



SHEPHERD+WEDDERBURN

Final report for OCECPR

Broadband acceleration study for Cyprus

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1 Executive summary

This document is the final report from a study carried out for the Cyprus Office of the Commissioner of Electronic Communications and Postal Regulation (OCECPR) and the European Bank for Reconstruction and Development (EBRD) on the *acceleration of broadband in Cyprus*. This document has been prepared by Analysys Mason, with support from Shepherd and Wedderburn and Dr. K. Chrysostomides & Co LLC.

1.1 Purpose of the study

The purpose of the study is to propose regulatory and policy-level measures to accelerate development of Cyprus's broadband market, based on in-depth analysis of the status of its electronic communications sector. The proposed measures aim to attract investment, promote competition, support the Digital Agenda for Europe (DAE), and deliver social and economic benefits for Cyprus.

The recommendations we make (outlined in the following subsections) have been developed with this purpose in mind.

1.2 Summary of work

The study has a wide-ranging scope, including a detailed review of a large number of issues relevant to the development of broadband in Cyprus. An overview of our approach is shown in Figure 1.1.

Figure 1.1: Overview of study approach [Source: Analysys Mason, 2016]



We conducted an initial period of desktop research and held consultations with a wide range of stakeholders (including operators, policy makers, the regulator, and representatives from relevant government departments and trade bodies). Following this initial stage, we conducted work on three parallel workstreams: demand- and supply-side modelling, policy and regulatory analysis, and any additional research and consultations that were required. The final stage was to produce this report and our recommendations.

In the remaining sub-sections, we first describe the overall approach for broadband acceleration, then outline our recommendations for policy and regulatory measures, and finally present our recommended next steps.

1.3 Analysis of potential evolutions of next-generation infrastructure in Cyprus

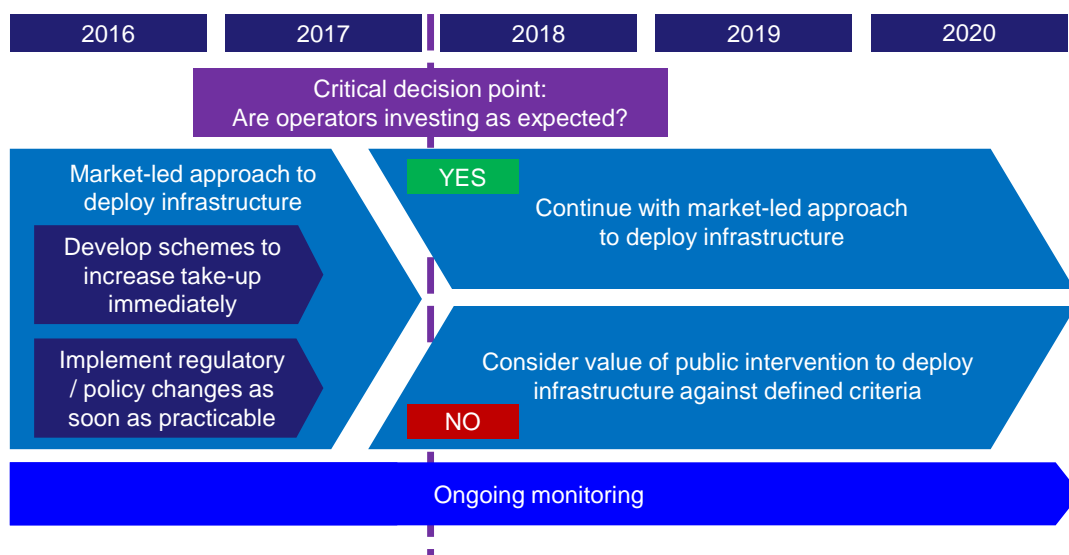
1.3.1 Conclusions and the expected result for Cyprus

Our first set of key findings concerns the optimal approach for delivering next-generation access (NGA) infrastructure.

The DAE targets include providing 100% coverage of 30Mbit/s broadband by 2020, and ensuring that 50% of the population subscribes to broadband above 100Mbit/s by 2020. Regarding the 30Mbit/s target, our analysis shows that the market can provide almost all of the coverage required.

The 100Mbit/s target is more challenging, and we propose a pragmatic approach whereby Cyprus meets the DAE ambition of 50% take-up of 100Mbit/s, but potentially later than 2020. Our recommended approach is summarised in Figure 3.12.

Figure 1.2: Summary of recommended approach for access network [Source: Analysys Mason, 2016]



We recommend that OCECPR and the government of Cyprus initially pursue a market-led approach to deploying infrastructure and, in parallel, immediately develop schemes to increase broadband take-up (see Section 1.4.1). We also propose that our recommendations relating to regulation and policy are implemented as soon as practicable (see Sections 1.4.2, 1.4.3 and 1.4.4).

The expected premises coverage of different broadband speeds in 2020 under the market-led approach is shown in Figure 1.3. This forecast of future coverage includes both the results of our viability modelling and the stated plans from operators.

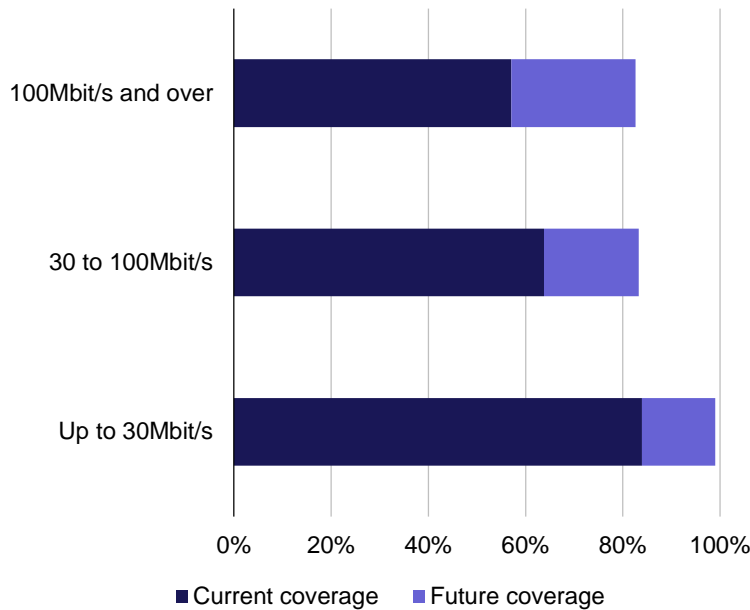


Figure 1.3: Forecast of NGA broadband premises coverage in 2020 under market-led approach [Source: Analysys Mason, 2016]

Under a market-led approach, Cyprus would enjoy significant coverage of NGA infrastructure. This approach benefits from limited distortion of the market, as very little infrastructure-based (supply-side) intervention is envisaged.

A very small amount of public subsidy could be used to ensure 100% coverage of 30Mbit/s connectivity (which could be provided by long-term evolution (LTE)) and thus meet the DAE coverage target for 30Mbit/s broadband in all areas. An alternative approach could include the use of coverage obligations for newly awarded spectrum.

This approach is likely to result in Cyprus missing the 2020 DAE take-up target for 100Mbit/s. 100Mbit/s would not be available in all areas, and therefore it is likely that take-up within covered areas would have to exceed the best take-up performers in Europe (according to our analysis in Section 1.3.2), but with the expectation that the implemented demand/regulatory/policy measures, and technology advancements, will improve the case for further commercial investment.

However, we also recommend that OCECPR continues its ongoing monitoring of the market,¹ and defines a critical decision point around the end of 2017. At that point, OCECPR should assess whether the operators are investing as expected (i.e. on the basis of their stated plans):

- If they are, then we recommend that the market-led approach is allowed to continue.
- If they are not investing, then we recommend a detailed consideration of the value of public intervention to deploy 100Mbit/s-capable infrastructure, assessed against defined criteria. These criteria could include: the extent of network deployment costs to increase the availability of 100Mbit/s broadband; the rate of NGA take-up in the market; the socio-

¹ Ongoing monitoring should include coverage and take-up by broadband speed, and the data should be collected on a quarterly basis. OCECPR's quarterly telecoms bulletin already includes take-up and breakdown of speed. OCECPR should request quarterly data from operators on their coverage (including actual locations if possible), although this should not be published.

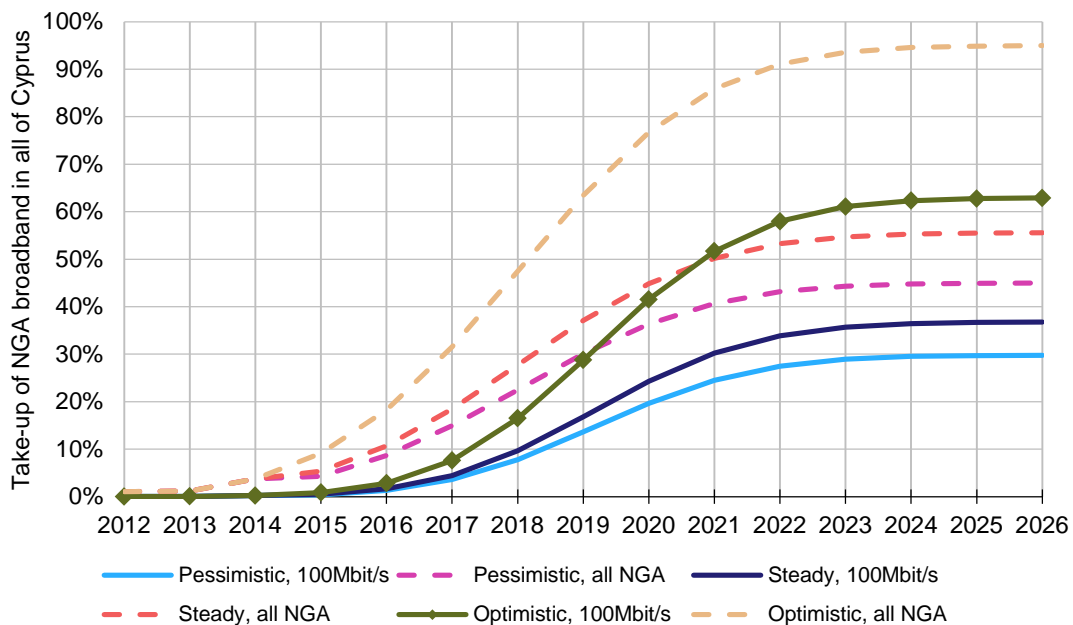
economic benefit of an infrastructure intervention; any revised infrastructure plans from operators; the right timescale for Cyprus to achieve the target.

Our recommendations in Section 1.4 below are based on two supporting pieces of analysis: a forecast of demand for NGA broadband in Cyprus (outlined in Section 1.3.2), and an assessment of several scenarios for models of NGA networks for Cyprus (outlined in Section 1.3.3).

1.3.2 Forecast of demand

Our forecast of the take-up of NGA broadband in Cyprus is shown in Figure 1.4. The forecast includes the estimated proportion of NGA users who will take 100Mbit/s broadband, adjusted for the coverage of 100Mbit/s provided by the market-led approach to deploying infrastructure. The forecast includes a number of assumptions and dependencies (see below) and should therefore be considered with appropriate caution.

Figure 1.4: Forecast of NGA broadband demand in all of Cyprus, showing the proportion of users who will take 100Mbit/s [Source: Analysys Mason, 2016]



Our forecasting analysis included the definition of three forecasts for NGA take-up in Cyprus. The *optimistic* and *pessimistic* cases, based on benchmarks of historical broadband take-up, represent the top and bottom performers for broadband take-up in Europe respectively. The *steady* case is based on an analysis of the market factors in Cyprus that will drive take-up if no action is taken.

The forecast also includes an estimate of the proportion of NGA subscriptions that will be 100Mbit/s or more. There is a distinct lack of data in this area, due to 100Mbit/s subscriptions being in the “early adopter” stage. It has therefore been necessary for us to estimate the proportion of users who will adopt these speeds. This element of the forecast should be treated with particular caution, due to the lack of data.

The analysis suggests that Cyprus will not be able to reach the DAE target of 50% of the population subscribing to 100Mbit/s broadband by the target date of 2020. Our analysis suggests that Cyprus may be able to reach the target soon after 2020, but this is subject to some important dependencies:

- Whether Cyprus can drive demand at the rate represented by the optimistic curve, i.e. in line with the top performers in Europe.
- The accuracy of our 100Mbit/s forecast.
- Take-up not being held back by the fact that it will take time to deploy infrastructure: once infrastructure is deployed in an area, latent demand can be rapidly realised (latent demand will exist because of the recommended demand-stimulation measures).

We present our recommendations for encouraging demand in Section 1.4.1.

1.3.3 Scenario analysis

In conjunction with our demand forecasting work, we undertook detailed scenario analysis to assess a range of approaches to NGA infrastructure for Cyprus. We recognise that any potential policy intervention would need to be technology neutral. However, the scenario analysis had to assume the use of specific technologies, so that we could understand the costs and associated issues with different approaches to deploying infrastructure.

