Methodology of Pricing Model of Access to Physical Infrastructure

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pwc

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Should you have any questions with regards to the methodology itself or findings included therein please do not hesitate to contact us:

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1. Introduction

The document was prepared as part of the project *Development of methodology and corresponding pricing model of access to physical infrastructure.* The implementation of the project is governed by the Agreement on State Procurement concluded between the N(N)Le Open Net and PricewaterhouseCoopers Advisory s.r.o. ("PwC"), dated 14. 03.2024 and the relevant annexes.

The main purpose of this document is to provide:

- Definition of services and description of related costs
- An overview of cost calculation approaches
- An overview of calculation process

The document consists of three main methodologies:

- Methodology of the BU LRIC+ model for linear physical infrastructure
- Methodology of the BU LRIC+ model for non-linear physical infrastructure
- Methodology of the BU LRIC+ model for access to buildings and entrances to buildings, including interface points, infrastructure for provision of access to in-building infrastructure

The methodology is based on:

- The EC Recommendation of 11/9/2013 on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment[1] - which describes costing methodologies to be used in regulating physical infrastructure access prices
- Experience of PwC during development of LRIC+ costing models
- Consultations and meeting with the regulatory authority and other relevant stakeholders

In order to achieve the objectives set by ComCom, the BU LRIC+ is the most common approach for determining the cost of access to the physical infrastructure, that is in line with European Commission recommendations.

[1] Recommendation 2013/466/EU of the European Commision of 11 September 2013 on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013H0466

2. Purpose of document and applicable legislative framework

The objective of the methodology is to describe the procedure for calculating the long-term incremental cost (LRIC+) of access to physical infrastructure for metallic and fibre optic cable retraction (including placement of adjacent active and passive technologies for electronic communications. For the avoidance of doubt, the active network elements are out of the scope of this methodology and the relevant costing model. The methodology serves as a summary of guiding principles for development of a cost model for calculation of eligible costs in case of potential dispute on pricing conditions between physical infrastructure access seeker and provider.

The present procedures are interpreted taking into account the international agreements of Georgia, EU recommendations and the best international practices. The relevant EU legislation includes in particular:

- Directive (EU) 2018/1972 establishing the European Electronic Communications Code
- Directive 2014/61/EU of the European Parliament and of the Council of 15 May 2014 on measures to reduce the cost of deploying high-speed electronic communications networks
- Commission Recommendation of 11 September 2013 on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment (hereinafter "EC Recommendation")

The basic objective of the methodology is to ensure cost recovery by the operator together with an adequate return on invested capital. The methodology should appropriately ensure effective competition in the physical access market, while at the same time sufficiently incentivising operators to invest in upgrading infrastructure, in particular through the deployment of NGA.A costing methodology that provides the appropriate 'build-or-buy' signal strikes an appropriate balance between ensuring efficient entry and sufficient incentives to invest and, in particular, to deploy NGA networks and hence deliver new, faster and better-quality broadband services."

For calculation of relevant costs based on relevant Regulatory Asset Base in the case of physical infrastructure, the EC Recommendation defines 2 types of elements of this infrastructure, from which further assumptions for determining the method of cost calculation are then derived, namely:

Within the **Definitions**:

"(o) „Non-reusable civil engineering assets' are those legacy civil engineering assets that are used for the copper network but cannot be reused to accommodate an NGA network.

(r) „Reusable civil engineering assets' are those legacy civil engineering assets that are used for the copper network and can be reused to accommodate an NGA network."

The EC Recommendation further provides under the **Costing Methodology section:**

A) for <u>Reusable civil engineering assets of physical infrastructure</u>:

"34. NRAs should value reusable legacy civil engineering assets and their corresponding RAB on the basis of the indexation method. Specifically, NRAs should set the RAB for this type of assets at the regulatory accounting value net of the accumulated depreciation at the time of calculation, indexed by an appropriate price index, such as the retail price index. NRAs should examine the accounts of the SMP operator[2] where available in order to determine whether they are sufficiently reliable as a basis to reconstruct the regulatory accounting value. They should otherwise conduct a valuation on the basis of a benchmark of best practices in comparable Member States. ***NRAs should not include reusable legacy civil engineering assets that are fully depreciated but still in use.***

35. When applying the method for asset valuation set out in point 34, NRAs should lock-in the RAB corresponding to the reusable legacy civil engineering assets and then roll it forward from one regulatory period to the next.

[2] In the context of this methodology it implies a network owner.

36. NRAs should set the lifetime of the civil engineering assets at a duration corresponding to the expected period of time during which the asset is useful and to the demand profile. ***This is normally not less than 40 years in the case of ducts.****"*

And also:

"(34) Unlike assets such as the technical equipment and the transmission medium (for example fibre), ***civil engineering assets*** *(for example ducts, trenches and poles) are assets* ***that are unlikely to be replicated.*** *Technological change and the level of competition and retail demand are not expected to allow alternative operators to deploy a parallel civil engineering infrastructure, at least where the legacy civil engineering infrastructure assets can be reused for deploying an NGA network.*

(35) In the recommended costing methodology the Regulatory Asset Base (RAB) corresponding to the reusable legacy civil engineering assets is valued at current costs, taking account of the assets' elapsed economic life and thus of the costs already recovered by the regulated SMP operator. This approach sends efficient market entry signals for build or buy decisions and avoids the risk of a cost over-recovery for reusable legacy civil infrastructure. An over-recovery of costs would not be justified to ensure efficient entry and preserve the incentives to invest because the build option is not economically feasible for this asset category.

(36) The indexation method would be applied to calculate current costs for the RAB corresponding to the reusable legacy civil engineering assets. This method is preferred due to its practicability, robustness and transparency. It would ***rely on historical data*** *on expenditure, accumulated depreciation and asset disposal, to the extent that these are available from the regulated SMP operator's statutory and regulatory accounts and financial reports and on a publically available price index such as the retail price index.*

(37) Therefore, the initial RAB corresponding to the reusable legacy civil engineering assets would be set at the regulatory accounting value, net of the accumulated depreciation at the time of calculation and indexed by an appropriate price index, such as the retail price index.

(38) The initial RAB would then be locked-in and rolled forward from one regulatory period to the next. The locking-in of the RAB ensures that once a non-replicable reusable legacy civil engineering asset is fully depreciated, this asset is no longer part of the RAB and therefore no longer represents a cost for the access seeker, in the same way as it is no longer a cost for the SMP operator. Such an approach would further ensure adequate remuneration for the SMP operator and at the same time provide regulatory certainty for both the SMP operator and access seekers over time."

B) for Non-reusable assets states:

"33. NRAs should value all assets constituting the RAB of the modelled network on the basis of replacement costs, except for reusable legacy civil engineering assets."

In general, the EC Recommendation identifies the best method for determining the cost of wholesale access service as the **Long Run Incremental Cost Model (BU LRIC+)**. The LRIC+ model accounts for the incremental capital and operating costs incurred by a hypothetical efficient operator providing all access services, with its price increased by a value that allows for the recovery of common costs. However, for the category of Reusable Assets, the specific approach described above requires.

A more detailed description of the implementation of these provisions will be described in Chapter 3 of this document.

3. Definition of services and description of related costs

3.1. Access to the linear physical infrastructure

Access to linear physical infrastructure is carried out under the sharing access service.

The service provides the user with free openings in the physical infrastructure for the purpose of placing metallic or fibre optic cables or other elements. Physical linear infrastructure elements in this methodology include duct, HDPE tube, multitube or Mini/microtube, and relevant accompanying components, including installation and maintenance manholes, and cabinets. Services include the following infrastructure elements or their functional equivalents:

- **Duct** - a pipe or a tubular channel for carrying electric power lines, telecommunication cables or other conductors, placed both over and under the ground, with underground ducts terminating into manholes (cable manholes for inspection and maintenance). Above ground duct usually terminate in cabinets or distribution boxes. Ducts can be used to install - cables, - tubes, or - multitubes; Its course can be divided into sections defined by manipulation manholes.

  Each duct can have a different structure with a different number of holes with different measurements.

  Part of duct structure is Duct Bank, which is the collection of underground ducts, consisting of several openings integrated into a single unit (body) The body of a duct banks is made of concrete or polyethylene. Duct bunks can have a different structure with a different number of holes with different measurements.

- **Tube** - long hollow cylinder placed directly in a trench (cuvette) or in a hole of a duct, which is mostly made of HDPE (high density polyethylene). Tube, when placed directly in a trench doesn't use manholes . The purpose of the tube is to install cables, multitubes, mini/microtubes or transport liquids or gases. Access to underground Tube is only possible after exposing the surface of the trench, if installed in a trench; or through a Manhole, if installed in a duct.

  In practice, they usually have a diameter of 32 or 40 millimeters and are used for outdoor infrastructure. The basic production length of a single HDPE tube is usually 1600 meters. The required length being achieved by joining the individual tubes with tube couplings.

- **Multitube –** A tube placed directly in a trench (cuvette), in a hole in a Duct, or in a Tube that consists of multiple Tubes into which the cable is installed and made of HDPE material (high-density polyethylene)

- **Mini/microtube -** a mini/microtube is made of MDPE (medium density polyethylene) or HDPE (high density polyethylene) and is used for installing cables.

  In practice, mini and microtubes are stored in ducts, HDPE tubes and multitubes. The size of the multitube depends on the amount of tubing it can contain.

The service Access to physical infrastructure is subject to technical capacities of the network owner and includes exclusively passive infrastructure, without any active elements or cabling. This methodology assumes a single average price per m at national level, taking into account geographical specificities on the weighted average basis. Eligible cost and price elements related to the physical infrastructures access include:

1. **one-off/occasional payment/price** of setting up, modifying, cancellation or on-demand field support

   When calculating prices for one-off/occasional services, it is necessary to allocate the time spent on the specific service using predefined process types. One-off services imply services such as setting up or restoring access to physical infrastructure when necessary, as supplied by the Provider. One-off services for the purpose of this methodology are divided into 5 categories - **Wholesale, Back-office, Technical Implementation, Technical Support and External Contractors**. In practice, these are mainly costs incurred in relation to the service of enabling access to elements of physical infrastructure, or supervising access to elements of physical infrastructure, or realising access to elements of physical infrastructure, particularly in terms of removing barriers and creating conditions for access beyond bringing the infrastructure up to the standard state necessary for the provision of the service of access to physical infrastructure.

