Impact of Regulation and Policy on a National Fiber-to-the-Home Deployment: Infrastructure Sharing

A financial modelling project to quantify the potential impact of infrastructure sharing on broadband deployment in the MENA region

A Report by Regulatory & Policy Committee Members
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FORWARD AND INTRODUCTION BY FTTH COUNCIL MENA

Whether as part of a national broadband network (NBN) programme or as an element of general broadband development, the policies and measures of Governments and regulators usually have a significant impact.

As part of its Regulatory and Policy Committee's mission, the FTTH Council MENA is committed to strengthening its cooperation with policy makers, governments and regulators in the region in order to positively influence relevant NBN policy development and have a positive impact on broadband deployment in general, and FTTH rollout in particular.

The FTTH Council MENA will produce a series of research papers based on financial modelling which seek to illuminate some of the potential impacts, cots and trade-offs involved. In this first paper we evaluate the potential impact of infrastructure sharing measures. We also ask whether it is worth delaying an NBN or other significant broadband programme in order to allow time for the implementation of infrastructure sharing. On other words, do benefits of such measures outweigh the economic and social benefits foregone through delay? And if so, how long a delay might be justified?

This report includes information, updates and generic recommendations that reflect the views and experience of the expert consultants. The potential impact, what is practicable and politically feasible will clearly vary by country and perhaps even by region within a single country.

EXECUTIVE SUMMARY

Evaluating the Impact of Infrastructure Sharing

This paper presents the methodology and results of a model measuring the significance of key regulatory and policy choices on the roll-out of a national fiber network. It is the third in the series of papers on regulation and policy that the FTTH Council MENA has sponsored.[1]

This paper examines the impact of **infrastructure sharing**. Infrastructure sharing is a broad term that may refer to a number of different approaches to reducing the cost of infrastructure roll-out. Policies to encourage infrastructure sharing are often a mainstay of any national broadband plan. However, the concrete benefits depend heavily on local conditions and the type of network roll-out under consideration. Moreover, infrastructure sharing is not achieved without cost.

To evaluate the potential and value of infrastructure sharing, we built a financial model of a representative MENA region. This is based on a mix of economic and engineering characteristics that reflect the "typical" characteristics of MENA based on an analysis of the highly varied, geography, economic level and population density of MENA.

Findings of the Cost Benefit Analysis

There are several findings that emerge from this analysis:

- The impact of infrastructure sharing is highly dependent on local conditions.
- The impact can potentially be huge. We believe that in certain circumstances, government subsidy could be reduced to zero under the right conditions for infrastructure sharing.
- Government has numerous instruments at its disposal to encourage infrastructure sharing: lifting existing restrictions on utilities from leasing and sharing infrastructure; "dig-once" policies; mandating access on dominant service providers; minimal additional capacity requirements at the time of duct installation; more liberal rights of way regulations; etc.
- Mandated infrastructure sharing is an obvious way to reduce the need for state financial involvement in the NBN deployment.

However, despite the considerable potential benefits, generally it is not worth putting off national deployment more than one or two years in order to achieve cost savings from infrastructure savings. This is because the economic impact of improved broadband is of a magnitude such that delaying too long costs the country more in foregone benefits than it can save with infrastructure sharing.

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[1] "Aligning Regulation with National Fibre Access Strategy," 14 October 2015 and "The 9 Dimensions of MENA NBN Policies", 27 November 2014.

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GLOSSARY

FTTH	Fibre to the Home. An access network utilising only optical fibre to connect the home (or other type of premise).
FTTP	Fibre to the Premise – a more generic and in some ways for NBN more correct term than FTTH.
Incumbent	The long established national fixed telephone company. Depending on the country, this organisation may still have a monopoly or protected position.
ISP	Internet Service Provider. A company that connects a customer over the NBN to the global Internet.
MENA	Middle East and North Africa.
NBN	National Broadband Network: a ubiquitous (or at least very extensive) open (fibre) broadband network stimulated by government.
NBNCo(s)	Abbreviation for NBN Company (or companies) – the organisation(s) responsible for delivering and operating the NBN itself.
PPP	Public Private Partnership: a financing structure for social / public service oriented projects. See section 2.3.8.
UAE	United Arab Emirates.
USF	Universal Service Fund: a funding mechanism to make good one or more operators that bear the cost of serving uneconomic areas or customers under the USO.
USO	Universal Service Obligation: an obligation placed on one or more telecom operators (or indeed the NBN) to provide service everywhere in a national territory including to uneconomic areas and perhaps also uneconomic types of customer (i.e. those that spend very little but need access in case of emergency).

1 INTRODUCTION

This paper presents the methodology and results of a model measuring the significance of key regulatory and policy choices on the roll-out of a national fiber network. It is the third in the series of papers on regulation and policy that the FTTH Council MENA has sponsored.[2]

The model developed for this paper is intended to be generic and flexible enough to address various regulatory and policy initiatives that will be treated over the course of a number of reports.

