In-building infrastructure, GIA and indoor coverage

Autor:
Dr. Sonia Strube Martins

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- Role of Wi-Fi for gigabit indoor connectivity

Challenges for in-building infrastructure

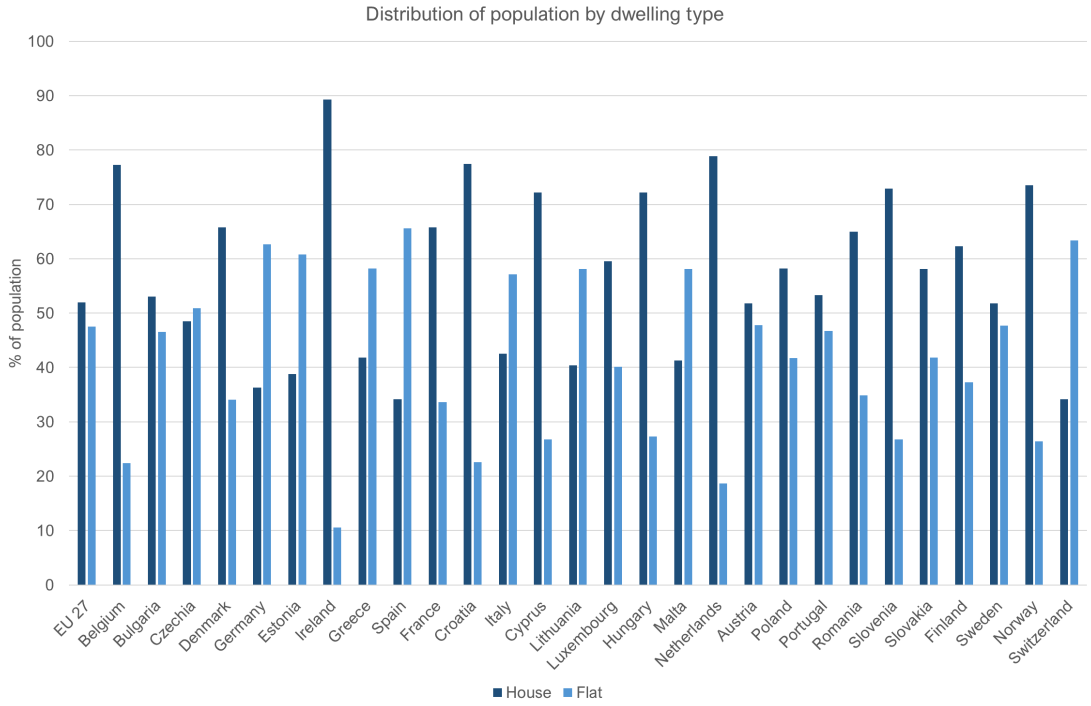
- **Roll-out of in-building infrastructure** is a necessary step in roll-out of FTTH and for copper switch-off but still presents a considerable challenge:
  - Low awareness of in-building obligations due to (telecom) regulations in the building and construction sector (more focus on construction law).
  - Some operators also note a lack of compliance by building owners to allow access to electronic communication network operators to install in-building infrastructure.
  - Need for standardisation
  - Architectural challenges impede effective access e.g. when FTTH installed as GPON or ducts too small to install extra wiring
- From an economic perspective sequential roll-out of FTTH is inefficient

