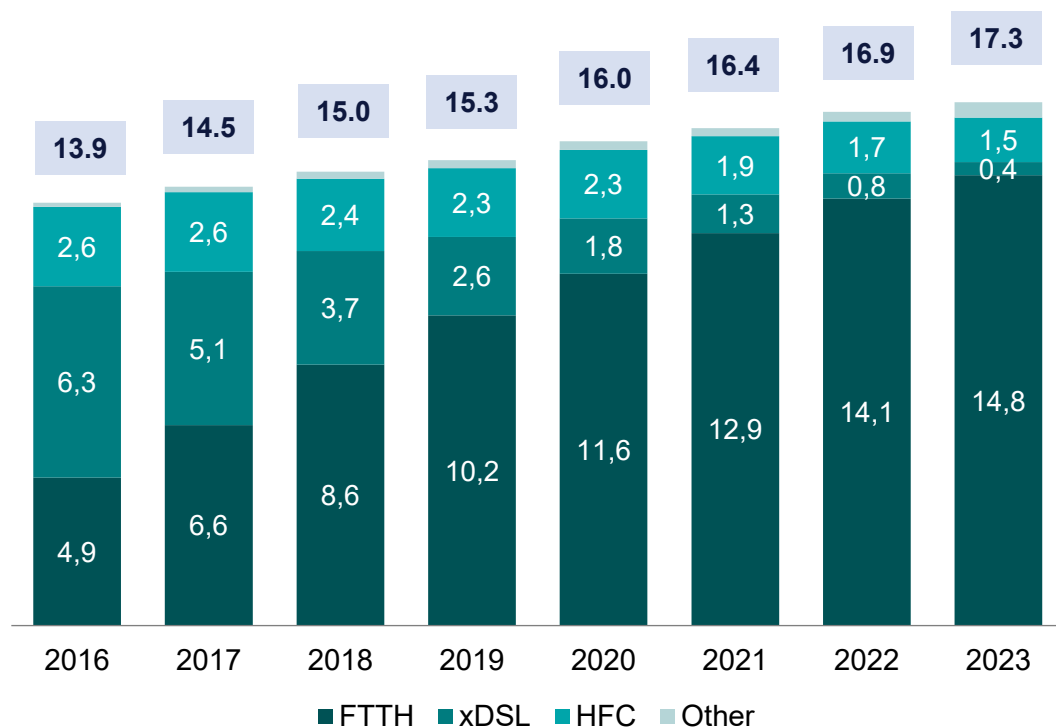
Evolution of installed NGA accesses,
thousands of accesses

NGA accesses: Includes all FBB points registered in a building unit, that means that in the same building many ISP could be overlapping its access points

Legend: HFC DOCSIS 3.x, FTTH

Year	HFC DOCSIS 3.x	FTTH
2016	10.357	31.522
2017	10.377	37.638
2018	10.312	45.992
2019	10.190	53.632
2020	10.085	58.955
2021	9.443	67.650
2022	7.782	73.763
2023	7.998	78.716

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The raise of alternative players has made the group "others" the second largest category after years of accelerated growth. Under this category lives a combination of Open Access platforms and regional operators

Evolution of installed NGA accesses by operator,
millions of accesses

Legend: HFC | FTTH | x.x Total accesses

Telefónica
- 2020: 25.9 (25,9)
- 2021: 27.5 (27,5)
- 2022: 28.3 (28,3)
- 2023: 29.7 (29,7)

orange
- 2020: 15.3 (15,3)
- 2021: 16.1 (16,1)
- 2022: 16.7 (16,7)
- 2023: 17.0 (16,7 / 0,3)

vodafone
- 2020: 11.3 (7,6 / 3,7)
- 2021: 11.3 (7,6 / 3,8)
- 2022: 11.2 (7,4 / 3,8)
- 2023: 11.2 (7,4 / 3,8)

MÁSMÓVIL
- 2020: 9.0 (9,0)
- 2021: 11.4 (2,1 / 9,3)
- 2022: 11.0 (1,7 / 9,3)
- 2023: 10.1 (1,7 / 8,4)

Others
- 2020: 3.7 (0,2 / 3,5)
- 2021: 9.9 (0,1 / 9,8)
- 2022: 13.0 (0,04 / 13,0)
- 2023: 19.3 (0,04 / 19,3)

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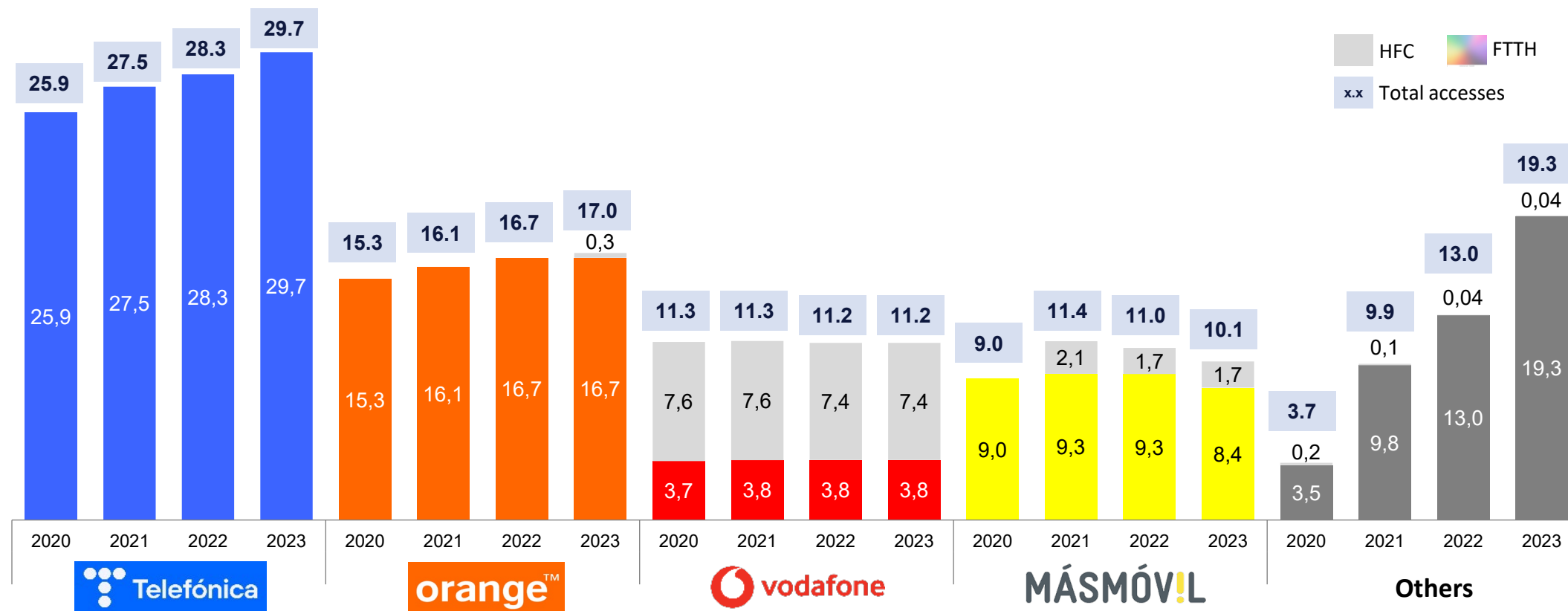
As the FTTH networks grow the investment is moving also from traditional vertical players to infrastructure companies and local operators. In 2023, with €2bn, the 'others' category was the largest capex investor in the telco industry

CAPEX by ISP, millions €
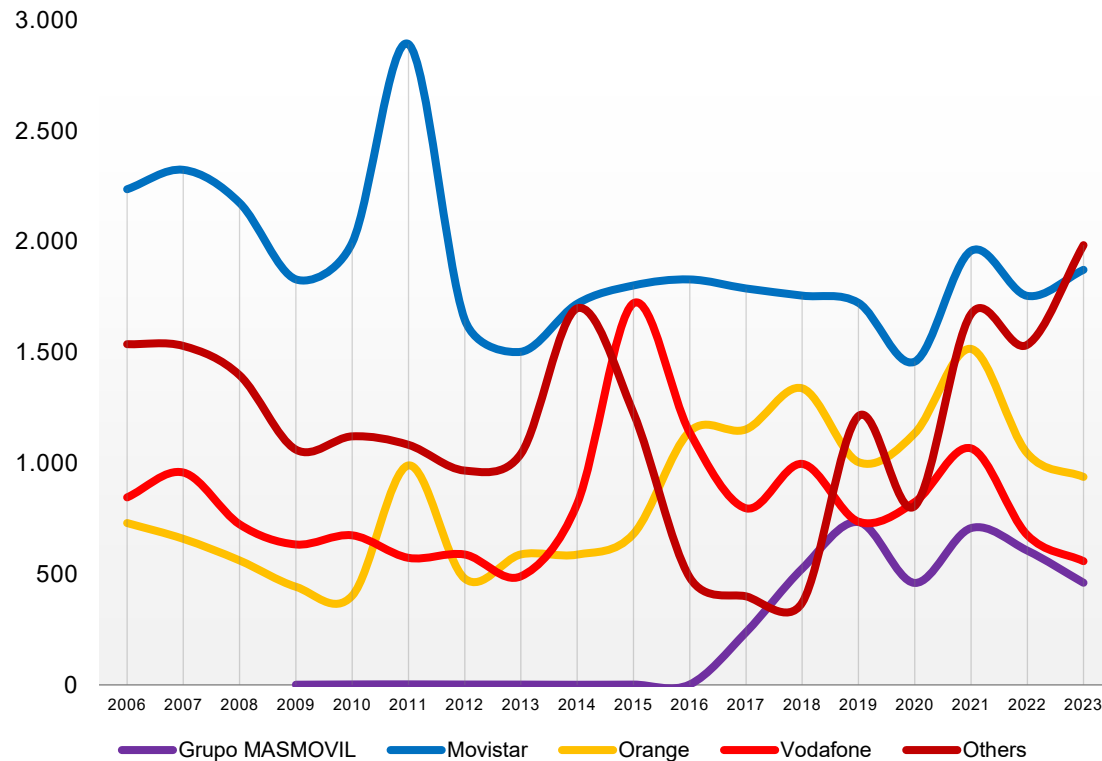
Who is investing in digital Infrastructure?