The results of the scenario analysis are summarised in Figure 1.5.

Figure 1.5: Assessment of scenarios against decision criteria aligned to project aims (green = good; amber = fair; red = poor) [Source: Analysys Mason, 2016]

Scenario	Attracting investment	Encouraging competition	100Mbit/s availability	Socio-economic benefit-cost ratio	State-aid implications
R1 (FTTP, active, large market share)	-0.4% IRR ²	Active only	Full coverage by 2020	2.58	Presence of black areas restricts scope for public subsidy
R2 (FTTP, passive, large market share)	1.2% IRR	Passive and active options	Full coverage by 2020	2.74	Grey areas allow possibility of public subsidy
R3 (FTTP, FTTC, ³ LTE, active, large market share)	15.8% IRR	Active only	Partial coverage by 2020	3.89	Minimal implications

² Internal rate of return.

³ Fibre to the cabinet.

Scenario	Attracting investment	Encouraging competition	100Mbit/s availability	Socio-economic benefit–cost ratio	State-aid implications
R4 (FTTP, active, small market share)	-19.2% IRR	Active only	Full coverage by 2020	1.07	Third network: no intervention in black areas
R5 (FTTP, passive, small market share)	-10.9% IRR	Passive and active options	Full coverage by 2020	1.59	Third network: no intervention in black areas
R6 (FTTP, LTE, active, small market share)	-3.2% IRR	Active only	Partial coverage by 2020	2.15	Third network: no intervention in black areas

Our scenarios were defined across three dimensions:

- the technology used (fibre to the cabinet (FTTC), fibre to the premises (FTTP), long-term evolution (LTE) wireless, or a mix)
- the method of wholesale access (active and/or passive), and
- the share of the wholesale market carried on the modelled network (large or small).

We then assessed each scenario against five criteria which aligned to the aims of the study:

- attracting investment
- encouraging competition
- providing 100Mbit/s availability
- delivering socio-economic benefit, and
- any concerns over State-aid implications.

We excluded from consideration those scenarios which feature a small market share (R4 to R6), because of their low attractiveness for investment, low socio-economic cost–benefit ratio, and issues with State aid. The results of scenarios R4 to R6 (which all featured a low wholesale market share) also show that, if the operator of any new network is found to have significant market power (SMP), it is important that timely fit-for-purpose wholesale access is mandated by OCECPR, to ensure that new NGA infrastructure attracts as many operators as possible, and so has a wholesale user base with sufficient scale to make it viable.

The remaining three scenarios provide the options on which our recommended approach is based:

- **Scenario R3** represents a market-led approach, and is efficient in that it makes widespread use of Cyprus’s existing FTTC-VDSL infrastructure, plus some deployment of new FTTP and LTE infrastructure in commercially viable areas by operators in the market. Scenario R3 requires almost no public subsidy or intervention. However, the sub-100% coverage of 100Mbit/s would impede Cyprus’s ability to reach the DAE take-up target by 2020.
- **Scenarios R1 and R2** provide 100% coverage of 100Mbit/s broadband, thus giving Cyprus the best chance of meeting the DAE take-up target. However, this coverage comes at

significant cost, and if Cyprus were to pursue this route, there could potentially be a large requirement for public subsidy.

1.4 Regulation and policy recommendations

In line with this approach to delivering NGA infrastructure, we make a number of recommendations for policy-level and regulatory measures that will support the acceleration of broadband in Cyprus. These recommendations fall into five areas, which are discussed in turn in the following sub-sections:

- Policy to encourage demand.
- Regulation of network infrastructure.
- Access to content.
- Institutional issues.
- Promoting Cyprus as an international hub.

1.4.1 Policy to encourage demand

If Cyprus is to derive the most benefit from high-speed broadband demand and achieve the DAE target of 50% take-up of 100Mbit/s broadband, it must aim to transition towards being one of Europe's best performers, as in the optimistic forecast case. Increasing take-up of 100Mbit/s broadband has a double effect: it will make any deployment project more commercially viable, and once the infrastructure is deployed, will allow Cyprus to move towards the DAE target of 50% take-up of 100Mbit/s in 2020.

In order to encourage demand, we recommend initiatives across business, residential and all users, based on best-practice adopted by similar broadband demand stimulation projects in Europe and Analysys Mason's experience of designing and managing such projects. These initiatives may require individual business cases to be developed, depending on the source of funding and any constraints on its use, as well as the total amount of funding that is available, for example from European Structural Investment Funds (ESIF). The initiatives will probably need to be prioritised based on funding availability as well as funding objectives and constraints.

Business users

- We recommend that the government of Cyprus considers developing a business-support programme, providing tailored support to help small and medium-sized enterprises (SMEs) exploit the benefits of high-speed broadband.
- We recommend that the government of Cyprus considers developing a programme to provide direct financial support to ICT businesses that develop products requiring high-speed broadband in order to be effective. For example, an ICT business that develops cloud services would be a good business to fund, as its products encourage the use of high-speed broadband.

This support could take the form of grants and/or low-cost loans, and the aim would be to stimulate the exploitation of high-speed broadband by *all* businesses.

- We recommend that the government of Cyprus considers setting up a connection voucher scheme to facilitate the take-up of high-speed broadband among SMEs and other suitable organisations. The voucher would cover the standard connection fee of a broadband provider, but could also fund additional costs that are necessary for an effective connection (such as the cost of addressing any in-building wiring issues).

Residential users

- We recommend that the government of Cyprus considers initiating a digital inclusion programme to improve the digital skills of residential users. Initiatives for developing digital skills should be linked to other policy initiatives, such as welfare support activities and educational policies. Schemes for digital skills development involving, for example, drop-in tutorials at community locations could be helpful for the general population; and schemes offered by major digital services companies should be another source of such skills development. Charities should also be engaged to offer support and reduce the financial burden on government, for example by helping specific groups such as the elderly and disabled get online.

All users

- We recommend that the government of Cyprus considers undertaking a marketing and advertising campaign to promote high-speed broadband. This could involve development of marketing collateral, both online and offline, and advertising campaigns, which could include printed material, email, social media, and potentially television advertising.
- We recommend that the government of Cyprus makes use of a digital champion⁴ to promote digital skills, digital inclusion of all residential users and the involvement of SMEs in the ICT and creative industries. The person appointed should act as ambassador for the policies and initiatives that are implemented to accelerate broadband roll-out and take-up in Cyprus.
- We recommend that the government of Cyprus continues to implement its e-Government and e-Health services strategies in parallel to other initiatives, to increase trust in digital services and drive a more “online culture” in Cyprus.

Additional considerations

Many of the above recommendations relate to digital skills and awareness. Our analysis also revealed two further points that may be influencing demand for high-speed broadband in Cyprus:

⁴ The EC expects EU Member States to appoint a digital champion. We are aware that this role already exists in Cyprus, but recommend that the role should be refined in line with policies developed as a result of this study.

- Regarding *affordability*, our analysis shows that the price for broadband of a given speed is higher in Cyprus than in some other countries. However, we expect that broadband prices will come down as competition increases in Cyprus's broadband market. A number of our other recommendations regarding wholesale access to infrastructure and content are designed to improve competition, and we would expect these measures to underpin a general reduction in prices. Therefore, we make no specific recommendation for a demand-related initiative on pricing.
- Regarding *employment rate*, we consider that it has an impact on demand, but policies that can increase employment are beyond the scope of this particular study.

1.4.2 Regulation of network infrastructure

Wholesale access to fibre infrastructure

If Cyta continues to hold SMP in the markets relevant to fibre infrastructure, we make the following recommendations to OCECPR regarding wholesale access:

- If Cyta chooses to deploy a gigabit passive optical network (GPON) architecture, OCECPR should consider a virtual unbundled local access (VULA) type wholesale access product, which could also be used for the FTTC network and would include multicast functionality (so that alternative operators could take advantage of the bandwidth savings multicasting can offer)
- OCECPR should monitor very closely the application of the wholesale access obligations imposed on Cyta over the existing FTTC networks, to ensure that they *can* be effectively applied and, if so, that they *are* applied correctly. This will include ensuring effective retail competition through the application of the obligations on access and pricing, as well as ensuring the application of margin-squeeze protections on new service deployments by Cyta
- OCECPR should facilitate discussions among operators to resolve any potential issues associated with vectoring, and consider imposing appropriate regulatory measures for such services
- OCECPR should consider ways to minimise the wholesale cost of line rental where multiple copper pairs per subscriber are used to deliver high-speed broadband services via bonding.

Wholesale access to duct networks

We recommend that further work is undertaken to secure compliance with the existing OCECPR-mandated methodology for access to the duct network. It is noted that a number of operators have raised the issue of ongoing technical barriers to effective implementation of the rules (for example, a lack of geo-survey technology). Two possible ways to tackle this issue are for a technical

oversight body⁵ to ensure that the barriers are reduced and/or to impose enhanced fines for further breaches, or both.

We recommend that any remediation charges to be imposed by public authorities, for example for footway reinstatement, should be reviewed to ensure they are necessary, cost oriented and proportionate, to avoid deterring effective deployment of new network infrastructure or increasing costs to consumers for broadband services.

Spectrum

We recommend that the Cyprus Department of Electronic Communications (DEC) continues to pursue the allocation of the 800MHz and 2.6GHz bands, as these will support the provision of wireless broadband services in Cyprus. In particular, the superior coverage characteristics of the 800MHz band will be important in providing cost-effective broadband access in very rural areas. We further recommend that, when setting coverage obligations, the DEC should consider the important role that wireless networks may play in providing 30Mbit/s access.

International connectivity

A number of concerns were raised during this study regarding the price of international capacity, and we have reviewed findings by the Commission for the Protection of Competition (CPC) that prices charged for international capacity have been excessively high. However, our analysis has shown that international capacity is not the sole cause of high prices in Cyprus, and that despite the cost of international capacity making up a greater proportion of the total broadband cost base with higher speeds, the cost of that capacity can be reduced if long-term capacity commitments can be made.

However, we acknowledge that access to such connectivity, at acceptable cost, is vital to some operators in Cyprus. We therefore recommend that OCECPR and the CPC monitor pricing trends in international capacity carefully over the next 18 months. This could be done in collaboration, potentially utilising the information gathering powers of OCECPR and the CPC, or the power of OCECPR to conduct consultations. Alternatively, OCECPR could request that the operators provide pricing information on a confidential basis when new capacity becomes available. If this monitoring exercise shows that the pricing of international capacity is having a detrimental impact on broadband roll out, the CPC should consider using its ex-post powers under the Protection of Competition Law (the “Competition Law”) to investigate the international connectivity market should concerns remain, especially once further capacity comes on stream.

1.4.3 Access to content

We consider that effective retail-level competition between players in the market will be a key factor in accelerating take-up of high-speed broadband access. We also envisage that access to

⁵ See, for example, the UK’s approach to technical deployment issues with local loop unbundling and the Office of the Telecoms Adjudicator, available at www.offta.org.uk.

content could become an important aspect of broadband competition in Cyprus over the next two to three years.

We recommend that OCECPR engages with the CPC to discuss the possibility of working together, as far as is legally acceptable, in order to review the content markets, and to examine whether certain regulatory remedies on the allocation of content rights should be imposed.

1.4.4 Institutional issues

From our engagement with stakeholders during this study, it appears that there may be potential gaps and issues in the present legal and institutional frameworks in Cyprus that need to be addressed to help support the acceleration of high-speed broadband deployment and take-up. Our recommendations on these issues fall into four areas:

- We recommend that the government of Cyprus considers a review of the powers for regulating the telecoms industry, which could include considering granting full concurrency of competition powers between OCECPR and the CPC. The aim of granting of such powers would be to tackle the issue that the body which has subject-matter expertise in telecoms cannot intervene in telecoms-related ex-post cases, but is instead limited to using its ex-ante sectoral powers.
- We recommend that OCECPR is given an ability to impose fines on operators for anti-competitive behaviour, based on a percentage of revenue relevant to the market in which the abuse occurred. The current penalty system, which applies a euro cap (apart from in cases of unjustified enrichment), may not necessarily act as a deterrent to larger operators with considerable income. The deterrent effect of fines has been the focus of other member states, for example in Ofcom's recently issued penalty guidelines.⁶ In the guidelines, Ofcom noted that regulated bodies with larger turnovers could be subjected to high penalties in order to achieve a deterrent effect, suggesting that penalties based on turnover to be more effective in ensuring compliance.
- We recommend that OCECPR and the CPC continue to use their powers to secure more robust undertakings from operators to alter and remedy any specific issues in their behaviour (especially where complex solutions or oversight is required), and
- We recommend that the present resourcing levels within OCECPR and the CPC are reviewed.

