

Rural connectivity toolkit

Improving digital coverage with innovative financing



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May 2021



Rural connectivity toolkit - Improving digital coverage with innovative financing © European Investment Bank, 2021.

This paper describes how innovative financing can help overcome the market failures that are leading to underinvestment in digital infrastructure.

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1 Rationale for developing a strategy

Officials in many countries face the task of addressing lack of connectivity in thinly populated areas. This toolkit provides actionable guidance on how to design a customised rural connectivity strategy that addresses this challenge by combining international best practices with local knowledge. It explains how best to select a suitable operational model to achieve high-quality coverage. Depending on locally specific objectives, this toolkit aims to improve telecom connectivity in areas where the commercial sector does not plan to provide service.

As increasing numbers of businesses become at least partly digital, broadband networks, software development and telecom services are priority areas for the European Investment Bank (EIB). The EIB supports the development of mobile and fixed broadband as well as transmission networks. For this purpose, the EIB Group is providing efficient financing for digital infrastructure projects with publicand private-sector promoters. This compensates for the lack of efficient local financing to expand connectivity coverage and, in turn, drive economic development.

Innovative businesses and projects often require innovative financing solutions to support their development. The EIB has a wide range of <u>products</u> to support public and private investments, offering flexibility, expertise and best practices to get projects off the ground.

In low- and middle-income countries, mobile phones are the primary means of accessing the internet: more than 55% of people using the internet access it exclusively via a mobile.¹

Mobile internet is now becoming a real need for the rural population: an International Telecommunications Union (ITU) study suggests that a 10% increase in mobile broadband penetration in Africa would lead to a 2.5% increase in gross domestic product (GDP) per capita.²

However, according to the ITU,³ 20% of the population in least developed countries lived outside the range of mobile cellular networks and 40% were not covered by a 3G network, as of year-end 2017. The ITU also estimated that 52.1% of the global population but only 24.4% of Africa's population was using the internet in 2018. For the 61%⁴ of the sub-Saharan population living in rural areas, this percentage can be expected to be even lower.

To benefit from the development impact of telecom connectivity, action is needed to increase the proportion of people with coverage and connections. With the world transforming into a digital information society, reliable connectivity and education about effective use of information and communications technology (ICT) becomes essential.

Rural communities have a high need for voice and data connectivity to overcome some of the challenges created by their remote location, but they tend to be the least connected parts of a society. The economics of investments in low-populated areas are often unattractive to the commercial sector. Digital exclusion of rural areas is creating a spatial rural divide⁵ that worsens their economic opportunities and access to productivity gains while also inhibiting access to a major development driver.

¹ GSMA Intelligence (2019). *Global 5G landscape (Q2 2019)*.

² ITU (2019). *Economic contribution of broadband, digitization and ICT regulation: Econometric modelling for Africa.*

³ ITU (2018). <u>Least Developed Countries on track to achieve SDG 9.c on universal and affordable Internet access by 2020</u>.

⁴ World Bank (2019). <u>*Rural population (% of total population)*</u>.

⁵ Salemink, K., Strijker, D., and Bosworth, G. (2017). "Rural development in the digital age: A systematic literature review on unequal ICT availability, adoption, and use in rural areas". *Journal of Rural Studies*, Vol. 54, pp.360-371.

Both short- and long-term benefits can be derived from increased broadband coverage. In the short term it can lead to growth in businesses and jobs through network operation and new business models, such as e-commerce. In the long term, connectivity contributes to population, income, productivity and GDP growth.

The digital sector has become one of the fastest-evolving economic and social areas worldwide, creating opportunities for sustainable development and inclusive growth. This evolution has resulted from increasing demand as people recognise the benefits of mobile communication, the internet and digital services. Digitalisation contributes to the 2030 Agenda for Sustainable Development by supporting many of the UN Sustainable Development Goals. Hence, investment in creating and advancing the digital economy can have a strong development impact.

The digital sector's development impact is centred on improved information exchange facilitating better and faster innovation processes. Greater innovation directly influences all Sustainable Development Goals, as digital services can be used to promote their achievement. It also impacts access to capital and financing. Widespread access to digital solutions enables the distribution of financial services without physical branches, giving the private sector easier access to scarce capital. This encourages entrepreneurship and decreases the cost of investments for established companies.

A growing digital economy can help to ease significant problems like poverty, unemployment and insecurity. Increased entrepreneurial activity and investment lead to more demand for labour, thus increasing the level of employment in connected regions. At the same time, the quality of jobs increases and digital education services can be used to build newly required skillsets. Economic and employment growth can further reduce insecurity, provided the gains are properly distributed and those disadvantaged by the digital transformation are included or compensated.

Providing high-quality broadband in areas with low population density or other geographical constraints is a challenge for market players, as the return on investment declines with decreasing population density. Consequently, in some countries the market fails to provide certain geographic areas with high connectivity services based on commercially sustainable models.

If the market is failing to provide access to broadband, governments should coordinate, encourage and/or incentivise market players to improve voice and data connectivity in rural areas through regulation and incentivisation. Such interventions can be developed based on international experience and best practices, making use of multiple existing approaches for solving rural connectivity issues. Many goals can be achieved by improving overall system efficiency, without the need for direct public spending. State-led interventions also create mid- and long-term financial benefits for the intervening government by increasing tax revenues through stimulating the wider economy.

This toolkit seeks to guide government officials (hereinafter the "agent") through the process of developing and implementing a strategy for increasing rural connectivity. It introduces some of the best practices and guiding principles but should not be seen as a recipe to copy: the proposed steps and practices have to be adapted to the national context. Section 2 introduces the concepts behind infrastructure sharing, section 3 guides the reader through the strategy design process and section 4 provides guidance on the implementation of such projects.