Quantifying the ecosystem: our methodology

Understanding network and service quality data from end-user perspective.

We have used MedUX QoE data to assess the digital gap in Spain between urban and rural areas

Medux speed test methodology,

SDK & Crowdsourcing

Quality of Experience (QoE) tests executed by MedUX Agents provide valuable insights into the level of network and service performance by location.

MedUX's massive crowdsourced field data sets provide both active and passive measurements collected from Wi-Fi and cellular networks. However, for this report, we have only used samples collected over the Wi-Fi interface. Additionally, we focused on speed tests and latency information, though the data sets also contain performance metrics for streaming, gaming, web browsing, and social media services.
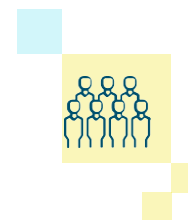
Please refer to https://medux.com/products/crowdsourcing for further information on crowdsourcing data collection and processing.

Homes connected estimation methodology,

7M data points

Data was captured in July, August and September of 2024.

+700 ISPs

ISPs selected by using the total number of tests performed in a month

6,543 mun.

Municipalities divided into urban and rural in accordance with MINECO's criteria.

NOTE: MedUX also offers agent- and probe-based solutions capable of assessing both Ethernet and Wi-Fi connectivity, providing a better understanding of the quality delivered into the customer premises and real in-home performance. However, these solutions were not used for the preparation of this report.

In Spain, 80% population live in less than 20% municipalities, mainly in urban and metropolitan areas and coastal zones. There is a large population dispersion in rural areas

Rurality definition,

Based on:

- CNMC and SETELECO rurality definition: a rural municipality is one with a population density under 100 inhabit/km2

- CNMC Rural quality methodology: 11 geotype groups based on inhabitants' number in a municipality

We have classified municipalities into 4 major groups to simplify.

Population

<100		
100 to 500		
500 to 1,000	SEMI-URBAN	RURAL
1,000 to 2,000		
2,000 to 5,000		
5,000 to 10,000		
10,000 to 20,000		
20,000 to 50,000	URBAN	SEMI-RURAL
50,000 to 100,000		
100,000 to 500,000		
>500,000		

d >=100 hab/Km2   100 hab/Km2 >d

Rural environment heat map,

RURAL
SEMI-RURAL
SEMI-URBAN
URBAN
No data available

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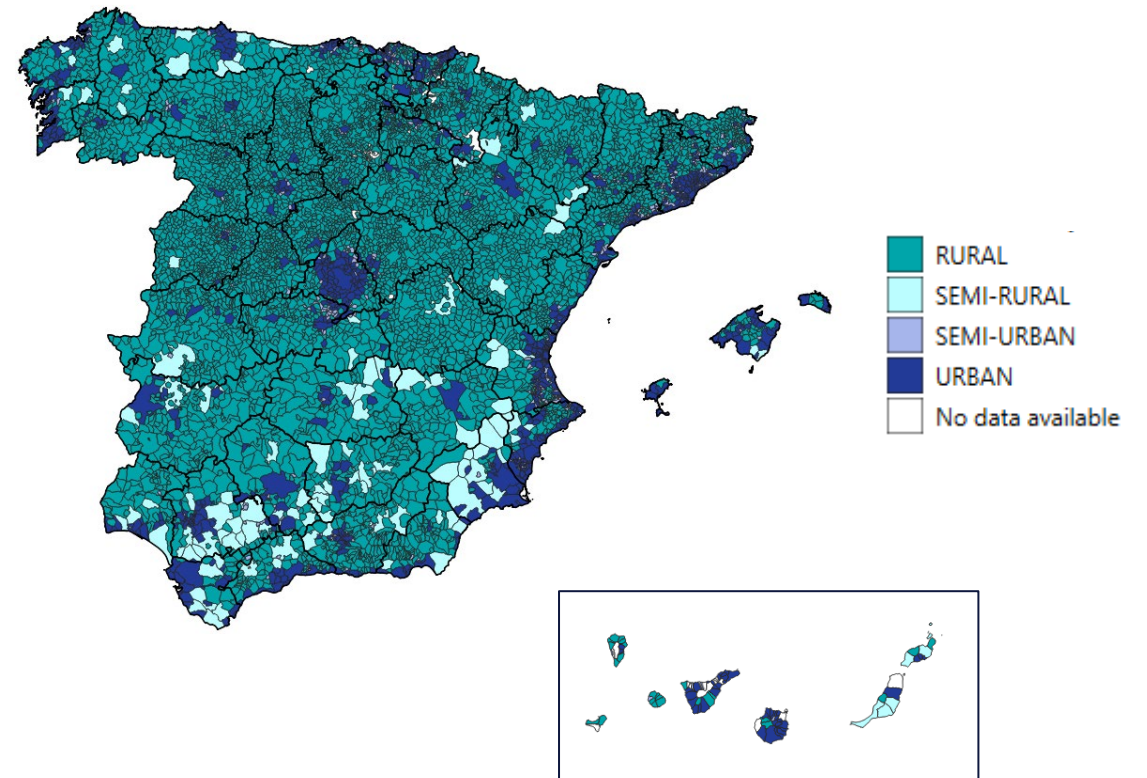
The FTTH geographical gap: rural vs urban

Areas where the effects of the digital divide can be appreciated.
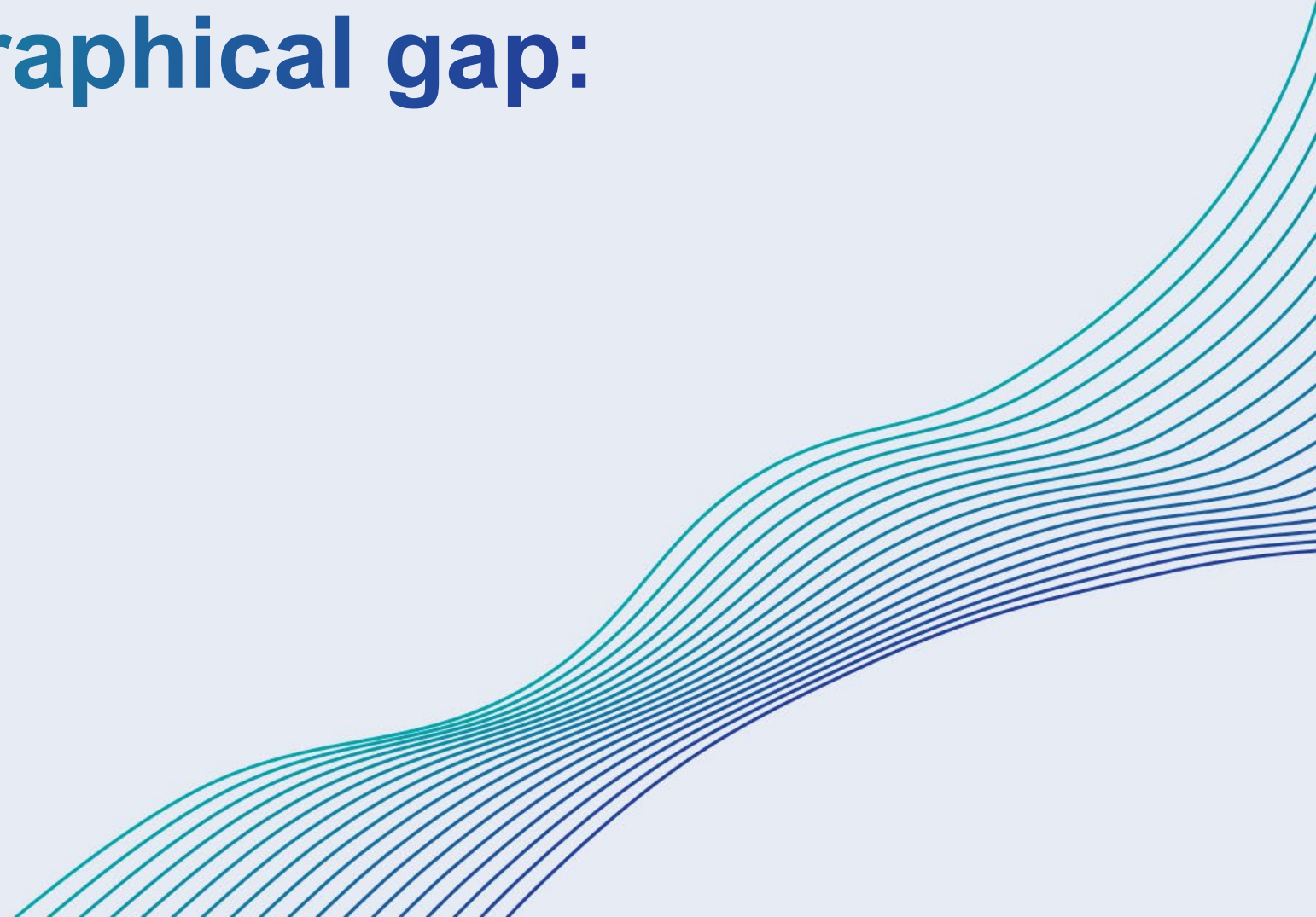
We have identified three areas where the effects of the digital divide between urban and rural areas can be appreciated

