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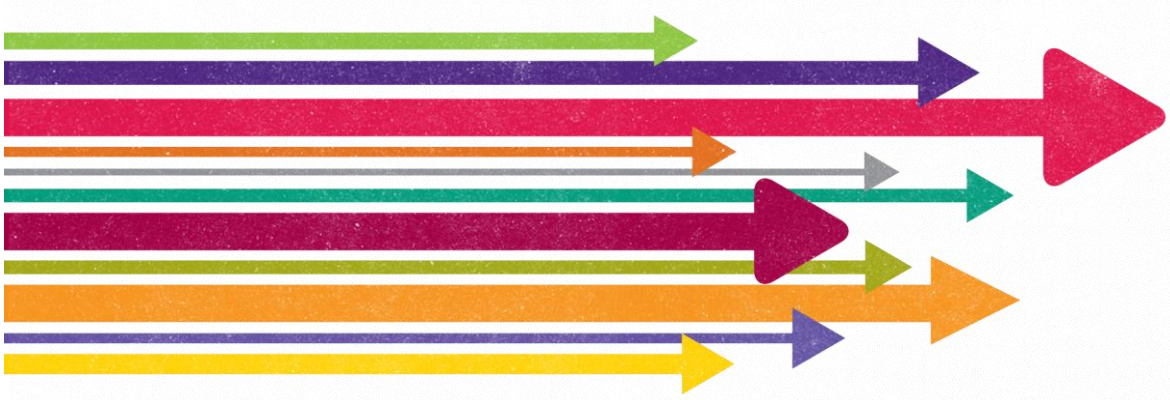
GEORGIA – NGA Consultation Paper

version 1.2

European Bank
for Reconstruction and Development



1 Executive Summary

1.1 Introduction

1. Purpose of the document

This document has been produced as part of the project "Information Communication Technology Sector Development - Harmonisation of laws, regulation of next generation access and regulatory development" (hereinafter "the project") supported by the European Bank for Reconstruction and Development. The project consists of three components:

(i) Component I: Legislation covers harmonisation of Georgian ICT and audio-visual media legislative framework with that of the European Union;

(ii) Component II: Next Generation Access regulation covers proposal and adoption of a framework for regulation of Next Generation Access and

(iii) Component III: Regulatory development covers universal service and measures to reduce the cost of deploying high-speed electronic communications networks, radio spectrum, market analysis and mergers and acquisitions regulation.

This document contributes to the fulfilment of Component II of the project related to the acceleration of high-speed broadband roll-out across Georgia. The objective of this document is to:

- analyse the current market situation and trends in broadband/Next Generation Access (hereinafter "NGA") in relation to future and existing regulation
- help to develop GNCC's regulatory strategy related to the broadband/NGA markets by defining a set of recommendations and steps for a regulatory approach
- foster positive trends and improve broadband/NGA coverage of Georgia by encouraging investment into modern broadband infrastructure
- establish a sustainable competitive environment in the field of the provision of broadband/NGA connection.

2. Basis of the analysis

Information for the analysis in this document has been sourced from the desktop research conducted by its authors, interviews with representatives of GNCC, data from GNCC analytical portal and GeoStat, interviews with representatives of the Ministry for Economy and Sustainable Development and interviews with representatives of telecom operators involved in broadband/NGA network roll out and development in Georgia. Most of the data in the document were collected at the end of year 2016.

3. Themes of our recommendations

We have developed our recommendations along four themes:

- **Improving the effectiveness of retail competition**
- **Improving access to wholesale connectivity**
- **Tackling the urban/rural divide**
- **The need for further demand (stimulation).**

Our recommendations are elaborated in the following sections. In each section, we follow a common structure: market context, market challenges, recommendations for actions by GNCC and other stakeholders to address challenges, and expected outcomes. **We stress that the recommendations deal with the main areas of focus and it is vital that GNCC first performs proper market analysis to confirm our initial hypothesis and concerns before introducing any kind of further regulation.**

4. Summary of recommendations key points

Improving the effectiveness of retail competition

- Perform market analysis focusing not only on overall market shares and prices, but also review existence of local monopolies and pricing (areas served only by one operator and assess if it is possible for competition to efficiently compete in such areas).
- Review situation regarding duct infrastructure access (both offered by operators and by utility companies and other ducts owners) and reveal what are the reasons, that this infrastructure is much less shared than it is usual and in some cases operators build their own parallel infrastructure (which from principle should be way more expensive) instead of using existing ducts.
- We recommend that network coverage and service availability is gathered in a defined structure from all operators (at a suitably granular level). We also recommend the gathering of data on the take-up/use of existing remedies, such as duct access.
- Based on the analyses and the adoption of the EU framework review existing regulation and if necessary consider imposing new ex-ante regulation, but always follow careful approach to avoid over or under-regulation. The obligations should lead to the establishment of competition by imposing access obligations at regulated prices (when appropriate), but this should not discourage investment by regulated entities by setting the prices at a level that provides a rate of return which discourages further investment.

Improving access to wholesale connectivity

- Investigate whether requirements for non-discrimination in wholesale access are being met by larger operators and, if discrimination is found, consider imposing penalties or strengthening obligations.
- If necessary intervene further, e.g. setting price controls to protect operators from margin squeeze and/or improving accounting transparency.
- Consider re-assessment of the market for access to backbone channels (divided into two submarkets:
  a) access to lines (passive)
  b) access to terminated devices and resources -active services (e.g DWDM, SDH))
  and modify remedies imposed in a manner that will contribute to development of broadband/NGA competition.
- Review approach of large wholesale players of giving access to local content and to local cached content of large worldwide players (like YouTube or Google) to their competition. There should not be discrimination of traffic generated by direct customers of the wholesale player and competitor's customers (ie. routing own customers to the cached content, while competitor's customers are directed to international lines)
- If necessary consider imposing interconnection obligation for dominant wholesale players which would require them to allow small operators to access both local content and worldwide internet resources on a non-discriminative basis.

Tackling the urban/rural divide

- Support the Government of Georgia in declaration of objectives regarding broadband/NGA and defining National Broadband Strategy.
- A rural task force should be created, to engage with stakeholders and understand in detail the impact of practical deployment issues that were highlighted during operator consultations, such as lack of addresses, lack of electricity, mountainous terrain, local government objections, difficulty in obtaining permits, etc.
- We recommend that operators expansion plans, including threshold-based plans are gathered to better understand how the coverage of broadband infrastructure in rural areas will evolve over time, and how the market may reduce the current coverage gaps on a commercial basis.
- Government plans to invest in the road and rail network should be shared with operators to allow them to coordinate any infrastructure build with the road investments to reduce rollout costs and expand coverage
- GNCC should undertake modelling of the commercially viable limit of different broadband technologies, accounting for the specific characteristics of rural areas (e.g. availability of poles and ducts, deployment costs, ARPUs) - this modelling can serve as an input to determine a realistic approach for infrastructure deployment in rural areas.
- It is important to note, that specific approach to broadband infrastructure development should be based on National Broadband Strategy objectives and existing market environment, but there are several best practices which should be considered for development projects like OpenNet:
    - Always assure that the development or incentives promote a competitive environment, i.e. the end user should be allowed to freely choose the service provider and services or that local operators have equal chance to operate the node without being disqualified (ie. by requirement of operating large areas where only big operators are currently fully present).
    - New infrastructure should be constructed only in areas where it does not exist and those areas are not economically feasible to cover by commercial operators.
    - Cost structure and tariffs should be tightly controlled to avoid exploitation of invested structure.
    - Open access principle and technological neutrality should be followed.
    - Invested infrastructure should be freely used by all retail operators on equal conditions.
    - End users should be able to freely choose retail operator and last mile technology.
- Considering the overall situation, strong urban/rural divide and low economical feasibility of extending NGA to rural areas due to lack of backhaul connectivity we believe that government support to build such NGA backhaul network is desirable. On the other side, low cost of last mile and seemingly adequate desire from both local and national operators to cover areas where the fiber backhaul is readily available, we believe that last mile coverage would be provided by operators.

The need for further demand (stimulation)

- We recommend to benchmark the scale of initiatives (like BfD) against similar initiatives from other countries to assess whether additional demand stimulation initiatives could be required in Georgia.
- We recommend encouraging operators to engage in demand stimulation

programmes.

- However, except for the existing state program on broadband infrastructure development in Georgia certain government initiated incentives should not be put in place unless a comprehensive analysis of their potential impact has been conducted. Ad hoc initiatives without the umbrella of a unifying digital strategy with clearly defined goals and KPIs can have mixed results (ie. strengthen the position of the biggest players and limit competition).
- Demand can be further stimulated by a range of tools and programs, from e-Government, e-Education, e-Business to supporting creation of co-working centres which not only attracts digital nomads who boost local economies, but can encourage, educate and support local talent in remote areas and have a generally positive impact on local communities. More in depth description of possible initiatives for broadband development are described in caption 7.23
- We recommend to monitor the development of demand in covered areas to assess whether further demand initiatives are required (especially in rural areas). Where demand for broadband services stagnates, and is far from its maximum potential level the reasons for such a situation should be analysed. Where appropriate, proper demand stimulation supported by government and/or service providers should be put in place.

1.2 Improving the effectiveness of retail competition

In this section, we consider how to improve the effectiveness of retail competition. The aim is to improve the outcomes for NGA broadband consumers in *existing* coverage areas.

1. Market context

Market share and concentration in the fixed broadband market

The market share for fixed broadband (using xDSL and fibre technologies as they are the most prospective ones for NGA in Georgia) is shown in Figure 1-1.

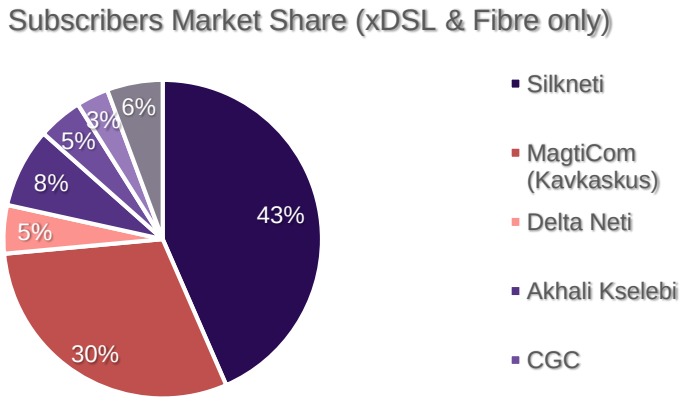


Figure 1-1 Subscribers Market Share[1] on xDSL or Fibre technologies

Silknet holds 43% of subscribers' market share and MagtiCom holds 35% share including subscribers added from the purchase of Delta Net. Together the two players control 78% of the fixed broadband market. The New Net group of Akhali Kselebi, CGC and Akhteli

[1] 3Q2016. Source: GNCC data, comparing shares only for xDSL or Fibre service subscribers.

together have 16% share with 6% shared among the rest of the market players.

The fixed broadband market in Georgia shows a moderate amount of concentration compared using a benchmark of the Herfindahl-Hirschman index (HHI) against countries in and around Europe, as shown in Figure 1-2.

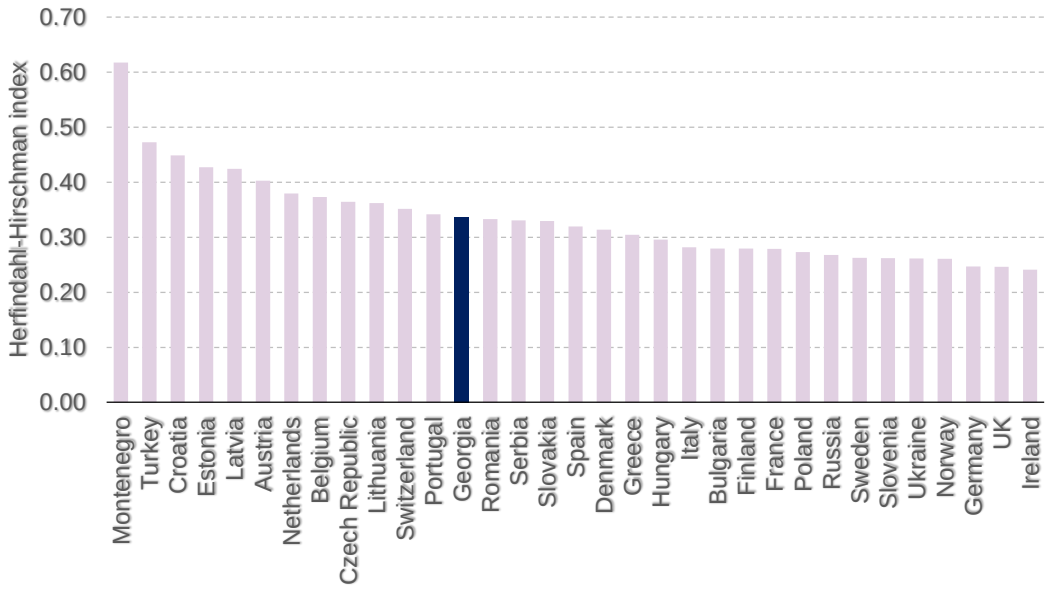


Figure 1-2 Benchmark of HHI for fixed broadband services in Q3 2016[2]

Retail broadband prices

Retail broadband prices for high speed (100 Mbit) NGA services appear to be high compared to benchmarks, as shown in Figure 1-3.

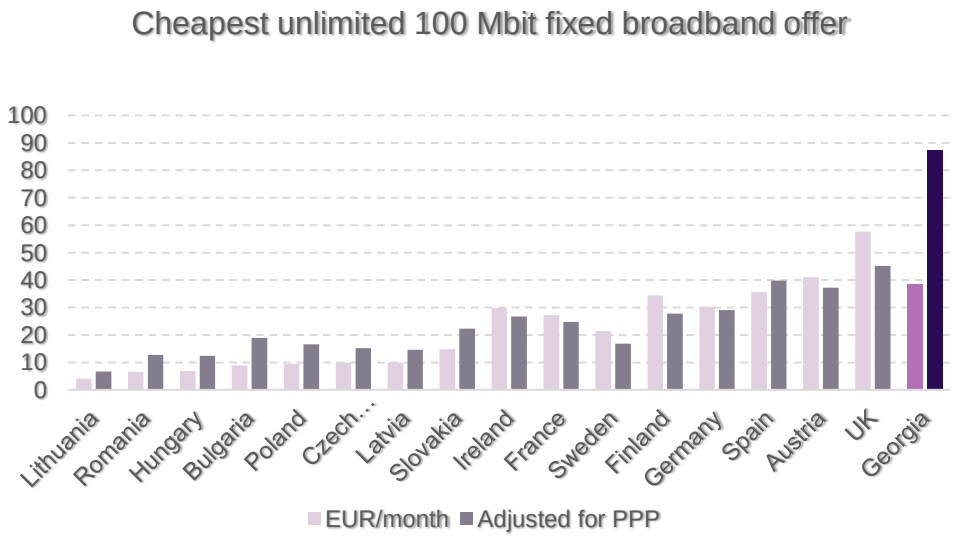


Figure 1-3 Cheapest unlimited 100 Mbit fixed broadband offer[3]

[2] Source: GNCC, Analysys Mason Datahub, 1 = monopoly, less than 0.15 fully competitive market
[3] EC/Van Dijk Broadband Internet Access Costs 3Q 2015 (prices are similar in 2017), Georgian operators web pages Jan 2017.

Furthermore, pricing is highly aligned, as shown in Figure 1-4.

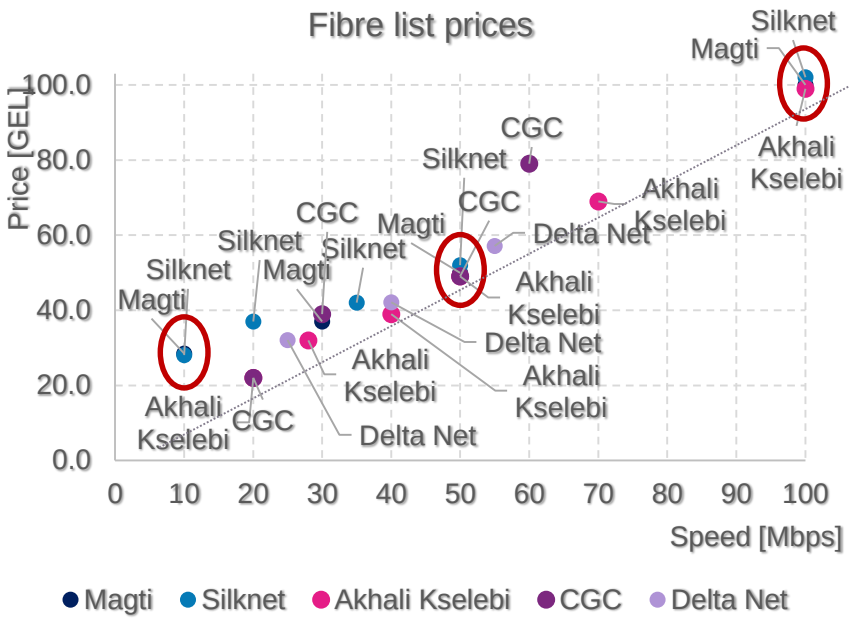


Figure 1-4 Fibre Optic Offers list prices in Georgia[4]

The pricing for the basic (and most popular) offer of 10 Mbps is very similar among the top 3 players. There is a small amount of choice between 20-40 Mbps (yet the price difference is usually driven by installation fees). At 50 and 100 Mbps, prices are again very aligned among the top 3 players.

Coverage by operators

Operators appear to provide partial coverage of major towns and cities, with most fibre localities served by only one operator.

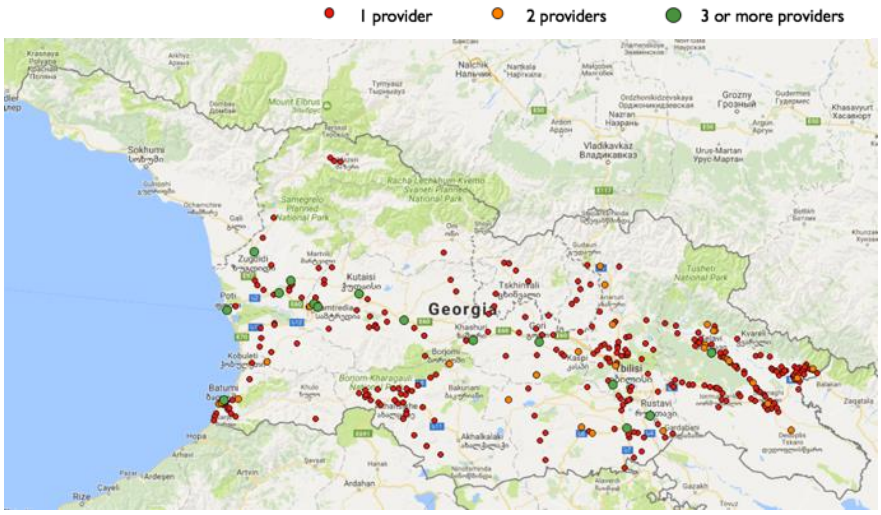


Figure 1-5 Map of Fibre localities by number of operators[5].

[4] Operator's web pages, Jan 2017. Installation fees are depreciated by 24 months.
[5] Source: GNCC analytical portal. Dec 2016.

In regions outside Tbilisi 41% of households do not have a choice of provider and for the 49% of households in localities covered by fibre that can seemingly choose a service from at least 3 operators, this assumes the whole locality is covered by all competitors, which is usually not a case. Most of the households in regions in Georgia are served by only one fixed broadband operator who essentially has a local fibre monopoly. Even in Tbilisi the choice is usually limited to Silknet or Magticom.

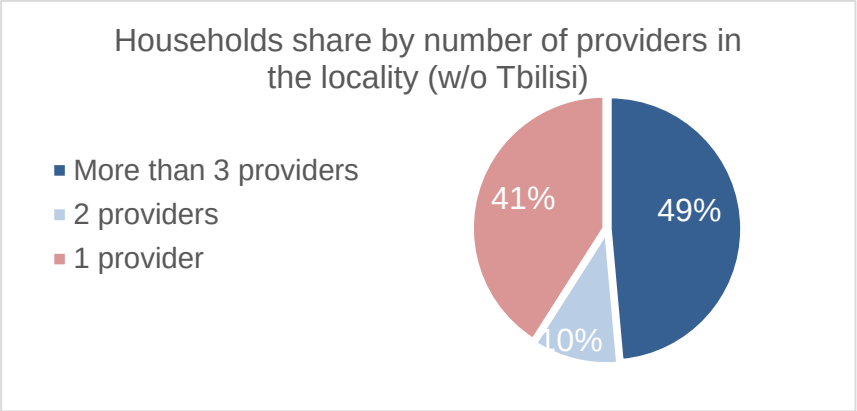


Figure 1-6 Households share by number of providers in the locality (without Tbilisi)[6]

2. Market challenges

Competition may not be effective

Despite the large proportion of the market being held by the two largest operators, the broadband market in Georgia is not highly concentrated on the basis of the HHI measure. However, the fact that the operators are only providing partial coverage of cities raises the concern that competition may not be effective. Information on exactly which homes are covered by which operators is not currently available to GNCC. It is possible that many homes especially outside Tbilisi are only served by one NGA network, and therefore each end user does not have a choice of operator. If such a situation is common, then the competition suggested by the market shares may not be effective in ensuring that improving prices and levels of service are delivered to end users.

Existing remedies are not being used

In other markets where fibre is the main choice of NGA infrastructure (e.g. Portugal and Spain), access to existing ducts (and poles) is the remedy used to ensure effective infrastructure-based competition.

GNCC has already implemented remedies to ensure that operators allow others to access their duct infrastructure. However, the extent to which these remedies are used is not available to GNCC. Our interviews with operators indicate that the duct access remedies are not widely used: according to some operators it is less attractive to use other operators' existing duct than it is to build new duct, which is counter-intuitive. "Exclusive" use of some utility infrastructure could also be a barrier to the development of effective infrastructure competition.

Conclusion from analysis

Based on the analysis, there is a concern that end users may not have a choice of NGA provider due to widespread instances of local monopolies. This is exacerbated by the lack of

[6] Source: GNCC analytical portal (including number of households). Dec 2016. Capital city of Tbilisi is not included.

take-up of the current duct access remedies, and may be contributing to high prices of NGA broadband services in Georgia.

3. Recommendations to address challenges

We highlight a series of recommendations to address the issues identified above, starting with the foundations for regulation.

Confirmation of the role of GNCC as the competent NRA

Ex-ante market regulation is a competence of GNCC stemming from the Law of Georgia on Electronic Communications and represents an essential tool in shaping an environment which should bring desirable outcomes from market evolution leading to achievement of sustainable competition in provision of electronic communications services including NGA. Ex-ante regulation has to be in compliance with principles of consistency, transparency, non-discrimination and technological neutrality. It should provide appropriate predictability to all stakeholders.

Ex-ante regulation should be imposed only in justified cases i.e. in cases where GNCC identifies that a relevant market is not effectively competitive and potential competitive problems exist on that market.

An insensitive approach to regulation may result in over or under-regulation both leading to undesirable market situations such as discouraging investment of both existing and potential investors or monopolisation or re-monopolisation of the market and discouraging entry of new market players. If, based on the market assessment, the GNCC concludes that market regulation is necessary, proper obligations should be imposed. The obligations should lead to the establishment of competition by imposing access obligations at regulated prices (when appropriate), but this should not discourage investment by regulated entities by setting the prices at a level that provides a rate of return which discourages further investment.

In order to be able to properly execute its tasks including ex-ante regulation the GNCC needs to keep its independence (its decisions shall be independent of all affected market participants) and should have all necessary resources (financial and human resources and expertise).

Adoption of a revised regulatory framework for NGA

Adoption of the EU framework for regulating markets relevant to NGA will provide GNCC with a range of options to encourage competition.

Implementation of the cost reduction directive, including creation of a multi-sector unified infrastructure database will be supportive of further NGA investment.

Due to universality of the regulatory framework, the Law of Georgia on Electronic Communications prior to and after the accomplishment of the Component I of the project does not include provisions specific to NGA treatment or regulation. The most essential tool for GNCC to support NGA development is the market definition and analysis procedure governed by the revised Regulation on methodological rules for the definition of relevant markets and market analysis for the purpose of ex ante regulation and the assessment of concentrations in the sector of electronic communications. By using such methodologies, GNCC will be able to properly define NGA related relevant markets, assess the competition in those markets and where appropriate impose relevant remedies intended to establish a competitive environment. The remedies imposed on authorised persons identified as holding significant market power in the NGA related markets shall reflect, where appropriate the obligations stipulated by the (European) Commission Recommendation of 20 September

2010 on regulated access to Next Generation Access Networks (NGA) (2010/572/EU) and the (European) Commission Recommendation of 11 September 2013 on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment (2013/466/EU).

Another important regulatory instrument available to GNCC comes from the transposition of directive 2014/61/EU of the European parliament and of the Council of 15 May 2014 on measures to reduce the cost of deploying high-speed electronic communications networks into the Law of Georgia on Electronic Communications. The implementation of the provisions of the amended law should lead to faster and cheaper deployment of electronic communications networks including NGA through sharing of existing passive infrastructure owned by infrastructure operators, coordination of civil works with infrastructure operators and deployment of intra-building physical infrastructure. However, success of the cost reduction tools will depend on infrastructure operators' willingness to cooperate and in case of disputes GNCC's ability to resolve the disputes effectively and in a reasonable time period. Creation of a comprehensive electronic database of existing physical infrastructure would significantly contribute to the implementation of the provisions intended to reduce costs of NGA deployment.

In order to achieve the two goals i) improvement of broadband coverage and ii) establishment of a sustainable competitive environment in the provision of broadband services, it is necessary that both tools stemming from the cost-reduction directive and tools stemming from the ex-ante market regulation are put in place and work in parallel.

Improved information gathering

An important next step is for GNCC to have the right information to be able to make decisions on the regulation of the market.

We recommend that network coverage and service availability is gathered in a defined structure from all operators (at a suitably granular level). We also recommend the gathering of data on the take-up/use of existing remedies, such as duct access.

Regulation to encourage competition

Given the current broadband market structure, a top priority for GNCC should be to assess the effectiveness of the obligations imposed in broadband/NGA related relevant markets in the past.

First, GNCC should assess if the remedies imposed in the market for access to subscriber's copper pairs and market for access to telecom channels (ducts and sub-ducts) have had any impact on competition development. If no positive impact can be detected, GNCC should analyse the reasons behind such a situation and put in place proper measures to address the situation.

As a second step (which could be initiated in parallel with the previous one), GNCC should consider initiating a market review of broadband/NGA related relevant markets reflecting the approach taken in the EU, where two broadband/NGA related relevant wholesale markets have been identified (*unbundled access* or *local access* and *wholesale broadband access* or *wholesale central access*). GNCC might consider inclusion or re-assessment of other relevant markets (such as long distance leased lines or access to international peering centres located within Georgia) that might contribute to development of broadband/NGA competition.

The NGA broadband market (xDSL and Fibre) in Georgia is characterised by the presence of two strong authorised persons jointly accounting for 78% of the NGA fixed broadband subscribers market. The New Net group of Akhali Kselebi, CGC and Akhteli together have

16% share with 6% shared among the rest of the market players. Considering the market structure, it might be useful to assess the competition from the joint significant market power perspective and from the geographic scope of market perspective to assess the intensity of competition among the authorised persons accounting for the biggest share of the retail market. If issues are proved by the market analysis results, access obligations taking into account the ladder of investment principle should be imposed. The ladder of investment principle is important from the small authorised persons' perspective, as it allows them to enter the retail market without the need to undertake costly and time consuming initial investment into network rollout. This would enable them to enter the retail market on a national scale with limited coverage of their own infrastructure by accessing networks of authorised persons designated as SMP (active and/or passive) under non-discriminatory conditions. Implementation of ladder of investment principle leads (over a medium- to long-term time horizon) to the development of infrastructure-based competition.

Proper end-user protection measures that will contribute to the development of competition should be put in place. If during the assessment of relevant wholesale markets any retail market foreclosing measures are identified, these measures should be eliminated via obligations imposed on authorised persons with SMP.

GNCC's ability to address the issues mentioned above significantly depend on the amendment of the Law of Georgia on Electronic Communications proposed in other streams of the project.

The prospect of other forms of access (e.g. dark fibre, active access) could provide an incentive for operators to improve duct offers; imposition of access remedies will stimulate deployment of NGA through sharing of existing infrastructure and provision of access products reflecting the ladder of investment principle.

GNCC should strictly avoid imposition of regulation in the retail broadband market in early stages of market regulation as retail regulation leads to decrease of retail prices but is contrary to the development of sustainable competition.

4. Expected outcomes

The aim of the recommendations in this section is to ensure that major operators are competing directly for selling services to individual households, leading to reduced prices and improved services.

1.3 Improving access to wholesale connectivity

In this section, we discuss the issues around improving access to national and international connectivity, to address the concern that smaller operators are paying high prices for wholesale connectivity.

1. Market context

Existing national and international connections in Georgia

Georgia is well connected, both nationally and internationally.

Georgia is connected for carrying international data traffic through several fibre routes. One goes from Tbilisi to Poti and through the Black Sea to Bulgaria and Romania (Rostelecom). Alternative routes are through Turkey using Turk Telecom (however operators complained about the quality of this route) and to Baku in Azerbaijan using Telia.

National and international connectivity (and the provision of wholesale access to this

connectivity) is controlled by the three largest players (MagtiCom, Silknet and New Net).

2. Market challenges

Operators which do not own infrastructure pay high prices

Operators have raised concerns about the cost of national and international connectivity. A large proportion of the cost components that influence retail prices is the cost of national and international connectivity, which must be paid for by those operators that do not have direct access to national and international infrastructure.

Based on the information provided by GNCC in May 2017 the price of global internet resources provided by Caucasus Online dropped. Depending on the capacity provided the price decrease is in the range of 13 to 21% with average list price of ~25 GEL/Mbps.

Caucasus Online Global Internet Access reference offer

Capacity in Mb/Sec	Before May 2017 (GEL excl. Tax)	New Rates (GEL excl. Tax)
0-50	32	28
51-100	32	27
101-200	31	26
201-500	30	25
501-1000	29	23
1001-10 000	27	22

Figure 1-7 Global Internet Access prices in Georgia[7]

Despite recent drop in IP transit prices in Georgia the price is still very high compared to international benchmarks.

IP transit prices in the world tend to converge to US/UK pricing. In UK the price is ~0.6 US$/Mbps, in Singapore 3 US$/Mbps and even in Brasil which was infamous for exorbitant prices the price recently dropped from 20 US$/Mbps to 6 US$/Mbps (~16 GEL) in the last three years.

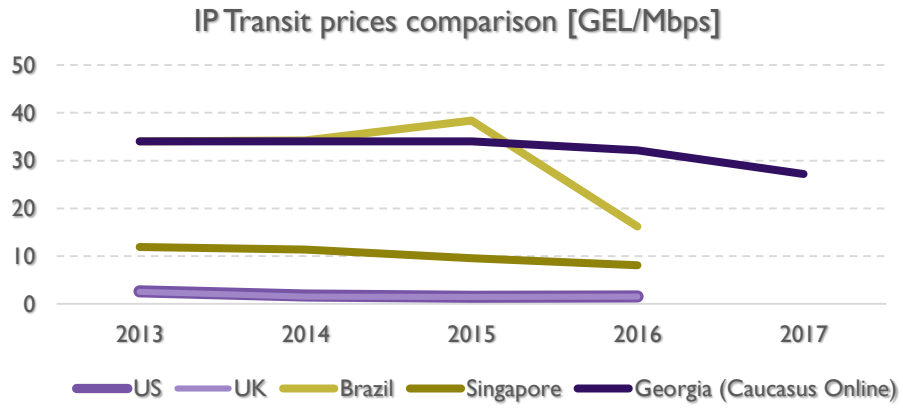


Figure 1-8 Global IP Transit prices compared to Georgia[8]

The analysis shows that operators who do not have direct access to international (and via a

[7] Source: GNCC

[8] Source: TeleGeography, GNCC for Georgia – list price average excl. tax, non GEL prices recalculated by average exchange rate of every year. Local players are Delta Com and Railway Telecom.

similar effect, national) infrastructure will struggle to offer higher speed services, due to the large proportion of their revenue which would need to be spent on wholesale connectivity (effectively a margin squeeze). Association of alternative operators believe that wholesale IP transit prices including the global internet access should be feasible at levels of $3-5.

There is no official local IP peering centre (for national traffic only), but operators usually offer free of charge peering for local internet traffic in their premises. Yet some alternative operators complained that YouTube or Google traffic are routed for them through expensive international lines instead of through local peering to local cache servers located in Georgia.

Conclusion from analysis

Despite the recent changes of the prices of access to global internet resource and IP transit products competition for national and international connectivity needs to be assessed. Smaller operators that do not have direct access to national and international infrastructure may find it difficult to compete effectively (on speed and/or price) with larger operators.

3. Recommendations to address challenges

Options for future regulation

GNCC should investigate whether requirements for non-discrimination in wholesale access are being met by larger operators and, if discrimination is found, consider imposing penalties or strengthening obligations.

GNCC should consider intervening further, e.g. setting price controls to protect operators from margin squeeze and/or improving accounting transparency.

GNCC should consider re-assessment of the market for access to backbone channels (divided into two submarkets: a) access to lines (passive) and b) access to terminated devices and resources -active services (e.g DWDM, SDH)) and modify remedies imposed in a manner that will contribute to development of broadband/NGA competition.

GNCC should review approach of large wholesale players of giving access to local content and to local cached content of large worldwide players (like YouTube or Google) to their competition. There should not be discrimination of traffic generated by direct customers of the wholesale player and competitor's customers (ie. routing own customers to the cached content, while competitor's customers are directed to international lines). If necessary GNCC should consider imposing interconnection obligation for dominant wholesale players which would require them to allow small operators to access both local content and worldwide internet resources on a non discriminative basis.

4. Expected outcomes

Smaller operators should pay a lower price for wholesale connectivity, and can launch a sustainable competitive challenge to the NGA retail offerings from larger operators. Georgia's retail market should become more effective and dynamic, with resulting improvements in price, choice and service.

1.4 Tackling the urban/rural divide

In this section, we discuss tackling the urban/rural divide in terms of NGA coverage. The aim of the recommendations in this section is to drive the coverage of NGA networks further out beyond Tbilisi and the main cities.

1. Market context

Existing broadband coverage

Georgia has reasonable coverage of a range of broadband technologies: fibre, ADSL and LTE. In particular, fibre coverage compares well with international benchmarks as shown in Figure 1-9.

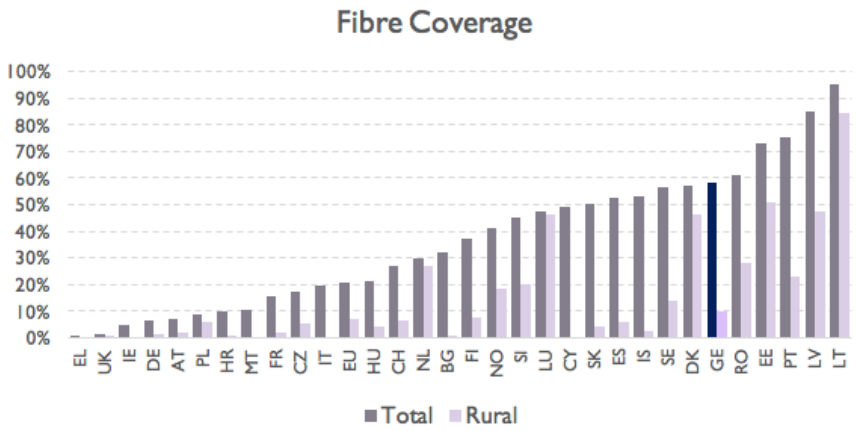


Figure 1-9 Fibre Coverage in EU and Georgia[9]

The focus on fibre deployment has put Georgia ahead of many EU countries in fibre coverage (mostly FTTH), although behind countries like Latvia or Lithuania which are currently amongst the leadersin European FTTH coverage.

[9] 2015 EU, 2016 Georgia, Source IHS and VVA for EU data and company assumptions based on data from operators and GNCC for Georgia.

Forecast broadband coverage

The forecast of broadband coverage and penetration in Georgia is shown in Figure 1-10. It includes a forecast without the impact of the OpenNet project on coverage, which may be limited by 2021 because of uncertainty about when it is expected to complete roll-out.

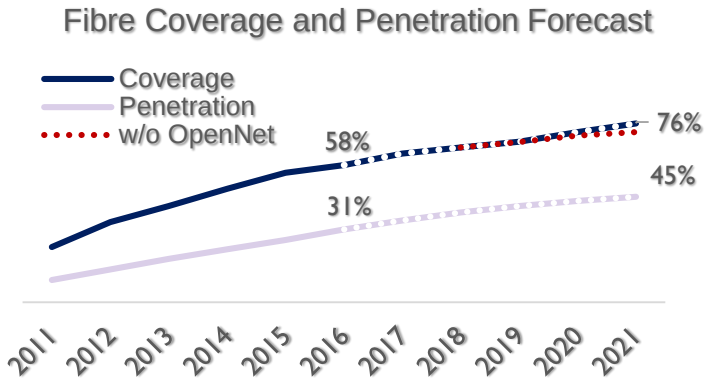


Figure 1-10 Fibre coverage trend and forecast[10]

Market consolidation and economic slow-down reduced the rate of fibre network deployment in recent years, but we assume that economy improvement, restart of deployment after consolidation and plans to replace legacy xDSL networks, together with the effect of the OpenNet project, should result in coverage growth in the next 5 years, increasing Fibre coverage from an estimated 58% in 2016 to 76% in 2021.

The increase in coverage will drive fibre subscriber growth, which we forecast to reach 45% connected households penetration in Georgia by 2021.

[10] Source: GNCC data for subscribers in regions, partial data from operators regarding coverage with assumptions made to model coverage in remaining areas based on number of subscribers per operator in region.

2. Market challenges

Urban rural divide

Despite the high overall coverage of fibre, most of the fibre coverage in Georgia is focused on urban areas with rural areas having only 10% of fibre coverage. The fibre and fixed broadband penetration by region is shown in Figure 1-11.

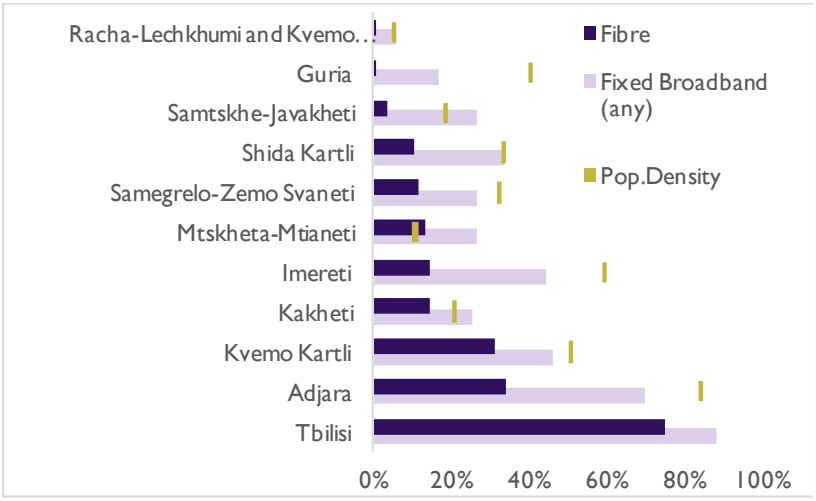


Figure 1-11 Internet penetration by region and type of broadband[11]

The capital city of Tbilisi is clearly better off in terms of both general fixed broadband penetration of 88% and fibre penetration of 75%.

Comparison to benchmarks

The urban/rural divide is reflected in the overall coverage of fixed broadband, which is low compared to benchmarks, as shown in Figure 1-12.

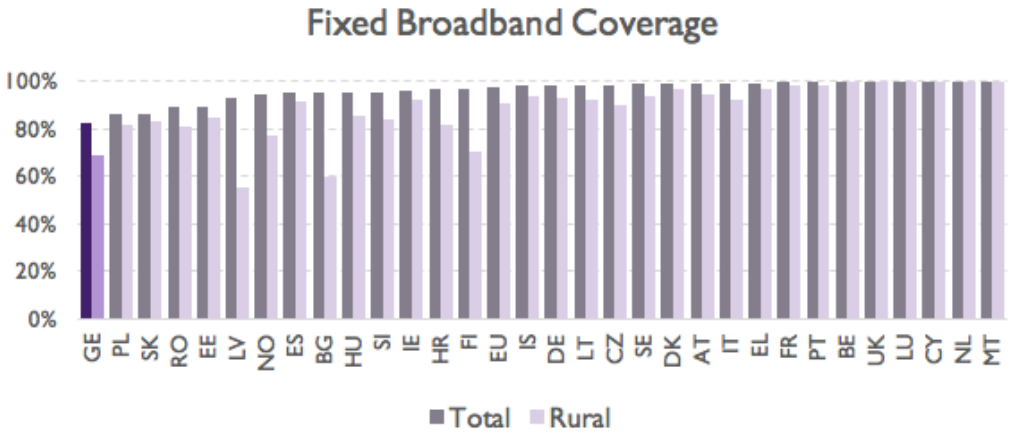


Figure 1-12 Fixed Broadband Coverage in EU and Georgia[12]

[11] Source: GNCC 4Q2016 (adjusted for error with Rustavi region not in Kvemo Kartli), Georgian Statistical Office.
[12] 2015 EU, 2016 Georgia, Source: IHS and VVA for EU data and company assumptions based on data from operators and GNCC for Georgia.

The analysis is based on fixed broadband coverage with any technology offering speeds over 1Mbps. Georgia has ~82% country coverage and only 69% of rural coverage, and is lacking behind the majority of European states.

The OpenNet project

As described in section 6.4 OpenNet is a non-entrepreneurial not for profit legal entity responsible for implementation of a State program on broadband infrastructure development in rural areas of Georgia. The aim of the program is to develop broadband infrastructure in order to improve access in areas where other operators will not invest commercially.

The program has two components:

a) A financial support component under which OpenNet will cover costs of interest of a loan that the beneficiary takes for the purpose of building a network covering non-commercial areas (known as 'white' areas) on condition that the network will be made available to other authorised persons via open access points; and
b) A broadband infrastructure rollout component under which OpenNet will be responsible for designing and building network infrastructure, planning and deploying the network, maintaining the infrastructure and the network and providing wholesale connectivity services via open access points.

However, the outcome of the OpenNet project is uncertain, i.e. it may not increase NGA coverage in rural areas significantly. The project will provide the backhaul infrastructure to open access points in rural areas, and in order to take full advantage of the initiative, action must be undertaken to build or upgrade the access networks in these areas. From the operator consultations, it is unclear if NGA broadband access networks will be built by operators in these 'white' areas.

Conclusion from analysis

Georgia has a strong urban/rural divide, which will only be partly tackled via the OpenNet project. Action is needed to take full advantage of the OpenNet investment, and drive out NGA coverage into areas beyond Tbilisi and the major cities.

3. Recommendations to address challenges

Defining national objectives for broadband availability

National objectives regarding broadband/NGA should be declared as a policy by the Government of Georgia; typically, this is done using a National Broadband Strategy (NBS) document. Such document should define specific NBS goals and targets, and stipulate roles and responsibilities of all stakeholders.

The EC's 2020 and 2025 NGA broadband targets are useful reference points, as are broadband universal service obligations (USO) targets being considered in other countries (which may provide lower speed targets for the most remote locations).

NGA Broadband goals for service quality, coverage and timeline are the cornerstone for the structure of measures that can be deployed in order to achieve those goals.

The OpenNet project

From the regulatory perspective, access to the OpenNet network under both the financial support component and the broadband infrastructure rollout component are planned to be provided under transparent non-discriminatory conditions and agreed wholesale tariffs.

It would be beneficial if OpenNet, when establishing the conditions, sets those conditions in cooperation with GNCC and make them public in the form of a reference offer. Any entity providing the wholesale access under both components should have the status of an authorised person in order to be under the supervision of GNCC, so GNCC have competence to include such authorised person (when deemed necessary) into market analysis and have the competence and authority in case of disputes arising in relation to the access provision.

When setting regulated access prices, it might be useful to consider putting in place a comprehensive costing model comprising of all potential access products that might be potentially imposed in the future on the basis of ex-ante market analysis where costs of access provided under both components of OpenNet project would be relatively easy to extract.

A significant role in the whole project will be played by authorised persons interested in rolling out local access networks throughout individual white areas, in which they will provide retail services to subscribers. Their interest in network rollout will depend on two main factors:

- conditions (including price) applicable to wholesale access products; and
- potential demand in the vicinity of the network access points.

Cooperation with utility companies when rolling out the networks under both components might yield positive effects in the form of cost savings for all participants involved.