This paper examines the impact of **infrastructure sharing**. Infrastructure sharing is a broad term that may refer to a number of different approaches to reducing the cost of infrastructure roll-out. In its narrowest sense it refers to the sharing of active or passive infrastructure deployed by public telecommunications service providers. More broadly, it may include the use of infrastructure deployed by utilities, transport or other non-telco network players as well as the coordination of civil works. The emphasis in policy debates is usually on the more CAPEX heavy passive layer.

Infrastructure sharing is assumed to have a major positive impact fibre infrastructure deployment. Policies to encourage infrastructure sharing are often a mainstay of any national broadband plan. However, the concrete benefits depend heavily on local conditions and the type of network roll-out under consideration. Moreover, infrastructure sharing is not achieved without cost. The magnitude and instances in which savings occur may have significant policy implications. Yet although there have been a number of publicly available studies that have examined specific savings of infrastructure sharing in Europe[3], we know of none that examine MENA environments.

1.1 Market Context and Baseline of a 4 Million Premise Representative Area

The market context for FTTH deployment varies drastically across MENA nations in terms of current penetration levels, relative development of mobile and fixed broadband networks, affordability (see Table 1) as well as the competitive environment and general business landscape.

Furthermore, for network deployment, geography and demographics have a significant impact on costs. Urbanization across the region varies significantly (e.g., Yemen at 30% and Qatar 99%), as does the percentage of population living in different household types (e.g., in UAE over two-thirds of the population live in apartment buildings, but less than 10% in Tunisia). See Table 2.

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[2] "Aligning Regulation with National Fibre Access Strategy," 14 October 2015 and "The 9 Dimensions of MENA NBN Policies", 27 November 2014.

[3] See, for example, "Improving the FTTH business case - A joint telco-utility network rollout model", *Telecommunications Policy* 38(2014) pp. 426-437.

Table 1: Broadband Accessibility and Affordability in MENA countries

#	Country	Fixed BB Penetration+ (2015)	Relative Mobile/Fixed Broadband Penetration (2015)	Affordability* (2014)
1	Morocco	3.38	11.62	4.68%
2	Algeria	5.57	7.20	4.35%
3	Tunisia	4.34	14.43	1.67%
4	Libya	0.97	83.09	2.10%
5	Egypt	4.52	11.21	4.05%
6	Lebanon	22.76	2.35	2.13%
7	Syria	3.14	3.31	5.30%
8	Palestine	5.23	7.49	N/A
9	Iran	10.86	1.84	0.88%
10	Iraq	1.0	3.46	34.49%
11	Jordan	4.16	8.55	7.35%
12	Bahrain	18.61	7.08	1.12%
13	Kuwait	1.37	101.69	0.29%
14	Oman	5.61	13.95	1.23%
15	Qatar	10.06	7.96	0.89%
16	Saudi Arabia	12.01	9.30	1.21%
17	UAE	12.81	7.18	1.68%
18	Yemen	1.55	3.77	9.46%
19	Djibouti	2.33	2.39	N/A

Sources: ITU, except for Palestine fixed BB penetration rates, which are from World Bank. Iraq fixed BB, and Libya and Palestine mobile BB penetration from 2014; Syria affordability from 2013.

+ Per 100 inhabitants

** Fixed broadband basket /Gross National Income per capita.*

Thus, there is no single *representative* MENA nation. However, for the base case of our model, the results of which we present in this paper, we have instead generated a *representative MENA notional region*.

1.2 Characteristics of the Representative MENA Notional Region

Based on available data we have derived a set of key assumptions that could represent a national broadband network (NBN) project in this region. For example, on the basis of the following representative housing types[4] in several MENA countries, we have chosen to use a split of one-third each for these housing types.

Table 2: Distribution of Housing Types of Selected MENA Country

Country	Urban MDU	Urban / Suburban SDU	Rural House
Bahrain	44%	43%	12%
Egypt	38%	5%	57%
Iran	30%	43%	27%
Qatar	35%	64%	1%
Tunisia	7%	60%	33%
UAE	69%	16%	15%
Yemen	7%	23%	70%
Average	**33%**	**36%**	**31%**
Mean	35%	43%	27%

We derive apply these to a set of 3.6 million residential premises. Based on an average household size of 5.3, this corresponds a population of around 19 million, which is representative for the region. Further, we assume business premises are 10% are residential[5]. Thus, the premises for this base-case financial analysis is as follows in Table 3.

Table 3: Premise Distribution by Types for Representative Area

Premise Type	Urban MDU	Urban/Suburban	Rural	Total
Mix	33.3%	33.3%	33.3%	**100%**
Homes	1,200,000	1,200,000	1,200,000	**3,600,000**
Non-Residential	200,000	133,333	66,667	**400,000**
Total Premises	**1,400,000**	**1,333,333**	**1,266,667**	**4,000,000**

1.3 Base Case Assumptions for MENA Representative Area

In Table 4 below we present the other main assumptions that constitute the relevant make-up of our MENA representative area. These have been derived from a range of sources with strong preference given to the actual experience of MENA region operators wherever we had such information.

