Letter of Engagement

between

The National Regulatory Agency for Electronic Communications and Information Technology (ANRCETI)

and

The International Telecommunication Union (ITU)

on

Building Interactive Terrestrial (Optical Fibre and Microwaves) Transmission Maps for Moldova

This Letter of Engagement is entered between the National Regulatory Agency for Electronic Communications and Information Technology (ANRCETI), having its headquarters in 134, Stefan cel Mare street, 2012 CHISINAU, Moldova (hereinafter referred to as "Organization") and the International Telecommunication Union, a United Nations specialized agency for information and communications technology, having its headquarters in Geneva, Switzerland (hereinafter referred to as "ITU"; both the Organisation and ITU are collectively referred to as "signatories").

Whereas ITU is responsible for bringing the benefits of modern communication technologies to people everywhere in an efficient, safe, easy and affordable manner,

Whereas the Organization is the National Regulatory Authority of Moldova in charge of broadband infrastructure mapping systems in the Country,

Considering the activities carried out by the Organization regarding the creation and maintenance of maps of telecommunications infrastructure in Moldova,

Considering that ITU's mandate extends, among others, to activities pertaining to the diffusion of knowledge for the improvement of telecommunication networks worldwide; in this respect, ITU produces interactive transmission maps of ICT infrastructure for different regions of the world, including Europe, and collects, processes data in this regard,

Recognizing the opportunities to create synergies between the signatories in relation to their respective initiatives and projects with similar objectives,

Recognizing the opportunities to avoid duplication of effort and reduce overall costs to both signatories,

Now therefore, on the basis of mutual trust and in a spirit of cooperation, the Organization and ITU decide to collaborate and hereby agree to the following:

1. Collaborate and share information including data on telecommunications infrastructure, in order to further produce, update and improve the comprehensive, interactive and integrated transmission map for Moldova (hereinafter referred to as the "Map"), as part of the global interactive transmission map of ICT infrastructure maintained by ITU on the ITU transmission maps website.

2. Data pertaining to the Map may be further produced, updated and improved in the context of independent and self-sustainable projects and/or activities of the Organization and of ITU, which have similar objectives and which fall within the respective missions and mandates of the two signatories.

3. The Organization shall endeavour to obtain necessary source material and data from the relevant telecom operators, as appropriate; To the extent that said data is not in the public domain, the Organization shall ensure that the owners of said data consent to the receipt, processing and publication by ITU of the data in the Map as part of the ITU transmission maps website, and as well as to the use of such data by ITU in the context of the corresponding ITU projects and activities; in the event when the owner of the data does not consent for their transfer to and use by ITU as described above, the Organization shall not provide the data to ITU.

4. The two signatories agree that they will each use their own funds or funding sources and bear their own costs for the implementation of the present collaboration in accordance with their respective rules, regulations and procedures. More specifically:

   4.1 ITU will perform the processing and integration of the data provided by the Organization in the Map, as part of the ITU transmission maps website; In addition, ITU shall bear the technical and operational costs for maintaining the Map and the ITU transmission maps website.

   4.2 The Organization shall request, collect and provide to ITU the data referred to in paragraph 3 above.

5. A disclaimer will be placed on the ITU transmission maps website stating that the Map builds upon data collected and validated by the Organization;

6. Without prejudice to existing third party ownership rights over the data provided by the Organization to ITU, each signatory shall retain ownership of any original work it creates in the context of the collaboration. Both signatories are entitled to use the data provided by the Organization and used in the Map for purposes related to their statutory activities, mission and mandate, without the consent of the other signatory.

7. The ITU shall publicly display the Map produced on the ITU transmission maps website. The ITU reserves the right to modify or update the Map and the ITU transmission maps website, to remove or to add relevant content and data, and to discontinue part or the entire Map and the ITU transmission website, as appropriate, in accordance with relevant decisions by its governance bodies or its Secretary General.