Digital gap

COVERAGE

Spain has one of the highest FTTH coverage levels thanks to private deployments and subsidized government plans

PERFORMANCE

For each municipality type information from MedUX has been extracted on:
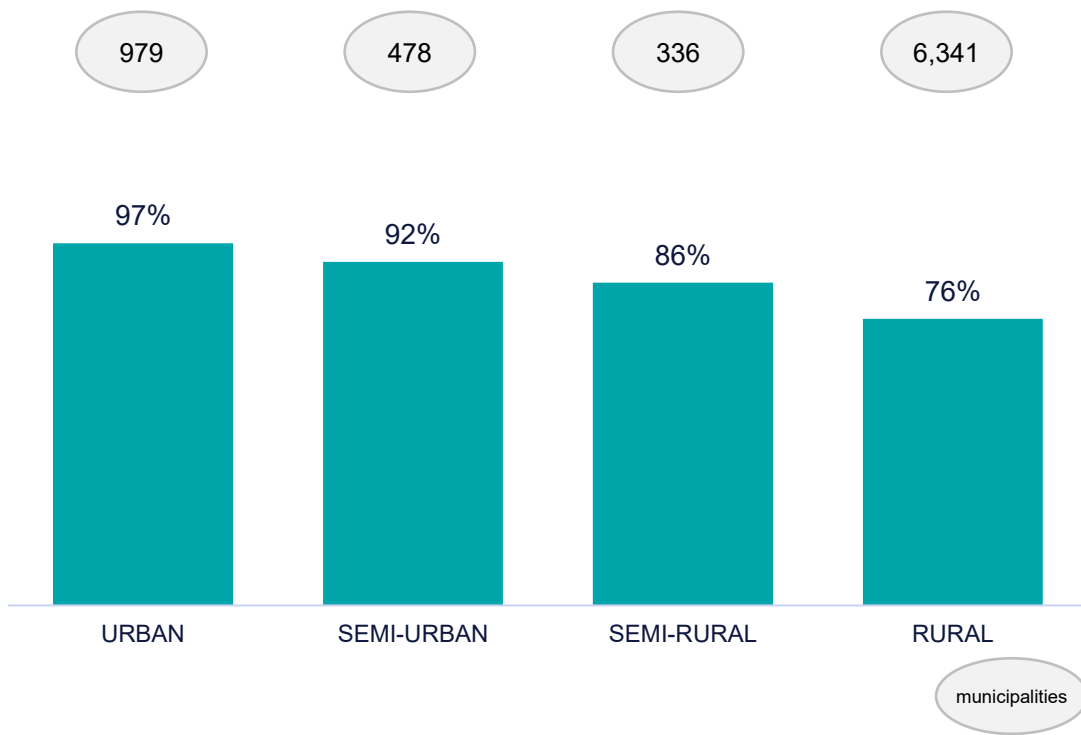
- Download speed
- Latency
- Packets loss

TECHNOLOGY

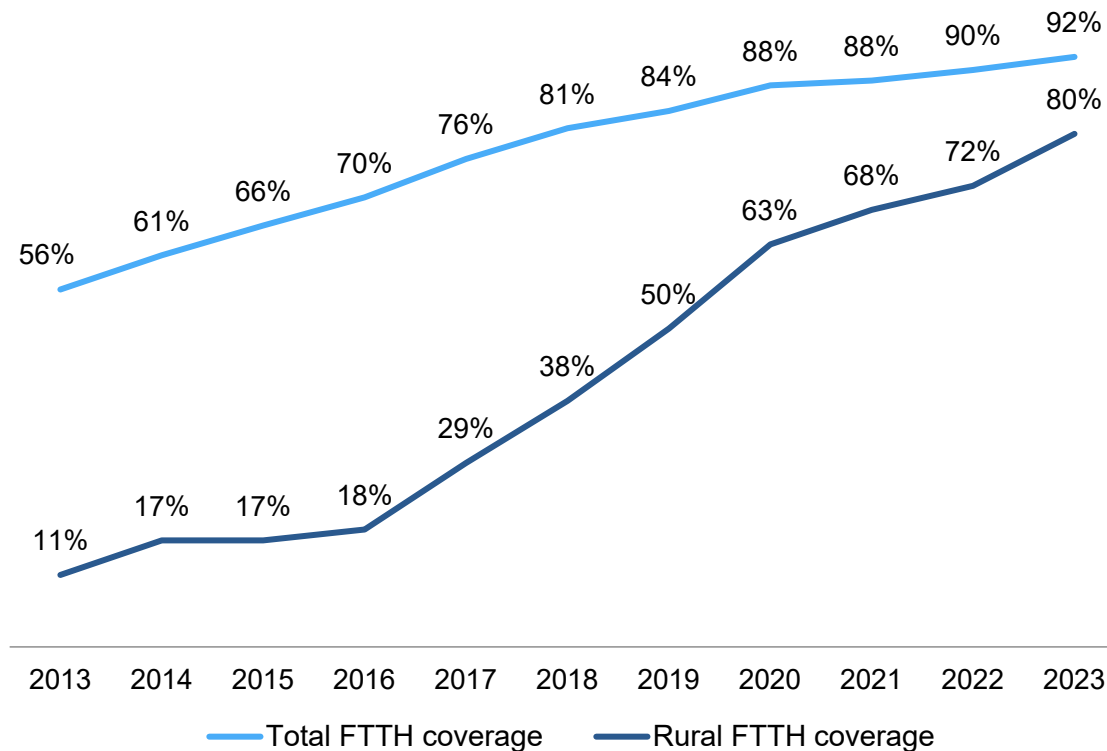For each type of municipality, information on WiFi technology has been extracted from MedUX

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Spain exhibits very high rates of fibre coverage (92%), driven by private deployments and government subsidized plans

Homes with FTTH coverage,
% households & # municipalities 2023

	URBAN	SEMI-URBAN	SEMI-RURAL	RURAL
municipalities	979	478	336	6,341
% households	97%	92%	86%	76%

Spanish FTTH coverage, **% households**

Total FTTH coverage: 56% (2013), 61% (2014), 66% (2015), 70% (2016), 76% (2017), 81% (2018), 84% (2019), 88% (2020), 88% (2021), 90% (2022), 92% (2023)

Rural FTTH coverage: 11% (2013), 17% (2014), 17% (2015), 18% (2016), 29% (2017), 38% (2018), 50% (2019), 63% (2020), 68% (2021), 72% (2022), 80% (2023)