1.4.5 Cyprus as an international hub

We have identified two regulatory or policy recommendations to encourage the development of Cyprus as an international hub for digital services:

- We recommend that OCECPR offers its sector-specific expertise to support the Ministry of Communications and Works in engaging with representatives of major digital services

⁶ <http://www.ofcom.org.uk/about/policies-and-guidelines/penalty-guidelines/>

companies such as Amazon Web Services, Facebook, Google and Microsoft to qualify the demand for providing digital services at a location such as Cyprus.

- We recommend that international capacity prices are monitored, in line with our recommendation in Section 1.4.2. We also recommend that our suggestions for improving digital skills are implemented as soon as possible, as outlined in Section 1.4.1.

2 Introduction

2.1 Purpose and context of the study

Analysys Mason Limited, supported by Shepherd and Wedderburn and Dr. K. Chrysostomides & Co LLC, has been commissioned by OCECPR and EBRD to undertake a Broadband Acceleration Study for Cyprus.

The purpose of the study is to propose policy-level and regulatory measures to accelerate the development of the Cyprus broadband market, based on an in-depth analysis of the status of the electronic communications sector in Cyprus. The aims of the proposed measures are to attract investment, promote competition, support the DAE targets, and deliver social and economic benefits for Cyprus.

This report presents the results of our study, which has analysed the facts of the Cyprus broadband market, and presents a number of recommendations to accelerate the demand for and supply of high-speed broadband in Cyprus. These recommendations are aimed at OCECPR and the government of Cyprus, although the associated findings are relevant for all stakeholders. We propose that the report can be used to facilitate discussions and cooperation among all stakeholders in the Cyprus broadband industry.

2.2 Cyprus broadband objectives

The DEC defined a Digital Strategy for Cyprus for the period 2012–2020. Key components of the Digital Strategy are the objectives relating to demand for and supply of high-speed broadband services. These objectives reflect the targets set by the European Commission's (EC's) DAE,⁷ which are that:

- the entire European Union (EU) should be covered by broadband above 30Mbit/s by 2020, and
- 50% of the EU should subscribe to broadband above 100Mbit/s by 2020.

However, this acceleration study includes a number of other objectives aimed at maximising the benefits of high-speed broadband for Cyprus. The five objectives of the study are therefore as follows:

- attracting investment
- encouraging effective and sustainable competition
- supporting the DAE targets
- delivering social and economic benefits
- ensuring that recommendations are feasible to implement.

It is against these objectives that we make our recommendations in the remainder of the report.

⁷ Source: <https://ec.europa.eu/dgs/connect/en/content/digital-agenda-europe>.

2.3 Overview of the study methodology

The study has a wide-ranging scope, and has included a detailed review of a large number of issues relevant to the development of broadband in Cyprus. An overview of our approach is shown in Figure 2.1.

Figure 2.1: Overview of study approach [Source: Analysys Mason, 2016]



We conducted an initial period of desktop research and consultations with a wide range of stakeholders. This included operators, policy makers, the regulator, and representatives from relevant government departments and trade bodies. Following this initial stage, we conducted work on three parallel work streams: demand- and supply-side modelling, policy and regulatory analysis, and any necessary additional research and consultations. The final stage was the production of this report and our recommendations.

The subject matter considered for the study encompassed a wide range of issues, across ten major tasks:

1. Project inception and defining the goals for the study.
2. Research country and sector background.
3. Demand analysis.
4. Design and modelling of a new NGA network.
5. Implementation planning and network scenario analysis.
6. Cost, revenue, business and investment models.
7. Socio-economic cost–benefit analysis.
8. International case studies of broadband acceleration.
9. Policy, legal, regulatory & investor perception review.
10. Final scenario selection, study outputs and recommendations.

2.4 Document structure

The remainder of this document is structured into two main sections:

- Section 3 presents our analysis of next-generation access infrastructure for Cyprus.
- Section 4 presents our recommendations on policy measures and regulation for the government of Cyprus and OCECPR to consider.

3 Analysis of potential evolutions of next-generation infrastructure in Cyprus

3.1 Introduction

The first key consideration in the acceleration of broadband in Cyprus is the access network. The access network provides the final connection to the end user and is therefore critical in the consideration of supply and demand for high-speed broadband. However, the access network also involves a large amount of cost, with associated issues regarding how to minimise that cost to Cyprus, while supporting competition and attracting investment. The crucial question for this part of the analysis is therefore: how can Cyprus adopt an approach for its access network which balances the five aims of broadband acceleration?

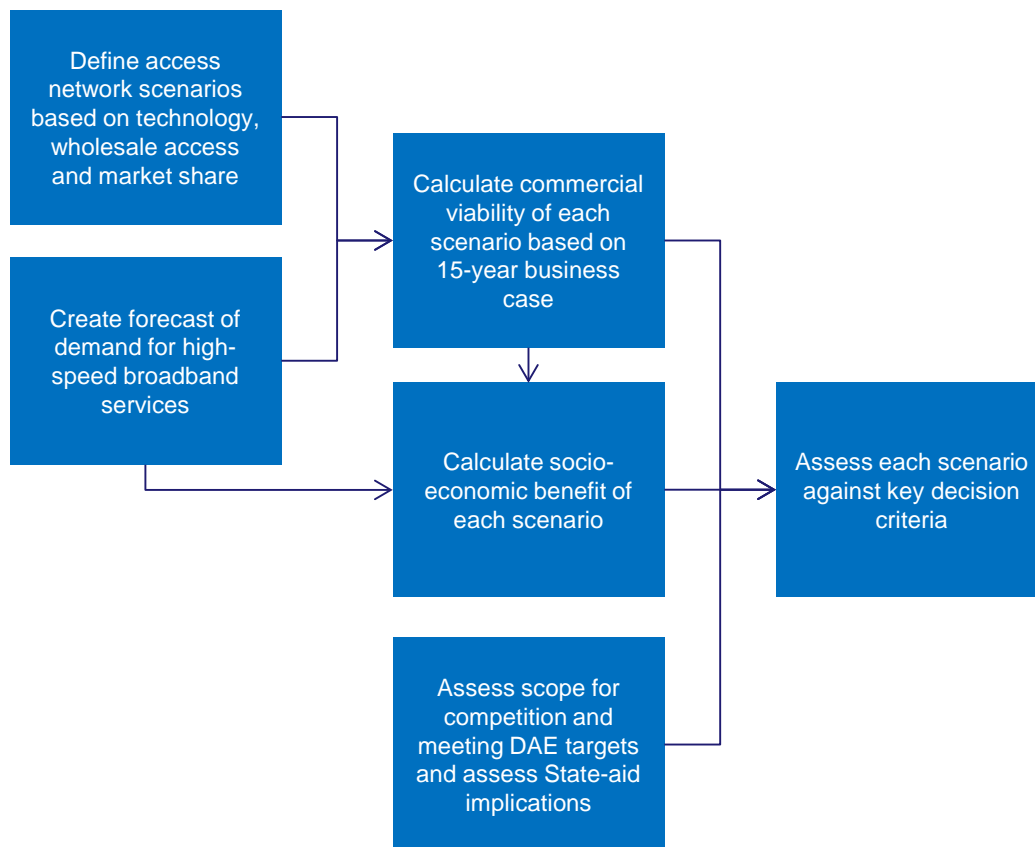
In the following sections we outline the scenario-based approach we have undertaken (Section 3.2), discuss the scenario selection criteria and results (Section 3.3), highlight the two major options suggested by our analysis, and explain why the critical decision for Cyprus is whether to adjust its timescale for meeting the DAE targets (Section 3.4).

It should be noted that the recommendations for regulation and policy measures made in Section 4 support all of the analysis in this section.

3.2 Scenario-based modelling approach

There are a wide range of infrastructure options for providing high-speed broadband connectivity. We recognise that any potential policy intervention would need to be technology neutral. However, we have had to consider specific technologies in order to understand the costs and associated issues with different approaches to deploying infrastructure. Each infrastructure option has its own pros and cons in terms of its deployment and operating cost, and the level of high-speed connectivity it is able to provide. To assess the optimum approach to access network infrastructure for Cyprus in the context of this study, we have employed a scenario-based modelling approach, as shown in Figure 3.1.

Figure 3.1: Overview of scenario-based modelling approach [Source: Analysys Mason, 2016]



3.2.1 Definition of access network scenarios

Our first task was to define a set of access network scenarios that captured a range of options for technology, the method of wholesale access and the market share carried on the modelled network:

- The **technology** dimension covers the type of infrastructure used for a *national* NGA network for Cyprus. Our modelling approach was to consider national coverage of each technology option, in order to assess the extent of commercial viability of that technology. In reality national coverage may not be possible due to financial constraints. We considered a wide range of technologies, including FTTC with very-high-speed digital subscriber line (FTTC-VDSL), FTTP with either gigabit passive optical network (GPON) or point-to-point (PTP) architectures, and LTE wireless. A mix of technology options was also considered
- The **wholesale access method** dimension includes access via active electronics (e.g. VULA or bitstream type access) and access through passive infrastructure (i.e. dark-fibre type access)
- The **market-share** dimension relates to the number of users that the modelled network will carry, and considers issues such as existing alternative infrastructure in Cyprus, and the fact that some types of wholesale access may not suit all operators.

An overview of the main components of our analysis is provided in the sections below.

We undertook an initial scenario-selection exercise with OCECPR, which reduced the number of scenarios from 21 to 6. During this refinement, we discounted scenarios where smaller operators would not take wholesale access, as the existence of OCECPR should ensure this scenario is never encountered, since it will impose regulatory obligations on any operator with SMP. We also discounted scenarios which considered passive unbundling of GPON networks (as our initial network analysis showed that PTP architecture provides the option of passive unbundling at lower cost).

The six scenarios carried forward to the detailed analysis are summarised in Figure 3.2. Note: in the figure below, the assumed wholesale market share is based on detailed analysis of the current and forecast retail market shares of operators, as well as their stated plans for using certain types of wholesale access.

Figure 3.2: Scenarios selected for detailed analysis [Source: Analysys Mason, 2016]

Scenario	Technology	Wholesale access	Long-term wholesale market share ⁸ on modelled network
R1 ⁹	National FTTP-GPON	Active	• 65% wholesale market share in the long term
R2	National FTTP-PTP	Passive and active	• 76% wholesale market share in the long term
R3	<ul style="list-style-type: none"> • FTTP-GPON in high-density areas • FTTC-VDSL in medium-density areas • LTE in low-density areas 	Active	• 65% wholesale market share in the long term
R4	National FTTP-GPON	Active	• 16% wholesale market share in the long term
R5	National FTTP-PTP	Passive and active	• 33% market share in the long term
R6	<ul style="list-style-type: none"> • FTTP-GPON in high- to medium-density areas • LTE in medium- to low-density areas 	Active	• 16% wholesale market share in the long term

3.2.2 Definition of demand forecast cases

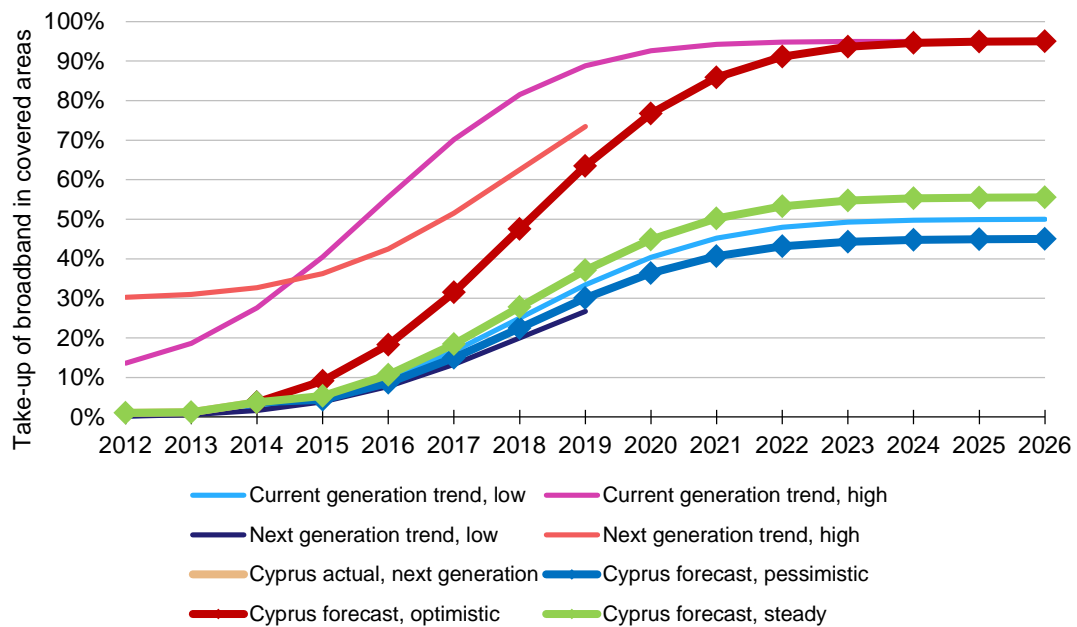
Our second task was to define a set of demand forecast cases to test the viability of each of the access network scenarios under different levels of take-up. We defined three levels of demand forecast (“pessimistic”, “steady” and “optimistic”) as shown in Figure 3.3.