8. The signatories shall utilize the seven (7) Broadband Capacity Indicators launched at the 9th World Telecommunication/ICT Indicators Meeting (WTIM) on 7-9 December 2011, and endorsed by the 10th WTIM, on 25-27 September 2012; the list of indicators is included in the annex to this Letter.

9. Each signatory shall be solely responsible for the manner in which it carries out its part of the activities under the present collaboration. No signatory shall have authority to make any statements, representations, or commitments of any kind, or to take any action which shall be binding on the other signatory unless this action has been authorized in advance and in writing by that signatory.

This Letter of Engagement shall become effective upon signature by both signatories and expire upon discontinuation of the Map or the ITU transmission website. It can be extended or modified by mutual written agreement. It may also be terminated without cause upon six months' notice in writing.

The signatories confirm that they will exercise good faith efforts to resolve any dispute between them arising from or in connection with this Letter of Engagement through mutual negotiation.

Nothing in this Letter of Engagement shall constitute a waiver of the privileges, immunities and facilities, which ITU enjoys by virtue of the international agreements and laws applicable to it.

This Letter of Engagement shall not affect any rights and obligations of the signatories under any international treaty. The provisions of this Letter of Engagement shall not be interpreted as an agreement within the meaning of the Vienna Convention on the Law of Treaties and shall not create rights and obligations in the area of international law.

This Letter of Engagement may be executed by facsimile or by electronic signature and in one or more counterparts, each of which (including signature pages) will be deemed an original, but all of which together will constitute one and the same instrument.

For the National Regulatory Agency for Electronic Communications and Information Technology (ANRCETI)		For the International Telecommunication Union	
Signature:		Signature:	
Name:	Mr Octavian Rău	Name:	Mrs Doreen Bogdan-Martin
Title:	Director	Title:	Director Telecommunication Development Bureau
Place:		Place:	Geneva
Date:		Date:	1 December 2020

Annex I

To the Letter of Engagement between National Regulatory Agency for Electronic Communications and Information Technology (ANRCETI) and International Telecommunication Union on Building Interactive Terrestrial (Optical Fibers and Microwaves) Transmission Maps for Moldova

Broadband Capacity Indicators

Indicator 1: **Transmission network length (Route kilometers)**
Definition: *Transmission network length* refers to the physical length of fibre optic cable in a network irrespective of the number of optical fibres contained within the constituent cables of that network (see Indicator 5: Cable structure), and can also be applied to microwave terrestrial networks. It is is expressed in route kilometres (route-kms).
Clarifications and scope: Transmission network length (Route kilometers) can also be applied to microwave terrestrial transmission networks in order to enable comparison on a like-for-like basis, even though the number of microwave 'hops' is also used (a 'hop' is the point-to-point link between one microwave radio antenna and the next, for example there are four 'hops' between five microwave radio antenna sites deployed in series).
Method of collection: Transmission network length can be compiled from three sources: 1) some operators indicate the length of individual routes in network maps or diagrams, which can be entered into a database and added together to produce a total, 2) some operators report the total length of cable (route-kms) in their transmission network, typically in annual reports, registration or other documents, 3) an operator's network can be digitised into a GIS (geographic information system) map, and the cumulative length of all of the individual lines representing its network calculated.
Relationship with other indicators: Transmission network length can also be classified by operational status (see Indicator 6: Operational status), in order to further quantify how much network infrastructure is operational, under construction, planned or proposed.
Methodological issues: Transmission network length data provided by operators or vendors will always tend to be higher than those calculated from a cartographic representation. This is because in the real physical world, the actual routing of cables necessarily follows irregular bends, slopes, obstacles and other physcial geographies at a micro scale which may be represented as straight lines on a map.