We believe that following a Lithuanian example in both setup and operation of OpenNet would be beneficial for Georgia and is fit for current situation. See Annex 1 for more detailed info and recommendation steps.

Data gathering

GNCC should request operators' expansion plans, including threshold-based plans (e.g. targeting settlements with over 500 homes) and/or information provided to OpenNet. This will allow GNCC to better understand how the coverage of broadband infrastructure in rural areas will evolve over time, and how the market may reduce the current coverage gaps on a commercial basis.

GNCC should also request government plans to invest in the road and rail network (which could support deployment of backhaul connectivity). These plans should be shared with operators to allow them to coordinate any infrastructure build with the road investments to reduce rollout costs.

Viability modelling

GNCC should undertake modelling of the commercially viable limit of different broadband technologies, accounting for the specific characteristics of rural areas (e.g. availability of poles and ducts, deployment costs, ARPUs).

This will allow GNCC to determine a realistic approach for infrastructure deployment in rural areas, e.g. fibre, mix of fibre plus wireless, wireless only.

Promote alternative financing solutions

Government investment has an essential role in situations where operators will not invest commercially in broadband network deployment, as such investment would not provide sufficient return on the investment due to high investment costs compared to revenues

generated by potential subscribers. In such situations, the government can put in place co-financing schemes where investment costs are shared by government and private investors or government can bear all investment cost itself.

Other forms of investment encouragement might be provided as tax relief or direct subsidies provided by government or municipalities.

Form a rural task force

A rural task force[13] should be created, to engage with stakeholders and understand in detail the impact of practical deployment issues that were highlighted during operator consultations, such as lack of addresses, lack of electricity, mountainous terrain, local government objections, difficulty in obtaining permits, etc.

4. Expected outcomes

A targeted and substantiated case for requesting funds to support investment in rural areas, where operators cannot create a commercially viable business case.

1.5 The need for further demand (stimulation)

In this section, we discuss the need for further demand stimulation, including monitoring the effectiveness of competition measures and existing demand stimulation initiatives.

1. Socio-Economic impact of high speed broadband

Expanded access to high speed Internet generates major economic growth and rapid job creation. High speed connections accelerate business development by providing new opportunities for innovation, expansion, and e-commerce. Connected communities create wealth and opportunity by attracting businesses that want to locate in areas with a strong broadband presence.

Policy should avoid groups without digital access being left behind because of a lack of private sector operators to invest in passive broadband infrastructure. The socio-economic benefits that society can reap from ubiquitous broadband connectivity outweigh the costs. Hence, it makes economic sense, from a public policy perspective to intervene and build these networks in areas where the market will not deliver.

[13] See a similar initiative in Ireland, http://www.dccae.gov.ie/communications/en-ie/Broadband/Pages/Mobile-Phone-and-Broadband-Taskforce.aspx

2. Market context

Demand for broadband services in Georgia

We have compared the progress of take-up of fibre services in Georgia (in areas where fibre services are available) with the performance seen in European countries. This is shown in Figure 1-13.

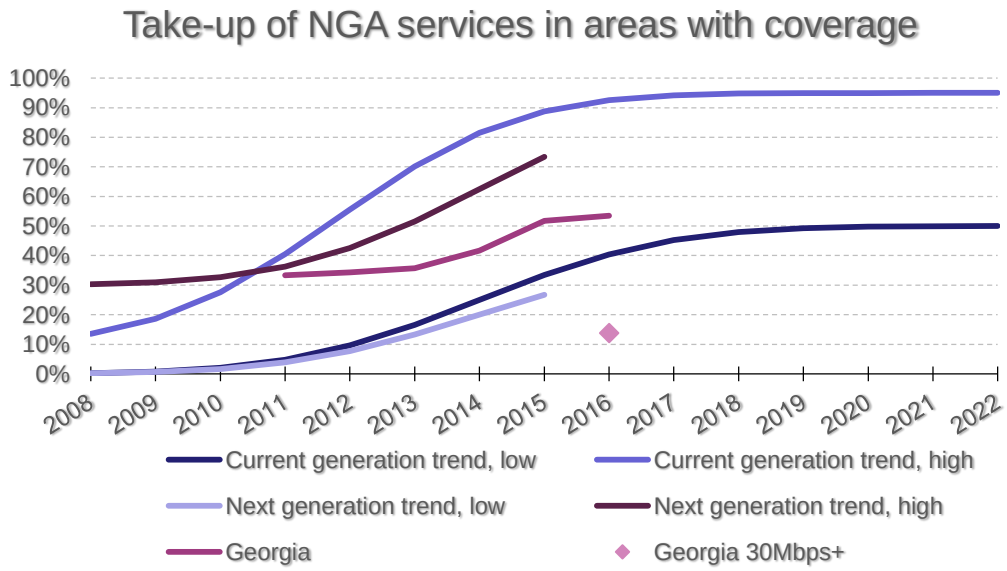


Figure 1-13 Benchmark of take-up of NGA services in covered areas[14]

We have compared the progress of Georgia with two trends from Europe:

- The take-up of current generation broadband in covered areas since launch in all European countries. The "high" and "low" trends are based on the max and min values seen in Europe and give a range in which demand can be expected to progress; and
- The take-up of next generation broadband in covered areas since launch in all European countries. The "high" and "low" trends are created and applied in the same way as current generation broadband.

The take-up of NGA services in covered areas in Georgia shows that, compared to European benchmarks, take-up was initially very high. However, over time, the trend has fallen back towards the middle of the benchmark range, which may indicate that further demand stimulation could be useful. In addition, higher prices of higher speed packages is contributing to most users having services with less than 30Mbps speeds despite having fibre services.

General barriers to broadband take-up in Georgia

Having proper regulation in place and high quality networks available to a wide population does not automatically lead to high broadband take up. There are many reasons behind low broadband demand and they should be properly analysed and tackled.

Among the potential reasons for low demand for NGA services are:

- availability of cheaper alternative solutions (WiFi, mobile); the shift from cheaper low quality solutions to more expensive solutions can be a challenge for individual

[14] Source: Grant Thornton and Analysys Mason

subscribers so requires a stimulus. It is possible that some subscribers will never switch as the cheaper solutions satisfy their needs;

- high retail price of an internet connection compared to disposable household income; in this case, demand can be stimulated by providing subsidies to predefined groups of subscribers upon their subscription to a broadband service. Conditions and qualification conditions should be communicated transparently. The stimulation schemes can be financed by authorised persons, government (either directly provided to subscribers or indirectly to authorised persons) or as a combination of both. It is important that such subsidies are not tied to a specific technology but are technology neutral to avoid discrimination;
- high price of terminal equipment; the most common demand stimulation tool in such situations is observed in the mobile market where mobile handsets are provided at a fraction of their market price if a subscriber signs a long-term contract for mobile services;
- lack of consumers' skills; in such situations, it should be both government and authorised persons' interest to provide sufficient guidance to end-users (both individuals and businesses) to improve their computer and/or internet skills and stimulate their interest into use of computers and/or internet;
- lack of consumers' awareness/interest; in some instances, mainly with elderly populations or populations located in remote areas consumers' awareness of benefits of internet use might be stimulated by campaigns disseminated via TV or radio broadcasting;
- demographic factors; there is a low probability that elderly population without any computer or internet skills will be interested in getting internet connection in any form.

The Broadband for Development project

The Broadband for Development (BfD) project, being overseen by the Georgia Innovation and Technology Agency (GITA), is providing a number of demand stimulation initiatives.

Some of the reasons for low broadband take-up stated above will be targeted by the BfD project. The initiative's intention is to encourage use of internet and computers by:

- providing vouchers to a group of households meeting the predefined criteria. The voucher recipients will be able to use those vouchers for purchase of a fixed internet connection with predefined quality. Only households registered in the social system (with low social score) and situated in rural regions will be eligible for vouchers. The number of vouchers will be limited
- Providing training on use of internet and computer to households and small and medium size enterprises (SMEs).

An initial pilot of the scheme with SMEs has witnessed encouraging outcomes for the participants. While the initiative's potential impact on increased use of computers and internet (in already covered areas) is undisputable its impact on network rollout to areas currently not covered by broadband networks is likely to be negligible.

3. Market challenges

Scope of the BfD project

The BfD project has a finite scope and funding. The BfD project is targeting the following end users:

- Support for 33,000 households (HH):
  - HH receive one day of basic IT skills training
  - HH must be outside of Tbilisi and a social service agency score <100,000 (c.GEL 300 income per month, c.150,000 households are eligible)

    - HH voucher includes GEL 150-200 for connection fee, and 10-20% cashback to acquire an eligible PC
- Support for 3,000 SMEs
    - SMEs trained in e-commerce, e-government and e-business (training value would be covered up to GEL 2,000)
    - SME training includes targets, e.g. set up a Facebook page (not just an account), and/or make five sales on a suitable e-commerce platform
    - SME voucher for max GEL 800 to finance 10-20% of IT costs (provided as a cashback incentive) and GEL 200 for internet access.

Although the end users are clearly targeted, the number of users involved means that the programme may not have a large impact on the overall take-up of NGA services in Georgia.

Operators are not engaged

We understand from our consultations with stakeholders that operators are not engaged in initiatives to boost demand. Operators are ideally placed to support such initiatives.

Conclusions from our analysis

Georgia is showing reasonable levels of NGA demand in covered areas, though additional demand stimulation would be useful to increase take-up, and ensure users are making full use of the high speeds NGA networks can offer.

4. Recommendations to address challenges

Assess expected outcomes of the BfD project

We recommend that GNCC benchmark the scale of each BfD initiative against similar initiatives from other countries. By looking at the scale and outcome of other initiatives, GNCC may be able to assess whether additional demand stimulation initiatives could be required in Georgia.

Encourage operators to engage

We recommend that GNCC encourages operators to engage in demand stimulation programmes. GNCC should highlight the benefits which will be generated for the operators themselves, including decreased investment risk, and increased returns.

Government services and subsidies

Implementation of incentives targeting end-user skills or deploying e-government services can be implemented any time, continuously and in case of e-government it should be implemented as soon as possible.

However, except for the existing state program on broadband infrastructure development in Georgia certain government initiated incentives should not be put in place unless a comprehensive analysis of their potential impact has been conducted. Ad hoc initiatives without the umbrella of a unifying digital strategy with clearly defined goals and KPIs can have mixed results.

For example, demand stimulation incentives provided in the form of a subsidy could strengthen the position of the biggest market players due to their extensive geographical coverage and ability to provide broadband connections to households that are not currently connected but are reachable by existing networks. Conversely, the introduction of incentives after authorised persons start to make use of regulated wholesale broadband products might create additional opportunity for expansion and help reach a 'critical mass' of subscribers.

Demand can be further stimulated by a range of tools and programs, from e-Government, e-Education, e-Business to supporting creation of co-working centres which not only attracts digital nomads who boost local economies, but can encourage, educate and support local talent in remote areas and have a generally positive impact on local communities.

More in depth description of possible initiatives for broadband development are described in caption 7.23 Other tools to promote the development of Broadband Services.

Monitor developments

We recommend that GNCC monitor the development of demand in covered areas to assess whether further demand initiatives are required (especially in rural areas).

Where demand for broadband services stagnates, and is far from its maximum potential level the reasons for such a situation should be analysed. Where appropriate, proper demand stimulation supported by government and/or service providers should be put in place.

5. Expected outcomes

Greater demand for broadband services in Georgia, adding value to the economy, and improving the business case for both private and public investments.

1.6 Other recommendations

1. Competencies

The following authorities/state agencies and their responsibilities relevant for development of broadband connectivity in Georgia have been identified in the course of our analysis.

Responsible/Competent Entity	*Responsibility/Competence*
Ministry of Economy and Sustainable Development of Georgia	- Approval of the amended Law and its submission for government approval - Proposal of national broadband strategy - Introduction of proper demand stimulating tools - Introduction of proper investment stimulating measures
Government of Georgia	- Approval of amended Law - Approval of demand stimulating tools - Approval of national broadband strategy - Approval of investment stimulating measures
OpenNet	- Implementation of the State program on broadband infrastructure development in Georgia
GNCC	- Execution of competencies and obligations stipulated by the Law

2. Time plan

GNCC should deal with the following essential milestones:

From the regulatory perspective, the crucial step is transposition of the EU regulatory framework into the Law of Georgia on Electronic Communications namely the part related to ex-ante market regulation.

Upon approval of the amended act, GNCC should issue an updated/revised methodology for ex-ante market regulation. In the meantime, GNCC should assess whether the market data currently collected for the purpose of market analysis will provide necessary inputs for the fulfilment of the procedure set by the updated methodology.

Once the methodology of ex-ante market regulation is issued, GNCC can officially identify markets susceptible to ex-ante regulation (either using markets defined by the European Commission or markets defined by GNCC on the basis of the methodology). GNCC should analyse competition in those markets and if the analysis proves existence of an authorised person/persons with significant market power, they should impose appropriate obligations on such authorised person/persons in order to remedy existing or potential market problems. The whole process might take at least six months depending on the accuracy of information provided by authorised persons.

When imposing obligations, GNCC should reflect the time the authorised persons with significant market power will need to put the obligations in place. Submission of a reference offer or implementation of accounting separation or cost based pricing might take six months.

Upon publication of a reference offer , competing authorised persons can start negotiations on access with the designated authorised person. Although it is not impossible it would be too ambitious to expect that negotiations start prior to publication of a reference offer.

It is reasonable to expect that during negotiations on reference offers, issues will be referred to GNCC and GNCC will have to initiate an administrative procedure to address these issues. When negotiations are successfully accomplished the competing authorised persons can start offering products to their end-users.

Based on the above-mentioned milestones it is expected that the whole process from initiation of market analysis to signing access agreements between competing authorised persons and authorised person with significant market power might take up to 18 months. See more detailed information in the timetable in Figure 1-14[15].

[15] Inidcative timings only. Numbers in days.

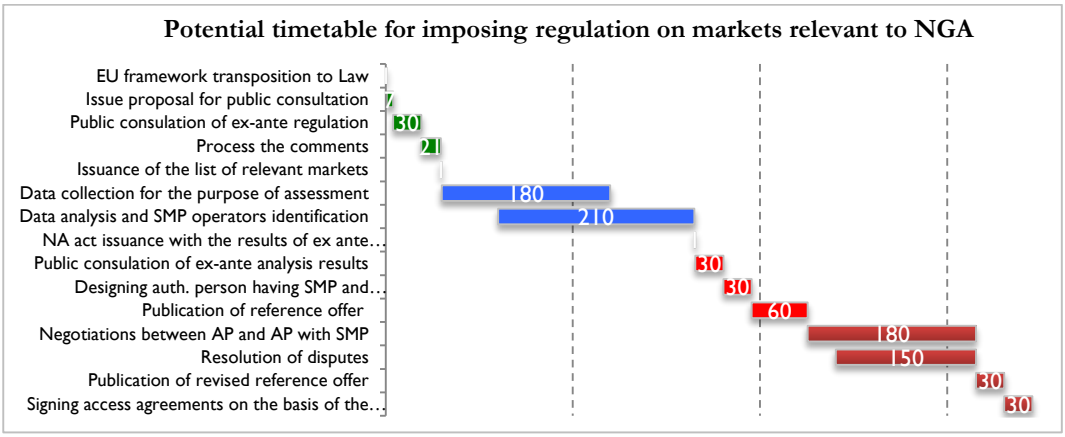


Figure 1-14 Potential timetable for imposing regulation on markets relevant to NGA

3. Key Performance Indicators to assess success

KPIs for assessing the success of a National Broadband Strategy should be declared by the Government of Georgia in an NBS document. This document should stipulate the specific KPIs and the roles and responsibilities of all stakeholders.

Key KPIs could include:

- NGA coverage
- NGA subscriber penetration
- % of households in the coverage of two or more broadband providers
- Proportion of high speed connections (30 Mbit/s and faster)
- Minimum download and upload speeds.

2 Introduction

This document has been elaborated as part of the project "Information Communication Technology Sector Development - Harmonisation of laws, regulation of next generation access and regulatory development" (hereinafter "the project") supported by the European Bank for Reconstruction and Development. The project consists of three components:

(i) Component I: Legislation covers harmonisation of Georgian ICT and audio-visual media legislative framework with that of the European Union;
(ii) Component II: Next Generation Access regulation covers proposal and adoption of a framework for regulation of Next Generation Access and
(iii) Component III: Regulatory development covers universal service and measures to reduce the cost of deploying high-speed electronic communications networks, radio spectrum, market analysis and mergers and acquisitions regulation.

The objective of the project is to provide support to Georgia National Communications Commission (hereinafter "GNCC") in the process of full harmonisation of the current EU acquis and implementation of proven EU practices, particularly in the area of the acceleration of roll-out of broadband internet connectivity. The objective of the project is to further harmonise the Georgian legal and regulatory framework for ICT with that of the EU, to use updated law and regulation as a basis for implementation of proven best practise methodology aimed at the acceleration of high-speed broadband roll-out across Georgia and to support the modernisation of regulatory practice based on the updated law.

This document contributes to the fulfilment of the Component II of the project related to the acceleration of high-speed broadband roll-out across Georgia. The objective of this document is to analyse current market situation and trends in broadband/Next Generation Access (hereinafter "NGA") in relation to future and existing regulation and to help to develop GNCC's regulatory strategy related to the broadband/NGA markets by defining set of recommendations and steps for regulatory approach to foster the positive trends and improve broadband/NGA coverage of Georgia by encouraging investment into modern broadband infrastructure, and establishing sustainable competitive environment in the field of the provision of broadband/NGA connection. This document provides summary of policy, legal and regulatory measures applied in the European union and analyses potential impact of their implementation in Georgia.

Information for this document has been sourced from the desktop research conducted by its authors, interviews with representatives of GNCC, interviews with representatives of the Ministry for Economy and Sustainable Development and interviews with representatives of telecom operators involved in the broadband/NGA network roll out and development.

2.1 Terms

ADSL - Asymmetrical Digital Subscriber Line

AP – Authorised Person

BEREC - Body of European Regulators for Electronic Communications

BfD – Broadband for Development Project

CATV – Cable TV

CMTS – Cable Modem Termination System

DSLAM – Digital Subscriber Line Access Multiplexer

FTTP – Fibre to the Building

FTTC – Fibre to the Curb

FTTH – Fibre to the Home

GNCC – Georgian National Communications Commission

HFC – Hybrid Fibre Coaxial Network

HH – Household - A household, is defined as a housekeeping unit or, operationally, as a social unit: having common arrangements; sharing household expenses or daily needs; in a shared common residence. A household includes either one person living alone or a group of people, not necessarily related, living at the same address with common housekeeping, i.e. sharing at least one meal per day or sharing a living or sitting room.

HHI - Herfindahl-Hirschman Index

ICT – Information and Communication Technology

KPI – Key Performance Indicators

NGA – Next Generation Access

NGC – Next Generation Core (network)

NGN – Next Generation Networks

NRA – National Regulatory Authority

PON – Passive Optical Network

SMP – Significant Market Power

UTP – Unshielded Twisted Pair

VDSL – Very High-Speed Digital Subscriber Line

2.2 Role of Broadband for Country Development

Development of information and communication technologies (ICT) has significant influence on technological progress and the development of society.

Provision of reliable high speed broadband infrastructure is crucial for future development of ICT, as well as spreading the positive impact across the country. Digital Agenda for Europe is charting a course to maximise the social and economic potential of ICT, most notably the internet, a vital medium of economic and societal activity: for doing business, working, playing, communicating and expressing ourselves freely. Successful delivery of high speed broadband will spur innovation, economic growth and improvements in daily life for both citizens and businesses. Wider deployment and more effective use of digital technologies will provide citizens with a better quality of life through, for example, better health care, safer and more efficient transport solutions, cleaner environment, new media opportunities and easier access to public services and cultural content. Following graphs demonstrate some of the key impacts of increased broadband speed and coverage:

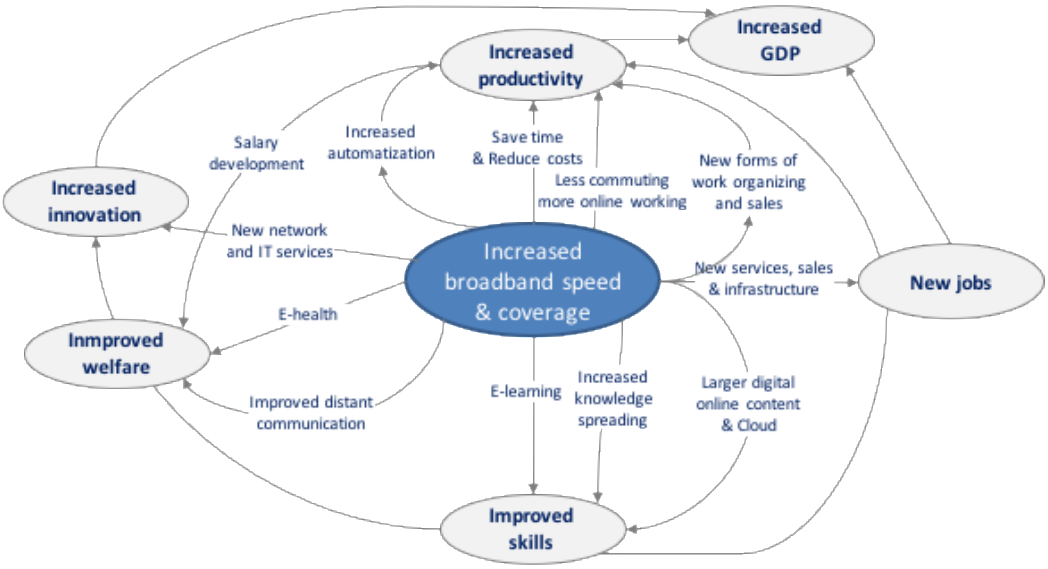


Figure 2-1 Socioeconomic web of NGA benefits

In the EU, the ICT sector was directly responsible for ~5% of European GDP, with a market value of € 850 billion annually in 2016[16], but it contributed far more to overall productivity growth (20% directly from the ICT sector and 30% from ICT investments). This is because of the high levels of dynamism and innovation inherent in the sector, and the enabling role the sector plays in changing how other sectors do business. At the same time, the social impact of ICT has become significant – for example, the fact that there are more than 400 million internet users[17] in Europe and virtually all Europeans own mobile phones has changed life style.

Access provision to high-speed and ultra-high speed Internet by means of NGA, as well as ICT in general, have a complex impact on the development of society, but its positive socio-economic influence could be seen in the following main trends:

[16] Source: Eurostat
[17] Source: InternetWorldStats

Economic Impacts

- on GDP growth
- on employment
- on productivity
- on business development
- on wages

Social Impacts

- on education
- on well-being and life quality
- on social inclusion
- on security

Need for speed

Actual speed of broadband services and of course no volume limitations are crucial to support all the positive impacts of the broadband mentioned above. Lack of demand for high speed is a favourite excuse from operators to offer subpar services when there are only marginal costs for true NGA offers (currently considered around 30-100Mbps). Yet the demand for high speed is tightly connected to content and services offer which require high speed - yet those are only offered (especially in localized versions) when there is already substantial high speed broadband penetration. High speed broadband is essential not only for content services, but for all the cloud and shared content and shared work services and for remote working which truly boost the country economy. It's important to keep in mind, that fixed broadband speed is shared by all the users and devices in the household.

However, it is important to stress out that national coverage and level of broadband penetration are way more beneficial for the economy and the society than the geographically limited high speed offers. For more detailed information regarding high speed broadband benefits read the EU Study: Socio-Economic Benefits of High Speed Broadband[18].

Need for government and regulatory support of new digital economy

An important part of the support of new digital economy is making sure that laws and regulations are aligned with needs and challenges. Mobile payments, shared economy like on-line apartment rentals, drive share and others are disruptive to the current settled market players, but are vital for the wealth distribution and give chances to participate on the benefits of the digital age to the wide masses of population. If Georgia would act fast and create legal and regulatory framework for digital economy it can attract new businesses and help to develop new business models. Estonia is a good example where proactive approach[19] and support through programs like SmartCap[20], programming lessons mandatory already in primary schools and relaxing the immigration rules to attract foreign talents to help startups lead to establishment of many successful start-ups (ie: Skype, TransferWise, Taxify, Bondora, etc.)

[18] http://europedirectpuglia.eu/files/Socio-economic-benefits-of-High-Speed-Broadband.pdf
[19] http://www.economist.com/blogs/schumpeter/2013/07/estonias-technology-cluster
[20] http://www.smartcap.ee/about/introduction

2.3 NGA Definition

1. Basic Definition

Next Generation Access Networks (NGA), are part of Next Generation Networks (NGN). Next Generation Networks consist of two main components:

- Next Generation Core Network (NGC) based on IP technology and
- Next Generation Access Network (NGA). As per the Commission Recommendation on regulated access to Next Generation Access Networks (2010/572/EU) **NGA means wired access networks** which consist **wholly or in part of optical elements** and which can deliver broadband access services with enhanced characteristics (such as higher throughput) as compared to those provided over already existing copper networks.

As per the EU Guidelines for the application of State aid rules in relation to the rapid deployment of broadband networks (2013/C 25/01) NGA networks are considered to have at least the following characteristics:

- reliably deliver services at very high speed (minimum of 30Mbps) to a subscriber with transmission close enough to the customer's premises, to ensure the actual delivery of very high speed;
- support many of advanced digital services, including converged all-IP services;
- have significantly higher speeds to upload files (compared to basic broadband networks).

In Georgia, if we speak about NGA networks, it's overwhelmingly fibre (FTTP or FTTB) with some VDSL mostly from Silknet. Cable networks are almost non-existent and due to quality of existing cable installations there is a little expectation that they might play any sizeable role in the future of NGA networks.

Technological infrastructure is distinguished by two basic characteristics to:

- **Passive infrastructure** involving physical elements that are required to build the fibre network. This includes the optical fibre, trenches, ducts and poles on which it is deployed, fibre enclosures, optical distribution frames, patch panels, splicing shelves and so on.
- **Active network** refers to the electronic network equipment needed to bring the passive infrastructure alive, as well as the operational support systems required to commercialize the fibre connectivity.

2. Types of NGA deployment

Depending on existing infrastructure NGA is deployed by modernisation or upgrade of existing infrastructure (Cable, FTTC) or by new build (FTTB, FTTH):

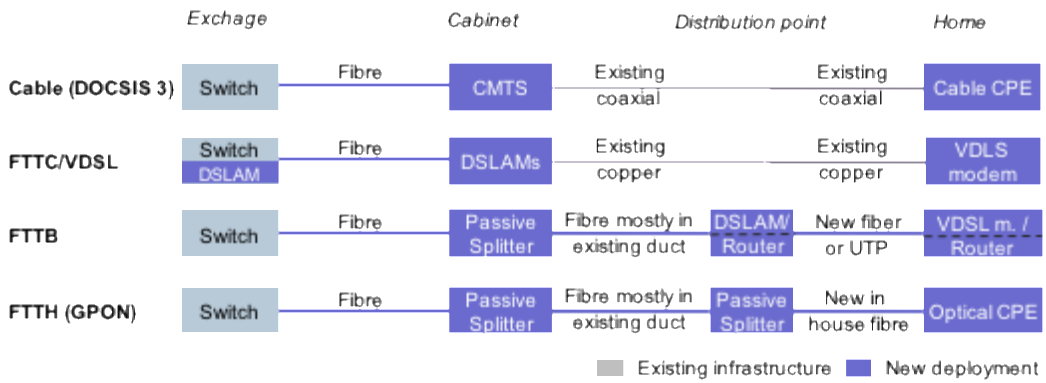


Figure 2-2 Overview of deployment of different types of NGA infrastructure

Depending on the demand and proportion and quality of existing copper infrastructure it is much cheaper to upgrade copper infrastructure and gradually replace it with fibre than deploy fibre to the premises. For a new deployment, the cost of copper and fibre deployment is equivalent, however fibre can deliver significantly higher speeds with lower operating costs, making the FTTH technology of choice.

Deployment cost levels for different NGA technologies

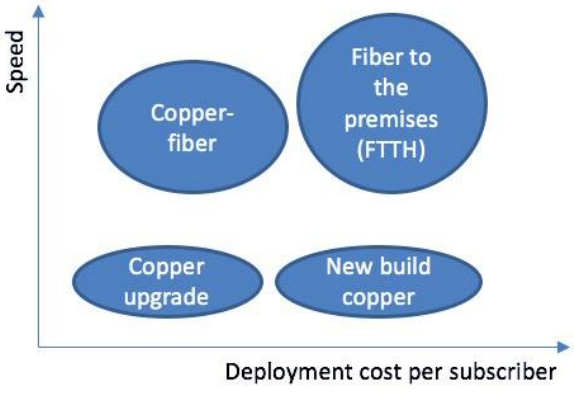


Figure 2-3 Deployment cost and speed of different NGA technologies[21]

Housing density impact on cost

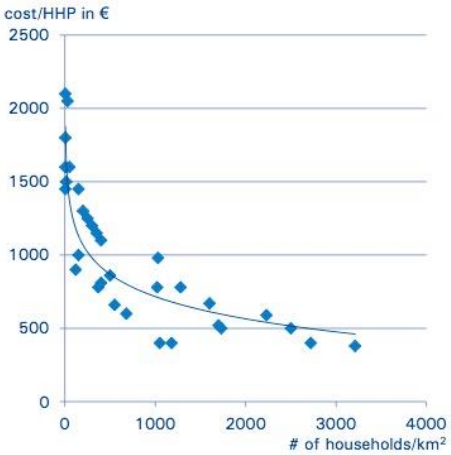


Figure 2-4 Housing density impact on NGA deployment cost[22]

Cost of deployment grows dramatically with lower housing density, creating "white spots" areas where deployment of NGA is economically unfeasible and some form of state subvention or obligation is necessary to cover these areas.

3. Hybrid Networks

Existing telephony (analogue or digital) or analogue cable TV networks are used for a "last

[2121] EU - FTTx Handbook 2015

[22] FTTH council – "The Cost of Meeting Europe's Network Needs", July 2012

mile access" and fibre is built only to a distribution point which connects users in the area.

The main disadvantages of this access network express the limited opportunities to implement two-way duplex video services (video telephony, video conferencing, etc.) and the small bandwidth of the twisted copper pairs the length of which could reach several kilometres. Other issue is the state and quality of either the copper pairs or cable networks as high speed data services are quite prone to interferences and require quite high quality cabling to be in place – what is unfortunately not the case in many areas in Georgia.

Hybrid Fibre – Coaxial Cable Networks (HFC)

Typically provided by the cable TV operators (CATV) which developed their infrastructure to such type of networks that allow two-way traffic. Currently the latest technology used for delivering the data over the coaxial cables is called DOCSIS 3.1. (There is an option to use VDSL which is described in following caption). First released in October 2013, and updated several times since, the DOCSIS 3.1 suite of specifications support capacities of at least 10 Gbit/s downstream and 1 Gbit/s upstream using 4096 QAM. It is important to note that those speeds are shared among all users in the area from the cable distribution point. The new specs do away with 6 MHz and 8 MHz wide channel spacing (what solve issue with different US and European channels) and instead use narrower (20 kHz to 50 kHz wide) orthogonal frequency-division multiplexing (OFDM) subcarriers; these can be bonded inside a block spectrum that could end up being about 200 MHz wide. DOCSIS 3.1 technology also includes some new energy management features that will help the cable industry reduce its energy usage, yet especially due to shared characteristic and necessity to deploy more HFC nodes if service rate increased it is still more demanding than fibre networks.
In February 2016 at the CableLabs Winter Conference, DOCSIS 3.1 Full Duplex was announced as an innovation project to improve DOCSIS 3.1 to use the full spectrum of the cable plant (0 MHz to ~1.2 GHz) at the same time in both upstream and downstream directions. This technology is proposed to enable multi-gigabit symmetrical services while remaining backwards compatible with DOCSIS 3.1.

There are several access options for allowing other operators to use the cable network. All are described in more detail in BEREC document "Wholesale Broadband Access via Cable "[23]. Following is an excerpt with the key information. The diagram below (Figure 2-5) illustrates a typical end-to-end network architecture for Internet access via a data over cable system. As can be seen there are a number of potential points of interconnect offering several access options.

CMTS Access

This can actually be accomplished in either one of two ways. An alternate operator may decide to actually co-locate CMTS equipment at the cable operator's headend and interface on the RF side to the HFC network. This is technically possible. However, CMTS-es for each operator would need to use distinct frequencies in both the upstream and downstream portions of the spectrum of the HFC network. While this may be simple to achieve in the downstream, upstream spectrum is very limited, so potentially this could only work in a limited fashion with a small number of third parties. Another way of potentially interconnecting at the CMTS is to handover at the network side, although no simple way of achieving this can be thought of presently.

Of course this type of solution almost echoes a "shared access" or "local loop unbundling" scenario. The alternative operator would either have to co-locate all other network devices required to provide service or would have to backhaul all traffic to their own network over

[23] Berec document: ERG (04) 19 rev1. Wholesale Broadband Access via Cable

leased lines or an optical backbone. This allows the new entrants the greatest degree of freedom in selection of network equipment, system parameters and service differentiation.

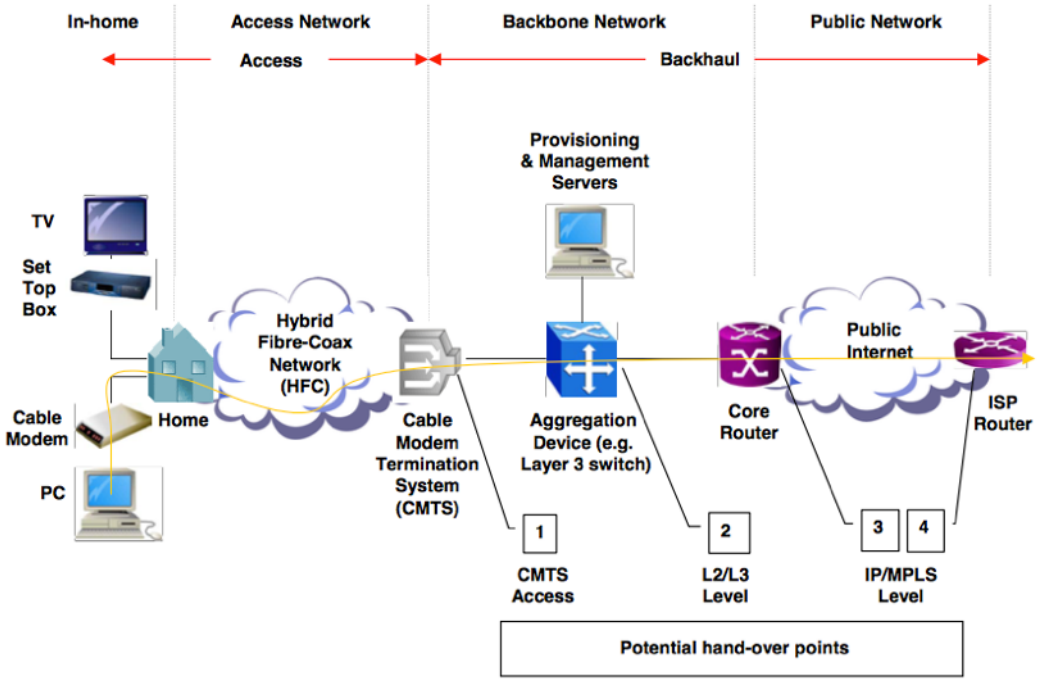


Figure 2-5 HFC network topology and potential hand-over points

Interconnection at the aggregation point

This would assume that the alternative operator or ISP would use the "incumbent" cable operator's access network but install via co-location equipment within the backbone network that would handle all customer traffic destine to, or originating, from that particular ISP's network. Use can be made of either the Layer 2 or Layer 3 solutions described previously for traffic segregation past the CMTS-es. This traffic segregation allows the new entrant to design its own service offerings. Once more, backhaul can be effected to the new entrant's own network at this stage. Alternatively OAM&P (Operations, Administration, Maintenance and Provisioning) servers can be installed within the incumbent's own network and managed remotely. This solution also gives the new entrant a significant amount of ability to differentiate its offerings from the incumbent.

Handing over at the service provider edge

This would imply using the incumbent cable operator's access and backbone's networks and management and provisioning servers. Due to the tunnelling facility described previously, a service level agreement can be contracted between the new entrant and the incumbent to ensure that the new entrant's service is guaranteed. Minimal service differentiation would be possible at this point apart from the type of upstream Internet connection that the new entrant decides to implement and any particular value-added services that can be implemented within their own networks.

Resale

Effectively here the new entrant is purchasing a wholesale broadband access product that includes ISP-services from the incumbent and can only "badge" it differently. This would not allow a new entrant to change any service parameters and can thus not be classified as

"bitstream" access.

Hybrid Fibre – Telephone (copper pair) Networks (VDSL/FTTN/FTTC)

Another way to implement hybrid networks is the use of VDSL (Very-high-bit-rate Digital Subscriber Line) technology.

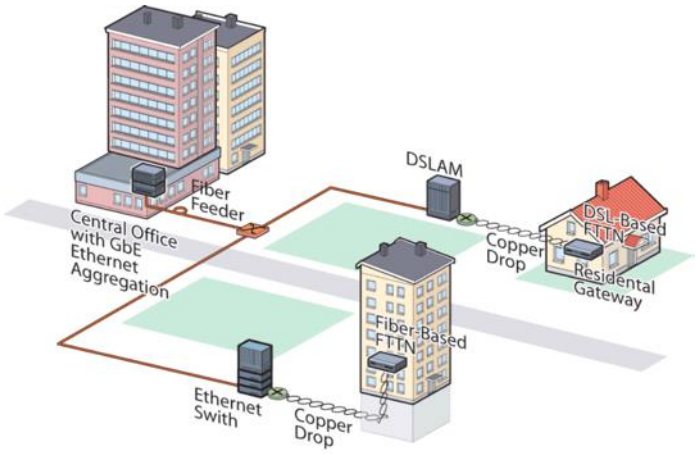


Figure 2-6 FTTN topology

VDSL is a type of DSL technologies which allows data transmission over copper pair at higher speeds - up to 52 Mbps downstream and 16 Mbps upstream when using a standard phone pair and 85 Mbps in both directions when using coaxial cable as a transmission medium. The technology is effective when the distributing module (DSLAM) is so positioned as to ensure short subscriber lines, e.g., when combined with an FTTC network architecture. The second generation VDSL2 permits the transmission of asymmetric and symmetric aggregate data rates up to 300+ Mbit/s downstream and upstream on twisted pairs using a bandwidth up to 35 MHz. It deteriorates quickly from a theoretical maximum of 350 Mbit/s at source to 100 Mbit/s at 0.5 km (1,600 ft) and 50 Mbit/s at 1 km (3,300 ft), but degrades at a much slower rate from there, and outperforms VDSL. Starting from 1.6 km (1 mi) its performance is equal to ADSL2+.

The latest generation of this type of technology VDSL2-Vectoring which is a transmission method that employs the coordination of line signals for reduction of crosstalk levels and improvement of performance. It is based on the concept of noise cancellation, much like noise-cancelling headphones.

Although technically feasible, at the moment vectoring is incompatible with local-loop unbundling but future standard amendments could bring a solution.

Version	Standard name	Common name	Downstream rate ⬍	Upstream rate ⬍	Approved on ⬍
VDSL	ITU G.993.1	VDSL	55 Mbit/s	3 Mbit/s	2001-11-29
VDSL2	ITU G.993.2	VDSL2	100 Mbit/s	100 Mbit/s	2006-02-17
VDSL2	ITU G.993.2 Amendment 1 (11/15)	VDSL2 Annex Q VPlus/35b	300 Mbit/s	100 Mbit/s	2015-11-06

Figure 2-7 VDSL standards and speeds

Access options

In the traditional metallic cables environment the access has two basic forms:

- access to the unbundled local loop and
- bitstream access.

Access to the unbundled local loop has been provided in the MDF (Main Distribution Frame) of a regulated operator and therefore requires high level of investment of an alternative operator. An alternative operator needs to build its network up to an MDF of a regulated operator.

Bitstream access consists of access to local loop and access to regulated operator's backhaul service. The backhaul service replaces an alternative operator's own network and provides this operator with the opportunity to offer its own broadband retail service to some extent different from the service offered by a regulated operator. The level of alternative operator's ability to differentiate its service depends on where in a regulated operator's network is bitstream access provided. The bitstream access can be provided either at the DSLAM level or at the ATM level.

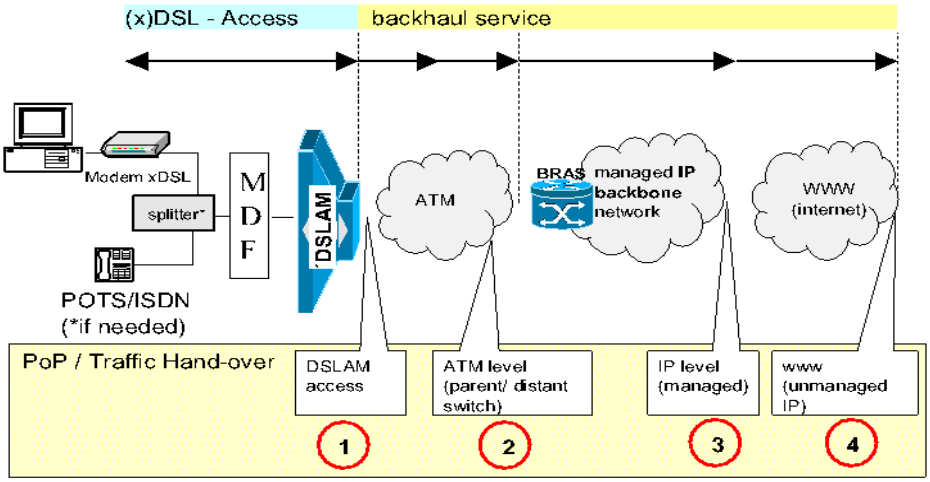


Figure 2-8 Bitstream access options[24]

Access to unbundled local loop and bitstream access are not substitutes but rather complementary wholesale products.

As a consequence of partial replacement of metallic cables in the access network with fibre the existing local loops become shorter than local loops in the past. This leads to a situation where an alternative operator in order to achieve advantages of the local loop access product needs to extend its own network closer to the distribution point to be able to connect to the local loop (sub-loop). Such extension could have a form of an access product provided by a regulated operator (backhaul connection), access product provided by other alternative operator (based on regulated operator's backhaul connection or alternative operator's own backhaul infrastructure) or an extension of alternative operator's own network. For an alternative operator to be able to build its own backhaul network an access to regulated operator's passive infrastructure such as ducts is necessary.

[24] Bitstream access - ERG Consultation Document, July 14th 2003

With deployment of vectoring (and other acceleration techniques) the option of the access to the local loop becomes problematic as the quality of the service provided via vectoring decreases when parallel access to the copper loop is provided at the street cabinet. In cases where demand for sub-loop unbundling (SLU) is very low and its imposition leads to a degradation of retail service quality NRAs may decide to withdraw an obligation to provide SLU and replace such obligation with an obligation to provide non-physical wholesale access with functionalities similar to SLU. However, NRAs shall take into account future technological developments leading to possibility to provide access to SLU with vectoring in place.

Bitstream access remains a valid option in the case of upgraded metallic cables.

Fibre Access Networks FTTP (FTTB, FTTH)

In this type of networks the optical fibre, from the main network node, reaches directly to the end user's home. FTTP (Fibre to the Premises) is the general name of architectures in which optical cables reach the premises where customers are located. Depending on the final point of terminating fibre cables, the architecture is divided into FTTB or FTTH.

FTTB – Fibre to the Building

In FTTB (Fibre to the Building) the optic cable is terminated in a common premises (or basement) of the building, while for distribution of signals to the end users in the building different transmission medium (usually UTP cable, copper pair or wireless connection) is used. Actually, FTTB is a hybrid solution in which the ultimate connection between the hub and the end user is based on copper cable with improved transmission characteristics (structured cabling systems). From this perspective, FTTB access networks have characteristics similar to those of FTTC with VDSL2 technology. Unlike solutions for point-to-point connectivity, here the fibre connection from the optical distribution cabinet to the building will be used by many users, whereby the optical connection can be seen as a backbone of the access network.

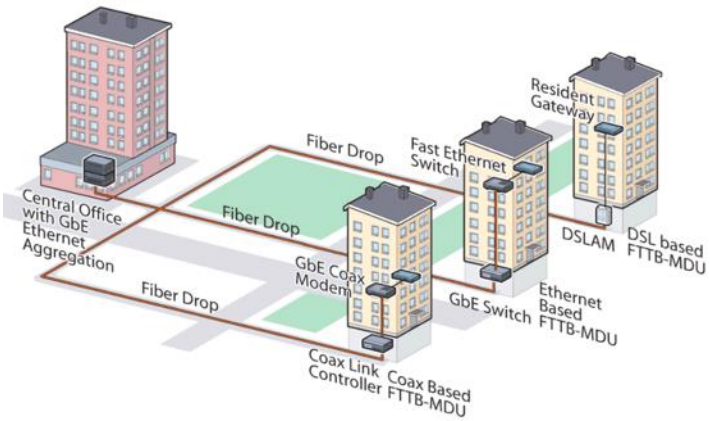


Figure 2-9 FTTB optional implementations

FTTH – Fibre to the Home

In FTTH (Fibre-to-the-Home), termination of optical fibre cables is made in the premises of the client. FTTH is a fully optical solution, based on the deployment of fibre-optic cables along the entire route - from the optical distribution cabinet in the local exchange (main node) to the home or office, with the ability to reach speeds of several Gbit/s per subscriber in both directions.