[4] MDU is Urban multi-dwelling unit; an SDU is a single dwelling unit such as a villa or Arab-style home.

[5] Premises that are used strictly for business purposes range from between 8%-14% based on available information from several Middle East countries. The share of dual use (residential + business) premises can be a significant share of the building stock, particularly in less developed Middle East countries. We assume that the demand and locational characteristics are of dual-use premises are closer to residential premises and so treat them as such.

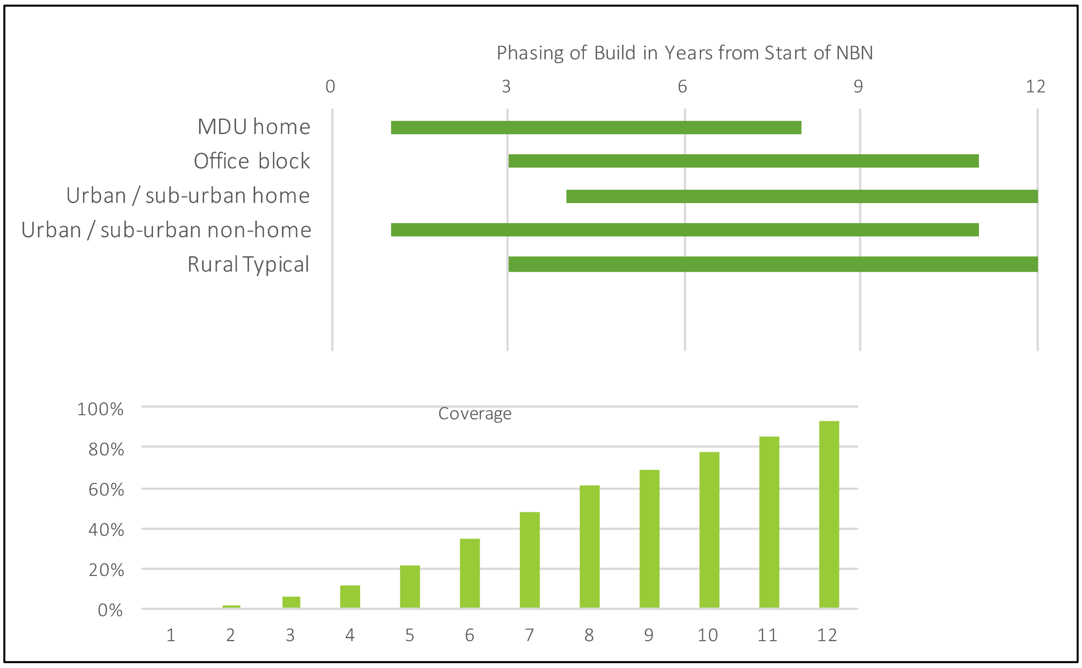
Table 4: Key Base Case Assumptions for Representative MENA Nation

#	Variable	Driver	Value (% or USD)	Source
1	Capex PoP to Secondary FCP* - MDU	Per Homes Passed	300	Operator data
2	Capex PoP to Secondary FCP*– SDU Urban/Suburban	Per Home Passed	800	Operator data
3	Capex PoP to Secondary FCP*– Rural Typical	Per Home Passed	2700	Operator data
5	Capex per Connection – House	Per Connection	300	Operator data
6	Capex per Connection -MDU	Per Connection	120	Operator data
7	Capex Core Network	Access Network Capex	15%	Operator data
8	WACC – Market	Market Equity & Debt	12%	WACC studies
9	WACC – Social	Gov't Debt	5%	WACC studies
10	FTEs	Minimum + Per connection	5,000	Operator data
11	Average Staff Costs	Fully loaded per head	130,000	Operator data
12	Opex for passive infrastructure	Per connection per month	2% of CAPEX	Operator data
13	Demand – Urban	Take-up at price levels	$y = 119.44e^{-2.706x}$	Published tariffs and actual take-up
14	Demand -Rural	Take-up at price levels	$y = 153.23e^{-6.165x}$	Published tariffs and actual take-up

*FCP=Fibre Concentration Point

1.4 Phasing of NBN Coverage

The NBN is assumed to be built over ten years from launch of the programme (no construction during the first year) with the more expensive rural areas back-ended to reduce financing burden.



2 MODELLING THE IMPACT OF INFRASTRUCTURE SHARING

The term "Infrastructure sharing" may refer to a number of different approaches to reducing the cost of infrastructure roll-out. In this case, in a new fiber roll-out, the network deployer is assumed to use assets built – or in the process of being built – for other purposes so "piggy backs" on these other civil works, rights of way, etc.