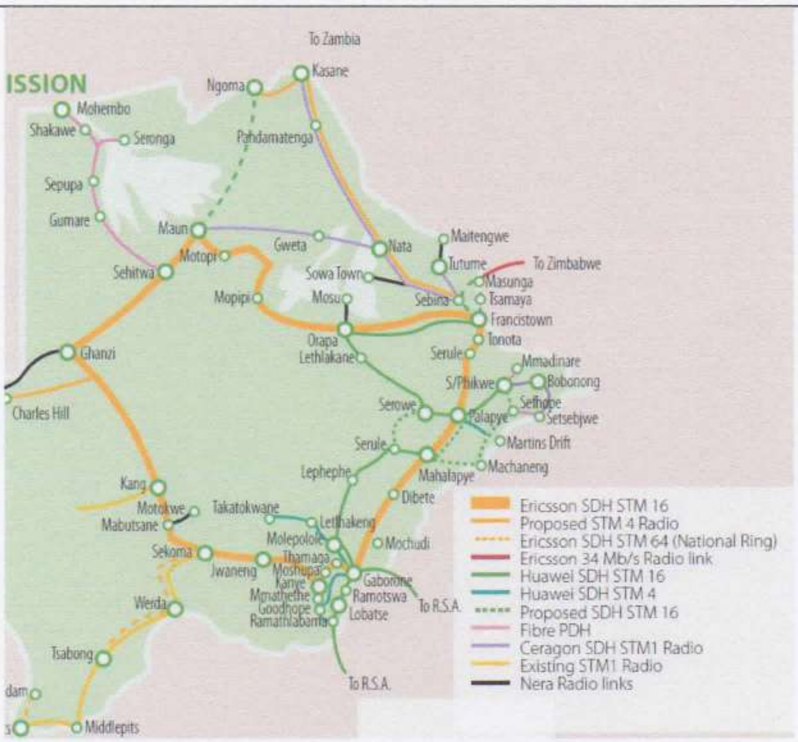
Indicator 2: **Node locations**

Definition: *Node locations* refers to the geographic location of the nodes in a transmission network. A node is an access (entry or exit) point to a transmission network. In a fibre optic transmission network, a node is an add/drop (drop/insert) point. Transmission equipment is installed at each node which is capable of providing access into the network. It is expressed by the name of the location, and the corresponding geographic coordinates (in decimal degrees of latitude and longitude).

Clarifications and scope: Node locations do not include repeater sites. Because the strength of optical signals attenuate through glass fibre media over distance, the signal is amplified (or repeated) at repeater sites at certain intervals. As there is no means of access (entry or exit point) to the network at repeater sites, these are not classified as nodes. In a fibre optic submarine cable network for example, landing points would be classified as node locations, but not repeaters or branching units. It is worth noting that just as there are often many places with the same name even within the same country (for example 'Washington'), there may well be node locations with the same name. In this case it is useful to attach suffix to avoid confusion and miscalculation ('Washington DC') and important to have noted the coordinates of the node.

Method of collection: Operators may provide or publish network maps or diagrams to varying degrees of technical and cartographic detail. The most detailed network maps may provide locations of all nodes, repeater sites and so on. Less detailed maps may just show places which are specifically named as nodes on the network. In the example below for Botswana Telecommunication Corporation (source: 2010/11 Annual Report), nodes are plotted in the centrepoint of those places which are specifically and deliberately named on the map.

Example: Botswana Telecommunications Corporation (BTC) Core Transmission Network



Source: Botswana Telecommunications Corporation 2010/11 Annual Report
http://www.btc.bw

Relationship with other indicators: Node locations can also be classified by operational status (see Indicator 6: Operational status). The co-ordinates of node locations are used to calculate the population within reach of the transmission network (see Indicator 7: Percentage of the population within reach of transmission networks).

Methodological issues: Node locations are plotted as the centrepoint of places (city, town, village, border post, or other specifically named place) through which the network runs and has an access (add/drop) point. In the production of a regional or world transmission map, the concern is to record the location of long-haul nodes. It is not necessary or desirable at this scale to mark the actual building in which a network node is located. There will be many more add/drop points on the network within towns and cities and to individual customers. However, this level of detail for metropolitan area networks is not included in the production of regional or world core transmission map(s).