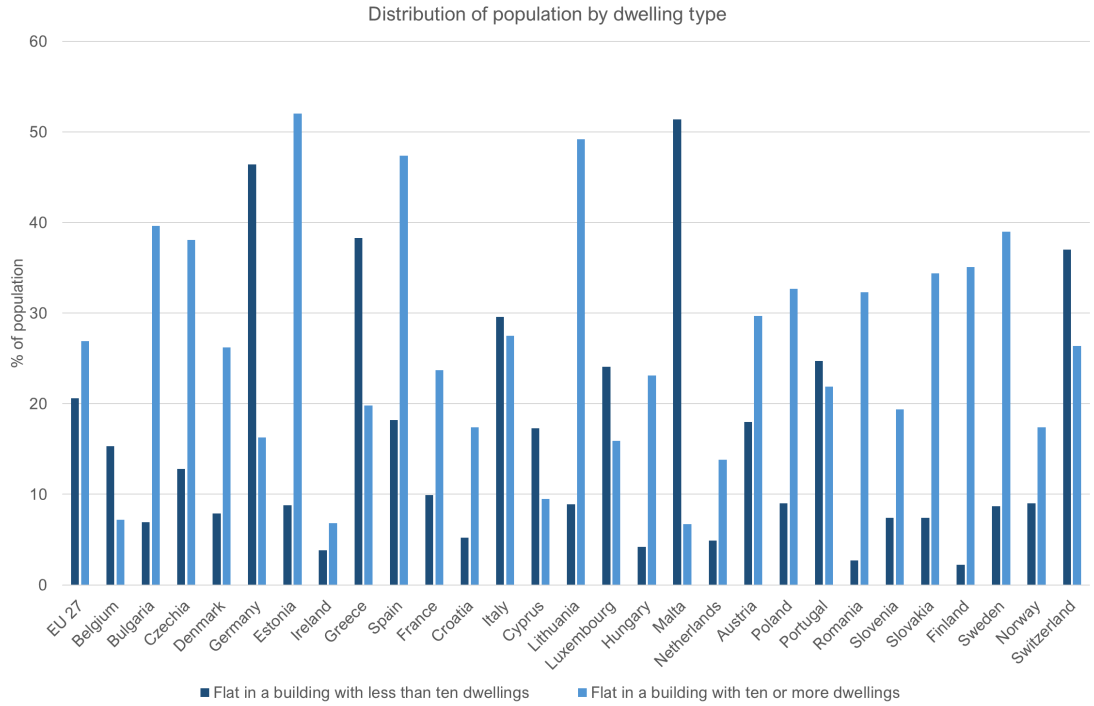
https://op.europa.eu/en/publication-detail/-/publication/fe50cedf-b718-11ed-8912-01aa75ed71a1/language-en
https://www.wik.org/en/publications/publication/gebaeudeinterne-infrastruktur-nr-499
https://www.wik.org/en/publications/publication/working-paper-no-5-in-building-telecommunications-infrastructure

Challenges for in-building infrastructure

Complexity of in-building infrastructure roll-out - housing and dwelling type

Heterogenity of housing structure increases complexity of in-building infrastructure roll-out