As indicated in the introduction, in the context of fiber network deployment and NBN, there are two basic types of infrastructure sharing:

- With other utilities, i.e., the use of infrastructure deployed by and the coordination of civil works with utilities, transport or other non-telco network players. The opportunities are most often seen in the core and backhaul networks; however, in the Middle East there are specific examples of infrastructure sharing in access networks, e.g., Oman. Not all utility infrastructures are able to accommodate a new fiber network but those that are could, in principle, offer a significant cost saving as well as reducing time to market. The most useful are likely to be water or sewer networks and overhead electricity distribution networks.
- With the incumbent telecom operator, in which excess capacity of the existing national telecom infrastructure is offered up for lease to the NBN. Of course, most typically, incumbent telecoms operators do not offer such infrastructure sharing willingly. Many regulators around the world have therefore mandated incumbent access and core network infrastructure available for fibre roll-out on regulated terms and conditions

In either case, the extent of savings depends on where in the FTTH network (i.e., the various elements of the passive or active infrastructure) the benefits of sharing might be realized.

2.1 Passive Sharing

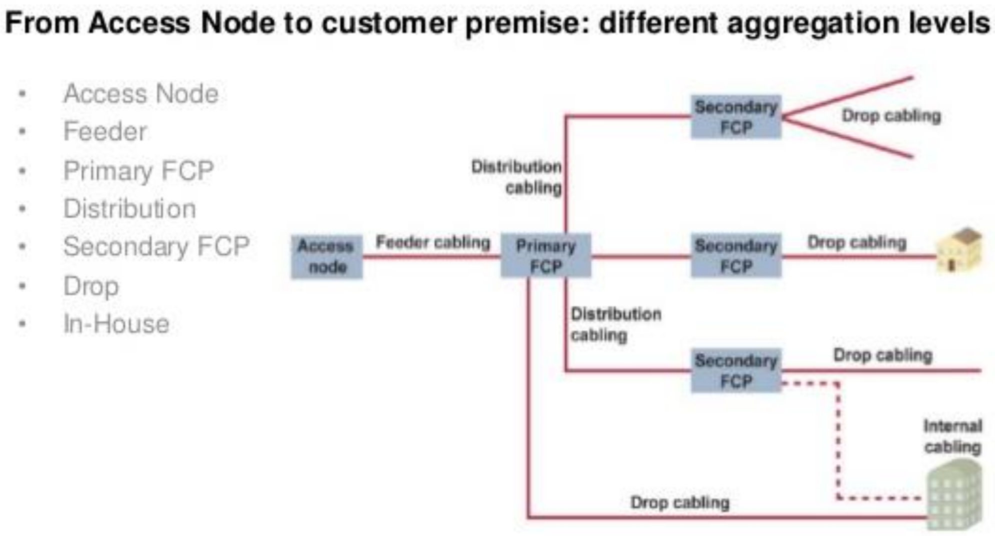


Figure 1 Structure of the Passive Infrastructure Layer (FTTH Council Europe)

Numerous factors contribute to the net benefit of infrastructure sharing within the passive network, and many are highly dependent on local conditions:

1. Extent of underground plant. The more of the fibre plant that is deployed underground, the larger the overall cost of the roll-out and the higher potential cost savings from shared civil works.
2. Greenfield or brownfield. Whether the deployment takes place within a new development or where existing assets are in place will have a major impact on cost. Greenfield deployments allow for greater scope for exploiting economies of scope. Brownfield may benefit from existing asset deployment but incur the higher cost of break-up and restitution of built up areas. However, as discussed below, when brownfield refers to leasing of assets from a purpose-built incumbent's network, the capex may be effectively replaced by opex charges.
3. Nature of ground surface above the underground plant. In many cases in the MENA region, suburban or rural deployments means installation under a ground surface of sand, whereas urban may involve dealing with the same pavement issues as in another geography, yet at a significantly lower cost given the relatively low cost of labour.
4. Network segment: Metro network, homes passed, final drop. The opportunities for infrastructure sharing diminish as the close the infrastructure is to the home. Yet, in terms of impact to the overall development, a greater share of cost is found in the distribution network (homes passed).
5. Density of deployment. All other things equal, denser deployment areas imply greater savings available per home passed.
6. Cost allocation. Civil works is proportionate heavy in fixed and common cost. Under such conditions, there will be many ways to allocate costs. The net benefit to the NBN will depend on what approach to cost sharing is negotiated.
7. Civil Works deployment regulation. Local statutes may contain strict guidelines on how utility services are to be installed which may increase the cost of infrastructure sharing. Indeed, there are some contexts in which infrastructure sharing is forbidden by law.
8. Coordination costs. In many instances infrastructure build by utilities is conducted in parallel rather than coordinated or shared simply because utilities are not structured or incentivized to engage in cross-sectoral activities. The administrative barriers to cooperation may be very high, thus delaying projects or raising the transactions costs to make it happen.

2.2 Active Sharing

Although we generally think of infrastructure sharing of passive layer assets, sharing can also occur in the active layer. This provides considerable economic and risk reduction benefits in the active layer as well as affording the consumer a much more effective choice and encourages service innovation by lowering the incremental cost of providing new services.

