



Small Cells Drive Microwave Backhaul Boom

Small Cells 2019 - 2026



Companies mentioned: ADVA, ADTRAN, Actelis Networks, Airspan, AT&T, Broadway Partners, Cambium Networks, Cambridge Communication Systems, Ceragon, Cisco, China Mobile, China Telecom, China Unicom, DragonWave, ECI Telecom, Ericsson, Facebook, Fastback Networks, Huawei, Juniper, Motorola, NEC, Nokia, Ontix, RADWIN, Telecom Infra Project, Telefonica, Verizon, Vodafone, ZTE.

RAN RESEARCH: THE RESEARCH ARM OF WIRELESS WATCH

Lead analyst: Philip Hunter

Executive Summary

"Rethink has a commitment to forecasting markets that others shy away from – those on the verge of radical transformation"

RETHINK
TECHNOLOGY
RESEARCH

<https://rethinkresearch.biz/>



CONTENTS

	Page
Contents	2
Table of Figures	3
Introduction	4
The Forecast	6
Drill Down by Geography	9
Small Cells	13
Backhaul Evolution	17
Fronthaul Comes of Age	21
Towards the Future – O-RAN and eCPRI	27
Optical Backhaul Transport	29
Vendor Snapshot (optical)	34
Wireless Backhaul	35
Vendor Snapshot (wireless backhaul)	39
Use cases and backhaul	42
Conclusions	44
Methodology	45
The Rethink RAN Research process summarized	47
RAN Research: Forecasting disruption in wireless	48
Contacts	49
About Rethink Technology Research	50



TABLE OF FIGURES

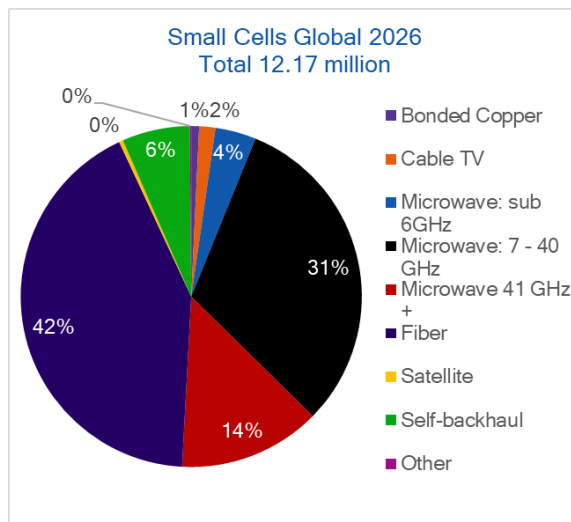
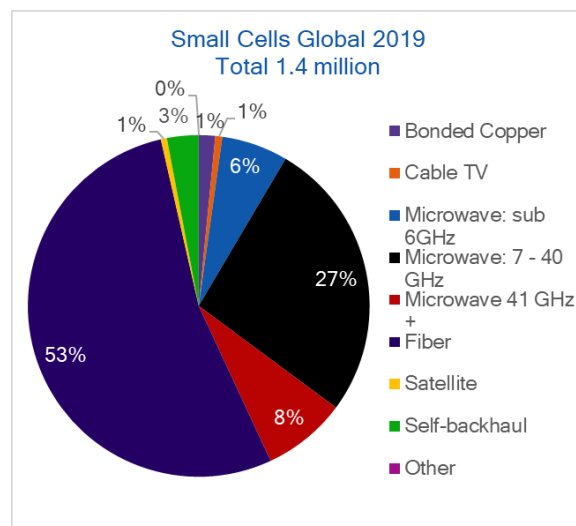
	Page
Small Cells Global 2019	4
Small Cells Global 2026	4
Macro Cells Global	5
Fiber 2016	6
Fiber2019	6
Microwave: sub 6GHz 2026	7
Microwave: 7—40 GHz 2026	7
Microwave 41 GHz + 2026	8
Self-backhaul 2026	8
Macro Cells China	10
Macro Cells APAC ex China	10
Macro Cells Europe	11
Macro Cells North America	11
Macro Cells Latin America	12
Macro Cells MEA	12
Small Cells China 2019	13
Small Cells China 2026	13
Small Cells APAC ex China 2019	14
Small Cells APAC ex China 2026	14
Small Cells Europe 2019	15
Small Cells Europe 2026	16
Small Cells North America 2019	16
Small Cells North America 2026	16
Small Cells MEA 2019	16
Small Cells MEA 2026	16

