

Study on

Regulatory issues related to the deployment of telecommunications networks in new property developments

Final Report

16 June 2008

Executive Summary

The findings contained in this report can be summarized as follows:

From the analysis in Bahrain one can conclude that under the current conditions a principal problem in setting incentives for infrastructure investment in telecommunications networks in an appropriate way exists. Therefore it seems advisable that developers should play a more active role in providing this infrastructure, by not only providing corridors but potentially also by providing the ducts or even fibre in order to alleviate the investment requirements to telecommunications operators.

The fact that the telecommunications market has been opened to competition should lead to an advantage for the users in new developments, and as the demand uncertainty is rather high for telecommunications infrastructure providers (operators), it seems advisable that the developers should take a larger share of responsibility when rolling out infrastructures of this kind, as they also do for roads, power, water, sewage, etc. In order to ensure continued competitive choice for end users, it would be preferable to run an open access policy which on the one hand allows different operators also to install their (fibre or) cable networks in the ducts, and on the other hand allows various operators to use the physical infrastructure deployed by the developer.

In this way, JUCONOMY believes that Bahrain can create investment incentives for the provision of telecommunications networks and services, as well as maintaining a high level of competition.

1. Introduction

The telecommunications regulatory authority of the Kingdom of Bahrain (hereinafter “TRA”) in January 2008 commissioned JUCONOMY to conduct a study regarding “regulatory issues related to the deployment of telecommunications networks in new property developments”.

New property developments are a recent phenomenon implying also the establishment of new infrastructures in various forms such as roads, electricity, water, sewerage and telecommunications. The availability of these infrastructures in general and telecommunications specifically is a prerequisite for the viability of new developments of this kind. This does not only refer to the viability of a development compared to other developments, but also holds true for the Kingdom of Bahrain in its totality. Considering the importance of the establishment of new zones for economic activities, centres of excellence and new cities with high standards of living for the economic development of the country and the long-term vision of the national development plan 2030, state-of-the-art telecommunication plays a vital role for attracting foreign investment and establishing Bahrain as a preferred location for international high-tech business. If the Kingdom of Bahrain were to lag significantly behind its international competitors with regard to the bandwidths available to residential and business users, then the pace of innovation in the economy could slip behind that of those competitors, especially in the Gulf region, as they prepare for their economic future.

The specific feature that distinguishes the telecommunications market from other utility infrastructures is that it has been opened up to competition. Competition in telecommunications brings numerous advantages to business and residential consumers, such as choice, lower prices, variety of available services, etc. Therefore, when deploying telecommunications infrastructure in new developments, it is important to maintain the advantages of competition whilst in parallel ensuring that sufficient investment incentives are in place in order to roll out the required telecommunications infrastructures in the new property developments. There are, however, some economic features of these new developments which may create challenges in terms of simultaneously achieving investment in telecommunications facilities, and competition. To this end, the study identifies the obstacles in the marketplace today which may hinder the roll-out of telecommunications networks in and to new property developments. The study examines the local situation in the Bahraini market and the technologies available for fixed as well as wireless provision of networks and services, and identifies options for a regulatory approach that will both create investment incentives and bring the benefits of competition.

In order to gain a common understanding of what a “new property development”¹ is we refer to it as

¹ Also referred to in this study as „new developments“ or „developments“.

- an area, single buildings with more than one accommodation unit or cluster of buildings built for the permanent use by its occupants,
- which was built after the enactment of the Bahrain Telecommunications Law (23 October 2002) or will be built in the future,
- established as private development (whereby the analysis has demonstrated that the rules would likewise be applicable to public new developments) and
- for which telecommunications infrastructure and telecommunications services are being provided or shall be provided in the future.

With this definition we ensure a broad applicability (e.g. by making reference to telecommunications in general and not only to fixed networks and services) to cover many kinds of different new developments such as high-rise buildings, new industrial zones, new cities etc. However, small private (residential) houses, as well as buildings which do not have permanent use by the same tenant / user and where the temporary tenant / user does not enter into a contract for the provision of access to telecommunications networks and services, shall be excluded from the scope of the recommended framework. The reasons are (1) that if someone builds a new home for his family on private ground, the process for the provision of telecommunication shall be defined by MOSS (Municipal One-Stop-Show), whereby the current rules may need to be modified in order to ensure the goal of competition; (2) that hotels, short-term lease offices etc. should be excluded because for these types of buildings it can be assumed that demand will exist and that this demand can better be bundled by the owner / tenant towards the operator than by the temporary users. Nevertheless, some technical rules and provisions (see section 6 subsection D) may also apply to these.

2. Goals of the study

Any definition of a regulatory approach by TRA to new property developments in Bahrain needs to take into account a number of specific features of the telecommunications market in the Kingdom of Bahrain, such as:

- The current status of market development regarding fixed and mobile network penetration, and the degree of competition that has been achieved in the market. This includes consideration of the sustainability of competition, and the envisaged way forward with respect to the openness of the market for entry by further players.
- The economic importance and role of the establishment of specific new developments, and the requirements for providing telecommunications infrastructure in and to these developments. This necessitates consideration of the diversity of developments which was one of the factors taken into account when deriving the classification and the operational models.
- Global trends in the provision of telecommunications services with respect to next generation networks, and especially the laying of fibre connections, including in access networks. This point is of specific importance due to the fact that state-of-the-art telecommunications networks and services are a crucial factor for business and residential customers in today's economic situation, and may also be a crucial decision-making factor for businesses when considering the Kingdom of Bahrain as an important location for their activities.
- The involvement of different "stakeholders" in the deployment of infrastructure and the establishment of new developments, such as specifically telecommunications infrastructure providers, telecommunications (network) operators as well as developers.

The goal of the study is to provide TRA with an independent view of the issue of new developments in the Kingdom of Bahrain, and to come forward with options as to which regulatory policy TRA could follow in order to achieve the goals set out by TRA, namely

- ensuring competitive choice for business and residential users and
- creating sufficient incentives for investment in facilities enabling the establishment of telecommunications networks (this could be investment by operators but also by developers or other stakeholders) to ensure that, despite potential or actual obstacles, the respective networks will be rolled out to users in new developments.