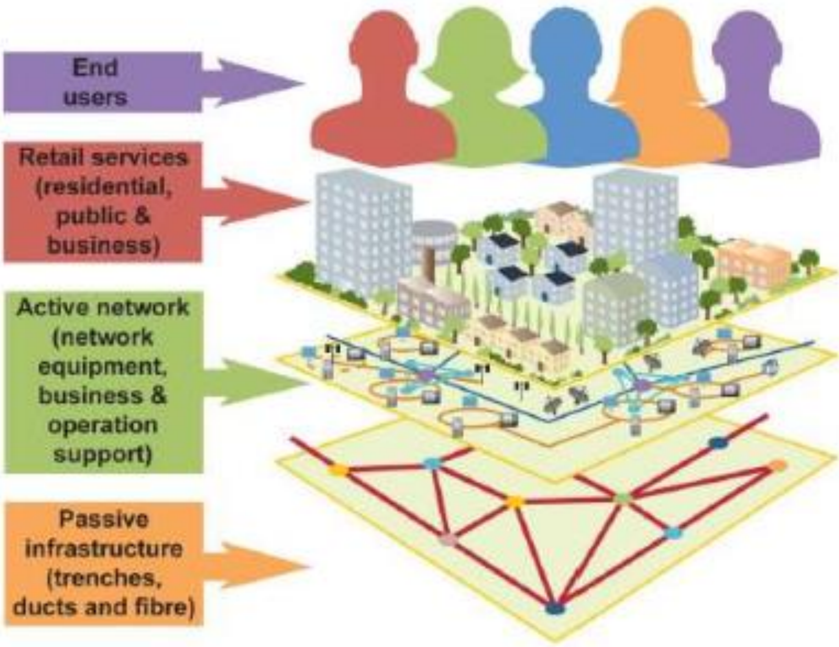


Figure 2 Network Layers (Alcatel Lucent for FTTH Council Europe)

2.3 Typical or Representative Impact of Infrastructure Sharing

As indicated above, the benefits of infrastructure sharing vary widely depending on the specific market, geographic and utility infrastructure conditions locally. Furthermore, there are two types of sharing opportunities that offer varying benefits:

1) leasing existing infrastructure – we call this retro-fit;
2) greenfield joint development – we call this new build.

Under leasing some savings captured through reduced opex is sacrificed to increased opex.

Under each of these scenarios, we examine the likely impact for different network segments and different deployment densities urban, suburban and rural.

For the purposes of this research we have taken typical percentage figures for the cost savings arising from industry analyses and our experience in the region and elsewhere modified by the eight factors contributing to the net benefit of passive infrastructure sharing discussed above. These are shown in the table below. We assume no infrastructure sharing is available in the final drop as these are likely to be limited and we have found no examples in the MENA region.

Impact of Infra Sharing	**% Potential Saving via Lease arrangement in Brownfield deployment**			**% Potential Saving via Joint Greenfield Development**		
Segment	*urban*	*suburban*	*rural*	*urban*	*suburban*	*rural*
Core Network	70%-80%	70%-80%	70%-80%	40%-50%	40%-50%	40%-50%
Access Network	60-70%	65%-75%	70%-80%	15%-25%	10%-20%	5%-15%
Final Drop	0%	0%	0%	0%	0%	0%

In the base case we do not assume any growth in population or premises in the representative area, but we do assume that 5% over the period will be capable of new build infra sharing. This greenfield joint development will be re-developed areas, renewal or modernization of the building stock and to allow a facsimile of what would happen in a growing region.

3 QUANTIFYING THE BENEFITS OF INFRASTRUCTURE SHARING

3.1 Three Layer Financial Model

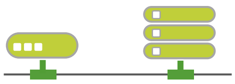
The financial model of the NBN project is split into three different layers:

Services: Broadband, TV etc.

The NBN will deliver a range of services, most importantly, fibre broadband.

In this model the services themselves are run by ISPs and mobile operators over the open NBN so are not included in the financial model – only in the retail price assumed.

Active Layer: Switches, routers, OSS, wholesale BSS



This is the wholesale telecom layer. Whether this is operated in the NBN by a separate company or is organizationally integral to the NBN it is treated here as logically and financially distinct.