Introduction

Backhaul will be even more critical for MNO competitiveness and ability to meet rising customer expectations in the 5G era than it has been under 4G. The rapid expansion in spectrum and support for much greater diversity in use cases will strain backhaul capacity and demand extra layers of complexity to deliver on performance and flexibility. This will drive growth in capacity of backhaul links and changes in architecture as radio functions are separated from baseband signal processing to enable both to scale independently and be supplied by different vendors.

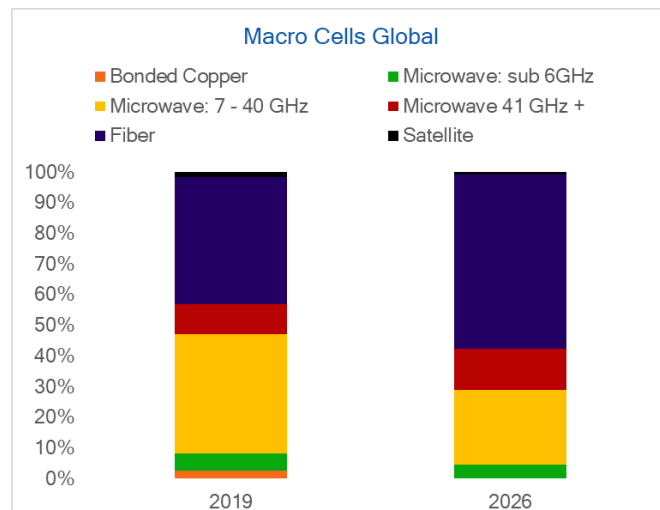
The drive for higher bit rates and capacity will accelerate growth of small cells that cut the distance between radio units and User Equipment (UE) and that will be the main driver of backhaul links over the next six years. This is reflected in the latest RAN Research forecast and analysis of global backhaul trends until 2026 covering a major period of transition from 4G to 5G in most regions. The number of small cell backhaul links is forecast to grow almost nine times between 2019 and 2026 from 1.4 million to 12.27 million.

The small cell boom will also increase use of microwave for backhaul because, although fiber provides more capacity and lower latency, it will not always be available or affordable at the cell sites. This will be reflected in the three microwave categories – sub 6 GHz, 7-40 GHz, and 41 GHz plus – collectively increasing their share of small cell backhaul links from 36% in 2019 to 47% by 2026. The share taken by fiber as the other principal contender will shrink correspondingly from 53% to 42% over that 7 year period.



This is quite different from the situation in conventional backhauling of the macro cells that still dominate cellular infrastructure in 2020. Here fiber is in the ascendant and will increase its penetration of backhaul over the forecast period, in line with continuing deployment in the field by fixed operators, propelled in many cases by government investment. RAN Research forecasts global fiber penetration of macro cell backhaul by number of connections to increase from 41.7% in 2019 to 56.9% by 2026.

However, with macro cells already widely deployed their total numbers will grow at a relatively sedate pace compared with small cells over the forecast period, rising from 7.44 million in 2019 to 9.53 million by 2026.



These global figures mask great regional variations that depend on factors such as terrain, investment in fiber locally and regulatory actions. This will be especially the case for small cells, whose deployment will proceed faster in North America and many countries of Asia Pacific than in Europe. At the macrocell level the march towards fiber will proceed at varying paces, being strongest in the leading markets of Europe, North America and Asia Pacific.

Beyond growth in numbers of connections, there will be major increases in average link capacity driving increased use of Dense Wave Division Multiplexing (DWDM) for optical backhaul and higher mm Wave frequencies for microwave. The other major trends will be growth in the variants of backhaul called mid haul and fronthaul in association with small cell deployment. This is arising through disaggregation of the radio and baseband functions at the RAN level.

This RAN Research report and forecast analyses these variants and associated challenges for operators under the heading of xHaul, in the light of the forecast projections.