2. **recurring monthly rental payments/price** which include:
   a. **directly attributable design and engineering costs,** such as costs for design-build documentation, documentation associated with building permits and reporting obligations, temporary traffic restriction projects, and associated legislative and administrative fees; allocated proportionally according to the type of infrastructure element in line with causality principle
   b. **directly attributable costs related to the lease of the area/establishment of the easement**, including geodetic costs; proportionally allocated depending on the type of infrastructure element in line with causality principle
   c. **directly attributable civil engineering costs**, including earthwork and other civil works, such as excavation and capping, formwork and concrete works, material movements, horizontal drilling, stamping, water extraction, works related to the relocation and protection of other network structures and connections, and the cost of civil works related to the restoration of the surface to its original condition; pro rata allocated according to the type of infrastructure element in line with causality principle
   d. **directly attributable material**, such as concrete, manholes, junctions, aboveground cabinets and connectors; proportionally allocated depending on the type of infrastructure element in line with causality principle
   e. **directly attributable maintenance costs**; proportionally allocated according to the type of infrastructure element in line with causality principle
   f. **Other ad-hoc costs** directly attributable to infrastructure elements; proportionally allocated depending on the type of infrastructure element in line with causality principle.

From the above-described costs of linear physical infrastructure, economically unjustified costs defined in section 3.4 are excluded.

Given the hierarchical nature[3] of the costs associated with the above elements, it is essential to exclude any duplication of costs, as well as allocate the common costs of these elements proportionally. In case a hierarchically higher infrastructure element (e.g. a tube) is located in a hierarchically lower infrastructure element (e.g. a duct), it will not be considered separately in terms of cost, but will be included in the total cost of the item. However, since the tube occupies a smaller space in the overall diameter of the infrastructure, the allocated cost will take into account the proportion of the diameter used, regardless of occupancy.

3.2. Non-linear physical infrastructure

As part of the non-linear physical infrastructure access, the Provider agrees to let the Applicant use the poles, or space on the pole, masts, towers or antenna assemblies, cabinets and other. Thus, a pole is an element of physical infrastructure on which high-speed network lines or equipment can be placed and operated. The Non-linear physical infrastructure is subject to the technical capacities of the Provider, and includes passive infrastructure only, without any active elements or cabling. This methodology assumes a single average price per piece at national level, taking into account geographical specificities on a weighted average basis.

Eligible costs associated with the rental of poles include:

1. **one-off/occasional payment/price** of setting up, modifying, cancellation or on-demand field support

[3] Hierarchical nature represents various infrastructure layers used. For example, microtube can be placed in HDPE tube, which is placed either directly in trench or in duct, which is placed in trench; while there might be multiple elements placed in each layer (e.g. more HDPE tubes in a duct). The model allocates the relevant proportion of each element.

When calculating prices for one-off/occasional services, it is necessary to allocate the time spent on the specific service using predefined process types. One-off services imply services such as setting up or restoring access to poles when necessary, as they have to be provided by the Provider. One-off services for the purpose of this methodology are divided into 5 categories - **Wholesale, Back-office, Technical Implementation, Technical Support and External Contractors.** In practice, these are mainly costs incurred in relation to the service of enabling pole access, or supervising pole access, or realising pole access, particularly in terms of removing barriers and creating conditions for access beyond bringing the infrastructure up to the standard state necessary for the provision of pole access service.

2. **recurring monthly rental payment/price** which include:
   a. **directly attributable design and engineering costs**
   b. **directly attributable costs related to the lease of the area/establishment of the easement**
   c. **directly attributable construction costs**, including earthwork and other construction work and materials
   d. **directly attributable maintenance costs**
   e. **other ad-hoc costs**

Economically ineligible costs are excluded from the non-linear physical infrastructure costs described above.

3.3. Access to buildings and entrances to buildings, including interface points, infrastructure for the provision of access to in-building infrastructure

The rental service includes rental of physical infrastructure or installations at the end-user's location, intended to host wired and/or wireless access networks, where such access networks are capable of delivering electronic communications services and connecting the building access point with the network termination point (hereinafter referred to as a vertical infrastructure for the purposes of this methodology). The price is calculated per m or per piece of device, depending on the specific characteristic of the service.

The vertical infrastructure rental service is subject to technical capacities of the Provider and includes only physical infrastructure excluding any active elements. This methodology assumes a single average price per piece of equipment or m at the national level, calculated based on costs incurred by the access service Provider.

Eligible costs related to the rental of vertical infrastructure include:

1. **one-off/occasional payment/price** of setting up, modifying, cancellation or on-demand field support

   When calculating prices for one-off/occasional services, it is necessary to allocate the time spent on the specific service using predefined process types. One-off services imply services such as setting up or restoring access to described physical infrastructure when necessary, as supplied by the Provider. One-off services for the purpose of this methodology are divided into 5 categories - **Wholesale, Back-office, Technical Implementation, Technical Support and External Contractors.** In practice, these are mainly costs demonstrably incurred in relation to the service of enabling access to buildings and elements of in-building infrastructure, or supervising access to elements of such physical infrastructure, or realising access to elements of such physical infrastructure, particularly in terms of removing barriers and creating conditions for access beyond bringing the infrastructure up to the standard state necessary for the provision of the service of access to defined physical infrastructure.

2. **recurring monthly rental payment/price** which include:
   a. **directly attributable design and engineering costs**; proportionally allocated according to the type of infrastructure element in line with causality principle
   b. **directly attributable costs related to the lease of the area/establishment of the easement**; proportionally allocated according to the type of infrastructure element in line with causality principle
   c. **directly attributable construction costs**, including earthwork and other construction work and materials related to the installation of vertical infrastructure elements; proportionally allocated according to the type of infrastructure element in line with causality principle

d. **directly attributable maintenance costs**; proportionally allocated according to the type of infrastructure element in line with causality principle
e. **other ad-hoc costs**; proportionally allocated according to the type of infrastructure element in line with causality principle

From the above-described costs of renting access to buildings and elements of in-building infrastructure, economically unjustified costs are excluded, as well as the costs which were not incurred by the service Provider (e.g. costs incurred by the real estate owner, developer etc.).

Given the physical infrastructure in the buildings, at the entrances to buildings, including interface points, is generally under the management of the building owner, who is not subject to the regulation of the telecommunication sector, the price of access to such infrastructure is subject to commercial agreement between the owner of the infrastructure and the operator. The model calculates only rental price for the infrastructure that is owned by the infrastructure operator and should be rented to the interested parties for the pre-agreed fee.

3.4. Economically unjustified costs

The economically unjustified costs include costs which have not been incurred in accordance with the cost-effective provision of services. Examples of such a costs are:

a) Costs resulting from calculation errors, bookkeeping calculations, duplicate charges;
b) Costs of unused investments;
c) Indirect costs that are not related to the provision of services described in sections 3.1 to 3.3 of this methodology;
d) Inefficiently spent costs;
e) Extraordinary costs;
f) Tax non-deductible costs *[to be added by ComCom according to the national legislation].*

4. Cost calculation approaches

This chapter focuses on the evaluation of different alternatives for modelling the costs of services, describing the theoretical methods and procedures chosen taking into account legislative constraints and best-practice:

4.1. Geographical assumptions

Every economic-technical model is a simplification of reality because it is not possible to model each network element separately. In defining the geographic assumptions of the model, the following factors must be taken into account: the type of a settlement and the terrain conditions that define the placement, technical parameters and costs of the different network elements.

For the purpose of this methodology, the territory of Georgia will be divided into **3 so-called "geotypes"** for the purpose of this model:

- **Geotype A) Settlements and parts of settlements with dense construction**

  The category is characterised by the heavy concrete surfacing, with the need for reinstatement, need for relocation and crossing of utilities networks and roads, various historic constraints in central parts of settlements and buildings.

- **Geotype B) Settlements and parts of settlements without dense construction**

  The category is characterised by predominantly grass surface coverage in urbanised areas, usually outside settlement areas, with only rare need for relocation and crossing of utilities networks and roads.

- **Geotype C) Territory outside the settlement**

  The category of terrain is assumed to be predominantly located within arable land or alongside road infrastructure with no hard surfacing.

Each of these types has different costs for the placement of physical infrastructure due to the difficulty of the terrain, such as steepness, costs of constraining third parties during construction, natural barriers (e.g. watercourses), road and transport route crossings, nature reserves, etc. Depending on the complexity of the physical infrastructure construction, different coefficients may be used for different units:

- Coefficient 1) Non-challenging
- Coefficient 2) Moderately challenging
- Coefficient 3) Challenging

Thus, in total, the individual elements of physical infrastructure will be located in 1 of 9 units with different coefficients. This classification will not be used to differentiate the pricing of the services offered (as these will have a uniform national level), but to allow for a better understanding of the cost variability and the possibility to cross-check data inputs of the service provider against publicly available information and inputs of other network operators when determining the cost of access providers.

4.2. Topology of modeled network

For the purpose of this model, the real topology of passive infrastructure network of access provider is taken into consideration. However, pricing attributes and relevance of cost consideration are in-line with guidelines set in EC recommendation and described in Section 2 of this document.

4.3. Bottom-up vs. Top-down

4.3.1. BU LRIC+ costing model

Economic theory suggests that the optimal price of a service is achieved when the marginal revenue equals the marginal cost of providing a service. Marginal costs in this context are defined as the increase in the cost base associated with the provision of one additional unit of service. However, the telecommunications industry is characterised by a high level of fixed common costs for individual services and long investment cycles. The concept of long-run average incremental costs assumes that both variable and fixed costs are variable in the long run.

Under the LRIC+ concept, the costs incurred as a result of providing an additional unit of a particular service are to be calculated in a way that takes into account the future average incremental costs incurred over the long term. The concept takes into account the cost of investment in new infrastructure and network elements, assuming the use of the most efficient technology available, as well as the cost of existing infrastructure or network elements, but only that part which is used to provide the service.

The basic principles of the LRIC+ concept are as follows:

- **Long-term horizon** – assumes that all inputs are considered variable and at the same time must cover the whole period including all relevant investments.
- **Incremental** – represents additional output, which may represent an additional unit of quantity of service provided, or adding an entirely new service to a company's portfolio.
- **Common costs** – the cost of inputs that serve to provide one or more services and cannot be directly allocated to a specific service. These costs are included into the calculation of the regulated prices using the mark-up method. ComCom will determine the proportion of allocable and common costs for a particular service based on the data collection from the Provider and then use this to quantify the common costs.