— Total FTTH coverage — Rural FTTH coverage
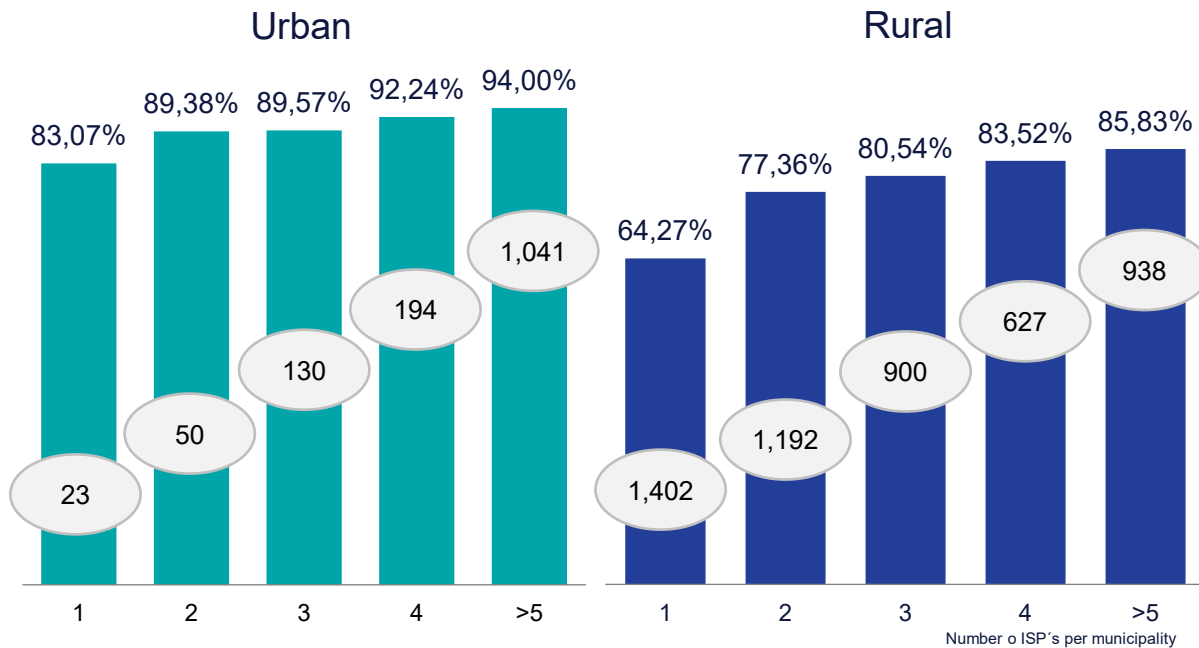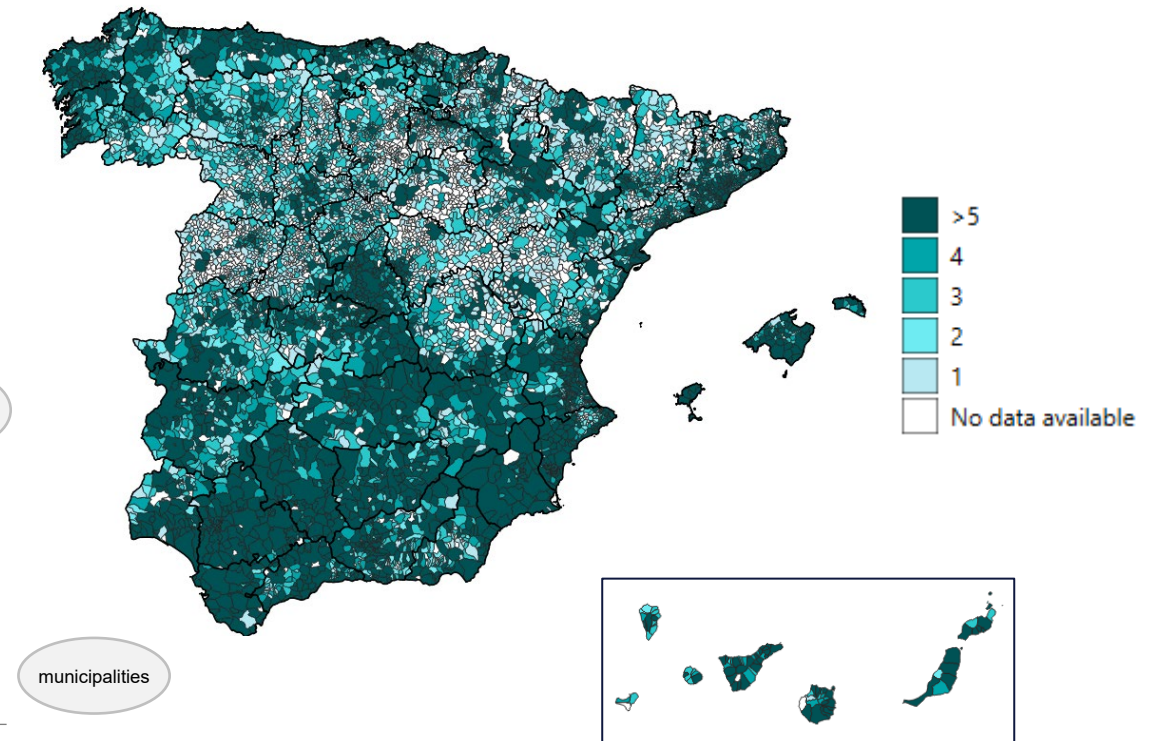
ONIVIA· | nae,

Private deployments from, traditional players, local players and wholesalers have enabled high levels of FTTH coverage; As a result, the higher the number of FTTH competitors, the higher the levels of FTTH coverage

Coverage vs ISPs

- FTTH coverage grows in municipalities where there are more ISPs.
- Municipalities with more ISPs are located around large cities and in the southeastern area

Urban

ISPs	Coverage	Municipalities
1	83,07%	23
2	89,38%	50
3	89,57%	130
4	92,24%	194
>5	94,00%	1,041

Rural

ISPs	Coverage	Municipalities
1	64,27%	1,402
2	77,36%	1,192
3	80,54%	900
4	83,52%	627
>5	85,83%	938

municipalities

Number o ISP´s per municipality

ISPs by municipality,

Legend:
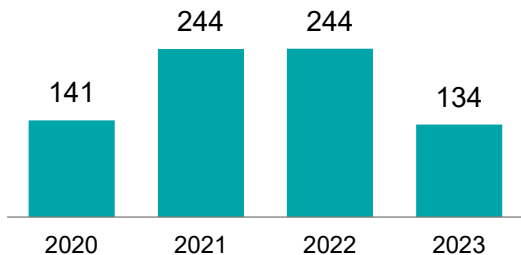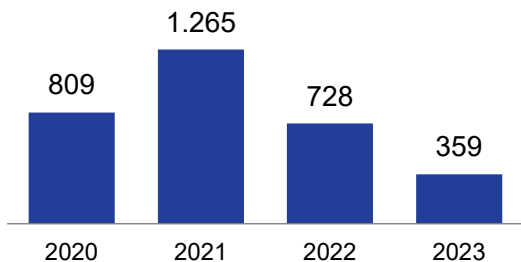- >5
- 4
- 3
- 2
- 1
- No data available

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UNICO Banda Ancha program has subsidized 3M BU in rural areas with 760 M€ in last four years to close the geographical digital gap
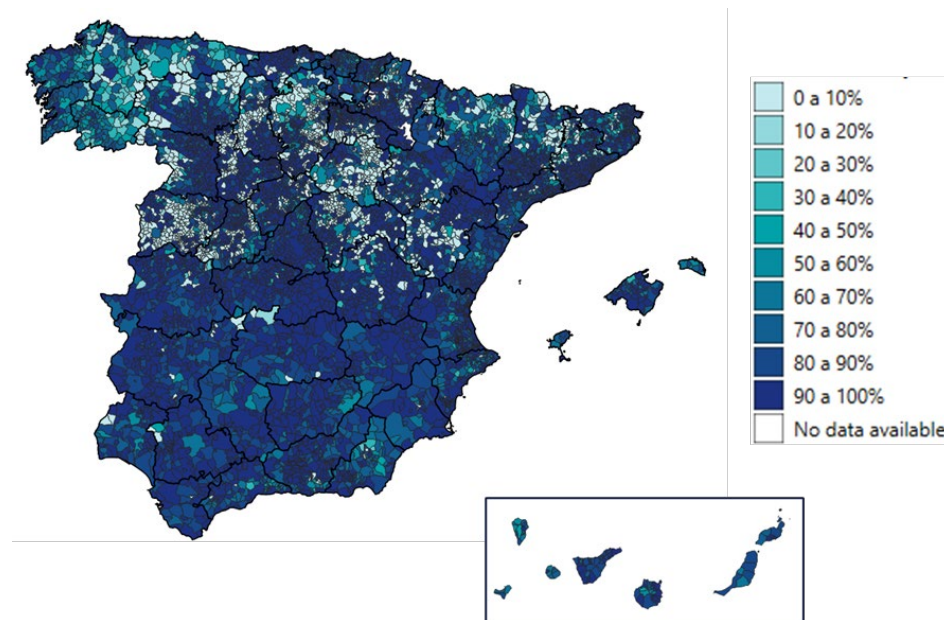
Public grants,

FTTH coverage heat map,

UNICO focus,

Public grants (M€)

141	244	244	134
2020	2021	2022	2023

UUII (thousands)

809	1.265	728	359
2020	2021	2022	2023

Legend:
- 0 a 10%
- 10 a 20%
- 20 a 30%
- 30 a 40%
- 40 a 50%
- 50 a 60%
- 60 a 70%
- 70 a 80%
- 80 a 90%
- 90 a 100%
- No data available
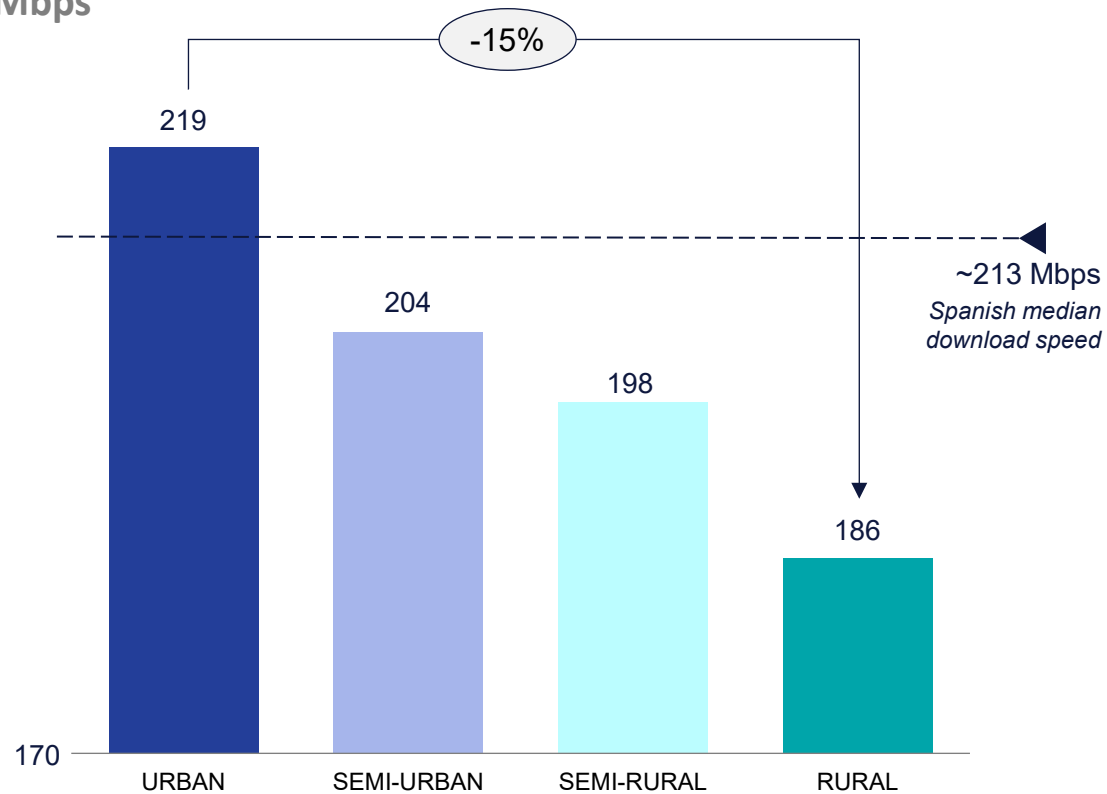
- cover infrastructure deployment in "white zones"