Indicator 3: **Equipment type of terrestrial transmission network**

Definition: The *equipment type of terrestrial transmission network* describes the physical media of the terrestrial transmission network: microwave radio, or optical fibre cable (buried or aerial). For the purposes of clarity on the map, optical fibre cable can also be differentiated into cable which is either buried (usually along the rights of way of roads or railways) or is deployed aerially (usually along electricity power transmission lines).

Clarifications and scope: This indicator can be sub-divided into further technical detail, for example into the technology or specific frequencies allocated for point-to-point microwave radios, the category of optical fibre used (for example ITU standard G.652), or whether the fibre optic cable is laid in ducts, along poles, in optical groundwire (OPGW) and so on. This level of detail is usually only obtainable through primary research with operators. For the purpose of speed, clarity and simplicity is not collected uniformly for regional or world maps, and can be included where available on a best effort basis.
Method of collection: Operators usually show their network by type in the legend of their network maps or diagrams.
Relationship with other indicators: This indicator can be cross-referenced against ITU equipment standards. For example, the category of optical fibre deployed can be G.652 or other.
Methodological issues: For the purpose of producing a clear, legible regional transmission map the number of equipment types is reduced to these simple categories: microwave, fibre (buried), fibre (aerial).

Indicator 4: **Network capacity (bit rate)**
Definition: *Network capacity (bit rate)* refers to the transmission rate of the links in the network, irrespective of the services (voice, data, Internet, other) which are delivered through it. This is a measure of throughput and is expressed in Gbit/sec (Gbps).
Clarifications and scope: The total potential design capacity of the network may be very high, for example in the tens of Gbps, hundreds of Gbps or Tbps range, and is determined by factors including the category of optical fibre, number of optical fibres in the cable, the opto-electrical transmission equipment, multiplexing scheme (for example WDM, DWDM) and transport protocol (for example PDH, SDH) which is used. By itself, total design capacity is not a particularly meaningful indicator and is less useful than recording the equipped capacity of a particular route, as this expresses the capacity which is actually available for use. The equipped capacity is the total capacity of the circuits (E1, DS3, STM-1 and so on) which have been activated in the network transmission equipment on that particular route.
Method of collection: Operators usually indicate the equipped capacity of transmission routes in either Gbit/sec (Gbps) or using the SDH protocol. In the example for Botswana Telecommunications Corporation (BTC), the network has links of variously equipped capacity (STM-1, STM-4, STM-16). For example the trunk fibre optic route from Gaborone to Francistown is equipped at STM-16 (2.488 Gbps), and the microwave radio link from Middlepits to Tsabong is equipped at STM-1 (155 Mbps).
Relationship with other indicators: This indicator can be cross-referenced against ITU standards (such as the specifications for SDH and corresponding bit rates.
Methodological issues: This level of information is not uniformly made available by operators, some operators do disclose this level of detail but others do not, and it is therefore collected on a best effort basis. The equipped capacity is usually upgraded over time as additional capacity is required in order to cater for increasing traffic demands. Networks originally equipped at STM-4 may be upgraded to STM-16 and so on.

Indicator 5: **Number of optical fibres within the cable**

Definition: The number of individual optical fibres in a cable.

Clarifications and scope: This indicator is alternatively expressed as the number of fibre *pairs* in the cable, for example 12 fibre pairs are 24 individual optical fibres. Sometimes operators may report the length of optical fibre in their network by multiplying route kilometres by the number of fibres in each of the constituent cables in their network, to produce the number of fibre strand kilometres. Alternatively, there may be two or more cables in a pipe or duct along certain routes.

Method of collection: This level of information is rarely provided by network operators in published documentation, network maps or network diagrams. It may be made available by operators from primary research, and is collected on a best effort basis.

Relationship with other indicators: The number of optical fibres within the cable affects the total design capacity of that cable.

Methodological issues: Cables within the same overall network may contain different numbers of optical fibre, for example 12, 18, 24, 48, 72, 96, or 144 optical fibres per cable. In this case, the number of optical fibres in each link within the network can be recorded, and totalled to produce the total number of route kilometres containing x, y and z optical fibres. Multiplying the two would derive the total number of fibre strand kilometres.