Methodology

This backhaul report took our previous forecasts of small cells and macro cells as a starting point and then extrapolated these to totals of backhaul links. These do not quite correspond one to one with number of cells because there are some cases of RAN sharing for example, in which case a single cell would have two separate backhaul connections into the two operator's core networks, so that was taken into account. Adjustments were also made on a regional basis accounting for feedback received from interviews with operators, vendors and representative bodies such as the Telecom Infra Project. This led us for example to downgrade the projected numbers of small cells and associated backhaul in Europe over the next few years.

Our projected data then fed forecast graphs for backhaul through to 2026, diced by the main geographical regions and physical transport types, primarily optical fiber, self-backhaul over the same spectrum and three categories of wireless backhaul, that is sub 6 GHz, 6-40 GHz and 41 GHz +.

A substantial part of the report analyses these backhaul categories and technical background to them, discussing challenges and issues. This was based on detailed study of published reports and white papers, as well as feedback from leading backhaul vendors, ranging from the big well known players like Ericsson and Huawei, to smaller backhaul specialists such as Ceragon and Cambridge Communication Systems.

This document contains explanatory notes and commentary to accompany the Excel spreadsheet. That contains further data breakdowns including regional patterns. The surveys and forecasts on which the outputs are based were conducted in January to March 2020.

There were 94 responses from operators (66 traditional mobile network operators and 28 private, enterprise or neutral host operators, plus a partner study of 72 large to medium corporations in North America, Europe, China, India and south-east Asia.

The MNO sample is taken from the top 40 international mobile operator groups, which account for 80% of the global mobile subscribers (IMG-40). From this representative group of operators, the small cell forecasts are developed. Other inputs to the model come from alternative mobile deployers including neutral hosts, private network operators, cloud providers and enterprises.

From the starting point of a calculation of the number of cell sites already deployed worldwide, forecasts were made of the numbers of base stations and edge nodes that would be rolled out a) to brand new sites and b) to replace or upgrade existing sites. These deployment forecasts were then categorized by network topology, spectrum band, spectrum mode, region and other factors. The equipment deployed in each case was also surveyed and modeled.

Based on the surveys of operators and vendors, it was then calculated how the cell and edge sites would be equipped – by base station type, edge node type and location, technology, frequency band etc, leading to a detailed unit and market size measurement.

Who should buy this report?

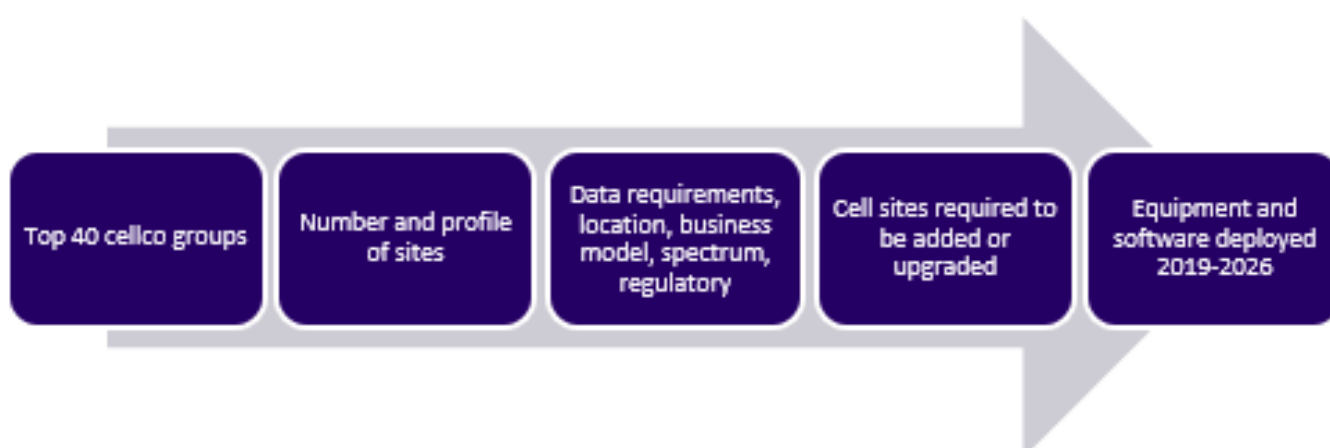
This report is essential for mobile operators plotting their move into and through the 5G era, highlighting and explaining challenges that will arise and identifying options for backhaul both at the small cell and macro cell level. The report is equally valuable for vendors across the mobile ecosystem including the RAN and core as well as backhaul, since they are becoming inseparable for meeting performance targets and supporting the increasingly diverse use cases of 5G. The report also provides invaluable insight into regional differences with forecasts to 2026, relevant for international operators as well as vendors addressing multiple markets.