This implies that any regulatory framework will need to strike the right balance between incentivising efficient investment and ensuring sustainable competition. Given the high capital cost, the long payback period of these investments and the high degree of commercial uncertainty and risk involved, simply extending the current regulatory framework to next generation broadband access may not achieve this balance.

This final report contains an analysis of the obstacles that may hinder achievement of the goals described above, as well as the main proposals that have been derived by JUCONOMY throughout the study. The study has been based not only on discussions with TRA and other stakeholders, but also on an analysis of the local conditions and the regulatory framework in place, interviews with market players, and an international benchmark.

3. Obstacles potentially limiting the deployment of state-of-the-art telecommunications networks in new property developments

It first needs to be analysed whether and how the current situation and the potential continued establishment of new developments in the future require a specific regulatory treatment. The interviews with the stakeholders – the Economic Development Board (“EDB”) and other institutions, developers and their consultants, and licensed operators in the Bahraini market – and the analysis of the market situation has led us to conclude that there are a total of 4 obstacles which may imply that the roll-out of telecommunications networks in new property developments could be subject to problems which may require a specific regulatory approach.

- Obstacle No. 1: The **market uncertainty** comprises two aspects: This is the uncertainty on the demand side (“**demand uncertainty**”) as well as the uncertainty on the supply side (“**investment uncertainty**”). The first aspect refers to the difficulty for developers and for telecommunications operators of assessing the demand side of the market in new developments. This implies that neither developers nor telecommunications operators can easily justify an investment based on a business plan which has a very large number of parameters which are unknown or hard to estimate. As long as the foreseen occupancy of these developments is uncertain, and the time at which the occupancy will be achieved is unknown, any investor will be reluctant to fund a roll-out for a telecommunications network in the light of uncertain payback conditions. This demand uncertainty is accompanied by an investment uncertainty on the supply side, because the companies that may be investing are currently unsure regarding the regulatory framework (see No. 2 below) that may apply to new developments but also regarding the overall project costs and technological developments.

Obstacles can also be interrelated, e.g. the lack of regulatory clarity (see No. 2 below) may (in addition to demand uncertainty) lead to hesitancy in investing in long-lived assets like fibre-optic cables. Therefore, investment uncertainty could arise as an obstacle resulting from demand and regulatory uncertainty. The investment uncertainty focuses on the amount of investment and the share of investment for each major building block of the activities:

- (1) civil engineering (digging, installation),
- (2) passive components (ducts, cables ...),
- (3) active components (routers, switches, customer premises equipment) and
- (4) administration and maintenance.

International comparative studies show that 60 to 80 % of the cost of the telecommunications infrastructure can be attributed to the two first items (civil engineering and passive components).

If state-of-the-art fibre infrastructure is deployed in the access network, the crucial question remains as to whether the occupancy and the penetration of networks, services and usage will allow the economic viability of the investment to materialise, and this is one of the main hurdles for infrastructure investment in new deployments

Whether investment in physical infrastructure in new developments of this kind will form a sustainable business case for the future (and if so, based on which technology), or whether service-based competition will prevail in the future, is difficult to answer. The assessments of the supply and demand side are also interrelated and influence each other in a cyclical way. This means that, while the public value of next generation broadband for society and the economy as a whole is potentially high, the large scale of investment combined with a significant number of uncertainties surrounding the prospects for recouping that investment mean that the potential private value available to investors is comparatively weak. Considering this gap, the current infrastructure, and planned investment in that infrastructure, may not be able to support the demand for bandwidth in the medium- to long-term – especially considering Bahrain’s growth in population. This implies the requirement to consider the responsibilities of the parties involved for investments in such networks in new developments to overcome this gap.

- Obstacle No. 2: The **regulatory uncertainty** concerns the elements of the current regulatory framework (such as existing obligations) as well as the future design of the regulatory framework, especially with respect to the position of the regulatory authority regarding the balance between infrastructure-based and service-based competition. It is as yet unclear what (if any) obligations may be levied upon networks which are being rolled out at this point in time. Under such regulatory uncertainty, investments tend to be regarded as risky, and may not be made in such high volumes as when the investment conditions in the regulatory framework were clear. Especially for Batelco, the situation is complex due to the fact that the determination of their significant market power in certain retail markets and the determination of dominance in wholesale markets currently covers the whole Kingdom of Bahrain (with the exception of Amwaj Island). If the currently-applicable asymmetrical regulatory remedies were to apply to Batelco if the company extended its network to new developments on land not yet covered by telecommunications networks this may lead to disincentives for investments, provided other operators deploying their networks in these developments are not treated similarly. Therefore, a more symmetrical approach for new developments may be appropriate here. On the other hand, competitors have to consider similar uncertainties, as they may face the question of whether to invest into physical infrastructure to provide networks and services to users in new developments, or whether to wait with their activity and instead to provide services using the infrastructure of other operators, potentially based on regulated wholesale conditions.

The desired regulatory certainty is intended to give clear directions with respect to the balance between infrastructure-based and service-based competition. Where eco-

nomically feasible, infrastructure-based competition is favoured above service-based competition due to the advantages that can be achieved (e.g. a structural safeguard with respect to independence of new entrants and incumbents due to a larger portion of self-provision of elements of the value chain), but to make this type of competition happen, usually a longer period of time is necessary. Therefore, service-based competition may have advantages in the short term. Looking at other regions, one can conclude that e.g. the EU has taken a positive approach to the “parallel roll-out” of ICT infrastructure. Infrastructure competition, in which different network owners compete with one another in offering services to end users, has the advantage that it creates competitive pressure throughout the value chain. Infrastructure competition also requires less regulation, since the same needs do not arise as with competition in services with regard to ensuring that competitors can obtain access to the infrastructure on non-discriminatory terms higher up in the value chain. At the same time the duplication of infrastructures is an economic concern in case such duplication would lead to inefficient investment and inefficient market entry as this could harm all market players.