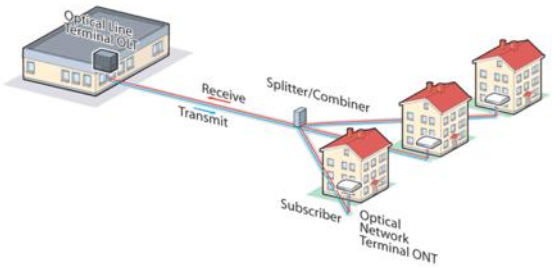


Figure 2-10 FTTH topology

The main difference between FTTB and FTTH is that the first optical infrastructure is developed to a certain optical distribution cabinet or a shared optical network device, i.e. it is used by many households. The inside household infrastructure is realised on UTP Ethernet or on copper pairs xDSL solution similar to FTTC. However, FTTB and FTTH are often regarded as one and the same scenario, since they are similar in terms of throughput and prices.

Access options

Access options depend on the network topology.

In case of Point to Point technology every subscriber is connected via dedicated fibre connection. Such technology is equivalent to the local loop unbundling. Physical access to fibre loop can therefore be imposed on a regulated operator. Ability of alternative operators to use such access products depends on their ability to roll out their network up to the ODF (Optical Distribution Frame) of a regulated operator.

In case of Passive Optical Network (PON) which uses Point to Multipoint technology single optical fibre connects ODF with passive splitter. Every subscriber is connected via dedicated fibre connection running from passive splitter to customer's termination point. In this case physical access can be imposed only to the fibre connecting customer's termination point with passive splitter. PON technology at its current phase does not allow to impose commercially viable physical unbundled access. However, future imposition of such wholesale product depends on the development of a technology such as Wavelength Division Multiplexing (WDM). By that time imposing non-physical or virtual network access remains the most appropriate access obligation imposed on a regulated operator. Such virtual access shall be functionally equivalent to metallic loop unbundling.

4. Wireless Solutions

Taking into account the fact that broadband/NGA related regulation in EU countries and the two EC recommendations (Commission recommendation of 20 September 2010 on regulated access to Next Generation Access Networks (NGA) (2010/572/EU) and Commission recommendation of 11 September 2013 on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment (2013/466/EU)) apply to fixed broadband/NGA networks, NGA networks covered by this document are wired access networks as defined by Commission recommendation of 20 September 2010 on regulated access to Next Generation Access Networks.

3 Background

3.1 Country Overview

1. Population

Georgia covers a territory of 69,700 square kilometres (26,911 sq mi), and its 2015 population was about 3.75 million. Georgia is divided into 9 regions, 1 city, and 2 autonomous republics. These in turn are subdivided into 64 districts and 12 self-governing cities.

Figure 3-1 Regions of Georgia

Region	Population	Households	Pop/km²
Tbilisi	1,108,717	313,576	1,540
Imereti	533,906	145,760	82
Kvemo Kartli	423,986	106,381	70
Adjara	333,953	70,501	116
Samegrelo-Zemo Svaneti	330,761	118,045	44
Kakheti	318,583	115,644	28
Shida Kartli	300,382	90,775	52
Samtskhe-Javakheti	160,504	58,895	25
Guria	113,350	40,623	56
Mtskheta-Mtianeti	94,573	30,463	14
Racha-Lechkhumi and Kvemo Svaneti	32,089	14,481	6
Grand Total	**3,750,804**	**1,105,144**	

2. Economy

Georgia's strongly growing economy was hit by 2008 conflict with Russia, and sunk to negative 3.7% GDP growth in 2009 as foreign direct investment and workers' remittances declined in the wake of the global financial crisis. The economy rebounded in 2010-13, but FDI inflows have not recovered fully. Last four years have been marked by declining economic growth in the region due to the ongoing conflict in eastern Ukraine, the international sanctions imposed on the Russian economy and falling global commodity prices. The economies of Ukraine and Russia were particularly affected, and their problems were transmitted to other countries in the region, including Georgia. These circumstances, along with the conflict in Syria, all led to a deterioration of global expectations, which increased depreciation pressure on local currencies and stoked inflation. Georgia's economy lost steam in Q3 2016 as weak exports dampened momentum. Despite the slowdown, the economy is holding up well in the face of strong headwinds such as Russia's recession and low prices for commodities. The economy's resilience was underlined by the International Monetary Fund following a staff visit in November 2016, but it also highlighted the need for structural reforms and infrastructure investment. In the political arena, Prime Minister Giorgi Kvirikashvili presented his new cabinet in November 2016, which is largely unchanged from the previous one, when the ruling Georgian Dream party retained its majority.

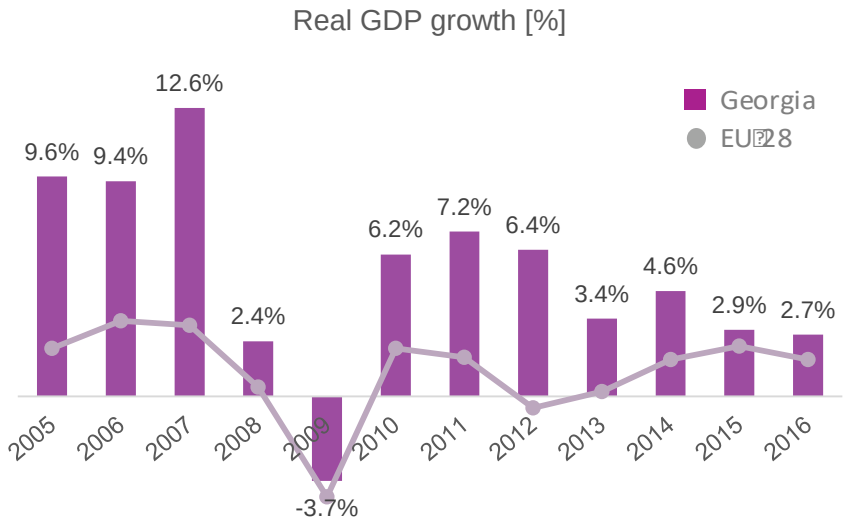


Figure 3-2 Real GDP growth in Georgia vs EU28[25]

GDP per capita by regions

As expected GDP per capita[26] is highest in capital city of Tbilisi standing at ~11,000 GEL (~4.500 USD) with rest of the country varying from 4-6,000 GEL with regions next to Black Sea (Adjare, Guria and Samegrelo-Zemo Svaneti) having the highest GDP per capita after Tbilisi.[27]

[25] Source: National Statistics Office of Georgia
[26] Source: National Statistics Office of Georgia
[27] Regions of Mtskheta-Mtianeti and Racha-Lekchumi and Kvemo Svaneti are not reported separately.

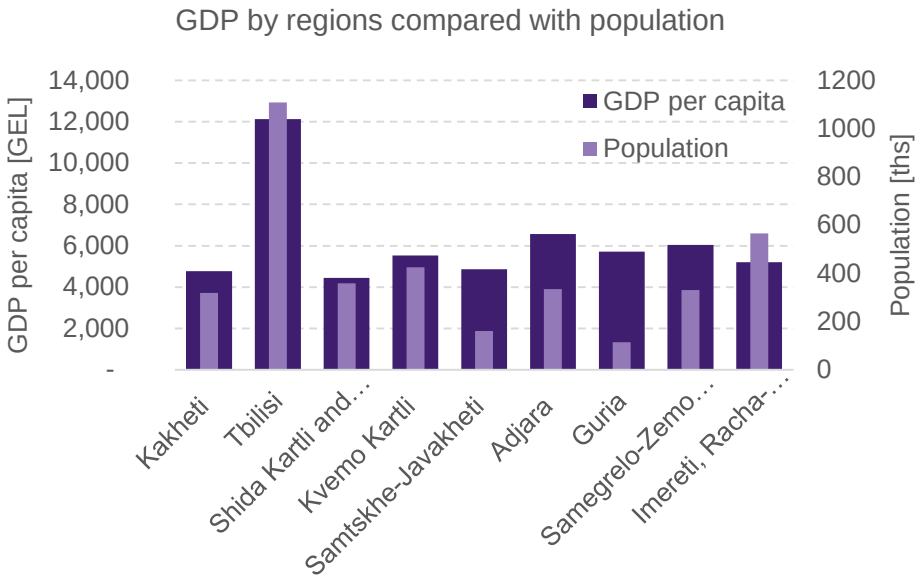


Figure 3-3 Regional GDP per capita compared to population levels

GDP growth forecast

Georgia's economic performance is set to improve in 2017, thanks to the country's improving business climate, increased public expenditure and abating regional headwinds. The Focus Economics panel sees the economy expanding to 3.1% this year and 4.1% in 2017. IMF expects the economic activity to increase up to 4% in 2017 as they assume an increase in public and private investments. National Bank of Georgia projects[28] the most optimistic 4.5% for 2017 growing ever so slightly to 4.9% in 2018.

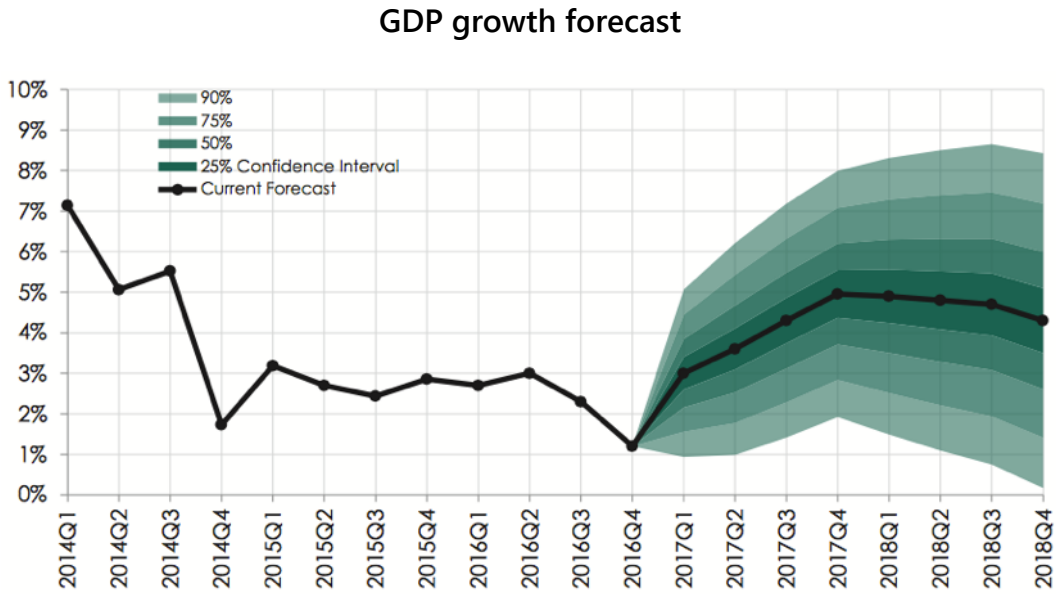


Figure 3-4 GDP forecast of National Bank of Georgia

[28] Source: National Bank of Georgia – February 2017 report

Inflation rate

Inflation Rate in Georgia averaged 7.57% from 1996 until 2016, reaching an all-time high of 59.31% in April of 1996 and a record low of -3.30% in May of 2012. In 2016 the inflation was low at only 1.8% well below the target[29] of National Bank of Georgia, which targets 5% level for the 2016, 4% for 2017, and for 2018 the inflation target will decrease to 3%.

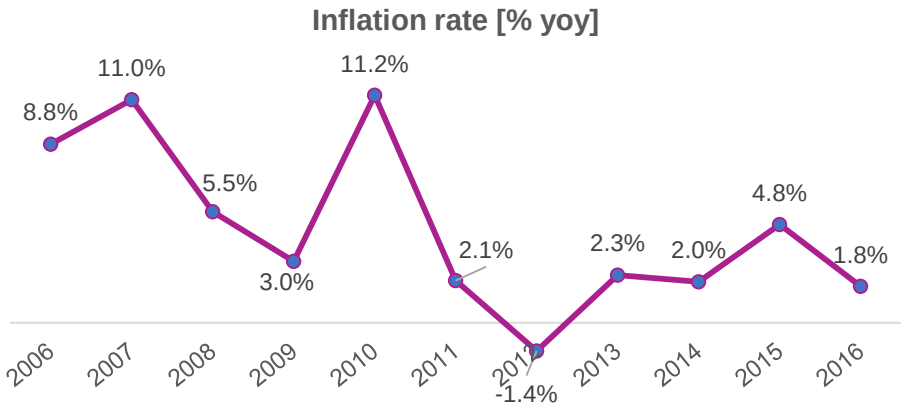


Figure 3-5 Historical CPI rates

Inflation rate forecast

National Bank of Georgia forecasts that given the effects of increased excise tax rate and exchange rate depreciation, the inflation will temporarily increase above its target in 2017. In particular, the global strengthening of the US dollar and the depreciation of the Turkish lira continue to influence the value of the Georgian lari. However, inflationary pressure will be constrained by weak aggregate demand and, provided that the impact on inflationary pressures is temporary, the National Bank expects the inflation rate to reach the target in the medium term. Based on the NBG's estimates, the inflation rate will fall below the target in 2018. Nevertheless, inflation will subsequently gradually increase and reach the target in the medium term.

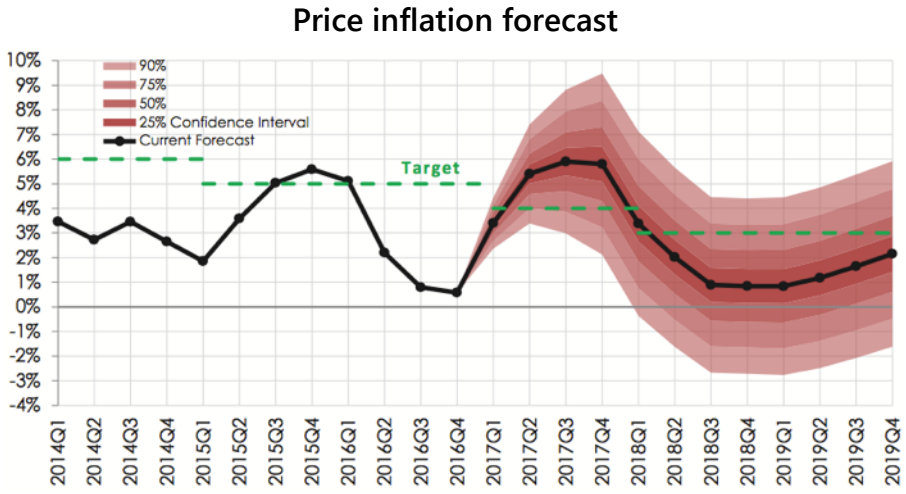


Figure 3-6 Headline CPI rate forecast of National Bank of Georgia

[29] Source: National Bank of Georgia

Average monthly wages

Average monthly wages are growing with healthy rate of 11.7% in nominal prices, or 9.5% in EUR, yet current average monthly salary of €357 it is still well behind of €1508 average monthly salary in the EU, yet closing the gap to Bulgaria with €382, Romania with €463 or Lithuania with €585 of average monthly salary[30].

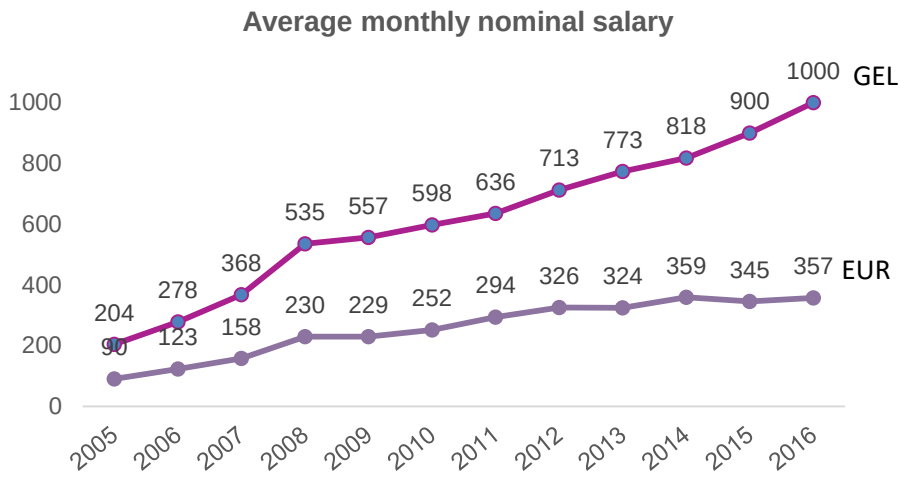


Figure 3-7 Average monthly nominal wage in GEL and EUR equivalent

Unemployment rate

Unemployment rate[31] in Georgia hit the lowest levels of 12% in 2015 after it reached all time high of 16.8% in 2009 when the country was in recession. Despite the unemployment rate is on high levels, it is relatively close to the average EU levels with a tendency to close the gap yet Georgia is still on par with countries like Italy or Portugal and lagging behind Lithuania, Bulgaria or Latvia.

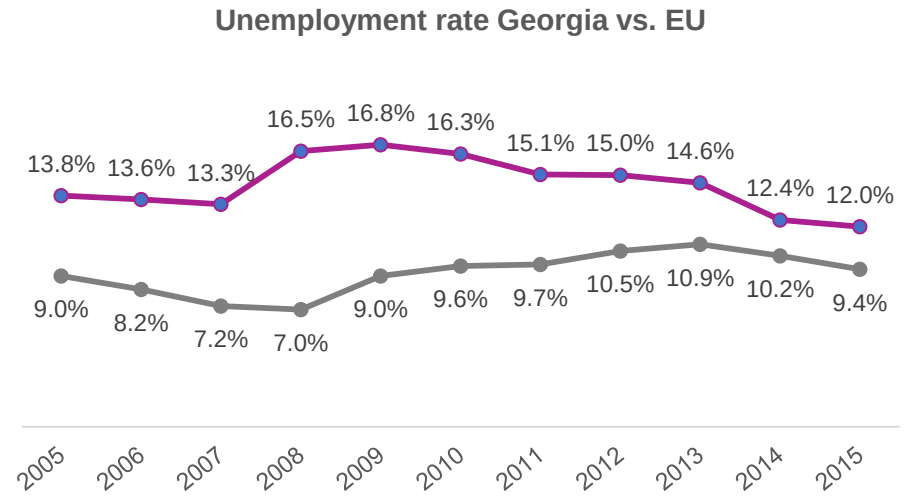


Figure 3-8 Unemployment rate comparison for Georgia and EU28

[30] Sources: National Statistics Office of Georgia, https://www.reinisfischer.com/average-salary-european-union-2016
[31] Source: National Statistics Office of Georgia (data available only till 2015)

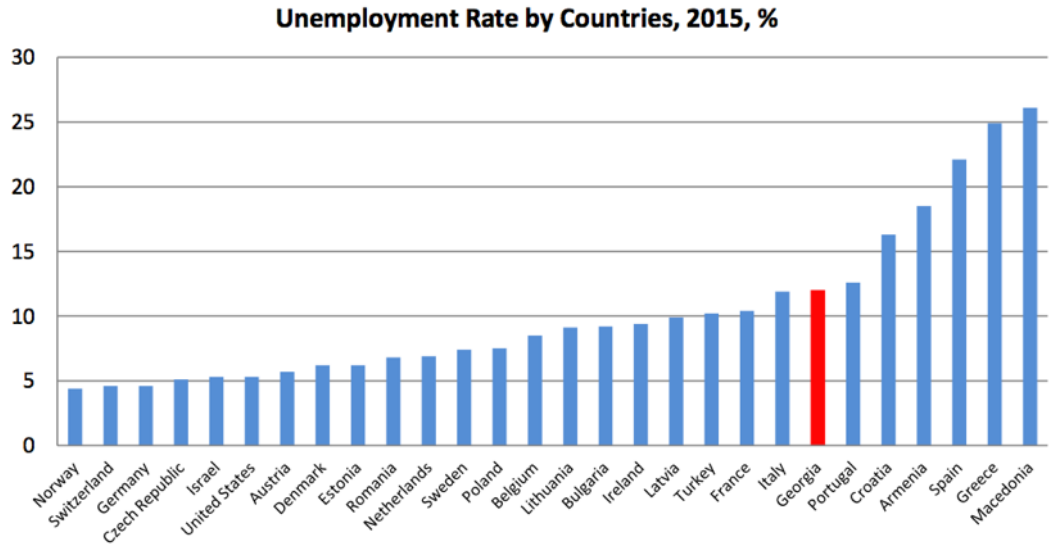


Figure 3-9 Unemployment Rate by Countries in 2015[32]

Exchange rate

Exchange rate was stable for many years around 2.3 GEL per 1 EUR, yet recently lari depreciated to its lowest levels hitting all time low of 2.93 GEL/EUR and 2.82 GEL/USD in January 2017 despite recent direct market interventions by the National Bank of Georgia, who considers the exchange rate is worse than fundamental factors and rational expectations would suggest. Exchange rate partially stabilised in the 1Q 2017 to 2.7 GEL/EUR and 2.4 GEL/USD respectively. National Bank is dedicated to limit the fluctuations either by further interventions or by tightening the monetary policy. Lari depreciation possess high risk to country economy as lot of debts are denominated in US dollars. Government introduced several initiatives including covering spread of 0.20 for personal loans issued before January 2015 by converting them to GEL through the Larization Program. Also from January 2017 all loans up to 100.000 GEL (and up to 200.000 GEL from 2018) have to be issued only in national currency which should further stabilise the economy.

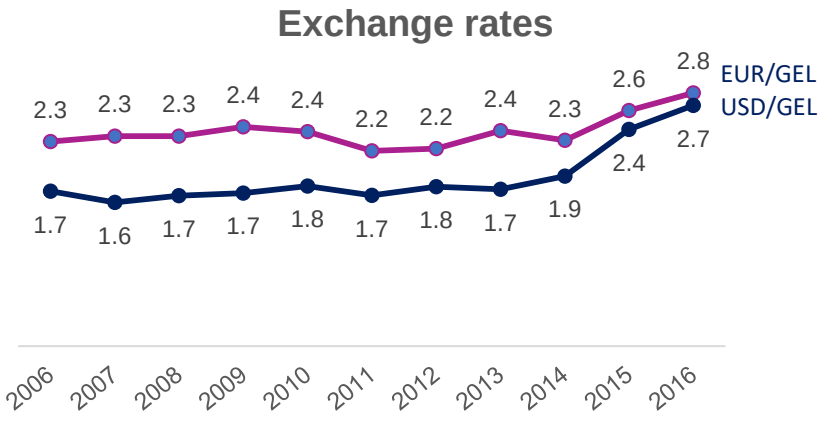


Figure 3-10 Lari's exchange rate with EUR and USD

[32] Source: 2015 Annual report from National Statistical Office of Georgia

3.2 Broadband

1. Key Fixed Broadband Players

MagtiCom

MagtiCom is owned by the USA companies: International Telcell Cellular LLC and Telcell Wireless LLC.

MagtiCom, Ltd was set up on February 12, 1996 as an operator of mobile communications and commenced its commercial activities in September 1997, in 2016 it purchased the second largest fixed broadband operator Caucasus Online and later in the year also another fixed operator Deltacom which made MagtiCom the second largest fixed broadband operator in the country closely following his key competitor Silknet.

MagtiCom currently provides full set of telecommunication services including fixed and mobile telephony and internet services together with satellite and IPTV services.

Based on former footprint of Caucasus Online and Deltacom, MagtiCom provides it's fibre services in the most of Georgia's regions covering: Tbilisi, Samegrelo-Zemo Svaneti (Zugdidi, Foti, Senaki), Shida Kartli (Rustavi, Gori, Kaspi, Kareli), Adjara (Batumi), Kakheti (Akhmeta, Telavi, Lagodekhi, Kvareli, Sagarejo, Sighnaghi, Gurjaani), Kvemo Kartli (Bolnisi, Tetri, Marneuli, Gardabani), Mtskheta-Mtianeti (Mtsketa, Dusheti, Tianeti), Samtskhe-Javakheti (Akaltsikhe, Borjomi, Adigeni) covering approximately ~40%[33] of Georgia's households with it's Fibre to the Building and Fibre to the Home services. In terms of fibre coverage and number of subscribers MagtiCom is currently the largest NGA operator.

Fibre offers start at 27 GEL/month for 10 Mbps unlimited service or for 43 GEL for bundle with IPTV (although minimum combination of IPTV & fibre is available for 36 GEL (27+9) per month. Average ARPU of 26 GEL for fibre Internet Service indicates that majority of users are opting for the cheapest and slowest offer of 10 Mbps.

MagtiCom Fibre Offers and pricing structure[34]

Figure 3-11 Magticom Fibre Optic Offers

[33] Including Deltacom subscribers. Sources: Information from Operators, GT estimate based on GNCC subscribers numbers.
[34] Source: MagtiCom web pages. Offers valid for Tbilisi, offers in region are in nearly the same price levels, with missing 100Mbit option.

Silknet

Silknet has been established in its current form in 2010, when the JSC "United Telecom" (former fixed line incumbent), the "Vanex" and "Adjara Electric" merged.

Silknet provides full range of communications services throughout the country mobile and fixed telephony, mobile and fixed internet services and IPTV over fibre or DSL.

Silknet is the largest fixed broadband operator providing both xDSL and fibre internet access with fibre gradually replacing the copper lines.

Silknet fibre coverage include Tbilisi, Adjara (Batumi, Kobuleti), Imereti (Kutasi, Zestafoni), Kakheti (Gurjaani, Telavi, Lagodekhi), Samegrelo-Zemo Svaneti (Zugdidi, Foti), Shida Kartli (Gori, Khasuri) and Kvemo Kartli (Rustavi) covering circa 31% of Georgia's population. On top of fibre coverage, Silknet also covers Samtske-Javakheti with its xDSL service.

Fibre offers start at 26 GEL/month for 10 Mbps unlimited service or for 35 GEL for bundle with IPTV. Average ARPU of 26 GEL for fibre Internet Service indicates that majority of users are opting for the cheapest and slowest offer of 10 Mbps. Pricing structure, ARPU and service bundling is almost identical to MagtiCom.

Silknet Fibre Offers and pricing structure[35]

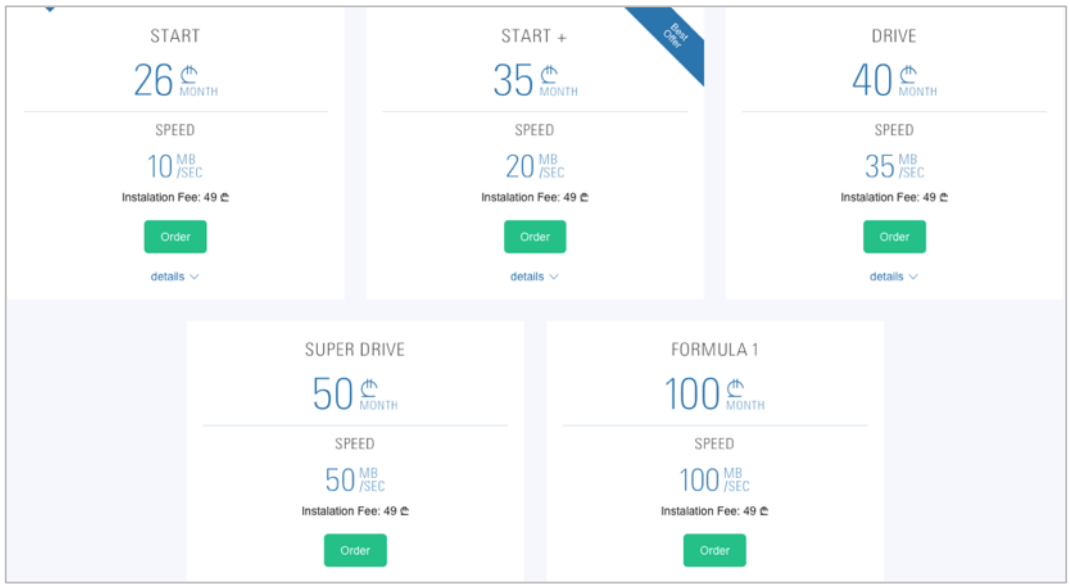


Figure 3-12 Silknet Fibre Optic Offers

[35] Source: Silknet web pages.

Akhali Kselebi - NewNet

Akhali Kselebi Ltd (in English New Net) was founded in August 2, 1996 and is one of the largest fixed telephony providers providing fixed telephony, Internet (both xDSL and fibre), IP-TV and IP-telephony services.

Akhali Kselebi is a member of (T&T Group) consisting of the following companies:

- CGC Ltd
- Akhtel Ltd
- System Net Ltd
- Foptnet Ltd
- GTC Ltd
- Iveria Net Ltd
- Sanapiro Ltd

CGC and Akhali Kselebi brands are the biggest fixed internet providers with Akhali Kselebi accounting for 63% of the 84 ths total subscribers and 46% of 61 ths fibre subscribers, while CGC has 32% of total subscribers and 37% of fibre subscribers.

CGC operates only in Kvemo Kartli (Rustavi, Gardabani).

Akhali Kselebi Operates in Tbilisi, Samegrelo-Zemo Svaneti (Poti), Imereti (Kutaisi), Shida Kartli (Gori) and Imereti (Zestaponi, Terjola).

Both Akhali Kselebi and CGC entry offers start at 20 Mbps for 22 Gel per month with similar per Mbps pricing for other tariffs.

Akhali Kselebi and CGC Fibre Offers and pricing structure[36]

Optic	Speed	Tariff	+ WiFi *
Minimal	20 Mbps	22 Gel	32 Gel
Standard	28 Mbps	32 Gel	42 Gel
Standard +	40 Mbps	39 Gel	49 Gel
Premium	50 Mbps	49 Gel	59 Gel
Premium +	70 Mbps	69 Gel	79 Gel
Business	100 Mbps	99 Gel	109 Gel

Figure 3-13 Akhali Kselebi Fibre Offers

Optic	Speed	Tariff	Web
Exclusive	20 Mb/s	22 Gel	100 MB
Standard	30 Mb/s	39 Gel	300 MB
Premium	50 Mb/s	49 Gel	500 MB
Business	60 Mb/s	79 Gel	1000 MB

Figure 3-14 CGC Fibre Offers

[36] Source: Akhali Kselebi and CGC web pages.

2. Basic Indicators

Market Shares

After recent acquisitions Magticom - currently also with Delta Net has 30% and Silknet has 37% subscribers' market share. Together they dominate the fixed broadband market. New Net (T&T) group companies is third with 11% combined market share. Majority of other operators do not control more than 1% of the market. These small players are also more a complementary to the market leaders than a competition as they successfully serve only underserved areas out of focus of the market leaders. In Tbilisi where fibre coverage from the top 2 players is the largest the Wi-Fi players serve only 2.3% subscribers.

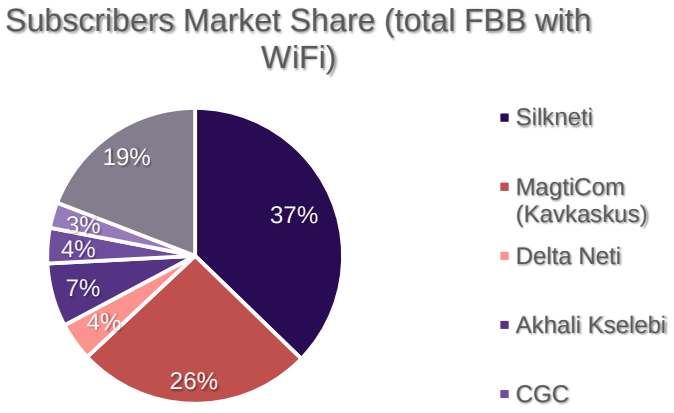


Figure 3-15 Subscribers Market share[37] xDSL,Fibre and WiFi

xDSL & Fibre Subscriber's Shares

Focusing only on "NGA prospective" fixed broadband market on xDSL and fibre technologies, Silknet holds 43% of subscribers' market share and MagtiCom holds 35% share including recent purchase of Delta Net. Together the two players control 78% of the fixed broadband market. New Net group of Akhali Kselebi, CGC and Akhteli holds together 16% with only 6% shared among the rest of the market players.

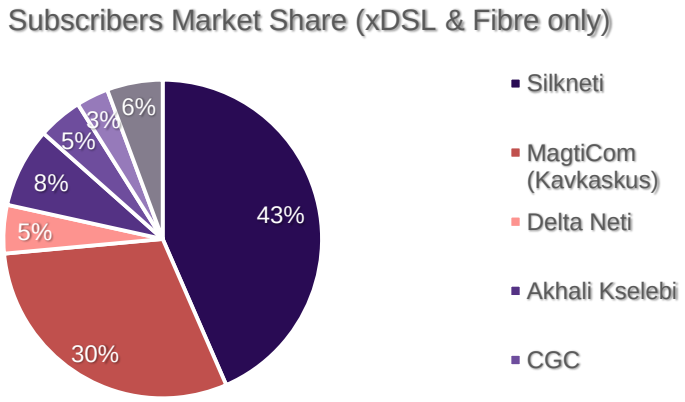


Figure 3-16 Subscribers Market Share[38] on xDSL or Fibre technologies

[37] 3Q2016. Source GNCC comparing total numbers for xDSL, Fibre and Wifi Subscribers (other technologies are negligible).
[38] 3Q2016. Source: GNCC data, comparing shares only for xDSL or Fibre service subscribers.

Fibre Subscriber's Shares

Comparing only the prevailing fixed broadband technology which is fibre in Georgia with 61% share among the technologies, we can see that MagtiCom together with Delta Net holds 49% of subscribers' market share followed by Silknet with 27% - yet Silknet is gradually replacing it's xDSL technology with fibre which would gain him much higher share in the future. New Net group follows with 17%. Alternative operators hold only 8% of the fibre subscribers market.

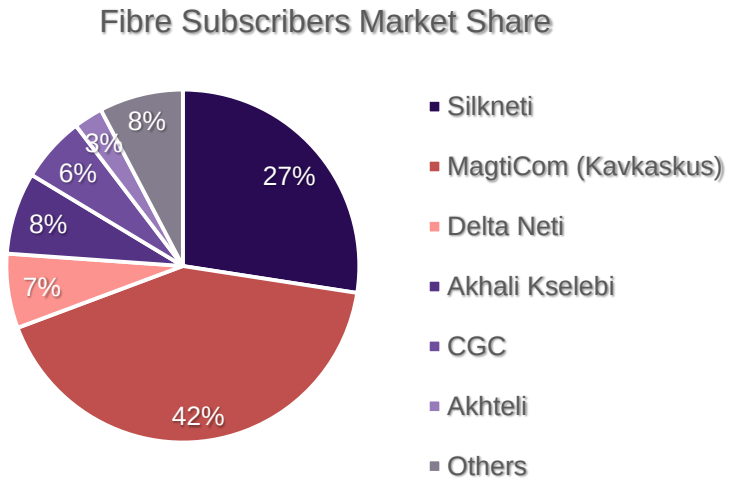


Figure 3-17 Fibre Subscribers Market Share[39]

[39] 3Q2016. Source GNCC.

Top2 players vs. Other Operators

The top 2 players MagtiCom (Caucasus Online) and Silknet, were either growing it's subscriber base faster or kept the gap to other operators. Other operators despite gaining some market share struggle to close the subscribers gap and recent acquisition of Delta Net further increased it. Graph compares only xDSL and Fibre subscribers, as these services compete head to head.

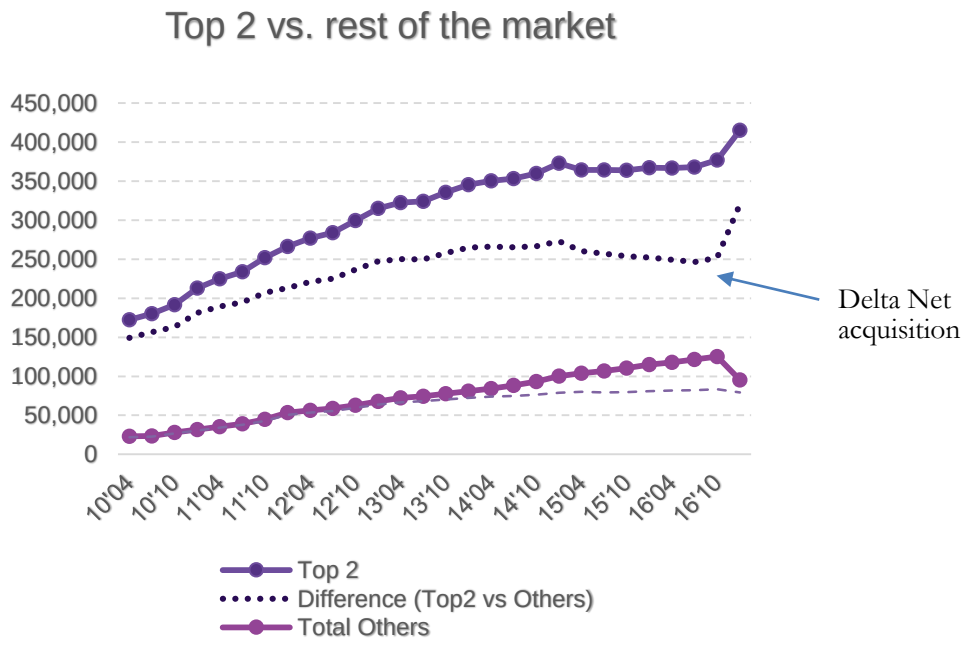


Figure 3-18 Subscribers acquisition comparison[40] for top 2 operators vs the rest of the market.

ARPU & Pricing

Pricing is extremely aligned across the market. Both two largest operators MagtiCom and Silknet have almost precisely same pricing and they usually move their prices at the same time. According to article in Georgian Journal[41] on 4th March 2015 Silknet increased fixed fibre broadband prices by 6-10 GEL (20-30%) and doubled the speeds offered at the same time (to align with Caucasus speed offers). Caucasus Online (now MagtiCom followed on March 23rd and increase tariffs by 2-5 GEL (5-11%) to align with Silknet pricing.
Despite significant penetration of FTTx the average speed is artificially limited to 10 Mbps by prohibitive price hike for faster speeds. While cheapest Fibre offers start at 22 GEL in price list and even as low as 10-18 GEL according to reported ARPU by some regional players, the 100 Mbps offers start at 100 GEL per month (~36 EUR). In comparison 100 Mbps costed ~12 GEL in Ukraine, 26 GEL in Latvia, 11 GEL in Lithuania and 17 GEL in Romania (March 2016).

[40] Source GNCC. Top 2 operators are MagtiCom (without Delta Net) and Silknet.
[41] http://www.georgianjournal.ge/business/30229-georgias-internet-market--low-quality-high-prices.html

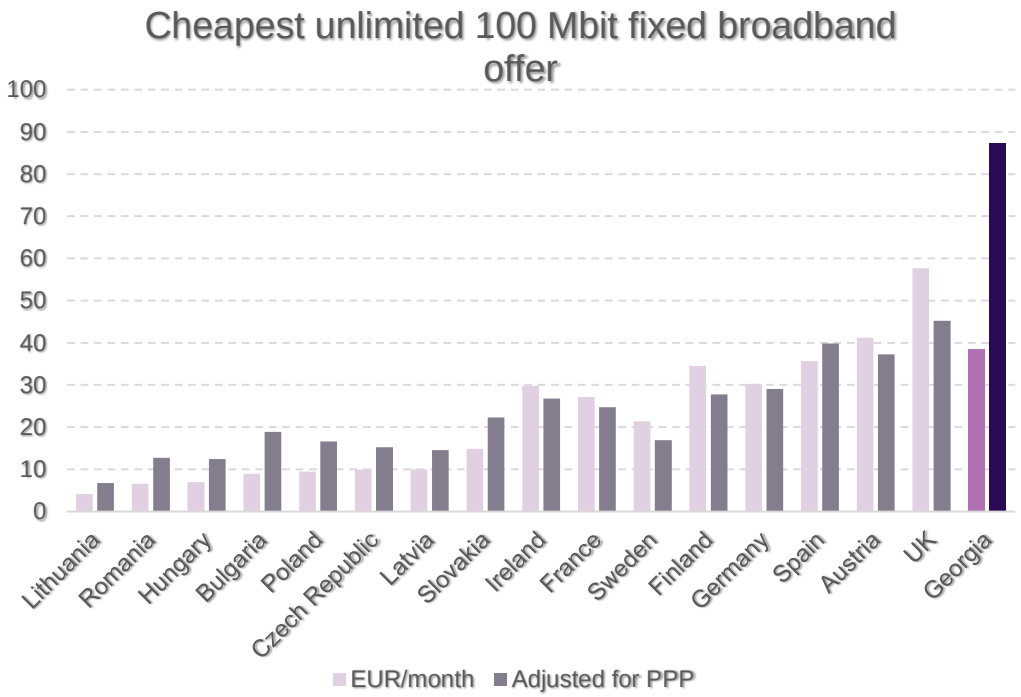


Figure 3-19 Cheapest unlimited 100 Mbit fixed broadband offer[42]

Comparing any Fixed Broadband prices, Georgia is just under the EU27 average considering purchasing power parity[43], yet how it was already mentioned for example in Latvia customers get not only significantly cheaper, but also much faster connection.

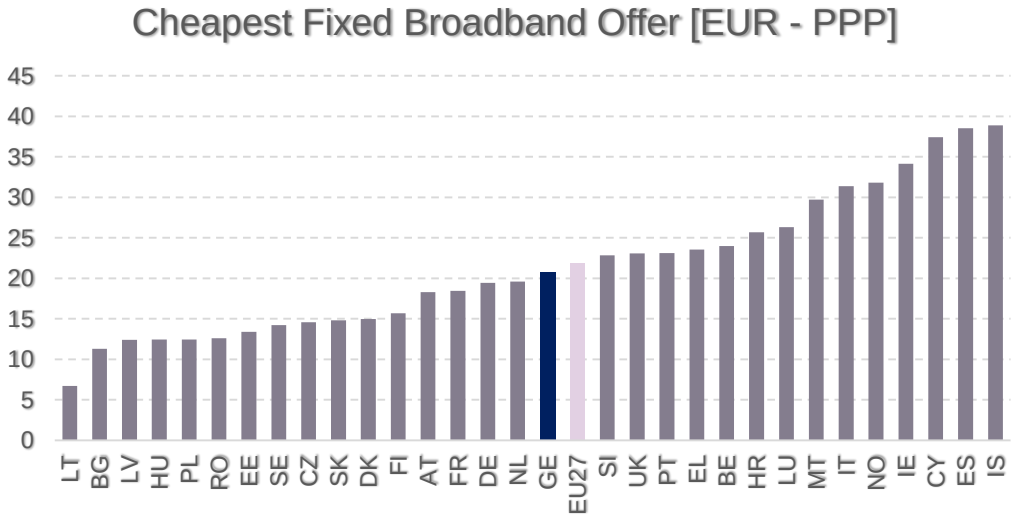


Figure 3-20 Cheapest Broadband Offer adjusted for PPP

[42] EC/Van Dijk Broadband Internet Access Costs 3Q 2015 (prices are similar in 2017), Georgian operators web pages Jan 2017.
[43] EC Digital Agenda Scoreboard - Monthly price of standalone Fixed Broadband Internet Access offers, including VAT, excluding the additional cost of telephony or cable line (if any). The minimum and median prices refer to the group of similar subscriptions offered by internet service providers. Offers are not weighted with market shares, so the offers' median price cannot be interpreted as the median price paid by consumers.

Fibre Retail Prices

Basic and most popular offer of 10 Mbps is nearly the same among the top 3 players. There is a bit of choice between 20-40 Mbps (yet the price difference is usually driven by installation fees) and again the 50 and 100 Mbps are very aligned among the top 3 players.