Multilateral public banks can take an active role in helping government implement this process.

2 Concepts of infrastructure sharing

As one possible approach for increasing connectivity, infrastructure sharing reduces the cost of increasing coverage while maintaining the level of competition in the market. More specifically, some of the major benefits include reduced operating and capital expenditure, making it easier to expand the network quickly; lower barriers to entry, which increases service competition and leads to lower prices; and less asset duplication, which reduces the environmental and visual impact of the infrastructure.

The sharing arrangement can focus on passive and/or active infrastructure.

Passive infrastructure sharing involves, for example, the sharing of towers, fibre cables and access to buildings. This type of sharing is linked to the growing importance of towercos/infracos (see section 2.1) and represents the large majority of future investments in telecom infrastructure.

Active infrastructure sharing involves, for instance, the sharing of a radio network, national roaming, and the introduction of mobile virtual network operators. This type of sharing is usually subject to authorisation or validation by regulatory authorities. Consequently, active equipment sharing is only just emerging but has interesting prospects.



Infrastructure-sharing models⁶

⁶ GSMA (2012). *Mobile infrastructure sharing*.

When choosing a model, the expected quality of service has to be analysed:

- In a passive sharing model, each operator decides how its network will be operated (for example, in terms of capacity, technical and mechanical settings, quality of service delivered, network generation 3G/4G).
- In a network roaming model, the hosted operator fully depends on the hosting operator's investments choices, and customers' quality of services can be interrupted, for example with the network name not recognised or dropped calls and lost connections switching from or to the home network.
- In an active sharing model, technical and mechanical settings are the same for all operators, and some capacity problems can occur.

The backbone can be formed using radio links (microwave transmission) or physical links (such as fibre). Radio links can be easier to deploy, but the required capacity and the distance and landscape between two transmitters can present challenges.

Conversely, shared physical backbone infrastructure can be integrated when constructing roads, electricity lines, railways or pipelines. Considering future fibre deployment during the construction of other infrastructure can avoid high future costs for passive network components.

Several different models exist for arranging infrastructure sharing. Table 1 provides a compact overview of the most prominent examples.

	Model	Description
1	Joint development	The infrastructure owner cooperates with telecommunication companies in the coordination and planning of networks.
2	Hosting	The infrastructure owner offers to host the equipment of telecommunication companies.
3	Passive	Complete passive infrastructure is provided by a host company. Network operators lease access to this network (such as dark fibre for fixed networks and towers for mobile networks).
4	Joint venture	The operator and infrastructure owner cooperate on a profit- sharing basis, with the operator providing commercial services.
5	Wholesale telecom service	The infrastructure owner provides commercial wholesale access, including active equipment, to network operators.

Table 1: Examples of infrastructure-sharing business models

Various public institutions have important roles in creating a conducive environment for infrastructure sharing. The graphic below highlights some of these roles.

Telecommunications

Policymakers	regulator	Other bodies
 Make the deployment of cross-sector infrastructure part of a broadband strategy Encourage cross- sector infrastructure development approaches Support sharing financially Provide a database of current planning 	 Oblige inclusion of infrastructure for sharing (such as space for additional operators, ducts) when approving planning Oblige sharing of subsidised infrastructure 	 Raise awareness Conduct advocacy Develop guidelines Improve use of rights of way
	<i>Role of public institutions</i> ⁷	

2.1 The role of towercos/infracos

Wholesale telecom service providers own the telecommunication networks that are used by retail operators. Over recent years, mobile network operators have transferred their tower infrastructure⁸ to dedicated business units and/or made increasing use of towercos. As towers constitute a large part of mobile network operators' expenses in developing countries, sharing towers or renting access from a third party often makes economic sense. The sharing of tower infrastructure is especially relevant for rural areas where it is not viable for various operators to roll out their own infrastructure.

By focusing solely on the construction and operation of towers, dedicated companies can improve their services and develop new business models to increase site-level profitability while also improving operational quality. Depending on the local context, new business or profit can be generated through, for example, reducing redundancies, active network sharing and cooperating with energy service companies able to supply power and fuel at a predictable cost per kWh.

Beyond enabling cost sharing, towercos develop a clear value proposition including energy management, operations and customised site planning focused on low-cost designs. With power and fuel supply accounting for up to 70–80% of the network cost, specialised companies with dedicated expertise can ease the financial burden and reduce CO_2 emissions by using green energy.

⁷ World Bank Group (2017). <u>Infrastructure sharing and co-deployment issues</u>.

⁸ ATKearney (2012). *The rise of the tower business*.

2.2 Technology selection

Each technology serves different types of uses and services:



Nowadays, 2G is a "must-have" as the technology that implements the basic needs in mobile telephony (voice calls and SMS), while 4G is increasingly replacing 3G in terms of services offered.

To minimise the costs of switching to a new technology, it is recommended to deploy the latest generation available, as long as no areas lose coverage and the population can access the technology (for example, there is no need to deploy a 5G network if the population cannot access 5G-compatible terminals). The minimum recommendation is to deploy equipment compatible with generations, so it will only be necessary to make software upgrades to switch to new technology.

2.3 Telecom infrastructure and environmental impact

While ICT and digital infrastructure play a clear role in enabling climate action in other sectors, it is currently challenging to robustly measure their environmental impact. Moreover, the enabling impact of ICT and digital infrastructure is not currently reflected in the multilateral development banks' climate action eligibility criteria. The EU taxonomy for sustainable activities clearly recognises ICT as a sector with a substantial enabling impact, but has not identified specific technical criteria and thresholds for recognising the enabling effect of ICT.