The costs of the deployment of fibre to individual homes in international studies is found to be between approximately € 800 and € 1,250 per household. However it may not necessarily be a requirement to connect all facilities in Bahrain with fibre access; wireless solutions also remain an option, and have been included in the analysis. Although wireless technologies will play a part, the move to next generation broadband will require the deployment of optical fibre deeper into the local access network, either to the street cabinet or directly to the customer premises. This will require a huge capital investment. Despite continued innovation and investment in new fixed and mobile wireless technologies, they are not expected to provide end-to-end substitutes for “last mile” next generation broadband due to spectrum constraints. Wireless networks have some good characteristics with respect to cost for the last metres: that is, mobility and flexibility. They are, however, not capable of sending large amounts of data over larger distances or providing service to many users simultaneously. These limitations are for the most part inherent to wireless technologies. It is therefore expected that wireless networks will be mostly used in and around the end-user premises to bridge the last metres from the device to the physical network or for users who do not want or need access to high bandwidth. However, new wireless technologies may be incorporated into mixed technology solutions where the final connection is provided wirelessly to the end user over a very short distance. Wireless may be the only viable choice for the “first mile” in certain geographical situations where the population is extremely dispersed and remote, and where spectrum scarcity and sharing do not pose problems. JUCONOMY concludes that exclusive reliance on wireless and mobile technologies will not be sufficient to achieve state-of-the-art telecommunications infrastructure and services.

- Obstacle No. 3: Alternative operators made it clear that **connections to new developments** via their existing networks is a challenge due to the fact that they would have to establish their own backbone networks to connect the new developments.

This would be realised by establishing networks (by one operator or by sharing of investment with (telecommunications) infrastructure providers (e.g. utilities for water, electricity, sewerage etc.) and subsequent usage by several operators) on public ground, or by buying Batelco wholesale services – two alternatives which are both considered time-consuming and/or expensive but for which no alternatives exist and therefore pose challenges to the market which are interrelated to the regulatory treatment of new developments.

- Obstacle No. 4: We summarise a number of observations under the heading of **“management of expectations”**. In our view this comprises (1) **improvement of coordination**, (2) **more transparent and coherent selection mechanisms** and (3) **increasing the knowledge by developers of competitive offers**. The first aspect refers to the relationship between developers and telecommunications operators. The discussions with the stakeholders revealed that the exchange of information between these two groups had potential for improvement. We conclude that developers are not so well-acquainted with the regulatory framework for the telecommunications market in general. Furthermore, telecommunications operators have, in our view, not yet given sufficient attention to new developments, and therefore have not considered a specific approach for addressing the need for telecommunications networks and services relevant to new developments. Such lack of coordination is an obstacle to healthy development and the rapid roll-out of telecommunications infrastructures in the new developments. In addition, the method used by developers for selecting telecommunications operators in planning and setting up new developments indicates that information is not always effectively shared amongst the participants. This may imply that operators are not sufficiently informed about investment opportunities in telecommunications infrastructures in new developments, and developers are not completely equipped with recent information with respect to the framework that applies, and are not analysing which type of solution serves their needs and the character of their development in the best possible manner. Finally, the knowledge by developers about competitive offers is another area with potential for improvement. There seems to be (as in many markets where competition is developing, such as in telecommunications) a strong belief that the incumbent operator would be interested, or at least somehow obliged, also to roll out its telecommunications network to new developments. This represents a “safe harbour” assumption that may not be necessarily fulfilled in practice. Therefore, education of developers regarding alternative suppliers of infrastructure in new developments would be very useful.

The analyses of the obstacles have led us to consider various options regarding a regulatory policy for the Kingdom of Bahrain. Before presenting these options, it is necessary to take a look at the international picture and solutions found in other countries.

4. Summary of international benchmark

The United Arab Emirates (UAE), France and Hong Kong served as benchmark countries for this study. These countries were chosen because they represent

- one example from the GCC states and one European country with intensive fibre deployment;
- countries with high economic growth and activity especially with respect to new developments;
- countries with – at least partially – advanced practical experience and policies with respect to the deployment of next generation networks;
- one example similar to Bahrain, due to the fact that it also has an island character, is densely populated, and is also growing significantly in terms of its economic development.

In summary, the benchmark shows that there is no fully-developed regulatory approach and treatment of new property developments that could easily be adapted to Bahrain. On the one hand, this is due to the fact that the most comparable country in terms of large new property developments, the UAE, indeed faces similar problems but the national regulator has not taken action so far. The other two benchmarked countries, France and Hong Kong, both do have certain regulatory elements which deliver insights; however neither has a conceptual overall regulatory framework which could be adopted in Bahrain. The findings from France e.g. show the importance of regulation, but not how to enable customer choice on the one hand, and how to create incentives for investments by operators on the other hand.

4.1 *United Arab Emirates*

In the United Arab Emirates no specific regulations have been issued so far. This also applies to access rules or obligations with respect to new developments or multi-tenant buildings. Furthermore, there are no special provisions for mobile network operators, or universal service obligations. No rules concerning open access can be found. This regulatory void does not reflect the political and economic relevance of new developments in the UAE regarding the provision of telecom infrastructure and services in practice. A first count in the UAE, which revealed about 69 new developments established by 16 developers within the 7 Emirates, shows that the relevance of the topic is high. From the analysis undertaken, and with respect to the market structure in the telecommunications area it seems as if the dominant approach currently is that developers and telecommunications operators attempt to enter into exclusivity arrangements. The disadvantages of such arrangements against the background of the regulatory goals are described in section 5.

4.2 France

In France there is advanced discussion on FTTH (Fiber to the Home) roll-out, access to end users and the sharing of facilities on private ground. However, there is no special regulation of new property developments as such, due to the fact that France does not have such a phenomenon.

The provisioning of apartments and buildings with telecommunications infrastructure is compulsory at the time of construction, and installed by either the constructor or the operator. A second operator may request the use of in-house cabling, in which case the necessity of such access must be decided by the local courts. The local courts also decide with regard to access to private properties for the installation of parallel new infrastructure by a second operator, and thus the telecom regulator plays little role in the access to private properties. However, the NRA (National Regulatory Authority) determines the commercial and technical conditions for access granted by a local court. In addition, municipalities have the right to impose an obligation to share telecom installations when issuing building permits for ROW (rights-of-way).