The justification for using the LRIC+ model stems from the following advantages that the concept provides:

- Provides incentives for efficient investment as well as efficient use of existing infrastructure
- By the use of bottom-up model envisaged by this methodology, it is possible to extract the costs of obsolete investments, sunk costs and inefficient methods used in the past
- Reflects costs based on modern equivalent asset prices, thus contributing to the optimisation of telecommunications infrastructure
- A predictable approach based on transparent forecasting to optimise technology, cost and demand

The LRIC+ model thus ensures transparency and effective competition on the physical access market as well as sufficient long-term cost recovery for the theoretically efficient operator that provides the appropriate 'build-or-buy' signal to network operators in line with the long-term objectives of the EC. However, in view of the specific EU recommendations on how to calculate the cost of reusable assets, the model also includes elements of a top-down approach, while the bottom-up approach is used for detailed analysis of underlying costs and its potential benchmarking.

4.4. Costs included

The costs associated with the rental of physical infrastructure consist of the following items, which will be calculated into a set-up and/or monthly payment/price per unit:

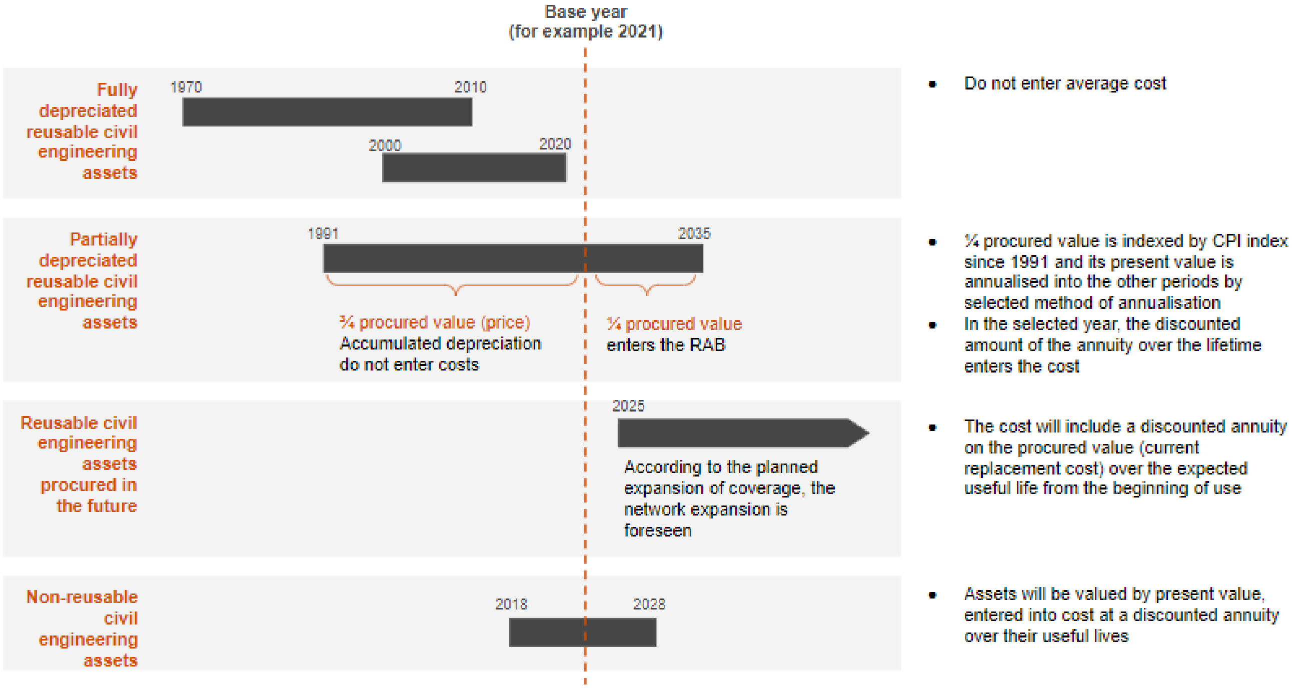
$$TCO = CAPEX + OPEX + \text{mark-up}$$

Where:

CAPEX - the cost of capital investment in network elements entering into the cost of service through a discounted annuity (calculation specified in more detail in section 4.6 of this methodology)

OPEX - operating costs directly related, or proportionally allocable to the network element strictly necessary for the provision of the service mark-up - the proportionally attributable part of common costs which cannot be included in the CAPEX or OPEX category but which are clearly related to the provision of the service (the costs, or the attributable part thereof, would not have been incurred if the service had not been provided)

Taking into account the expected materiality and also the legislative requirements given by the EC Recommendation, the method of calculation of CAPEX will differ depending on the nature of the asset:



4.5. Asset valuation method

The two most widely used asset valuation methods are Historical Cost Accounting (HCA) and Current cost Accounting (CCA).

- **Historical Cost Accounting (HCA)** – uses historical accounting information from accounting systems. This method provides reliable and objective information on the cost of individual assets used in the network, but it is partially restrictive in the environment of the telecommunication industry, which is characterized by changes in prices and technologies used. As a result of this, historical costs do not reflect material changes in asset prices, whether it is an increase or decrease in the price of an asset. The final calculated costs of a theoretical efficient operator may be different from the real costs incurred when the operator is entering the market. In addition, historical costs reflect all the inefficiencies that have been achieved in the past and do not take into account new technologies that are more efficient.
- **Current Cost Accounting (CCA)** – This method determines the price of an asset at which the asset could be replaced at present. Assets that are no longer available on the market due to technological developments are valuated using the Modern Equivalent Asset (MEA) criterion. Current costs are calculated by adjusting the historical costs by inflation and by changes caused by technological and market development.

Asset valuation can be based on various information sources:

- Information provided by suppliers of the assets
- Internal and external benchmarks
- Data obtained from market participants during the data collection phase

The most common approach is to collect data including prices of network equipment from market participants, which are compared and/or adjusted according to the benchmarks.

Each of the valuation methods has its advantages and limitation:

Method	Advantages	Limitations
Historical Cost Accounting	• Reliable and objective data based on statutory accounting • Accessibility of historical data • Reflects the actual costs incurred by the operator	• Does not reflect changes in prices of assets • HCA calculates with historical inefficiencies
Current Cost Accounting	• CCA reflect changes in prices of assets and inflation • Reflects technological changes • Provides the costs that would be incurred by the operator that is entering market and building the network at present	• Complexity of revaluation of historical costs • The modern equivalent asset may not have the same parameters as outdated technologies • The data about current prices of assets does not have to be available what may cause subjective estimates

During the development of the costing model, we will use the Current Cost Accounting method (replacement costs according to Article 33 of the EC Recommendation), where possible, in accordance with the EC Recommendation.

The EC Recommendation also refers to the measurement of the cost of reusable legacy civil engineering assets, i.e. mainly trenches and similar assets that do not need to be renewed on a regular basis. These types of assets will be valued using the indexation method according to the EC Recommendation, but only for the residual assets value. Thus, in line with the EC Recommendation, fully depreciated reusable assets as well as the depreciated portion of reusable assets in the amount of accumulated depreciation will not be entered into expense.

4.6. Method of annualizing costs in the period after the base year

The purpose of the model is to calculate the cost of services in given year. Network build-out costs in a given year are capital expenditures that need to be annualized by calculating depreciation. In economic terms, depreciation should reflect the change in the value of assets over the given period.

The value of an asset can be influenced by number of factors, including:

- Its running costs and changes in running costs over its lifetime;
- The value of its outputs and changes in value of outputs over its lifetime;
- Its productivity (in terms of the volume of outputs it can generate) and changes in productivity over its lifetime; and
- The existence or expectation of a challenger asset (i.e. an alternative technology), which threatens to redefine the modern equivalent asset.

In practice, the economic depreciation approach is not usually used because it may be highly complex and would require the specification of a number of complex and/or subjective assumptions. Additionally, there may be problems with rational expectations in that the value of outputs in a regulated industry will be influenced by the depreciation of its inputs. Economic depreciation approach is therefore usually replaced by annuity approach as specified below.

4.6.1. Standard annuity

The calculation of the constant periodic payments for a given number of periods, i.e. the sum of the economic depreciation and the cost of capital, can be determined from the following formula:

$$C = I_{t=0} \cdot \frac{r}{1-(1+r)^{-n}}$$

Where: C is the constant annual capital charge;

It=0 it the replacement value of the asset at the start of the period;

r cost of capital - WACC;

n useful life of the asset.

The standard annuity would accurately describe the total annual capital costs associated with the asset in a situation where its price would not change over the useful life of the asset. However, in the telecommunication sector this assumption does not coincide with reality as the telecommunication sector is characterized by substantial price changes of used assets over time.

4.6.2. Tilted annuity

The tilted annuity can be determined by following formula:

$$C_{t=1} = I_{t=0} \cdot \frac{(r-i)}{1-\left(\frac{1+i}{1+r}\right)^{n}}$$

Where: Ct=1 annual capital charge in period t

i annual change in the price of the asset

It=0 replacement value of the asset at the start of the period

r cost of capital - WACC

n useful life of the asset

The above formula assumes a rate of change of asset price i which is consistent with the useful economic life of the asset n. Both i and n, however, are defined as exogenous variables which implies that i is the average annual rate of price change over the assets lifetime. The above approach requires that all the above variables be collected for each asset type that is to be modelled.

4.6.3. Modified annuity

Thus far, we have assumed that the asset is acquired, put into operational service and cash expended simultaneously on the first instant of the first period (t=1). This assumption is unrealistic since it ignores any time to build the network during which capital is tied up and in which no revenues are being earned. In the ordinary world of continual investment, this is analogous to assuming away the existence of capital work in progress, and would understate the costs of the network. To correct for this omission the price of the asset at the start of the period needs to be adjusted to reflect its price when the outlay of expenditure was actually incurred and the cost of capital tied up during the unproductive period. This can be achieved by the following adjustment:

$$I'_{t=0} = I_{t=0}.(1+i)^{-u}.(1+r)^{u} = I_{t=0}\left(\frac{1+r}{1+i}\right)^{u}$$

Where:

I`t=0 is the adjusted value of the asset to reflect the time taken in building the asset

u is the average time taken to build the asset

i annual change in the price of the asset

r cost of capital

Thus, the appropriate formulation for the annual capital charge of an assets is in the following form:

- for the standard annuity

$$C = I_{t=0} \cdot \left(\frac{1+r}{1+i}\right)^{u} \frac{r}{1-(1+r)^{-n}}$$

- for the tilted annuity

$$C_{t=1} = I_{t=0} \left(\frac{1+r}{1+i}\right)^{u} \frac{(r-i)}{1-\left(\frac{1+i}{1+r}\right)^{n}}$$

Based on our experience and expertise **we recommend the use of modified tilted annuity**, because this method reflects the real conditions, implying that the output will change in time based on input parameters.

