



# The Mobile Economy North America 2021



## GSMA<sup>®</sup> Intelligence

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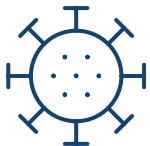
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# Executive summary



## The vital role that the mobile industry plays came into sharp focus during the pandemic

With lockdown restrictions and social distancing measures in place, people relied on mobile networks to stay connected and access life-enhancing services, reflecting the importance of mobile connectivity to societies and economies everywhere. North American operators have been proactive in reaching out to their customers, working with public authorities and third parties to provide a range of vital services, and supporting the communities in which they operate.

Mobile operators are also contributing to addressing social issues through their efforts to tackle climate change. In April

2021, the mobile sector was credited by the United Nations (UN) for achieving a critical breakthrough towards its mission of combatting climate change. Being the first major sector to achieve the rigorous criteria set by the UN's Race to Zero campaign demonstrates the commitment and leadership of mobile operators in the push to meet the goals of the Paris Agreement. In North America, several operators have set science-based targets to cut their carbon emissions rapidly over the next decade. Furthermore, operators in the region are also starting to set ambitious net-zero targets.



## Subscriber growth slows, but mobile's contribution to the North American economy remains pivotal

By the end of 2020, 327 million people in North America subscribed to mobile services, representing 83% of the region's population. This places North America among the world's most developed mobile markets. However, increasing market saturation also means that subscriber growth is slowing, a scenario that is also occurring in other advanced markets around the world.

In 2020, mobile technologies and services generated 4.4% of GDP in North America, a contribution that amounted to around \$1 trillion of economic value added. The mobile ecosystem also supported more than 2.1 million jobs (directly and indirectly) and made a substantial contribution to the funding of the public sector, with more than \$100 billion raised through taxes on the sector.



## 5G momentum builds as 4G reaches its peak

By the end of 2025, 5G will account for almost two thirds of total mobile connections, which is equivalent to nearly 270 million connections. The US and Canada will be among the global leaders in terms of 5G adoption, reflecting the ambitious 5G deployment plans of operators in those countries. 5G will account for 98% of mobile capex over the next five years as operators step up deployments of mid-band spectrum.

While the provision of enhanced mobile broadband (eMBB) to the consumer market has been the core proposition in early 5G deployments, B2B is the largest incremental opportunity in the 5G era. The move to 5G standalone (SA) will gather momentum over the next couple of years, bringing a number of enhanced functionalities and an improved ability to support use cases for IoT (machine type), network slicing and ultra-reliable low-latency communications (URLLC). These capabilities will prove crucial to scaling IoT services in the 5G era.



## Enterprise digitisation and network transformation continue to be a focus

Covid-19 caused considerable disruption to the IoT market in 2020, mostly due to the economic uncertainty caused by the pandemic, leading to IoT projects being put on hold or postponed. That said, there is significant upside potential in the long term, as the pandemic has increased the urgency of enterprise digitisation among many firms. To capitalise on this opportunity, North American operators are pursuing a range of opportunities within the IoT value chain.

Alongside this, operators in the region are also looking to bring new suppliers and technologies into the network. The GSMA Intelligence Operators in Focus survey indicates that expanding 5G coverage and open RAN deployments are the top RAN priorities in North America, while virtualisation investments, security and edge computing are crucial for the core network.



## Policies to enable digital advancement

The speed, reach and quality of 5G services depends on governments and regulators supporting timely access to the right amount and type of affordable spectrum, under the right conditions. To achieve 5G's full potential, access to mid-band spectrum is particularly important, as it offers a balance of coverage and capacity critical to 5G's success. Revenues from the US mid-band spectrum auction (3.7–3.98 GHz) highlighted this need. It exceeded all price predictions, with \$81 billion spent. The price reflects not only the high demand for mid-band spectrum but also US-specific market conditions.