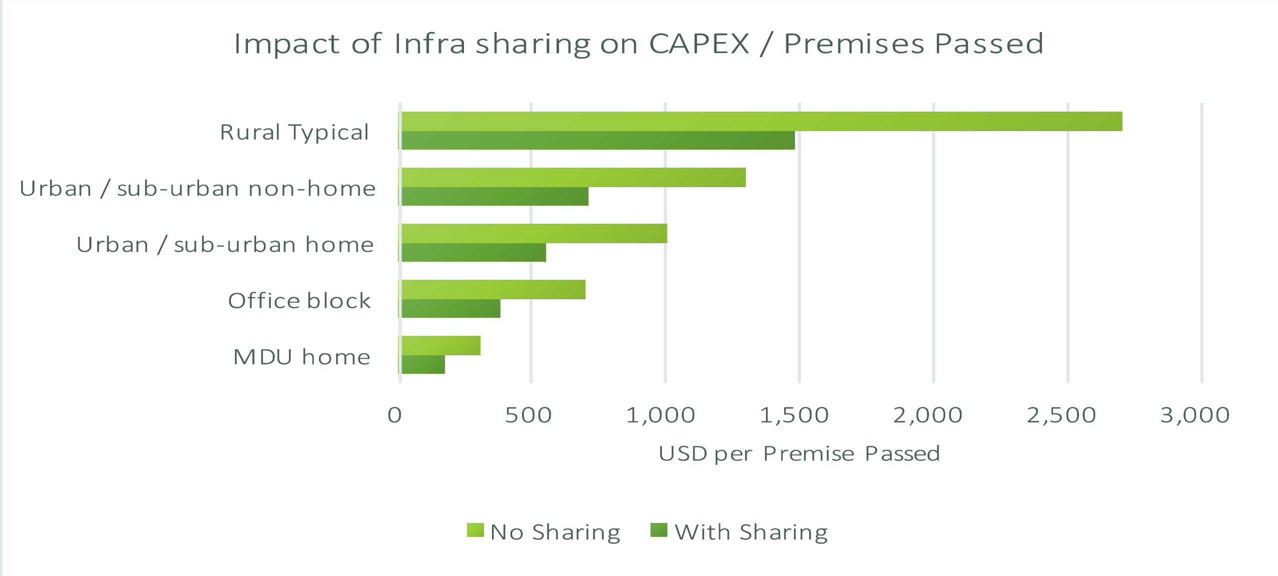
Passive Layer:
Ducts, fibre, civil works

This is the real estate asset that is the basic infrastructure. The initial capital cost is very high but running and maintenance costs low. This layer of the network is the financial challenge at the heart of any fibre of NBN policy. For this paper this layer has its own financial model.

The financial models for layers 1 and 2 use generic but benchmarked assumptions representative of the region for the cost of passing six different types of premise in both urban and rural areas. The investment is split into coverage driven and success drive as follows:

- Premises passed: The cost of deploying fibre past the boundary of premises varies with each case to realistically represent the geography and type of building.
- Premises connected: We also assume a cost for connecting that home or premises passed to the fibre network but this capital cost is only incurred for those premises where a customer subscribes to the NBN.

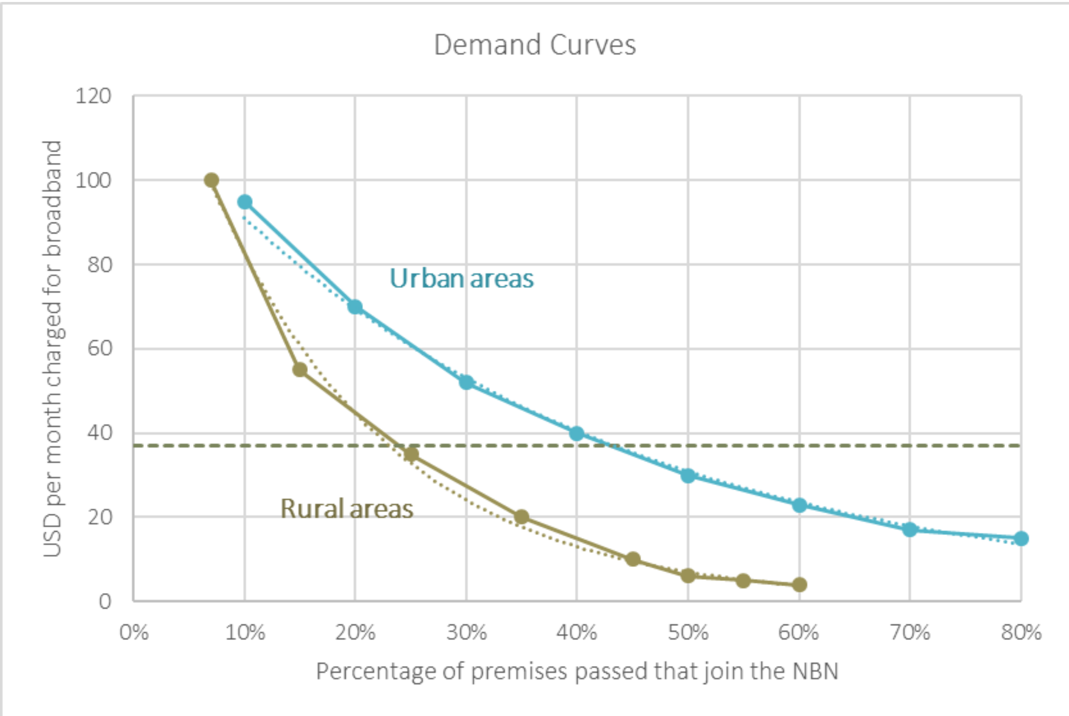
Based on this structure, the impact of infrastructure sharing is modelled using six different segments of the network for retrofitted infrastructure and different assumptions for the same six segments of the network for new greenfield new build scenarios.