We recommend selecting one depreciation method and not to change it during the calculation in individual years.

4.7. Indexation

In accordance with the EC Recommendation, the current cost of Reusable legacy civil engineering assets (RAB) will be calculated using the indexation method. The reason for using this method is that these assets are not expected to need further investment or renewal. The indexation method uses historical data on procurement prices, accumulated depreciation (amortization) and depletion of assets available in the infrastructure owner's accounting records (both statutory and regulatory accounting), financial statements and publicly available price indices, such as the retail price index.

The index will be applied to the regulatory asset base, which is the historical cost less accumulated depreciation. This value in the reference period will be further input into subsequent periods, adjusted by the index, with the gradual reduction of the asset residual value over time until it is fully depreciated.

The procedure described above will ensure that assets that have been fully depreciated will no longer enter into the cost of network access. According to the EC Recommendation, this approach will also ensure sufficient cost recovery for the infrastructure owner and provide certainty of regulated prices for both the infrastructure owner and the access customer.

4.8. WACC

The return on capital employed should be calculated in line with the decision "On determining the weighted average cost of capital (WACC) for mobile and fixed networks" of the Georgian National Communications Commission of September 5, 2017 N592/9 available publicly. [4] In case the infrastructure is used for multiple purposes (e.g. telecommunication and utility), the above defined WACC will be applicable only to that part of the infrastructure used for telecommunication purposes. Vice-versa, WACC defined for other sectors will not be used for share of infrastructure used for telecommunication purposes.

4.9. Timeline

Based on the appropriate time period, the LRIC+ cost models can be divided into two groups:

- The first group is consisting of models that individually model costs for each year

[4] "On determining the weighted average cost of capital (WACC) for mobile and fixed networks" of the Georgian National Communications Commission of September 5, 2017 N592/9. Available at: https://comcom.ge/ge/legal-acts/solutions/2022--22-19-306

- The second group is consisting of models that model costs of one specific target year in the future

Theoretically, the LRIC+ models for individual years should offer a more precise picture of reality of the market, but they require a significantly larger amount of input data, which may not always be available or collected. In case of unavailability of data during development of the model, it is necessary to use assumptions and estimations, which can affect the subjectivity of the model and thus distort the reality of the market. The second type of the models determines the expected LRIC+ costs at a certain selected year in the future. The main disadvantage of this group of models is the lower ability of the models to take into account significant changes in the market as the first group of models, but they require a lower amount of input data, which can be collected more accurately.

This methodology and the corresponding pricing model will be used to calculate the cost of the access services in the future. The precise definition of these access services is unknown at the moment. The starting point will be the selected “current” year on,which the calculation of the costs entering into the price of reusable infrastructure will be based.

4.10. Definition of theoretical efficient operator (TEO)

LRIC+ cost modelling methodology for price calculation is usually based on the theoretical efficient operator principle, which simulates the behaviour of an efficient operator in a fully competitive market. TEO is the operator using the most efficient technologies and the most efficient network equipment. TEO can be determined in three ways:

- TEO with the most cost effective inputs at the highest possible coverage, that means use of inputs provided from individual operator;

  Approach is mostly used by bottom-up modelling of a theoretical network based on scorched earth approach.

- TEO based on the average prices and demand calculated from operators inputs
- Average prices calculated from inputs of multiple operators, mostly defined as SMPs. TEO set manually

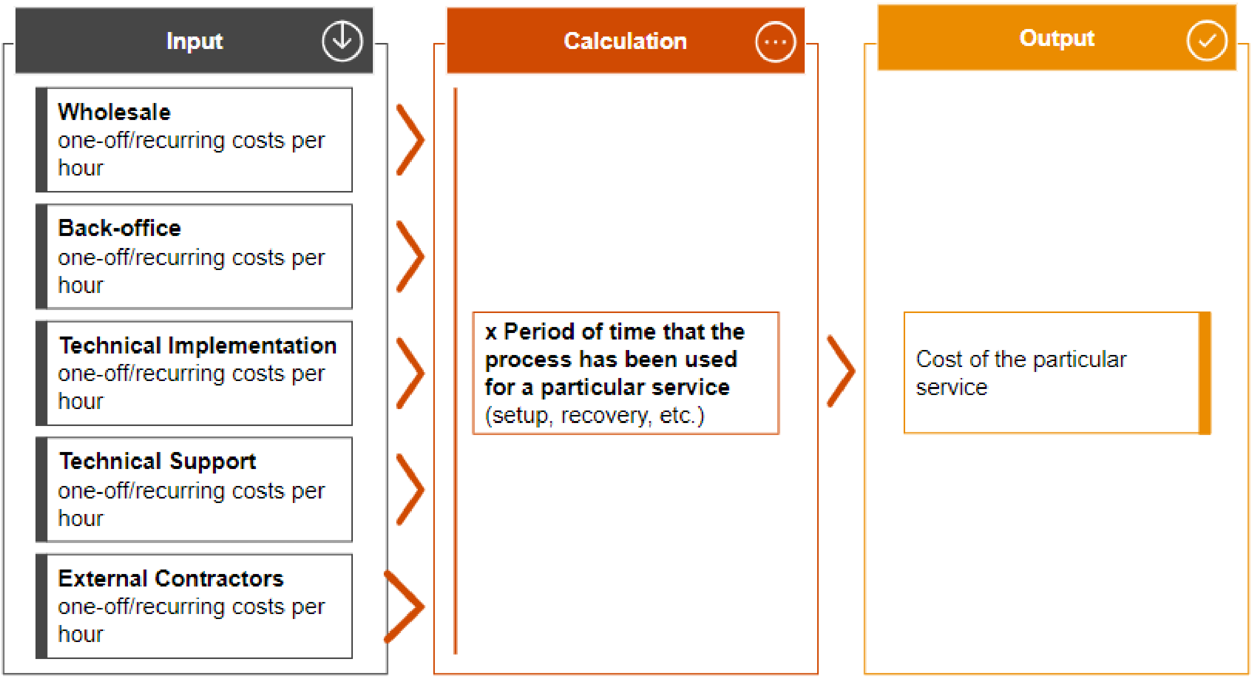
  Any other combination of inputs defined by the NRA, with regards to regulatory reporting obligation and/or data availability.

In the EC Recommendation, it is recommended to include in the model the costs that a theoretically efficient operator will achieve in building an efficient modern network. However, in the case of physical infrastructure in relation to reusable assets, it is based on the historical costs of the modelled operator, which will be adjusted through indexation (if they have not been fully depreciated and therefore still have a residual value). Depending on the decision of the ComCom and the specific situation, these may be set or adjusted manually based on benchmarking with other operators or publicly available values.

5. Calculation process

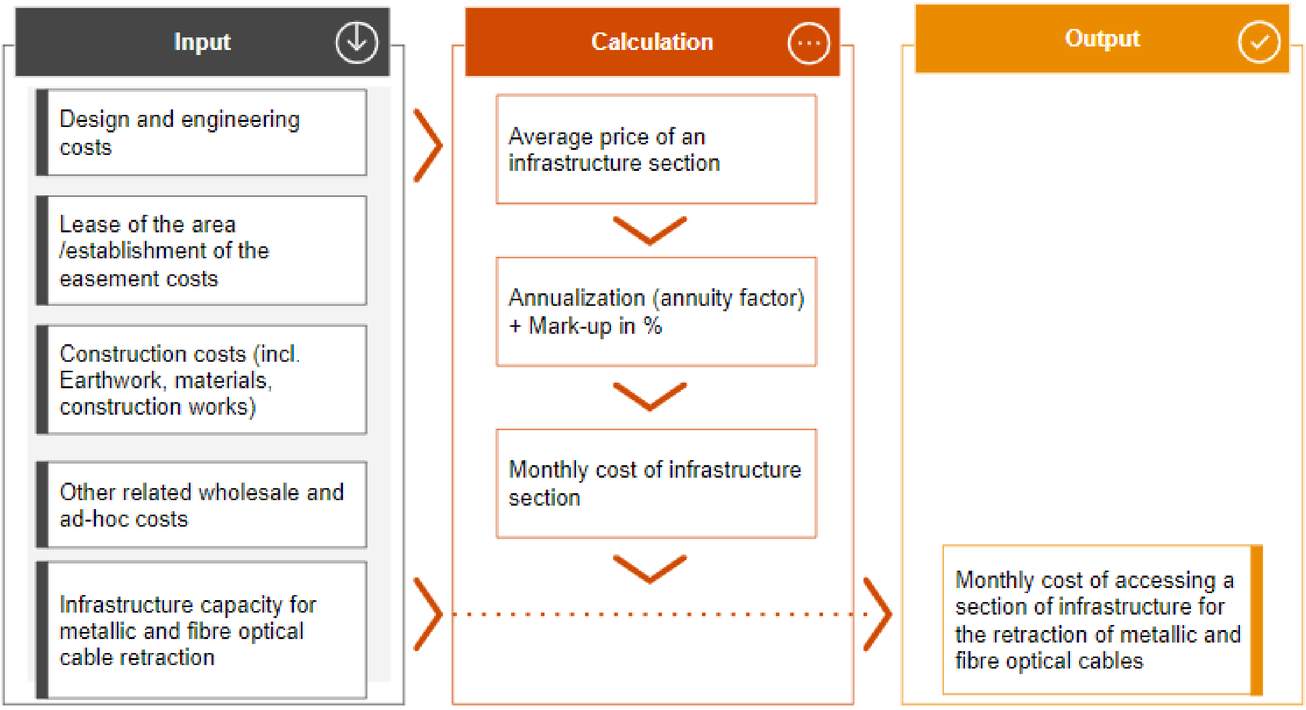
5.1. One-off payments/prices

When calculating the prices of individual one-off services for access to physical infrastructure, it is necessary to allocate the time during which a particular service uses predefined types of processes. One-off services include, for example, services for setting up or renewing access. One-off processes are the types of processes divided into 5 categories - Wholesale, Back-office, Technical Implementation, Technical Support and External Contractors. The cost calculation for one-off services for all service types is as follows:



5.2. Recurring monthly payments/price

The procedure for calculating the recurring costs for providing access to a section of infrastructure for pulling metallic and optical cables is illustrated below:



Monthly cost of infrastructure section are in the model calculated based on the following formula:

$$Monthly\ costs\ per\ 1\ m = \left(\frac{annualized\ CAPEX\ costs + OPEX\ (maintanance) + OPEX\ (other\ operating\ costs)}{total\ element\ lengh}\right) / \ 12$$

Infrastructure capacity is calculated based on potential capacity of infrastructure element and space potentially available to access seekers, regardless of actual occupancy.