In 2018, an estimated 2 135 million metric tonnes of CO_2 equivalent was saved thanks to mobile phones, while mobile technologies such as machine-to-machine and internet of things reduced global energy consumption by 1.44 billion MWh and saved 521 billion litres of fuel worldwide.⁹

Therefore, mobile phone technology can have a positive impact on the environment. However, infrastructure has to be resilient to climate change, as it will face increasing occurrences of extreme weather such as storms, violent winds, floods or drought. The network design must therefore be planned to withstand these particular conditions through robustness, equipment ventilation, sealing and other measures.

The public agent will need to anticipate these specifications in the competitive tender.

ICT and digital infrastructure projects are aligned with the decarbonisation objectives of increased energy efficiency (to decrease energy consumption) and 100% decarbonised energy mix, as envisioned by the European Union's Green Deal. These projects also enable decarbonisation through smart grids and cities, which can generate significant sustainability benefits (such as e-health and car safety).

⁹ OECD (2020). Greenhouse gas emissions statistics.

2.4 Associated services

Many people believe that mobile technology services are limited to voice calls, text messages and surfing the web. In reality, a whole ecosystem can be created via mobile technologies, helping to drive the development of local economies. It is therefore necessary to provide solutions offering services that will encourage use, change habits and generate traffic, thereby improving operational viability over time.

For example, a network operator/internet service provider can offer a connection that delivers coverage and other services, such as solar battery recharging, access to administrative services or cached content (such as for schools), and a voice interface for those who cannot read or write. The target is to encourage people to use the different services, including data, thereby fostering private investment.

3 The strategy design process – From definition to contract

This section sequentially explains each different stage/element in the design process and provides best-practice examples. The graphic below shows the process for building and executing a national rural connectivity intervention. The toolkit covers how to define the intervention's key principles and choose a suitable strategy, while also providing practical guidelines on basic principles and objectives.

To clarify the terminology, a **goal** is considered the primary outcome one wants to achieve, a **strategy** is the approach one chooses to achieve a goal, and **objectives** are measurable steps towards achieving a strategy. This toolkit aims to increase rural connectivity by guiding the design of strategy suitable for the local context.



Stages of the intervention strategy development and implementation process

In practice, steps 2 and 3 have to be done in parallel or simultaneously.

This type of project may be led entirely by the private sector on a commercial basis. However, when led by the public sector to secure part of the funding, the project must comply with procurement rules in the intervention country (see the guide to procurement for EIB-financed projects¹⁰). That is the objective of steps 7 and 8.

¹⁰ EIB (2018). *Guide to Procurement for projects financed by the EIB*.

Each step of the process is accompanied by recommendations, best-practice examples, or various possible models that can be discussed and chosen according to national preferences. The steps "assess the market," "define intervention area," "define objectives" and "select ownership model" contribute to drafting the strategy document.

Process output: Multiple documents serve as the basis and components of and the guidelines for the intervention, including:

- A detailed description of the steering group
- A strategy document that
 - Assesses the market
 - o Defines and explains the intervention objectives
 - o Defines the intervention area
 - Selects the infrastructure ownership model
- An open call for tender
- A contract

Process outcome: A strategy for increasing rural broadband connectivity.

Process impact: High-quality broadband connectivity in rural areas not currently served by market participants.

3.1 Set up a steering group



Large-scale government-driven projects need to be well managed to coordinate all those involved. For this purpose, a steering group should be set up to develop a

strategy that suits the context. A steering group is formed of experts and stakeholder representatives that oversee the development and implementation process of a national rural connectivity strategy. It considers the big picture, usually meets at key stages during the process and advises the implementing agent on strategic decisions. It is also responsible for monitoring project progress against defined goals and objectives.

If applicable, this steering group will set up other groups or subcommittees: a working group to directly manage operational aspects of the project, as well as local groups with responsibility for ensuring the strategy suits the local context in terms of market forces, regulation changes, investment trends, security, etc. These groups would then report to the steering group.

Furthermore, this local-group architecture will monitor the reach of the goals.



What is the aim in this step? The agent should prepare a document describing the steering group in detail, which forms the basis for setting up the group. Table 2 provides step-by-step guidance on this process.

Step	Description
1. Choose name	Choose a name for the steering group
2. Define mission	What is the purpose and the role of the group?
3. Define objectives	What are the major objectives of the group?
and goals	 What specific goals need to be reached?

Table 2: Steering group set-up process and elements

		What are the intermediate goals?			
4.	Choose	What is the ideal number of members?			
	approximate size	 Smaller (≤5) for increased efficiency 			
		 Larger (≤10) for increased buy-in, but requires very structured 			
		meetings			
		Should comfortably fit around a conference table			
5.	Consider	The roles should include:			
	important roles	Chairman/chairwoman			
	•	Secretary			
		General members			
6.	Define	What are the desired qualifications and responsibilities of members?			
	qualifications				
	•	Include specific expertise:			
		Telecom experts			
		Academics			
		 Representatives of underserved regions 			
		Consider potential conflicts of interest			
7.	Decide on a	Who decides what?			
	decision-making	How are decisions taken?			
	mode				
8.	Define meeting	How frequently will it meet?			
	schedule	Where are meetings held?			
		What is the agenda and minutes format?			
		Who will prepare and distribute the minutes?			
		Is a quorum of members required?			
9.	Consider	Are subcommittees required for some tasks?			
	subcommittees	How large should they be? Should a should they be?			
		Snould a chairman/chairwoman be appointed? Will additional monthings be recorded?			
		• Will additional meetings be necessary:			
10.	Decide on	How often should progress be reported to the agent?			
	reporting	who exactly should receive the reports?			
	approach				
11.	Decide on	Identify audience Define communication notion			
	communication	Define communication policy Select communication modia and agonda			
	approach	Chauld the word, he conclusted by the event on self such stad?			
12.	Choose evaluation	Should the work be evaluated by the agent or self-evaluated?			
	approach	Will there also be a final evaluation process?			
		 What are the evaluation criteria? 			
		 What are the evaluation methods? 			
4.7		Define the agent's staff to whom the group has access			
13.	Ensure staff	 Define the agent's start to whom the group flas access Decide who will provide administrative assistance 			
	support	 Will there be liaison staff between the agent and the group? 			
	C	How will each goal and objective he completed?			
14.	. Set up a work plan	 N/ho will perform which tasks? 			
		When does each task in the work also need to be several to 2			
15.	Define a timeline	when does each task in the work plan need to be completed?			