Policy also has a role to play in the shift towards open and virtualised networks, by creating an enabling environment that will support the deployment of new RAN infrastructure. Policymakers can support the transition to mix-and-match RAN infrastructure by funding R&D, providing security assurance and certification, promoting and recognising specifications that enable interoperability, and accelerating 5G network deployment

# Mobile Economy North America

## UNIQUE MOBILE SUBSCRIBERS



2020-2025  
CAGR: **0.9%**

2025

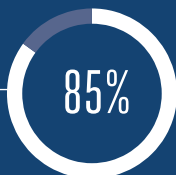
2020

327m

342m



Penetration rate  
Percentage of population



## MOBILE INTERNET USERS



2020-2025  
CAGR: **1.7%**

2025

2020

296m

323m



Penetration rate  
Percentage of population



## SIM CONNECTIONS

(excluding licensed cellular IoT)



2020-2025  
CAGR: **1.2%**

2025

2020

400m

424m



Penetration rate  
Percentage of population



## OPERATOR REVENUES AND INVESTMENT

Total revenues

2020

\$275.1bn



2025

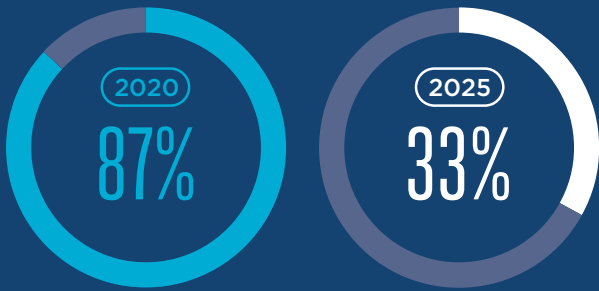
\$317.1bn



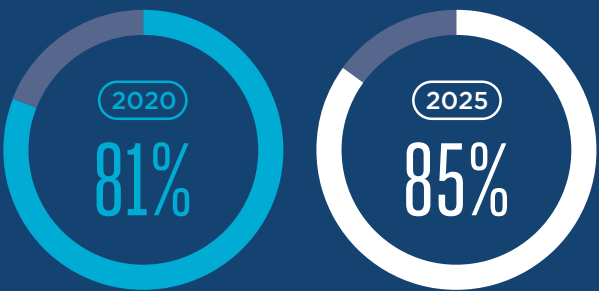
Operator capex of **\$300 billion** for  
the period 2020-2025 (98% on 5G)

4G

Percentage of total connections  
(excluding licensed cellular IoT)



SMARTPHONE ADOPTION



Percentage of connections  
(excluding licensed cellular IoT)



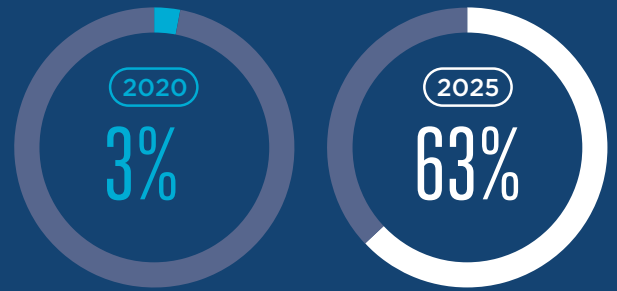
MOBILE INDUSTRY CONTRIBUTION TO GDP



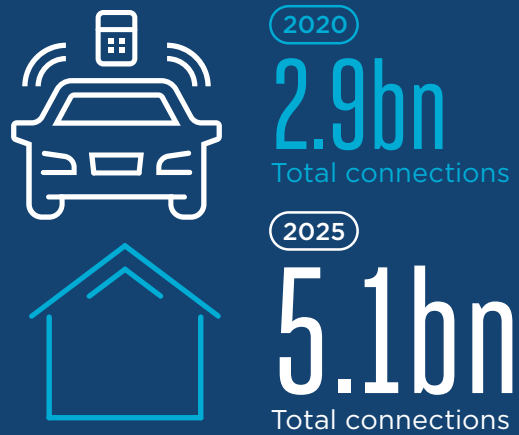
2020  
\$1.0 trillion  
(4.4% of GDP)

5G

Percentage of total connections  
(excluding licensed cellular IoT)