Currently, the following regulations are being discussed in order to overcome some of the shortcomings of existing regulations, because the French NRA wants to promote FTTH roll-out. It is envisaged that operators and tenants will have to offer an operator access to existing installations (most prominently in-house cabling) if the request is reasonable. In case the operators agree, a contract shall regulate the conditions. In case of disputes it is planned – according to a proposal by the NRA which has not yet been implemented in practice – that the French NRA should be able to decide on these issues. Furthermore, all new properties shall then be equipped with telecommunication lines which enable very high bandwidth services. Legislation has been proposed recently to oblige developers and constructors to enable fibre access in all newly-built premises of a certain size (construction projects with more than 25 apartments). The lines will then be available in each apartment and must offer access to public telecommunications networks. In addition to this, it is planned that the landlord should be able to insist on sharing in the event that in-house installations for very high broadband services are already in place. Finally, an obligation to equip all new premises with fibre access lines is also under consideration.

4.3 Hong Kong

The most extensive regulation concerning access to telecommunications infrastructure on private property can be found in Hong Kong, in an environment which is in some respects comparable to Bahrain. The purpose of the NRA is to assist developers in the planning and provisioning of access facilities within their property developments to a standard which the developer considers desirable for meeting their customers' needs. Although the standard of the facilities to be provided depends on the decision of the developers, according to public

policy a minimum standard should be met which enables the occupiers to have unimpeded access to public telecommunications and broadcasting services.

Consequently, in addition to the rather extensive provisions already in place in the telecommunications law and the telecommunications ordinance, the NRA has issued several codes of practice and guidelines for the provision of access facilities and in-building telecommunication systems. Firstly, the telecommunications ordinance states that network operators have a statutory right of access to install their networks within private property developments. Secondly, the opportunity to access other service providers' and network operators' networks and to use their services must be granted. Thirdly, developers are not entitled to impose an access charge on the network operators for the use of cabling facilities. Fourthly, the property occupiers should have non-discriminatory access to the telecommunications services of their choice. Fifthly, concerning existing buildings, there should be coordination among the operators.

This regulation is supported by the building (planning) regulations. In that respect, the NRA is working closely with the buildings department to amend the code of practice for architects and developers to include adequate equipment rooms and ducting facilities in new buildings. Every building shall be provided with access facilities for telecommunications services in accordance with the design requirements as may be specified by the building authority. On the other hand, there are no market definitions regarding access to infrastructure, and in particular the NRA has not defined markets regarding the passive part of the access infrastructure. Consequently, no network operator or service provider of telecommunications services is designated as enjoying SMP (Significant Market Power) or dominance. Regulation is triggered by anti-competitive behaviour (i.e. the regulatory authority may initiate action with an ex-post approach if potential anti-competitive behaviour may be the reason for some market failure) or is constructed symmetrically from the outset, e.g. as regards the installation of facilities in new developments where all operators are treated alike. Furthermore, there is no special right for the universal service provider to access any private property.

Owners and developers usually approach one network operator for the planning and installation of in-building telecommunication systems. The NRA strongly advises developers to contact operators early in a planning stage to discuss matters concerning the provision of access facilities to meet the requirements of the operators. Furthermore, the telecommunications ordinance states that the NRA may direct licensees to coordinate and cooperate among themselves in sharing the use of any facility.

Comparing these three countries to Bahrain, we find that there are few "templates" which are usable as best practice examples. Not even the consultation launched recently by Ofcom on "New Build" addresses the issues from a perspective which is relevant for the Kingdom of Bahrain. The rules ensuring mutual access to buildings in Hong Kong seem to be a possible route to follow when it comes to detailed provisions on a technical level, but for unoccupied

new developments none of the countries – nor other countries researched – provide a work-able solution.

5. Operational models

The interviews in the Bahraini market revealed that there are different theoretical possibilities and different practical approaches to the establishment of telecommunications infrastructure in new developments. We call these different approaches “operational models” and they all display different facets of sharing the responsibilities for certain steps of the value chain between developers and telecommunications operators. These models are described and assessed against the goals of this study in the sequel.

5.1 *Relevance of shared functions and responsibilities between operator and developer*

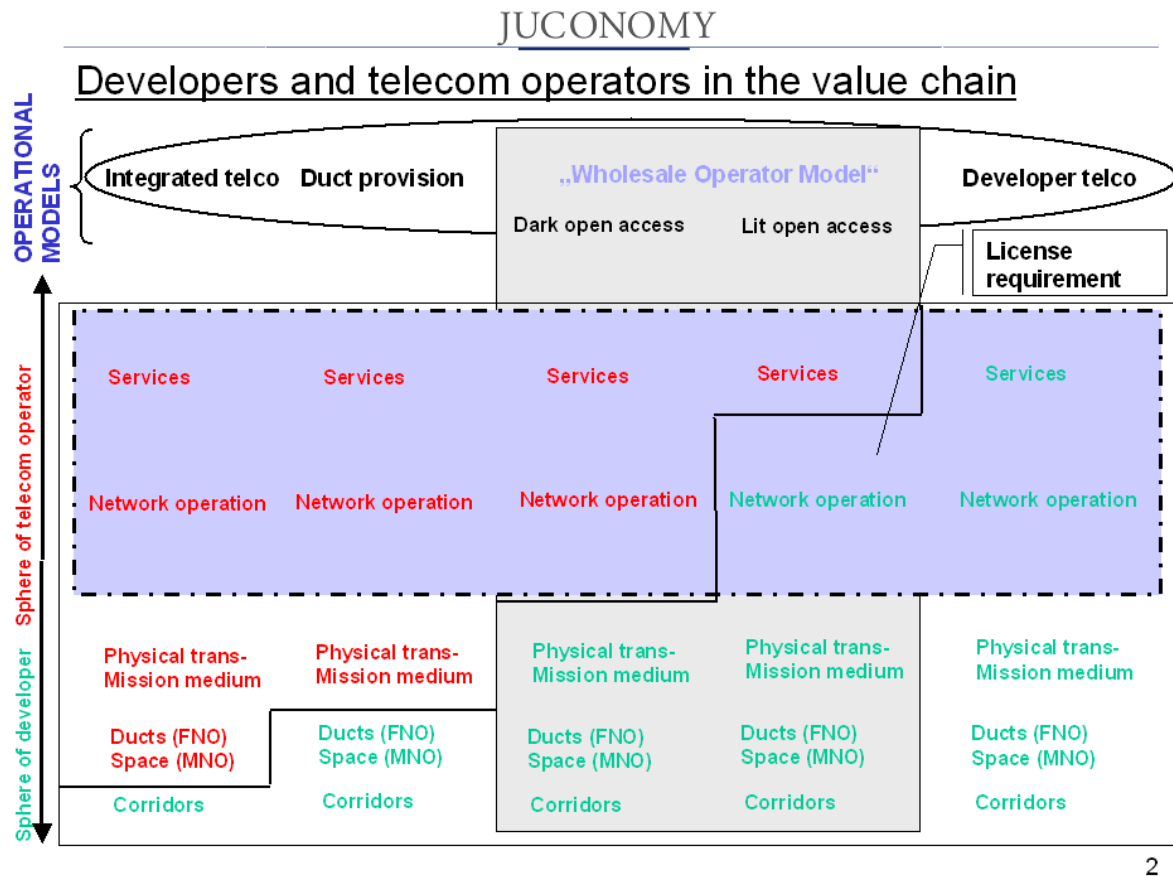
The specific feature characteristic of new developments is that developers, operators and telecommunications infrastructure providers (who can be developers, operators or third parties) can play different roles with respect to the establishment of the infrastructure in these new developments, because there is no “historically inherited network” or structure. This leaves ample room for flexible and innovative solutions, but also suggests that the mere application of the classical regulatory toolbox is inadequate to cover the specific issues arising from these developments. This does not mean that the current regulatory framework is not suitable (in fact, it is for some of the features), however, to cover the full picture of new property developments, some modifications and extensions may be needed.