Annex A Flowcharts of the cost calculation

This Annex contains flowcharts for calculating the eligible recurring monthly rental costs for the elements of physical infrastructure.

The following is a schematic method for calculating the **recurring monthly rental costs** for the Access to the linear physical infrastructure for metallic and optical cables on an element-by-element basis.

Access to linear physical infrastructure for metallic and optical cables

Ducts

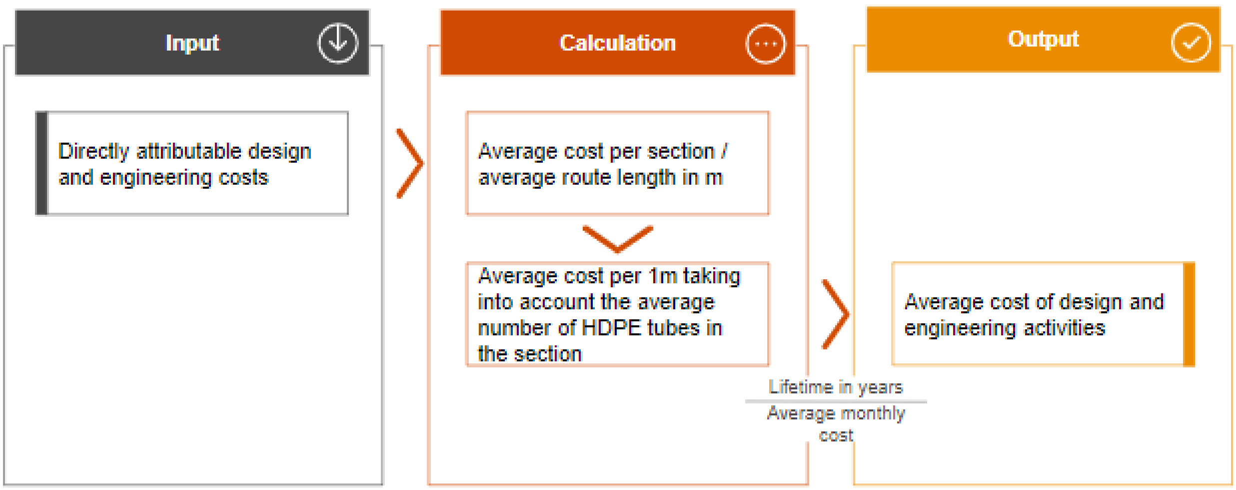
Given the almost completely depreciated nature of these assets, whereas from the EC Recommendation they can be considered to be reusable assets, only the RAB based on the residual value of these assets will enter into the cost calculation. The residual value of ducts must be adjusted by indexation and subsequently allocated to the total distance of the sections in meters. The final costs of ducts must be then allocated to the service proportionally according to the space occupied or the number of occupied openings in the ducts.

HDPE tubes

The recurring monthly costs of HDPE tube renting include:

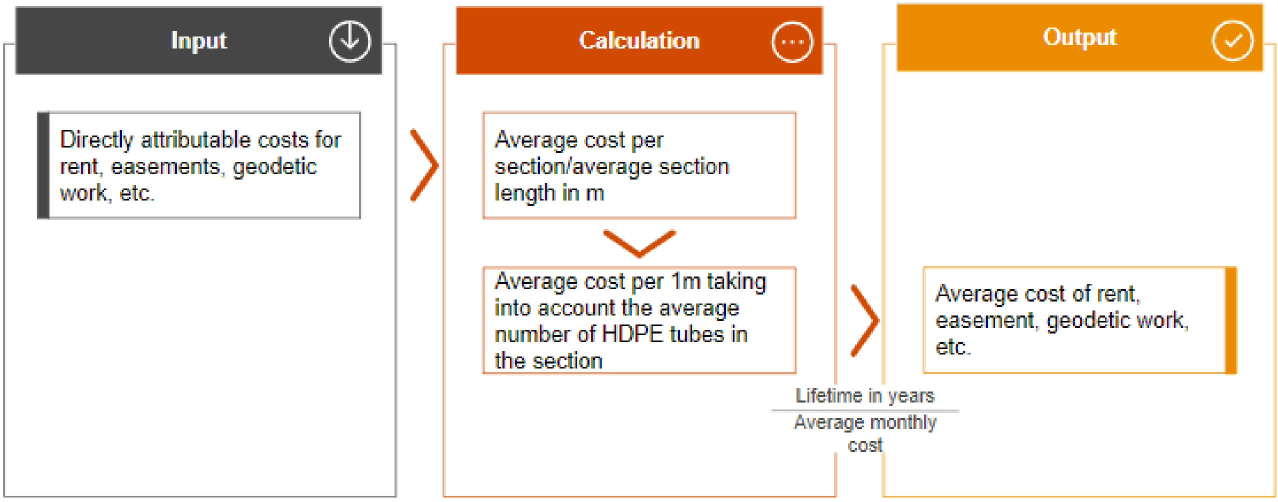
a) directly attributable design and engineering costs

Directly attributable design and engineering costs, such as the costs of design-build documentation, documentation associated with building permits and reporting requirements, temporary traffic restriction projects, and associated legislative and administrative fees, are **allocated proportionally** depending on the type of infrastructure element.



b) directly attributable costs related to the lease of the area/establishment of the easement, including the geodetic costs

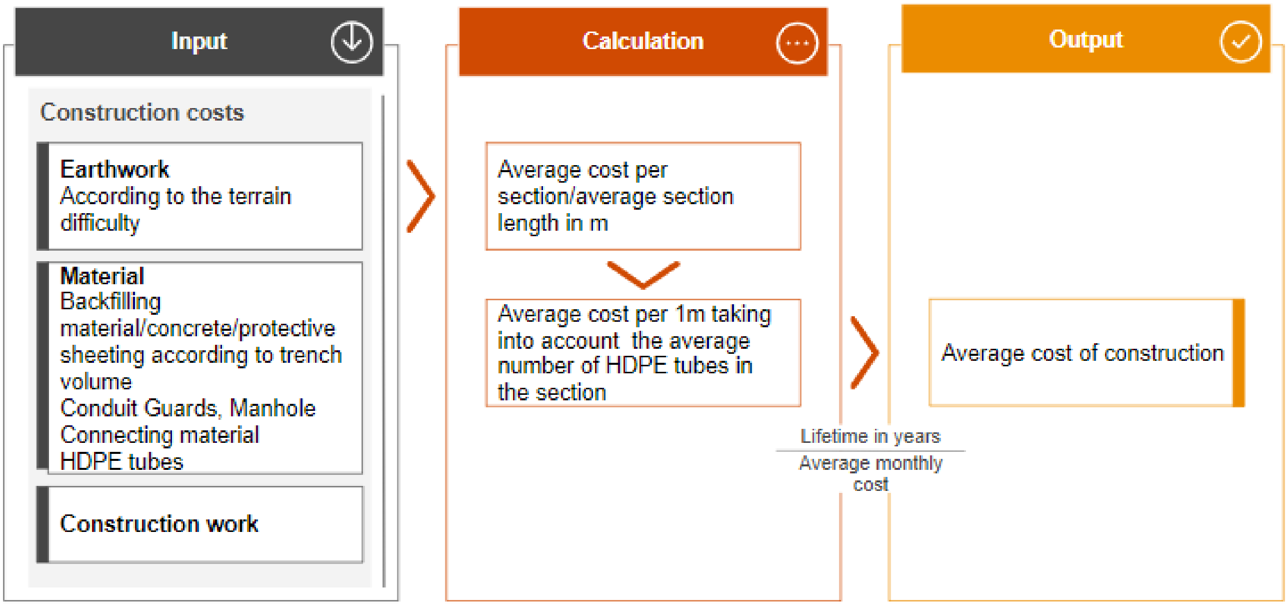
Directly attributable costs related to the lease of the area/establishment of the easement, including the geodetic costs are **allocated proportionally** depending on the type of infrastructure element.



c) **directly attributable construction costs, including earthwork and other construction work; and (d) directly attributable material**

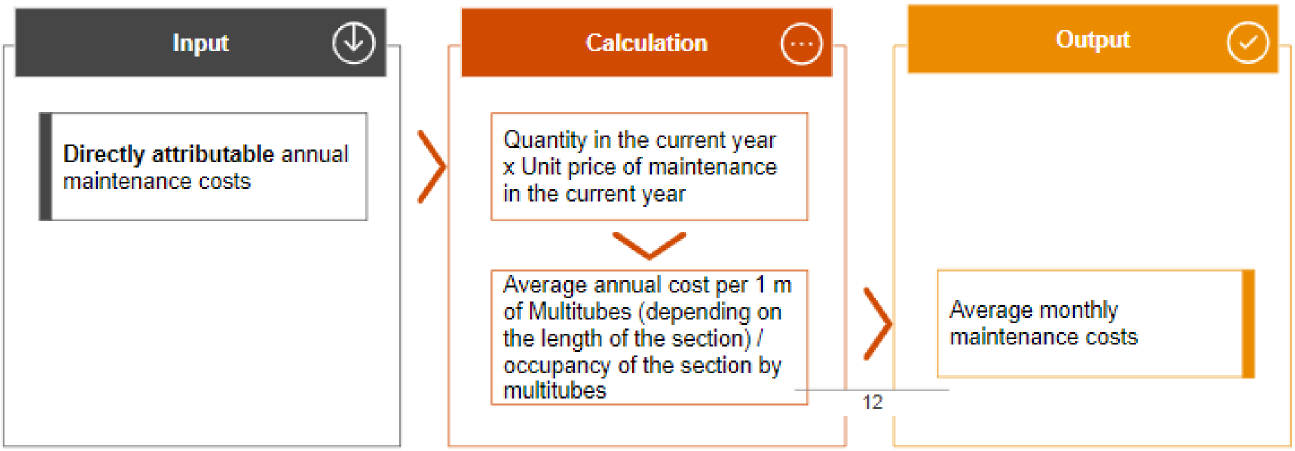
Directly attributable construction costs, including earthwork and other construction activities such as trenching and capping, formwork and concrete work, material movements, horizontal drilling, stamping, dewatering, work related to the relocation and protection of other network structures and connections, and the cost of construction work related to the restoration of the surface to its original condition, are allocated proportionally depending on the type of infrastructure element.