- supports fiber network deployment

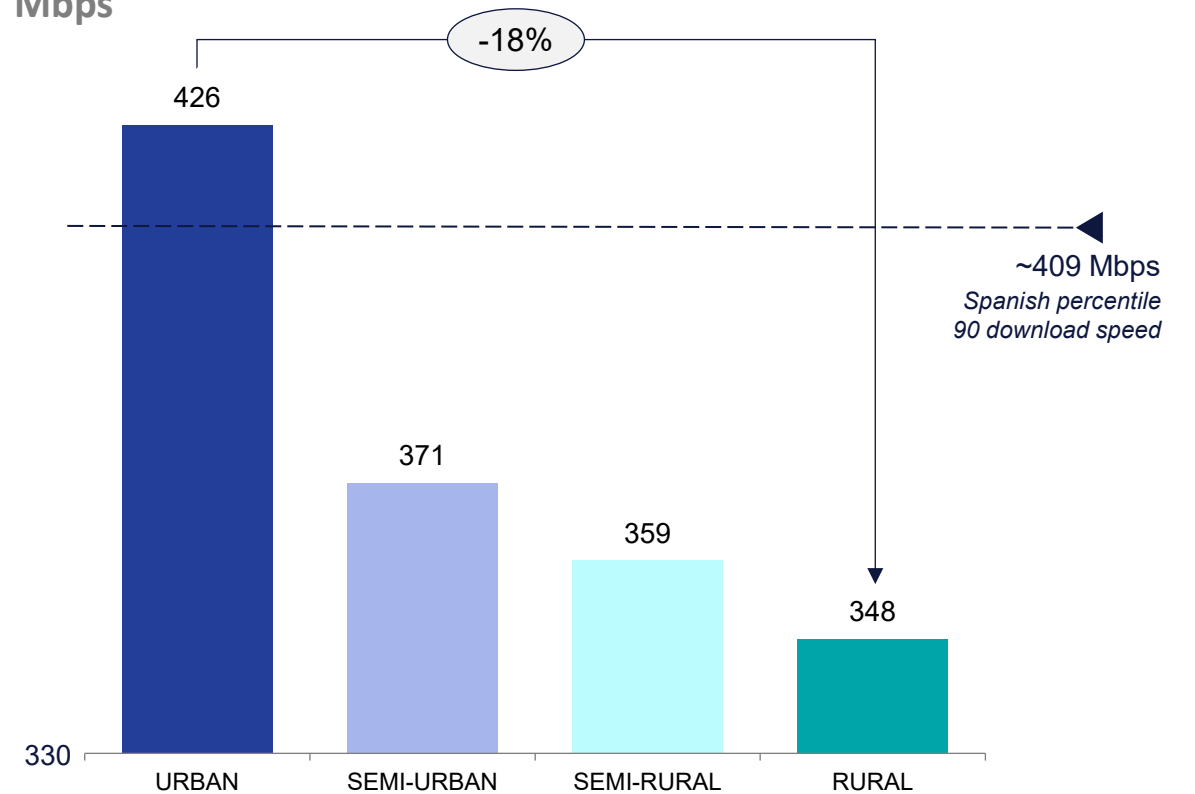- supports existing technology upgrades to offer higher speeds

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The data shows a performance gap between urban and rural areas of around 15% for download speed

Median download speed comparison by municipality , Mbps

-15%

219

204

198

186

~213 Mbps
Spanish median download speed

170

URBAN   SEMI-URBAN   SEMI-RURAL   RURAL

Percentile 90 download speed comparison by municipality, Mbps

-18%

426

371

359

348

~409 Mbps
Spanish percentile 90 download speed

330

URBAN   SEMI-URBAN   SEMI-RURAL   RURAL

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Source: Medux report
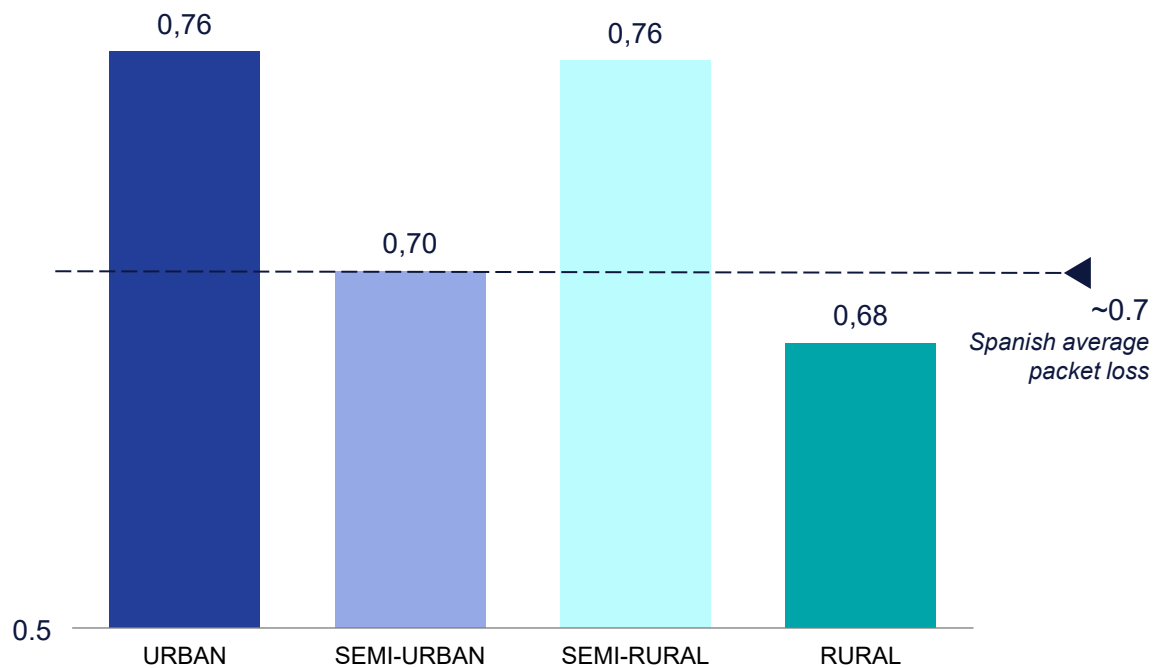
Latency shows also Urban vs Rural gap of 10%. However, no clear correlation can be seen in average packet loss

Average latency comparison by municipality, ms

+12%

17,15

16,77

15,26   15,22

~16 ms
Spanish average ping

| URBAN | SEMI-URBAN | SEMI-RURAL | RURAL |

15
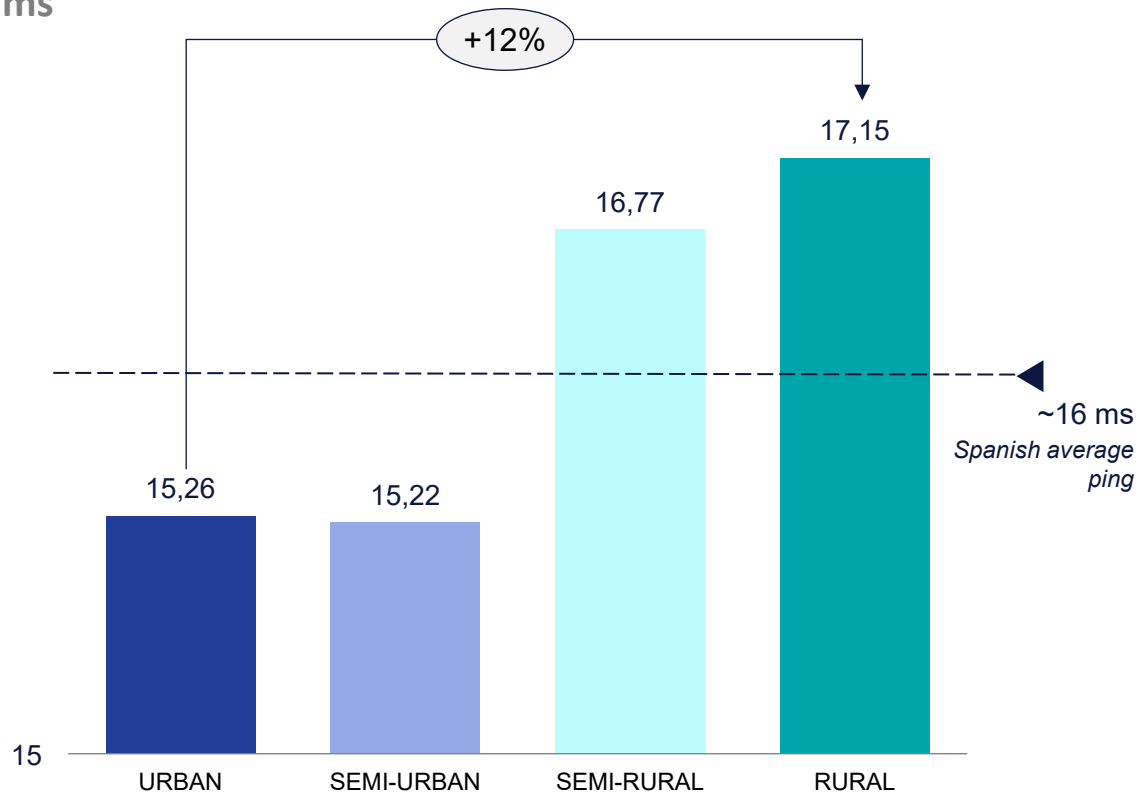
Average packet loss comparison by municipality, packets