The different functions do not only relate to whether the property is private or public, but also to the extent of the activity of either the developer and/or the telecom operator in the value chain. The different coverage of the value chain by either developer or telecom operator leads to different operational models and to specific regulatory issues for each of the models. The models can be described by looking at who is responsible for supplying the different elements of the value chain, i.e.

- corridors
- ducts (in the case of fixed networks) or space (with respect to mobile networks)²
- the physical transmission medium (for example fibre)
- network operation
- service provision

² As stated above, international comparative studies show that 60 to 80 % of the cost for the telecommunications infrastructure can be attributed to the establishment of ducts and passive components. See e.g. OECD: Public rights of way for fibre deployment to the home, April 2008
EURESCOM P1651: Fibre in Access Network Greenfield Scenarios, 2007;
Banerjee, Sirbu 2005: Towards Technologically and Competitively Neutral Fiber to the Home (FTTH) Infrastructure;

Depending on the coverage of elements of the value chain provided either by the developer or by the telecom operator, several delineations between their activities are thinkable and will lead to different relationships with respect to the provision of networks and services. In total, we believe that a distinction between five different models is a useful approach. As there are examples of all of these models in the market in the Kingdom of Bahrain, it needs to be noted that all of these models are workable, however, with respect to the goals to be achieved (ensuring competitive choice for users as well as creating investment incentives) some of the models fulfil these goals better than other models.



MNO = Mobile Network Operator; FNO = Fixed Network Operator

This framework has two dimensions: One axis determines the “frontier” between developer and telecommunications operator with respect to provision of certain functions and elements in the value chain. From left to right, along the horizontal axis, the developer increases its role in the value chain. The other axis shows the composition of the elements that together comprise the value chain and which are made up of the five elements described above. Depending on where the “cut” takes place, there are different economic and technical conditions that apply to each of the resulting models. These are called “operational” models because they deal with the operation of telecommunications in a new development by sharing responsibilities and functions.

The examples referred to in the headline (specific new developments as representatives of certain models) focus on private new developments. However, also for new developments established on public ground, we conclude that this distinction and the regulatory approach to these models is applicable.

In what follows the relative strengths and weaknesses of each model are discussed.

5.2 Integrated telco

In this model, the involvement of the developer is minimal and only consists of making corridors available for operators to install the required telecommunications infrastructure, including all passive elements. In such an environment, it would in theory be possible to have several independent infrastructures, which would all start from scratch without any historic burden.

<p>Strengths</p> <ul style="list-style-type: none"> • If replicability of infrastructure is feasible (which e.g. depends on demand and growth) this model creates a good environment for infrastructure-based competition. 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Incentives for investment for even one operator may not be sufficient. • The telecommunications operators have to recoup investment from sales in a competitive environment. Considering the uncertainty of demand, this might not lead to a positive business case.
<p>Opportunities</p> <ul style="list-style-type: none"> • Mobile operators will have advantages in rolling out their networks, because less investment is needed. • First-mover advantage possible by reaping the benefits of signing up customers and gaining a strong position / high market share in the early phase. 	<p>Threats</p> <ul style="list-style-type: none"> • No telecommunications infrastructure will be built prior to demand. • The value of the property decreases because no state-of-the-art telecommunications infrastructure is available. • Investment can hardly be recouped under these circumstances. • First-mover disadvantage possible if regulatory framework is assessed incorrectly and benefits are challenged by competitors with certain access rights.

SWOT for integrated telco operational model

Despite the openness of this model for infrastructure competition, it also runs a high risk of meeting neither the goal of state-of-the-art telecommunications infrastructure nor competition or choice for consumers. As the highest degree of competition could be achieved, the ex-ante rules can be restricted to general guidelines for deployment of outside plant and in-house facilities. Regulatory treatment in case of market failure would address the following:

- If infrastructure-based competition develops, no specific regulatory treatment is necessary.
- If no operator invests in fixed telecommunications infrastructure, further investment incentives are needed which may be provided by the other operational models.
- If only one operator invests in telecommunications infrastructure, service competition can be achieved by obliging this operator to offer wholesale products.