INTERNET OF THINGS



PUBLIC FUNDING



Mobile ecosystem contribution to public funding  
(before regulatory and spectrum fees)

EMPLOYMENT

Jobs supported by the mobile ecosystem in 2020



830,000  
Direct jobs

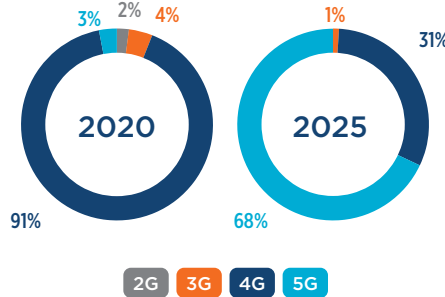
+1.3m  
Indirect jobs

# Subscriber and technology trends

## US



### TECHNOLOGY MIX\*



### SUBSCRIBER PENETRATION



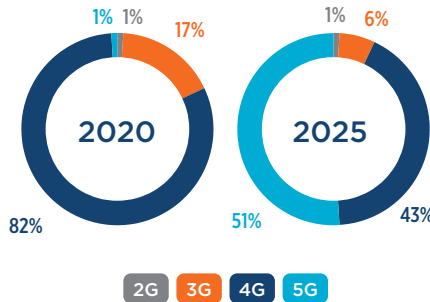
### SMARTPHONE ADOPTION



## Canada



### TECHNOLOGY MIX\*



### SUBSCRIBER PENETRATION



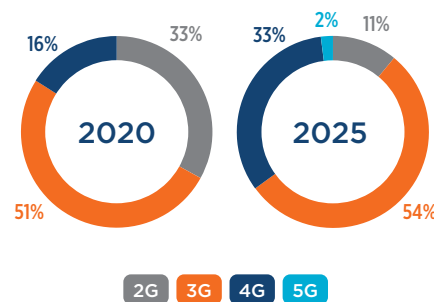
### SMARTPHONE ADOPTION



## The Caribbean



### TECHNOLOGY MIX\*



### SUBSCRIBER PENETRATION



### SMARTPHONE ADOPTION



### Defining North America

We define North America in this report as the US, Canada and the Caribbean (for Mexico, please see The Mobile Economy Latin America report).

The Caribbean includes the following countries or territories: Anguilla; Antigua and Barbuda; Aruba; Bahamas; Barbados; Bermuda; Cayman Islands; Curacao; Dominica; Grenada; Guadeloupe; Haiti; Jamaica; Martinique; Montserrat; Puerto Rico; Saint Kitts and Nevis; Saint Lucia; Saint Pierre and Miquelon; Saint Vincent and the Grenadines; Trinidad and Tobago; Turks and Caicos Islands; British Virgin Islands; and the US Virgin Islands.

\* Percentage of total mobile connections (excluding licensed cellular IoT)  
 Note: Totals may not add up due to rounding





A man with a beard, wearing a black t-shirt, is holding a smartphone in his hands. The background is blurred, suggesting an outdoor setting. The image is overlaid with a blue pattern of dots in the bottom left corner.