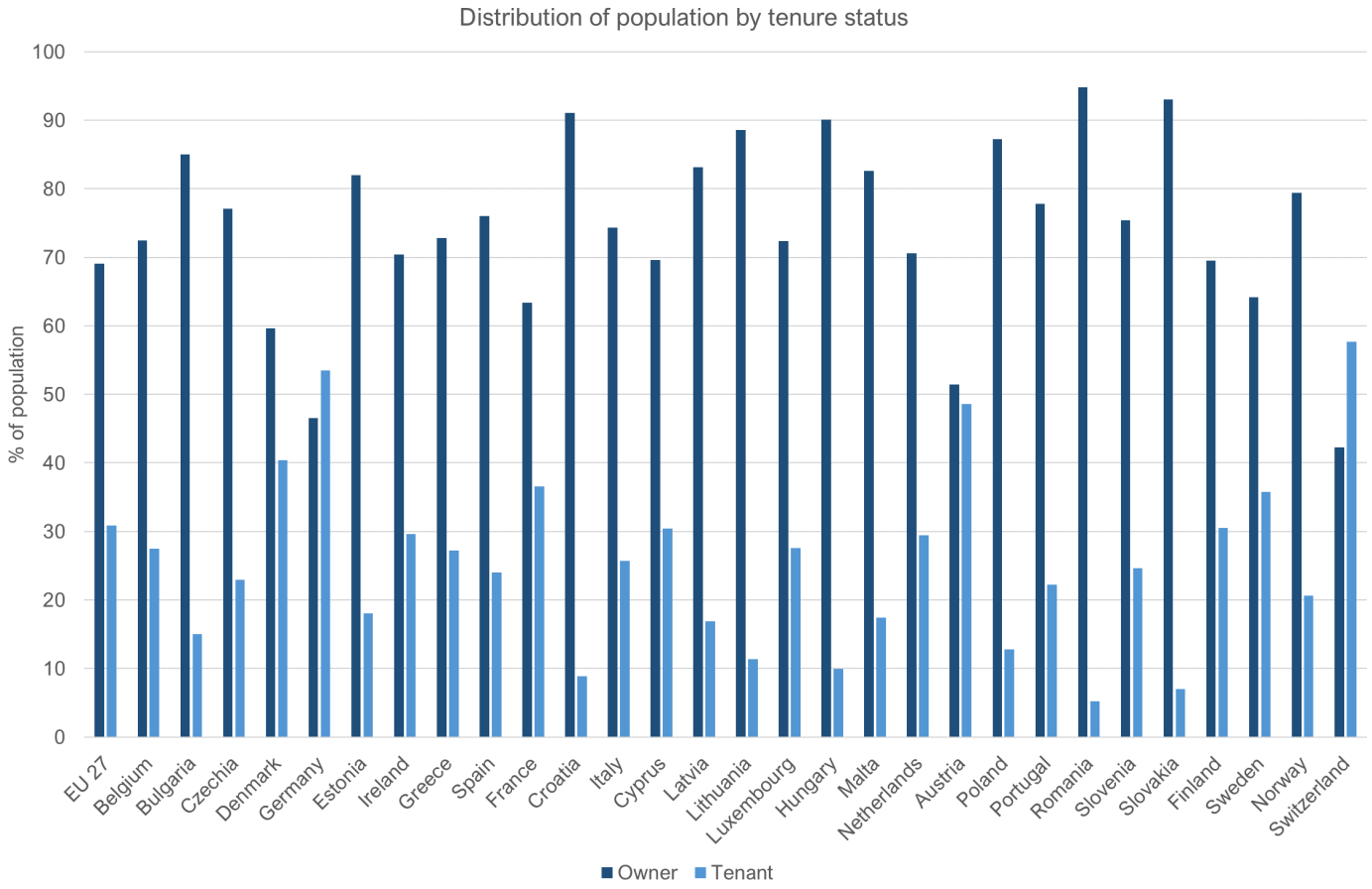


Source: Eurostat, Distribution of population by degree of urbanisation, dwelling type and income group - EU-SILC survey [ILC_LVHO01__custom_10203681], https://ec.europa.eu/eurostat/databrowser/view/ILC_LVHO01__custom_10203681/default/table?lang=en&page=time:2022 (last accessed on 05.03.2024)

Challenges for in-building infrastructure

Complexity of in-building infrastructure roll-out - housing and tenure status

High share of tenants may further increase complexity of in-building infrastructure roll-out



Source: Distribution of population by tenure status, https://ec.europa.eu/eurostat/databrowser/view/ilc_lvho02/default/table?lang=en&category=livcon.ilc.ilc_lv.ilc_lvho (last accessed on 05.03.2024).

Challenges for in-building infrastructure

Access to in-building infrastructure

- Most Member States have not defined the terms for **access to in-building infrastructure.**
- Installed infrastructure/wiring often does not meet the needs of ECN operators. Technology (coax, copper instead of fibre) or architecture (GPON instead of P2P) might not fit.
- GIA clarifies that GIA addresses PI while access to wiring and cables is addressed under article 61 (3) EECC (and addresses question raised in the evaluation of the BCRD over the coherence between Article 9 BCRD and article 61(3) EECC, which is focused on (optional) access to wiring and cables and associated facilities inside buildings up to the NTP including PI such as ducts and access points).
- In the evaluation of the BCRD, majority of respondents to the WIK/ICF survey requested PIA, but several note that a significant number of their requests were refused. Rejection reasons vary from: infrastructure full, unsuitable infrastructure to unreasonable T&C and building owner not having the right to grant access (infrastructure owned by the cable operator)
- Main concerns raised in the evaluation of the BCRD: perceived unfair T&C for access to in-building PI / access points and the related need to resolve disputes with multiple parties (building owners, ECN already providing service in the building)

https://op.europa.eu/en/publication-detail/-/publication/fe50cedf-b718-11ed-8912-01aa75ed71a1/language-en
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Challenges for in-building infrastructure