After completion of the set-up process, the steering group can start working towards its mission of developing the country's rural connectivity strategy.

Best practice: steering group role

- Provide guidance to the working group on achieving the milestones set out in the programme plan;
- Advise on the precise goals and objectives of the programme that might inform the agent's policy decisions;
- Monitor programme delivery and ensure that appropriate remedial action is taken, if necessary;
- As appropriate, evaluate key recommendations from the working group, providing direction for the programme as it advances;
- Ultimately, provide assurance to the agent that the proposed strategy and the preferred bidder(s) put forward by the working group will achieve the objectives.

The steering group should not be responsible for any decisions relating to policy, but its views may, where appropriate, be included in any working group memo to the agent that informs strategic policy decisions.

3.2 Assess the market

Understanding the local telecommunications market is vital to creating an appropriate strategy for improving the market and fixing its failures. Accordingly, the market should be comprehensively assessed.



undertaking the market assessment.



Table 3: Elements of the market assessment

Elements	Description			
Market structure	 Provide an overview of the local market structure Include different layers of the market (such as retail service, wholesale, active/passive) Assess the presence and strategies of key stakeholders 			
Market segments and participants	 Analyse the major market segments (such as mobile, fixed) Analyse market participants' positions 			
Investment plans	 Assess whether market players have existing investment plans for developing networks in their market segments Existing extension plans must be considered when determining the intervention area 			
State of market failure	 Assess where the local market fails to provide affordable high- quality broadband access This insight is key to designing the intervention 			

To fully grasp the state of market failure, it is necessary to have a detailed coverage map showing where operators provide high-quality broadband access. Therefore, the next step ("define intervention area") should be conducted concurrently with this second step.

3.3 Define intervention area

bi up Barring Group	P		P	Define intervention grow
Safers Learner schip medial	-	Referier pinsjen of delivery	+	Define signation
		_		_
Popurationale	Þ	. La majorita espera e emplete en factorita	P	Properties

To create an effective strategy, one needs to know which areas of the territory lack proper access to connectivity. The intervention should be constrained to areas where

state-led intervention is necessary to reach the objectives and targets because the market fails to provide adequate services.

State-led interventions should not be undertaken where commercial investment is scheduled, which explains the need to know the operators' investment plans. Therefore, a detailed map should be created that incorporates any planned and current deployments, thus showing where services are or will be provided commercially over a specified number of years.

What is the aim of this step? A detailed national map highlighting the intervention area is another important part of the strategy document. This map will be updated during the next step ("define objectives") to identify areas where objectives are or will be reached without an intervention. It thus provides a clear understanding of where commercial enterprises are able or planning to provide high-quality broadband access and which areas require intervention.



Intervention area definition process

3.3.1 Step 1: Consult the public

Consulting the public enriches understanding of where connectivity is lacking and helps to assess the concerns, requirements and demands of people and businesses. Support from a local administration is recommended for performing this step.

3.3.2 Step 2: Engage with the industry

Industry experts should be consulted to learn their ideas on rural connectivity and how to approach the problem of limited connectivity. During this engagement exercise, connectivity providers in the market should be informed about potential new opportunities arising from the bundling of community demand. The consultation should result in the agent clearly understanding in which areas industry players are struggling to provide connectivity at an affordable price.

3.3.3 Step 3: Define the requirements

Define the requirements based on the previous consultations:

- How is market failure defined?
- How is an underserved area characterised?

The requirements will also provide the foundations for defining strategic objectives (see section 3.4). Therefore, defining the requirements with the objectives in mind will lead to a map that clearly serves strategic aims.

3.3.4 Step 4: Assess notified commercial investment plans

Some operators may have ongoing or planned investments in new networks. All notified investments should be assessed in preparation for the mapping exercise. Those plans should be compared against licence requirements to identify and understand the reasons for any discrepancies.

3.3.5 Step 5: Mapping exercise

Areas that meet the previously defined criteria should be selected and mapped to visualise where state-led intervention is necessary. This map should include:

- Areas already covered by high-quality broadband internet
- Areas where the bundling of community demand enables a market-based solution
- Underserved areas for which market participants notified investment plans
- Areas experiencing market failure, as defined in section 3.2.

To improve this map's reliability, the coverage of each operator, in line with the objectives set, could be simulated independently or by the operators themselves as part of the above-mentioned engagement. Not-spot areas will thus be clearly identified.

Drive tests/field tests can also be conducted to check the reliability of maps or as an alternative means of assessing coverage if maps are unavailable.

3.3.6 Step 6: Publish/distribute

The intervention area map should be shared with all relevant stakeholders. Consider making it available to the public and opening a channel for receiving feedback. Support from a local administration is highly recommended.

3.4 Define objectives



Objectives help guide people towards their goals and are therefore important for achieving them.

What is the aim of this step? The "objectives and goals" section is another key component of the final strategy document. The underlying objectives of the intervention strategy should include quantifiable targets that need to be reached for the objectives to be considered completed.

The outputs of step 2 ("assess the market") and step 3 ("define intervention area") provide useful inputs for defining the objectives. Table 4 provides guidance on the definition process.