5.3 Duct provision

The developer moves further down the value chain in this approach by also laying the ducts so that telecom operators are relieved from a major part of the capital expenditure relating to the digging and laying of physical infrastructure:

<p>Strengths</p> <ul style="list-style-type: none"> • If replicability of infrastructure is feasible (which e.g. depends on demand and growth), this model creates a good environment for infrastructure-based competition. • Investment for ducts (costs for digging) can be shared between various utilities. • Improves the contestability of investment at the point of deployment. • Upfront sunk costs for the operator are significantly lower than in the “integrated telco” model 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Uncertainty of demand may make it difficult to develop a sustainable business case and to recoup the investment. This weakness / risk is smaller here than in the “integrated telco” approach though. • Potential dependency on regulation regarding access and price regulation for using the ducts (see opportunities as well).
<p>Opportunities</p> <ul style="list-style-type: none"> • Mobile operators will have advantages in rolling out their networks, because less investment is needed. • Potentially less regulation as access to ducts is a rather technical issue which can also be agreed commercially in a less complex manner (see weaknesses as well). 	<p>Threats</p> <ul style="list-style-type: none"> • The investment needed may not justify the business case, however, the threat is less relevant than in the “integrated telco” model. • The pace of roll out will be constrained by economic considerations (e.g. level of investment). • The goals of the government and the developers for state-of-the-art infrastructure based on optical fibre might not be met.

SWOT for duct provision operational model

Again, one can assume a risk of meeting neither the goal of state-of-the-art telecommunications infrastructure nor competition, due to the fact that the risk of investment is not likely to be covered by any private investor. Comparing the duct provision model to the integrated telco model it is obvious that this risk is much lower in the duct provision model due to the larger share of investment undertaken by the developer. In such a model there needs to be, in addition to general technical guidelines, rules for joint use of ducts (including issues of spare capacity and the coordination process) on non-discriminatory, reasonable and fair terms. These guidelines need to take into account later entrants and extensions. Further, reference offers may be necessary in such a setting, which could be supervised, if required, by the regulatory authority.

Regulatory intervention in case of market failure would partly be similar to the “Integrated telco” model

- If infrastructure-based competition develops, no regulatory intervention is necessary.
- If no operator invests in fixed telecommunications infrastructure, further investment incentives are needed. However, if ducts are provided by the developer, the fact that the majority of the relevant investments are provided by the developer should trigger sufficient incentives for investments by operators and thus reduce the risk compared to the integrated telco model.
- If only one operator invests in telecommunications infrastructure, service competition can be achieved by obliging this operator to offer wholesale products like bitstream access or dark fibre.
- If later entrants cannot gain access to ducts because space is fully occupied, provisioning of dark fibre could be required.

5.4 Wholesale model based on home-run fibre (dark open access)

Investment by the developer is greater than in the previous models, and now also covers the physical transmission medium (cable) which is offered “dark” (i.e. a point-to-point fibre connection to each home as a wholesale product without active components) and thus outside the area of licences required by the Telecommunications Law

<p>Strengths</p> <ul style="list-style-type: none"> • High bandwidth. • Increased value of properties. • Business case for developer is positive (value increase is deemed higher than cost of home-run fibre). • Strengthening of Bahrain as location of choice for international businesses. • Contribution to economic growth. 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Real infrastructure competition has low probability of materialising if not supported by duct access as additional tool for later entry. • Need to develop wholesale products.
<p>Opportunities</p> <ul style="list-style-type: none"> • Environment is conducive to the development of innovative services. • Future-proof. • If duct access included (as an option for other telcos also to deploy their cables in ducts in parallel or later on), possibility of real infrastructure competition exists. • Separate business and revenue from wholesale. 	<p>Threats</p> <ul style="list-style-type: none"> • Telecommunications operators may be drawn towards service competition (depending on demand and occupancy and thus attractiveness of additional infrastructure rollout). • Wholesale only versus integrated wholesale and retail service provision to be sorted out (potential competitive problems e.g. margin squeeze).

SWOT for wholesale model based on home run fibre

Regarding likely regulatory treatment, we believe that TRA needs to get involved in developing rules for sharing fibre infrastructure on fair, reasonable and non-discriminatory terms. Access regulation thereby needs to be concerned with the sharing of infrastructure. TRA might need to develop a cost model or other forms of tariff regulation for the use of dark fibre in order to assess the reasonableness of the rates proposed by the infrastructure owner or to set prices should access rates be regulated. Wholesale offers need to be transparent and supervised by TRA. Thereby, regulatory action should focus on market failures, implying that any possible involvement of TRA should preferably take place ex-post.

5.5 Wholesale model based on lit open access

Compared to the dark open access model, the developer can go further and also get involved in network provision, meaning that he operates the network (and also enters the sphere of licensed activities according to the Telecommunications Law of Bahrain). From a

technical point of view a fibre access network can be built as passive optical network, active star or point-to-point home-run fibre.³

<p>Strengths</p> <ul style="list-style-type: none"> • High bandwidth. • The price for the active components for GPON is considered less than for home-run fibre but home-run fibre is future-proof and allows for higher bandwidths and more innovation. This implies that several technical options can fulfil the goals and an optimisation with respect to costs and benefits can be chosen. 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Real infrastructure competition has a low probability of materialising, if not supported by duct access as additional tool for later entry • Lit open access is an area where technological development is ongoing. This means continuous updating of equipment and higher maintenance costs than in the dark fibre model. This increases the risk of stranded investment • The developer is brought under the purview of the Telecommunications Law.
<p>Opportunities</p> <ul style="list-style-type: none"> • Good environment for innovative services but less flexibility than in the dark open access model. • If duct access included (as an option for other telcos also to deploy their cables in ducts in parallel or later on), possibility of real infrastructure competition exists 	<p>Threats</p> <ul style="list-style-type: none"> • Technological obsolescence and stranded or sunk investment in wrong technology. • Wholesale only versus integrated wholesale and retail service provision to be sorted out (potential competitive problems e.g. margin squeeze).

SWOT for wholesale model based on lit open access

TRA’s involvement is likely to be of the same character as in the previous model, i.e. involvement in developing rules for sharing fibre infrastructure on fair, reasonable and non-discriminatory terms. Regarding regulatory treatment in case of market failure, this could involve access regulation for the sharing of infrastructure. TRA might need to establish a cost model or other forms of tariff regulation for the use of bitstream access in order to assess the reasonableness of the rates proposed by the infrastructure owner or to set prices should access rates be regulated. Wholesale offers need to be transparent and supervised by TRA whereby this supervision could be limited to cases in which a dispute arises.