Access to in-building infrastructure

- If cabling is included, question of who installs and pays for the cabling, who owns it and what are the consequences for PIA T&Cs? Some examples:
  - “Glasfaserbereitstellungsentgelt” according to § 72 TKG in DE enables network operators deploying in-building fibre to charge building owners an installation fee which is capped. Building owner takes ownership of the wiring and can recover fee from tenants over max. timeframe. Building owner must offer access to in-building fibre infrastructure to ECN operators free of charge (currently proposal to change law and allow one-time fee of 60€ when access is provided).
  - When cabling installed directly by ECN for consumer e.g. in SDU, some countries pursue cost-orientation (potentially with risk adjustment) under Art 61(3) EECC
- With increased VHCN coverage access to existing in-building wiring becomes more relevant

https://op.europa.eu/en/publication-detail/-/publication/fe50cedf-b718-11ed-8912-01aa75ed71a1/language-en
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GIA provisions

GIA proposal (version of 5th December 2023)

- Article 8 mandates in-building physical infrastructure, access points and in-building fibre wiring for new and majorly renovated buildings. This includes buildings at the end-user's location when they are renovated to improve energy efficiency. Exemptions are expanded to address the possible lack of proportionality for specific locations based on a cost-benefit analysis.
- Obligation for Member States to adopt relevant national standards/technical specifications (standardisation at national level)
- Voluntary 'broadband ready' label for complying buildings.
- ...

https://www.consilium.europa.eu/en/press/press-releases/2024/02/06/gigabit-infrastructure-act-council-and-parliament-strike-a-deal-for-faster-deployment-of-high-speed-networks-in-the-eu/

GIA provisions

GIA proposal (version of 5th December 2023)

- Article 9 complements article 8 with rules on access to in-building infrastructure
- Any provider of public electronic communications networks shall have the right to roll out its network at its own costs up to the building access point
- Access to existing in-building physical infrastructure under fair, reasonable and non-discriminatory terms and conditions, including price, where appropriate. Member States may specify detailed requirements for these requests
- “In the absence of available fibre-ready in-building physical infrastructure, any provider of public electronic communications networks shall have the right to terminate its network at the premises of the subscriber, subject to the agreement of the owner or the subscriber, using, the existing in-building infrastructure, to the extent that it is available and accessible under paragraph 3, and provided that it minimises the impact on the private property of third parties.”
- Member states may provide guidance on the application of this Article.
- ...

GIA - Provisional agreement

- factors when calculating fair and reasonable conditions for access were clarified
- specific provisions were agreed on a voluntary ‘fibre-ready’ label for buildings
- …