⁸ We consider the share of the market on the modelled access network at the *wholesale* level, i.e. including the connections to the customers of the network owner *and* the connections to the customers of the operators which purchase wholesale access to the access network.

⁹ The “R” prefix on each scenario number denotes that the scenario is from the “Revised” set.

It should be noted that the forecast includes a number of assumptions and dependencies (see below) and should therefore be treated with appropriate caution.

Figure 3.3: Forecast cases for demand for high-speed broadband in covered areas [Source: Analysys Mason, 2016]

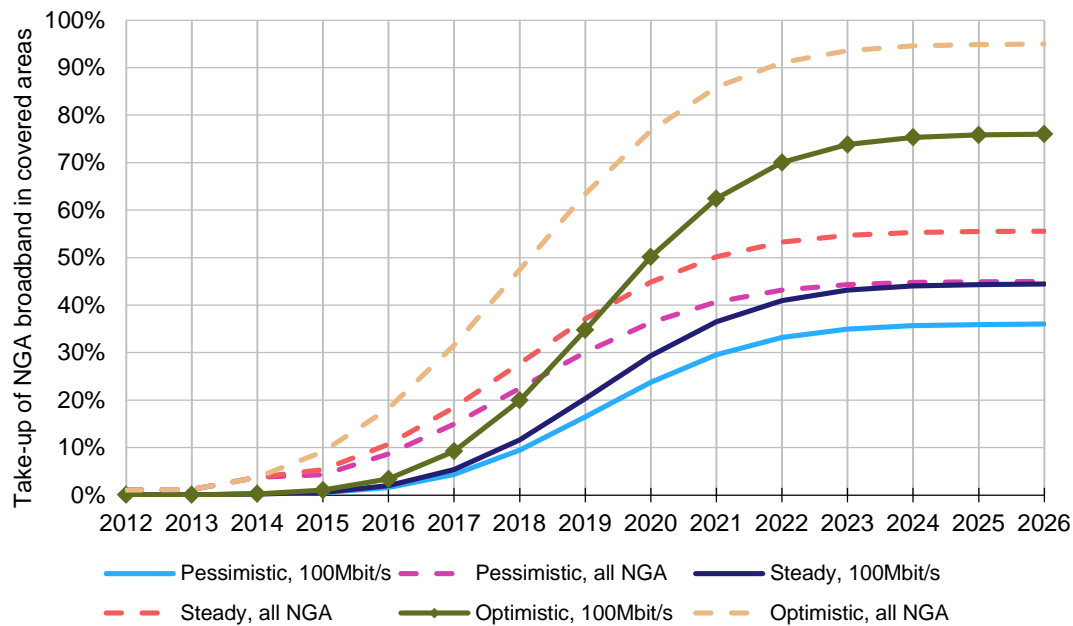


We defined the “optimistic” and “pessimistic” cases based on the take-up trends for current- and next-generation broadband across all countries in Europe. These curves represent the take-up of high-speed broadband that Cyprus would achieve if its performance was aligned to the best and worst performers for broadband take-up in Europe. Our “steady” case was defined relative to the other two cases, and represents the expected path if no action is taken and current market conditions prevail. We estimated the position of the “steady” case between the other two cases based on an analysis of the drivers that influence broadband take-up around Europe. The “steady” case was used as the base case in our scenario modelling.

It should be noted that the above forecast curves are for users of *all* high-speed broadband services (i.e. those over 30Mbit/s), including users who take broadband over 100Mbit/s. There is a distinct lack of data on the proportion of users taking 100Mbit/s, due to 100Mbit/s subscriptions being in the “early adopter” stage. It has therefore been necessary for us to estimate the proportion of users who will adopt these speeds (if they are available from the local infrastructure), but this element of the analysis should be treated with particular caution, due to the lack of data.

Figure 3.4 shows our demand forecast curves for Cyprus, including the estimated proportion of high-speed users who will take 100Mbit/s broadband. Again, it should be noted that the curves forecast the take-up in *covered areas*.

Figure 3.4: Forecast of demand in covered areas, showing the proportion of users who will take 100Mbit/s
 [Source: Analysys Mason, 2016]



The analysis shows that Cyprus is only likely to hit 50% take-up of 100Mbit/s broadband by 2020 if it can drive demand along the optimistic curve, *and* if there is 100% coverage of infrastructure that is capable of delivering 100Mbit/s.

This assessment is also subject to the following dependencies:

- The accuracy of our 100Mbit/s forecast.
- Take-up not being held back by the fact that it will take time to deploy infrastructure: once infrastructure is deployed in an area, latent demand can be rapidly realised (latent demand will exist because of the recommended demand-stimulation measures).

3.2.3 Business case and commercial viability modelling

Having defined the access network scenarios and demand forecast, we undertook detailed business-case modelling for each of the scenarios. This exercise considered the revenue, capex and opex associated with each scenario over a period of 15 years. The resultant cash flows allowed us to calculate the IRR for national coverage under each scenario and so assess its commercial viability.

3.2.4 Socio-economic benefit modelling

The final stage in the quantitative assessment of the scenarios was to calculate a socio-economic cost-benefit ratio. We employed a model framework which considers the socio-economic benefit of high-speed broadband from four sources:

- An increase in the productivity of SME employees leading to an increase in gross value add (GVA).
- The existence of a consumer surplus¹⁰ among residential users, due to the benefits of high-speed broadband.
- Cost savings for government due to the introduction of online government (e-Government) services.
- Cost savings for government due to the introduction of online health (e-Health) services.

The socio-economic benefits model framework combined the outputs of the detailed business-case modelling for each of the scenarios (see Section 3.2.3 above), with Cyprus-specific inputs and additional non-Cyprus-specific inputs from a literature review to create a socio-economic cost-benefit ratio for each scenario.

In the next section we present the results of the scenario analysis.

3.3 Scenario selection criteria and results

In order to assess the merits of all six scenarios on an objective basis, we defined a series of criteria that align with the objectives of this broadband acceleration study. These criteria are summarised in Figure 3.5.

Figure 3.5: Assessment criteria for assessing scenarios [Source: Analysys Mason, 2016]

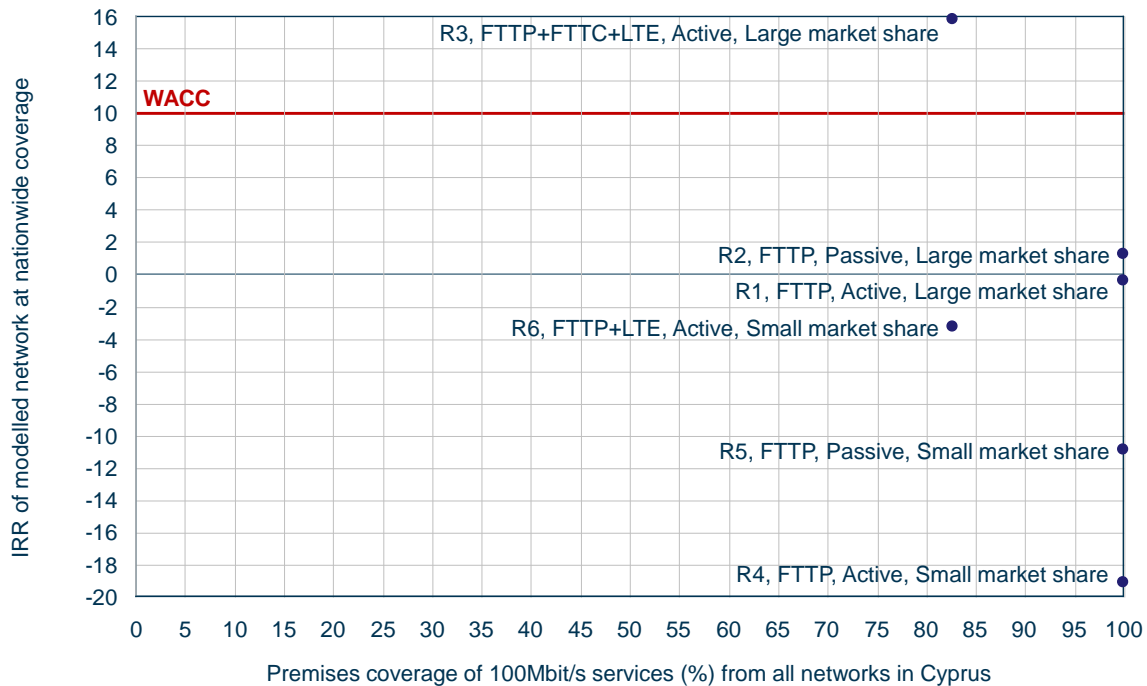
Decision criterion	Measure of merit of each scenario	Basis of assessment
Attracting investment	Internal rate of return (IRR)	Higher IRR from scenario modelling outputs is preferable
Encouraging effective and sustainable competition	Scope of scenario encourages innovation ¹¹	Passive (with active access options) is preferable for competition and innovation than active access only
Supporting the DAE targets	Availability of 100Mbit/s	Higher percentage coverage of 100Mbit/s from the scenario modelling is preferable
Delivering social and economic benefits	Socio-economic cost-benefit ratio	Higher ratio from the socio-economic modelling is preferable
State-aid implications for implementation (note: we consider State-aid compliance a major component of each scenario's feasibility)	Impact of State-aid constraints on ability to use public funds	Fewer State-aid challenges is preferable: <ul style="list-style-type: none"> • white areas are easier for approval • grey areas need a step-change argument • black areas are highly unlikely to gain approval

¹⁰ Consumer surplus is the additional amount that a consumer would be willing to pay for the same service. It is a major component of the benefits delivered by a service.

¹¹ It should be noted that the quantitative impact of innovation is not considered in the modelling of the financial IRR of each scenario.

A summary of the results of the network modelling, covering the *attracting investment* and *supporting the DAE targets* criteria, is shown in Figure 3.6. Please note that the figure shows the IRR of the modelled network vs. the coverage of 100Mbit/s from both the modelled network and the cable network in Cyprus. We assumed a weighted average cost of capital (WACC) of 10% for a telecoms operator in Cyprus.

Figure 3.6: Summary of results of access network business case modelling [Source: Analysys Mason, 2016]



The chart shows the three key drivers of differences in the business case for each access network scenario:

- **Market share** has a large impact on the viability of a scenario. The three scenarios with large market share are far more viable than the three scenarios with a small market share
- **Choice of technology** creates a trade-off between coverage of 100Mbit/s and viability. Those scenarios which have full FTTP ensure 100% coverage of 100Mbit/s, but have much lower viability than the scenarios which use a mix of technologies (for a given market share). The opposite is true for the mixed-technology scenarios: viability is higher, but coverage is lower
- The **method of wholesale access** creates another trade-off. In the cases with a passive option, the higher deployment costs are offset by the fact that the availability of passive unbundling means that more operators may choose to use the network.

Figure 3.7 below provides a breakdown of the net present value (NPV) of the business case for the modelled network in each scenario. The NPV of the modelled network is made up of two elements:

- **Viable areas**, where the business case for deployment returns an IRR above WACC, including existing network, planned expansion and (where viable) further expansion beyond current plans.
- **Non-viable areas**, where the business case for deployment returns an IRR below WACC. In these areas, some form of additional funding (e.g. public subsidy) would be required to deploy and operate the network.

Figure 3.7: Composition of NPV for each scenario, EUR million [Source: Analysys Mason, 2016]

Scen. No.	Scenarios	Viable	Non-viable
R1	FOTP, active, large market share	+19	-89
R2	FOTP, passive, large market share	+23	-95
R3	FOTP+FTTC+LTE, active, large market share	+28	-5
R4	FOTP, active, small market share	0	-111
R5	FOTP, passive, small market share	0	-122
R6	FOTP+LTE, active, small market share	+4	-35

The results show that if Cyprus were to follow a course of action that involved deploying full coverage of FOTP as an overlay to the existing infrastructure, public subsidy of between EUR89 million and EUR122 million would be required, depending on the market share and method of wholesale access. Alternatively, if a mixed-technology approach were taken, as in scenario R3, very little public subsidy would be required.

Our assessment of the scenarios against *all* the decision criteria is shown in Figure 3.8.