0,76   0,76

0,70

0,68

~0.7
Spanish average packet loss

| URBAN | SEMI-URBAN | SEMI-RURAL | RURAL |

0.5

ONIVIA | nae,

Source: Medux report

We can conclude that performance in urban areas is better in terms of download speed and average latency than those in rural areas

Average download speed (229 Mbps) heat map,

Under average
Over average
No data available
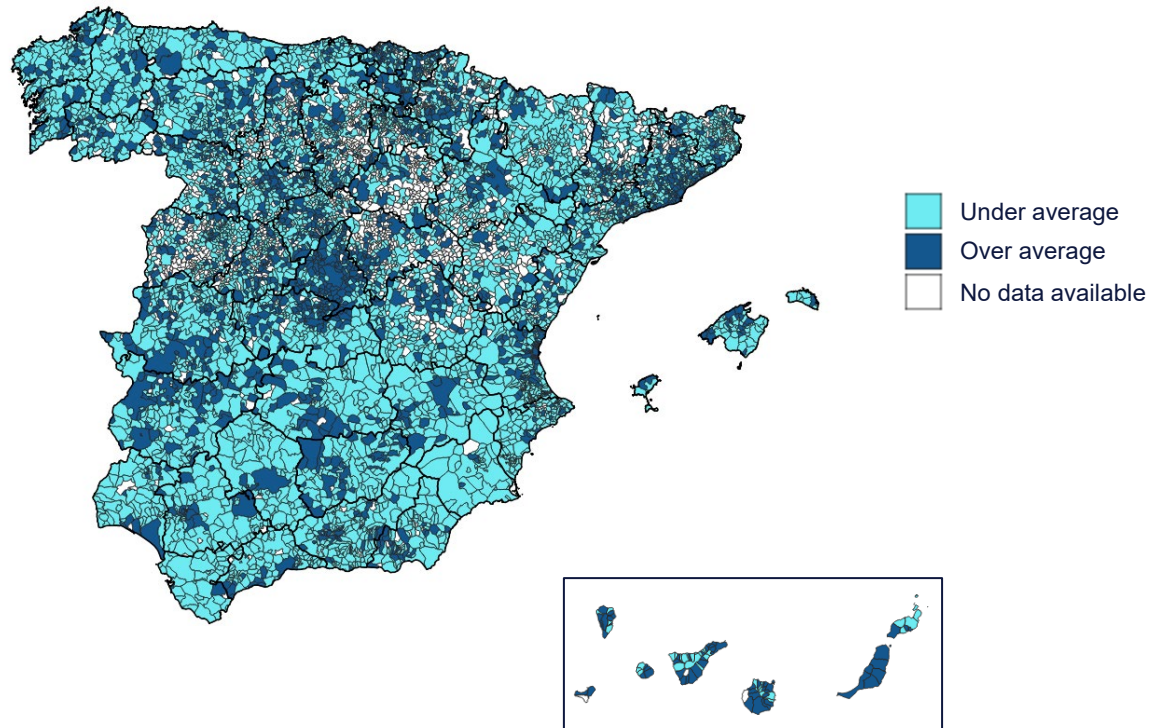
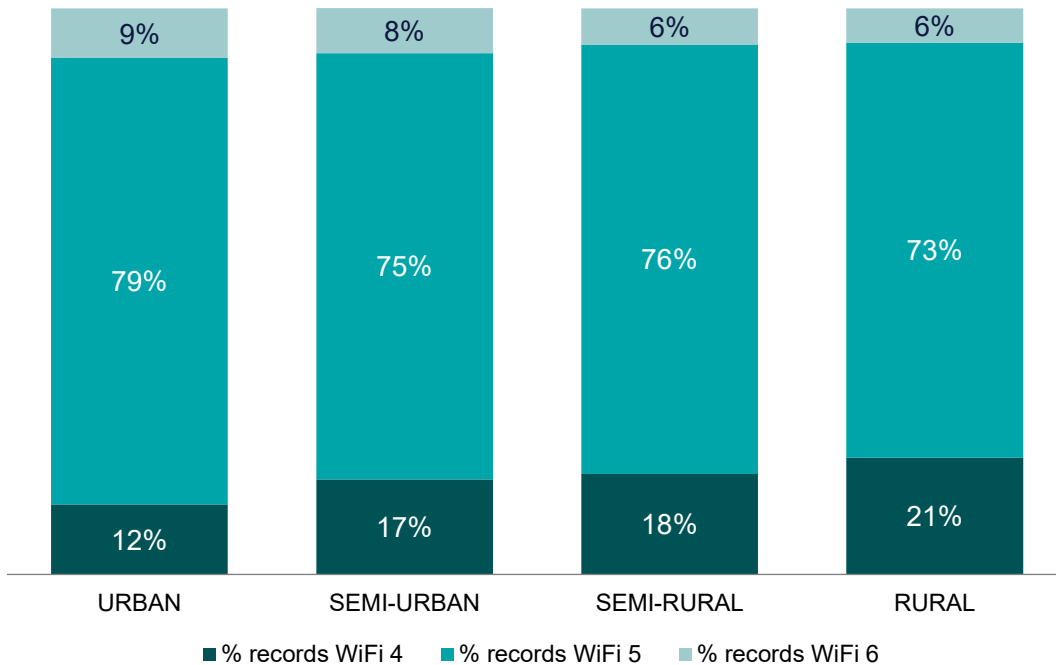**Average download speed by municipality,**

high in large cities thanks to extensive fiber optic coverage, while in rural and semi-urban areas the situation is less homogeneous, with lower speeds

○ Inequality in telecommunications infrastructure

○ Limitations on the deployment of new technologies in less profitable areas

○ Customers contracted speed

○ Technological limitations

○ Customer equipment and homes constructive types
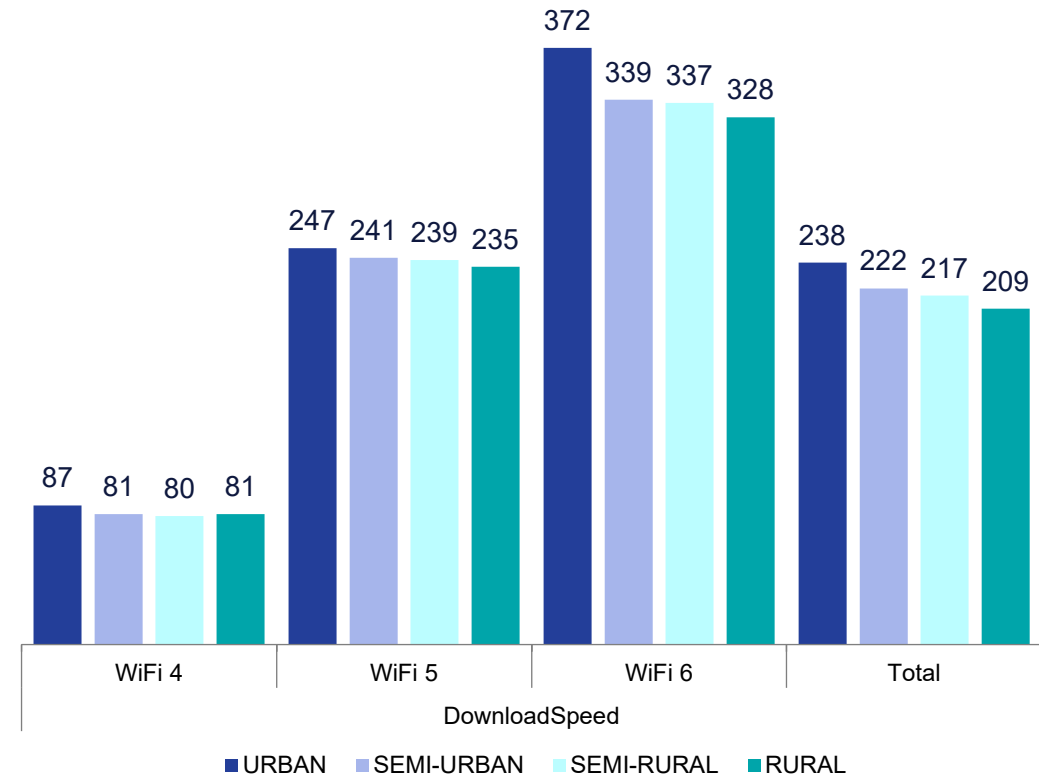
ONIVIA. | nae,

The greater use of obsolete WiFi technology partly helps explain the rural gap. The presence of WiFi 4 almost double in rural areas than urban areas (21% vs. 12%)

Records percentage comparison by environment, %

URBAN: 9% / 79% / 12%
SEMI-URBAN: 8% / 75% / 17%
SEMI-RURAL: 6% / 76% / 18%
RURAL: 6% / 73% / 21%

■ % records WiFi 4   ■ % records WiFi 5   ■ % records WiFi 6

Average download speed comparison by environment, Mbps

WiFi 4: 87 / 81 / 80 / 81
WiFi 5: 247 / 241 / 239 / 235
WiFi 6: 372 / 339 / 337 / 328
Total: 238 / 222 / 217 / 209

DownloadSpeed

■ URBAN   ■ SEMI-URBAN   ■ SEMI-RURAL   ■ RURAL

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The new quality framework

Measuring the digital Gap.