Table 4: Objective definition process

Step	Description
1. Start with the market assessment	Base the development of objectives on the previously created market assessment
2. Define the objectives	 Clearly define major terms used in the objectives Ensure the objectives are measurable Tailor them to the local context Define achievable objectives
3. Underpin with quantifiable targets or key performance indicators	 Complement the objectives with numerical targets (see examples in section 3.4.1) Clearly define milestones towards target achievement and the threshold for considering an objective completed

Acquired knowledge of existing coverage will inform the definition of objectives and quantifiable targets, especially once the requirements (step 3) and the map (step 5) are respectively defined and drawn. By knowing, for example, the population of the underserved area, it will be possible to quantify targets.

Best practice example	Sub-objective
Develop intervention strategy for areas where commercial operators cannot deliver connectivity	Deliver an intervention within a given time frame to ensure a national high-speed broadband network.
Provide high-quality and reliable broadband services	Every home/business to have access to broadband with a choice of service providers. Ensure the network can meet current and future data demands.
Value for money	Design an economically advantageous procurement strategy. Maximise re-use of existing infrastructure. Incentivise additional commercial investment.
Underpin government policy on economic recovery and jobs	Stimulate job retention/growth. Enable farming, e-health, trading online, e- education, tourism, consumer savings, etc.

3.4.1 Examples of relevant targets and key performance indicators (KPIs)

These examples come from good practices observed worldwide in the industry.

Voice KPIs (all technologies):

To ensure good quality of service, it is recommended to define some level of coverage ("very good coverage," "good coverage," "limited coverage"), or at least define a field-level minimal quality of service to be reached by the different networks.

An illustrative KPI: "Provide X% of the intervention area population with 'good coverage' or Y dBm¹¹ (field level) by a defined date" (such as X = 95%, Y = -85 dBm).

Alternatively, replace "population" with "households."

Data KPIs (especially for 4G):

Several KPIs can be defined for data.

The most used concerns bandwidth speed, expressed in Mbps:

- A minimum speed to reach during a specified period: "Within the intervention area, to reach at least 8 Mbps for 90% of the time and for over X% of the population by a defined date."
- A median or average speed to reach during a specified period: "Within the intervention area, to reach a median speed of 15 Mbps over each 24-hour period by a defined date."

Some other KPIs can be set for service quality:

- The success rate of a video viewed in good quality
- The success rate of displaying a web page
- The success rate of a file transfer

3.5 Reflect principles of delivery

Larger Annual Constraints of the second seco

Defining basic guiding principles of delivery among relevant stakeholders will improve the delivery of the strategy. The aim of building a consensus on these

principles is to increase the returns of the project by decreasing costs. The best-practice principles presented in Table 5 are based on the idea that competitive markets generate benefits for consumers and that government interventions are required to fix market failures.

What is the aim of this step? This step develops a clearly defined set of principles of delivery, which are then incorporated into the strategy document and guide all further steps of the process.

¹¹ dBm is an abbreviation for the power ratio in decibels (dB) of the measured power referenced to one milliwatt (mW). It is used in radio, microwave and fibre optic networks as a measure of absolute power.

Table 5: Market-based principles of best-practice delivery¹²

Principle	Description
Deliver a material change at the service level	 The difference between connectivity in rural and urban areas is likely high The strategy should therefore aim for a material change to significantly address this gap
Stimulate private investment where appropriate	 The telecom sector has transitioned from state monopolies towards private-sector competition The strategy should not lead to a revival of state-centred deployments
Intervene only where the market does not deliver	 Competitive markets tend to create benefits for consumers Therefore, government-led interventions should address only areas experiencing market failure The intervention area should be limited to locations where commercial operators do not plan to roll out a network
Minimise the amount of state subsidy where possible	 Aim to maximise value for public money Subsidise only if and where necessary Trade-offs between: overall cost and government asset control intervention cost vs. consumer prices cost vs. creating level playing field Trade-offs need to be considered and balanced Any public subsidy should be subject to a "return to better fortune" clause
Promote competition through fair wholesale access	 Open access to wholesale networks for increased competition Focus on providing wholesale services instead of retail services to avoid distorting the competitive landscape Efficient private-sector participation through competitive open tenders for delivery
Maintain technology neutrality	 Technology develops faster than public planning processes can adapt Therefore, the strategy should not restrict or demand the use of specific technologies, but focus instead on service delivery
Maximise total economic benefit	 Increased connectivity enhances the total economic benefit This principle also helps establish the competition and minimise the state subsidy
Maintain legal and regulatory compliance	 The strategy must comply with the current regulatory system It should avoid conflicts with existing laws and regulations

¹² PwC (2015). Broadband strategy for Ireland. Post-consultation strategy.

3.6 Select ownership model

In cases where new infrastructure is constructed, it is important to decide on the final ownership model. The chosen model should ensure competition, choice of retail service providers, and transparent, equal terms for network access.

What is the aim of this step? This step involves choosing the ownership model for any new infrastructure. To guide the process, this section outlines the different models and illustrates a process for deciding on the final model.

Except for a commercial roll-out, achieving mobile coverage in rural areas requires some level of subsidy to incentivise frequency owners. Since most of the investment is directed to financing passive infrastructure (such as towers, energy and connectivity), the model should be geared towards making the project financially viable. The model should also minimise possible complexities in both the award and operation. Gap funding or concession models are of great interest in this context.