Figure 3.8: Assessment of scenarios against all decision criteria (green = good; amber = fair; red = poor) [Source: Analysys Mason, 2016]

Scenario	Attracting investment	Encouraging competition	100Mbit/s availability	Socio-economic benefit-cost ratio	State-aid implications
R1 (FOTP, active, large market share)	-0.4% IRR	Active only	Full coverage by 2020	2.58	Presence of black areas restricts scope for public subsidy
R2 (FOTP, passive, large market share)	1.2% IRR	Passive and active options	Full coverage by 2020	2.74	Grey areas allow possibility of public subsidy
R3 (FOTP, FTTC, LTE, active, large market share)	15.8% IRR	Active only	Partial coverage by 2020	3.89	Minimal implications
R4 (FOTP, active, small market share)	-19.2% IRR	Active only	Full coverage by 2020	1.07	Third network: no intervention in black areas

Scenario	Attracting investment	Encouraging competition	100Mbit/s availability	Socio-economic benefit–cost ratio	State-aid implications
R5 (FTTP, passive, small market share)	-10.9% IRR	Passive and active options	Full coverage by 2020	1.59	Third network: no intervention in black areas
R6 (FTTP, LTE, active, small market share)	-3.2% IRR	Active only	Partial coverage by 2020	2.15	Third network: no intervention in black areas

On the basis of the above assessment, we eliminated scenarios R4, R5 and R6, because of their low attractiveness for investment, low socio-economic cost–benefit ratio, and issues with State-aid. These scenarios all feature a small market share and highlight the importance of operators in Cyprus’s broadband market working together to achieve scale at the wholesale level.

Should the operator of any new network be found to have SMP, it is important that timely fit-for-purpose wholesale access is mandated by OCECPR, to ensure that new NGA infrastructure attracts as many operators as possible, and so has a wholesale user base with sufficient scale to make it viable.

Regarding the other three scenarios, we have the following comments:

- Scenario R3 is efficient in that it makes widespread use of Cyprus’s existing FTTC-VDSL infrastructure, plus the potential for deployment of new FTTP and LTE infrastructure in commercially viable areas by operators in the market. Scenario R3 requires almost no public subsidy or intervention. However, the sub-100% coverage of 100Mbit/s would impede Cyprus’s ability to reach the DAE take-up target by 2020.
- Scenarios R1 and R2 provide 100% coverage of 100Mbit/s broadband, so giving Cyprus the best chance of meeting the DAE take-up target. However, this coverage comes at significant cost, with the potential for a large requirement for public subsidy.

3.4 Key decision point: the DAE targets

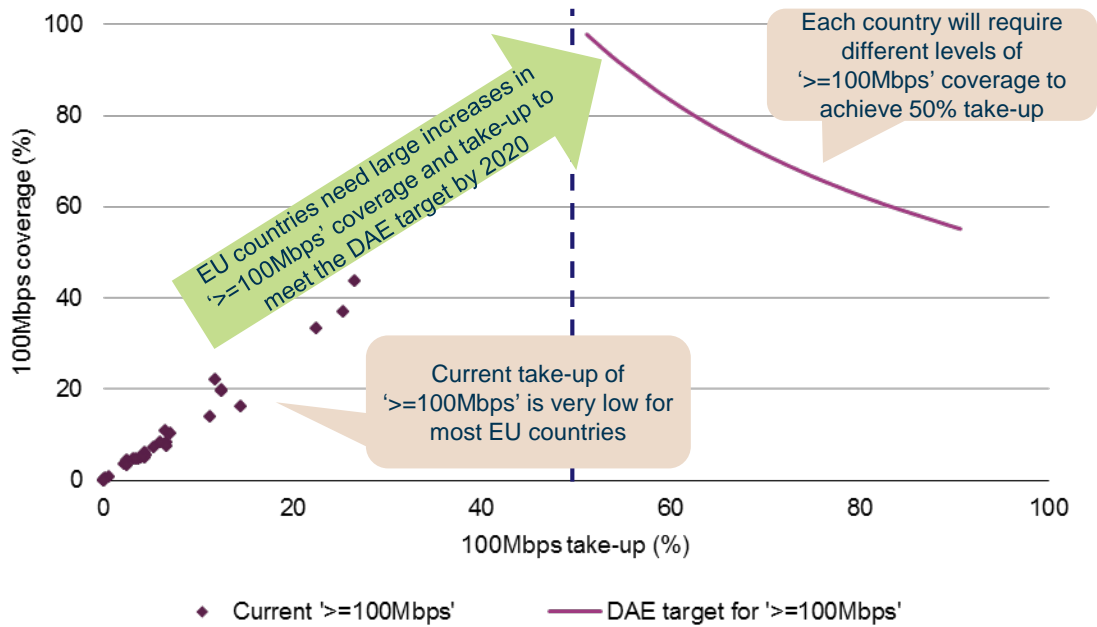
On the basis of the above scenario analysis, it would appear that a key decision point for the acceleration of broadband in Cyprus is whether to aim for the DAE targets by 2020, given the cost associated with doing this. In this section, we explore this issue in more detail, including the available options.

Coverage and take-up present different challenges

We expect that Cyprus will have widespread availability of 30Mbit/s broadband by 2020, due to a combination of wireline and wireless technologies. However, as highlighted above, the ability to meet the 100Mbit/s DAE take-up target will be constrained by the availability of infrastructure that

can provide such speeds. At this point, it is worth considering how other countries are progressing towards the 100Mbit/s take-up target, as summarised in Figure 3.9.

Figure 3.9: Summary of progress towards DAE targets by EU Member States [Source: Analysys Mason, 2016]



The analysis in Figure 3.9 shows that all countries are finding it challenging to meet the take-up target. Therefore, if Cyprus did decide to relax its efforts towards meeting the DAE take-up target, it is unlikely that it would be the only country in Europe to do so.

Option 1: Market-led approach to deploying infrastructure

A market-led approach (similar to scenario R3) has a lot of merit. We note that the coverage of 100Mbit/s is below 100%, but still quite high, and the limited requirement for public intervention makes the approach financially very efficient for Cyprus as a whole.

The expected premises coverage of broadband services of different speeds in 2020 under the market-led approach (similar to scenario R3) is shown in Figure 3.10. This forecast of future coverage includes both the results of our viability modelling and the stated plans from operators.

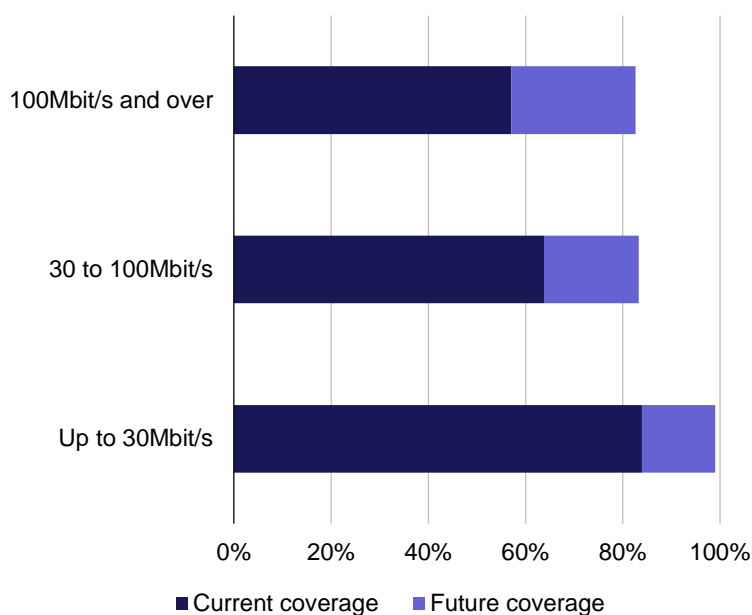


Figure 3.10: Forecast of NGA broadband premises coverage in 2020 for scenario R3
[Source: Analysys Mason, 2016]

Under a market-led approach, Cyprus would benefit from significant coverage of NGA infrastructure. A very small amount of public subsidy would be required to ensure 30Mbit/s coverage in all areas (which could be delivered by LTE) and thus meet the DAE coverage target for 30Mbit/s broadband. An alternative approach could include the use of coverage obligations for newly awarded spectrum.

Another benefit of this approach is limited distortion of the market (as very little infrastructure-based (supply-side) intervention is envisaged).

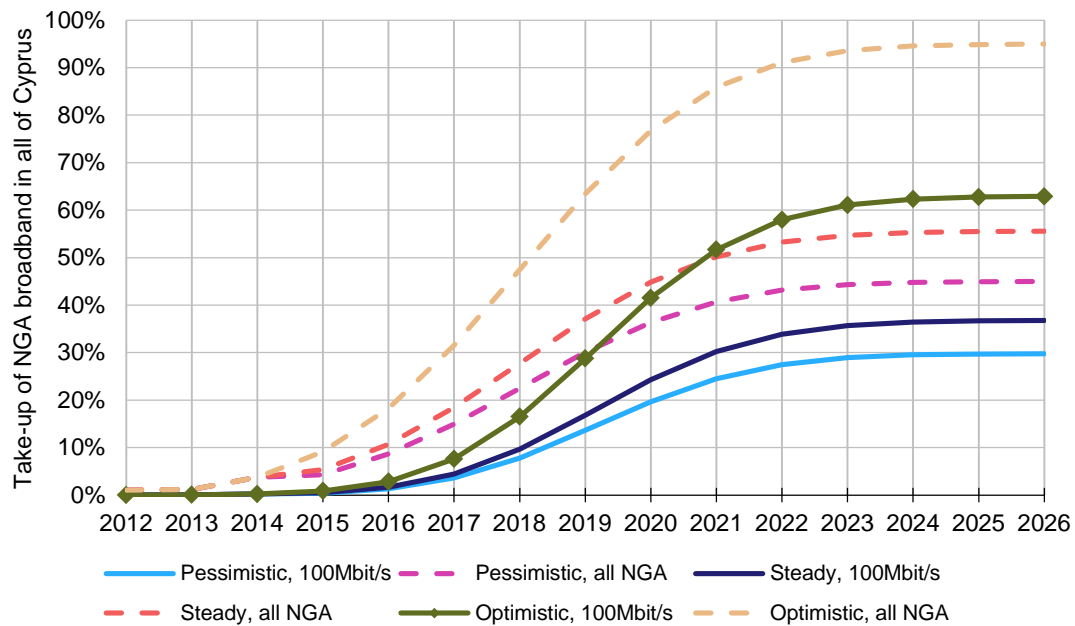
However, the market-led approach is still dependent on some key potential challenges being overcome, e.g. issues with vectoring and the charges for bonded pairs, along with adoption of fit-for-purpose active wholesale access. These issues are discussed in Section 4.

► *Revised timescales for DAE take-up*

As noted above, a market-led approach such as this will not provide 100% availability of 100Mbit/s broadband, and so will impede Cyprus's ability to meet the 100Mbit/s DAE take-up target by 2020.

In Figure 3.11 we present our demand forecast curves for Cyprus, including the estimated proportion of NGA users who will take 100Mbit/s broadband, adjusted for the coverage of 100Mbit/s provided by the market-led approach. As discussed in Section 3.2.2, this analysis is subject to a number of assumptions and dependencies and should therefore be considered with appropriate caution.

Figure 3.11: Forecast of demand in all of Cyprus, showing the proportion of users who will take 100Mbit/s
[Source: Analysys Mason, 2016]



The analysis suggests that Cyprus will not be able to reach the DAE target of 50% of the population subscribing to 100Mbit/s broadband by the target date of 2020. Cyprus may be able to reach the target soon after 2020, but this is affected by some important dependencies:

- Cyprus driving demand at the rate represented by the optimistic curve, i.e. in line with the top performers in Europe.
- The accuracy of our 100Mbit/s forecast.
- Take-up not being held back by the fact that it will take time to deploy infrastructure: once infrastructure is deployed in an area, latent demand can be rapidly realised (latent demand will exist because of the recommended demand-stimulation measures).

We present our recommendations for encouraging demand in Section 4.

Option 2: Consider value of public intervention to deploy infrastructure against defined criteria

If operators are not investing in infrastructure, we recommend a detailed consideration of the value of public intervention to deploy 100Mbit/s-capable infrastructure, assessed against defined criteria. These criteria could include:

- the extent of network deployment costs to increase the availability of 100Mbit/s broadband
- the rate of NGA take-up in the market
- the socio-economic benefit of an infrastructure intervention
- any revised infrastructure plans from operators
- the right timescale for Cyprus to achieve the target.