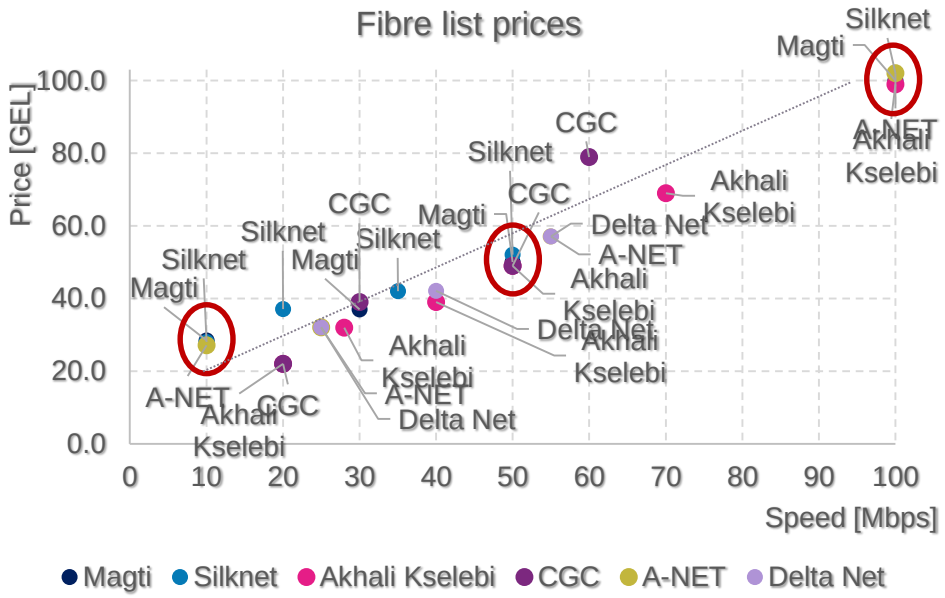


Figure 3-21 Fibre Optic Offers list prices in Georgia[44]

[44] Operator's web pages, Jan 2017. Installation fees are depreciated by 24 months.

Prices in Capital City vs. Regions

Regions outside Tbilisi have slightly more low speed fibre offers priced between 20 to 30 lari but in general there is no significant difference between prices and speeds offered by either big or smaller players in regions compared to the capital city which is mainly driven by the fact that higher speeds over 40 Mbps are offered almost exclusively by one of the Top5 players. On Figure 3-22 we can see that small operators (with less than 20.000 subscribers) are focusing on offers between 1 to 20 Mbps. It's noteworthy that those small operators almost exclusively offer lower speeds for higher prices than leading players and gained any significant numbers of customers usually only in areas where top players are not currently present which again might indicate that market conditions and/or regulation do not contribute to achievement of competitive environment. It's very common that small local players usually offer cheaper or significantly cheaper services than market leaders either on their own infrastructure or reselling wholesale services to retail customers. Possible reasons are either the fact, that local players act as local monopolies or that wholesale interconnection prices effectively prohibit them to offer cheaper connectivity than market leaders who are usually providers of this interconnection.

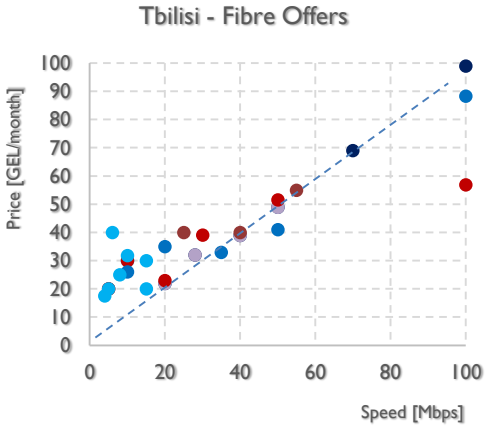


Figure 3-22 Fibre Offers comparison in Tbilisi[45]

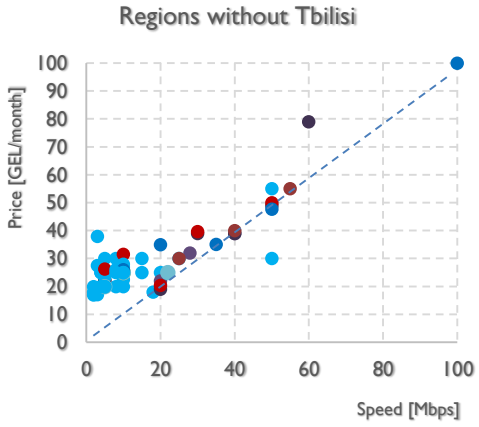


Figure 3-23 Fibre Offers comparison outside Tbilisi

Small players (<20k subs) Silknet Magticom T&T group (New Net, Akhtel)

[45] Source data from GNCC, filtered for offers with at least 10 subscribers and basic speed tiers. Retail offers only.

Penetration, Technology mix & Coverage

Fibre is quickly becoming technology of choice for broadband in Georgia. Currently 61% of subscribers have fibre connection, while only 24% are on xDSL followed by 15% Wi-Fi subscribers. Already in 2013 fibre became leading technology in Georgia.

Compared to Europe the share of fibre is clearly way higher than in average EU country, where even among only NGA technologies fibre has only 25% share while in Georgia it's 61% if we include local WiFi providers, or even 72% considering only EU NGA technologies.

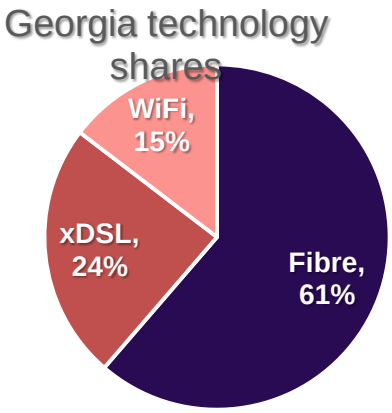


Figure 3-24 Broadband Subscribers by technology[46]

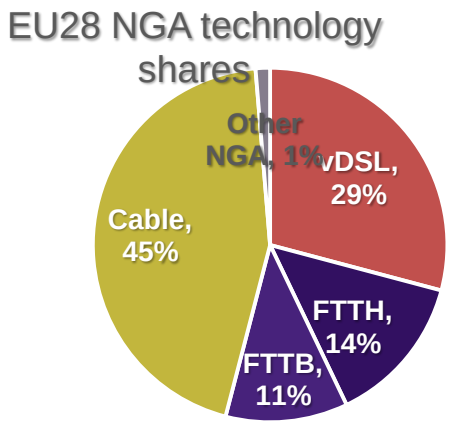


Figure 3-25 NGA technology shares in EU[47]

Fixed Broadband Coverage

Looking only on fixed broadband coverage with any technology offering speeds over 1Mbps, Georgia with ~82% country coverage and only 69% of rural coverage is significantly lacking behind any European state including Latvia or Bulgaria

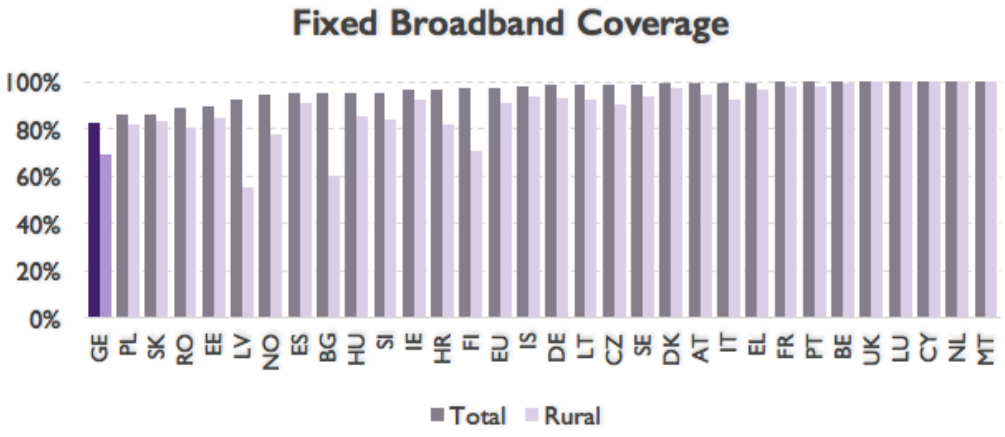


Figure 3-26 Fixed Broadband Coverage in EU and Georgia[48]

[46] Source: GNCC. 3Q2016
[47] Source: Communication Committee, July 2015
[48] 2015 EU, 2016 Georgia, Source: IHS and VVA for EU data and company assumptions based on data from operators and GNCC for Georgia.

Fixed Broadband Household Subscriber's Penetration

And of course, lack of coverage is reflected in fixed broadband penetration as well, where Georgia with only 51% in 2016 was well behind every EU country and many of its peers.

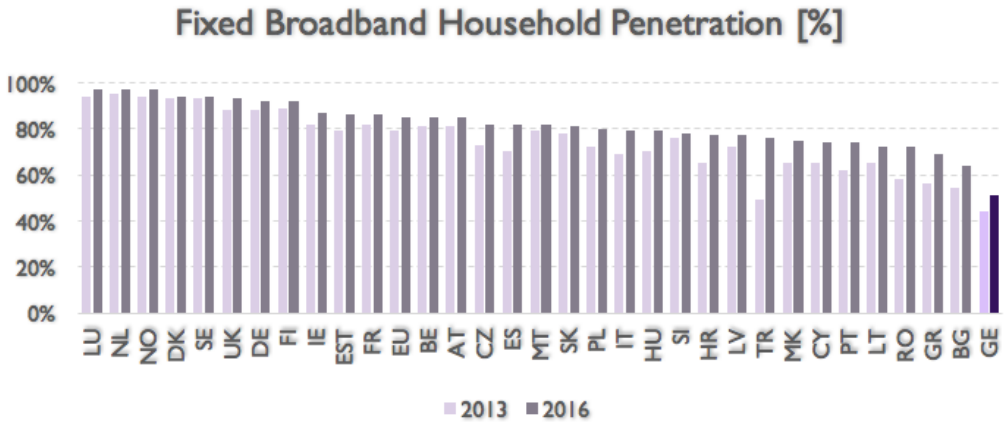


Figure 3-27 Fixed broadband penetration[49]

Fibre Coverage

However, focus on fibre deployment put Georgia ahead of many EU countries in fibre coverage (mostly FTTH), yet still behind countries like Latvia or Lithuania which are currently leading the European FTTH coverage league. Also most of the coverage in Georgia is focused on urban areas with rural areas having only 10% of fibre coverage.

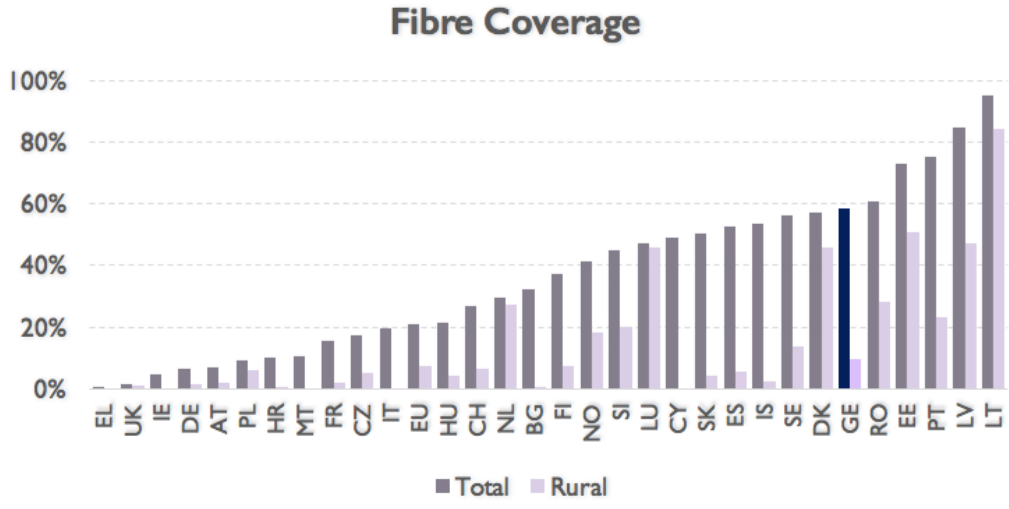


Figure 3-28 Fibre Coverage in EU and Georgia[50]

[49] Source: European Commission.
[50] 2015 EU, 2016 Georgia, Source IHS and VVA for EU data and company assumptions based on data from operators and GNCC for Georgia.

Share of FTTx Subscriptions among all Subscriptions

Looking solely at mix of technologies, Georgia is between top 3 countries in the EU with ~55% of all fixed broadband subscription realized on fibre – and mostly fibre to the premises.

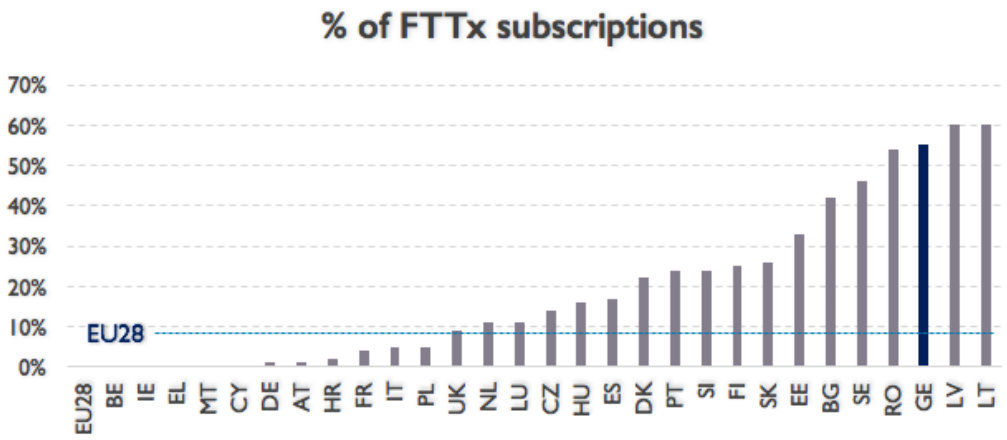


Figure 3-29 Share of FTTx subscriptions among all broadband subscriptions[51]

Subscriber's Speed Mix

However, despite the favourable mix of technologies, the penetration of high speed offers is still significantly lagging behind other countries as despite the FTTx services offered in Georgia are in majority capable of delivering speed of 100Mbps, the speed is artificially limited by providers and higher speed is offered only for very premium price.

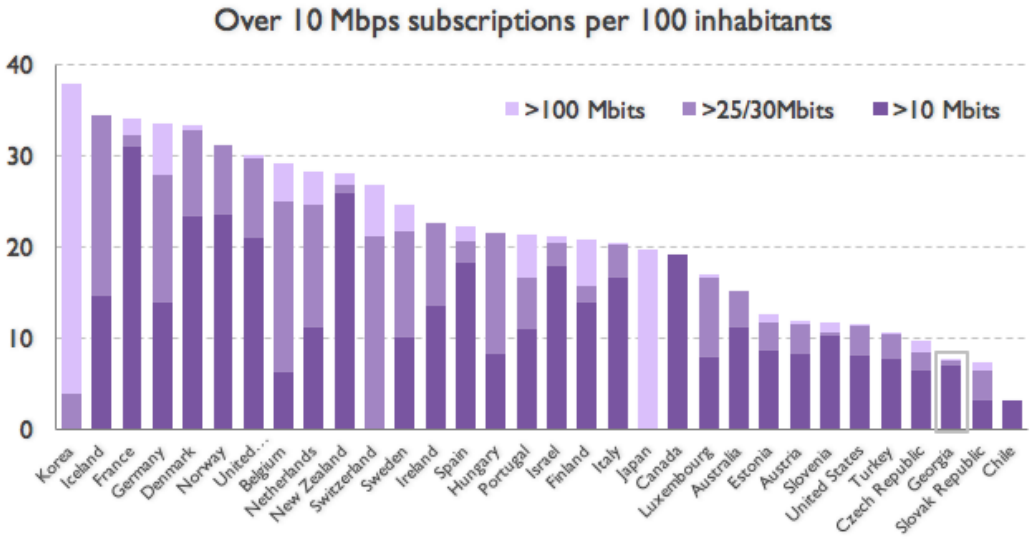


Figure 3-30 High Speed Subscriptions per 100 inhabitants[52]

[51] Source: European Commission. GE data Analytic portal GNCC July 2015, Fibre, xDSL, WiFi vs Fibre total subscribers c+b
[52] Source: OECD June 2014, GNCC December 2016.

Broadband Penetration in Regions

Capital city of Tbilisi is clearly better off in terms of both general fixed broadband penetration of 88% and fibre penetration of 75%.

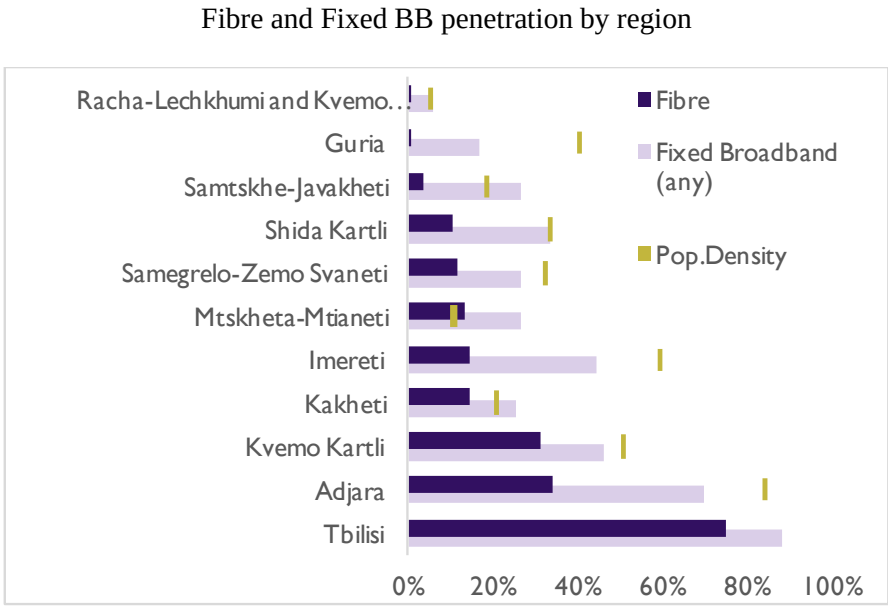


Figure 3-31 Internet penetration by region and type of broadband[53]

More than usual population density in developed countries the broadband and especially fibre coverage follows main infrastructure in Georgia. With obviously highest penetration in Tbilisi and then connecting Rustavi with Tbilisi and from Tbilisi through highway E60 through Gori and Kutaisi to Poti and then the coastal regions of Georgia while north and south of the country are lacking coverage.

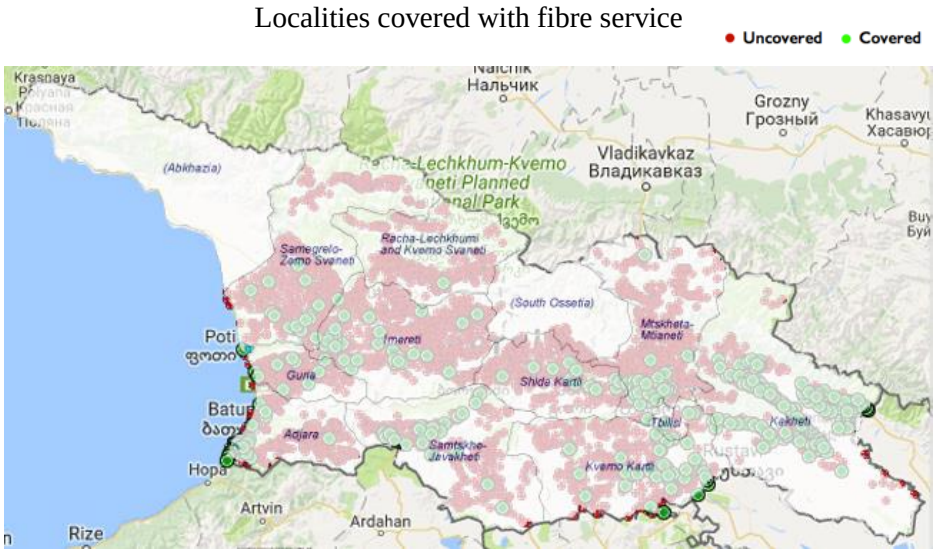


Figure 3-32 Cities and location covered and uncovered with fibre in Georgia[54]

[53] Source: GNCC 4Q2016 (adjusted for error with Rustavi region not in Kvemo Kartli), Georgian Statistical Office.
[54] Source GNCC

Coverage by operators

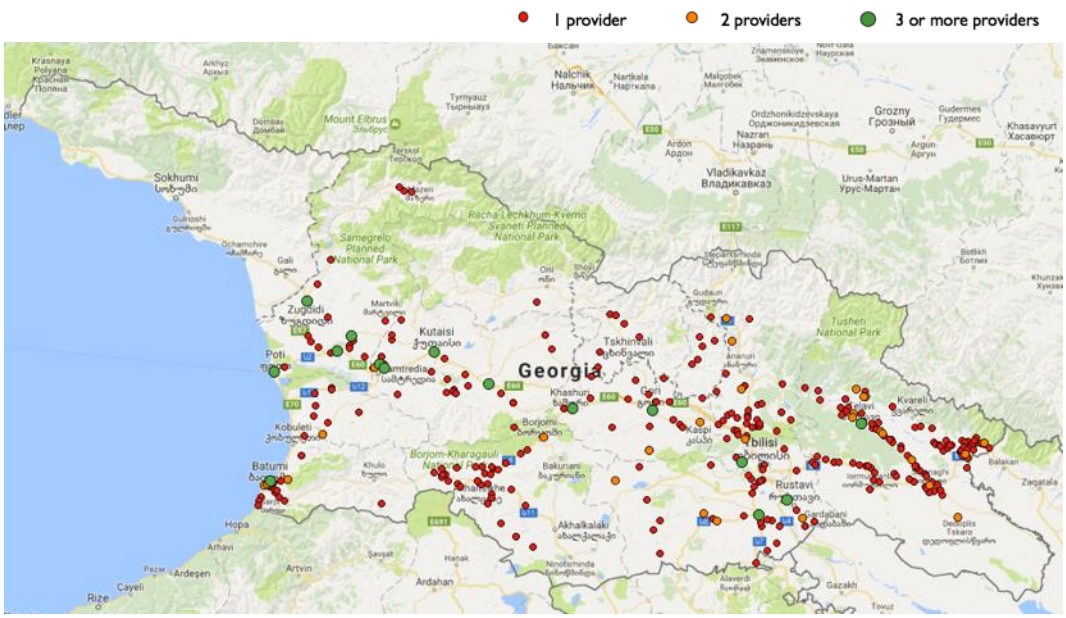


Figure 3-33 Map of fibre localities by number of service providers[55].

Most fibre localities are served by only one operator, with only 31 localities served by 2 operators and 16 localities served by 3 or more operators.

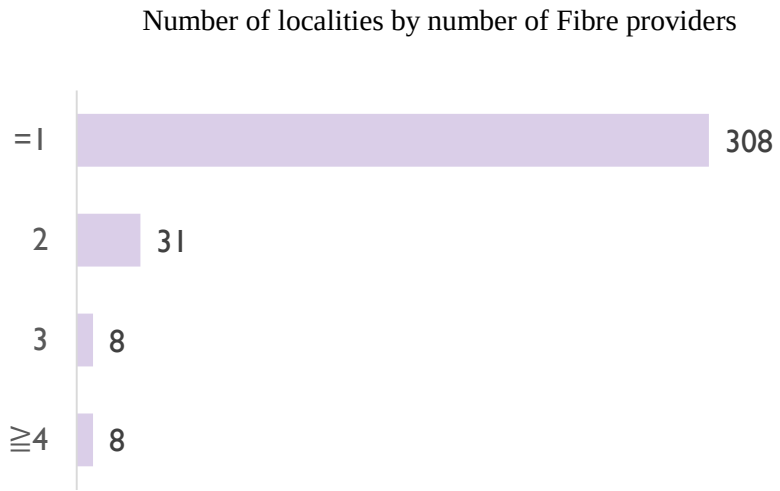


Figure 3-34 Fibre localities by number of service providers

In regions (without Tbilisi) only less than 50% households in localities covered by fibre can pick service from at least 3 operators and this is assuming that locality is covered evenly by all competitors, which is usually not a case. Most of the households in regions in Georgia are served by only one fixed broadband operator who essentially has local fibre monopoly. Even in Tbilisi the choice is usually limited to Silknet or Magticom.

[55] Source: GNCC analytical portal.

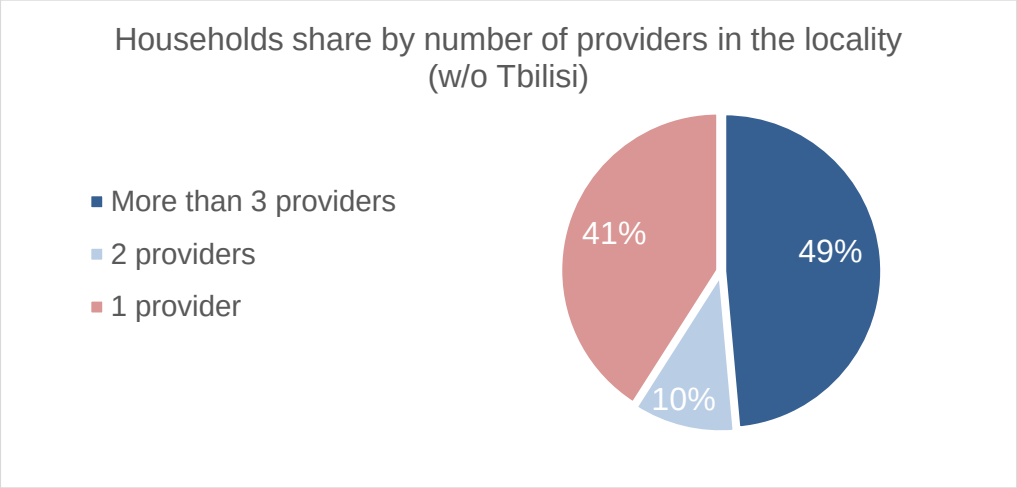


Figure 3-35 Households share by number of providers in the locality (without Tbilisi)[56]

ICT skills and technology penetration

Personal computer is still not a standard in Georgian households. According to Caucasus Barometer research[57] only 47% of Georgian households owned personal computer in 2015 and even in Tbilisi it's only 66%, while in EU is personal computer almost ubiquitous standard of household's equipment. It was impossible to cross reference data from this research so they should be taken only as indicative as the reality might be somehow different.

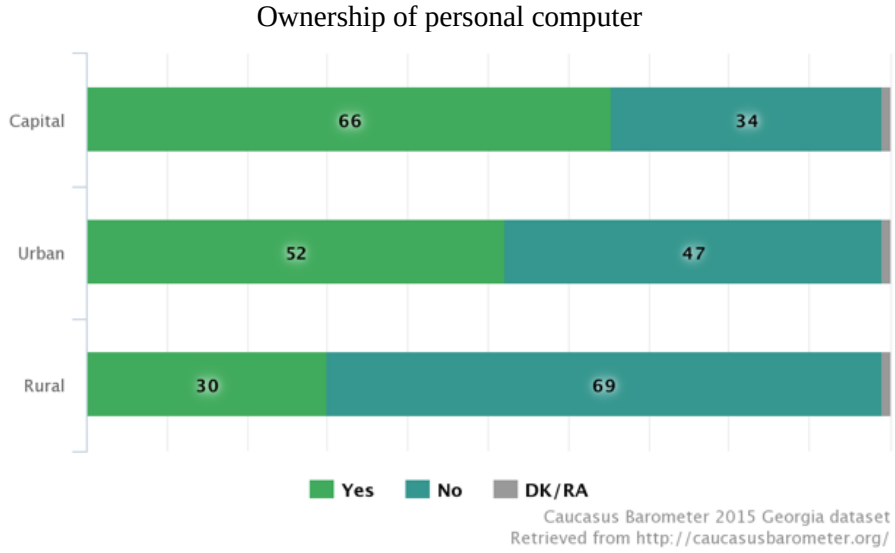


Figure 3-36 PC Ownership

Almost all owners of personal computer in Tbilisi and urban areas in general has also an internet access with it. Yet only 78% PC owners in rural areas have internet access.

[56] Source: GNCC analytical portal (including number of households). Capital city of Tbilisi is not included.
[57] Source: http://caucasusbarometer.org/en/

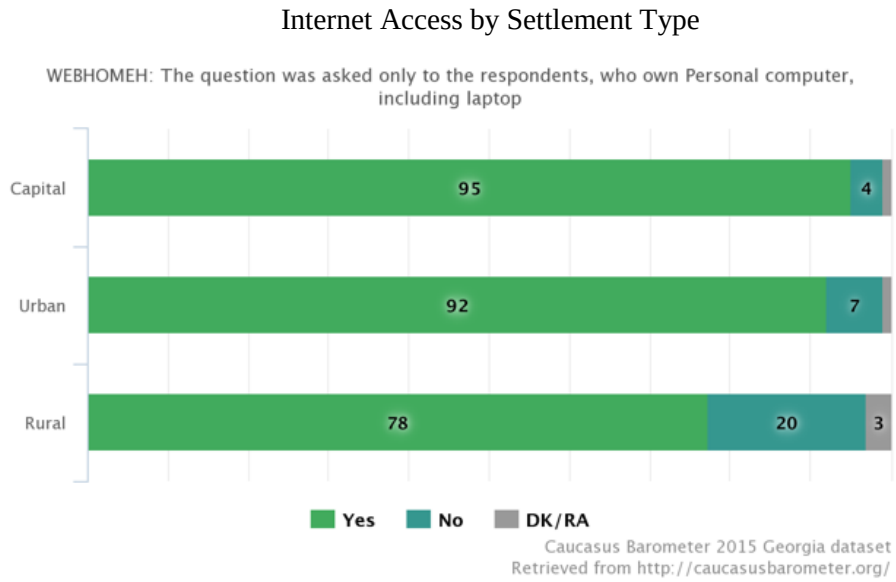


Figure 3-37 Internet Access of PC owners

Caucasus barometer data also shows that real broadband penetration would be rather lower than the numbers devised by dividing reported number of subscribers with number of households. But as all sources for comparisons are using this methodology we did only minimum adjustments to penetration data to make them comparable. Real internet penetration data for the end of 2016 would be closer to circa 45% households in Georgia, 70% in Tbilisi, 50% in Urban areas and 25% in Rural.

Major reason why people do not use internet is that they are not interested or they don't feel any need for it. 44% of people gave one of these two reasons. Another major reason is lack of access device (PC) or connectivity (together 34%). 13% of respondents who doesn't have internet stated that they don't know how to use it.

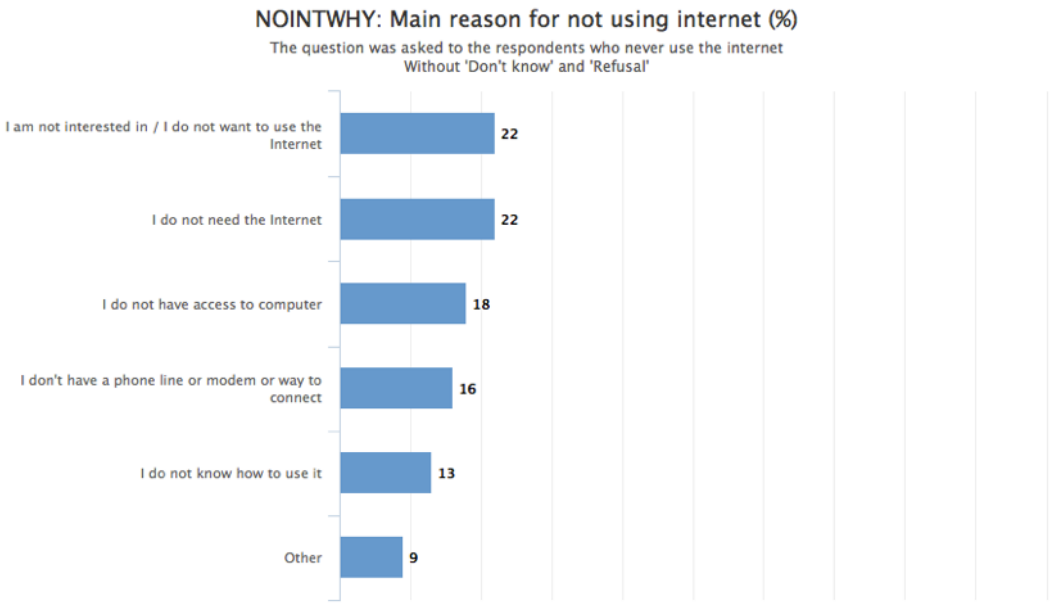


Figure 3-38 Main reason for not using internet

Wholesale bandwidth access

Wholesale bandwidth access prices are key to increase affordability of the internet access to the end customers. Worldwide there is a clear trend of a dramatic drop of the prices of global IP transit and local peering is in many countries provided for free (or just one-off fee covering the interconnection costs) in local peering centres.

Georgia is connected to international data traffic through several optical lines. One goes from Tbilisi to Poti and through the Black Sea to Bulgaria and Romania (Rostelecom), alternative routes are through Turkey via Turk Telecom (however operators complained about quality of this line) and to Baku in Azerbaijan (Telia).

International connectivity and wholesale is dominated by three largest players (MagtiCom, Silknet and New Net)

Following graph shows sheer drop in IP transit prices in US, where prices dropped from $50 levels to $0.6 in last decade.

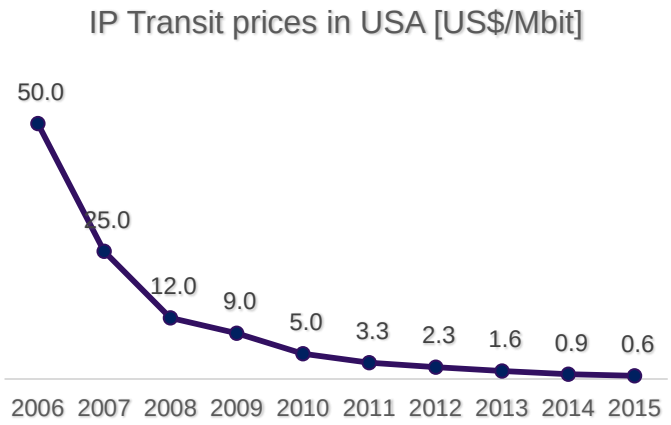


Figure 3-39 IP Transit prices in USA[58]

Despite recent drop in IP transit prices in Georgia the price offered by ie. Caucasus Online wholesale division is still very high starting at 22 GEL/Mbps (with average around 25 GEL ~10$) at exchange point in Tbilisi, with extra 2-5 GEL/Mbps for access line from other cities, effectively limiting the competition to offer competitive prices to compete with market leaders. Association of alternative operators believe that wholesale IP transit prices including the global internet access should be feasible at levels of $3-5.

Caucasus Online Global Internet Access reference offer

Capacity in Mb/Sec	Before May 2017 (GEL excl. Tax)	New Rates (GEL excl. Tax)
0-50	32	28
51-100	32	27
101-200	31	26
201-500	30	25
501-1000	29	23
1001-10 000	27	22

Figure 3-40 Global Internet Access prices in Georgia[59]

[58] William B. Norton - Internet Transit Prices study
[59] Source: GNCC

IP transit prices in the world tend to converge to US pricing. In UK the price is ~0.6 US$/Mbps, in Singapore 3 US$/Mbps and even in Brasil which was infamous for exorbitant prices the price recently dropped from 20 US$/Mbps to 6 US$/Mbps (~16 GEL) in the last three years.

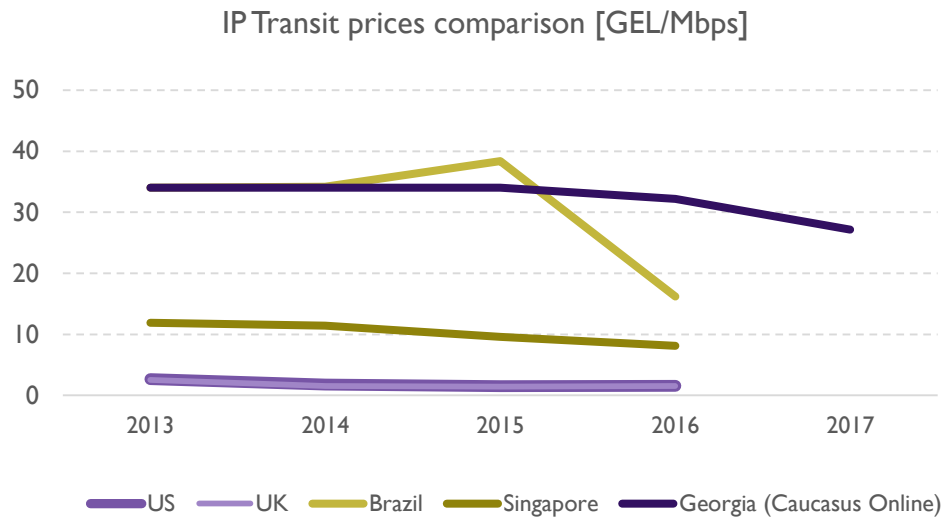


Figure 3-41 Global IP Transit prices compared to Georgia[60]

There is no official local IP peering centre (for national traffic only), but operators offer usually free of charge peering for local internet traffic in their premises. Yet some alternative operators complained that YouTube or Google traffic are routed for them through expensive international lines instead through local peering to local cache servers located in Georgia.

3.3 Regulatory Environment

Regulatory environment of the electronic communications sector is defined by a legal framework applicable in the sector, regulatory decisions issued by NRA and court decisions issued in cases of appeals against those decisions submitted by affected market players.

Legal framework is defined by law/laws specific for the electronic communications sector (sector specific law) stipulating responsibilities and competencies of an NRA, rights and obligations of market players and end users and laws stipulating responsibilities and competencies of other authorities influencing the electronic communications sector (for example authority responsible for personal data protection, authority responsible for issuance of construction permits related to network roll out etc.).

Ex-ante market regulation is a competence of an NRA stemming from the sector specific law and represents an essential tool in shaping up an environment which should bring desirable outcomes in the field of market evolution leading to achievement of sustainable competition in provision of electronic communications services. Unlike the ex-post market regulation performed by competition authorities, ex-ante regulation is not initiated on the basis of the occurrence of anti-competitive behaviour of a market participant but the starting point is rather an overall forward-looking assessment of the structure and the functioning of the relevant market. Ex-ante regulation has to be in compliance with principles of consistency, transparency, non-discrimination and technological neutrality. It should provide

[60] Source: TeleGeography, GNCC for Georgia – list price average excl. tax, non GEL prices recalculated by average exchange rate of every year. Local players are Delta Com and Railway Telecom.

appropriate predictability to all stakeholders.

Ex-ante regulation shall be imposed only in justified cases i.e. in cases where an NRA identified that a relevant market is nor effectively competitive and potential competitive problems exist on that market.

Insensitive approach to regulation may result in over or under-regulation. Over-regulation occurs in situations where either the relevant market which does not indicate competition problems becomes regulated or where obligations imposed on an entity designated as having significant market power are too burdensome. Over-regulation results in discouragement of investment of both existing and potential investors. Under-regulation occurs in situation where an entity designated as having significant market power has not been designated despite the fact that the relevant market indicates existing or potential competition problems or where obligations imposed will not lead to establishment of the competitive environment in the future. Under-regulation leads to monopolisation or re-monopolisation of the market and discourages entry of new market players.

In order to be able to properly execute its tasks including the ex-ante regulation the NRA needs to be independent (its decisions shall be independent of all affected market participants) and should have all necessary resources (financial and human resources and expertise).

Ex-ante regulation should be conducted with the following objectives:

(i) promote competition in the provision of electronic communications networks, electronic communications services and associated facilities;
(ii) contribute to the development of the internal market inter alia by promoting efficient investment and innovation;
(iii) produce benefits for end-users by making retail markets effectively competitive on sustainable basis.

1. Current Regulatory Framework in Georgia

Framework for ex-ante regulation in Georgia is defined by:

- the Law of Georgia on Electronic Communications (hereinafter "the law") chapters IV (articles 20, 21, 22, 23, 24 and 28) and V (articles 29, 30, 31, 32, 33, 34 and 35),
- Resolution No.5 "On Approval of the Methodological Rules for Determination of Relevant Market Segments and Analysis of Competitiveness", dated August 31, 2007 which includes methodological rules and conditions for performance of the preliminary research in order to determine the relevant segments of the service market with public electronic communications networks and facilities; to carry out the study and analysis of competition in the activities of the undertakings authorised in this segment; to determine the authorised undertaking or the undertakings with joint significant market power and the specific obligations imposed to them; as well as to reveal possible violations of competition or unfair competition in the relevant market segment during acquisition and merger of shares (hereinafter "the methodology") .[61]
- Resolution No.5 "On Methodological Rules for Cost Accounting and Recording of Expenses Separately by the Authorised Undertakings", dated April 20, 2006 and
- Decisions of GNCC issued as a result of a specific market analysis.

The rules set by the law and the methodology apply to any relevant market including relevant markets related to broadband/NGA.

GNCC's objectives in the field of competition regulation defined by the law are:

- create conditions contributing to effective competition in the field of electronic communications;
- prohibit the discrimination against authorised persons, and ensure their equality;
- prohibit discrimination against end-users in the provision of electronic communications services and protect their rights;
- monitor and control compliance by authorised persons having significant market power with obligations imposed on them;
- create a transparent, equal and competitive environment when using numbers and frequencies.

According to the law ex-ante regulation shall be conducted in accordance with principles of objectivity, technological neutrality, functional equivalence, the minimum required regulation and principles of the imposition of proportionally balanced specific obligations, stimulation of effective competition, transparency and non-discrimination.

Ex-ante regulation shall be performed in the following steps:

Step 1: determination of the relevant and closely related segments of the service market, and

[61] As part of the project the methodology for market analysis is being updated in order to comply with the amended Law and to be in line with the best practice applicable in the EU member states.

appropriate geographic boundaries of the market;

Step 2: analysis of the competitiveness of the relevant segments of the service market;

Step 3: determination of authorised persons with significant market power in the relevant segment of the service market;

Step 4: determination of authorised persons with significant market power in the relevant and closely related segments of the service market by taking into account the primary and secondary criteria and imposing specific obligations on them.

2. Determination of relevant segments of a service market

Ex-ante regulation of competition shall be carried out based on the relevant and closely related segments of the service market determined by GNCC and the relevant geographic boundaries of the market. The relevant segments of the service market shall be determined by GNCC in accordance with criteria determining the service types and geographic boundaries of electronic communications services.
In determining the relevant segments of a service market, GNCC shall take into account the objective criteria that uniformly determine the relevant and closely related segments of the service market.

3. Analysis of the competitiveness of the relevant segments of the service market

GNCC shall make a decision on the commencement of the study and analysis of the service market:
a) on the basis of a justified request of an authorised person, if GNCC agrees with the justification;
b) upon a justified request of state bodies, if GNCC agrees with the justification;
c) on its own initiative.

The study and analysis of the service market for the purpose of identifying authorised persons with significant market power shall be conducted on the basis of the methodology and procedures for determining market competitiveness and for identifying authorised persons with significant market power approved by a resolution of GNCC[62].

When conducting an analysis of the competitiveness of the relevant segments of the service market GNCC shall take into account the following analytical factors:

- the conditions prevailing in the relevant and closely related segments of the service market, the concentration level and relative market shares held by authorised persons;
- the demand and supply characteristics (flexibility, increase in the demand, etc.) of the service types in the relevant segment of the service market, as well as conditions for demand-side and supply-side substitution;
- levels of tariffs set on potentially non-competitive and interchangeable service types, as well as past changes in the tariffs;
- financial and economic indicators of authorised persons in the relevant segment of the service market, the degree of their interdependence and opportunities for authorised persons interested in starting activities in this segment, including infrastructural and dynamic factors impeding entry into the market, and relevant investment risks;
- the degree and nature of vertical integration of an electronic communications networks

[62] Resolution No.5 "On Approval of the Methodological Rules for Determination of Relevant Market Segments and Analysis of Competitiveness", dated August 31, 2007

present in the relevant segment of the service market;
- other related characteristics determined by a resolution of GNCC.

The main criterion for designating an authorised person as having significant market power shall be the relative market share held by the authorised person or by a group of interrelated persons in the relevant segment of the market. In addition to the primary criterion, use shall be made of secondary criteria (determined by GNCC taking into account analytical factors) which, in accordance with primary criterion, objectively determines the possibilities of authorised persons with significant market power to restrict competition and carry out non-competitive actions in the relevant segment of the service market.

Competition in the relevant segment of the service market shall be deemed effective if no authorised person with significant market power carries out its activities in that segment. Competition in the relevant segment of the market shall not be deemed to be effective if one or several authorised persons operating in that segment have joint significant market power. An authorised person shall be designated as having significant market power if it holds at least 40% of the market share in the relevant segment of the market.
Two or more authorised persons shall be deemed to hold joint significant market power if in the relevant segment of the service market:

a) the total market share of two authorised persons is at least 60%; at the same time, the market share of each of them must be at least 25%;
b) the total market share of three authorised persons is at least 80%; at the same time, the market share of each of them must be at least 15%.

4. Imposition of obligations on authorised persons with SMP

GNCC shall impose one or a combination of the following specific obligations on authorised persons in a position of significant market power:
- obligation to ensure transparency of information;
- obligation to prohibit discrimination;
- obligation to record expenditure and income separately in accordance with the methodological rules approved by GNCC;
- obligation to provide access to relevant elements of an electronic communications network;
- obligation to regulate tariffs and prepare cost estimates.