A new quality of service framework focused in measuring the Rural Gap

Measuring the digital Gap

On May 29th, 2024, CNMC approved the methodology to a new bi-annual study on **Service Quality in Rural areas**.

The study will be focused in measuring any gap in Telecommunication services between Urban and Rural areas and is absolutely new in the service quality regulatory framework in Spain.

The methodology approval is the first step to the effective start of the measurement process. The methodology has been submitted to public consultation and have received comments from the industry (Operators, Associations and QoE Measurement Enterprises).

Methodology covers both fixed and mobile services, but the level of complexity (including ad hoc measuring campaigns and crowdsourced data recollection) is far bigger for mobile access.

Fixed part information to be analyzed must be provided directly by operators answering specific "information requirements" to be issued by CNMC.

Quality of service measurement methodology scope

ONIVIA | nae,
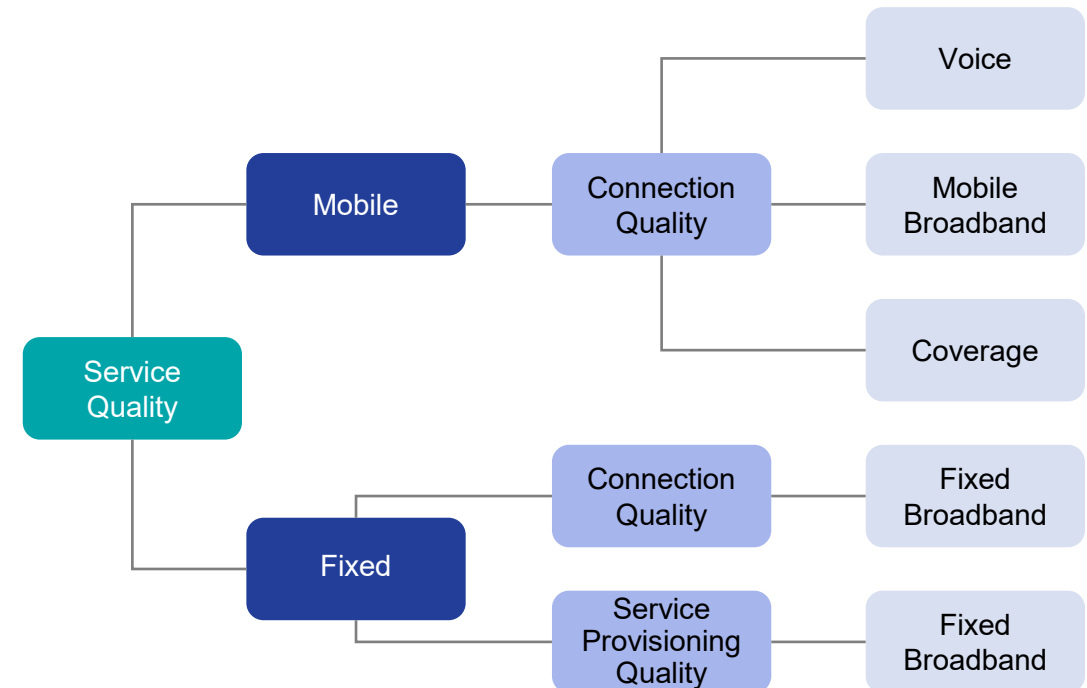
Redefining Rurality

Sampling Geotypes

A large part of the methodology is about to identify where the information will be requested and how assure "comparability" between rural under populated areas an urban dense cities.

A combination of population density and municipality size in inhabitants is used to generate a list of 22 "Geotypes". These Geotypes are used to represent municipalities archetypes. Three are currently vacant as no existing municipality fits in the definition.

ISP will provide information for 602 different combinations of Geotype and Province. The information will be aggregated to Geotype or municipality level (8,131).

"Information requirements" will be issued to ISP´s, so operators acting in the retail market. Wholesalers or Independent Infrastructure Providers will not be included. ISP´s must provide the information regardless service is provided by their own network or via another type of agreement.

Municipalities distribution by Geotype and Rurality

Population	Rural	Urban	Total
<100	1,356	-	1,356
100 to 500	2,601	25	2,626
500 to 1,000	956	45	1,001
1,000 to 2,000	779	104	883
2,000 to 5,000	649	303	952
5,000 to 10,000	218	331	549
10,000 to 20,000	73	274	347
20,000 to 50,000	39	227	266
50,000 to 100,000	5	82	87
100,000 to 500,000	-	58	58
>500,000	-	6	6

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A municipality level detailed reporting including network quality and service provisioning

Information to be reported

Information to be provided by ISP´s covers both connection quality and service provisioning quality.

The connection quality parameters are infrastructure related and no associated to actual measurements. Must be segmented by technology:
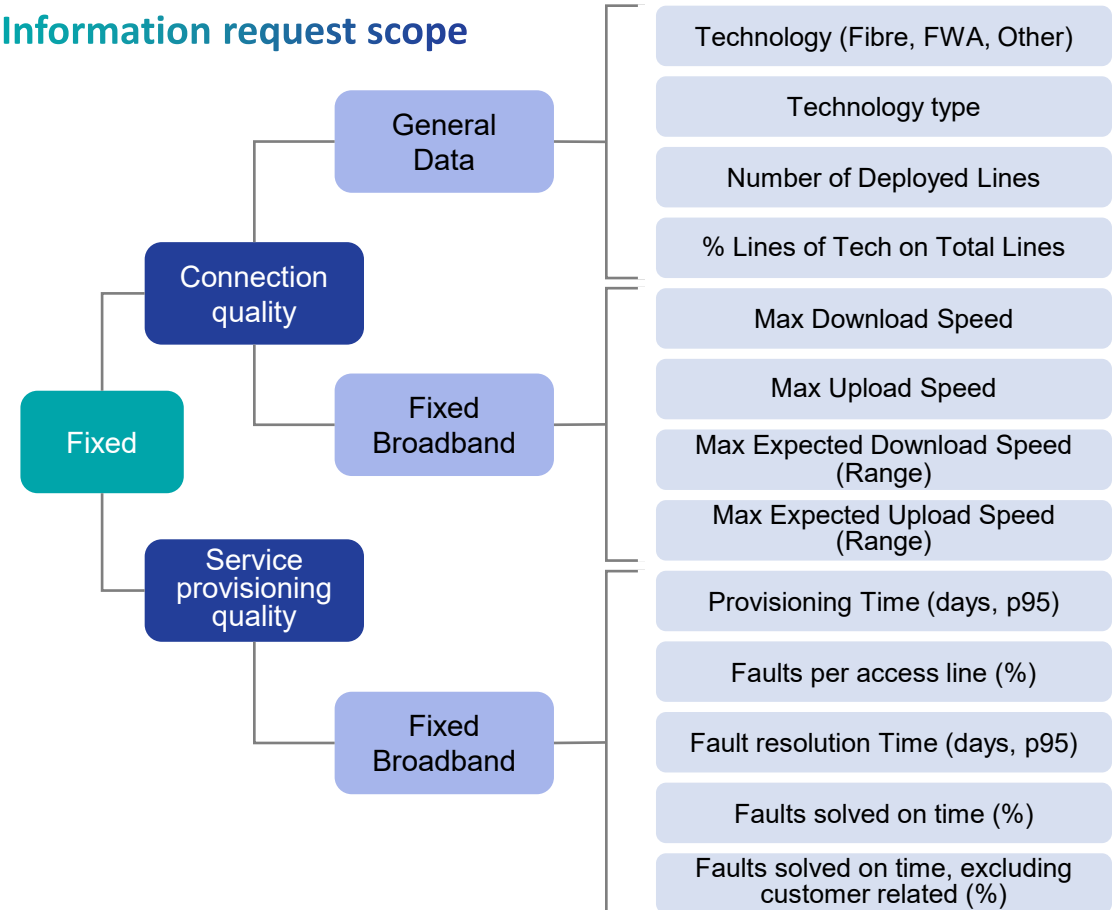
- Fibre | FWA | Other (HFC, Sat)

For FWA and "Other" additional details on technology type must be provided.