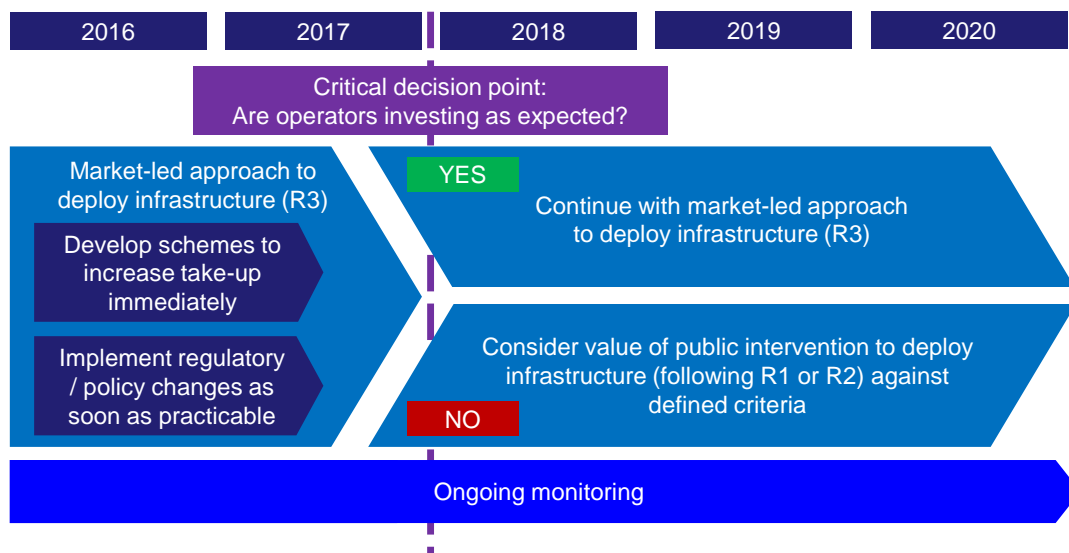
If it is determined that the 2020 date for meeting the DAE 100Mbit/s target is important for Cyprus, we see no alternative but to plan a major intervention scheme to deploy a network capable of 100Mbit/s broadband, for example using a technology such as FTTP. Under this option, the networks modelled under scenarios R1 and R2 both have interesting features. Scenario R1 includes an active access method and incurs lower cost than the passive access-capable topology of scenario R2, but would likely attract fewer operators and therefore generate less revenue than R2. This trade-off means that the two options are so similar in terms of financial viability that the difference is likely to be within the margin of error of the modelling and therefore financial viability cannot be used as a differentiator between the two.

Either of these scenarios would give Cyprus the greatest chance of meeting the 100Mbit/s take-up target and provide a clear statement that it aims to accelerate high-speed broadband network roll-out. However, both scenarios represent a heavily interventionist approach, with costly supply-side subsidies for non-viable areas. They would also require new forms of market co-operation.

Overall recommendation

Taking all of these factors into account, we propose a potential way forward for Cyprus which harnesses the ‘best of both worlds’, with a pragmatic approach whereby Cyprus meets the 100Mbit/s DAE target, but likely at a later date than 2020. Our recommended approach is summarised in Figure 3.12.

Figure 3.12: Summary of recommended approach for access network [Source: Analysys Mason, 2016]



We recommend that OCECPR and the government of Cyprus initially pursue a market-led approach (similar to scenario R3), but in parallel, immediately develop schemes to increase broadband take-up (as discussed in Section 4.2). Also, our recommendations relating to regulation and policy should be implemented as soon as practicable (see Sections 4.3, 4.4 and 4.5).

This approach is likely to mean that Cyprus will miss the 2020 DAE 100Mbit/s take-up target, but with the expectation that the implemented demand/regulatory/policy measures and technology advancements will improve the case for further commercial investment.

However, we also recommend that OCECPR continues its ongoing monitoring of the market,¹² and defines a critical decision point around the end of 2017. At this point, OCECPR should assess whether the operators are investing. If they are, then we recommend that the market-led approach is allowed to continue. If they are not investing, then we recommend that the case for public intervention in infrastructure is considered against defined criteria.

¹²

Ongoing monitoring should include coverage and take-up by broadband speed, and the data should be collected on a quarterly basis. OCECPR's quarterly telecoms bulletin already includes take-up and breakdown of speed. OCECPR should request quarterly data from operators on their coverage (including actual locations if possible), although this should not be published.

4 Regulation and policy recommendations

4.1 Introduction

A major lever that Cyprus has for accelerating its broadband market is the broadband policy defined by the government of Cyprus. The regulatory initiatives undertaken by OCECPR also have the potential to have a material impact on the market. However, there are a wide range of issues that have been raised with policy and regulation in Cyprus over the course of this study, and we are recommending that only those issues which are most relevant to accelerating broadband in Cyprus are tackled. When developing the policy and regulatory recommendations our approach has been to provide the best foundation for broadband acceleration.

In the following sections we present recommendations in five areas: policy to encourage broadband demand; regulation of access to network infrastructure; regulation of access to content; institutional issues; and policy considerations for promoting Cyprus as an international hub.

These recommendations underpin all the analysis presented in Section 3.

4.2 Policy to encourage NGA broadband demand

In order to encourage demand, we recommend initiatives across business, residential and all users based on best practice adopted by similar broadband demand stimulation projects in Europe and Analysys Mason's experience of designing and managing such projects. These initiatives may require individual business cases to be developed, depending on the source of funding and any constraints on its use, as well as the total amount of funding that is available, for example from European Structural Investment Funds (ESIF). The initiatives will probably need to be prioritised based on funding availability as well as funding objectives and constraints.

4.2.1 Importance of demand for broadband services

Demand for high-speed broadband services is essential to Cyprus for three reasons:

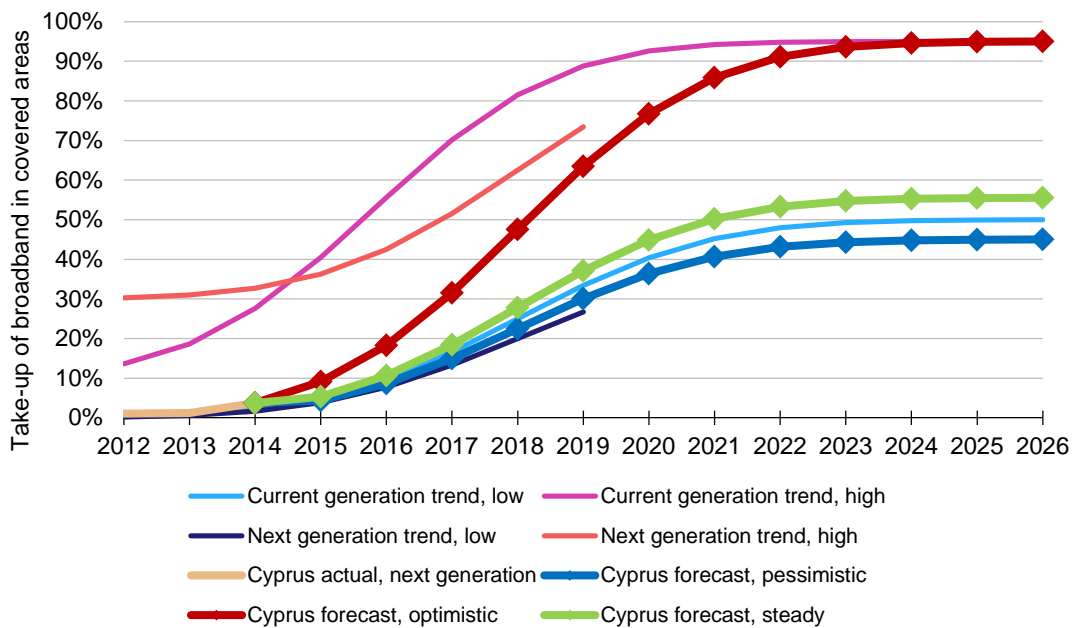
- The demand for high-speed broadband is one half of the business case for NGA infrastructure deployment (the other half being the cost of providing infrastructure on the supply side). The higher the demand in a given area, the more revenue is available to recover the fixed costs of deploying infrastructure to cover that area. With higher demand, more areas are commercially viable, which will increase the network coverage that can be viably provided by the market, thus reducing the need for public subsidy.
- It is only through take-up of services from NGA infrastructure that the socio-economic benefits of that infrastructure can be realised. The increase in demand is likely to lead to an increase in the efficiency of, and citizen participation in (for example) e-Government and

e-commerce. Therefore, a higher take-up is a pre-requisite for a higher socio-economic benefit.

- Finally, as discussed above (see Sections 3.2.2 and 3.4), Cyprus’s ability to meet the DAE target of 50% take-up of 100Mbit/s broadband is dependent on sufficient demand.

Our forecasts of demand for high-speed broadband services in Cyprus show the need for policy initiatives that encourage demand. This point is illustrated in Figure 4.1.

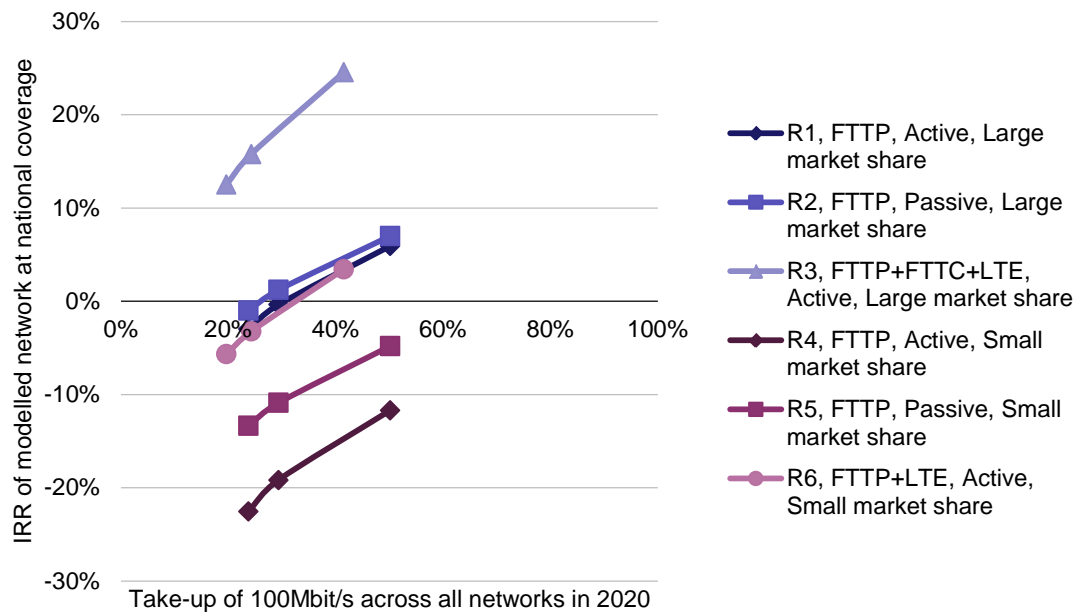
Figure 4.1: Forecast of demand for high-speed broadband services [Source: Analysys Mason, 2016]



If Cyprus is to derive the most benefit from high-speed broadband demand and achieve the DAE target of 50% take-up of 100Mbit/s broadband, it must aim to follow the “optimistic” forecast curve (shown in red on Figure 4.1). The “steady” curve represents our forecast if current market conditions prevail. It shows that, without demand-side initiatives, Cyprus may end up with a level of high-speed broadband demand which is close to the lowest performers in Europe (represented by the pessimistic case on Figure 4.1).

There are two benefits of achieving higher demand, as illustrated in Figure 4.2, which plots the IRR against the take-up of 100Mbit/s in 2020 for each of the access network scenarios. It should be noted that the caveats associated with the estimated 100Mbit/s forecast (see Section 3.2.2) apply to the precise values of the results (but the way in which the results behave is valid regardless of the accuracy of the 100Mbit/s forecast).

Figure 4.2: Sensitivity analysis on NGA broadband forecast [Source: Analysys Mason, 2016]



Each series includes three points: the bottom-left point is the pessimistic case, the middle point is the steady case and the top-right point is the optimistic case.

The results show that increasing broadband take-up has a double effect: it makes any deployment project more commercially viable, and once the infrastructure is deployed (assuming that take-up of 100Mbit/s subscriptions increases over time according to our estimate), it moves Cyprus towards the DAE target of 50% take-up of 100Mbit/s in 2020.

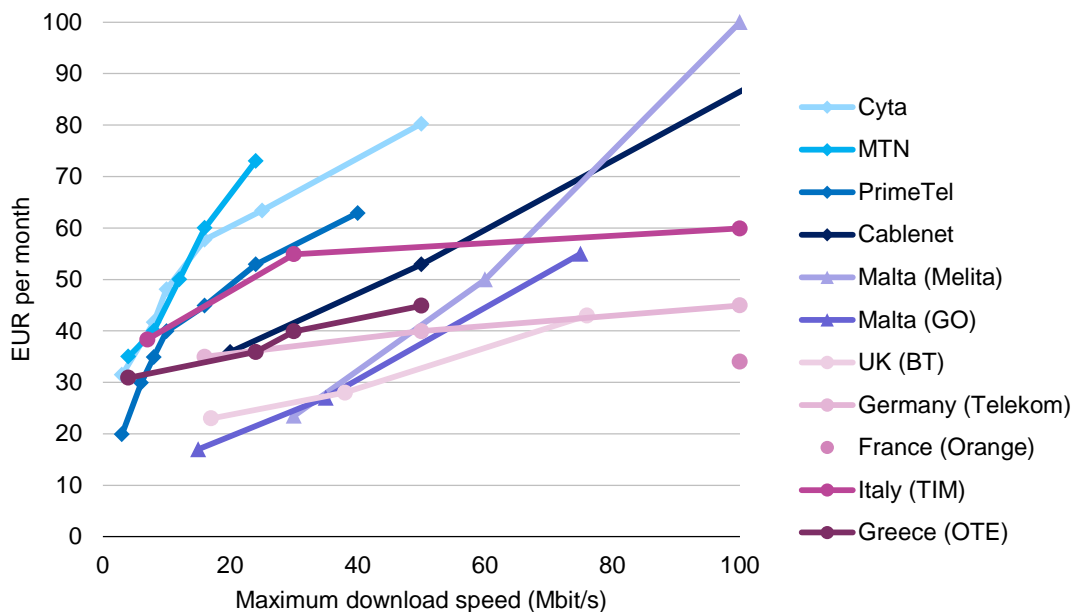
4.2.2 The factors that influence demand

Our demand analysis highlights three factors that appear to be influencing demand in Cyprus at present:

- affordability (pricing)
- employment rate
- digital skills (and digital awareness).