5.6 Developer telco

In this most extreme model, the developer also enters the value chain element of service provision. Any specific feature of a network operator is thus no longer in place, the developer

³ For a description and comparison of these deployment models see Banerjee, Sirbu (2005).

has complete control over all functions of a network operator, and is therefore called “developer telco”.

<p>Strengths</p> <ul style="list-style-type: none"> • Investment incentives for one telco. 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Customers do not have choice between telecommunications operators.
<p>Opportunities</p> <ul style="list-style-type: none"> • Integrated utilities service provision and one face to the customer from developer’s side. 	<p>Threats</p> <ul style="list-style-type: none"> • No competition. • No flexibility for changing environment in the future.

SWOT for developer telco operational model

In this model, the degree of competition achieved is zero. The protection of consumers may require the involvement of the regulator and therefore it does not seem to be a viable option, especially if it involves any kind of exclusivity. Since competition at the infrastructure level is non-existent, we consider this model in itself to be a market failure. The operator, who by definition dominates the wholesale and the retail market, has to be supervised with regard to abusive behaviour to ensure customer protection. Possible regulatory measures concern access for fixed and wireless network operators. Regulatory treatment has also to be balanced against ensuring legal certainty and protecting the lawful expectations of the parties. The regulatory measures can be guided by the following principles:

- If infrastructure competition is deemed feasible, the granting of rights of way to other operators is sufficient. There is however the question as to whether this provides enough incentives for a fixed network provider, considering that the existing provider might already have acquired a significant market share.
- If full infrastructure competition is not deemed feasible, TRA could conduct a competition assessment and define appropriate remedies. The remedies could include interconnection, bitstream access, duct access or provision of dark fibre (unbundling).
- A third option is the requirement to offer resale products to other operators.

5.7 How to mitigate the investment risks?

The models described above show that there are workable models which, in theory, would provide competition and consumer choices to benefit the economy of the Kingdom of Bahrain. However, these models also entail the risk of insufficient investment because of e.g. demand uncertainties and lesser risks if only service competition is pursued.

The dilemma seems to be that there is a strong probability that higher-speed broadband will be crucial in order to maintain competitiveness. However there is, as yet, no clear commercial model for widespread network deployment in new developments.

This implies that facility-based competition is uncertain given demand and other risks. Developers who are building these new property developments have an important role and responsibility in this respect. They can mitigate the risks associated with the deployment of networks at minimal incremental cost and thereby contribute to the value of the development and help to overcome obstacles. Developers are well-placed to take on the additional costs to lower the barriers for complementary investment by telecom operators. This can also be justified by the fact that developers are also the ones to gain from the increased value of the developments.

6. Proposed regulatory policies

From the above we have derived a number of conclusions on which we base our proposals for regulatory policy.

- Although we are discussing private developments, none of the projects fall outside the Telecommunications Law, i.e. the Telecommunications Law is fully applicable with the consequence that even where e.g. developer and telecommunications infrastructure provider have agreed upon an exclusivity arrangement, TRA would in our opinion still be in a position to grant rights of way to other operators as well as impose any other regulation included in the Telecommunications Law.
- Although the project focused on private new developments the analysis reveals that the solutions developed could likewise be applied to new public developments.
- The role of the developers is crucial and depends on the extent of elements of the value chain for which they take responsibility in order to improve the business case of infrastructure roll-out.
- As the motivation to install multiple infrastructures may be limited, both in general and specifically in new developments, an open access policy is the most feasible approach to ensuring state-of-the-art telecommunications and networks in new developments.

Based on the principal conclusions, our proposals are as follows, covering five different areas (A through E):

A) General regulatory principles

- In general, TRA should only take action in case regulation is necessary, i.e. in case of market failure which can arise if the developer selects a model where no operator is willing to invest, or where negotiations regarding access fail. TRA would also have to decide whether to intervene in situations where the operational model does not allow competition but has been established before the definition of a regulatory policy, or whether to allow these models to continue with a “softer” regulatory approach.
- The provision of wireless services has to be assured so that the customers have at least the possibility of using this communications service. To fulfil this goal, TRA should enforce the corresponding use of private property for mobile facilities (antennas, base stations, etc. as well as a fixed network connection to them) pursuant to sect. 61 of the Telecommunications Law.
- Sect. 65 of the Telecommunications Law gives TRA the possibility of taking action against practices, especially an abuse by a licensed operator, or the concluding of any agreement which restricts competition or any acts effecting anti-competitive

changes in the market structure (sect. 65 (b) Telecommunications Law). These provisions may be especially applicable in case a developer/owner signs a contract with one operator granting exclusivity. Such an exclusivity arrangement does not promote a competitive environment and customer choice, but rather leads to the possibility that operators will refrain from providing new developments with telecommunications services at all.

- Applying universal service obligations, as laid down in sect. 64 of the Telecommunications Law, towards the provision of telecommunications services in new developments does not appear to be the appropriate tool, due among other things to the limited scope with regard to the definition of universal service in Bahrain.

B) Open access policy

- Open access to alternative wayleaves and passive network elements can mitigate a significant amount of the total capital cost of NGA (Next Generation Access) deployment, and thereby also increase the possibilities for competition between several providers using the same infrastructure.
- Open access should be implemented at the layer where monopoly-like behaviour (only one infrastructure is deemed economically feasible) is observed. Open access ensures competition on equal terms above this level. The level addressed depends on the operational model. However, regulation may not only address this one level with respect to solving competitive problems but should also have the possibility to address different layers, especially if the competitive problems are linked to the inter-relationship of service provision by different layers.
- For new developments, TRA should implement an open access policy. TRA could use the provisions concerning right of way and other means to use private property (sect. 61 and other regulations) as well as the access rules (sect. 57 and corresponding regulations). Likewise, the application of Sect. 65 may be possible – depending on the actual situation in the specific case:
 - If only corridors are available, the regulation can take the form of granting the right of way to those who request it, in order to enable them to establish ducts, cables etc., and potentially to provide services.
 - If ducts are available, the regulation should enable ducts to be offered to companies wanting to install their physical transmission media in the form of dark fibre, cables etc. Thus, a kind of access obligation would be levied on the ducts.
 - In addition, if there is no sufficient duct space available (e.g. in the form of sub-ducts), the requesting party should be able either to request the right of

way as aforementioned, or spare capacity on already installed dark fibres as provided for in further detailing TRA regulations.