The above chart shows the combined effect of the various assumptions on reducing the cost to pass a premise.

3.2 Demand Curve

Financial viability and degree of Government support will affect wholesale prices and in turn also retail prices. Price will affect demand, of course, and we build this non-linear feedback into the model by assuming two different demand curves; one for wealthier urban areas and another for rural area where the level of demand for broadband is structurally lower than in urban areas. The demand curves assumed are shown below.



In our model, the average retail price (vertical axis in the diagram above) is an input – we assume what it will be. The model then takes the predicted take-up rate (horizontal axis) to drive costs and revenues in the financial models. The assumed curve does not take into account the relative availability of substitutes, e.g., the extent of copper broadband and 4G mobile etc. – it simply is *the* demand curve for fibre NBN broadband in the representative area.

The resulting take-up rate drives the number of connections which determines the amount of capital investment in homes premises connected and, of course, the asset utilization for the common physical and electronic assets. In the active layer each new connection also drives some capital cost including for a gateway device in the home or office.

3.3 Financing Structure

With respect to the passive layer the financial model is primarily concerned with capital investment and includes some modest operating costs relating to the maintenance and management of the passive asset. Financing is a mix of private and public investment.

Public investment in the NBN is treated as a subsidy rather than a loan. We account for government funding or subsidy of the NBN as a reduction in the capital cost which in turn leads to a reduction in the annual depreciation charge. The rest of the (private) financing required to build infrastructure is treated as a conventional mixture of debt and equity invested as necessary to meet the build-out timetable.

The relative mix of private and public financing is determined by a sustainable maximum payment on private long-term debt. We assume that private long-term debt burden must never exceed 6 times the operating profit. Any additional financing gap must be met with public subsidy.

These assumptions and calculations generate the three basic financial statements and allow us to model, in very simple terms, drawdown of debt and eventual repayment of debt should the cash flow be sufficient.

For the active layer we have a simple cost model equating to some common equipment and the operating cost per port representing an efficient operator of such an open network. Operating costs are modelled as:

- labour cost reflecting an assumed level of staff productivity
- a flat dollar cost purport per month to represent all the costs such as power, insurance, software licenses et cetera.

The result is a set of financial statements for the active layer including profit loss, cash flow and balance sheet. The active layer is assumed to be financed by a much higher proportion of equity compared to the passive layer. Debt provided for the active layer is added significantly higher interest rate representing leasing or similar financial instruments.

In each layer model we assume a capital structure and cost of debt used in the financial projections as follows:

	Equity %	Debt %	Cost E	Cost D	WACC
Passive layer	40%	60%	12%	5%	7.8%

	Equity %	Debt %	Cost E	Cost D	WACC
Active layer	60%	40%	18%	12.0%	15.6%

4 Financial Results

We summarise the financial results for the representative MENA case with a retail price of a fibre connection set at US$37 per month by presenting:

- the peak annual funding required to meet cash requirements,
- years required to pay back the investment, i.e., year cumulative cash-after- investment turns positive;
- the 12 year cumulative CAPEX;
- the total government subsidy required; and
- and the Internal Rate of Return of the NBN project.

In the tables below, we examine the cases with and without infrastructure sharing for our MENA representative nation.

With infrastructure sharing:

	Price $/mth	Peak Funding	Payback Yrs	12 yr CAPEX	Govt Subsidy	Private IRR
Passive layer	15	135	19	1,965	432	8.6%
Active layer	13	12	7	444	-	38.2%
Service layer	9	-	-	-	-	-
	37	148		2,409	432	

Without infrastructure sharing:

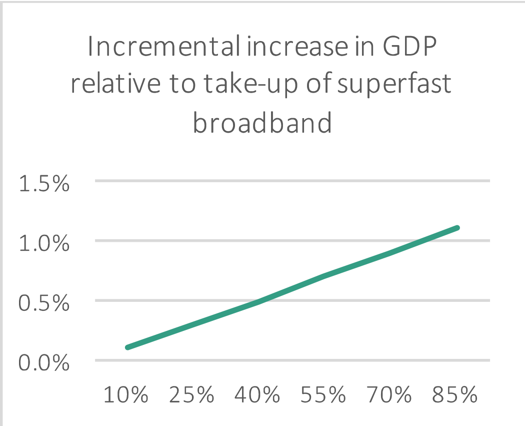
	Price $/mth	Peak Funding	Payback Yrs	12 yr CAPEX	Govt Subsidy	Private IRR
Passive layer	15	145	20	5,682	3,892	8.5%
Active layer	13	12	7	444	-	38.2%
Service layer	9	-	-	-	-	-
	37	158		6,127	3,892	

In this example, as the government is essentially stepping in and funding the investment gap, the difference for the network deployer between the infrastructure share and non-share case is not of direct financial concern. The IRR, payback and peak funding are not significantly different. However, the impact on the capital investment is significant. Over the course of the life of the project, the infrastructure share can more than halve the overall project CAPEX.