The obligations imposed shall be proportional and objectively justified.

Non-compliance of an authorised person with specific obligations imposed is considered as an abuse of significant market power.

GNCC may change or add specific obligations on the basis of a study and analysis of the service market. If a study and analysis of the service market reveals that there is no authorised person with significant market power in the relevant segment of the market, the specific obligations shall be annulled and the relevant segment of the market shall be considered to be competitive.

The following table contains the list of relevant markets identified and analysed by GNCC and obligations imposed on authorised persons designated as having significant market power:

	Market	*Remedies*
1.	Call origination and call termination in PSTN (Fixed wired)	- Transparency - Non-discrimination - Access - Accounting separation - Price control
2.	Call origination and call termination in Mobile Network 2G/3G	- Transparency - Non-discrimination - Access - Accounting separation - Price control
3.	Call origination and call termination in CDMA (Fixed wireless)	- Transparency - Non-discrimination - Access - Accounting separation - Price control -
4.	Mobile retail	- Accounting separation - Price control
5.	International Call Termination	- Price control
6.	Copper pairs	- Transparency - Non-discrimination - Access - Accounting separation - Price control
7.	Duct and Channels	- Transparency - Non-discrimination - Access - Accounting separation - Price control
8.	Wholesale Internet (access to internet global recourses)	- Transparency - Non-discrimination - Access - Accounting separation - Price control
9.	Internet retail	- Transparency
10.	Backbone access	- Transparency - Non-discrimination - Access - Accounting separation

5. Current Regulatory Framework in the EU

The EU regulatory framework in the sector of electronic communications consist of:

a) six directives
   (i) Directive 2002/21/EC of the European parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic; communications networks and services (Framework Directive) as amended by Directive 2009/140/EC and Regulation 544/2009;

   (ii) Directive 2002/20/EC of the European parliament and of the Council of 7 March 2002 on the authorisation of electronic communications networks and services (Authorisation Directive) as amended by Directive 2009/140/EC;

   (iii) Directive 2002/19/EC of the European parliament and of the Council of 7 March 2002 on access to, and interconnection of, electronic communications networks and associated facilities (Access Directive) as amended by Directive 2009/140/EC;

   (iv) Directive 2002/22/EC of the European parliament and of the Council of 7 March 2002 on universal service and users' rights relating to electronic communications networks and services (Universal Service Directive) as amended by Directive 2009/136/EC;

   (v) Directive 2002/58/EC of the European parliament and of the Council of 12 July 2002 concerning the processing of personal data and the protection of privacy in the electronic communications sector (Directive on privacy and electronic communications) as amended by Directive 2006/24/EC and Directive 2009/136/EC;

   (vi) Directive 2014/61/EU of the European parliament and of the Council of 15 May 2014 on measures to reduce the cost of deploying high-speed electronic communications networks;

b) several regulations such as:
   (i) Regulation (EC) No 717/2007 of the European parliament and of the Council of 27 June 2007 on roaming on public mobile telephone networks within the Community and amending Directive 2002/21/EC as amended by Regulation (EC) No 544/2009;

   (ii) Regulation (EU) No 531/2012 of the European parliament and of the Council of 13 June 2012 on roaming on public mobile communications networks within the Union;

   (iii) Regulation (EC) No 1211/2009 of the European parliament and of the Council of 25 November 2009 establishing the Body of European Regulators for Electronic Communications (BEREC) and the Office;

   (iv) Regulation (EU) 2015/2120 of the European parliament and of the Council of 25 November 2015 laying down measures concerning open internet access and amending Directive 2002/22/EC on universal service and users' rights relating to electronic communications networks and services and Regulation (EU) No 531/2012 on roaming on public mobile communications networks within the Union;

c) several decisions such as:
   (i) Decision No 676/2002/EC of the European parliament and of the Council

of 7 March 2002 on a regulatory framework for radio spectrum policy in the European Community (Radio Spectrum Decision); and

d) guidelines and recommendations such as:
   (i) Commission guidelines on market analysis and the assessment of significant market power under the Community regulatory framework for electronic communications networks and services (2002/C 165/03);

   (ii) Commission recommendation of 7 May 2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU (2009/396/EC);

   (iii) Commission recommendation of 20 September 2010 on regulated access to Next Generation Access Networks (NGA) (2010/572/EU)

   (iv) Commission recommendation of 11 September 2013 on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment (2013/466/EU);

   (v) Commission recommendation of 9 October 2014 on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services (Text with EEA relevance) (2014/710/EU).

Framework for ex-ante regulation in the EU (hereinafter "the framework") is defined by:

- Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services (Framework Directive) as amended by Directive 2009/140/EC and Regulation 544/2009;

- Directive 2002/19/EC of the European Parliament and of the Council of 7 March 2002 on access to, and interconnection of, electronic communications networks and associated facilities (Access Directive) as amended by Directive 2009/140/EC;

- Commission guidelines on market analysis and the assessment of significant market power under the Community regulatory framework for electronic communications networks and services (2002/C 165/03);

- Commission Recommendation of 11 February 2003 on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communication networks and services (2003/311/EC);

- Commission Recommendation of 17 December 2007 on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services (2007/879/EC);

- Commission Recommendation of 20 September 2010 on regulated access to Next Generation Access Networks (NGA) (2010/572/EU);

- Commission Recommendation of 11 September 2013 on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment (2013/466/EU);

- Commission Recommendation of 9 October 2014 on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services (2014/710/EU)

The framework strives to achieve the following policy objectives identified by the Framework Directive:

- promotion of an open and competitive market for electronic communications networks, services and associated facilities;

- development of the internal market and

- promotion of the interests of European citizens.

Ex-ante regulation shall be conducted in the following steps:

Step 1: identification and definition of relevant retail market from product and geographical perspective and initial assessment of competitive situation in that market,

Step 2: identification and definition of relevant wholesale market(s) regulation of which would address the problems identified in step 1,

Step 3: assessment, using the three criteria test, whether the wholesale market defined in step 2 is susceptible to ex-ante regulation,

Step 4: market analysis and identification of authorised person/persons with significant market power,

Step 5: imposition of obligations on the authorised persons with individual or joint significant market power intended to remedy identified competition problems,

Step 6: regular market reviews.

6. Market definition

Identification of a relevant market is the first step in the process of the competition assessment. In fact, identification of a relevant market for the purpose of ex-ante regulation consists of three steps (step 1 to 3 mentioned above).
Relevant markets defined for the purpose of ex-ante sector specific regulation are always assed on forward looking basis as the NRA will in its assessment take into account the expected future development of the market.
Relevant market shall be identified from two different aspects: product/service aspect (comprise of all products/services which are sufficiently interchangeable or substitutable) and geographic aspect (area in which the undertakings concerned are involved in the supply and demand of the relevant products/services where mutually substitutable products/services are available).

The starting point in the ex-ante market analysis process is identification of relevant retail market. After the relevant retail market has been defined an NRA shall conduct preliminary

assessment of that market in order to identify whether the market is effectively competitive and whether any existing or potential competitive problems exist on that market. The preliminary assessment of the relevant retail market shall be based on criteria such as market shares of authorised persons active on the market and level of the products'/services' retail prices and quality and their evolution in time. The preliminary assessment does not entail the full market analysis described later in this document.

If the preliminary assessment reveals that the relevant retail market is not effectively competitive the corresponding wholesale market susceptible to ex-ante regulation should be identified, defined and assessed. The wholesale market to be identified and analysed first is the one that is most upstream from the retail market in question in the vertical supply chain i.e. the wholesale market regulation of which would most significantly influence the development of effective competition in the relevant retail market. In some instances, it is beneficial for the development of sustainable competition if more than one wholesale market is identified. This is the case where retail product/service consists of more than one wholesale products that could be supplied independently of each other (for example fixed voice call the call can be established by 'putting together' three different wholesale inputs: call origination, call transit and call termination) or where sustainable competition can be more efficiently established by imposing access obligation on different levels of infrastructure (for example entry of competitors in the broadband connection service can be achieved via access to local loop or its equivalents and via bitstream access or its equivalents).

After the identification of the wholesale market the so called 'three criteria test' shall be conducted. The purpose of the three criteria test is to decide, whether the wholesale market identified complies with the conditions for ex-ante assessment of competition conditions on that market. Only markets that cumulatively fulfil all the three criteria (the presence of high and non-transitory structural, legal or regulatory barriers to entry, the market structure's tendency towards effective competition within the relevant time horizon, having regard to the state of infrastructure-based and other competition behind the barriers to entry and sufficiency of competition law alone to adequately address the identified market failure(s)) shall be subject to further assessment for the purpose of ex-ante regulation.

Those EU member states' NRAs who analyse relevant markets stipulated by the most up to date recommendation on relevant markets issued by European Commission in accordance with the provisions of Framework Directive, do not need to undertake the process of relevant market definition consisting of the steps 1 to 3.

7. Market analysis and identification of SMP undertaking

Once the relevant market passed the three criteria test the NRA can start with an assessment of the competition on that relevant market. Markets without efficient competition are markets where there are one or more undertakings with significant market power. According to article 14 (2) of framework directive an undertaking shall be deemed to have significant market power if, either individually or jointly with others, it enjoys a position equivalent to dominance, that is to say a position of economic strength affording it the power to behave to an appreciable extent independently of competitors, customers and ultimately consumers.
When assessing the effectiveness of the competition on the relevant market the NRA shall use combination of the following criteria:

- overall size of an authorised person;
- control of infrastructure not easily duplicated;
- technological advantages or superiority;
- absence of or low countervailing buying power;
- easy or privileged access to capital markets/financial resources;
- product/service diversification;

- economies of scale;
- economies of scope;
- vertical integration;
- highly developed distribution and sales network;
- absence of potential competition;
- barriers to expansion.

The NRA does not have to assess all the above mentioned criteria but only those criteria that are the most relevant for the analysed relevant market.

If the NRA comes to the conclusion that relevant market is not effectively competitive it shall identify an SMP undertaking or SMP undertakings (in case of joint SMP).

8. Imposition of obligations on SMP undertaking

Where the NRA concludes that the relevant market is effectively competitive, it shall not impose or maintain any regulatory obligations. When the NRA concludes that the relevant market is not effectively competitive it shall impose one or combination of the following specific obligations on SMP undertaking/s:

- transparency;
- non-discrimination;
- accounting separation;
- access to, and use of, specific network facilities;
- price control and cost accounting obligations and
- functional separation.

The purpose of the obligations imposed is to remedy identified potential or existing competition problems. The obligations shall be imposed in a manner that is least burdensome for the SMP operator but shall always address the problems identified. Transparency and non-discrimination obligations can have very positive effect on competitive situation in the relevant market with relatively low costs on the SMP operator's side. On the other side accounting separation and price control are quite burdensome but in certain situations are unavoidable. The access obligation although burdensome is unavoidable in all wholesale markets as it is impossible to develop competition without access to certain wholesale products. Functional separation shall be used only in specific cases where all the other obligations were not able to deliver desirable outcome. The same principle applies to retail price regulation as this obligation, when imposed very early in the market regulation life cycle and without prior imposition of wholesale obligations might lead to market distortion in a form monopolisation due to market exit of mainly small competitors.

Regular market reviews

Relevant markets where SMP undertaking has been designated shall be subject to regular review. The review represents a repeated assessment of the competition on the relevant market. If the review indicates that the obligations imposed on the SMP undertaking in the past have not yielded desired outcomes in the form of improved competition and improved consumers' welfare the NRA shall consider a possibility to impose different set of obligations. On the other side where the repeated market review reveals that the market is competitive even in the absence of regulatory obligations, the NRA shall remove all the obligations imposed on the basis of the previous market analysis.

Ex-ante regulation in the EU in its present form has been in place since 2003. Since then the

European Commission has issued (in accordance with article 15 of Framework Directive) three recommendations on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation. The recommendations identify those product and service markets within the electronic communications sector the characteristics of which may be such as to justify the imposition of regulatory obligations. The markets in the recommendations have been identified on the basis of the three criteria test. The NRAs, when analysing the markets should start from a presumption that the markets listed in the relevant recommendation met the three criteria test. This simplifies the task of market assessment compared to the situation where the NRA decides to assess a market not stipulated by a recommendation.
The first recommendation was issued in February 2003[63] and included 18 relevant markets (7 retail markets and 11 wholesale markets). The second recommendation was issued in December 2007[64] and included 7 relevant markets (1 retail market and 6 wholesale markets). The third recommendation issued in October 2014[65] includes 5 wholesale markets. The reduction in the number of relevant markets between 2003 and 2014 from 18 to 5 is result of developing competition caused by regulation, technological changes and changes of consumers' preferences.

The following table[66] presents the state of competition on relevant markets in individual EU member states as of 31 December 2016. The relevant markets are grouped on the basis of the three recommendations on relevant markets issued by the European Commission. It is obvious that the most critical markets, beside termination markets, are markets for wholesale broadband services. This is despite the fact that these markets have been regulated for more than a decade.

[63] Commission recommendation of 11 February 2003 on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communication networks and services (notified under document number C(2003) 497) (2003/311/EC)
[64] Commission recommendation of 17 December 2007 on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services (notified under document number C(2007) 5406) (2007/879/EC)
[65] Commission recommendation of 9 October 2014 on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services (2014/710/EU)
[66] Source https://ec.europa.eu/digital-single-market/en/news/definition-and-analysis-relevant-markets

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Article 7 cases as at 31/12/2016

	Effective competition - no ex ante regulation
	No effective competition - ex ante regulation
	Partial competition - partial ex ante regulation

1	1st round-competition/regulation
2	2nd round-competition/regulation
3	3rd round-competition/regulation
4	4th round-competition/regulation

	2014 RECOMMENDATION					2007 REC.		2003 RECOMMENDATION								
	Call term. on fixed network	Voice call term. on mobile networks	Wholesale local access	Wholesale central access	Wholesale high-quality access	Access to PSTN for res & non-res.	Call orig. on fixed network	Local/nat. Call for res.	Internat. call for res.	Local/nat. call for non-res.	Internat. call for non-res.	Retail LL	Transit on fixed network	Trunk segments LL	Access & call orig. on mobile network	Broadcast Transmis.
	Market 1	Market 2	Market 3a	Market 3b	Market 4	ex-Mkt 1	ex-Mkt 2	ex-Mkt 3	ex-Mkt 4	ex-Mkt 5	ex-Mkt 6	ex-Mkt 7	ex-Mkt 10	ex-Mkt 14	ex-Mkt 15	ex-Mkt 18
Austria	3	4	3	3	4	3	3	3	2	4	3	4	1	2	1	3
Belgium	2	2	2	2	1	2	1	3	1	3	1	1	2	1	1	w
Bulgaria	5	3	2	2	3	2	3	2	2	2	2	1	1	1		
Croatia	1	1	1	1	1	1	1	1		1		1		1		
Cyprus	2	3	4	4	2	3	3	3	2	3	2	2	3	2	3	3
Czech Republic	4	4	3	3	3	4	4	2	2	2	1	2	1	1	1	2
Denmark	3	4	3	3	4	3	3	2	2	1	1	2	1	1	1	1
Estonia	3	4	3	3	3	3	3	1	1	1	1	1	1	2	1	3
Finland	2	1	3	3	1	2	3	2	1	2	1	2	2	1	V	3
France	4	4	4	4	2	4	4	1	1	1	1	2	1	2	W	4
Germany	4	5	3	3	2	3	3	2	1	2	1	2	2	1	1	3
Greece	3	3	4	4	2	3	2	3	1	3	1	2	3	2	1	1
Hungary	3	5	3	3	3	6	3	3	3	3	3	3	2	2	2	2
Ireland	3	1	2	2	2	3	2	2	2	2	2	2	2	2	1	2
Italy	3	4	3	3	2	3	2	2	2	2	2	2	3	2	2	2
Latvia	5	4	3	3	3	1	3	4	3	4	3	3	2	1	1	1
Lithuania	4	3	3	3	2	1	2	3	2	3	2	1	2	2	1	5
Luxemburg	3	3	2	2	2	3	3	2	2	2	2	2	1	1	1	
Malta	3	3	2	2	3	3	3	2	2	2	2	3	2	2	2	1
Netherlands	4	4	5	3	3	3	2	2	2	2	2	2	2	2	1	2
Poland	2	3	2	3	1	2	2	2	2	2	2	2	1	1	2	2
Portugal	2	2	3	3	3	2	2	2	2	2	2	1	1	3		2
Romania	2	2	2	1	1	2	2	1	1	1	1		2			1
Slovakia	4	4	3	3	3	4	4	2	2	2	2	2	2	1	1	2
Slovenia	2	5	3	3	2	3	3	2	1	1	1	2	3	1	3	3
Spain	3	3	3	3	3	4	3	2	2	2	2	2	2	3	1	3
Sweden	4	4	3	3	3	3	3	1	1	1	1	2	2	1	1	4
United Kingdom	3	4	2	4	4	4	3	2	2	2	2	4	2	4	1	2

There are several reasons for such situation. First of all, in majority of EU member states the main feature of the broadband market is presence of historically strong incumbent with extensive copper network coverage. The incumbents played the most important role in the beginning of broadband deployment as their networks were the only ones capable of providing broadband. In order to allow other operators to enter retail market, incumbents had to be regulated at the wholesale access level in the form of local loop unbundling and bitstream access. As the competition has built up the new technology trends occurred and incumbents started to upgrade their copper networks with fibre. Although fibre deployment requires essential network investment, bringing fibre closer to the end-user allows provision of higher speeds and brings costs saving in operating costs. Regulatory framework had to follow the trend as the fibre deployment caused that 'copper based' wholesale access products were not able to target competition problems on their own. NRAs came with the concept of so-called virtual unbundled local loop. In parallel to incumbents' fibre rollout alternative operators started with their own fibre network rollout, in most cases in the FTTH form. These networks were usually deployed in parallel with incumbents' networks but only in highly populated areas where effect of economies of scale could be achieved. Beside that, new technologies allowed broadband to be provided over the networks originally built for the purpose of transmission of TV channels (cable TV networks) and wireless technologies such as WiMax and Wi-Fi (in case of Wi-Fi profitable even if provided in the small scale).
All the above mentioned factors contributed to the fact that broadband regulation became rather complex or even more complex than in the beginning and regulators all over the EU have to be very careful when dealing with issues such as indirect competition, geographical segmentation of the relevant market and oligopolistic market structure. NRAs have to be very careful when regulating to put in place regulation that not only brings competition but also stimulates investment into modern infrastructure which makes the issue even more complex. Combination of the factors like presence of strong incumbent, limited geographical presence of competing networks and oligopolistic market structure lead to a situation where the ex-ante regulation of the broadband market in majority of EU member states is still legitimate.

Implementation for broadband/NGA

Having regard to the above mentioned policy objectives and in accordance with Article 15 of the Framework Directive the European Commission issued the following three recommendations on relevant product and service markets that identify those product and service markets within the electronic communications sector the characteristics of which may be such as to justify the imposition of regulatory obligations:

- Commission recommendation of 11 February 2003 on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communication networks and services (2003/311/EC)
- Commission recommendation of 17 December 2007 on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services (2007/879/EC)
- Commission recommendation of 9 October 2014 on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services (2014/710/EU).

All three recommendations include, among others, relevant markets related to broadband.

The Recommendation 2003/311/EC includes markets for

- *wholesale unbundled access (including shared access) to metallic loops and sub-loops for the purpose of providing broadband and voice services* and
- *wholesale broadband access*.

The Recommendation 2007/879/EC includes markets for

- *wholesale (physical) network infrastructure access (including shared or fully unbundled access) at a fixed location* and
- *wholesale broadband access.*

The Recommendation 2014/710/EU includes markets for

- *wholesale local access provided at a fixed location* and
- *wholesale central access provided at a fixed location for mass-market products.*

The European Commission when differentiating between the two types of markets defined in all recommendations used so called 'ladder of investment' principle. The basic rule that applies in this principle is that closer to end-users an alternative operator (the term alternative operator refers to an operator competing with the traditional incumbent or SMP operator) reaches with its own infrastructure less dependent he becomes on incumbent's infrastructure and has more control over the parameters of the retail service. Alternative operators reaching the highest level of ladder of investment are those who own the whole network path up to the end-users' premises. The ladder of investment provides an opportunity for a wide spectrum of alternative operators depending on their level of network development to compete on the retail broadband market. While alternative operators with less developed networks can enter the retail market using wholesale broadband access (considered to be a non-physical access product) in its different forms (bitstream access, access at ATM level, access at IP level or simple resale), alternative operators with more developed networks can enter the retail market using unbundled access to the local loop (considered to be a physical access product). In addition, alternative operators capable of using unbundled access to the local loop can become active also on the wholesale broadband access market and compete with an incumbent on that market. From the perspective of the two wholesale markets the market for *unbundled access* or *local access* represents the higher level of ladder of investment compared to *wholesale broadband access* or *wholesale central access* respectively.

The reason behind the shift in the market definition between 2007 and 2014 recommendation where physical access has been replaced with local access and broadband access replaced with central access is the ongoing investment into fibre networks. As certain fibre based network topologies are not able to provide physical access to last mile (equivalent to unbundled access to copper loop) but such access can be substituted by so called *virtual unbundled local access* (VULA) the European Commission requalified the market from physical network infrastructure access to local access (covering both physical and virtual) while still respecting the high level of ladder of investment. With the shift of virtual access higher in the investment ladder it was not possible to keep the difference between the two wholesale markets on the basis of their physical/virtual characteristics. The European Commission therefore used the actual location of the point of handover, network contention and degree of flexibility of the network control as a differentiating point between the two wholesale markets.

Recognising the importance of the NGA rollout whether in the form of greenfield investment or as an upgrade of the legacy network on one side and necessity of regulation in order to create sustainable competitive environment in provision of high speed network the European Commission issued the following two recommendations intended to harmonise regulatory approach throughout the European Union, promote rapid development of very high-speed broadband services, promote efficient investment and innovation in new and enhanced infrastructure and foster competition:

- Commission Recommendation of 20 September 2010 on regulated access to Next Generation Access Networks (NGA) (2010/572/EU) (hereinafter '2010 Recommendation') and

- Commission Recommendation of 11 September 2013 on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment (2013/466/EU) (hereinafter '2010 Recommendation').

Both recommendations provide guidance on how to approach existing 'universal obligations' such as non-discrimination, transparency, access and cost orientation in the NGA environment in order to achieve regulatory and investment objectives.

In cases where NRA finds SMP operator on market for unbundled local loop the following obligations should be imposed on such operator:

- access to civil engineering infrastructure where duct capacity is available based on principle of equivalence (applying same conditions to internal and third party access seekers) and provided at cost oriented prices;
- publication of reference offer for access to civil engineering infrastructure no later than in 6 months after an NRA imposed the obligation to grant access;
- encourage, when building civil engineering infrastructure, installation of sufficient capacity for other operators to make use of it;
- access to the terminating segment of the access network of the SMP operator including wiring inside the building, where an SMP operator deploys 'Fibre-to-the-home' (FTTH), and oblige the SMP operator to provide detailed information on its access network architecture;
- following consultation with potential access seekers determination of placement of distribution points of the terminating segments of the access network (each distribution point should host sufficient number of end-user to be commercially viable for access seekers);
- access to distribution point provided on principle of equivalence and at cost oriented prices;
- publication of reference offer for access to the terminating segment no later than in 6 months after an NRA imposed the obligation to grant access;
- encourage deployment of multiple fibre lines in terminating segments;
- unbundled access to the fibre loop in the case of FTTH accompanied by measures assuring co-location and backhaul and provided at the most appropriate point in the network[67];

[67] Metropolitan Point of Presence refers to the point of inter-connection between the access and core networks of an NGA operator. It is equivalent to the Main Distribution Frame (MDF) in the case of the copper access network. All NGA subscribers' connections in a given area (usually a town or part of a town) are centralised to the MPoP on an Optical Distribution Frame (ODF). From the ODF, NGA loops are connected to the core network equipment of the NGA operator or of other operators,

- unbundled access to the fibre loop provided on cost oriented prices taking into account investment risk specific to the fibre loop reflected in a premium included in the costs of capital;

- unbundled access to the fibre loop provided under non-discriminatory conditions where non-discrimination should be assessed based on margin squeeze test specified by the NRA in advance;

- unbundled access to the copper sub-loop in the case of FTTN supplemented by backhaul (fibre and Ethernet) where appropriate and non-discriminatory access to facilities for co-location; all provided at cost oriented prices and included in the reference offer published no later than in 6 months after an NRA imposed the obligation to grant access.

In order to facilitate the access obligation a data-base accessible to all operators containing information on geographical location, available capacity and other characteristics of civil engineering infrastructure suitable for fibre network deployment shall be put in place.

Exemption to mandating unbundled access to the FTTH should be justified in geographic areas where the presence of several alternative infrastructures, such as FTTH networks and/or cable, in combination with competitive access offers is likely to result in effective competition on the downstream level.

Margin squeeze can be demonstrated through:

1) equally efficient competitor test showing whether the SMP operator's own downstream operations could trade profitably on the basis of the upstream price charged to its competitors by the upstream operating arm of the SMP operator or

2) reasonably efficient competitor test showing whether the margin between the price charged to competitors on the upstream market for access and the price which the downstream arm of the SMP operator charges in the downstream market is sufficient to allow a reasonably efficient service provider in the downstream market to obtain a normal profit

In cases where NRA finds SMP operator on market for wholesale broadband access the following obligations should be imposed on such operator:

- provide wholesale broadband access over VDSL as substitute to existing wholesale broadband access over copper-only loops;

- non-discrimination throughout making new wholesale broadband access products available at least six months prior to their marketing by SMP operator or its retail arm on cost oriented prices or putting in place reliable margin squeeze test in cases where cost orientation has not been imposed;

- provision of different wholesale products reflecting bandwidth and quality of NGA

possibly via intermediate backhaul links where equipment is not co-located in the MPoP.

infrastructure in order to enable effective competition of alternative operators.

In justified cases where there is effective access to the unbundled fibre loop of the SMP operator's network and that such access is likely to result in effective competition on the downstream level, NRAs should consider removing the obligation of wholesale bitstream access in the area concerned.

In situation where operators do not benefit from the same economies of scale and scope and have different unit costs it is usually more appropriate to use a reasonably efficient competitor test.

Any obligations imposed in the past shall be kept unless an agreement on migration path between the SMP operator and access seekers has been reached. In case of absence of such agreement access seekers shall be informed no less than five years before decommissioning of existing points of interconnection. Such period can be shorter if fully equivalent access is provided at the point of interconnection. NRAs should put in place transparent framework for migration from copper to fibre based networks and use their powers to obtain all relevant information regarding SMP operator's network modification likely to affect competitive conditions in the marker.

NRAs can ensure non-discriminatory behaviour by ensuring equivalence of access and ensuring technical replicability of SMP operator's new retail offers.

When ensuring equivalence of access NRAs can use two different approaches:

- equivalence of inputs (EoI)[68] which is in principle the surest way to achieve effective protection from discrimination. Given the potentially high compliance costs, it may be disproportionate to require the SMP operator to apply EoI at every level of the value chain. NRAs would first need to identify the level at which the imposition of EoI would deliver the greatest benefits to competition and innovation, and then assess whether EoI would also be appropriate and proportionate for additional levels as well. EoI should be introduced at the deepest possible network level at which competition will be effective and sustainable in the long term.

- equivalence of outputs (EoO) which should be put in place in case of high number of small scale SMP operators, when the imposition of EoI may be disproportionate. EoO ensures that the wholesale inputs provided to alternative operators – while not using the same systems and processes – are comparable, in terms of functionality and price, to those the vertically integrated SMP operator consumes itself.

Technical replicability represents a tool that allows access seekers to effectively replicate new retail offers of the downstream retail arm of the SMP operator in particular where EoI obligation is not fully implemented. NRAs should ensure that SMP operator's retail arm and access seekers have access to the same technical and commercial information regarding the

[68] (EoI)' means the provision of services and information to internal and third-party access seekers on the same terms and conditions, including price and quality of service levels, within the same time scales using the same systems and processes, and with the same degree of reliability and performance. EoI as defined here may apply to the access products and associated and ancillary services necessary for providing the 'wholesale inputs' to internal and third-party access seekers.

relevant regulated wholesale input and corresponding service level agreements (SLAs)[69], key performance indicators (KPIs)[70] and service level guaranties (SLGs)[71] are available. Imposing SLAs ensures that access seekers are provided with an agreed quality of service, whereas the use of corresponding SLGs acts as a deterrent against discriminatory behaviour. NRAs should be closely involved in the development of SLAs (for instance, by approving the SLAs developed by the SMP operator as part of a regulatory reference offer).[72]

KPIs should be:

- audited and published in a manner that allows for the early detection of potential discriminatory behaviour,
- related to the key activities in the provisioning cycle, covering all its stages, i.e.:
    - ordering process,
    - delivery or provision of the service,
    - quality of service, including faults,
    - fault repair times,
    - migration between different regulated wholesale inputs (excluding one-off bulk migrations),
- complemented by Service Level Agreements (SLAs) and Service Level Guarantees (SLGs).

When imposing cost oriented prices, it is appropriate to use a costing methodology that leads to access prices replicating as much as possible those expected in an effectively competitive market and ensures that operators can cover costs that are efficiently incurred and receive an appropriate return on invested capital (cost recovery).

Such a costing methodology should:

- be based on modern efficient network
- reflect the need for stable and predictable wholesale copper access prices over time, which avoid significant fluctuations and shocks
- deal appropriately and consistently with the impact of declining volumes caused by the transition from copper to NGA networks

The bottom-up long-run incremental costs plus (BU LRIC +) costing methodology allows for recovery of the total efficiently incurred costs and calculates the current costs of deploying a modern efficient NGA network and therefore best meets the objectives for setting prices of the regulated wholesale access services.

Valuation of the assets of such an NGA network at current costs best reflects the underlying

[69] SLAs means commercial agreements under which the SMP operator is obliged to provide access to wholesale services with a specified level of quality.
[70] KPIs are indicators that measure the level of performance in the provision of the relevant wholesale services.
[71] SLGs form an integral part of SLAs and specify the level of compensation payable by the SMP operator if it provides wholesale services with a quality inferior to that specified in the SLA.
[72] In order to ensure transparency and to facilitate the monitoring of the evolution of the investment environment for NGA broadband as well as of competitive conditions NRAs should ensure that operators provide them with up-to-date information, including investment and NGA roll-out plans on a regular basis.

competitive process and, in particular, the replicability of the assets. Unlike assets such as the technical equipment and the transmission medium (for example fibre), civil engineering assets (for example ducts, trenches and poles) are assets that are unlikely to be replicated.

When modelling an NGA network, NRAs should include any existing civil engineering assets that are generally also capable of hosting an NGA network as well as civil engineering assets that should be newly constructed to host an NGA network.

When building the BU LRIC + model, NRAs should not assume the construction of an entirely new civil infrastructure network for deploying an NGA network.

NRAs should:

- value all assets constituting the RAB (Regulatory Asset Base) of the modelled network on the basis of replacement costs, except for reusable legacy civil engineering assets,
- examine the accounts of the SMP operator where available in order to determine whether they are sufficiently reliable as a basis to reconstruct the regulatory accounting value,
- not include reusable legacy civil engineering assets that are fully depreciated but still in use,
- set the lifetime of the civil engineering assets at a duration corresponding to the expected period, during which the asset is useful and to the demand profile - normally not less than 40 years in the case of ducts,
- only update the data input into the costing methodology when conducting a new market review, in principle after three years,
- only adjust such data in line with the real evolution of individual input prices and in any case ensure the full recovery over time of the costs incurred to provide the regulated wholesale access services, when updating the model,
- publish the updated outcome of the costing methodology and resulting access prices over the relevant three-year period.

Price regulation should not be imposed in the presence of low retail prices (due to other equivalent wholesale inputs or existence of alternative infrastructures), assuming the existence of EoI and technical and economic (ex-ante) replicability.

Ex-ante economic replicability test assesses whether the margin between the retail price of the relevant retail products and the price of the relevant NGA-based regulated wholesale access inputs covers the incremental downstream costs and a reasonable percentage of common costs.

NRAs should specify at least the following parameters of the ex-ante economic replicability test:

- the relevant downstream costs taken into account,
- the relevant cost standard,
- the relevant regulated wholesale inputs concerned and the relevant reference prices,
- the relevant retail products,
- the relevant time period for running the test.

Equally efficient competitor test:

Price charged third-party access seekers	+	Costs of the SMP operator's own downstream businesses	≤	Price of the most relevant retail products including broadband services ('flagship products') offered by the SMP operator
The most relevant regulated inputs: • active input • passive input • non-physical or virtual input offering equivalent functionalities to a passive input		• Audited or adjusted downstream costs (for example where very low volumes of lines indicate that objective economic conditions do not favour the acquisition of scale by alternative operators) • LRIC+		From the perspective of: • the volume • advertising expenditure • attractiveness for alternative operators

NRAs should evaluate the profitability of the flagship products on the basis of a dynamic multi-period analysis, such as the discounted cash flow (DCF) approach. Where the reasons not to impose price control are met only in certain areas, price control should be imposed only where these conditions are not met.

The decision not to impose or maintain regulated wholesale access prices should be accompanied with measures, which monitor the evolution of the investment environment for NGA broadband and of competitive conditions.

NRAs should perform price control through margin squeeze test (ex post).

3.4 Initial Findings

1. Macro economy situation

After the dramatic slowdown in 2008 caused by conflict with Russia and following financial crisis and challenges due to fragile recovery and slow-down in Russia due to low oil prices and international sanctions the situation is stabilising and the economic growth is coming back, together with increased wages, lower unemployment and relatively low inflation which together creates favourable environment for ongoing investments in broadband infrastructure and continuing growth of subscribers base.

Nevertheless, Georgia's exposure to external shocks, fiscal pressures, elevated rural poverty, and rising exchange rates pose important challenges to the Government's economic development and planned NGA objectives.

2. Broadband situation

Georgia is clearly behind European countries in terms of both broadband coverage and penetration. However the good news is that majority of current broadband connections are on fibre and in most cases even the most future proof fibre to the home. New deployment is almost exclusively fibre in urban areas and fibre or WiFi in rural areas.

Despite the dominant share of fibre services the access speeds are relatively slow averaging around 10 Mbps as they are artificially limited by operators to get price premium for higher speeds.

Prices are rather high and highly aligned especially among the dominant players. Alternative players are limited by wholesale access prices which are extremely high and doesn't allow to provide competitive prices.

3. Issues identified by operators

Several areas of concern were identified during the meetings with operators. Some of them were more mobile specific and were covered in other streams of the project, but many have overlap into fixed broadband or were specifically raised by fixed broadband operators. Following is a list of concerns and if relevant possible suggestions how to address the concern.

Area of concern	*Issue*	*Suggestions*
Construction and registration permits	• Construction permits for infrastructure can be difficult to obtain due to a variety of government bodies involved in granting permits and difference across their requirements. In regions, permits cannot be obtained electronically • Right to register infrastructure is not granted along with a construction permit. In the absence of the former, infrastructure owner can be asked to move or remove the infrastructure at own cost - there is a contradiction across different legal acts as to what party must bear the infrastructure relocation cost - tower builds often meet protests from local population, and sometimes operators are followed to remove the towers despite having been granted a construction permit	• A "one-stop shop" for national and regional permits with simplified registration of ducts • A publicly available database of permits (potentially Business House) • Transparent regulation on infrastructure registration, protecting operators' property rights – to be supported (but not developed) by the GNCC
Geographic and socio-economic factors	• Mountainous terrain and scarce population density in rural Georgia • Low purchasing power of population outside of major cities • Especially in rural areas there is low penetration of personal computers and low	• Demand stimulation programs • IT education • Support of infrastructure development in

	or none IT skills	difficult to access areas
Civil works transparency	• Currently there is a lack of timely information about planned civil works (such as building of roads and bridges, new developments) - this could lead to lost opportunities for cost-effective network infrastructure deployment - moreover, awareness of future civil works could influence deployment decisions, allowing operators to assess the risk of potentially having to move or remove infrastructure	• A publicly available announcement board with planned civil works with option to receive notification for specific areas
GNCC transparency	• GNCC is not currently obligated to hold public consultations or set an appropriate timescale for consultation responses; operators claim they have a month to respond to draft documents, and there are no guarantees their responses would be considered	•
Pricing	• Due to lack of wholesale price regulation, there are incidences of price damping (retail prices seemingly lower than cost) and cross-subsidising • ISP Association is concerned about wholesale access to networks and high pricing of bandwidth, and discriminatory retail pricing hindering the possibility for alternative operators to offer lower prices than the dominant players • Some local municipalities ask for exorbitant prices from operators to install their technology on state owned buildings	• Market analysis to identify possible issues • Impose remedies based on real cost structure of the services offers
Access to deployment initiatives	• ISP Association is concerned that conditions for deployment or service provision required by government agencies (like OpenNet) might favour only larger players operating in multiple areas and won't let small "single locality" operators to participate	• Supervise conditions of deployment initiatives that they allow everyone to participate
Missing geographic and statistical data	• According to operators in many areas there is no clear and unified identification of premises (like ZIPcode/house number)	• Introduce unified geographic identification system

	• There are no data regarding number of dwelling units in the buildings	• Collect data regarding dwelling units and offer it as a database
Ducts access	• Some operators see the ducts access regulation as insufficient. Prices are too high, that it is not feasible to rent ducts, but it is cheaper to build them in parallel. Duct owners also claim that they have insufficient capacity which is impossible to check • Some duct owners (like utility companies) strike exclusive deals with selected operator and block access to their ducts to others.	• Market analysis to identify possible issues • Impose remedies based on real cost structure • Collect and monitor free capacity in ducts • Regulate exclusive deals for critical deployment infrastructure

4. Regulation

Ex-ante regulatory frameworks currently in place in Georgia and in the EU have certain similarities as both strive to achieve sustainable competitive environment throughout the process of assessment of competition in the relevant market, designation of SMP operator and imposition of relevant obligations. However, there are issues in this process that need to be addressed in the law and related secondary legislation that will bring more certainty, consistency and flexibility into ex-ante regulation. These issues include: i) use of three criteria test for definition of relevant market subject to ex-ante market assessment, ii) use of criteria to identify authorised person with significant market power, iii) definition of geographic scope of the relevant market, iv) tackling the oligopolistic market structure and v) imposition of broadband/NGA specific remedies/obligations on authorised persons with significant market power. Only after these issues are addressed GNCC can built upon the EU best practice either directly or in a form adapted to local circumstances and will be able to target existing and potential competition problems.

4 Broadband and NGA Objectives

4.1 NGA Reference Points

Recognising the role that broadband and especially the high-speed Internet plays in the society the European Commission in its document "Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions"[73] dated 19 May 2010 set the following objectives in the area of high-speed internet connection and coverage:

(i) to bring basic **broadband to all** Europeans **by 2013**[74];
(ii) all Europeans have access to much higher internet speeds of above 30 Mbps and
(iii) **50% or more** of European households **subscribe to internet connections above 100 Mbps by 2020.**

While the above mentioned goals remain valid the European Commission in its Communication to the European Parliament, the Council, the European economic and social committee and the Committee of the regions "Connectivity for a Competitive Digital Single Market - Towards a European Gigabit Society[75]" (COM(2016) 587 final) dated 14 September 2016 set the following complementary longer term objectives by 2025:

(i) **gigabit connectivity for all main socio-economic drivers** such as schools, transport hubs and main providers of public services as well as digitally intensive enterprises;
(ii) all urban areas and all major terrestrial transport paths to have uninterrupted 5G coverage.
Intermediate objective for 2020: 5G connectivity to be available as a fully-fledged commercial service in at least one major city in each Member State, building on commercial introduction in 2018 and
(iii) **all EU households, rural or urban, will have access to Internet connectivity offering a downlink of at least 100 Mbps, upgradable to Gigabit speed**.

These complementary objectives have been set in order to match a time horizon for infrastructure investments, technological development and the role that high speed connectivity plays for Europe's growth, jobs, competitiveness and cohesion.

4.2 NGA Objectives Set-up

National objectives regarding broadband/NGA **shall be declared on a central level by a document issued by the government of Georgia.** Such document should beside the specific goals stipulate responsibility of all stakeholders.

Broadband/NGA goals in the sense of service quality, coverage and timeline are the corner stone for the tools that have to be deployed in order to achieve those goals.

For the purpose of this document **we believe that the EU objectives** for the 2020 horizon **might be a good reference point** for setting broadband/NGA objectives for Georgia.

[73] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52010DC0245&from=EN
[74] As per the European Commission's press release dated 17 October 2013 (http://europa.eu/rapid/press-release_IP-13-968_en.htm) 100% basic broadband coverage was achieved across Europe thanks to pan-EU availability of satellite broadband.
[75] https://ec.europa.eu/digital-single-market/en/news/communication-connectivity-competitive-digital-single-market-towards-european-gigabit-society

5 Broadband Market Trends

5.1 Coverage & Technology

1. Subscribers and Technology Trends

Fibre is nowadays dominant and the fastest growing fixed broadband technology in Georgia, followed by WiFi which is technology of choice in remote regions and local municipalities. xDSL technologies are decreasing on increased pace as they are gradually replaced by FTTx.

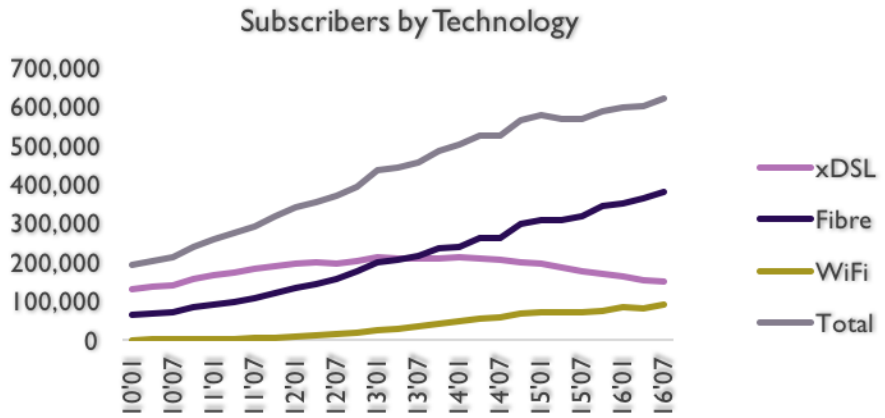


Figure 5-1 Subscribers by technology[76]

Fixed broadband market was dominated by Silknet and Caucasus Online, after recent acquisition Caucasus Online become part of MagtiCom who early in 2017 also finished acquisition of Delta Net and further increased its customer base from 153,000 to 180,000 subscribers.

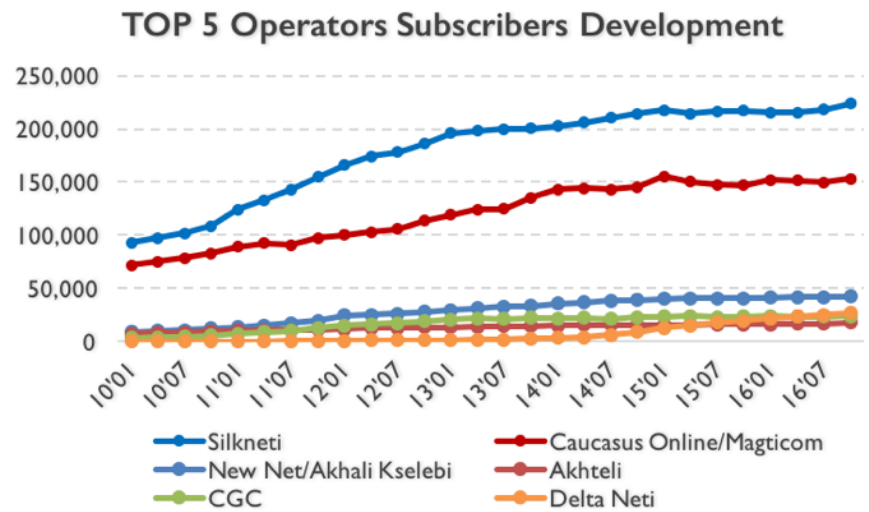


Figure 5-2 Top 5 Operators Subscribers Development

[76] Source GNCC.

FTTx Coverage

Comparing fibre coverage Georgia is well ahead of the European Union average comparing only fibre technologies, yet still lagging compared to all NGA technologies (including VDSL and Cable). In average EU countries had 71% NGA coverage in 2015 compared to 54% in Georgia (and already 58% in 2016) with a similar growth trend as for EU NGA.