- If “dark” or “lit” infrastructure is available, regulation should cover the availability of appropriate wholesale products. It needs to be considered that wholesale products which differ from products available will have to be developed. As this is a time-consuming and difficult process it has to be ensured early on when setting up such an operational model that these products will be available. To this end it may be useful to develop standardised wholesale products, if such products are needed across several new property developments.
- Considering the consequence that an open access policy of this kind may lead to a refusal by the operators to deploy their networks in new developments, TRA should encourage the developers/owners to deploy the necessary infrastructure (according to the models identified above) at their own expense, with a possibility to have it operated by a third party providing open access to all interested parties.

C) Market analysis and dominance for new developments

- The overall size of Bahrain (geographically and with respect to population) indicates that it is a small market. Therefore, any market regulation that deviates from a national market definition would have to be justified. Despite different degrees of density of population and economic activity it seems advisable and consistent to maintain a national view of the telecommunications market.
- A national view also implies that any change of the current designation of dominant operators is not advocated with respect to the national scope of analysing market power. This could lead to an overly complex situation with respect to TRA’s assessment and the locations in which specific remedies apply (and where they do not apply).
- In order, however, to enable competition in new developments, even if the infrastructure is provided by a company which is not dominant on a national scale, it could be useful to apply symmetrical open access policies in new developments. This would put all operators in a new development on an equal footing and not overburden any of the operators with “old” or “new” remedies. It would also mean that if the new development is served by only one operator or infrastructure provider this company may become subject to essentially the same remedies as the national dominant operator for the rest of the country.
- In case symmetrical open access policy is insufficient in terms of competition and consumer choice, TRA will have to undertake an analysis of competition conditions and to consider appropriate remedies. The analysis of competition may point to the existence of separate geographic markets. Where only one infrastructure provider has emerged in a new property development, it would be likely to constitute a presumption of dominance. TRA would then have to consider appropriate remedies pro-

portionate to the issues identified. Where the prospects of replication of existing infrastructure are weak or inexistent, TRA would require open access at the appropriate level in the value chain in order to protect consumers and promote competition. TRA could also complement this open access requirement by additional supporting measures, such as non-discrimination, general prohibition of price squeeze and ultimately approval of access prices if a commercial outcome is not achieved or is unsatisfactory.

- Additional regulatory safeguards may be needed in case of vertical integration (i.e. operating at both the wholesale and retail level) of the provider of infrastructure in the development to prevent discrimination, including price squeeze.

D) Accompanying policy proposals

- The policies described above may be accompanied by additional regulations, such as obligations to publish a reference offer, technical rules, etc. JUCONOMY regards the existence of technical implementation rules for possibilities for access to fixed and fixed wireless network elements as well as for facility sharing as helpful in ensuring workable solutions, cooperation between the operators, and transparency.
- From a technical perspective, the following proposals are made:
 - access facilities should be made available to telecommunications infrastructure providers (fixed and wireless) on a non-discriminatory basis;
 - cables and ancillary equipment operated by developers should be interconnected with public networks on a non-discriminatory basis;
 - developers in general should consult and coordinate with the telecommunications infrastructure providers with regard to the provision of access facilities and, for new buildings and developments, should request the operator's requirements in advance; and
 - there should be coordination via the telecommunications technical office at TRA.
- While interconnection obligations are applicable to any public telecommunications operator (based on sect. 57 of the Telecommunications Law) the access obligations are limited to a case where the licensed operator is in a dominant position (sect. 57 (e)). As long as a network in a new development is not seen as a separate network, or the operator is not seen as a public telecommunications operator as defined in sect. 57 (a) of the Telecommunications Law, there would, in our understanding, be no possibility for another operator to gain access to this network based on the current interconnection obligations. In that respect, an amelioration of sect. 57 (e) of the Telecommunications Law should be considered, according to which not only dominant operators would be obliged to offer access, but all operators. This would prevent the

definition of each new development as a single market and a corresponding dominance. In other countries, there is quite often an access obligation for operators running an access network. This is based on the idea that this not only improves choice for the customers (especially where carrier selection is provided for), but also that it promotes the end-to-end connectivity between networks. Quite often, access networks (e.g. mobile networks) of this kind are considered as monopolies. In such cases, it would in general be possible to treat these access networks according to the rules for dominant operators, however the change in the law enabling access obligations to be imposed without the need to determine dominance would make it more transparent and more reliable.

- Another option to be considered in the future could be a change in the public law applicable to developers/real estate owners. Considering the fact that developers/owners are paying for roads, water and power supply infrastructure, this could be amended for telecommunications infrastructure. One possibility, of course, would be to introduce a corresponding obligation in the applicable construction laws. Another possibility would be to add a corresponding requirement for the award of a building permit. This is an option which is being explored further in France. Very recently – after the completion of our benchmark – it was announced that France is considering amending its construction laws to force owners and developers to ensure that new houses are being constructed with a broadband connection/access.
- A further idea could be to oblige all network infrastructure providers that have established a network at new developments to offer wholesale services and to allow for service competition. Thus obligations arising from dominance and applicable to one of the potential operators should not lead to a bias, but instead one could make the obligations for the infrastructure providers identical. There is, however, no legal provision to support this policy and it may become necessary to introduce licence amendments which enable TRA to levy obligations for e.g. interoperability, interconnection or wholesale access upon all licensees, provided, however, that such amendments are possible pursuant to the Telecommunications Law.

E) Information and education of the market

- JUCONOMY proposes that TRA informs the market participants fairly soon of its regulatory approach for new developments, as well as possible measures to ensure customer choice and sustainable competition. The market participants should be informed about the best practices for telecommunications network deployments in new developments as well as the upcoming regulatory means in case customer choice is not viably enabled by the developer/owner.