GIA will enter into force in the next months

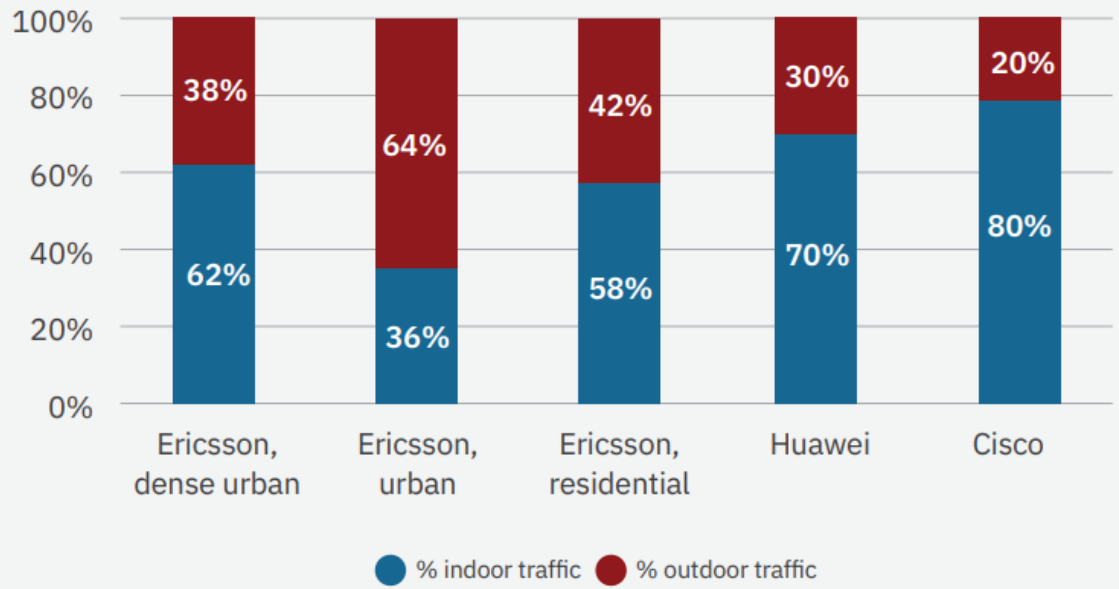
Further options to accelerate FTTH roll-out:

- Integrate GIA rules in building law (already included in GIA as an option)
- Extend modernization of infrastructure to existing buildings

Role played by WiFi for gigabit indoor connectivity

- Most broadband traffic (also on mobile devices) is consumed indoors.

Figure 7: Proportion indoor versus outdoor for mobile traffic



Source: Ofcom (2022)

https://www.wik.org/en/publications/publication/nachhaltigkeitsvorteile-bei-der-6-ghz-spektrum-vergabe

Role played by WiFi for gigabit indoor connectivity

In principle, wireless devices can be supported by either Wi-Fi or mobile technologies. The different technologies have advantages or disadvantages in specific settings. Differentiating factors include

- Performance
  - 5G offers a theoretical peak downlink rate of 10 Gbps but
    - peak speeds envisaged are rarely achieved in practice
    - peak performance will be further reduced if more traffic is relayed over mobile as opposed to fixed infrastructure due to the shared nature of the medium
  - Wi-Fi 6 supports peak data rates of up to 9.6 Gbps. Performance is further optimized with access to 6 GHz by Wi-Fi 6E and subsequent generations of Wi-Fi technologies.

    => with access to the 6 GHz band, Wi-Fi implementations can extend the full capabilities of FTTH access connections to the device level, surpassing 1 Gbps.
- Indoor coverage and cost
  - Currently, for indoor coverage, mobile networks rely on outdoor base station deployments

  => radio signals need to propagate into buildings which can have varying structural characteristics (building materials, insulations etc.)

  => higher transmit power levels and lower frequencies but "…there is not enough spectrum to address capacity demand in future even if more were made available" (Ofcom 2022)

  => use of higher frequencies but these higher radio frequencies are by nature more sensitive to reflection and absorption

https://www.wik.org/en/publications/publication/nachhaltigkeitsvorteile-bei-der-6-ghz-spektrum-vergabe

Role played by WiFi for gigabit indoor connectivity

- Indoor coverage and cost (continued)
  - Over time, buildings will become more energy efficient and have thicker, more insulated walls and windows (building entry loss will increase)

  => small cells (microcells, picocells or femtocells) outside and inside buildings to complement existing large cell towers but
    - from a performance and initial purchase price perspective, indoor picocells seem only economically feasible for large enterprises, airports, large railway stations, sport arenas etc., but not for mass market (e.g. residential deployment)
    - Femtocells are less costly and may be feasible for the consumer market as their purchase price is comparable with Wi-Fi routers. However, femtocell deployments require additional expenditures on the mobile data package from a mobile operator.

  => comparably priced Wi-Fi 6E router in combination with the existing internet connection can deliver similar connectivity for a fraction of the cost

  - Outdoor mobility
    - significant advantage of cellular technology is ubiquitous mobile connectivity. But proportion of data consumed outdoors is significantly smaller compared with data requirements indoors

Wi-Fi is more energy efficient and affordable to connect indoor devices than 5G indoor solutions.