Directly attributable materials such as concrete, manholes, junctions, aboveground cabinets and connectors are **allocated proportionally** depending on the type of infrastructure element.



e) **directly attributable maintenance costs**

Directly attributable manhole maintenance costs are **allocated proportionally** depending on the type of infrastructure element.

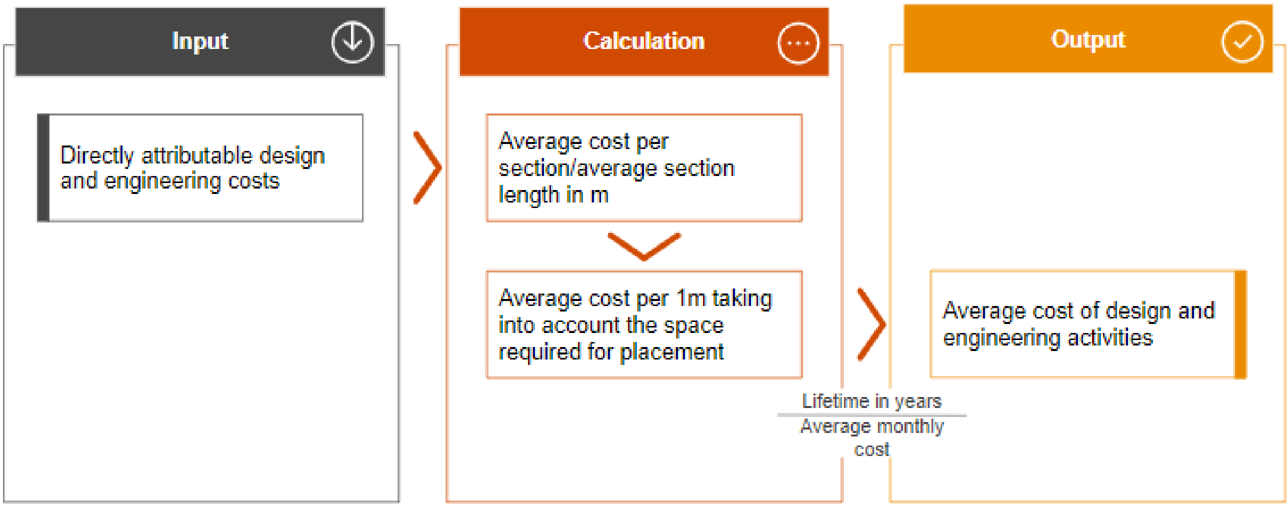


Multitubes

The recurring monthly rental costs of multitube include:

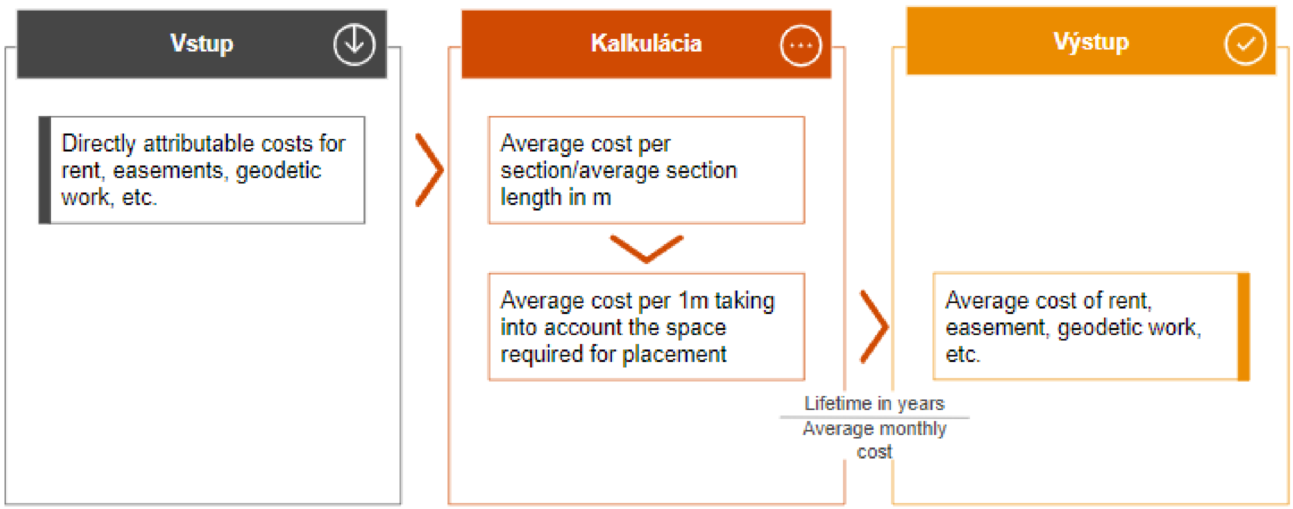
a) **directly attributable design and engineering costs**

Directly attributable design and engineering costs, such as the costs of design-build documentation, documentation associated with building permits and reporting requirements, temporary traffic restriction projects, and associated legislative and administrative fees, are **allocated proportionally** depending on the type of infrastructure element.



b) **directly attributable costs related to the lease of the area/establishment of the easement, including the geodetic cost**

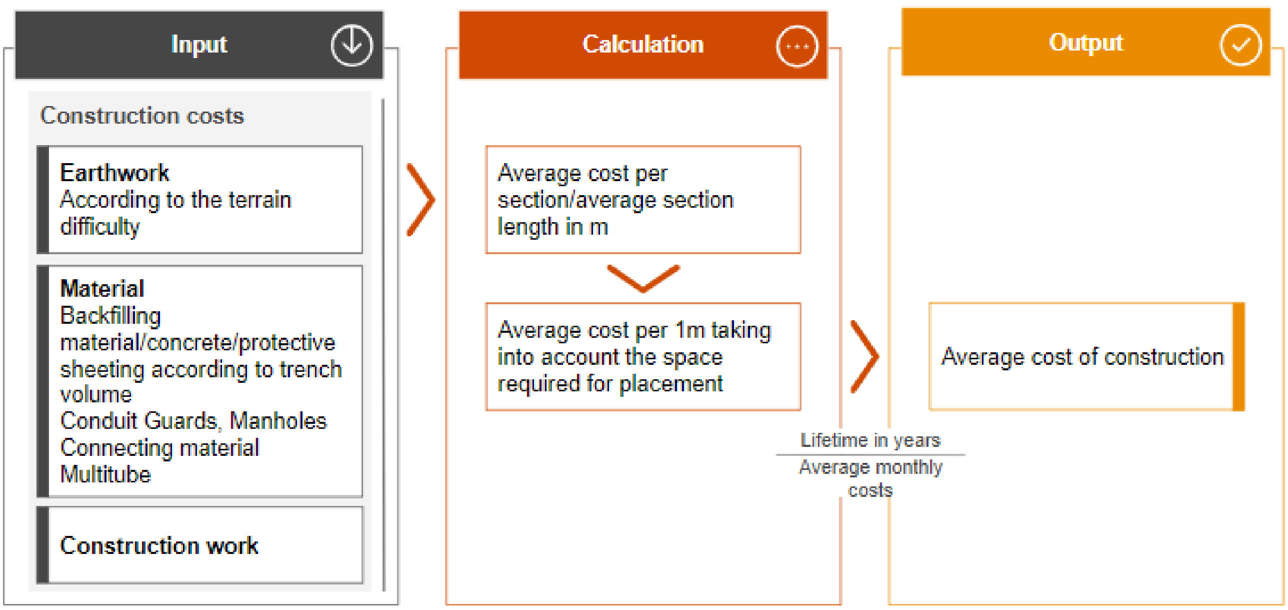
Directly attributable costs related to the lease of the area/establishment of the easement and geodetic costs are **allocated proportionally** depending on the type of infrastructure element.



c) **directly attributable construction costs, including earthwork and other construction work; and (d) directly attributable materials**

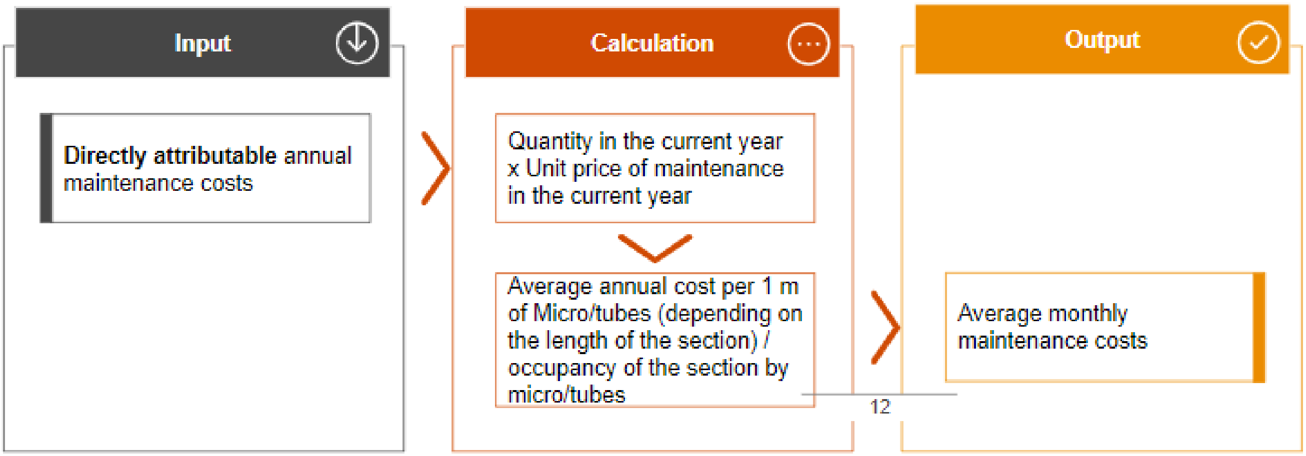
Directly attributable construction costs, including earthwork and other civil works such as excavation and capping, formwork and concrete works, material movements, horizontal drilling, stamping, water extraction, works related to the relocation and protection of other network structures and connections, and civil works costs related to the restoration of the surface to its original condition, are **allocated proportionally** depending on the type of infrastructure element.