Regarding *affordability*, broadband prices do appear to be high in Cyprus at the moment. Figure 4.3 shows monthly prices for different broadband speed bands (including line rental) in Cyprus and benchmark EU countries.

Figure 4.3: Monthly retail prices for different broadband speed bands (including line rental) in Cyprus and benchmark EU countries, 2015 [Source: Analysys Mason, operator websites, EC Digital Agenda, 2015]



The figure shows that the price of broadband rises more steeply with speed in Cyprus than in some other countries. However, we expect that broadband prices will come down as competition in the broadband market increases in Cyprus. It should be noted that comparisons of prices between countries are affected by the specific market conditions of those countries, including the number of operators and the geographical distribution of the population.

A number of our other recommendations regarding wholesale access to infrastructure and content are designed to improve competition, and we would expect these measures to underpin a general reduction in prices. Therefore, we make no specific recommendation for a demand-related initiative on pricing. We note that some operators have recently increased the speed they provide for a given price.

Regarding *employment rate*, we consider that it has an impact on demand, but policies that can increase employment are beyond the scope of this particular project. Therefore, we do not make a specific recommendation on this point.

In terms of *digital skills*, we make a number of recommendations in the following sections to encourage digital skills among both business and residential users. We also include other recommendations aimed at reducing barriers to take-up, and promoting a more “online culture” in Cyprus.

4.2.3 Increasing demand from business users

We propose three policy initiatives to increase demand from business users:

- a business support programme
- direct financial support for business growth and innovation
- a connection voucher scheme.

Business support programme

A business support programme would provide tailored support for SMEs to exploit the benefits of high-speed broadband. As well as increasing awareness and encouraging take-up of high-speed broadband, the goal of a business support programme should be to improve digital skills and encourage the use of e-commerce services by Cyprus's SMEs. Individual businesses could be assisted through one-to-one consultations, participation in workshops and attendance at educational seminars. The programme could have measurable targets for the number of businesses that undertook a consultation, workshop or seminar; this approach is typical of many projects funded by European Structural Investment Funds (ESIF).

A programme could be structured around the principle of knowledge sharing, supplemented by expert guidance. For example, topics for workshops would be linked to high-speed broadband capabilities but also focused on business need (to attract interest from businesses) as well as policy needs (such as a focus on international exports). On this basis, topics might include digital marketing, international e-commerce trading and online security for business. Many other topic options exist and it would be important to identify topics that fit with the Cypriot business profile (for example, to help very small businesses) and demonstrate how a business can use high-speed broadband for growth.

We recommend that the government of Cyprus considers developing a business support programme.

Direct financial support for business growth and innovation

Direct financial support from public and private funding could be provided to ICT businesses that can help other businesses exploit high-speed broadband due to the nature of the products and services that they develop. For example, an ICT business that develops cloud services requiring high-speed broadband in order to be effective would be a good business to fund, as its products encourage the use of high-speed broadband. This type of action could be used to encourage private investment, and individual businesses could be given support from public funds in the form of grant funding or low-cost loans. The overall aim would be to stimulate exploitation of high-speed broadband by all businesses.

A financial support programme could be developed in collaboration with private investors, such as banks and multinational companies, to help ICT businesses access funds for growth. The products and services offered by the ICT businesses which receive direct financial support should be

suitable for exploitation of high-speed broadband by any SME business. Funding guidelines and contractual protections would need to be developed to ensure that the intended outcomes were achievable.

We recommend that the government of Cyprus considers developing a programme to provide direct financial support to ICT businesses that can help the exploitation high-speed broadband by all businesses.

Connection voucher scheme

A connection voucher scheme would aim to directly increase the take-up of high-speed broadband by offering vouchers to subsidise the costs of connections to high-speed broadband for SMEs (and potentially other organisations considered suitable for funding, such as charities). The voucher would fund part, or all, of the cost for eligible organisations to procure a high-speed broadband connection. The voucher would typically cover the standard connection fee of a broadband provider, but the voucher could also fund additional costs that are necessary for an effective connection (such as the cost of addressing any in-building wiring issues).

The scheme should be developed in collaboration with broadband providers, to secure their cooperation in providing connections to organisations approved for a voucher. The scheme should also determine a funding limit for a voucher which balanced the attractiveness of the value to an organisation against the target number of organisations for the scheme. The maximum value of a voucher would need to be set with regard to constraints on the total amount of funds available. Funding for the scheme might be secured from a combination of public and private sources (as outlined in the previous subsection on direct financial support).

Promotional activities to increase awareness of the scheme among eligible organisations would be essential, along with clear and simple guidelines for completing voucher applications, to ensure that applications were processed efficiently. In addition, various contractual protections would need to be put in place to ensure that the intended outcomes were actually achieved.

We recommend that the government of Cyprus considers setting up a connection voucher scheme to facilitate take-up of high-speed broadband among SMEs and other suitable organisations.

4.2.4 Increasing demand from residential users

We propose one policy initiative to increase demand specifically from residential users – a digital inclusion programme. In addition, a connection voucher scheme could be developed, similar to that described above for business users. However, at this stage we would expect a voucher scheme to be lower priority and to involve additional complexities and funding constraints, as well as being more challenging to justify from a policy perspective.

Digital inclusion programme

A digital inclusion programme could involve a myriad of activities that would require an extensive study in their own right to determine the priorities for Cyprus, and it would need to be linked to wider government social and welfare policies. Overall, further development of the ideas presented here – and their affordability – is needed in order to develop a digital inclusion strategy that meets the needs of Cyprus. However, based on our study findings, digital skills should be a focus of attention. Initiatives for developing digital skills should be linked to other policy initiatives such as welfare support activities and educational policies. Schemes for digital skills development involving, for example, drop-in tutorials at community locations could be helpful for the general population; and schemes offered by major digital services companies should be another source of such skills development. Charities should also be engaged to offer support and reduce the financial burden on government, for example by helping specific groups such as the elderly and disabled get online. At a community level, local digital champions could be appointed to support initiatives and help promote the take-up and use of high-speed broadband. At a policy level, the digital inclusion programme should be coordinated with government initiatives to increase the availability and use of e-Government services.

We recommend that the government of Cyprus considers initiating a digital inclusion programme to improve the digital skills of residential users.

4.2.5 General initiatives to increase demand

We propose three general policy initiatives to increase demand from all users:

- promotion of high-speed broadband
- a digital champion for business and residential users
- continued pursuit of e-Government and e-Health services.

Promotion of high-speed broadband

Initiatives to promote the take-up and use of high-speed broadband should be developed. This could include development of marketing collateral, both online and offline, and advertising campaigns, which could involve printed material, email, social media, and potentially television advertising. The promotion should be undertaken in collaboration with operators, but remain operator-neutral, and could also involve a specialist public relations agency in order to reach the required level of press coverage. For Cyprus, the tourism sector could be a particularly useful channel for promotional opportunities, because of the international reach of this sector and the potential to use tools that are already available in the industry.

There would be a need to coordinate activities across various channels and define the frequency of communications to ensure that promotional activity was cost effective. There may be a need to promote high-speed broadband via specific channels, for example in trade press relevant to

Cyprus, as well as develop provocative articles, for example to encourage SMEs to adopt new working practices.

Promotional activities could also include calling campaigns, either to elicit reasons why high-speed broadband is not attractive to residents and SMEs, or to raise awareness and encourage take-up via other initiatives such as connection vouchers.

We recommend that the government of Cyprus considers undertaking a marketing and advertising campaign to promote high-speed broadband.

A digital champion for business and residential users

A national digital champion should be appointed.¹³ The person appointed should act as ambassador for the policies and initiatives that are implemented to accelerate broadband roll-out and take-up in Cyprus. They could have a wide-ranging remit, but based on the findings of this study they should put particular emphasis on digital skills, inclusion and SMEs in the ICT and creative industries.

The role of digital champion would also require engagement in a multitude of promotional activities, such as giving keynote addresses at major conferences in Cyprus and internationally; this would help to promote and give credibility to broadband initiatives in the country and naturally increase press coverage and awareness among citizens. The digital champion should also promote ‘local’ successes and opportunities by attending launch and milestone achievement events of the various projects and programmes that encourage the take-up and use of high-speed broadband.

We recommend that the government of Cyprus makes use of a digital champion to promote digital skills, inclusion and SMEs in the ICT and creative industries.

Continued pursuit of E-Government and e-Health services

The government of Cyprus already has strategies for delivering more public services online and for connecting healthcare institutions with high-speed broadband. The government should continue to implement these strategies in parallel to the other initiatives. This will help to increase trust in digital services and drive a more “online culture” in Cyprus, which will support take-up.

Targets should be set to achieve appropriate levels of online service take-up and cost savings within government; this will help to justify business cases and secure funding for initiatives that might otherwise stagnate.

¹³ The EC expects EU Member States to appoint a digital champion. We are aware that this role already exists in Cyprus, but recommend that the role should be refined in line with policies developed as a result of this study.

We recommend that the government of Cyprus continues to implement its e-Government and e-Health services strategies in parallel to other initiatives, to increase trust in digital services and drive a more “online culture” in Cyprus.

4.3 Regulation of network infrastructure

OCECPR plays a key role in Cyprus’s broadband market by regulating access to network infrastructure that would otherwise represent an economic bottleneck for competing broadband operators. In this section we make a number of recommendations regarding the regulation of access to that infrastructure. These recommendations are important in promoting effective and sustainable competition, and most importantly, in ensuring that as many operators as possible can function on a viable basis in the market, which is an important insight from the analysis in Section 3.

4.3.1 Wholesale fibre regulatory remedies

Wholesale access to Cyta’s infrastructure

Cyta currently operates an FTTC-VDSL network. Wholesale regulatory access to the existing network includes duct access, local loop and sub-loop unbundling, and bitstream services.

We would like to recommend that OCECPR considers the following points when determining the methodology for wholesale access to Cyta’s infrastructure:

- Should Cyta choose to deploy a GPON FTTP network, we would like to highlight that our analysis has shown that passive unbundling of a GPON network incurs significantly more cost than active unbundling. If Cyta deploys a GPON network, we recommend that OCECPR considers an active unbundling method (e.g. VULA). This method of access would have advantages in that it could also be used on Cyta’s FTTC-VDSL network.
- We recommend that OCECPR maintain very close oversight of the application of the wholesale-access obligations imposed on Cyta over the existing FTTC networks. This should include ensuring effective retail competition through the application of the obligations on access and pricing, as well as ensuring application of the margin-squeeze protections on new service deployments by Cyta.
- If OCECPR chooses a VULA-type access method for Cyta’s fibre infrastructure, we recommend that a requirement to provide multi-cast functionality is included. This would ensure that wholesale customers could make use of this bandwidth-saving technology for delivering video services.
- Our analysis has also shown that Cyta’s existing FTTC-VDSL network could play a significant role in providing coverage of 100Mbit/s broadband under a market-led approach, if vectoring and bonding techniques were employed:

- Vectoring requires cross-talk from all the lines on a network node (cabinet or exchange) to be controlled in the same way, in order to realise gains in broadband speed. We recommend that OCECPR facilitates discussions between operators to deploy compatible equipment and/or agree compensation for any existing equipment that may need to be removed to allow vectoring to function and ensure that existing obligations on Cyta in this regard are applied effectively.
- Bonding involves the use of two or more copper pairs for each user, to achieve further speed gains. We recommend that OCECPR ensures that the cost models applied for wholesale access to such services are appropriate, to ensure that no margin squeeze or discrimination occurs *vis-à-vis* any incumbent retail offering.

In summary, we make the following recommendations to OCECPR:

- That if Cyta chooses to deploy a GPON architecture, a VULA-type wholesale access product is considered, which could also be used for the FTTC network, and would include multicast functionality (so that alternative operators can take advantage of the bandwidth savings offered by multicasting)
- That OCECPR maintain very close oversight of the application of the wholesale access obligations imposed on the incumbent over the existing FTTC networks. This should include ensuring effective retail competition through the application of the obligations on access, pricing and also new service variants as well as ensuring the application of margin-squeeze protections on new service deployments by the incumbent.
- That OCECPR facilitates discussions among operators to resolve any issues associated with vectoring, and considers imposing appropriate regulatory measures which do not lead to an increase in the price of broadband provided over bonded pairs.