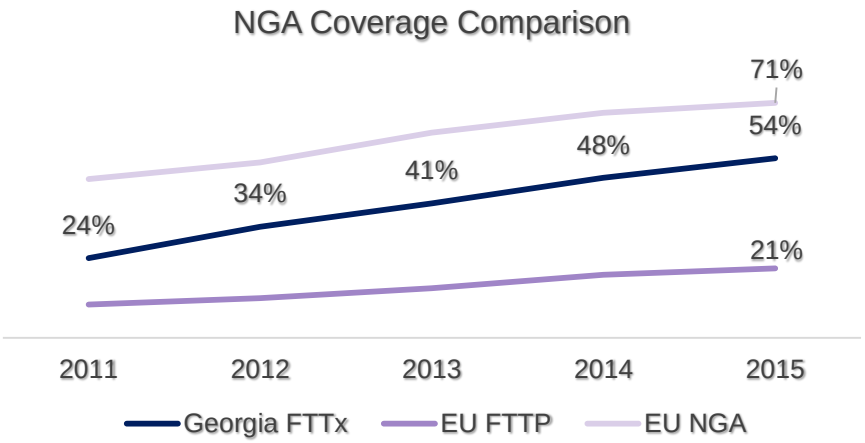


Figure 5-3 NGA Coverage[77] Trends Comparison

Demand for broadband services in Georgia

We have compared the progress of take-up of fibre services in Georgia (in areas where fibre services are available) with the performance seen in European countries. This is shown in Figure 5-4.

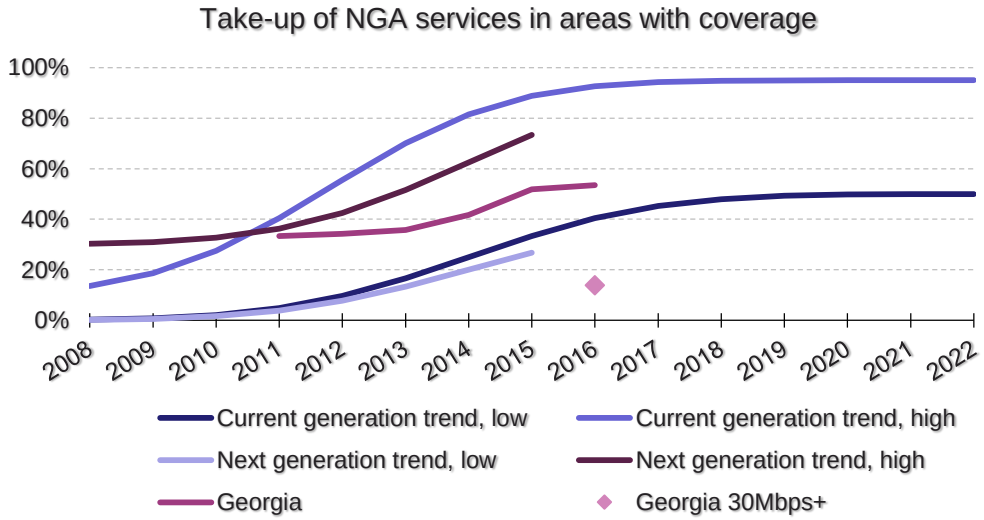


Figure 5-4 Benchmark of take-up of NGA services in covered areas[78]

[77] Source: Digital Economy and Society Index 2016 Telecommunications data. Georgian data are based on subscribers penetration data from GNCC and GeoStat combined with coverage penetration assumptions as described in Figure 1-9 Fibre Coverage in EU and Georgia in Annex 2. For Georgia any FTTx service is considered to be NGA.

[78] Source: Grant Thornton and Analysys Mason

We have compared the progress of Georgia with two trends from Europe:

- The take-up of current generation broadband in covered areas since launch in all European countries. The "high" and "low" trends are based on the max and min values seen in Europe and give a range in which demand can be expected to progress; and
- The take-up of next generation broadband in covered areas since launch in all European countries. The "high" and "low" trends are created and applied in the same way as current generation broadband.

The take-up of NGA services in covered areas in Georgia shows that, compared to European benchmarks, take-up was initially very high. However, over time, the trend has fallen back towards the middle of the benchmark range, which may indicate that further demand stimulation could be useful. In addition, higher prices of higher speed packages is contributing to most users having less than 30Mbps speeds despite having fibre service.

Subscriber's Fibre Penetration in Regions

Subscriber's fibre penetration[79] is growing in almost all regions with exception of Guria and Racha-Lechkhumi and Kvemo Svaneti. Average country penetration of fibre broadband is 31%, with Tbilisi well above average with 64% penetration. Adjara and Kvemo Kartli are around average and the rest of the regions are well below average with the highest penetration reaching only 17% in Kakheti. In Tbilisi, we can already see signs of saturation as the penetration growth is slowing down.

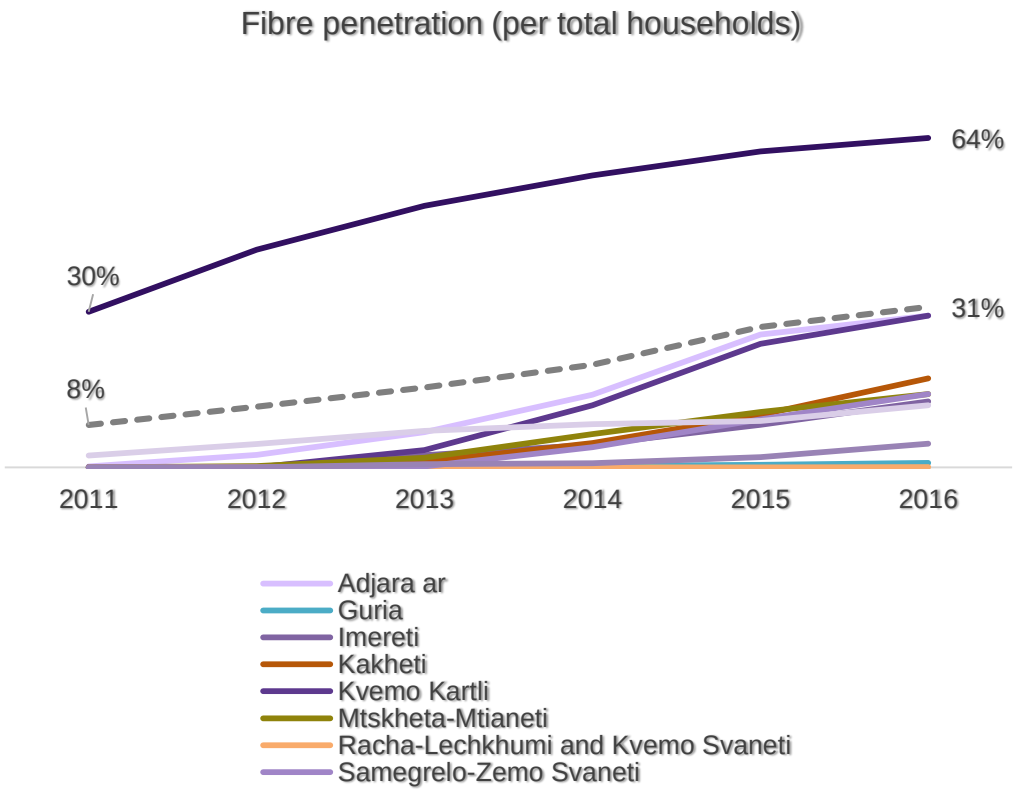


Figure 5-5 Fibre penetration trends

[79] Penetration = Retail Subscribers / Total Households in a region. There might be a slight double counting as some offers are prepaid and operators can keep subscribers in their totals while also using a competitive service. However, due to the relatively small overlap in coverage we do not expect significant impact on total numbers.

The maps of localities covered by fibre[80] demonstrate the rapid growth of fibre connections in the last four years. Notable change is visible in the western region of Kakheti where Delta-net (recently purchased by Magticom) was deploying it's network and managed to connect nearly 15% of all households in the region.

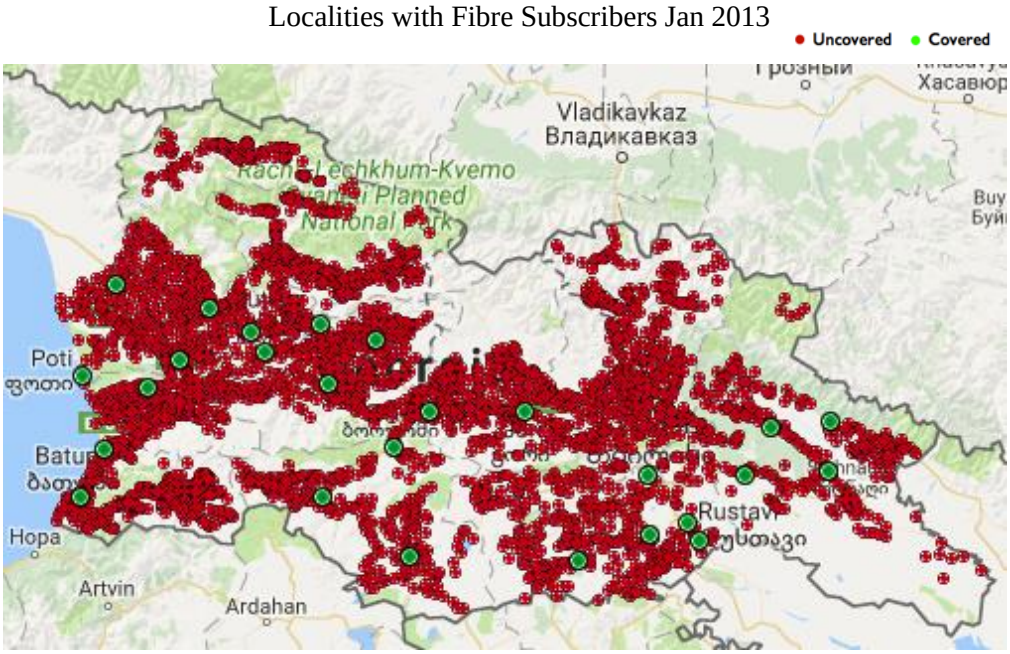


Figure 5-6 Localities with fibre connection[81] January 2013

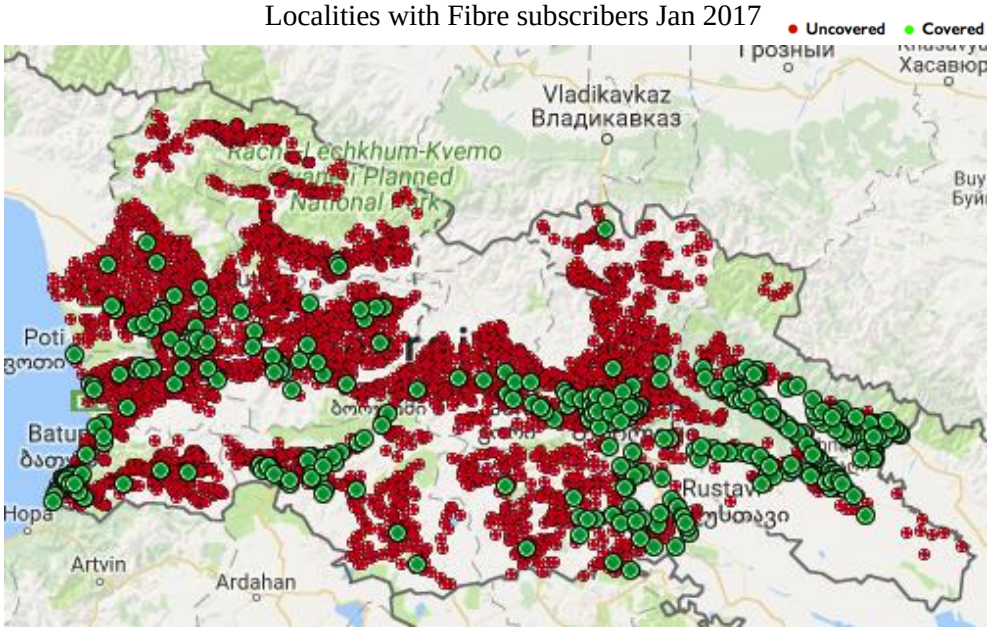


Figure 5-7 Localities with fibre connection January 2017

[80] Source: GNCC analytics portal.
[81] Source: GNCC Analytical Portal

2. Fibre Coverage and Penetration Forecasts till 2021

Market consolidation and economic slow-down slowed the fibre coverage deployment in recent years, but economy improvement and "restart" of deployment plans after the consolidation, together with the effect of the OpenNet project should result in coverage growth in the next 5 years driving the coverage from an estimated 58% in 2016 to 76% in 2021.

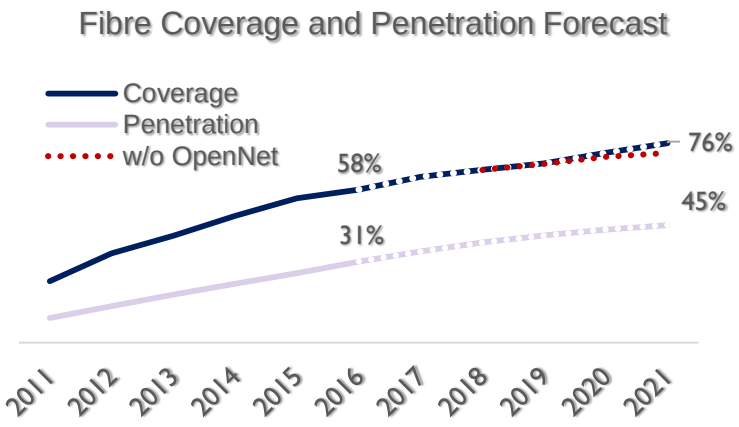


Figure 5-8 Fibre coverage trend and forecast[82]

Despite the signs of early saturation in Tbilisi, current economy growth improvement and plans to replace legacy xDSL network should both drive further growth reaching 71% connected households penetration in Tbilisi by 2021, which is still less than current 83% of fixed broadband penetration in the capital. Steady growth is expected in the total fibre penetration with OpenNet project having only marginal impact of 1.5% percentage points on the total penetration numbers by 2021, as there is uncertainty about when it will finish building backbone connectivity and there wouldn't be enough time for providers to deploy local infrastructure.

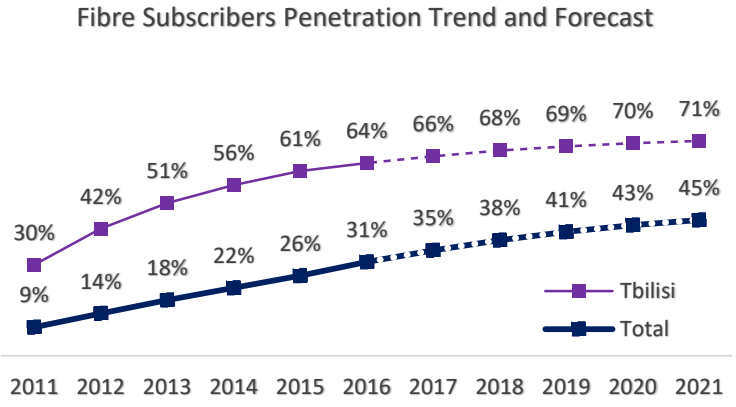


Figure 5-9 Fibre subscribers penetration trend and forecast

[82] Source: GNCC data for subscribers in regions, partial data from operators regarding coverage with assumptions made to model coverage in remaining areas based on number of subscribers per operator in a region.

3. Fixed Broadband and Fibre Subscribers Forecast to 2025

With a more forward looking forecast[83] the number of fixed broadband subscribers is projected to reach 76% of Georgian households by 2025. This assumes not only organic growth fueled by an improved economic situation, but other support initiatives increasing the reach of service like OpenNet, which can address up to 8.3% of households, together with improvement of IT skills and technology penetration. The share of FTTx subscribers is expected to grow from 61% in 2016 to 66% in 2025 as fibre is clearly the technology of choice in Georgia. Total fibre penetration is projected to reach 50% by 2025.

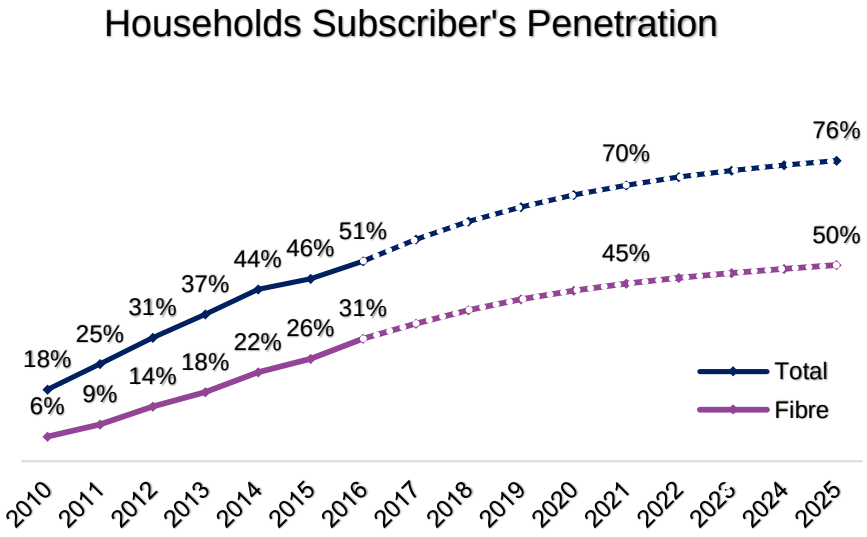


Figure 5-10 Retail Subscriber's Penetration trend and long term forecast.

4. Fixed and mobile LTE impact

Despite the fact LTE is not strictly considered as a fully-fledged NGA technology due to limitations on capacity and upload speeds (which are rarely higher than 10 Mbps) it will definitely have sizeable impact on broadband penetration in Georgia, as it allows coverage of areas where fibre deployment wouldn't be feasible and also helps operators to speed-up NGA deployment, lower investment risk and better target prospective areas by offering fixed LTE services first and then deploying fibre to the areas where they managed to acquire broadband customers.

[83] 2010-2016 source data from GNCC analytic portal, forecast based on growth supported by growing economy yet hindered by saturation of economically feasible roll-out. Assuming any fixed broadband capable of delivering over 3 Mbps. Fibre assumes fibre technology connection technically capable of delivering 100 Mbps speeds yet it can be artificially limited by operator to much lower speeds. Number of households is expected to grow 1% YoY since 2017 reaching 1.19 m in 2025 (it used to be over 1.2m in 2010)

Silknet offers fixed LTE service using 2.3 GHz LTE technology with similar pricing and download speeds as for fibre offers. However as mentioned above all offers are limited to 5Mbps upload speeds and have volume limits.

Silknet Fixed LTE tariffs

Figure 5-11 Silknet fixed LTE tariffs[84]

Customers are not limited only by fixed LTE offer, but they can purchase standard mobile data offers. LTE technology in Georgia is usually offered with zero price premium compared to other mobile data technologies and offers very attractive startup prepaid tariffs making internet access affordable for much greater audience and especially with low frequency LTE (700 or 800 MHz) mobile operators coverage will reach lot of rural areas using existing grid of base stations. Despite it is not economically feasible to build fixed LTE solutions instead of FTTx there will be lot of free LTE capacity in rural areas and extremely low population density in those areas would allow average speeds to be in tenths mbps as the network shouldn't get so easily saturated there. There are already examples in other countries, where LTE is offered as a substitution for fixed broadband but the offer is limited only to sparsely populated areas where there is free capacity.

LTE technology can be also good entry level broadband service for many users. Current mobile internet tariffs start as low as 3GEL per month albeit only with 0.5GB data limit.

Magticom mobile internet tariffs

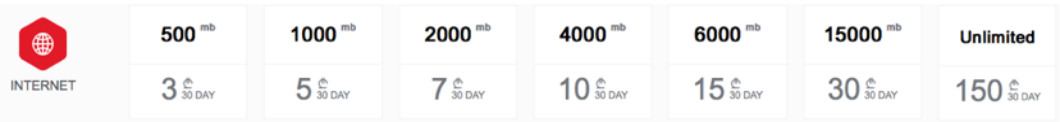


Figure 5-12 Magticom mobile broadband tariffs[85]

[84] Source: Silknet web pages March 2017.
[85] Source: Magticom web pages March 2017, strictly speaking this is not LTE specific offer, but general mobile broadband tariffs with LTE as one of the available technologies.

5.2 Prices

1. Fibre ARPU Trend

Average Fibre ARPU is staying within 20-25 GEL level and competitive offers have tendency to converge higher to the average level. Compared to the EU the average price is almost in line with average broadband prices in the EU, yet usually the European subscribers will get much higher speeds than the subscribers in Georgia and in cases of Lithuania, Latvia, Romania, Hungary, Poland and Czech Republic, they will get speeds around 50-100 Mbps for even lower prices than average ARPU in Georgia.

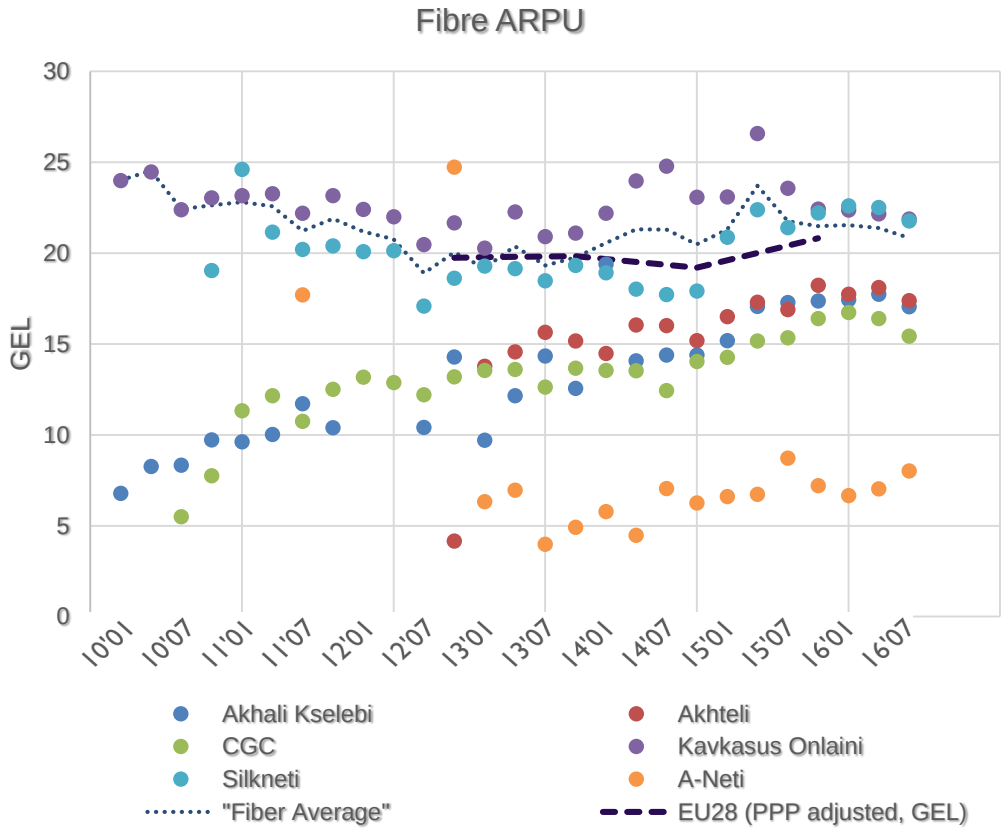


Figure 5-13 Fibre ARPU in Georgia compared to EU broadband prices[86]

[86] GNCC data, ARPU without VAT, EU data source: EC/Van Dijk Broadband Internet Access Costs Autumn 2015.

2. Fibre and Total Broadband ARPU Forecast

Looking forward ARPU is expected to grow slightly with higher demand and inflation, yet regulatory and competitive pressure and advance in technology with economies of scale are expected to keep ARPU relatively stable in range between 20-25 GEL with fibre ARPU slightly higher than overall ARPU.

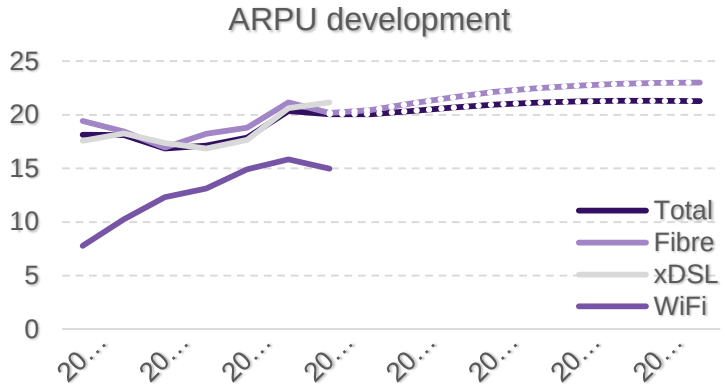


Figure 5-14 ARPU development forecast

5.3 Demand

Experience from other countries indicate that there is a large underlying appetite for data consumption for example in UK the average fixed broadband data consumption[87] grew from already quite staggering 96GB/month in 2015 by 36% year over year to 132GB/month in 2016 with average download speeds of 37 Mbps (grew 28% from 37 Mbps in 2015). For superfast broadband the numbers are even higher with 74Mbps and 169GB per month (grew 50% from 112 GB in 2015). In Japan the average data consumption[88] was already 160GB per month in 2015. According to data from operators majority of subscribers are now on 10-20Mbps tariffs, however this could be a result of operator's pricing strategy, when higher speeds are offered for significantly higher prices. We can safely expect that if the prices for high speed broadband would drop, the data demand will greatly increase.

According to the information from operators, current high volume consumption is led by sites with illegal movie content both national and international production, which is offered in great range and surprising quality including subtitles or even amateur dubbing.

The greatest barrier for future demand is low penetration of personal computers coupled with limited IT skills especially in rural areas. There is a number of government initiatives to tackle this issue. See caption 7.2 Demand Stimulation for more details.

[87] Source: http://www.ispreview.co.uk/index.php/2016/12/89-uk-covered-30mbps-broadband-1-7-can-get-full-fibre.html
[88] Source: Analysis Mason – Data traffic growth Aug2016 RDTW0_RDTN0

5.4 Conclusions

We are currently developing four themes for the NGA document:

- Improving the effectiveness of retail competition
- Improving access to wholesale connectivity
- Tackling the urban/rural divide
- The need for further demand (stimulation)

Improving the effectiveness of retail competition: improving the outcomes for consumers in existing coverage areas

Market context	*Market challenges*
Retail broadband prices appear to be high compared to benchmarks, and pricing is highly aligned. Operators appear to provide partial coverage of major towns and cities.	- Information on whether there are local monopolies is not available - Existing remedies (e.g. duct access) are not used on a large scale - Multiple duct networks is unusual; providing access between operators could be complex; "Exclusive" use of some utility infrastructure could be a concern

[Hypothesis] Citizens do not have a choice due to widespread instances of local monopolies

Possible actions by GNCC to address challenges	*Possible outcomes*
Adoption of the EU framework for regulating NGA will provide GNCC with a range of options to encourage competition • Implementation of the cost reduction directive, including creation of a multi-sector unified infrastructure database will be supportive of further NGA investment Gather network coverage and service availability in a defined structure from all operators (at a suitably granular level) Symmetric regulation is a more pragmatic approach than trying to regulate on a 'per street' basis, due to market structure including multiple large operators A focus on improving the use of the existing ducts could be pursued, following the success in countries such as	Major operators competing directly for individual households, leading to reduced prices and improved services,

Portugal and Spain The prospect of other forms of access (e.g. dark fibre, active access) could provide an incentive for operators to improve duct offers; imposition of access remedies will stimulate deployment of NGA through sharing of existing infrastructure Assessment of relevant market from Joint SMP perspective to address potential duopoly or oligopoly concerns following recent mergers	

Improving access to national and international connectivity: smaller operators are paying a high price

Market context	*Market challenges*
Georgia is well connected, both nationally and internationally	- Operators have raised concerns about the cost of connectivity, e.g. trunk leased lines: a large proportion of retail prices have to be paid for national and international connectivity by those operators that do not own national and international infrastructure

[Hypothesis] Competition for national and international connectivity is not effective: smaller operators that do not own national and international infrastructure cannot compete effectively (on speed and/or price) with larger operators

Possible actions by GNCC to address challenges	*Possible outcomes*
GNCC should investigate whether requirements for non-discrimination are being met by larger operators and, if discrimination is found, consider imposing penalties or strengthening obligations GNCC should consider intervening further, e.g. setting price controls and/or improving accounting transparency GNCC can define the market for wholesale trunked leased lines (if not already encompassed by backbone access market)	Georgia's retail market becomes more effective and dynamic, with resulting improvements in price, choice and service

Tackling the urban/rural divide: driving the coverage of NGA networks further out beyond Tbilisi and the main cities

Market context	*Market challenges*
Georgia has reasonable coverage of a range of broadband technologies: fibre, ADSL and LTE Fibre coverage compares well with international benchmarks	- Overall coverage of fixed broadband is low compared to benchmarks; a strong urban/rural divide - Outcome of the OpenNet project may not increase NGA coverage in rural areas significantly

Possible actions by GNCC to address challenges	*Possible outcomes*
Data gathering: request operators' expansion plans, including threshold-based plans (e.g. targeting settlements with over 500 homes) and/or information provided to OpenNet; also request government plans to invest in the road network (which could support backhaul connectivity) **Viability modelling:** model the commercially viable limit of different technologies, accounting for the specific characteristics of rural areas (e.g. availability of poles and ducts, availability of copper, deployment costs, ARPUs) to forecast an achievable infrastructure approach for rural areas, e.g. fibre, fibre plus wireless, wireless only **Form a rural task force:** to engage with stakeholders and understand in detail the impact of softer issues such as lack of addresses, lack of electricity, mountainous terrain, local government objections, difficulty in obtaining permits (see similar initiative in Ireland, http://www.dccae.gov.ie/communications/en-ie/Broadband/Pages/Mobile-Phone-and-Broadband-Taskforce.aspx)	A targeted and substantiated case for requesting funds to support investment in rural areas The EC's 2020 and 2025 targets are useful reference points, as are broadband USO targets being considered in other countries

The need for further demand (stimulation): monitor the effectiveness of competition measures and existing initiatives

Market context	*Market challenges*
The Broadband for Development (BfD) project, being overseen by the Georgia Innovation and Technology Agency, is providing a number of demand stimulation initiatives	- Operators have raised concerns about the cost of connectivity, e.g. trunk leased lines: a large proportion of retail prices have to be paid for national and international connectivity by those operators that do not own national and international infrastructure

[Hypothesis] Georgia is showing reasonable levels of demand in covered areas, though appears to still be in early stages of the take-up development curve

Possible actions by GNCC to address challenges	*Possible outcomes*
Benchmark the scale of each BfD initiative to forecast the expected outcome, and assess whether additional initiatives could be required Encourage operators to engage in demand stimulation programmes which will generate benefits for the operators themselves Monitor the development of demand in covered areas to assess whether further demand initiatives are required (especially in rural areas)	Greater demand for broadband services in Georgia, adding value to the economy, and improving the business case for both private and public investments

6 Regulatory strategy

National regulatory strategy in the field of broadband and NGA should create an environment encouraging investment via stable and predictable regulatory framework stimulating competition on the providers' side and bringing maximum benefits for end users (residential, business and governmental).

Government's role in this strategy lies in developing appropriate legal framework providing the NRA with proper competencies, legal certainty to market players and protection to end users. Government also plays significant role in situations where market forces (private investors) are not able or not interested to rollout networks in areas where such network rollout would not ensure sufficient or required profitability. Another way of potential government involvement could have a form of investment stimulation provided to private investors.

Regulatory strategy in the field of broadband and NGA is determined by the following factors:

(i) strategic broadband/NGA objectives set on a national level;
(ii) existing regulatory framework affected by transposition of the EU regulatory framework; and
(iii) other factors.

6.1 Role of NGA regulation

Due to specific characteristics of NGA and an its economic and social impacts the regulation of NGA is rather complex issue. Deployment of NGA is characterized by high entry barriers. NGA rollout is driven either by incumbents (either telecommunications of cable operators) with already developed legacy network capable of providing broadband services, mobile operators with strong market position who see the NGA rollout as an opportunity to diversify their business or new entrants (or so-called alternative operators) with strong investment background. Common sign of all three scenarios is that NGA networks are being primarily built in areas with high population density. A consequence of this approach is that in many countries there are on one side areas with quite developed competition at retail level, where end-users have choice of three or more service providers offering high quality high speed broadband connection, and on the other side areas, where end-users hardly have an opportunity to get basic broadband connection. Regulation plays an essential role in wiping these differences away. The basic dilemma of NGA regulation is, how to promote investment without causing harm to existing competition achieved via regulation as these two aspects are rather contradicting. On one side regulation of NGA discourages investment as operators investing into NGA perceive any regulation as an interfering factor eroding their investment. On the other side non-regulation leads to formation of duopoly or even monopoly and leaves end-users without an advantage of having choice in the broadband connection service.

It is therefore essential for an NRA to find a balanced approach providing sufficient incentives for investment and creating sustainable competitive environment.

6.2 Current regulatory framework in Georgia

Currently there is no specific regulatory framework related to NGA regulation. However, the existing regulatory framework is universal and can be used for regulation of any service including broadband provided over NGA.

The following table provides details related to analysis of markets to some extent related to

broadband or NGA conducted by GNCC on the basis of the current version of the law .
Despite the fact that the currently regulated relevant markets cover all the necessary segments relevant for development of competition in the provision of broadband services, the regulation does not seem to sufficiently tackle the issues discussed in the previous chapters of this document such as insufficient use of duct access, potential existence of local monopolies, aligned retail prices of the most common broadband products. Based on the recent data provided to GNCC by authorised persons as of 31 December 2016 there were 774.878 copper pairs in the access networks of the SMP operators throughout Georgia but only 457.866 (59,09%) were active. The number of copper pairs provided by SMP operators to other authorised persons continuously decreases from 3.629 in December 2014 to 1.642 in December 2016 which represents 0,36% of the active copper pairs. These numbers confirm both the decreasing importance of copper technology and lack of authorised persons' interest in getting access to the copper pairs. The decreasing importance of the copper technology is supported by the fact that 61% of broadband connections in Georgia are provided via fibre technology (followed by 24% provided via xDSL and 15% provided via WiFi). The reasons for limited interest in getting copper access might be beside the decreasing importance of copper technology and low quality of the existing copper network also the fact, that the option of getting access to copper pairs is viable only for those authorised persons who are able to rollout their networks close enough to the point in the SMP operators' networks where access to copper pairs can be provided (very high level of ladder of investment). It means that access to copper pairs requires high investment on the access seekers' side and is therefore not that attractive. Ideally access to copper pairs should be complemented by the bitstream access which consists of access to local loop and access to regulated operator's backhaul service. The backhaul service replaces an alternative operator's own network and provides this operator with the opportunity to offer its own broadband retail service to some extent different from the service offered by a regulated operator. Although the level of control over characteristics of the retail service provided via bitstream is lower than in the case of service provided via copper pairs access product access to bitstream requires less investment from the access seeker (lower level of the ladder of investment than access to copper pairs) and might therefore attract more access seekers.
With regard to future ex ante regulation GNCC should assess the importance of currently regulated relevant markets and obligations imposed on authorised persons designated as SMP on these markets for the development of competitive environment in the broadband/NGA services provision. Based on the assessment GNCC shall decide on the approach that will contribute to the development of the competition in the broadband/NGA service provision taking into account factors such as ladder of investment principle (local access vs. central access, local loop unbundling vs. bitstream access), technologies in place (copper, fibre, FTTH, FTTC), necessity of keeping the existing obligations until the new obligations are effective. The obligations shall be imposed in a way that will address the market problems identified in the least burdensome manner for SMP operators.

	Operators involved in market analysis	*Criteria used for SMP designation*	*SMP and geographic and/or product scope*	*SMP obligations imposed*	*Decision number*	*Issue date*	*Effective date*
Market for access to subscriber's copper pairs	Akhteli LTD Akhali Kseliebi Ltd Iveria Qseli Ltd. (only in Zugdidi) CGC LTD (only in Rustavi) Foptnet LTD Caucasus Online Ltd Railway Telecom JSC Silknet JSC Systemenet LTD Geocell LTD ANet ltd (in Batumi) CDN LTD	market share	- Tbilisi, Kutaisi Zugdidi Rustavi, Zestafoni, Terjola - - - the whole territory of Georgia - - - -	Transparency Non-discrimination Access Accounting separation Price control	N620/9	6 Nov 2014	1 Jan 2015
Market for access to telecom channels (Duct and Channels)	Akhteli LTD Akhali Kseliebi Ltd Iveria Qseli Ltd (only in Zugdidi) CGC LTD (only in Rustavi) Foptnet LTD Caucasus Online Ltd Railway Telecom JSC Silknet JSC Systemenet LTD Magticomi LTD Geocell LTD A- Net ltd (in Batumi) CDN LTD Metakomi LTD	market share	- Zestaponi, different districts of Tbilisi - Rustavi - - - different districts of Tbilisi and the whole territory of Georgia different districts of Tbilisi different districts of Tbilisi - - - -	Transparency Non-discrimination Access Accounting separation Price control	N620/9	6 Nov 2014	1 Jan 2015

End user retail internet service from fixed location, wireless (CDMA) and mobile	Akhteli LTD Akhali Kseliebi Ltd Iveria Qseli Ltd (only in Zugdidi) CGC LTD (only in Rustavi) Caucasus Online Ltd Railway Telecom JSC Silknet JSC Magticomi LTD Geocell LTD	market share	Tbilisi/fixed Tbilisi, Kutaisi/fixed Zugdidi/fixed Rustavi, Zestafoni, Terjola/fixed the whole territory of Georgia until assets' transfer to Magticom - the whole territory of Georgia/fixed and wireless Tbilisi/wireless, the whole territory of Georgia/mobile the whole territory of Georgia/mobile	Transparency	N610/9 (fixed) N400/9 (mobile and wireless)	20 Jul 2007 13 Nov 2009	1 Aug 2007 11 Feb 2010
Market for access to backbone channels (divided into two submarkets: a) access to lines (passive) and b) access to terminated devices and resources - Active Services(e.g DWDM, SDH)	Foptnet LTD Caucasus Online Ltd Silknet JSC Systemenet LTD Georgian Telecom LTD Akhali Kseliebi Ltd	market share	Local (within city/region) - Tbilisi, Kutaisi, Adjara; Intercity/inter-region Local (within city/region) - Tbilisi, Kutaisi, Adjara; Intercity/inter-region Local (within city/region) - Tbilisi, Kutaisi, Adjara; Intercity/inter-region - - -	Transparency Non-discrimination Access Accounting separation	N498/9	31 Aug 2007	11 Sept 2007

6.3 Transposition of the EU regulatory framework

Transposition of the directives mentioned in Chapter 3.3 under points (i) to (v) into Georgian legislation will significantly influence authorised persons' behaviour towards their subscribers or end-users, competitors and GNCC. It will also impact end users' rights and tools available to the GNCC when regulating electronic communications market in general as well as its broadband/NGA part. In the field of broadband/NGA regulation the GNCC will have to adjust its rules in the whole chain of ex-ante regulation related activities such as market definition, market analysis and designation of one or more authorised persons as having significant market power in the relevant market and imposition of obligations on those authorised persons.
Regarding the ex-ante regulation in place, GNCC will have to ensure that any obligations imposed are kept until the new round of market analysis of existing or newly defined relevant markets is conducted and until such obligations, if relevant and still justified, are re-imposed or if deemed not-relevant or not-justified removed.
The GNCC will have to implement the new rules in a way that will not lead to a distortion of existing market situation in markets with efficient competition or markets where regulation used so far has led to an improvement of competition. However, when considering differentiated approach, the GNCC shall not deviate from the applicable general rules.

Where justified the GNCC does not have to fully mimic approaches used at the EU level but rather find its own way respecting defined principles and objectives taking into account potential differences in the field of market development, market structure and historical regulatory issues.

6.4 Other Factors

1. Cost Reduction Directive

Transposition of directive 2014/61/EU of the European parliament and of the Council of 15 May 2014 on measures to reduce the cost of deploying high-speed electronic communications networks (hereinafter 'the cost reduction directive') into the law should improve deployment of electronic communications networks (including broadband/NGA networks). Such improvement should be achieved due to cost savings and faster network deployment that will potentially materialise through sharing of existing passive infrastructure, coordination of construction works and sharing of intra-building physical infrastructure.

Upon transposition of the cost reduction directive infrastructure operators[89] will have an obligation to provide access to their passive physical infrastructure[90] to an electronic communication network operator under non-discriminatory, fair and reasonable terms and conditions, including price.
Public sector bodies will have an obligation to meet all reasonable requests for access, under proportionate, non-discriminatory and transparent terms, to the assets such as lanes of state and municipal roads, publicly available open spaces such as squares, plazas, land plots, pipelines, water bodies and their shores, bridges, viaducts, tunnels and other structures in

[89] Infrastructure operators are defined as electronic communication network operators, undertakings providing physical infrastructure intended to provide a service of production, transport or distribution of gas, electricity, including public lighting, heating, water, including disposal or treatment of waste water and sewage, and drainage systems and undertakings providing physical infrastructure intended to provide transport services, including railways, roads, ports and airports
[90] Passive physical infrastructure means any element of an infrastructure operator's network (including but not limited to electronic communications network) which is intended to host other elements of a network without becoming itself an active element of the network, such as pipes, masts, ducts, inspection chambers, manholes, cabinets, buildings or entries to buildings (including co-location areas), antenna installations, towers and poles; for avoidance of doubt cables, including dark fibre, as well as elements of networks used for the provision of water intended for human consumption are not physical infrastructure within the meaning of the Law of Georgia on Electronic Communications.

their ownership for the construction of public communications networks.

Public sector bodies and infrastructure operators holding in electronic format specific information regarding passive physical infrastructure (location, and route; type and current use of the infrastructure; and a contact point), shall provide such information to GNCC to make it available via its website or via any other dedicated website. If specific information regarding passive physical infrastructure is not available via website infrastructure operators will have an obligation to provide such information to electronic communication network operators upon their written request.

Infrastructure operators will be obliged for the purpose of construction works coordination to make available upon a specific written request of an electronic communication network operator under proportionate, non-discriminatory and transparent terms the minimum information concerning on-going or planned civil works related to their physical infrastructure (the location and the type of works, the network elements involved, the estimated date for starting the works and their duration and a contact point) for which a permit has been granted, a permit granting procedure is pending or first submission to the competent authorities for permit granting is envisaged in the following six months.
All newly constructed buildings or buildings undergoing major renovation shall be equipped with intra-building physical infrastructure and in case of multi-dwelling buildings with an access point. Both intra-building physical infrastructure and an access point shall have sufficient capacity and shall be made available to an electronic communications network operator for the purpose of deployment of its own intra-building cabling or connecting the existing intra-building cabling to its network connected to an access point.
GNCC will have competence to resolve disputes between infrastructure operators and electronic communications network operators related to the above mentioned obligations.

The successful achievement of the goals envisaged by transposition of the cost-reduction directive will depend on several factors.
Infrastructure operators need to see benefits behind the obligations imposed. Obligation to provide access to an existing physical infrastructure can create new stable revenue stream for utility operators as they will be able to monetize free capacity in their physical infrastructure. On the other hand, electronic communications network operators will be able to deploy their networks faster and with lower costs than if they were building them on their own. Potential time savings stem from the fact that network will be deployed without a need to conduct civil works which saves also a time needed to obtain necessary construction permits. From the state budged point of view the new revenue stream generated for utility providers might yield some additional tax revenue. Accelerated network roll out will be beneficial for end-user (both residential and business) as they will be able to get their network connection in shorter time.
Obligation to coordinate network construction will be beneficial for both infrastructure operators and electronic communications network operators as they will be able to roll they networks out with lower costs than if they were building them on their own. Cost savings achieved can be invested in other projects including further network rollout.
Both measures have significant environmental impact as multiple networks could be deployed using single trench (in case of coordinated construction) or without a need to carry out civil works (in case of existing physical infrastructure use).
Use of intra-building physical infrastructure and access point will significantly speed up intra-building network deployment with minimum interference into private property which is beneficial for both electronic communications network operators and end-users or building owners respectively.
On the other side in case of disputes GNCC will have to allocate sufficient time and proper staff in order to effectively resolve such disputes and establish an adequate information system able to collect and make available in electronic format information on available physical infrastructure and planned civil works.

In order to make the whole system more efficient it might be useful to implement electronic system for construction permit granting as well as comprehensive electronic database of existing physical infrastructure at least in the sector of electronic communications.

Such database could include information such as:

- type of physical infrastructure including its owner and provider
- placement of physical infrastructure (location, depth, type of surface)
- capacity (total, used, available).

Existence of such database would simplify the procedure for physical infrastructure sharing but on the other side its establishment is time consuming process which requires extensive cooperation with physical infrastructure owners.

The transposition of the cost-reduction directive will undoubtedly improve conditions for faster and more cost-efficient broadband networks' deployment. However, the potential disputes arising from the rights and obligations stipulated by the law (upon the transposition of the cost-reduction directive), GNCC's ability to solve such disputes in a timely manner and availability of useful electronic system on available physical infrastructure and planned civil works will have significant impact on successful achievement of the directive's goals.