Directly attributable materials such as concrete, manholes, junctions, aboveground cabinets and connectors are **allocated proportionally** depending on the type of infrastructure element.



e) **directly attributable maintenance costs**

Directly attributable manhole maintenance costs are **allocated proportionally** according to the type of infrastructure element.

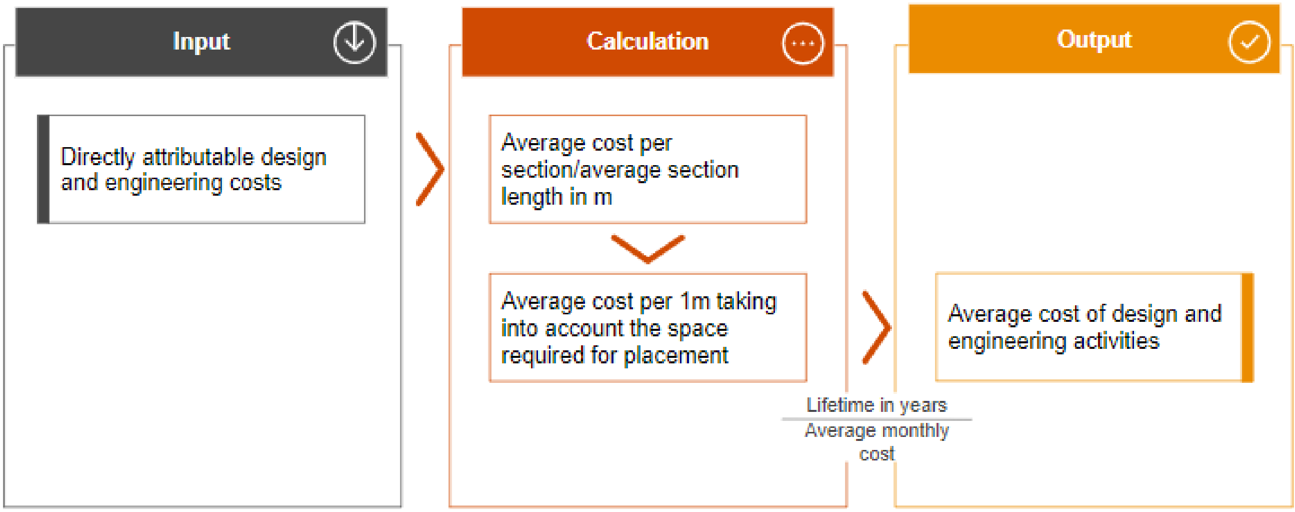


Mini/microtube

The recurring monthly costs of renting Mini/microtubes include:

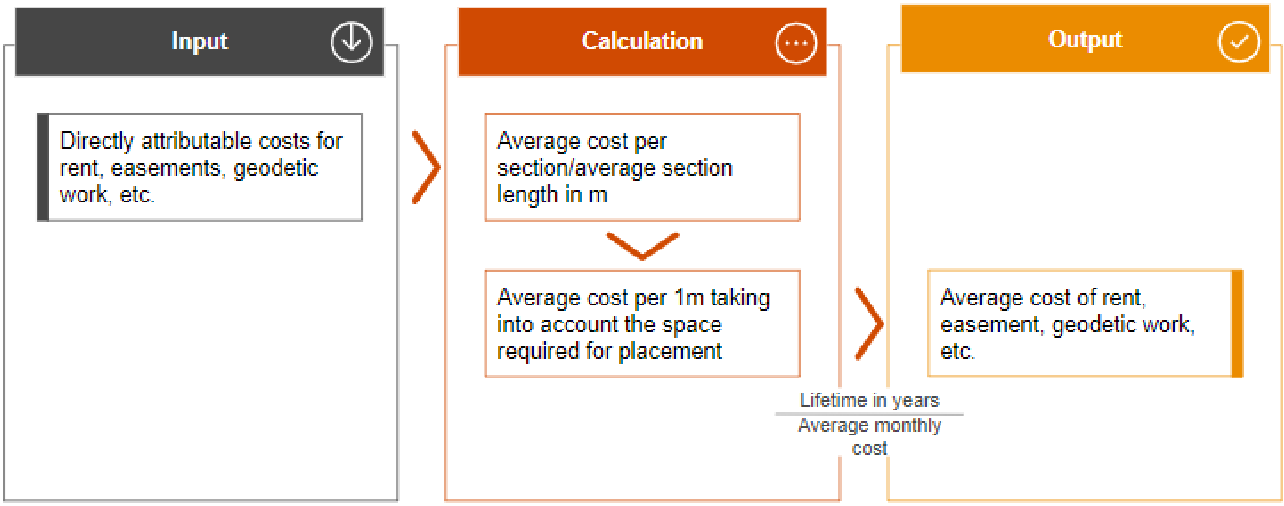
a) directly attributable design and engineering costs

Directly attributable design and engineering costs, such as the costs of design-build documentation, documentation associated with construction permitting and notification requirements, temporary traffic restriction projects, and associated legislative and administrative fees, are **allocated proportionally** depending on the type of infrastructure element.



b) directly attributable costs related to the lease of the area/establishment of the easement, including the cost of geodetic work

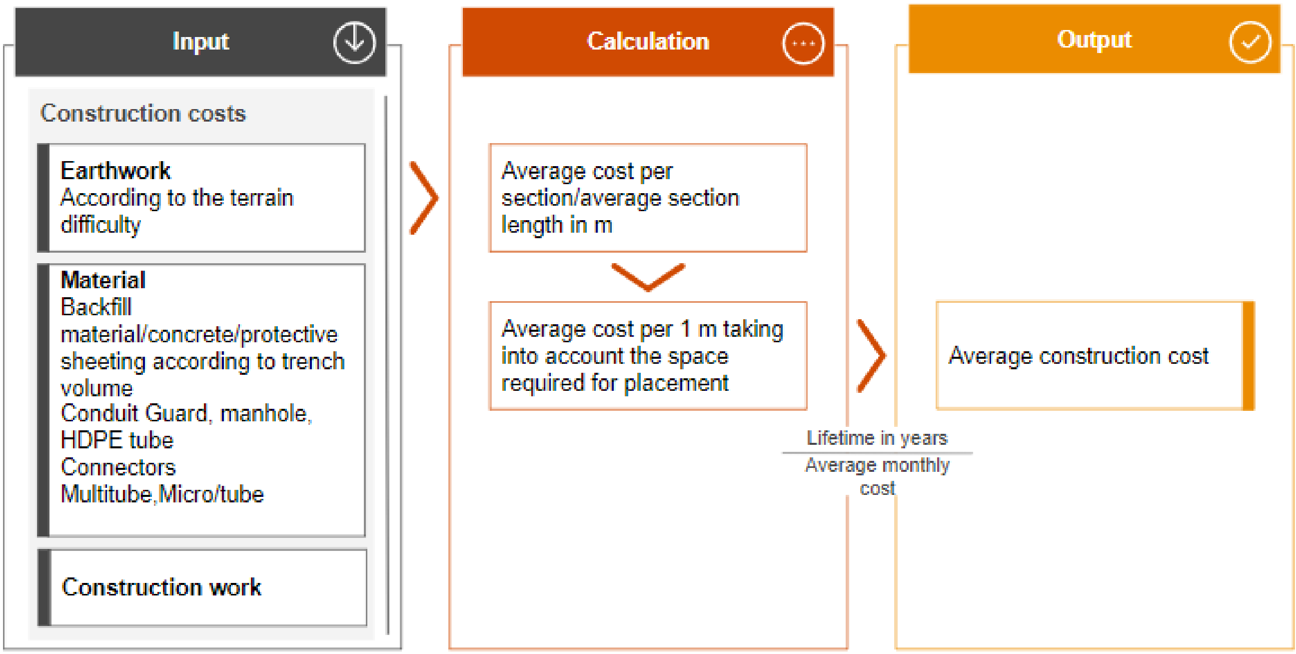
Directly attributable costs related to the lease of the area/establishment of the easement and geodetic costs are **allocated proportionally** depending on the type of infrastructure element.



c) **directly attributable construction costs, including earthwork and other construction work; and (d) directly attributable materials**

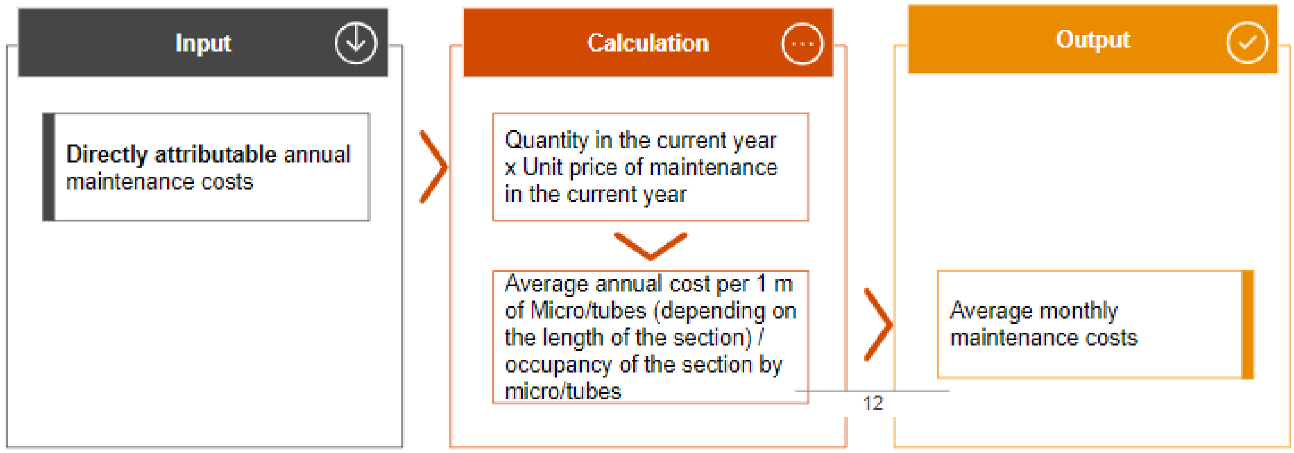
Directly attributable construction costs, including earthwork and other construction works such as excavation and capping, formwork and concrete works, material movements, horizontal drilling, stamping, water extraction, works related to the relocation and protection of other network structures and connections, and the costs of construction works related to the restoration of the surface to its original condition, are **allocated proportionally** depending on the type of infrastructure element.