Model examples	Owner	Finance	Design	Build	Operation	Comment
Example 1: Commercial roll-out	Private	Private	Private	Private	Private	Incentives other than direct financing
Example 2: Gap funding	Private	Private + Public grant	Private	Private	Private	Supported by a public grant, if required
Example 3: Full concession	Public	Private	Private	Private	Private	Asset reverts to public ownership
Example 4: Corporate joint venture	Private + Public	Private + Public	Private + Public	Private + Public	Private + Public	Notably used for submarine cables
Example 5: Operating concession	Public	Public	Private + Public	Private	Private	Establishing a new operator adds extra complexity
Example 6: Public	Public	Public	Public	Public	Public	Design and construction services contracted

Table 6: Examples of ownership models¹³



¹³ Sources: KPMG (2015). Ownership report. National broadband intervention strategy; EIB-EPEC (2012). <u>Broadband.</u> <u>Delivering next generation access through PPP</u>.

3.6.1 Example 1: Commercial roll-out

A commercial roll-out can be achieved through non-financial support from the government, such as establishing a reliable regulatory system in which a telecommunication regulator operates predictably and consistently.

3.6.2 Example 2: Gap funding

The whole process from design to financing, construction and operation is undertaken by a private company. The requirements, rights and duties are organised through a contract with the government. At the end of the contract the private company retains ownership of the constructed network.

Model element	Description
Possible contract duration	25 years
Public grant if required and provided efficient financing is available	 Conditional public grant as a capital subsidy if required: Covers minimum amount of project delivery (deployment and operation) plus acceptable rate of return Clawback provision based on actual financial performance compared to forecasts Grant payment subject to operator meeting performance standards defined in the contract
Risk distribution	 Operational and deployment risk borne by private sector Reputational and policy risk in case of company failure Public/private sector bears risks proportionate to funding contributions

How to establish this model

The government body responsible for digital infrastructure runs a competitive procurement process. At the end of this process, the bidder with the best tender (according to the predefined evaluation criteria) is chosen to deliver the project.

3.6.3 Example 3: Full concession

In a full concession model, a private company undertakes the design, financing, construction and operation under a contract with the government, with the constructed network reverting to public ownership when the contract expires. For the duration of the contract, the private company derives economic benefit from the infrastructure. The nature of the asset that will revert to public ownership needs careful assessment to ensure the infrastructure will remain operational.

Model element	Description
Possible contract duration	25 years
Public grant if required and provided efficient financing is available	 Conditional public grant as capital subsidy if required: Covers minimum amount of project delivery (deployment and operation) plus acceptable rate of return Clawback provision based on actual financial performance compared to forecasts Grant payment subject to operator meeting performance standards defined in the contract
Risk distribution	 Operational and deployment risk borne by private sector Reputational and policy risk in case of company failure Public/private risks related to funding contributions After contract ends, ownership risk borne by public sector

How to establish this model

A competitive procurement process should be undertaken, with the bidder submitting the most economically advantageous tender being selected to deliver the project.

3.6.4 Example 4: Corporate joint venture (public–private partnership)

For this model, a joint venture between the state and a private-sector partner is established. This jointly owned company designs, builds and operates the wholesale network.

Model element	Description		
Equity	Possibly owned by both parties 50:50		
Public grant if required and provided efficient financing is available	 State pays a grant to cover the gap in commercial viability, if required All grant payments are subject to contractual conditions 		
Risk distribution	 Sharing of ownership, deployment and operational risks and rewards Risk mitigation through subcontracting construction and, potentially, operation 		

How to establish this model

A special purpose vehicle is established through equity contributions from the state and the privatesector partner. The usual share distribution is 50:50, but alternatives can be considered that will likely also alter the distribution of risk and reward. To renew infrastructure or to ensure that objectives are met, additional equity may be required during the life of the joint venture: the state can choose, or may be required, to provide this to keep its equity share at the same level.

3.6.5 Example 5: Operating concession

An operating concession requires high investment by the public sector as the government funds and owns the infrastructure, provided efficient financing is available. The design, construction and operation of the network is undertaken by a private-sector partner.

Model element	Description
End of contract	Government decides whether to operate the network itself, sell it, or retender the contract
Risk distribution	 Private sector benefits economically and bears the operational risks until the contract ends
	Government bears financial, reinvestment and ownership risks

How to establish this model

The responsible government body runs a competitive procurement process; the bidder submitting the best tender (according to predefined evaluation criteria) is selected to deliver the project.

3.6.6 Example 6: Public

In this model, a wholesale network is designed, built, operated and owned by the government through a state entity. The private sector's only involvement is through government procurement and contracts. All benefits and risks are with the state, and high investment of state funds is required. There is also a high risk of losing the efficiencies of a market-based solution. Therefore, this model is not advisable for market-based economies.

3.7 Procurement: Prepare a tender

If the chosen intervention includes the need to procure from private-sector partners, a procurement process must be undertaken according to applicable procurement

rules. The procurement approach should be adapted to the preferred ownership model. The procurement process should be based on clear principles determined before inviting bids. These principles could include, for example:

- Maximising competition among bidders
- Extracting benefits from each operator's comparative advantages
- Ensuring compatibility with investment incentives

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Steps	Description
1. Define technical tender specifications	 Define these specifications in a terms of reference (ToR) document Include important criteria
	Define evaluation criteria
	Refer to best-practice document examples
2. Define lots	The intervention area can be split into multiple geographical lotsIt can alternatively be covered by one single lot
3. Define procurement process type	The process should serve the procurement principlesChoose a single- or multiple-lot process
4. Procurement process commences	 Publish the ToR Collect bids Evaluate bids through an evaluation committee
5. Award contract	 Award the contract after selecting the best offer according to predefined criteria

3.7.1 Step 1: Define technical tender specifications

The technical specifications, or ToR, constitute a major part of the tender document and should be set out clearly so all bidders know and understand the criteria. If the subject of the contract will be divided into lots, this should be explained and a separate section devoted to each lot.

The ToR must give equal access to tenderers and create no unjustified obstacles to competitive tendering.