Taking into account potential weaknesses of the cost-reduction directive the obligation to provide access to physical infrastructure combined with price regulation of such access imposed as a result of ex-ante market analysis remains the most efficient tool enabling competing authorised persons to access physical infrastructure of the authorised person designated as having significant market power (SMP operator) in the relevant "broadband related" market. Limitation of this tool from the network rollout perspective is the fact that SMP operator's physical infrastructure is situated in areas already covered by, at least, SMP operators broadband network. Its contribution to the network rollout in non-covered areas is therefore minimal as the extent of network rollout (based on access to physical infrastructure of the SMP operator) of competing authorised persons will be limited by the SMP operator's physical infrastructure coverage. This tool will therefore contribute mainly to improvement of competitive conditions in the already covered areas.

In order to achieve the two goals i) improvement of broadband coverage and ii) establishment of sustainable competitive environment in the provision of broadband services it is necessary that both tools stemming from the cost-reduction directive and tools stemming from the ex-ante market regulation are put in place and work in parallel.

2. OpenNet

In situations where market forces (private investors) are not able or not interested to rollout networks in areas where such network roll out would not ensure sufficient or required profitability governments tend to put in place programs that either encourage private investment into network roll out in specific areas or act themselves either directly or via state governed entities as investors who ensure network roll out in such areas (examples of such initiatives conducted in other countries are provided in annex 1 of this document) .

The Government of Georgia approved 'the State program on broadband infrastructure development in Georgia' by its resolution N375 of 28 July 2016.

The objective of the program is to develop broadband infrastructure in Georgia in order to improve access to such infrastructure throughout the entire territory of the country. Broadband infrastructure under the program shall be built only in geographic areas covered by the program and up to telecommunications hubs owned by authorised persons. The hubs

shall be selected based on criteria such as shortest and optimum network path, network topology, layout and technical specifications (availability of channels in the required number and capacity, availability of free optical pairs).The government of Georgia should contribute to the achievement of the project's objective by promoting free entrepreneurial activity, development of competition and private investments in the area of telecommunications by introducing financial support mechanisms (financial support component) on the one hand, and on the other, by building the respective infrastructure (broadband infrastructure building component).

Projects to be carried out under the program may be financed by the international and donor organizations, as well as through other funds authorised by the legislation of Georgia.

The program is divided into two components:

a) financial support component which consists of establishment of mechanisms to provide access to financial resources and provision of the service by beneficiaries of the financial support through the infrastructure built under the program and
b) broadband infrastructure rollout component which consists of designing and building the infrastructure, planning and deploying the network, maintaining the infrastructure and the network and providing open access to the network.

Geographic areas covered by the financial support component shall be determined by the populated localities of the white zone where the population size exceeds or equals 200 and where broadband infrastructure shall not be built by the authorised persons within three years from the entry into force of the program.

Geographic areas covered by the broadband infrastructure rollout component shall be determined by populated localities of the white zone where the population size exceeds or equals 200 and where broadband infrastructure shall not be built either under the financial support component or by the authorised persons within three years from the entry into force of the program.

The white zone is defined as set of localities within 2-km radius from which, according to the information provided by GNCC or authorised persons, there is no optical broadband infrastructure either owned or held for use by authorised persons that is connected to authorised persons' optical backbone.

OpenNet, a non-entrepreneurial (non-commercial) legal entity is responsible for implementation of the program in coordination with the Ministry of Economy and Sustainable Development of Georgia.

OpenNet has been entrusted with the following competencies of the program:

- check the accuracy of information provided by the operators with the goal of providing financial support and correctly identifying the geographic areas of the broadband infrastructure components,
- with regard to financial support component
  - sign a contract with the operators concerned in order to identify the geographic area of the financial support component[91];

[91] The contract shall define the authorised persons' responsibility for building the broadband infrastructure in the white zone within 3 (three) years from the entry into force of the program and the obligation of authorised persons to remove the populated localities from the geographic areas subject to the program. The authorised person shall incur the fine under the contract if it fails to build the broadband infrastructure in the populated locality in due time.

  - following the consultation with the concerned parties develop and submit for approval to the Ministry methods of defining lots, as well as a list of the localities divided into lots, which come within the geographic area of the component;
  - day to day monitoring of the projects funded under the program including the compliance with the commitments set forth in the co-financing agreement;
  - directly participate as a co-financer (though not as a guarantor) in the legal relations between the program beneficiary and the commercial bank/international financial institution;
- with regard to broadband infrastructure rollout component
  - submit to the Ministry for approval, and upon approval of the Ministry, determine the geographic area of the component;
  - following the consultation with the parties concerned, develop and submit for approval to the Ministry methods of defining lots and dividing them into phases, as well as a list of the localities divided into lots and phases, which come within the geographic area of the component, together with the technical specifications of the infrastructure, network topology and the bill of quantities. The methods shall specify the volume and schedule of works, the territory, in which they are to be carried out, the size and density of population, the complexity of such works, their seasonality and priorities;
  - prepare and submit for approval to the Ministry a technical, financial and time schedule for carrying out works in the geographic area covered and for deploying broadband infrastructure;
  - announce an open bidding to design and build the infrastructure for the construction of broadband infrastructure for each lot or/and phase within the target geographic area;
  - announce an open bidding to plan and deploy the network
  - establish terms of participation (including eligibility requirements) in the component, and determine criteria for assessment and selection of the winner;
  - exercise day to day surveillance and control over the works and services;
  - responsibility for the use and management of the broadband infrastructure and the network.

Beneficiaries of the financial support component (authorised persons) will be selected based on the open bidding procedure. In case where more than one authorised person submits a bid for the same location the authorised person applying for the smallest amount of co-financing and proposing to cover the largest number of populated localities will be selected as a winner.

Beneficiaries shall be eligible for co-financing if they receive loans with interest rates not exceeding 10 (ten) percent in foreign currency and 12 (twelve) percent in the national currency for a maximum of 120 (one hundred and twenty) months from the allocation of a loan. The loan shall be allocated by the commercial bank/international financial institute exclusively for building the broadband infrastructure up to the populated localities of the geographic area and for arranging an access point in those localities.

OpenNet shall co-finance the annual (effective) interest rate of the loan by transferring the sum to the commercial bank/international financial institution, subject to the loan servicing schedule.

Each beneficiary shall be required to ensure the implementation of works in keeping with the timeframe and phases for a respective lot and to build broadband infrastructure based on the

topology and construction standards agreed under a respective contract and, if so requested by other operators, to provide them with an open access service in the preliminarily determined threshold amounts and tariffs.
If the beneficiary of the financial support violates its obligation, OpenNet shall have the right to be compensated by the beneficiary against all losses incurred by it due to this violation.

With regard to the broadband infrastructure rollout component the bidding to design and build the infrastructure is open to any legal person or individual entrepreneur registered and carrying out its activities in Georgia, which meets the bidding requirements established by OpenNet, while bidding to plan and deploy the network is open to any legal person which meets the bidding requirements established by OpenNet.

The infrastructure and the network built within the broadband infrastructure rollout component shall be the property of OpenNet, for the purposes of providing open access services to the populated localities within the geographic area under the program and shall not be disposed of within 10 years from the day they are accepted for operation.

The infrastructure and the network will be provisionally administered by an entity selected based on open bidding. The bid submitted by an applicant shall take into consideration the requirements such as technical specifications on the use of the network, tariff plan, as well as conditions relating to open access and other services. Provisional administrator shall be required to fully comply with the service standards set by OpenNet, including technical specifications on the use of the network, and in case of other authorised persons – to provide them with open access and other services at agreed tariffs.

OpenNet shall provide other authorised persons with wholesale and open access services via the infrastructure and the network built under the program. OpenNet shall not provide the service to the end customer.

3. Market Consolidation

Market consolidation in the telecommunications sector represents a natural evolution and its intensity differs from country to country and from service to service. Market consolidation refers to a process where number of market players decreases as a consequence of mergers and acquisitions. Such process might lead to two contradictory outcomes depending on its impact on the market.

Market consolidation might lead to healthier competition than in highly fragmented market. Consolidated market with a few stable players allows for consolidated larger scale investment which has potential to yield economies of scale/scope and leads to lower unit costs. Lower unit costs create opportunity for both investor (higher margins) and end-user (lower retail price in case where investor gives up proportion of the margin to the benefit of end-user). Margins, if transformed into profit, can be reinvested into improvement of an existing network or into rollout of new network.

Positive effects of market consolidation take place only when the consolidation does not lead to creation of oligopolistic market structure that is prone to anticompetitive behaviour such as tacit collusion or cartel where behaviour of market players has negative effects on competition and end-users.

Generally speaking, lower is the number of market participants higher is the potential for occurrence of anticompetitive behaviour.

Mergers and acquisitions are, depending on their relevance, subject to ex-ante assessment and approval by relevant competition regulatory authority. The goal of such assessment is to establish whether the merger/acquisition would lead to a significant lessening of the competition in the relevant market. It might be useful if competition regulatory authority, when assessing merger/acquisition where at least one of the participants is active in the telecommunications sector takes into account opinion of relevant NRA. Such approach is even more desirable in cases where the merger/acquisition participant has been designated as SMP operator and certain obligations addressing competition problems have been imposed on him. In that case it is necessary that obligations imposed on the merger/acquisition participant stay in palace also after the merger/acquisition is accomplished.

Another aspect of merger/acquisition is fact that despite its approval by competition regulatory authority it can not be excluded that the market participant will be designated as SMP operator based on the ex-ante market assessment conducted by NRA. In such case relevant obligations pursuant to regulatory framework in place shall be imposed on such operator.

Another aspect that arises in case of consolidated market is presence of joint significant market power which occurs when two or more operators are in a position of significant market power i.e. they are in a position which allows them to enjoy a position equivalent to dominance, that is to say a position of economic strength affording them the power to behave to an appreciable extent independently of competitors, customers and ultimately consumers. This is likely to be the case where the market is concentrated and cumulatively fulfilling all the following criteria:

a) there is a possibility of reaching terms of coordination; in order to assess this criterion, the NRA shall look at the factors like
   (i) existence of a clear focal point such as price, denial of access, service quality, market share or network investment;
   (ii) symmetry expressed by similar market shares, cost structures, capacity constraints, homogeneity of the products and vertical integration;
   (iii) no destabilizing developments identified in the form of limited growth, established authorised persons with high barriers to entry and stable market shares, as well as limited innovation;
   (iv) short term vs long term approach characterised by stable pricing in the long term.
b) market participants are able to monitor deviations; in order to assess this criterion, the NRA shall look at the factors like transparency, complexity, stability and heterogeneity of market or product respectively and links (both formal and informal) between market participants
c) there is an effective deterrent mechanism in place; in order to assess this criterion, the NRA shall look at the factors like symmetry of market participants' ability to deviate from the coordinated outcome and their ability to punish the other firm(s) in case of a deviation, long term benefits of market participant achieved via deterioration from coordinated approach, time required between detection of deterioration and reaction and nature of the focal point (ability of market participants to monitor and react to the changes of the focal point), and if
d) there are insufficient reactions of outsiders; in order to assess this criterion, the NRA shall look at the factors like entry barriers, countervailing buyer power and potential competitors.

In addition to ex-ante regulation GNCC has competence (under article 27 of the law) to investigate and regulate mergers or acquisitions of ownership interests, shares or operating assets. According to the law the investigation of a merger or acquisition shall be necessary if:
a) after the merger or acquisition, structures of vertically and horizontally integrated

undertakings are created that would be able to gain significant market advantage in the relevant segments of the market through mutual control, creation of barriers to entry and significant restriction of competition;

b) if one or several undertakings participating in the merger or acquisition is a vertically integrated authorised person having significant market power both in the retail market and closely related wholesale market segments;

c) if the initiating undertaking participating in the merger or acquisition has significant market advantage in the retail (wholesale) service market segments and the potential merger is conducted with an undertaking that has significant market advantage in the closely related upstream (downstream) segments of a wholesale (retail) market.

In the case of granting its consent, GNCC may impose on the authorised person formed as a result of the merger, or on the authorised person acquiring an operating asset one or more obligations in order to maintain competition in the relevant segments of the service market. GNCC may, on the basis of a substantiated decision, request that the conditions of a merger or acquisition be corrected, or it may prohibit the merger or the acquisition of the ownership interest, shares, or operating assets of the authorised person if it considers that the merger or acquisition will significantly distort competition in the relevant segment of the service market.

If competition in the relevant segment of the service market is significantly distorted by an authorised person with significant market power formed as a result of a merger or acquisition effected with the consent of GNCC, GNCC may request from the authorised person formed as a result of the merger, or from an authorised person that has acquired an operating asset, or from an authorised person whose ownership interest or shares have been acquired, to ensure functional separation (separation of functionally separated structural units into a separate legal person/persons). Parties to a merger or acquisition may offer their own proposals to GNCC at any stage of the merger or acquisition to avoid significant distortion of competition in the relevant segments of the service market.

It is necessary that GNCC when assessing a merger/acquisition takes into account the potential impact of merger/acquisition on wholesale competition. For example, when two authorised persons providing broadband network within the same geographic area are being merged, it is necessary to look at the merger also from the prospect of its impact on future competition in the wholesale market for broadband local/central access. While under the conditions prior to merger potential competitor would have choice to get wholesale access from two authorised persons potentially competing with each other, under the post-merger conditions the potential competitors' choice will be narrowed to only one access provider. GNCC's role should be strengthened in the field of ex-ante market regulation via methodology for market assessment which deals with the issue of joint significant market power.

The third component of the project covers among other issues also a review of the existing GNCC's practice related to the regulation of mergers and acquisitions accompanied with recommendations on how to ensure full alignment with best practise. Based on the review an amendment of the law and draft methodology for assessment of concentrations have been submitted to GNCC.

4. Consumer protection

Although consumer protection primarily targets consumers and their rights related to use of electronic communications services, it plays an essential role in development of sustainable competition. Therefore, sustainable competitive environment can not be established without proper consumer protection framework in the sector of electronic communications in place.

It is necessary to ensure that following consumer protection factors that strongly correlate with the level of competition are considered:

a) maximum duration of subscriber contract – too long subscriber contract duration limits subscribers' ability to switch between service suppliers[92];
b) contract termination conditions – too strict contract termination conditions have dissuasive effect on supplier switch. In some cases, switching an operator is connected with purchase of relatively expensive terminal equipment and has significant impact on subscriber's decision on provider switching. Imposing additional disproportional expenses in the form of penalty for contract termination has significant deterioration effect.
c) transparency – it is necessary that contract conditions with all relevant limitations and prices are made available to subscriber prior to signing contract;

In addition to the above mentioned it is necessary to establish a framework providing adequate protection of consumers' personal data and protection of communication content.

5. Construction law

Construction law and all regulations related to permit granting necessary for network rollout in place play significant role in development of competitive environment in the field of network operation.

It is important to establish a framework that will not inappropriately hinder network rollout. Such framework should be applied consistently throughout the whole territory eliminating differences in permit granting between regions or cities.

Simplified or even preferential permit granting applicable in case of rollout of high speed networks that have specific characteristics such as capability to foster competition in the future might be considered. Criteria such as sufficient spare capacity of passive infrastructure made available to other authorised persons should be taken into account. Availability of the information on existing spare capacity in electronic format would further improve the rollout conditions.

Possibility of online permit granting is another important improvement factor.

It is important to ensure that potential preferences granted to high speed network rollout shall not go against the protection of individual property rights.

6. The EU accession

With regard to Georgia's accession to the EU the two groups of factors related to legal

[92] Article 30 (5) of the Universal service directive stipulates that Member States shall ensure that contracts concluded between consumers and undertakings providing electronic communications services do not mandate an initial commitment period that exceeds 24 months. Member States shall also ensure that undertakings offer users the possibility to subscribe to a contract with a maximum duration of 12 months.

regulatory environment can be identified.

First group represents conditions that will have to be accomplished prior to the EU accession e.i. the EU accession will be impossible without them being fulfilled. These conditions can simply be compiled under the umbrella of transposition of the directives constituting EU regulatory framework.

The second group are mandatory for each full-fledged EU member and will become efficient automatically upon Georgia's EU accession.

The post-accession factors based on the existing regulatory framework and other related documents issued by the European Commission are:

- regulations such as regulation of international roaming services' prices[93] and regulation on measures concerning open internet access[94] will become applicable;
- all market definitions deviating from the definitions established by the European Commission in its recommendations, all market analysis and SMP obligations (imposed or withdrawn) will have to be made accessible to the European Commission, BEREC and all NRAs (article 7 and 7a of the framework directive procedure);
- NGA related state aid shall be notified to the European Commission in accordance with EU Guidelines for the application of State aid rules in relation to the rapid deployment of broadband networks (2013/C 25/01)
- spectrum harmonisation will have to follow procedures and timelines designated by the European Commission

Some features of the abovementioned factors will simplify the situation for GNCC when performing regulation as GNCC will be able/obliged to adopt principles and best practice common in the EU without necessity to provide substantial justification to the stakeholders. On the other side, the obligations stemming from the abovementioned factors will put more burden on GNCC as their adoption will require more resources in the form of budget and staff.

[93] Regulation No 717/2007 of the European Parliament and of the Council of 27 June 2007 on roaming on public mobile communications networks within the Community

[94] Regulation (EU) 2015/2120 of the European Parliament and of the Council of 25 November 2015 laying down measures concerning open internet access and amending Directive 2002/22/EC on universal service and users' rights relating to electronic communications networks and services and Regulation (EU) No 531/2012 on roaming on public mobile communications networks within the Union

7 Government incentives

7.1 OpenNet

As described in section 6.4 above OpenNet is a non-entrepreneurial not for profit legal entity responsible for implementation of the State program on broadband infrastructure development in Georgia. The aim of the program is to develop broadband infrastructure in Georgia in order to improve access to such infrastructure throughout the entire territory of the country.

Execution of the program have two different components:

c) financial support component under which OpenNet will cover costs of interest of the loan that the beneficiary of the component takes for the purpose of building the network covering white area and under the condition that the network will be made available to other authorised persons via open access point and
d) broadband infrastructure rollout component under which OpenNet will be responsible for designing and building the infrastructure, planning and deploying the network, maintaining the infrastructure and the network and providing open access to the network.

From the regulatory perspective access under both components shall be provided under transparent non-discriminatory conditions and agreed wholesale tariffs. It would be beneficial if OpenNet, when establishing the conditions, sets those conditions in cooperation with GNCC and make them public in the form of a reference offer. Any entity providing the open access under both components should have status of authorised person in order to be under the supervision of GNCC, so GNCC have competence to include such authorised person (when deemed necessary) into market analysis and have competence in case of disputes arising in relation to the access provision.

When setting wholesale tariffs, it might be useful to consider to put in place comprehensive costing model comprising of all potential access products that might be potentially imposed in the future on the basis of ex-ante market analysis where costs of access provided under both components would be relatively easy to extract.

Significant role in the whole project will play authorised persons interested in rolling out local access networks throughout which they will provide retail services to subscribers in individual white areas. Their interest into network rollout will depend on the two main factors:

- conditions (including price) applicable to wholesale access product; and
- potential demand in the served area.

Cooperation with utility companies when rolling out the networks under both components might yield positive effect in the form of cost savings for all participants involved.

7.2 Demand Stimulation

1. Demand challenges

Having proper regulation in place and high quality network available to wide population does not automatically lead to high broadband take up. There are many reasons behind low

broadband demand and they should be properly analysed and tackled.
Among potential reasons are:

- availability of cheaper alternative solutions (WiFi, mobile); in such case the shift from cheaper low quality solution to more expensive solution shall be left solely to individual subscribers. It is possible that some subscribers will never switch as the cheaper solutions suffice their needs;
- high retail price of internet connection compared to disposable household income; in such case demand can be stimulated by providing subsidies to predefined group of subscribers upon their subscription to broadband service. Conditions and qualification conditions shall be communicated transparently. The stimulation schemes can be financed by authorised persons involved, government (either directly provided to subscribers or indirectly to authorised persons) or as combination of both. It is important that such subsidies are not tied to a specific technology but are rather technology neutral in order to avoid discrimination;
- high price of terminal equipment; the most common demand stimulation tool in such situation is observed in mobile market where mobile handsets are provided at fraction of their market price paid upfront if a subscriber signs long term contract for mobile services;
- lack of consumers' skills; in such situation it should be both government and authorised persons' interest to provide sufficient guidance to end-users (both individuals and businesses) to improve their computer and/or internet skills and stimulate their interest into use of computers and/or internet;
- lack of consumers' awareness/interest; in some instances, mainly in case of elderly population or population situated in remote areas consumers' awareness of benefits of internet use might be stimulated by campaign disseminated via TV or radio broadcasting;
- demographic factors; there is very low probability that elderly population without any computer or internet skills will be interested in getting internet connection in any form;
- non-appealing content such as e-government, e-health etc.; services provided via internet play important role in promoting internet use. Among most important are e-government services that allow citizens to arrange their legal duties or execute their rights without necessity of physically attending respective offices. Government role in deployment and provision of such services is irreplaceable.

2. Demand stimulation initiatives in place

Some of the reasons of low broadband take-up stated above will be targeted by the "Broadband for development" initiative planned by Georgia's Innovations and Technology Agency (GITA). The initiative's intention is to encourage use of internet and computers by:

- providing vouchers to a group of households meeting the predefined criteria. The vouchers recipients will be able to use those vouchers for purchase of fixed internet connection with predefined quality. Only households registered in the social system and situated in rural regions will be eligible for vouches. The number of vouchers will be limited
- Providing trainings on use of internet and computer to households and small and medium size enterprises.

While the initiative's potential impact on increased use of computers and internet (in already covered areas) is undisputable its impact on network rollout to areas currently not covered by broadband networks will be negligible. Note about 2Mbps (not NGA support)

3. Other tools to promote the development of Broadband Services

Crucial demand and development stimulation by adequate regulation should help create a

fully competitive environment. Such environment will facilitate improvement in pricing and service offering as well as network development. Government and partially regulator can further promote Broadband Services development by demand stimulation with following key tools. It is vital to **first create a national strategy for e-Services**, **set a national coordinating body** responsible for overview, coordination and implementation of the strategy **and** of course **provide financial means** for provision of such services. Following are some examples of areas of demand support for e-Services which might be considered:

Promoting e-Government development

(e-Administrative services; e- Government; e-Municipality)

- simplify the regulatory framework of administrative services;
- facilitating access to e-administrative services;
- encouraging the development of municipal plans to introduce e-Municipality services;
- developing a training course system for central, regional and local administration;

Promoting e-Education development

(Schools; Universities)

- elaborating an e-Education development plan in schools and universities;
- developing a system of learning courses for teachers and lecturers;
- developing models of financial support to assist the introduction of ICT; developing models for financial support of scientific research and innovative activity in the ICT field;
- developing models of financial support of remote learning by electronic means;

Promoting e-Healthcare development

(e-Health; pre-hospital medical care; hospital medical care).

- elaborating working plans for e-Health development by all health centres;
- developing a system of learning courses for doctors and nurses;
- developing models of financial promotion and support to introduce ICT;

Promoting e-Business development

(Internet providers; e-Banking; e-Insurance; e-Commerce; e- Busines (co-creation); smart grids and smart buildings; work at home and flexible working hours etc.

- partially covered by GITA and BfD initiatives
- developing a system of learning courses for businesses and self-employed individuals;
- introducing tax relieves for setting up and running e-Business initiatives and purchase of ICT
- develop favourable regulation/environment for service providers providing both guidelines and stable and secure business environment to introduce and offer e-Business services

Promoting the use of Broadband Services by Households

- partially covered by GITA and BfD initiatives
- introducing tax reliefs for purchasing and using ICT;
- conducting communications campaigns to promote awareness regarding the opportunities provided by broadband Internet;

Promoting the Last Mile offering

As a part of the OpenNet project they could be considered support for local residents to start actively deploy broadband services in their area, by helping them to learn and acquire necessary skills to do so and possibly offer some incentives for creating start-up companies, for example:

- developing a system of learning courses "how to become local internet operator"
- introducing tax relieves or incentives for start-ups to purchase/deploy network technology in underserved areas.

Promoting the creation of Co-working Centres

Remote working, digital nomading and other forms of independent working life style is growing in popularity. It has been estimated that by 2035, there may be as many as 1 billion Digital Nomads globally[95]. High quality co-working centres in remote areas would attract those highly skilled individuals to visit those areas. Digital Nomads tend to stay for longer periods in one place than regular tourists and they exhibit a range of consumer purchasing behaviours that are distinct from more traditional tourists boosting local economy in broader sense than traditional tourists. Especially when they offer ICT equipment, those centres attract not only digital nomads, but also local prospective entrepreneurs who can highly benefit from sharing the experience with international visitors. Some successful examples of such centres include Impact Hub[96], WeWork, BetaHaus or SurfOffice.

Those centres can also host events and programs to further educate and inspire locals and help business development in the area. Digital nomads are usually encouraged to host such events and share their experience.

- elaborating a Co-working Centres development plan;
- introducing incentives, subsidies or create initiative to create and offer high quality co-worker spaces with high speed broadband in selected areas;

7.3 Investment Encouragement

Encouragement of investment into broadband/NGA networks is subject to proper mix of regulation, competition, demand stimulation and government investment.

Regulation shall be executed by competent NRA supported by appropriate regulatory framework established by relevant law, including secondary legislation (if any) issued by NRA. In case of Georgia, competence of GNCC shall be established on the basis of its independence both from market players and government and its ability to execute its powers supported by proper budget. Appropriate regulatory framework should be based on the best practice applicable in the Georgian circumstances and established by amended law and updated secondary legislation such as the methodology for definition of relevant markets and market analysis for the purpose of ex-ante regulation in the sector of electronic communications.

NRA properly equipped with all necessary tools shall strive to assess the level of competition in the market relevant for development of sustainable competition in provision of broadband services. If, based on the market assessment, the GNCC comes to the conclusion

[95] https://levels.io/future-of-digital-nomads/
[96] http://www.impacthub.net , https://www.wework.com , http://www.betahaus.com/ , https://www.thesurfoffice.com

that the market regulation is necessary proper obligations shall be imposed. The obligations should lead to establishment of competition by imposing access obligation at regulated prices (when appropriate) on one side but shall not discourage investment of regulated entity by setting the prices at the level that does not provide rate of return encouraging further investment.

Where demand for broadband services stagnates despite the saturation rate (such as percentage of households with broadband connection) being far from its maximum potential level the reasons for such situation shall be analysed and identified. Where appropriate, proper demand stimulation supported by government and/or service providers shall be put in place.

Government investment has essential role in situations where market forces are not able to invest into broadband networks rollout as such investment would not provide sufficient return on the investment due to high investment cost compared to revenues generated by potential subscribers. In such situation the government can put in place co-financing schemes where investment costs are shared by government and private investors or government can bear all investment cost itself.

Other forms of investment encouragement might be provided as tax relief or direct subsidies provided by government or municipality.

8 Action Plan

8.1 Strategic Objectives and Priorities until …

1. Implementation of regulatory strategy

Given the current broadband market structure and the fact that regulated products do not seem to be used in an extensive manner a top priority of the GNCC should be to assess, as soon as possible the effectiveness of the obligations imposed in broadband/NGA related relevant markets in the past. First of all, GNCC should assess if the remedies imposed in the market for access to subscriber's copper pairs and market for access to telecom channels (duct and channels) have aby impact on competition development. If no positive impact can be detected GNCC should analyse the reasons behind such situation and put in place proper measures. Such measures could have a form of revised obligations imposed based on new round of market analysis of the existing relevant markets. However, the most appropriate approach should have a form of redefinition of relevant markets reflecting recent changes in the access technology development (prevalence of fibre connections) and upon designation of SMP operator/operators imposition of obligations that are most suitable to remedy competition problems identified.

GNCC should consider to initiate market review of broadband/NGA related relevant markets reflecting approach taken in the EU, where two broadband/NGA related relevant wholesale markets have been identified (*unbundled access* or *local access* and *wholesale broadband access* or *wholesale central access*).
Based on our preliminary analysis of the broadband market in Georgia, the market is characterised by presence of two strong authorised persons accounting together for 73% market share (on subscriber basis taking into account xDSL and fibre technology). Taking into account the market structure, pricing policy and the level of high speed products (faster than 30 Mbit/s) take up it might be useful to assess the competition from the joint significant market power perspective and from the geographic scope of market perspective in order to assess the intensity of competition between the two authorised persons accounting for the biggest share of the retail market. If proved by the market analysis results access obligations taking into account ladder of investment principle should be imposed beside other appropriate obligations. Ladder of investment provides access seekers with the opportunity to access SMP operators network at different levels. It is important from the small authorised persons' perspective as it allows them to enter retail market without necessity to undertake extensive and time consuming initial investment into network rollout. Basically, they would be able to enter retail market on national scale with limited coverage of their own infrastructure if they are able to access network of authorised person designated as SMP (active and/or passive) under non-discriminatory conditions. Such measures aim to contribute (in the medium to long term horizon) to the development of infrastructure based competition as they provides an opportunity to continuously develop market position throughout step by step network rollout to areas (geographic markets) that provide the best investment opportunity.
GNCC ability to address the above mentioned issues significantly depend on the amendment of the law proposed in other streams of the project.

2. Government incentives implementation and priorities

Except for the state program on broadband infrastructure development in Georgia certain government initiated incentives shall not be put in place unless a comprehensive analysis of their impact on effective competition has been conducted.

For example, demand stimulation incentive provided in a form of subsidy could strengthen market position of the biggest market players due to their extensive geographical coverage and ability to provide broadband connection to households that are not currently connected but are reachable by existing network. On the other side, introduction of incentive after authorised persons start to make use of regulated wholesale broadband product might create addition opportunity for expansion and reaching of 'critical mass' of subscribers.

Implementation of incentives targeting end-user skills or deploying e-government services can be implemented any time, continuously and in case of e-government it shall be implemented as soon as possible.

3. Objectives regarding NGA coverage and penetration

National objectives regarding broadband/NGA shall be declared on a central level by a document issued by the government of Georgia. Such document should beside the specific goals stipulate responsibility of all stakeholders.

Broadband/NGA goals in the sense of service quality, coverage and timeline are the corner stone for the whole structure of tools that have to be deployed in order to achieve those goals.

8.2 Competencies

The following authorities/state agencies and their responsibilities relevant for development of broadband connectivity in Georgia have been identified in the course of our analysis.

Responsible/Competent Entity	*Responsibility/Competence*
Ministry of Economy and Sustainable Development of Georgia	- Approval of the amended law and its submission for government approval - Proposal of national broadband strategy - Introduction of proper demand stimulating tools - Introduction of proper investment stimulating measures
Government of Georgia	- Approval of amended law - Approval of demand stimulating tools - Approval of national broadband strategy - Approval of investment stimulating measures
OpenNet	- Implementation of the State program on broadband infrastructure development in Georgia
GNCC	- Execution of competencies and obligations stipulated by the law

8.3 Time plan

Depending on GNCC approach to this document it can be used solely as an internal analysis for GNCC and possibly a basis for forming National NGA strategy by Georgian

government which should define key targets and milestones which should be added to the document while other parts regarding detailed recommendation for regulation approach should be possibly removed and in this updated form the document should be published and consulted. We expect that this is doable by the end of 2017.

Independently based on findings and recommendations in this document GNCC should implement NGA regulation as described.

Due to several factors being out of GNCC's influence it is difficult to estimate exact time plan for development of competitive environment in the provision of broadband/NGA services. However, GNCC can deal with the following essential milestones:

From the regulatory perspective the crucial point is transposition of the EU regulatory framework into Law of Georgia on Electronic communications namely the part related to ex-ante market regulation.

Upon approval of the amended act GNCC should issue updated/revised methodology of ex-ante market regulation. In the meantime, GNCC should assess whether the market data currently collected for the purpose of market analysis will provide necessary inputs for the fulfilment of the procedure set by the updated methodology.

Once the methodology of ex-ante market regulation is issued GNCC can officially identify markets susceptible to ex-ante regulation (either using markets defined by the European Commission or markets defined by GNCC on the basis of the methodology) analyse competition on those markets and when the analysis proves existence of an authorised person/persons with significant market power impose appropriate obligations on such authorised person/persons in order to remedy existing or potential market problems. The whole process might last at least six months depending on the willingness of authorised persons to provide relevant information requested by GNCC.

When imposing obligations GNCC should reflect the time the authorised persons with significant market power will need to put the obligations imposed in place. Submission of reference offer or implementation of accounting separation or cost based pricing might take six months.

Upon publication of reference offer competing authorised persons can start negotiations on access with the designated authorised person. Although it is not impossible it would be too ambitious to expect that negotiations start prior to publication of reference offer.

It is not unreasonable to expect that during negotiations on access the issues come to GNCC that will need to be addressed throughout changes in reference offer. In such cases GNCC will have to initiate an administrative procedure to address those changes.

When negotiations on access are successfully accomplished the competing authorised persons can start offering their products to their end-users.

Based on the above mentioned milestones it is expected that the whole process from initiation of market analysis to signing access agreement between competing authorised persons and authorised person with significant market power might take not less than 18 months.

Milestone / Activity	*Time/Duration*
Transposition of ex-ante market regulation related EU regulatory framework into the law	Starting point
Issue proposal of normative administrative act on updated/revised methodology of ex-ante market regulation for public consultation - Regulation on methodological rules for the definition of relevant markets and market analysis for the purpose of ex ante regulation and the assessment of concentrations in the sector of electronic communications	Within 1 week following publication of the amended law
Public consultation on revised methodology of ex-ante market regulation for public consultation	30 days following issuance
Processing of comments on revised methodology of ex-ante market regulation received during the public consultation	Within 3 weeks following public consultations' closing date
Issuance of the list of relevant markets susceptible to ex-ante regulation based on the revised methodology	Immediately upon issuance of the revised methodology
Data collection for the purpose of assessment of identified relevant markets	Starts immediately upon issuance of the list of relevant markets Duration at least 6 months
Analysis of the data provided and identification of SMP operators	Starts immediately upon receiving the first market data Duration at least 3 months from the date when the last data is provided
Issuance of a normative administrative act with the results of ex ante analysis with authorised person(s) having significant market power designated and a proposal for remedies	Issued 9 months upon starting the data collection
Public consultations on results of ex ante analysis	30 days following issuance of the results

Issuance of an individual administrative act (a decision) designating authorised person having significant market power and imposing obligations	30 days upon closing the public consultations on results of ex ante analysis
Publication of reference offer on defined access products (if imposed) by authorised person having significant market power	60 days upon validity of an individual administrative act (a decision) designating authorised person having significant market power
Start of negotiations between authorised persons and the authorised person having significant market power	Upon publication of reference offer
Resolution of disputes related to conditions set by the reference offer between authorised persons and the authorised person having significant market power	Up to 6 months following publication of reference offer
Publication of revised refence offer reflecting the dispute resolution decision	Within 1 month upon issuance of final dispute resolution decision
Signing access agreements on the basis of revised reference interconnection offer	Within 1 month upon publication of the revised refence offer

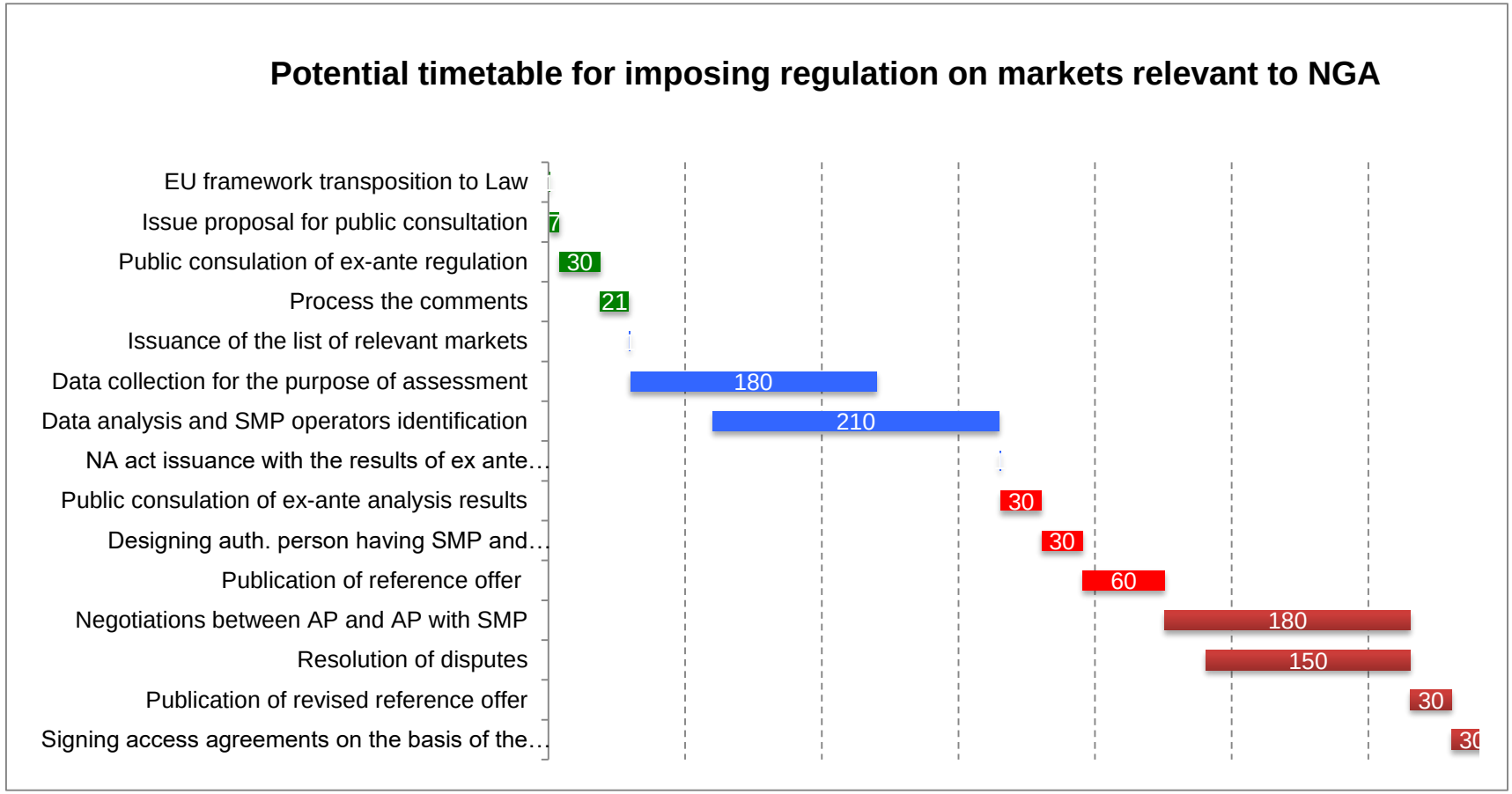


Figure 8-1 NGA Regulation Time Plan

8.4 Key Performance Indicators to assess success of the strategy

Similarly to the national objectives the KPIs for assessing the strategy success should be declared on a central level by the government of Georgia. Such document should beside the specific KPIs stipulate responsibility of all stakeholders.

Key KPIs should include

- NGA coverage
- NGA subscriber penetration
- % of households in the coverage of two or more broadband providers
- Proportion of high speed connections (30 Mbit/s and faster)
- Minimum download and upload speeds.

9 List of figures

10 Annex 1

10.1 Recommendation regarding Broadband Development Projects

Following is a set of recommendations regarding Broadband Development Projects based on best practices from other countries.

- GNCC should support the Government of Georgia in declaration of objectives regarding broadband/NGA and defining National Broadband Strategy.
- GNCC should undertake modelling of the commercially viable limit of different broadband technologies, accounting for the specific characteristics of rural areas (e.g. availability of poles and ducts, deployment costs, ARPUs) - this modelling can serve as an input to determine a realistic approach for infrastructure deployment in rural areas.
- Operators expansion plans, including threshold-based plans should be gathered to better understand how the coverage of broadband infrastructure in rural areas will evolve over time, and how the market may reduce the current coverage gaps on a commercial basis.
- Based on the viability modelling, operators plans and National Broadband Strategy objectives the NGA network gap should be defined with list of localities which needs to be covered as an output. With cooperation with government and local governance localities with existing demand (with schools, libraries, etc.) should be prioritized when coverage plan will be created.
- Supervisory Committee with members from the government, local governance authorities, the state organisation and regulator should be created to supervise the implementation of the project, work timeliness, achievement of planned results, assesses the project's long-term impact and encourages the distribution of the project's results. The SC should give guidance on the project's activities and implementation. The Supervisory Committee should meet at least once a quarter.
- There are several models which can be considered but we believe that similar approach like in Lithuania might be a good fit for Georgia too, yet we recommend further assessment of an appropriate model for Georgia based on the information gathered from operators and viability modelling should be undertaken to confirm that. Using Lithuania as an example, it means that non-profit organisation, controlled by the state will perform the exclusive functions of infrastructure management and control of the provision of services. The company will provide wholesale services. Introduction of new services and infrastructure maintenance would be outsourced.
    - All the assets and infrastructure would belong to the state. Technology-neutral infrastructure is provided for institutions and end-user service providers to use (open access).
    - In order to avoid market distortions, state organisation controls the network but does not provide services to individual users. It is intended that the infrastructure will encourage providers of broadband services to invest in connecting users in rural territories.
    - Service charges should be cost oriented reflecting efficient operating costs of network operation and maintenance, depreciation of assets and capital costs related to network rollout. based only on costs necessary to maintain the network (operational costs). The chosen management model aims to maximise total investment by providers in order to provide the opportunity for users to choose among services, providers and technologies. Initially subsidies to cover some costs would be necessary before the newly build

network would be fully utilised to allow feasible pricing.
    - Maintenance of the network is executed by private sector entities selected via public tenders structured geographically, with one tender for each region which should be defined in a way, which allows even local players to have the chance to maintain part of the network. Tenders for network equipment should be structured by equipment type: data transmission equipment, WDM equipment, network management systems and so on.
    - Only points (objects) to be connected with fiber optical lines should be defined with requirement to use optical cables with pre-defined minimum of fibre cables; Contractor's responsibility covers selection and design of line routes and arrangements with land owners. FIDIC (Fédération Internationale des Ingénieurs-Conseils) Yellow Book can be used for standard contracts.
- Government plans to invest in the road and rail network should be shared with operators to allow them to coordinate any infrastructure build with the road investments to reduce rollout costs and expand coverage.
- State organisation should secure wholesale deals with operators of the existing network, where the newly created parts of network will be connected, which would guarantee the access to the local and global internet resources.
- Planned fibre routes should be published and adjusted through working procedures upon receipt of operators' comments on their future plans, including changes in the use of their infrastructure and other comments.
- It is important to note, that specific approach to broadband infrastructure development should be based on National Broadband Strategy objectives and existing market environment, but there are several best practices which should be considered for development projects like OpenNet:
    - Always assure that the development or incentives promote a competitive environment, i.e. the end user should be allowed to freely choose the service provider and services or that local operators have equal chance to operate the node without being disqualified (ie. by requirement of operating large areas where only big operators are currently fully present).
    - New infrastructure should be constructed only in areas where it does not exist and those areas are not economically feasible to cover by commercial operators.
    - Cost structure and tariffs should be tightly controlled to avoid exploitation of invested structure.
    - Open access principle and technological neutrality should be followed.
    - Invested infrastructure should be freely used by all retail operators on equal conditions.
    - End users should be able to freely choose retail operator and last mile technology.

10.2 NGA deployment strategies in other countries

1. Lithuania

Lithuania was addressing digital divide with original internet penetration in rural areas standing only on 32% vs 99% in urban areas. The rural areas have received little private investment due to their commercial unattractiveness (due to low subscriber density). Lithuania due to many similarities with situation and current aims of Georgia is a good example of a successful NGA deployment strategy.

Project Aims

The RAIN (**R**ural **A**rea **I**nformation Technology Broadband **N**etwork) project aimed to provide opportunities for residents, public institutions and businesses to use broadband in the country's rural areas. It has three socio-economic goals:

- Reduction of Lithuania's digital divide by creating favourable broadband infrastructure conditions throughout the whole country, including areas that are unattractive to businesses.
- Promotion of competition in the broadband sector. An open-access policy to directly contribute to competition and development of new business opportunities, and contribute to making infrastructure more economically efficient.
- Acceleration of the development of an information society in Lithuania. The creation of advanced infrastructure in areas that did not have it to help to provide access to broadband networks for public institutions.

Once finished, it aimed to create favourable conditions in rural areas of the country for:

1. People to use e-services and access content, as well as work and study on distance programmes; giving the opportunity for Lithuanians to acquire knowledge, skills and qualifications to adapt to rapidly changing living and working conditions.
2. Businesses to use ICT in their operations, thus a creating a positive environment for IT businesses as well as increasing the level of productiveness by creating favourable conditions for innovation and SMEs.
3. Public institutions to modernize their activities and provide e-services, contributing to developing the use of IT to increase the efficiency of the decisions taken by public institutions.