Directly attributable materials such as concrete, manholes, junctions, manholes, aboveground cabinets and connectors are **allocated proportionally** depending on the type of infrastructure element.



e) **directly attributable maintenance costs**

Directly attributable maintenance costs are **allocated proportionally** according to the type of infrastructure element.

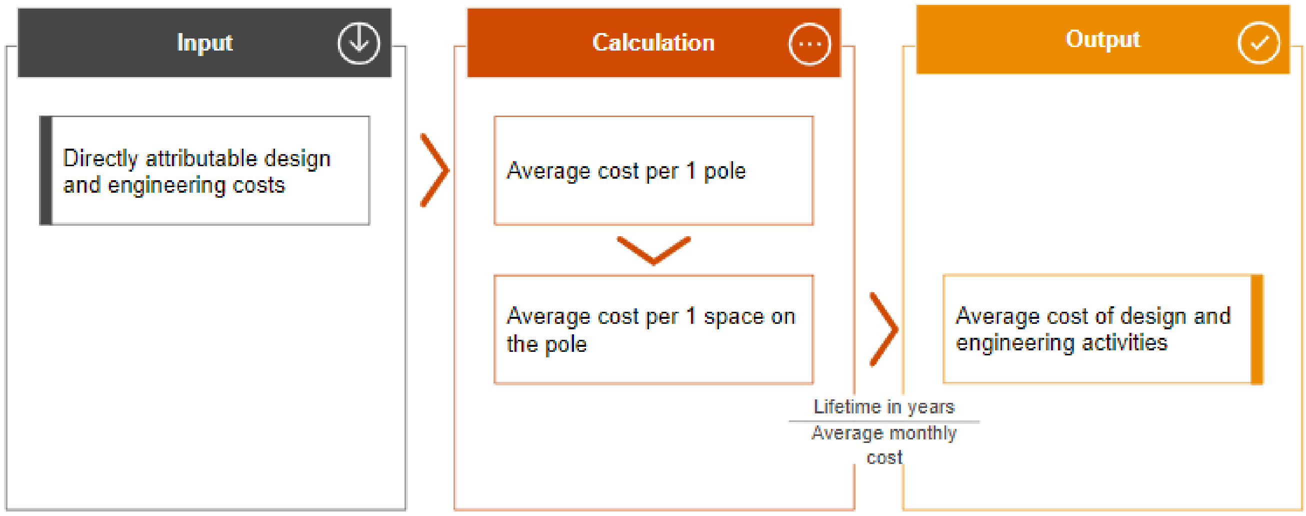


Non-linear physical infrastructure for metallic and optical cables

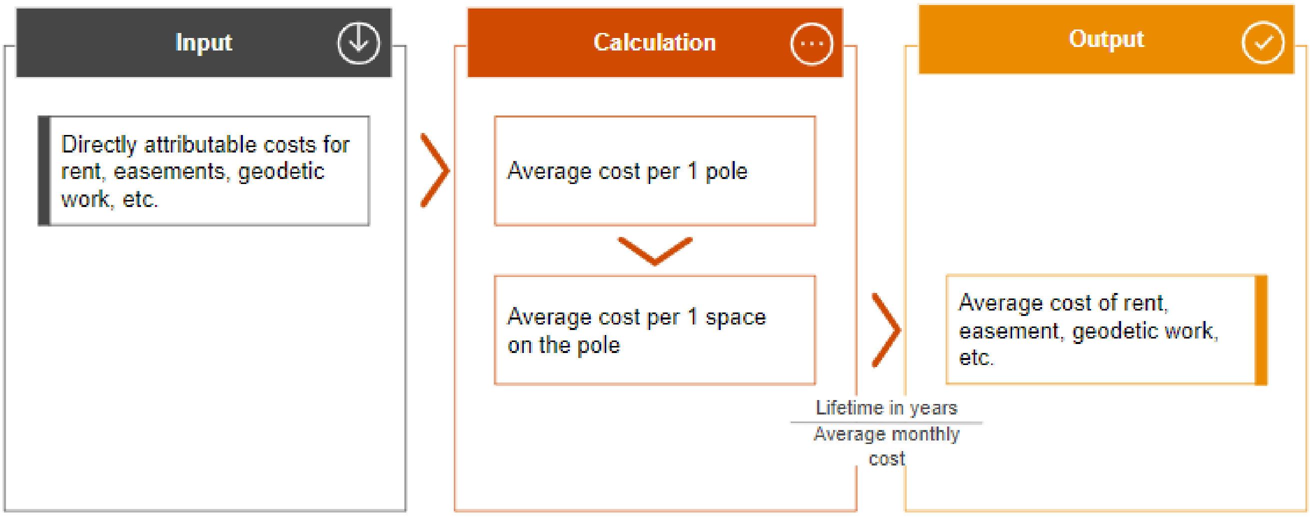
Below is provided a flowchart for calculating the recurring monthly rental cost for the Non-linear physical infrastructure for metallic and optical cables. That includes various types of poles, including antenna installations, towers and masts. For simplicity, these are referred to as poles in this methodology.

The recurring monthly costs of Non-linear physical infrastructure for metallic and optical cables include:

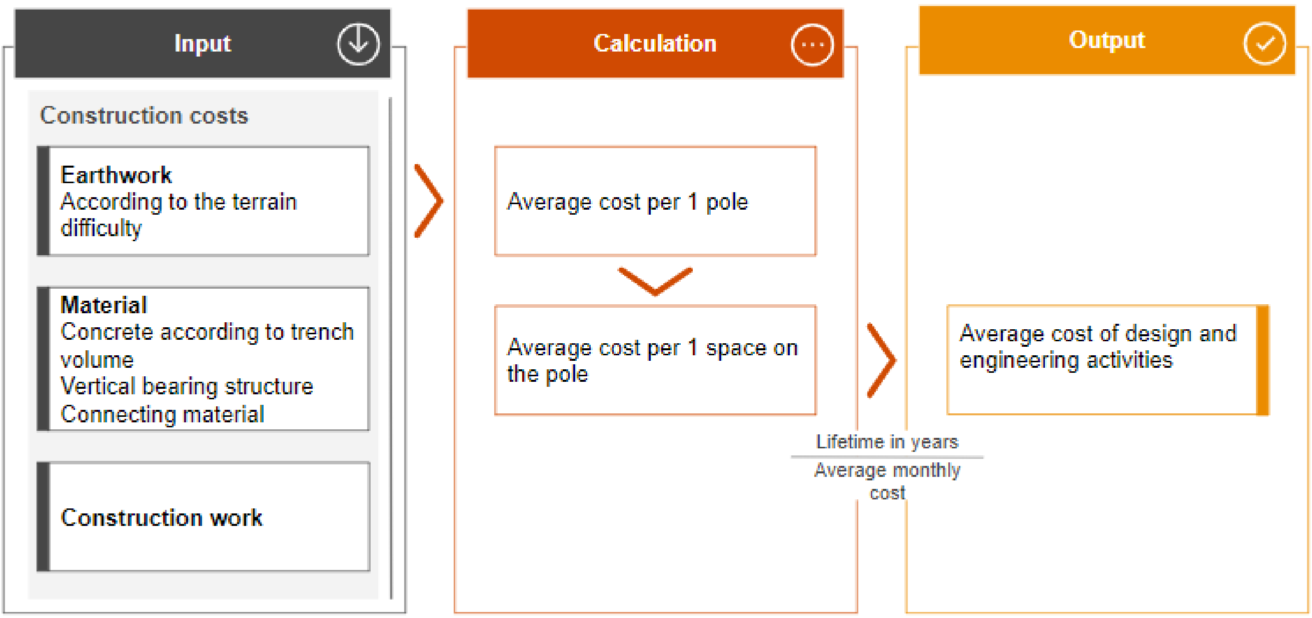
a) **directly attributable design and engineering costs**



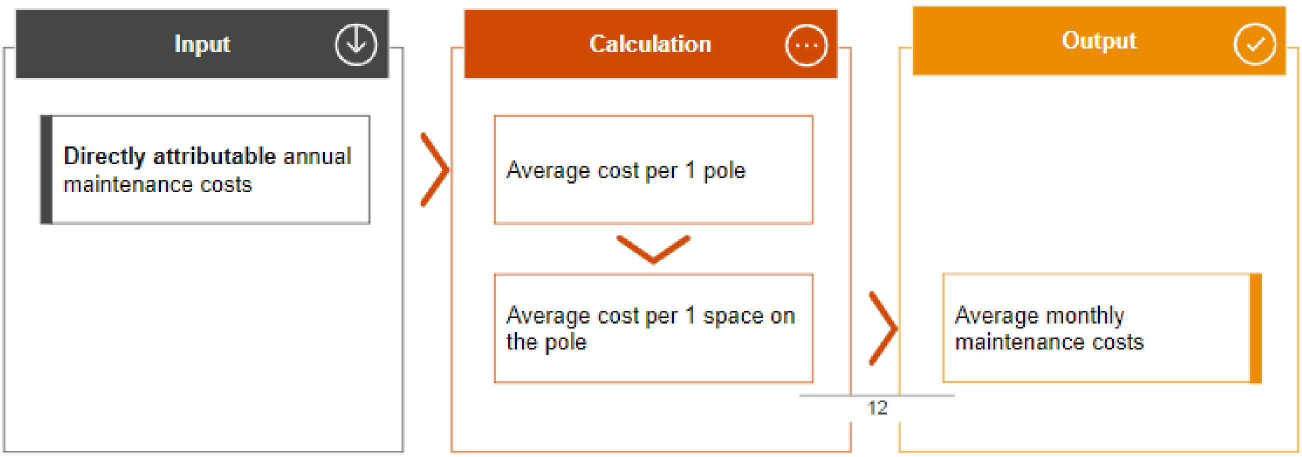
b) **directly attributable costs related to the lease of the area/establishment of the easement**



c) **directly attributable construction costs, including earthwork and other construction work; and material**



d) **directly attributable maintenance costs**



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