The Rethink RAN Research process summarized

These forecasts were based on a combination of data from:

- Detailed surveys, interviews and operator-by-operator modeling of the IMG-40 groups.
- Studies and modelling of the deployments and strategies of the top 100 4G operators, as tracked by Rethink Technology Research's quarterly surveys, interviews and desk research.
- A survey of tier one MNOs and alternative operators (see above) about their detailed plans for deployments to 2026.
- Input from ecosystem vendors on shipments, technology strategies and competitive landscape, also updated quarterly.
- Interviews with other stakeholders such as IoT service providers and regulators
- A calculation of the resources required in each type of location to achieve the deployers' stated objectives.

Note. While shared spectrum will be used for macrocells and fixed wireless networks, the main focus of this report is on small cells, particularly in enterprise and industrial environments. Where small cells are in virtualized or distributed configurations, each radio head counts as one unit.



RAN Research: Forecasting disruption in wireless

Rethink Technology Research is a specialized research and consulting firm with 12 years' experience in surveying wireless, broadband, over-the-top and quad play operators. This has resulted in a broad research base of over 140 service providers (MNOs, telcos, cable and satellite operators, over-the-top providers) worldwide. These organizations are surveyed on a regular basis about their network infrastructure and business plans, and have a relationship of trust with Rethink.

Rethink also has deep relationships with the telecoms ecosystem (tier one device OEMs, vendors, technology developers, integrators, regulators etc), and is perceived as a thought leader in many areas of the telecoms and media sectors. Key areas of expertise and research experience include HetNet migration, small cells and carrier WiFi; transformation strategies for the RAN and the BSS/OSS; convergence of IT and network skills and platforms; device and chipset roadmaps; spectrum strategy.

Here are some sample titles of reports we have produced recently:

- Private networks and shared spectrum making the 5G enterprise a reality
- Is it right to be a Tortoise or Hare in 5G migration
- RAN automation is central to the 5G case—but is it a distant dream?
- Open RAN architecture set to disrupt 5G landscape
- Making the mobile enterprise a reality at last?

SUBSCRIPTION COSTS

Single User license - \$2,000 (One Report)

Single User subscription (This report plus 5 more) \$6,000

Corporate license—\$4,000 (unlimited distribution inside your organization).

Corporate Subscription (This report plus 5 more) \$10,000.

RAN RESEARCH MAIN CONTRIBUTORS

Caroline Gabriel - **Research Director**

caroline@rethinkresearch.biz

+44 (0)207 450 1230

Philip Hunter — **Research Fellow**

phil@rethinkresearch.biz

+44 (0)117 329 1480

RETHINK LEADERSHIP

Peter White - **Co-founder and CEO**

peter@rethinkresearch.biz

+44 (0)117 925 7019

Caroline Gabriel - **Research Director and Co-founder**

caroline@rethinkresearch.biz

+44 (0)207 450 1230

www.rethinkresearch.biz

About Rethink Technology Research

Rethink is a thought leader in quadruple play, emerging wireless technologies and the energy market. It offers consulting, advisory services, research papers, webinars, plus three weekly research services; Wireless Watch, a major influence among wireless operators and equipment makers; Faultline, which tracks disruption in the video ecosystem, and OTT video; and Rethink Energy, designed to forecast the changing energy landscape and its investment possibilities as renewables begin to take over from conventional fossil fuels.



Need more information?

John Constant (*Business Analyst*)

john@rethinkresearch.biz

O: +44 (0)1794 521411

M: +44 (0)7468 460739



RAN Research

Bristol & Exeter House
Lower Approach Road
Temple Meads
Bristol
BS1 6QS
United Kingdom

Tel. +44 (0) 1173 291480
Tel. +44 (0) 1179 257019

www.rethinkresearch.biz

Published July 2020