The ToR describe in detail the essential characteristics of the required works, supplies and/or services. Items to be covered include:

- Work schedule
- Deliverables: type, delivery timetable, acceptance conditions
- Place of performance
- Conditions of delivery or performance
- Information to be provided by the agent
- Definition of critical success factors, identifying the most important things to do strategically, technically, organisationally or procedurally
- Definition of KPIs on the expected quality level and how work will be evaluated
- Duration of assignment
- Resources required (specific qualifications or types of expertise that service providers' staff must have)
- Any other requirements

According to best practices the ToR should, for example, not refer to specific makes, processes, trademarks, patents, types or origins. If a sufficiently detailed description cannot be created without doing so, then any specific characteristic could be cited with an accompanying comment such as "or equivalent."

It is important to specify the desired degree of reporting in the ToR, namely whether annual reports or interim progress reports are expected. This ToR section should also explain the approval process. To improve compliance, financial consequences should be stipulated for failing to meet reporting requirements. For payments to be withheld in the event of unsatisfactory reports, this right must be specified in the contract.

3.7.2 Step 2: Define lots

The ToR should include any definition of lots. Dividing a project into lots may make it more accessible to a broader range of implementing parties. Appropriately-sized lots encourage the participation of small- and medium-sized businesses, while also increasing competition for very high-value contracts that would otherwise only receive bids from a small number of large companies with sufficient resources to manage the extensive responsibilities. Lots can be created along geographic but also thematic lines (for example, different services provided by specialised industries such as web design or video editing).

To increase rural connectivity, lots can be geographically delineated into coherent packages, if deemed useful by the agent. In this case, the country is split into a number of geographic lots potentially awarded to different bidders. Alternatively, a single lot can cover the whole country.

A number of questions need to be answered when designing the lots:



3.7.3 Step 3: Single- vs. multiple-lot process

To decide whether a single- or multiple-lot process is more suitable, process features should be considered and the advantages and disadvantages of each option carefully weighed up. Table 7 offers useful guidance on this decision.

Table 7: Characteristics of single- and multiple-lot processes

Single-lot process	Multiple-lot process
Potentially less competition: If the geographic scope of the intervention area is too large, small and mid-size bidders might be excluded. This could be overcome by forming joint bids or consortia, but this brings increased cooperation problems.	Increased competition: Smaller lots can attract more bidders, which increases competition in the procurement process.
Economies of scale: The larger the lot, the larger the potential economies of scale in deployment or operation.	Leverage competitive advantages: Competitive advantages of certain bidders (such as an innovation network in a certain region or synergies with existing infrastructure) can be better highlighted in multiple-lot processes.

Easier access for retail service providers: A single lot means only one point of contact for retail service providers, which reduces their market entry barrier and costs.	Option of a single operator bidding for every lot: A multiple-lot process can be designed to allow one bidder to submit bids for the whole intervention area.
Simple procurement: Only one bid needs to be prepared by each bidder.	
Simple governance: Subsequent network governance processes are easier and cheaper to organise.	

A single-lot process lowers complexity for the principal in terms of the procurement process, governance and evaluation. The resulting wholesale network may also be less complex if constructed by a single entity, and potentially easier to access for retail service providers. However, the risk of running an uncompetitive single-lot procurement process may outweigh the downsides of a multiple-lot process. Reduced competitive pressure may increase the required state subsidy for delivering the network and may tempt bidders not to pass on the benefits of economies of scale. Allowing single bidders to bid for the whole intervention area or a combination of lots could encourage the transfer of economies of scale, thus reducing the required subsidy.

The right size and number of lots should be defined after consulting relevant industry players and government entities. Dividing a project into a small number of lots may strike a good balance between single- and multiple-lot processes. Local features that might hinder or encourage cooperation in certain regions need to be considered.

Potential risks and costs resulting from a high number of lots include the following:¹⁴

- High costs of governance for a larger number of operators;
- Increased risk of operator default occurring during the contract period;
- Inefficient network design;
- Loss of economies of scale in network operations and maintenance, and duplication of fixed costs, such as for setting up wholesale service platforms;
- Risk of not achieving the intervention on time (due to delays resulting from dealing with many operators);
- Inefficient network interconnections;
- Potential for multiple infrastructure, leading to inefficient wholesale supply in the intervention area retail service providers may have to purchase wholesale services from many different suppliers, potentially entailing higher costs through process duplication and the need to adjust systems to interface with those of several suppliers.

3.8 Procurement: Complete an open competitive tender¹⁵



An open procurement process is a good way to identify the best bid(s) for the defined lots from a large number of qualified private-sector partners. Transparency, non-discrimination and equal treatment are major principles of this process, which ends with the selection of the best bid and awarding of the contract. The agent needs to ensure that every stage of the procurement process is sufficiently documented to justify any decision taken.

¹⁴ PwC (2015). Broadband strategy for Ireland. Post-consultation strategy.

¹⁵ EIB (2016). *Vademecum on corporate procurement at the EIB, 2016*.