Wi-Fi and 5G are both necessary, the technologies are likely to play different roles. While Wi-Fi (in conjunction with FTTH) is best suited to meet indoor broadband connectivity needs, licensed mobile is the preferred solution to support outdoor connectivity.

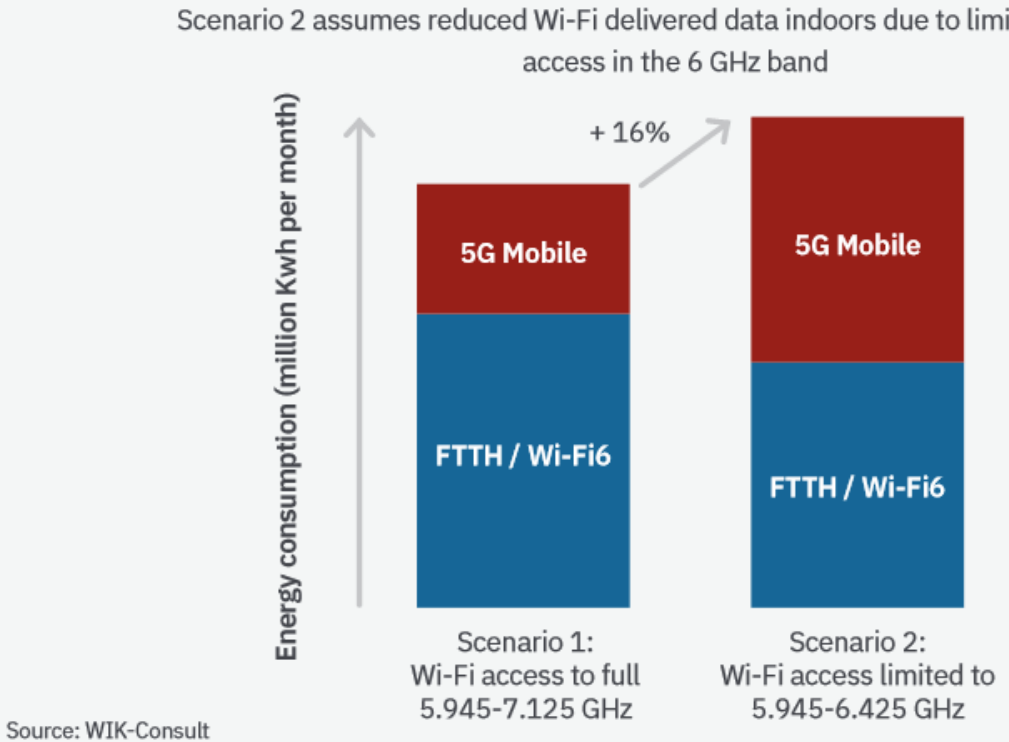
https://www.wik.org/en/publications/publication/nachhaltigkeitsvorteile-bei-der-6-ghz-spektrum-vergabe

Role played by WiFi for gigabit indoor connectivity

Results of scenario analysis regarding energy consumption

- Further, in WIK study for Wi-Fi alliance we estimated that as a result of insufficient spectrum availability for Wi-Fi, 15% of the data traffic would shift from FTTH/Wi-Fi networks to 5G mobile networks. This shift would lead to around 16% more energy consumption, which translates to 3.2 megatons of additional CO2 emissions in Europe per year. This is currently 4-6% of the overall CO2 emissions of the European Information and Communications Technology (ICT) industry, but this share is likely to increase towards 2030 as emissions from other elements of the ICT industry are planned to reduce.

Figure 5: Results of scenario analysis regarding energy consumption



Source: WIK-Consult

https://www.wik.org/en/publications/publication/nachhaltigkeitsvorteile-bei-der-6-ghz-spektrum-vergabe

WIK-Consult GmbH
Postfach 2000
53588 Bad Honnef
Deutschland
Tel.:+49 2224-9225-0
Fax: +49 2224-9225-68
E-Mail: info@wik-consult.com
www.wik-consult.com