Service provisioning information must be gathered from the operator operations. No special provisions are included on the methodology for ISP´s providing services using wholesale agreements.
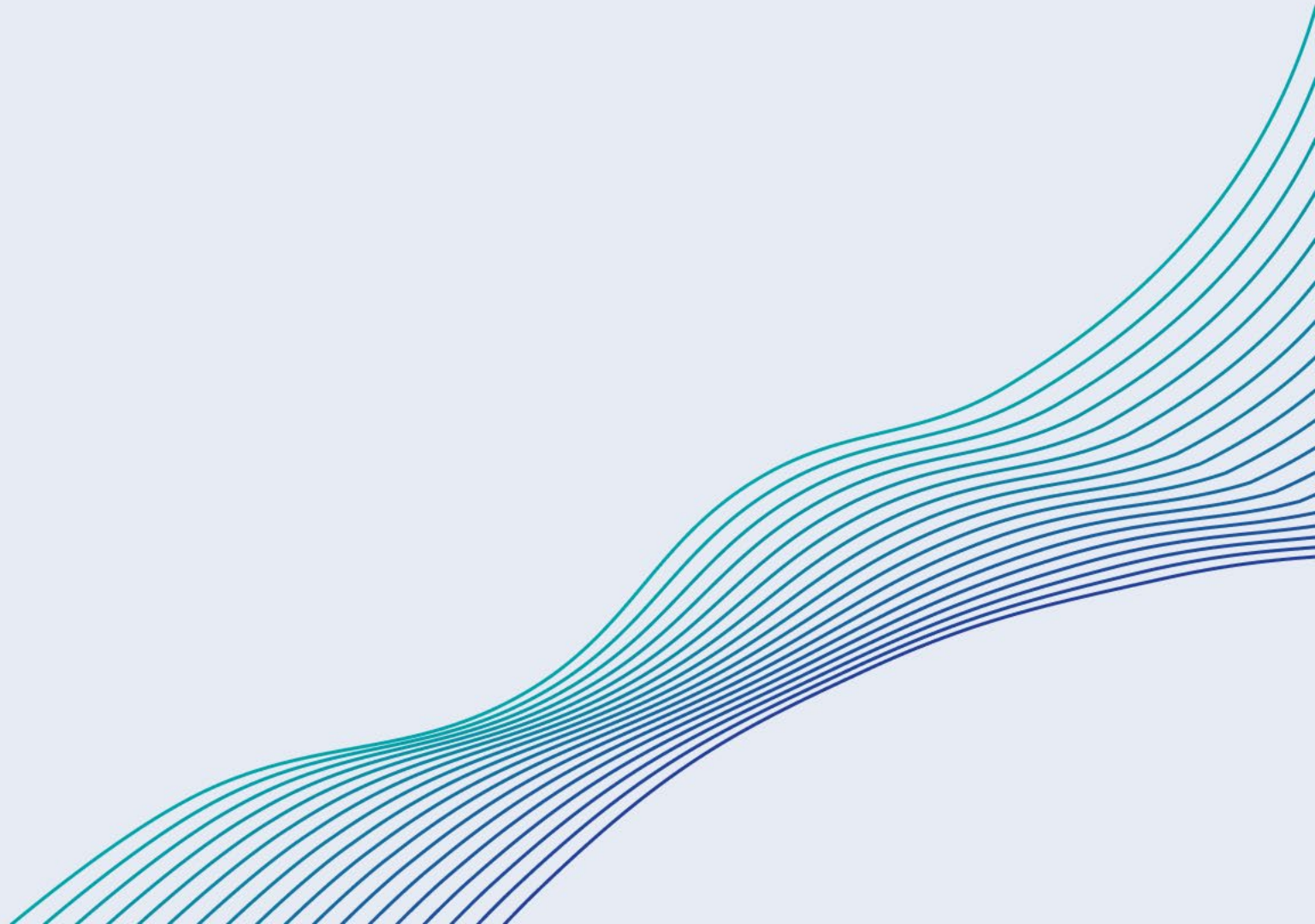
As a complementary measure to the biannual report CNMC will launch a "Quality Tool" aimed to be included to provide quality of service information directly to service final users. This information could also be included in the biannual report.

CNMC "Household Panel" will also be updated to better alignment with the new methodology.

Information request scope

Fixed

- Connection quality
  - General Data
    - Technology (Fibre, FWA, Other)
    - Technology type
    - Number of Deployed Lines
    - % Lines of Tech on Total Lines
  - Fixed Broadband
    - Max Download Speed
    - Max Upload Speed
    - Max Expected Download Speed (Range)
    - Max Expected Upload Speed (Range)
- Service provisioning quality
  - Fixed Broadband
    - Provisioning Time (days, p95)
    - Faults per access line (%)
    - Fault resolution Time (days, p95)
    - Faults solved on time (%)
    - Faults solved on time, excluding customer related (%)

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Conclusions

Conclusions

Span is a European and World leader in FTTH deployments. A key factor on this success is a very sophisticated market maximizing the Wholesale model opportunities. However, there is still a Rural Gap on coverage and in network performances that must be addressed. This is a Continuous Effort of the country institutions and the FTTH industry.

1

World Leader

Spain is a European and Global leader in FTTH deployment and adoption. With 92% coverage, 88% of Take-Up ratio, 79% of Penetration (more than 10 pp ahead of other EU4 countries) and rural coverage standing at 80% of households (32 pp ahead of EU average)

2

Wholesale Model

Near full-fibre coverage has been achieved thanks to the offering of FTTH network by Neutral Infrastructure Providers and Regional Operators (currently the second largest fibre network in Spain) and thanks to a sophisticated ecosystem with a very rich and deep mesh of players and agreements (up to 26 wholesale relationships have been identified amongst key players)

3

The rural gap – coverage

In terms of coverage a digital gap is still persistent despite the effort from private deployments and subsidised government programmes. A trend has been identified where higher coverage levels can be found in areas with greater presence of ISPs. Rural coverage stands at 80% of households whilst in urban areas stands at 96%

4

The rural gap – performance

Analysing data obtained by MedUX a digital gap is found in terms of performance & QoE. Performance in urban areas is better in terms of download speed (219 vs 186 Mbps) and average latency (15ms vs 17ms) than those in rural areas. The greater use of obsolete WiFi in rural areas partly helps explain the rural gap. The presence of WiFi 4 almost double in rural areas than urban areas (21% vs. 12%)

5

Continuous improvement

All the players in the Spanish broadband industry, the public institutions and regulators are working to maximize the benefits for the country and the society of leadership in FTTH deployments. There are, still, some lines of improvement and closing the rural performance gap can be one of them. The new process to assess rural quality by the regulator may be an important step

Closing the digital gap

Collaboration

Continue to foster Public-Private Partnerships (PPP) to close the digital infrastructure gap between rural and urban areas and keep evolving the private agreements.

Affordable Access

Ensure that services are affordable for all, encouraging the participation of all actors in the telecommunications value chain in rural opportunities. We must find a fine balance between affordability and long-term profitability.

Technology Innovation

Investing in new technologies to enhance coverage (XGSPON | 5G | satellite connectivity), performance and QoE. Improve equipment is essential to foster competition and provide the best options to end customers.

Sustainability

We need to continue improving best practices to reduce the carbon footprint of the deployment and maintenance of networks and to focus on enabling and capturing these "green" opportunities.
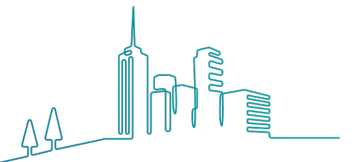
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Icíar leads the Markets and Product area in Onivia, the first neutral and wholesale FTTH fiber operator in Spain, focusing on the analysis, detection and development of strategic partnership programs, and the definition and implementation of wholesale product's go-to-market.

Telecommunication engineer with 25 years of experience and strong connections in telecommunications, Icíar has worked at Orange since her early days in Spain market and, during the expansion of the French operator into new brands and services in different technical and commercial roles.

Icíar Martínez Núñez
Markets & Product Director

Director at Nae. Joaquín Guerrero runs the Nae´s Telco prospective center and has worked in the Telecommunications industry for the past 30 years.

As a consultant he has developed his professional career working for the main industry groups on both sides of the Atlantic, including Telefónica, Claro, Tigo, Orange, Vodafone, Entel, MásMóvil and many other clients.

He has currently responsible in Nae for Network services globally. His goals include the conversations that will change the telco industry in the coming years. He also talks about Telco on the Telco Superligero podcast.

Joaquín Guerrero García
Director at Nae

About Nae,

Nae is as an industry expert in the **TMT** sector helps its clients identify new levers of value creation through its E2E consulting services.

Nae advises the technological areas of the main Telecom operators as well as companies with complex digital infrastructures and services, to drive them in the transformation and deployment of new technologies to boost their business.

Nae designs and implements high impact strategies for telecom operators helping them to achieve customer and operational excellence, developing their value proposition and simplifying, transforming and automating their operations and key business processes.

And Nae provides a differential competitive advantage in designing and implementing business strategies and supporting in corporate transactions (M&A) thanks to its deep expertise in TMT.

Nae, dare to go beyond

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We are growth enablers, we are Onivia

Onivia is the first neutral and independent wholesale bitstream operator in Spain offering wholesale fibre-to-the-home (FTTH) access and other connectivity services. With 10 million premises passed in urban & rural areas and more than 1,400 cities contributes to the development of rural areas by deploying fibre to reduce the digital divide, bringing ultra-fast and reliable broadband access to rural and urban communities in Spain and providing more choice for individual customers, as well as helping to connect communities and foster growth and innovation across all economic sectors.

Onivia is committed to investing heavily in digital infrastructure networks in Spain, having the support of the infrastructure funds that are part of its shareholding, all of them experienced investors that support this long-term industrial project capable of benefiting from the dynamic evolution of the telecommunications market in Spain with interesting growth opportunities.