4.3.2 Access to the existing duct network

Although OCECPR has already mandated access to Cyta's duct network, and has been active in enforcing that access, our consultations revealed a number of ongoing concerns.

We recommend that further work is undertaken to secure compliance with the existing OCECPR mandated methodology for access to the duct network, and note that ongoing technical barriers to effective implementation of the rules that were raised during the stakeholder engagement may need to be addressed by an independent technical oversight body to ensure they are not a significant barrier to compliance with the methodology (see, for example, the UK's approach to technical deployment issues with local loop unbundling and the Office of the Telecoms Adjudicator, www.offta.org.uk). Alternatively, enhanced fines may possibly need to be imposed for further breaches of the rules, or both.

During our consultations, a further concern was raised about the high cost of remediation imposed by local authorities in cases where new duct needs to be laid.

We recommend that any remediation charges to be imposed by public authorities, for example for footway reinstatement, should be reviewed to ensure they are necessary, cost oriented and proportionate, to avoid deterring effective deployment of new network infrastructure or increasing costs to consumers for broadband services.

4.3.3 Spectrum issues

Access to spectrum in Cyprus is managed by the Department of Electronic Communications (DEC). The DEC has encountered issues with the allocation of spectrum in the 800MHz and 2.6GHz bands – that is, interference from occupied territories in the 800MHz band and a lack of interest in the original 2.6GHz band auction.

However, when the DEC consulted on an auction of these bands more recently, a number of operators expressed interest.

We recommend that the DEC continues to pursue the allocation of the 800MHz and 2.6GHz bands, as they will support the provision of wireless broadband services in Cyprus. In particular, the superior coverage characteristics of the 800MHz band will be important in providing cost-effective broadband access in very rural areas. We further recommend that, when setting coverage obligations, the DEC considers the important role that wireless networks may play in providing 30Mbit/s access.

4.3.4 Backhaul infrastructure

We expect that each operator in Cyprus will continue to operate its own backhaul and core network.

Traffic on the backhaul and core network has already been aggregated and therefore economies of scope and scale can be realised, and the cost of providing bandwidth is dramatically lower than in the access network. We would also expect each operator to accommodate the additional traffic created by NGA networks as part of its “business as usual upgrade” plans. With the cost of capacity falling all the time and new scalable routing and switching solutions now available, we would not expect any issues with the backhaul and core networks in Cyprus.

This view was supported by the submissions provided by operators on the current and planned status of their core and backhaul networks. The submissions variously highlighted the existing high capacity of their networks, their plans for scalability and upgrades, and the high level of redundancy/protection provided by their networks.

4.3.5 International connectivity

As an island, Cyprus is reliant on international connectivity. At present ten international undersea cables serve Cyprus. Three further cables are under construction, and one cable connects landing points within Cyprus itself.

A number of concerns were raised during this study regarding the price of international capacity, and we have reviewed findings by the CPC that prices charged for international capacity have been excessively high. However, our analysis has shown that international capacity is not the sole cause of high prices in Cyprus, and that despite the cost of international capacity making up a greater proportion of the total broadband cost base with higher speeds, the cost of that capacity can be reduced if long-term capacity commitments can be made.

However, we acknowledge that access to such connectivity, at acceptable cost, is vital to some operators in Cyprus.

We recommend that OCECPR and the CPC monitor pricing trends in international capacity carefully over the next 18 months. If necessary, the CPC should use its ex-post powers under the Protection of Competition Law (the “Competition Law”) to investigate the international connectivity market should concerns remain, especially once further capacity comes on stream.

4.4 Access to content

We consider that effective retail-level competition between players in the market will be a key factor in accelerating take-up of high-speed broadband access. We further consider that access to content could potentially become an important aspect of broadband competition in Cyprus over the next two to three years. Many jurisdictions have either mandated access to content or regulated the sale of content rights (either through competition or sector regulators), in an attempt to address perceived market power issues.

There may be a need to review content rights in Cyprus, to ensure that retail-level competition is not hampered by such access issues. The availability of content to all players in Cyprus will need to be carefully assessed, including for example, access to the UEFA Champions League, English Premier League and other video-on-demand (VOD) and over-the-top (OTT) service offerings.

To date, there have been a range of content-related competition cases against parties in the market. The CPC could use its powers to request assistance from other regulatory authorities in carrying out a review of the market, taking into account the inputs of OCECPR. Such a review of how the market is functioning should examine in particular whether restrictions on the aggregation of different content rights are required, or whether ‘must offer’ and ‘must carry’ obligations for particular sporting rights should be imposed across different platforms.

We recommend that OCECPR engages with the CPC to discuss the possibility of working together, as far as is legally acceptable, in order to review the content markets, and to examine whether certain regulatory remedies on the allocation of content rights should be imposed, or other measures to address any market failings which are identified.

4.5 Institutional issues

From our engagement with stakeholders during this study, it appears that there may be potential gaps and issues in the present legal and institutional frameworks in Cyprus that need to be addressed to help support the acceleration of high-speed broadband deployment and take-up. These issues are described below, grouped into four areas.

OCECPR would benefit from having powers in converged service markets and over content, alongside its powers to address competition issues more generally

In an environment of converged service offerings in the telecoms space and the increasing trend of bundled service offerings there seem to be two potential issues associated with the present frameworks:

- *OCECPR's ability to address bundled service offerings effectively.* Although there are guidelines in place regarding the mechanisms for pricing bundles, it is unclear how effective these have been in practice
- *The lack of concurrent competition powers for OCECPR.* As a result, the body which has subject-matter expertise in telecoms cannot intervene in telecoms-related ex-post cases, and is tied to the use of its ex-ante sectoral powers.

We recommend these issues are reviewed to ensure that retail broadband competition is not hampered by access to content. Potential solutions to these issues could include granting full concurrency of competition powers between OCECPR and the CPC, or the creation of a single regulatory and anti-trust agency.

We recommend that the government of Cyprus considers a review of the powers for regulating the telecoms industry, which could include considering granting full concurrency of competition powers between OCECPR and the CPC.

The generally fixed nature of the fines available to OCECPR may be insufficient deterrent to operators

Whilst OCECPR has power to recoup up to twice the amount of 'unjust enrichment'¹⁴ from an operator, this is likely to be difficult to prove and so is unlikely to act as a deterrent. Without an effective deterrent, for example, an operator may engage in activities that exclude third parties from the market or make it more difficult for them to compete (although there may be no immediate benefit to the operator, the benefit may come in the longer term).

In a situation like this, it may be difficult to show unjust enrichment within reasonable timeframes. In our view, the scale of the fines available to OCECPR should be sufficient to deter market

¹⁴ Unjust enrichment refers to financial gains achieved unfairly due to abusive behaviour.

operators, and this generally only arises if operators know that they can be fined a percentage of their relevant turnover, i.e. turnover relevant to the market in which the abuse took place.

We recommend that OCECPR is given an ability to impose fines on operators for anti-competitive behaviour, based on a percentage of their relevant turnover.

The length of time that it takes to conclude cases could impede the acceleration of broadband

For an accelerated broadband market, there will need to be substantial levels of competition among the players, and in part this will derive from the existence of effective access models. In the event that remedies could not be implemented in time to prevent foreclosure of markets through abuses of the regulatory framework and/or competition rules, this would pose potentially material risks to achievement of the required acceleration.

Cyprus's move to a new administrative court system may speed up the process and the new damages regime (which permits more straightforward actions for follow-on damages) should help to overcome some of the current delays, but the effective implementation of infringements decisions should be kept under review by both OCECPR and the CPC. In particular, care will need to be taken that effective injunctive relief is available. Currently, interim measures can only be ordered if they are of a temporary and conservative nature, and their extent must not exceed what is absolutely necessary under the circumstances; in practice, this means that injunctive relief is rarely used. In addition, OCECPR and the CPC must use their power to secure undertakings to remedy behavioural issues (especially where complex solutions or oversight are required).

We recommend that OCECPR and the CPC use their power to secure undertakings to alter and remedy any specific issues in the behaviour of the operators (especially where complex solutions or oversight are required).

Resourcing in the relevant bodies may need to be reviewed

The resourcing levels available in both OCECPR and the CPC appear to be low by international standards. Although Cyprus is a small member state, OCECPR is still required to complete the same processes as the regulatory authorities in other member states, e.g. market reviews, and the CPC is still required to deal with an extensive case load. Resourcing levels and their impact on timing of regulatory and other competition-related decisions should be reviewed carefully, to ensure that such delays do not have a material impact on any regulatory review cycle or anti-trust intervention process. In the event that there *is* a material impact, it may be necessary to address the present funding model for the regulator (e.g. via increased contributions from industry based on a turnover model, as in other jurisdictions).

We recommend that the present resourcing levels within OCECPR and the CPC are reviewed.

4.6 Cyprus as an international hub for digital services

We have considered whether any regulation or policy recommendations can be made to encourage the development of Cyprus as an international hub for digital services. Such development would bring additional economic benefit to Cyprus, beyond the benefits already discussed in Section 3.2.4. We have considered the possibility of Cyprus acting as a location for hosting transit (e.g. at an Internet exchange point), data centres and/or satellite ground stations, serving regional countries and locations further afield.

Based on our project experience, we have collected the key requirements that make a location attractive to digital service providers. We have then assessed Cyprus against each of these requirements. Our analysis is shown in Figure 4.4.

Figure 4.4: Analysis of Cyprus's ability to become an international hub for digital services (green = good; amber = fair; red = poor) [Source: Analysys Mason, 2016]

Requirement	Description	Assessment
Location and connectivity	Low-latency and high-speed connections to countries of interest and the rest of the world	<ul style="list-style-type: none"> • Cyprus is well served by international links, although the cost of capacity has been raised as a concern by potential data-centre investors • Demand for data services from markets near Cyprus is still emerging
Energy	<p>Low-cost, reliable electricity is required to power and cool the electronics in data centres</p> <p>Carbon-conscious investors have an increasing preference for renewable energy</p>	<ul style="list-style-type: none"> • Electricity prices in Cyprus are considered to be above the EU average¹⁵ • Renewables make up just 3.6% of total power generated
Cool climate	A cool climate is a benefit to cooling of the electronics; warmer climates require more energy to create cool air	<ul style="list-style-type: none"> • Cyprus has a warm climate which will lead to high cooling costs • However, Cyprus's climate is likely to be similar to that of other countries in the region which it is hoping to serve • Also, solar-powered cooling options could be explored
Diverse local infrastructure and services	<p>Availability of multiple infrastructure options for connecting sites</p> <p>Availability of high-capacity connectivity services such as dark fibre and 10Gbit/s (or greater) active services</p>	<ul style="list-style-type: none"> • Cyprus features diverse physical infrastructure from multiple operators and the Electricity Authority of Cyprus (EAC) • Connectivity services are available, including 10Gbit/s (or greater) services, from various operators

¹⁵ Source: European Commission, https://ec.europa.eu/energy/sites/ener/files/documents/2014_countryreports_cyprus.pdf.

Requirement	Description	Assessment
Skilled resource pool	There should be a large pool of local resources with suitable IT skills to support data-centre operations, at reasonable cost	<ul style="list-style-type: none"> • Cyprus is ranked 25th out of 28 for Human Capital on the EC Digital Economy and Society Index (DESI) • While the specialist expertise required for hosting digital services is likely to be available in Cyprus, the DESI score may appear unattractive to investors
Tax rate	A low local tax rate will be attractive to investors	<ul style="list-style-type: none"> • Cyprus has a low corporate tax rate: the basic corporate income tax rate is 12.5%
Legal and regulatory environment	Investors will be looking for a stable and familiar regulatory environment	<ul style="list-style-type: none"> • Cyprus is considered to be a stable legal environment for investors • The regulatory environment is also stable, as OCECPR has been conducting market reviews and imposing regulatory remedies in the telecoms sector since 2006

Overall, Cyprus has a number of strengths for hosting digital services, including the local telecoms infrastructure/services, the low tax rate and the stable legal and regulatory environment. Cyprus's location and level of connectivity could be turned into an advantage, if the cost of international activity can be contained and the demand for services from regional countries can be qualified. Cyprus's warm climate is not conducive to low-cost cooling, but we suggest that Cyprus has a similar climate to other countries in the region and solar power could provide an attractive power source. While beyond the scope of this study, we note that the relatively high cost of electricity, and the low proportion of renewables, may be unattractive to potential digital investors. Finally, Cyprus's low score for digital skills on the DESI human capital indicator could provide further discouragement for potential investors.

Overall we recommend that OCECPR offers its sector-specific expertise to support the Ministry of Communications and Works in engaging with representatives of major digital services companies such as Amazon Web Services, Facebook, Google and Microsoft to qualify the demand for providing digital services at a location such as Cyprus. We recommend that international capacity prices are monitored, in line with our recommendation in Section 4.3.5. We also recommend that our suggestions for improving digital skills are implemented as soon as possible, as discussed in Section 4.2.