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SERIES L: ENVIRONMENT AND ICTS, CLIMATE
CHANGE, E-WASTE, ENERGY EFFICIENCY;
CONSTRUCTION, INSTALLATION AND PROTECTION
OF CABLES AND OTHER ELEMENTS OF OUTSIDE
PLANT

ITU-T L.1700 – Low-cost sustainable telecommunication for rural communications in developing countries using fibre optic cable

ITU-T L-series Recommendations – Supplement 22

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ITU-T L-SERIES RECOMMENDATIONS

**ENVIRONMENT AND ICTS, CLIMATE CHANGE, E-WASTE, ENERGY EFFICIENCY; CONSTRUCTION,
INSTALLATION AND PROTECTION OF CABLES AND OTHER ELEMENTS OF OUTSIDE PLANT**

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Supplement 22 to ITU-T L-series Recommendations

ITU-T L.1700 – Low-cost sustainable telecommunication for rural communications in developing countries using fibre optic cable

Summary

Supplement 22 to ITU-T L-series Recommendations identifies a low-cost, sustainable optical cable solution for potential users of broadband digital services in remote or rural areas who are unlikely to have such services. This solution would quickly and inclusively close the digital divide which is a key target of the ITU Connect 2020 Agenda.

Mature and proven technologies are best integrated into affordable and reliable solutions suitable for local, non-skilled people to install, operate, maintain and repair so that the system will become part of their community, thus leading to better system maintenance and quicker damage recovery.

Best practice examples use lightweight, thin and robust optical cables and commodity-type media converters. The results of field trials are presented in this Supplement. The cost of such cables, with their simple construction, is estimated to be one tenth that of using conventional optical cables.

History

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Backhaul networks, digital divide, lightweight optical cable, robust networks, rural communities.

* To access the Recommendation, type the URL <http://handle.itu.int/> in the address field of your web browser, followed by the Recommendation's unique ID. For example, <http://handle.itu.int/11.1002/1000/11830-en>.

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

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Supplement 22 to ITU-T L-series Recommendations

ITU-T L.1700 – Low-cost sustainable telecommunication for rural communications in developing countries using fibre optic cable

1 Scope

This Supplement identifies low-cost, sustainable optical cable solutions for potential users of broadband digital services in remote or rural areas who are unlikely to gain such services when based solely upon conventional urban practices needing a positive return on investment, thus quickly and inclusively closing the digital divide.

Best practice examples are included using lightweight, thin and robust optical cables and commodity-type media converters. The results of field trials are presented in this Supplement. The cost of cables and their construction are estimated to be a fraction of the costs when using conventional optical cables with underground ducts.

2 Abbreviations and acronyms

This Supplement uses the following abbreviations and acronyms:

CAPEX	Capital Expenditure
DIY	Do It Yourself
MTBF	Mean Time Between Failure
MTTR	Mean Time Between Repair
ODA	Official Development Assistance
OPEX	Operating Expense
USF	Universal Service Fund
US FCC	United States Federal Communications Commission

3 Key points of consideration for cost-effective, sustainable optical fibre backhaul solutions

3.1 System overview

Figure 1 provides an example of an optical cable backhaul layout. The optical cable backhaul connects the point of presence in the backbone with remote centres in rural/remote areas, and also with fixed access or mobile base stations, Wi-Fi stations and/or worldwide interoperability for microwave access (WiMAX) stations to the end users. The backhaul can take a ring form with redundant configuration for link survivability and improved resilience.

Figure 2 illustrates the best-of-class relationship between signal capacity vs. transmission distances without demanding electric power for the cable. Currently, typical practical capacities and distances in the backhaul are 10 Gbit/s/fibre-pair and 100 km, respectively. An optical cable solution is very attractive from an environmentally conscious standpoint; well over 100 km can be passively covered with passive optical cable, while respecting the landscape and allowing ease of construction, maintenance and disposal without the use of heavy machinery. Optical cable solutions require no power generators, solar panels, antennas or towers; only lightweight, manually-deployable robust cables are needed.

In order for optical cable solutions to be widely and quickly deployed across difficult terrains and environments, the solutions should seek cooperation with the local community. This relationship