5 COST BENEFIT ANALYSIS AND CONCLUSIONS

5.1 Approach to Cost Benefit Analysis

We can assess the overall benefit of the project compared to the cost to the government if we make an assumption about the economic impact of the NBN. This we have done based on a literature survey, and we have assumed the incremental add to GDP based on take-up of superfast broadband. For example, at a 45% take up of superfast broadband, we assume that 0.5% is added to GDP.[6]



For our base case, we have assumed a GDP per capita of US$20,000, which is the average for the region and representative of a handful of countries around the Gulf area.

With this assumption, we can estimate the economic impact of the NBN. By comparing the economic benefit over 10 years to the initial subsidy we can measure the approximate benefit in monetary terms of the NBN project.

Finally, by comparing this benefit in the base case and the infrastructure sharing case we can see the impact of an infrastructure bank policy at least in monetary terms.

The chart below shows the net benefit of increase in GDP less government subsidy, we see that government subsidy already pays for itself within 4 to 7 years. The impact of infrastructure sharing is to reduce that pay-back period between 1 and 3 years depending on the success factors of the infrastructure sharing. For example, without infrastructure sharing, the subsidy investment pays for itself in terms of increased GDP within 7 years. if the network deployer is able to maximize infrastructure sharing then it could reduce that public pay-back period to year 4.

[6] We make the further assumption that economic impact on GDP is delayed 2 years after the take-up rate is achieve.

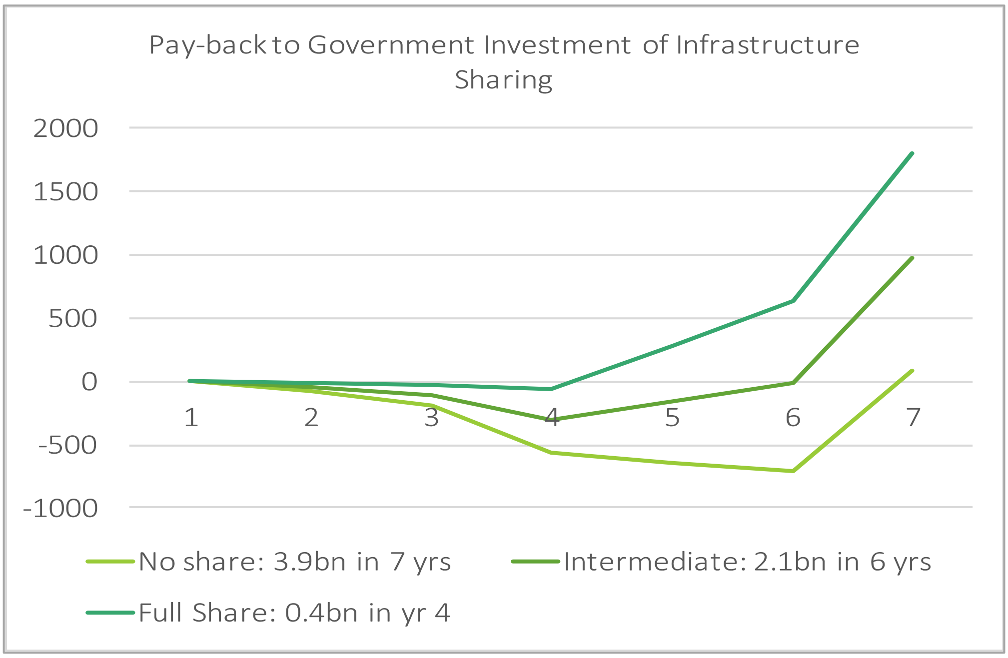


Figure 3 Payback to Government Investment of Infrastructure Sharing

5.2 Policy Implications

There are several implications for that emerge from this analysis. First, the impact of infrastructure sharing is highly dependent on local conditions. We believe that in many instances, government subsidy could be reduced to zero under the right conditions for infrastructure sharing.

Second, the government has numerous instruments at its disposal to encourage infrastructure sharing: lifting existing restrictions on utilities from leasing and sharing infrastructure; "dig-once" policies; mandating access on dominant service providers; minimal additional capacity requirements at the time of duct installation; more liberal rights of way regulations; etc.

Third, mandated infrastructure sharing is an obvious way to reduce the need for state financial involvement in the NBN deployment. However, the model does not measure the negative dynamic impacts on incumbent investment were the government simply require the incumbent to make available or incorporate excess capacity into its passive infrastructure.

Infrastructure sharing does not come without delay and cost, because of the significant benefits of high speed broadband, it may not be advisable, in an effort to achieve a degree of infrastructure sharing, to put off the roll-out.

In fact our analysis shows that, despite the considerable potential benefits, generally it is not worth putting off national deployment more than one or two years in order to achieve cost savings from infrastructure savings. This is because the economic impact of improved broadband is of a magnitude such that delaying too long costs the country more in foregone benefits than it can save with infrastructure sharing.

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