Indicator 6: **Operational status of the transmission network**

Definition: *Operational status of the transmission network* refers to the status of the network infrastructure and is categorised as being operational, under construction, planned or proposed.

- ***Operational:*** Transmission network which is live and carrying traffic.
- ***Under construction:*** Transmission network which is in the process of being physically deployed.
- ***Planned:*** Advanced network plan for which financing has been finalized, but a contract may not yet have been awarded.
- ***Proposed:*** An early network plan for which financing is being sought.

Clarifications and scope:

Method of collection: Operators usually indicate the operational status of network infrastructure in their maps or diagrams. Network which is under construction, planned or proposed is usually symbolised as dotted or dashed lines in the operators maps or diagrams.

Relationship with other indicators: The indicator is related to the indicator for the percentage of the population within reach of the transmission network (Indicator 7), which can also be calculated by operational status by classifying network nodes by operational status.

Methodological issues: The operational status of individual routes in an operators network may change constantly as they expand their network. It is important where possible to keep track of these changes in operational status. Operators may issue press releases, statements or other updates indicating when particular routes go into deployment, or enter service. This information can be used to update the operational status of routes within a network.

Indicator 7: **a. Percentage of population within reach of transmission networks**
b. Percentage of area within reach of transmission networks

Definition:

a. *Percentage of population within reach of transmission networks* refers to the percentage of people that are within physical reach of nodes on core terrestrial transmission networks.

b. *Percentage of area within reach of transmission networks* refers to the total area of coverage within physical reach of nodes on core transmission networks and can be provided both as a percentage of total area and in square kilometres. These indicators can be broken down by distances from network nodes (for example at 10-km, 25-km, 50-km intervals).

Clarifications and scope: The population living within reach of transmission networks is calculated from network nodes (points) rather than routes (lines), because nodes are access points to the network. This is the equivalent of a motorway: a motorway may pass through areas of high and low population density, but the only means of accessing the motorway are at junctions.

The actual catchment area, or how many people can be served by the core transmission network, is greater than the reach from nodes on the core network. This is because of the impact of local feeder networks interconnecting to the core network, and also because some wireless broadband networks are capable of providing their own backhaul.

This is a useful indicator of the catchment area of a core transmission network or networks, and how many people it potentially serves.

Method of collection: This indicator can be calculated using GIS (geographic information system) software from the co-ordinates of network nodes. The method outlined below can be applied to calculate this, or it could be submitted to ITU to be processed centrally.

- In a GIS software, create concentric circular buffers at a defined radius or radii (in kilometres) from the co-ordinates of network nodes. These network nodes can be classified by operational status, in order to produce the number of people within reach of network which is operational, under construction, planned or proposed.
- These buffers are merged into zones for each distance, so as to avoid the double counting populations which fall within reach of two or more network nodes.
- Clip the outputted file against the administrative units for which the indicator is being calculated. This is normally country level, but could be calculated for sub-national units such as provinces, counties, or wards. This produces seperate polygons for x-km, y-km and z-km zones for each administrative unit (eg country).
- Using a population density raster dataset, in which each cell of the raster contains a value for the number of people per kilometre, calculate the total value of all cells within each administrative unit (eg country) for which the indicator is to be produced.

- Calculate the total value of all cells in the population density raster falling within each zone (for eg 10-km). Divide the result against the total for the whole country in order to produce a percentage of the total value for that unit (country).
- Multiply the percentage of the population falling within each zone against the total population of that administrative unit for that year. This produces the number of people within reach of the nodes on the core transmission network.

Relationship with other indicators: This indicator is similar to the number of people within reach of GSM coverage. This indicator can be calculated by operational status (see Indicator 6) in order to show how many people are currently reach of an operational network, and how many will be once network which is under construction, planned or proposed is completed.

Methodological issues: This indicator can only be calculated by processing information in a GIS software. If the administration or authority does not have a GIS software, it can be submitted for central processing at ITU.