Open competitive tender	Description
1. Consider a preliminary market consultation	 Seek advice from independent experts, authorities or market participants to better understand the market Ensure this process does not distort competition or violate principles of non-discrimination and transparency
2. Publish a prior information notice	 This notice is used to inform economic operators ahead of the process about the publication of the tender
3. Open the tender by publishing a contract notice	 Set up a signing committee of at least three people with procurement experience Draft a contract notice to be signed by the committee Publish it in the intervention country's official journal and ideally online Attach the ToR to the contract notice Specify how bids should be submitted After the notice has been published, no material content changes can be made without cancelling the procedure
4. Publish any additional notices (if required)	 Keep the market informed (for example, publish a notice if the deadline for receiving bids is changed) Publish them in the same way as the contract notice
5. Receive bids	 Only accept bids contained in sealed envelopes Evaluate all accepted tenders in an equal and non-discriminatory manner
6. Evaluate bids	 Set up an evaluation committee of at least three people with procurement experience. Outside experts with no conflicts of interest can be appointed to observe the process Evaluate the bids according to the ToR evaluation criteria Publish a report of the evaluation
7. Confirm the award of a contract	 Publish a notice of award of contract Inform the successful and any unsuccessful tenderers Communicate clearly that the agent is only legally bound once a contract is signed The procedure could still be cancelled after confirming the award of a contract, with no entitlement to compensation

Table 8: Major elements of an open competitive tender process

3.8.1 Evaluation of tenders

To ensure the best tender is selected, the evaluation needs to follow a set of principles for equal treatment and non-discrimination. The evaluation committee must evaluate bids only according to the award criteria defined in the ToR. The committee should comprise at least three members. Outside experts with no conflicts of interest can be included as additional observers.

Bids not meeting all requirements defined in the published documents should be discarded, though the committee can ask tenderers to provide additional documents/materials before the predefined deadline for bid submission expires.

The following are examples of tenders not meeting the requirements:¹⁶

- Tenders differ on a point of substance from the detailed description of the contract subject in the specifications;
- Tenders propose a different solution to the one prescribed (unless variants are allowed);
- Tenders involve variants not permitted by the contract notice or specifications;
- Tenders propose a price above a fixed (non-indicative) maximum amount specified in the procurement documents;
- Tenderers do not accept the contractual terms or other conditions contained in the call for tenders and seek to impose their own conditions or contract;
- Required tender documents are incomplete, with one or more substantive parts missing.

In the case of an unusually low price, the agent can request a detailed explanation from the tenderer; if the explanatory information is unsatisfactory, the tenderer can be excluded. Special consideration should be given to potentially low prices due to non-compliance with laws or environmental, social and labour protection.

Candidates that clearly misrepresent information and fail to correct this when requested should be excluded. It is also necessary to exclude any candidate with a clear conflict of interest, which can be economic but also political or linked to national affinity or family/emotional ties.

¹⁶ EIB (2016). *Vademecum on corporate procurement at the EIB, 2016*.

3.8.2 Evaluation committee report

Ideally, the discussions and results of the evaluation committee should be compiled in a report, including the elements described in Table 9.

Table 9: Elements of the evaluation committee report

Report element	Description
Details of the contracting authority and contract	 Name Address Contract topic Contract value
Details of the pre- selected tenderers	Names of the selected and rejected tenderersReasons for selection and rejection
Comments on unusually low prices	 Reasons for rejection, if rejected on the basis of unusually low prices
Details of the successful tenderer	 Name Reason for selection Description of which lots have been awarded Share of subcontracted work Names of main subcontractors, if any
Information on conflicts of interest	Potential conflicts of interest detectedAny measures taken

3.9 Contract

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After completion of the procurement process, a contract is agreed between the respective government and the selected private-sector partner(s). Two originals of

the final contract should be sent to the provider for signature, with one signed original returned to the agent. Any contract signed by both parties should be copied and safely stored.

An important type of contract in this context is the concession contract. This is used to delegate the execution of works and/or management of services to a contractor. It tends to have a long duration and consider the operator's need to achieve a reasonable return on investment. This type of contract allows for the creation of new infrastructure without increasing debt, as the cost and profit are shifted to the private sector.

Table 10: Key contract elements

Contract elements	Description
Key definitions	 Include a list of definitions for key terms used in the contract Include definitions for any abbreviations used
Commencement and duration of the contract	 Commencement date of the contract Duration and any break clauses Description of different contract stages within the time frame, if applicable The duration should strike a balance between flexibility and predictability Technology improves quickly but the contract should be long enough to deploy the network and generate profits
Operator's obligations and warranties	 Reference to existing regulations Description of specific obligations of the operator
Progress meetings and reporting	 Define meeting schedule Define what needs to be included in progress reports, and any benchmarks Define when progress reports should be submitted
Delays and consequences	 Explain how delays are assessed and communicated Define any financial (or other) consequences of delays
Confidentiality	 Details on how each party will protect the other's confidential information Terms on what information can be published regarding contract breaches or non-conformity
Termination	 Conditions for termination in cases of contract breach (including notice period) Conditions for contract termination without cause (including notice period)
Force majeure	 Conditions for ending the agreement in case of unforeseen events beyond the reasonable control of a contract party
Notices	Conditions for notices to be considered valid
Disputes	Details of the process for settling disputes
Definition of the intervention area	Describe the intervention areaDefine the different lots
Operator's project plan	 Include detailed information about the operator's project plan Maps of the deployment area Description of the operator's deliverables, including expected completion dates and timelines
End of contract arrangements	 Describe the arrangements for after the contract ends Ensure that suitable wholesale service provision continues Ideally design the contract to protect end users against unintended effects after contractual obligations end

4 Project management

The contract is the document that will guide the life of the project and dealings between the agent and its partner.

To effectively monitor the partner's performance, it is recommended to set up another steering group, which can differ from the group set up to initiate the project (see section 3.1): instead of developing a strategy, it will follow the extent to which the partner leading the project adheres to the established strategy. The steering group should be formed of experts and stakeholder representatives that oversee project development and strategy implementation.

As mentioned above, this steering group could set up other groups or subcommittees, including a working group to directly manage project operations and some local groups to ensure the strategy suits the context and to supervise the project locally. These groups report directly to the steering group.

To confirm the partner has achieved its goals, especially about targets and KPIs, it is recommended to perform drive tests/field tests to check network efficiency and the reality of mobile coverage.



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Rural connectivity toolkit

Improving digital coverage with innovative financing