Project Results

Project has two phases RAIN 1 (Implementation period: 2005 – 2008) focusing on deployment and RAIN 2 (Implementation period: 2009 – 2015) focusing on development of broadband networks.

As a result of RAIN-1:

- 3,357 kilometers of fiber optical lines were built (original plan 3,200 km);
- 509 network nodes were installed (plan 410);
- 330 schools connected;
- 467 elderates[97] were connected (plan 430);
- more than 300,000 inhabitants got broadband coverage

Value of the project was: 21 million EUR (plan 20 million EUR).

As a result of RAIN-2:

- 5,775 kilometers[98] of fiber optical lines were added (partially build, partially rented) (original plan was not less than 4,400 km);
- 770 elderates[99] were connected;
- 850 operator's towers were connected with fibre;
- 700,000 more inhabitants got broadband coverage (plan 600,000) (together with

[97] small administrative area (town or few villages)
[98] https://sumin.lrv.lt/en/news/strategic-project-for-lithuania-rain-2-won-the-international-award
[99] Small administrative area (town or few villages)

RAIN-1 it was 1 million)

RAIN-2 Timeline:

Date	Stage
April 2007	Feasibility study (version 1)
July 2009	State aid decision.
December 2012	Agreement of financing and administration. First contracts signed.
July 2011	Final EC decision

RAIN-2 Funding:

Assigned funding	**60,265 M EUR**
EU funds	51,426 M EUR
State budget funds	8,839 M EUR
Applicant funds (The Ministry of Transport and Communications)	236 M EUR
TOTAL	**60,501 M EUR**

Project significantly improved coverage in rural areas growing the population coverage from 39% in 2008 to 97% in 2013 (any broadband technology).

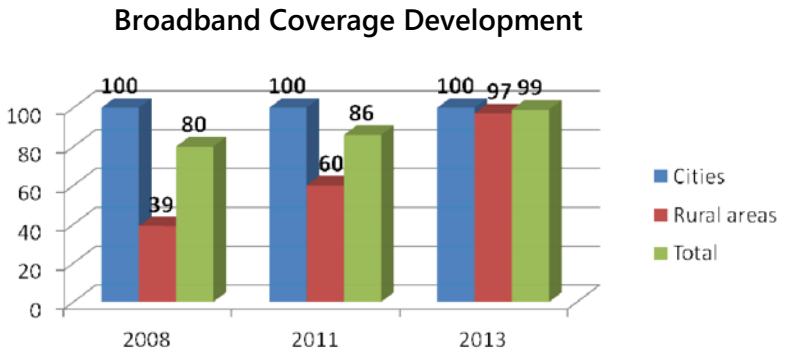


Figure 10-1 Percent of population living in areas with access to broadband internet services

Over the decade, the number of country's households that have a computer and broadband Internet access in the rural areas increased more than 12 times[100]. During that time, the average Internet speed increased by 45 times. Leading to the fact that Lithuania was ranked 8th globally and leader in Europe in terms of the fiber-optic (FTTH) Internet network penetration in 2015. RAIN-2 won the Social and economic impact and affordability award at a Europe-wide competition for a European Broadband Award launched by the European Commission.

Infrastructure choices core & backhaul

Across most of Lithuania there was sufficient last-mile infrastructure for broadband, but the necessary core/backhaul network infrastructure and capacity was missing.

The network was to adhere to principles of: open access, technological neutrality and

[100] https://www.stat.gov.lt/en

promoting competition. The infrastructure was built only in rural areas and where it did not already exist. The technical solutions chosen have to provide for the relevant needs for no less than ten years.

The goal of the RAIN network was to promote the use of broadband communications in rural areas. Whilst preparing the project, the following alternative techno-economic aspects were analysed:

- Transmission medium: fibre-optic cables; copper cables; wireless technologies
- Data transfer solutions:
  - MPLS technology to be used in the entire network;
  - MPLS technology to be used on the network distribution levels;
  - Ethernet technology to be used in the entire network
- Asset management systems:
  - multiple (up to ten) operators of the RAIN network;
  - one operator of the RAIN network (PEPI[101]);
  - one operator of the RAIN network (a private enterprise).
- The following economic alternatives were also analysed:
  - development of the RAIN network not to be implemented;
  - network development to be implemented by creating only the transmission medium;
  - network development to be implemented by creating the transmission medium and installing data transfer solutions.

It should be noted that the RAIN project did not involve the creation of a whole new network but rather the creation of missing parts of the current networks. Given the ideal of the network allowing everyone to use it who wishes to do so, it is important that the connection capacity is sufficient with the possibility of future expansion, and that there are enough resources for all providers.

It was determined that the most acceptable solution was fibre. Given the number of potential operators it was decided that no fewer than 24 fibre cables were to be used in principal links and no fewer than 12 fibre cables in inputs of network objects.

The infrastructure created during the project did not include the last-mile segment of the network. The infrastructure allowed the connection to the network of last-mile segments using all types of technological solution without modifying the network. The infrastructure aimed to encourage operators to provide broadband to end users, attracting investment of private capital into access infrastructure in rural areas and promoting competition. The infrastructure created during the project gives communications operators the opportunity to provide broadband communications services and allows users to freely choose a service provider in at least 98% of the country's rural areas.

Optical cables are being constructed according to conditions set in FIDIC (Fédération Internationale des Ingénieurs-Conseils) Yellow Book:

- Purchaser defines only points (objects) to be connected with fiber optical lines;
- Contractor's responsibility covers selection and design of line routes and arrangements with land owners.

[101] Public Enterprise Plačiajuostis Internetas (PEPI), a state-founded non-profit public enterprise.

Lithuania's RAIN project impact illustration

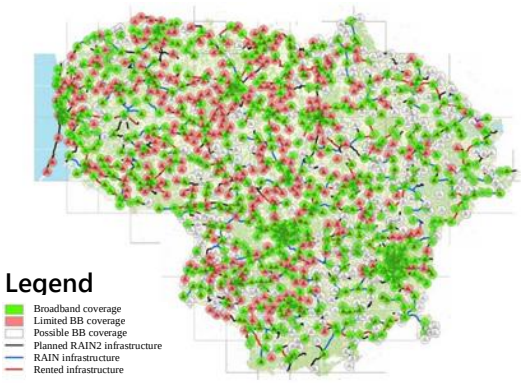


Figure 10-2 Situation after RAIN1 project

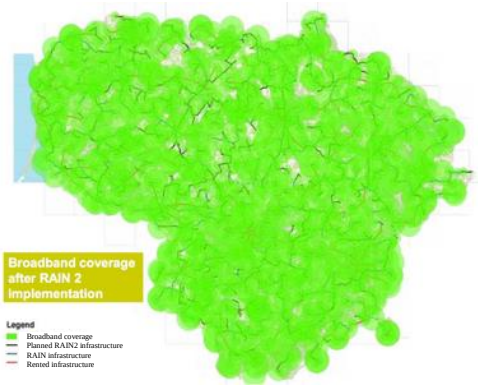


Figure 10-3 Situation after RAIN2 implementation

Investment model

The investment need to create necessary core/backhaul network was large and it was felt it would be carried out inefficiently if split among providers. It was envisaged that the project will connect public services to rural broadband network hubs and allow private users to connect in rural areas, thus helping to complete the national broadband strategy.

Three management models were considered for the infrastructure:

1. A collection of up to ten operators, one from each region, which provides wholesale services.
2. The creation of a public management company which provides wholesale services, where the introduction of new services and infrastructure maintenance is outsourced.
3. A private company, which manages and uses the network to provide wholesale services.

Two main problems were identified: the monopoly situation created under the last two models and the difficulty of ensuring that only wholesale services were offered under the first and third models (both of which may increase prices for users). Within Lithuania, the legal basis exists to control the monopoly situation (and would be especially easy under model 2); however, it is very difficult to prevent any private enterprises from providing services to the bulk, individual and vertical service markets at the same time. It was therefore decided to go with the second management model. To this end a non-profit organisation, controlled by the state, was formed to perform the exclusive functions of infrastructure management and control of the provision of services.

The state founded a non-profit public enterprise (Public Enterprise Plačiajuostis Internetas (PEPI)), to implement the project and manage the new infrastructure. All the assets and infrastructure belong to the state. Technology-neutral infrastructure is provided for institutions and end-user service providers to use (open access).

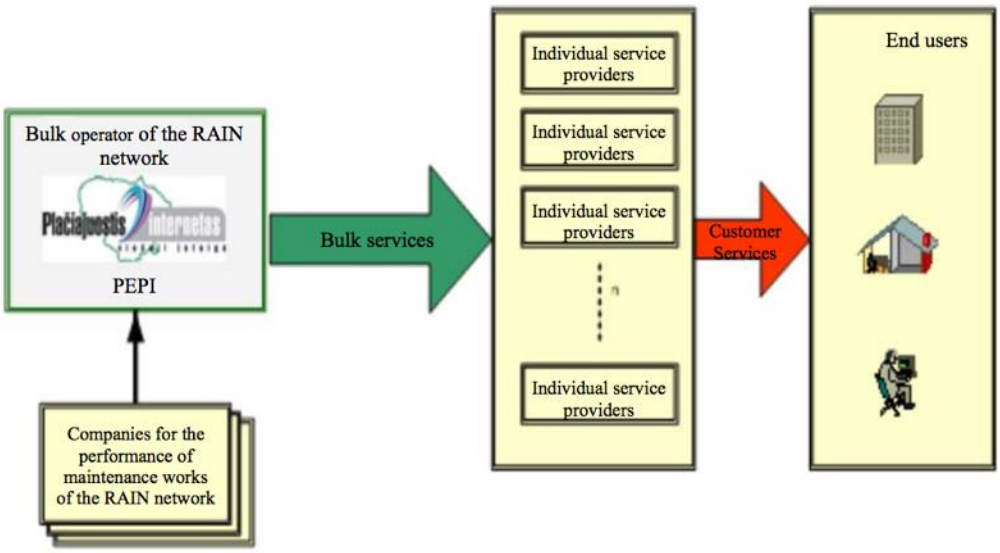


Figure 10-4 Service provision diagram [Source: RAIN Project]

In order to avoid market distortions, PEPI controls the network but does not provide services to individual users. It is intended that the infrastructure will encourage providers of broadband services to invest in connecting users in rural territories. Maintenance of RAIN network is executed by private sector entities selected via public tenders.

It is important that PEPI is non-profit as it means **service charges are based only on costs necessary to maintain the RAIN network**. The chosen management model aims to maximise total investment by providers in order to provide the opportunity for users to choose among services, providers and technologies.

Procurement tenders of fibre-optic lines were structured geographically, with one tender for each two administrative regions (ten in all in Lithuania). In total there were five tenders for fibre-optic lines. Tenders for network equipment were structured by equipment type: data transmission equipment, WDM equipment, network management systems and so on.

The tenders were evaluated differently: some by smallest price, others by economical usefulness, depending on the complexity of the tender. The prices that were proposed during the tender were very close to the planned prices in the budget of the project.

A 'Joint Activity Partnership Agreement' was made between the Ministry of Transport and Communications (MTC) and PEPI. The MTC agreed to undertake the project application, collection of funds, and participation in the Supervisory Committee (SC).

The SC supervises implementation of the project, work timeliness, achievement of planned results, assesses the project's long-term impact and encourages the distribution of the project's results. The SC gives guidance on the project's activities and implementation. The SC was created by the minister of Transport and Communications and consists of representatives of ministries, local governance authorities, educational establishments, etc. The Supervisory Committee meets at least once a quarter.

Service Rates (Tariffs)

The tariffs of provided services are determined by the Ministry of Transport and Communications and are applied for all operators, regardless in which part of Lithuania these operators provide their services.

Currently the cost calculation model (based on ABC - Activity Based Costing methodology) is used and all the tariffs of provided services are evaluated and changed on demand.

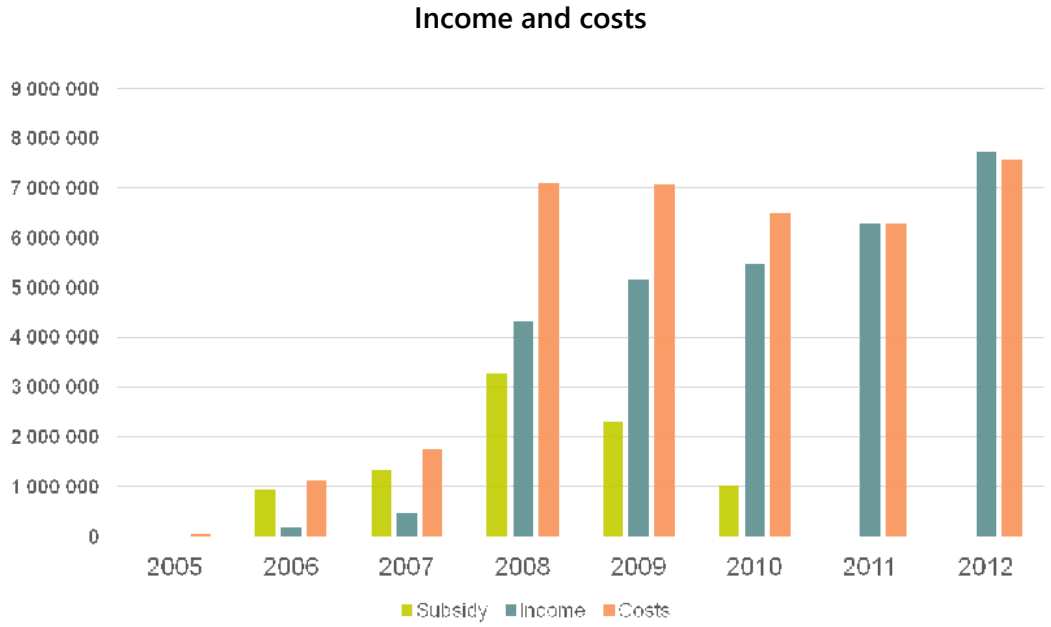


Figure 10-5 Subsidy, income and costs of the RAIN project

Planning, deployment and cost reduction initiatives

The following principles were followed in the planning of the network:

1. Cables only to be laid to areas where no other cables existed, with information on planned routes being provided to operators, allowing them to highlight any doubling of lines.
2. Ensure coverage of 98% of Lithuania and to knowledge centres (schools, libraries, Internet cafes, etc.).
3. Install fibre connection points in all settlements the line passes, allowing future connections to network.
4. Fibre lines to terminate at locations agreed by the municipalities and the operators.
5. Minimise the total distance of cable, while considering how to avoid natural obstacles (lakes etc.) and use protective zones such as those under roads.

A simultaneous network access project entitled "Creation of a Broadband Data Transmission Network in Lazdijai Region and Alytus Region Municipalities" (PDPT) and the infrastructure created during its implementation, were also taken into account when selecting fibre routes for the RAIN network. The towers built during the implementation of the PDPT project were connected to the RAIN network. In addition, the remaining unconnected infrastructure assets of other operators as well as establishments and organisations throughout the region were also connected to the RAIN network.

Operators provided PEPI with information about the communications infrastructure that they managed to aid in planning of the fibre routes. In return, PEPI provides information about planned fibre routes to any interested parties, with precise information about planned lines (i.e. with co-ordinates) provided to parties who enter into a confidentiality agreement.

Planned fibre routes are adjusted through working procedures upon receipt of operators' comments on their future plans, including changes in the use of their infrastructure and other comments.

As of today 40 different operators[102] uses PEPI services.

Demand Activities

About 1200 libraries in rural areas are participating in the Libraries for Advancement project. The project aims to: make it possible for every resident of Lithuania to use computers and the Internet free of charge in all public libraries; and encourage residents to make active use of this opportunity. The Ministry of Culture has provided a list of libraries where a strong need for broadband communications has been identified.

In order to accurately estimate the demand for, and ensure the provision of, broadband in rural areas, the operators provided a list of infrastructure that could be used to provide services to end users. The operators also agreed to allow third parties (other operators) to place equipment necessary for the provision of the services in objects that will be connected to the infrastructure of the RAIN network.

2. Slovakia

In Slovakia the government agency 'National Agency for Network and Electronic Service' is responsible for the national project with the aim of designing and building the regional backhaul optical networks. Regional optical networks will connect access points in the existing telecommunications backbone networks suitable for a specific cluster (a group of municipalities that will be provided with the access to the specific regional optical network) up to the planned termination points located inside a municipality (white spot). Termination points will be provided in a form of a mast equipped with electricity feeder and will be subject to continuous monitoring. Access networks will be rolled out by commercial providers interested in providing retail services to subscribers in the specific municipality. Price of access to regional network will be cost based.
White spots are defined as municipalities with no coverage of high speed broadband connection where commercial operators do not plan to roll out their networks in the horizon of three years.
Initial number of white spots was 600 and was set based on availability of basic broadband. However, after reassessment based on availability of high speed broadband the number of white spots has increased to 1800. The number will be reduced following a public consultation within which commercial operators will submit their plans and commitments to cover white spots with networks built by themselves.

https://www.nases.gov.sk/en/national-agency-for-network-and-electronic-services/index.html

3. Bulgaria

Bulgaria's broadband strategy published in 2014 ("National Broadband Infrastructure Plan for Next Generation Access") sets broadband targets which are in line with the DAE: 100% coverage with 30 Mbps until 2020, and 50% take-up rate for 100 Mbps. Furthermore, Bulgaria aims at 80% take-up rate (100 Mbps) for businesses until 2020. There are no separate regional or municipal broadband plans.

[102] Information directly from PEPI.

Bulgaria's broadband plan defines six investment priority areas which reflect its broadband target structure and envisage different measures for 'white', 'grey' and 'black areas'. In terms of investments, the Bulgarian national broadband plan (NBP) states that approximately 234 million BGN will be necessary to invest in white areas, and about 54 million BGN for grey areas. The NBP foresees that settlement areas will be treated differently with respect to network deployment technique depending on their population density.
Bulgaria completed in December 2015 the first Next Generation Access broadband co-financed by the European Fund for Regional Development (2007-2013). Bulgaria has also allocated EUR 30 million for the roll-out of further NGA broadband under the European Agricultural Fund for Rural Development (2014-2020). This budget will be used entirely for building the passive NGA broadband infrastructure. It aims at further reducing of construction costs by combining them with the costs of road rehabilitation and other infrastructure projects which are a priority of the operational programs. Thus, the impact of the intended budget would be multiplied several times with the objective to cover most of the costs of connecting all municipalities.
Apart from funding from the European Structural and Investment Funds, small scale national state aid is available in cooperation with local authorities. Public-private partnerships is an integral part of the national strategy. At the end of June 2015, Bulgaria had an NGA broadband coverage (> 30Mbps) rate of 72% of households4, but it only reached 2.7% in rural areas according to the Digital Agenda Scoreboard – which is below the EU average rate of 27,8%. All in all, Bulgaria's NBP highlights the importance of private investments for countrywide roll-out of high-end ICT infrastructures.

https://ec.europa.eu/digital-single-market/en/scoreboard/bulgaria

4. UK

The UK has developed and is implementing a national broadband strategy ('Superfast Britain') to extend broadband to the hardest-to-reach areas in the 'final third' of England, Wales, Scotland and Northern Ireland. The programme's target is to extend 'superfast broadband' (UK Government's definition: >24 Mbit/s)2 to 95% of the UK by 2017 and to ensure universal availability of standard broadband (> 2Mbit/s). The Government's 'Superfast Broadband Programme' involves approximately £ 1.7 billion in public funding from local authorities, devolved administrations, the UK Government (allocated by 'Broadband Delivery UK' (BDUK), a specialist body of the Department for Culture, Media and Sport) and European funding programmes. BDUK also provides the National Competence Centre for the State aid umbrella scheme of the UK for rural broadband development. The UK's first State aid scheme was approved in November 2012 and ran until June 2015. In January 2015 the UK pre-notified the extension of the scheme until 2021. The extension foresees a further budget increase of up to £500million.
Four ERDF funded Operational Programmes for England, Scotland, West Wales and the Valleys, East Wales have included the funding of broadband investments, for a total of l EUR 176 million.

https://ec.europa.eu/digital-single-market/en/scoreboard/united-kingdom

5. Czech Republic

The Czech Republic has put up a broadband strategy entitled Digitální Česko v. 2.0 Cesta k digitální ekonomice aiming at implementing the EU's Digital Agenda. The national strategy commits to providing broadband access with at least 30 Mbps for all households and 100

Mbps for 50% of households and enterprises until 2020. A new strategy entitled Národní plán rozvoje sítí nové generace (NPRSNG) is in preparation with consultation and discussion processes in the Government being in progress. The new strategy is expected to be finished by June 2016 including the addition of up-to-date information from an ongoing collection of geographic data (mapping of white, grey and black areas). The new strategy will also contain an action plan, a timetable and specific tasks for Government authorities.
In the Operational Programme for Enterprise and Innovation for Competitiveness, 521 380 364 EUR (14 billion CZK) was allocated to support NGA roll-out plan, which is in preparation, with call announcement being expected in autumn 2016. This initiative represents the operational programme for gaining financial resources from ESIF. Addressees of the programme are telecommunications providers and other subjects. The financing instrument is expected to allocate subsidies for about 50% of the costs involved in deploying the passive part of the NGA and backhaul networks (typically optical cabling, splitters, cabinets and their installations). Importantly, financial support can only be directed to the white areas.

https://ec.europa.eu/digital-single-market/en/scoreboard/czech-republic

6. Australia

In Australia NBN Co Limited, a wholly-owned Commonwealth company, was established to design, build and operate Australia's first national wholesale-only, open access broadband network to all Australian premises as soon as possible, at affordable prices, and at least cost to taxpayers. The Government expects the network will provide peak wholesale download data rates (and proportionate upload rates) of at least 25 megabits per second to all premises, and at least 50 megabits per second to 90% of fixed line premises as soon as possible.

NBN should roll out a multi-technology mix network (a combination of Fibre-To-The-Premise (FTTP), Fixed Wireless and Satellite technologies) and build the network in a cost effective way using the technology best matched to each area of Australia. NBN should prioritise locations that are poorly served, to the extent commercially and operationally feasible and retain optionality for future restructuring or disaggregation. The initially estimated costs of the project of around A$ 30 billion has reached almost A$ 5o billion without being finalized yet.

http://www.nbnco.com.au/assets/documents/statement-of-corporate-intent-2012-15.pdf

11 Annex 2

11.1 Figures data sources, assumptions and methodology

Overview of data sources and used methodology for figures with graphs and numbers.

Figure 1-1 Subscribers Market Share on xDSL or Fibre technologies

Data from: 3Q2016.

Source: GNCC analytical portal, using xDSL and Fibre filtered data, comparing number of subscribers per operator with total sum of subscribers across all operators.

Figure 1-2 Benchmark of HHI for fixed broadband services in Q3 2016

The Herfindahl-Hirschman index (HHI) is a commonly accepted measure of market concentration. It is calculated by squaring the market share of each firm competing in a market, and then summing the resulting numbers, and can range from close to zero to 1 (or alternatively from 0 to 10,000).

Read more: Herfindahl-Hirschman Index – HHI:
https://en.wikipedia.org/wiki/Herfindahl_index

Source: GNCC analytical portal for Georgia – subscribers market share as above, Analysys Mason Datahub for other countries.

1 = monopoly, less than 0.15 fully competitive market 0.25 or greater indicates concentrated marketplace. As a general rule, mergers that increase the HHI by more than 0.02 points in concentrated markets raise antitrust concerns.

Figure 1-3 Cheapest unlimited 100 Mbit fixed broadband offer

Source: EC/Van Dijk Broadband Internet Access Costs 3Q 2015 (prices are similar in 2017), Georgian operators web pages Jan 2017.

Purchasing Power Parity (PPP) adjustment used for Georgia was 44% (prices were multiplied by 2.27).

Read more about PPP: https://en.wikipedia.org/wiki/Purchasing_power_parity

Figure 1-4 Fibre Optic Offers list prices in Georgia

Source Operator's web pages, Jan 2017. Installation fees (if any) were depreciated by 24 months and added to the monthly price.

Figure 1-5 Map of Fibre localities by number of operators.

Source: GNCC analytical portal. Dec 2016. Location based digital map data source. Consumers only. Name of localities were automatically matched to locality position in database obtained from The US National Geospatial-Intelligence Agency GNS server at: http://geonames.nga.mil/gns/html/namefiles.html and mapped on Google Maps background in QGIS mapping software.

Figure 1-6 Households share by number of providers in the locality (without Tbilisi)

Source: GNCC analytical portal (including number of households). Dec 2016. Capital city of Tbilisi is not included. Share of HH only in areas where there is at least one fibre subscriber.

Figure 1-7 Global Internet Access prices in Georgia

Source: GNCC (information obtained from Caucasus Online). Price does not include 2 GEL for the access line to the exchange point.

Figure 1-8 Global IP Transit prices compared to Georgia

Source: TeleGeography, GNCC for Georgia – list price average of reference offer by Caucasus online with added 2 GEL for access line to the exchange point, non GEL prices recalculated by average exchange rate of every year (see Economy overview section of this document for detailed rates).

Figure 1-9 Fibre Coverage in EU and Georgia

Source IHS and VVA for EU data from 2015 study

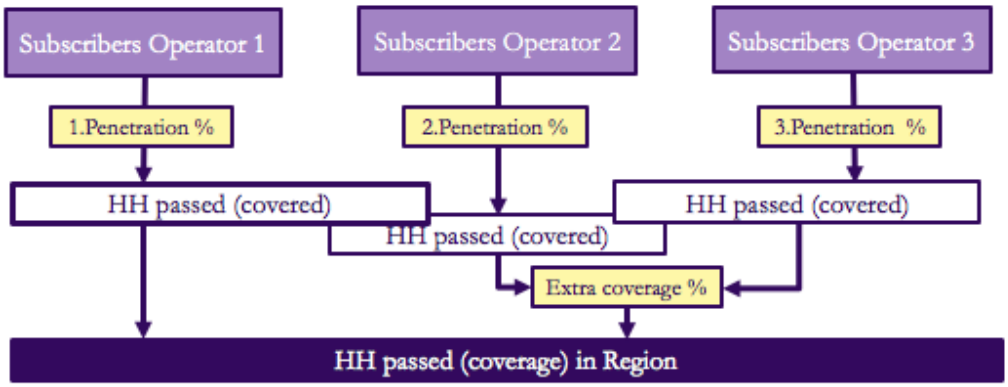
EU study counted homes passed by individual operator and/or technology networks by questionnaires sent to operators with guidance of assumed total number of households in each country based on population data published annually by Eurostat and average household size figures also published by Eurostat on a yearly basis for each country.

Household is assumed to be covered when operator is able (and willing) to provide fibre service solely on request from the subscriber within 1 month of such request.

As most of the operators in Georgia were unable to provide HH passed numbers we used data from operators who provided coverage data and extrapolated coverage for other operators using assumptions on level of service penetration in covered areas and number of subscribers in each area reported to GNCC and available on analytical portal. General experience is that larger operators tend to have lower penetration data than very small operators as the large operators tend to cover whole area and then upsell, while small operator goes more gradually one building to another and trying to upsell as much as he can before he continues with coverage expansion.

Assumed subscribers penetration in covered areas was from 20-47% for each single operator and 57% in average for whole Georgia (total fibre subscribers vs. total fibre coverage). Higher number for country average is a result of coverage overlay. For example in Tbilisi Silknet has 73,000 subscribers out of 268,000 covered households which means 27% penetration and Magticom had 139,000 subscribers (without DeltaCom) of 300,000 covered households which means 47% penetration. But total number of subscribers in Tbilisi was 236,000 out of 333,000 households resulting in 79% penetration.

Calculation was made for each of 10 regions and Tbilisi. Following picture describes the approach for each area:



Resulting coverage aggregated over all operators in area:

Region	Households	Subscribers	Penetration	HH passed	Coverage
Adjara ar	82,601	24,187	44%	55,454	67%
Guria	34,064	290	40%	723	2%
Imereti	165,079	20,962	34%	62,240	38%
Kakheti	96,796	16,641	31%	54,049	56%
Kvemo Kartli	112,638	33,022	46%	72,247	64%
Mtskheta-Mtianeti	29,106	4,112	28%	14,841	51%
R.-Lechkhumi & K.Svaneti	12,421	3	40%	8	0%
Samegrelo-Zemo Svaneti	99,032	13,996	33%	42,575	43%
Samtskhe-Javakheti	42,986	1,957	27%	7,152	17%
Shida Kartli	78,647	9,433	42%	22,400	28%
Tbilisi	333,062	235,655	78%	303,264	91%
Total	**1,086,433**	**360,258**	57%	**634,951**	**58%**

Despite there can be relatively high error margin for the regions the aggregated data are less sensitive as Tbilisi, where coverage is quite known accounts for large part of coverage and error margins in remaining regions should average out.

Urban vs. Rural distribution was based on Urban/Rural HH split data provided from GeoStat comparing sum of subscribers in localities where sum of households equals number of urban households to the total number of subscribers (93%) which was then used to split HH passed between urban and rural areas to get coverage assumption:

Urban & Rural coverage				
	Households	Coverage distribution	HH passed	**Coverage**
Urban	647,390	93%	590,505	**91%**
Rural	461,740	7%	44,447	**10%**
Total:			**634,951**	

Figure 1-10 Fibre coverage trend and forecast

In each region we assumed coverage growth (saturating when it get close to number of

households) and increase of subscriber's penetration to calculate projected coverage and subscriber's numbers growth. Again only total aggregated data were used as a result to minimise the error margin.

As we unfortunately didn't receive any data directly from OpenNet, we have to do the impact projections based solely on our assumptions. We took number of households in OpenNet localities, projected total achievable impact by assuming maximum HH passed. Then spread this projection over the time to see impact in each year. Total impact of OpenNet can be up to nearly 9% of extra coverage, but by 2021 we don't expect more than 3.7% extra coverage and ~16.000 new NGA subscribers as a result of OpenNet project.

OpenNet impact				
	Households	Achievable HH passed		Max. covg. impact
OpenNet reach	134,493	70%	94,145	8.7%
Projections	**2019**	**2020**	**2021**	**2022**
HH reachable	20%	50%	100%	100%
	26,899	67,247	134,493	134,493
HH passed	5%	25%	30%	35%
	1,345	16,812	40,348	47,073
Coverage impact	**0.1%**	**1.5%**	**3.7%**	**4.3%**
HH connected (of HH passed)	25%	35%	40%	50%
	336	5,884	16,139	23,536
Penetration impact	0.0%	0.5%	1.5%	2.2%

Figure 1-11 Internet penetration by region and type of broadband

Source: GNCC 4Q2016 (adjusted for error with Rustavi region not in Kvemo Kartli), Georgian Statistical Office.

For each region the number of residential subcribers was divided by number of households in the region to get the penetration of total broadband (Sum of Fibre, xDSL, WiFi) and Fibre only. For visual comparison population density was plotted using second x axis (except Tbilisi which is out of scale).

Figure 1-12 Fixed Broadband Coverage in EU and Georgia

Source: IHS and VVA research (2015) for EU data and company assumptions based on data from operators and GNCC from 2016 for Georgia.

Assuming 65% of subscribers penetration in covered areas the fixed broadband (xDSL, WiFi and Fibre) coverage is expected to be ~84%. The same methodology as for Fibre Figure 1-9 was used to assess the Urban/Rural split of coverage.

Figure 1-13 Benchmark of take-up of NGA services in covered areas

Source: Analysys Mason, GNCC data.

We have compared the progress of Georgia with two trends from Europe:

- The take-up of current generation broadband in covered areas since launch in all European countries. The "high" and "low" trends are based on the max and min values seen in Europe and give a range in which demand can be expected to progress; and
- The take-up of next generation broadband in covered areas since launch in all European countries. The "high" and "low" trends are created and applied in the same way as current generation broadband.

For Georgia the consumer fibre subscribers penetration in households was used for the NGA take-up and consumer fibre subscribers subscribed to tariff with speed of 30 and more Mbps (according to package and prices data provided by GNCC for December 2016) were used for 30Mbit+indication. We didn't get the data for other years.

Figure 2-3 Deployment cost and speed of different NGA technologies

Source: EU - FTTx Handbook 2015, high/low indication only, without precise speed/pricing.

Figure 2-4 Housing density impact on NGA deployment cost

Source: FTTH council – "The Cost of Meeting Europe's Network Needs", July 2012

Detailed model and methodology:
http://www.ftthcouncil.eu/documents/Reports/2012/Cost_Model_Report_Full_Version.pdf

Figure 3-2 to Figure 3-6

Data from National Statistics Office or National Bank of Georgia were taken as is including forecasts without any alteration.

Figure 3-7 Average monthly nominal wage in GEL and EUR equivalent

Sources: National Statistics Office of Georgia, EUR nomination using EOY exchange rates for calculation.

Figure 3-8 Unemployment rate comparison for Georgia and EU28

Source: National Statistics Office of Georgia (data available only till 2015), Eurostat – unemployment rate for EU28

Figure 3-15 Subscribers Market share xDSL,Fibre and WiFi

Data from: 3Q2016.

Source: GNCC analytical portal, using xDSL, Fibre and WiFi filtered data, comparing number of subscribers of all mentioned technologies per operator with total sum of subscribers across all operators.

Figure 3-16 Subscribers Market Share on xDSL or Fibre technologies

Data from: 3Q2016.

Source: GNCC analytical portal, using xDSL, and Fibre filtered data, comparing number of subscribers of all mentioned technologies per operator with total sum of subscribers across all operators.

Figure 3-17 Fibre Subscribers Market Share

Data from: 3Q2016.

Source: GNCC analytical portal, using only Fibre filtered data, comparing number of subscribers per operator with total sum of subscribers across all operators.

Figure 3-18 Subscribers acquisition comparison for top 2 operators vs the rest of the market.

Source GNCC. Using only consumer subscribers of Fibre and xDSL services. Top 2 operators are MagtiCom and Silknet. DeltaNet subscribers are added to Top2 and substracted from the Others (following the DeltaNet acquisition by MagtiCom).

Dotted mid-line is the difference between Top2 total and Total of Others. If this lines keeps growing it means that Top2 operators are adding more subscribers than everyone else together, increasing their "distance" in terms of number of subscribers.

NewNet is included in Others, but is also shown separately as by the end of 2016 it has 84% of Others xDSL and Fibre subscribers.

Figure 3-19 Cheapest unlimited 100 Mbit fixed broadband offer

Source: EC/Van Dijk Broadband Internet Access Costs 3Q 2015 (prices are similar in 2017), Georgian operators web pages Jan 2017.

Figure 3-20 Cheapest Broadband Offer adjusted for PPP

Source: Source: EC/Van Dijk Broadband Internet Access Costs 3Q 2015 (prices are similar in 2017), Georgian operators web pages Jan 2017.

Purchasing Power Parity (PPP) adjustment used for Georgia was 44% (prices were multiplied by 2.27). PPP prices all benchmarked to US.

Read more about PPP: https://en.wikipedia.org/wiki/Purchasing_power_parity

Figure 3-21 Fibre Optic Offers list prices in Georgia

Source Operator's web pages, Jan 2017. Prices include VAT. Installation fees (if any) were depreciated by 24 months and added to the monthly price.

Figure 3-22 Fibre Offers comparison in Tbilisi

Source GNCC packages pricing December 2016.

Figure 3-23 Fibre Offers comparison outside Tbilisi

Source GNCC packages pricing December 2016.

Figure 3-24 Broadband Subscribers by technology

Source: GNCC analytical portal. Shares are retail subscribers share reported for each technology.

Figure 3-25 NGA technology shares in EU

Source: Communication Committee, July 2015

Figure 3-26 Fixed Broadband Coverage in EU and Georgia

See methodology for Figure 1-12

Figure 3-27 Fixed broadband penetration

Source: European Commission. Eurostat. Total fixed broadband subscribers (retail and business) on any FB technology divided by total country population.

Figure 3-28 Fibre Coverage in EU and Georgia

See methodology for Figure 1-9.

Figure 3-29 Share of FTTx subscriptions among all broadband subscriptions

Source: European Commission for EU data, GNCC Analytics portal for Georgia. July 2015, Fibre, xDSL, WiFi vs Fibre Total Subscribers (always sum of consumer and business subscribers)

Figure 3-30 High Speed Subscriptions per 100 inhabitants

Source: OECD Digital Economy Outlook 2015 Chapter 2. The foundations of the digital economy Figure 2.26 Fixed (wired) broadband penetration by speed tiers, June 2014. Version PAC - Last updated: 29-May-2015.
Japan, data are OECD estimates with the tiers lower than 100 Mbits unseparated that may also include auxiliary portion of the top tier. For Korea 10.0% is for below 50Mbits / 90.0% is above 50 Mbits

GNCC subscribers by service packages report December 2016.

Figure 3-31 Internet penetration by region and type of broadband

Source: GNCC 4Q2016 (adjusted for error with Rustavi region not in Kvemo Kartli), Georgian Statistical Office.

For each region the number of residential subscribers was divided by number of households in the region to get the penetration of total broadband (Sum of Fibre, xDSL, WiFi) and Fibre only. For visual comparison population density (inhabitants per square km) was plotted using second x axis (except Tbilisi which is out of scale). Population density axis is not displayed.

Figure 3-32 Cities and location covered and uncovered with fibre in Georgia

Source: GNCC analytical portal. Localities with Fibre subscribers.

Figure 3-33 Map of fibre localities by number of service providers.

Source: GNCC analytical portal. Dec 2016. Location based digital map data source. Consumers only. Name of localities were automatically matched to locality position in database obtained from The US National Geospatial-Intelligence Agency GNS server at: http://geonames.nga.mil/gns/html/namefiles.html and mapped on Google Maps background in QGIS mapping software.

Figure 3-34 Fibre localities by number of service providers

Source: GNCC analytical portal. Dec 2016. Location based digital map data source. Consumers only. Data aggregated by number of service providers in the locality (1, 2, 3 and 4 and more).

Figure 3-35 Households share by number of providers in the locality (without Tbilisi)

Sources: GNCC analytical portal data aggregated by number of providers and number of households in the locality. Number of households were taken from GNCC data source. Tbilisi was excluded.

Figure 3-36 to Figure 3-38

Data sourced from: The Caucasus Research Resource Centers (CRRC) for detailed information, questionnaires and data go to: http://caucasusbarometer.org/en/downloads/

Figure 3-39 IP Transit prices in USA

Source: William B. Norton - Internet Transit Prices study

Figure 3-40 Global Internet Access prices in Georgia

Source: GNCC (information obtained from Caucasus Online). Price does not include 2 GEL for the access line to the exchange point.

Figure 3-41 Global IP Transit prices compared to Georgia

Source: TeleGeography, GNCC for Georgia – list price average of reference offer by Caucasus online with added 2 GEL for access line to the exchange point, non GEL prices recalculated by average exchange rate of every year (see Economy overview section of this document for detailed rates).

Figure 5-1 Subscribers by technology

Source: GNCC analytical portal quarterly data, consumer subscribers only.

Figure 5-2 Top 5 Operators Subscribers Development

Source: GNCC analytical portal quarterly data, consumer subscribers only.

Figure 5-3 NGA Coverage Trends Comparison

Source: Any fibre service was considered NGA despite the advertised speed which is usually lower than required 30 Mbps.
EU data source: EC (2016) Digital Economy and Society Index 2016 Telecommunications data files and EC (2013, EC (2014), EC (2015) EC studies on broadband coverage. The EC distinguishes three categories of broadband, namely "standard broadband" which includes all fixed and mobile broadband technologies but excludes satellite, "standard fixed broadband" which captures coverage provided by fixed technologies and "NGA broadband" which covers the technologies VDSL over copper, FTTP (comprising both fibre to the home (FTTH) and fibre to the building (FTTB)) and cable DOCSIS 3.0. Technologies which come under this very last category are chosen such that they can meet the DAE's 2020 objective of providing 30 Mbps to every household. Coverage is understood to be the percentage of households covered by NGA infrastructure. Georgian data are based on subscribers penetration data from GNCC and GeoStat combined with coverage penetration assumptions as described in Figure 1-9 Fibre Coverage in EU and Georgia.

Figure 5-4 Benchmark of take-up of NGA services in covered areas

Source: Grant Thornton (as above) and Analysys Mason. The take-up of current generation broadband in covered areas since launch in all European countries. The "high" and "low" trends are based on the max and min values seen in Europe and give a range in which demand can be expected to progress; and the take-up of Next Generation Access in covered areas since launch in all European countries. The "high" and "low" trends are created and applied in the same way as current generation broadband. The penetration of 30+ Mbps services are calculated based on data from GNCC document with BB subscribers by services in December 2016

Figure 5-5 Fibre penetration trends

Data are based on subscribers penetration data from GNCC and GeoStat combined with coverage penetration assumptions as described in Figure 1-9 Fibre Coverage in EU and Georgia.

Figure 5-6 Localities with fibre connection January 2013

Source: GNCC analytical portal. Localities with Fibre subscribers.

Figure 5-7 Localities with fibre connection January 2017

Source: GNCC analytical portal. Localities with Fibre subscribers.

Figure 5-8 Fibre coverage trend and forecast

Existing fibre coverage extrapolated as described in Figure 1-9, penetration data sourced from GNCC analytical portal combined with adjusted household data obtained from GeoStat. Adjustment was made to trend down the number of HH between years 2009 to 2015 instead of sharp drop only in 2015 in the official GeoStat data. Adjusted number of HH are as follows:

	2011	2012	2013	2014	2015	2016
GeoStat	4,469	4,498	4,484	4,491	3,714	3,720
Corrected for downtrend from 2009	**4,121**	**4,038**	**3,956**	**3,876**	**3,714**	**3,720**

Assumptions was made for every region and then it was aggregated to get countrywide data. Share of HH connected was projected to grow from 53% in 2016 to 62% in 2021, yet comparatively fibre subscribers penetration in 2021 is still assumed to be slightly lower than total fixed broadband subscribers penetration in 2016 in every region.

Subscribers fibre penetration in Households

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	For Comparison Total BB Subs. Penetration 2016
Adjara	0%	2%	7%	14%	26%	29%	34%	39%	45%	50%	56%	59%
Guria	0%	0%	0%	0%	0%	1%	2%	4%	8%	11%	15%	20%
Imereti	0%	0%	2%	4%	8%	13%	19%	25%	30%	33%	36%	39%
Kakheti	0%	0%	1%	5%	10%	17%	22%	26%	27%	28%	29%	30%
Kvemo Kartli	0%	0%	3%	12%	24%	29%	34%	37%	40%	42%	42%	44%
Mtskheta-Mtianeti	0%	0%	2%	6%	11%	14%	16%	19%	22%	23%	24%	28%
Racha-Lechkhumi	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	3%	7%
Samegrelo-Zemo Sv.	0%	0%	0%	4%	9%	14%	18%	19%	21%	22%	23%	31%
Samtskhe-Javakheti	0%	0%	1%	1%	2%	5%	8%	12%	17%	23%	27%	37%
Shida Kartli	2%	5%	7%	8%	9%	12%	17%	22%	26%	29%	30%	38%
Tbilisi	30%	42%	51%	56%	61%	64%	66%	68%	69%	70%	71%	83%
Total	**9.4%**	**14.0%**	**18.4%**	**22.5%**	**26.5%**	**31.0%**	**34.8%**	**38.3%**	**41.0%**	**43.2%**	**44.9%**	**52%**
Coverage	**24%**	**34%**	**41%**	**48%**	**55%**	**58%**	**63%**	**66%**	**68%**	**72%**	**76%**	
HH connected share	**40%**	**41%**	**45%**	**47%**	**48%**	**53%**	**55%**	**58%**	**60%**	**61%**	**62%**	

See Figure 1-10 for assumptions behind the OpenNet impact.
Note: All penetration and coverage data are projected over number of households in the area.

Figure 5-9 Fibre subscribers penetration trend and forecast

Same as above, only showing detailed data for Tbilisi for trend comparison.

Figure 5-10 Retail Subscriber's Penetration trend and long term forecast.

GNCC data for subscribers (Total includes WiFi, xDSL and Fibre) divided by ajdusted households numbers as described in Figure 5-8. Projections extended to 2025, estimated error range ±5% in 2021 and ±10% in 2025.

Figure 5-11 Silknet fixed LTE tariffs

Source: Silknet web pages March 2017. Printscreen copy.

Figure 5-12 Magticom mobile broadband tariffs

Source: Magticom web pages March 2017. Printscreen copy.

Figure 5-13 Fibre ARPU in Georgia compared to EU broadband prices

Sources: GNCC analytical portal, ARPU without VAT, EU data source: EC/Van Dijk Broadband Internet Access Costs Autumn 2015.

Purchasing Power Parity (PPP) adjustment used for Georgia was 44% (prices were multiplied by 2.27).

Figure 5-14 ARPU development forecast

Sources: GNCC analytical portal for actual data. Projections were made for market revenues (only total and fibre) interpolating GDP growth rates cycles to total fixed broadband market and total fibre broadband market assuming similar trends to saturation as seen in a developed countries. ARPU projects was result of dividing projected total revenues vs. assumed subscribers numbers as projected in Figure 5-10.

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