**01**

# **The mobile market in numbers**

# 1.1 Subscriber growth slows as market penetration rises

Figure 1

Source: GSMA Intelligence

## Key milestones over the next five years in North America

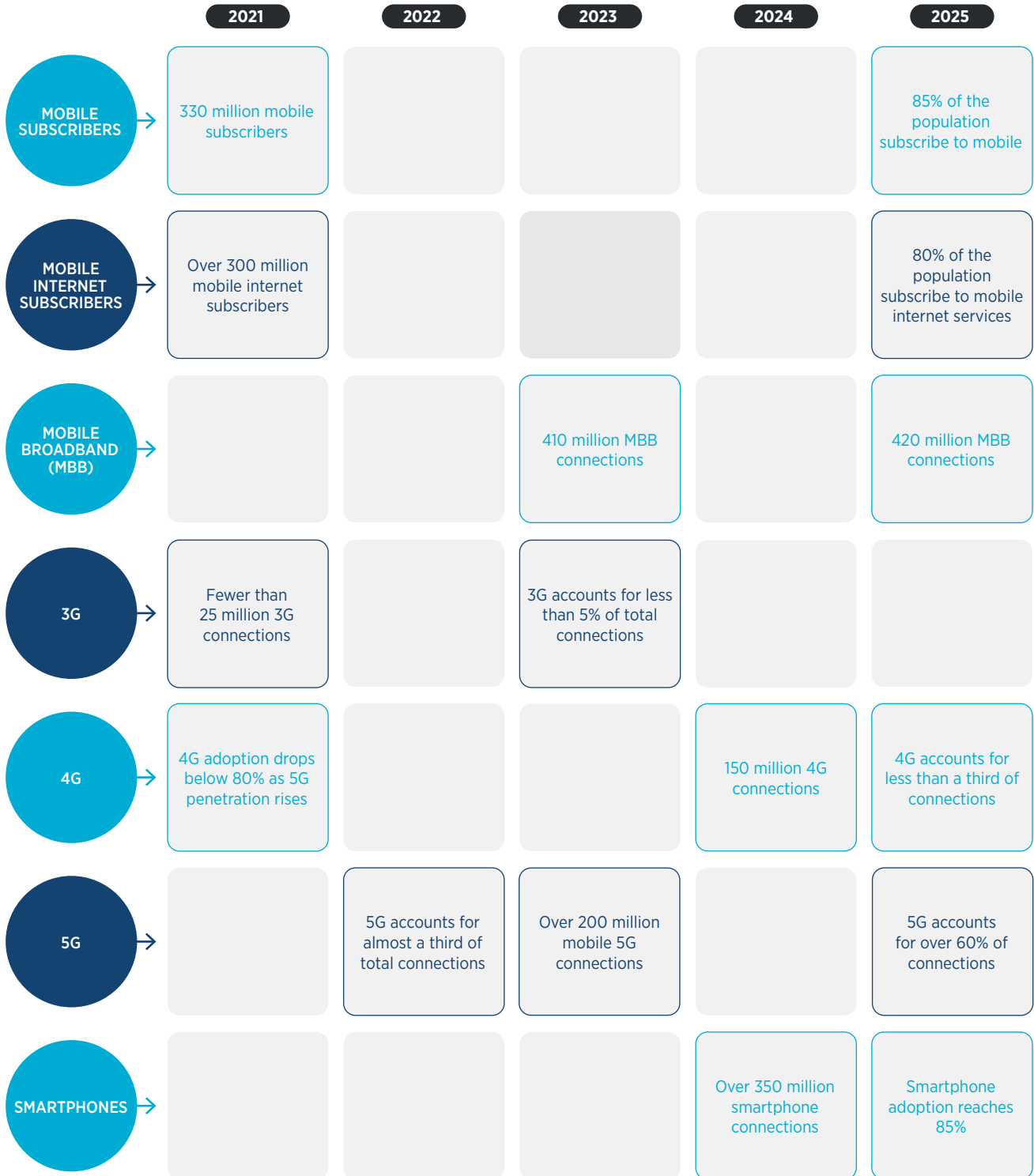
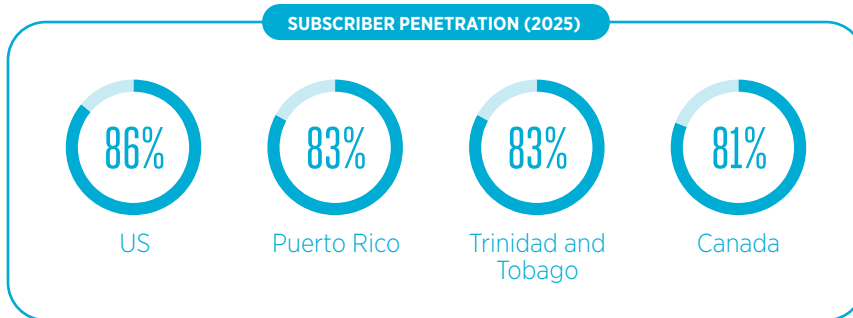
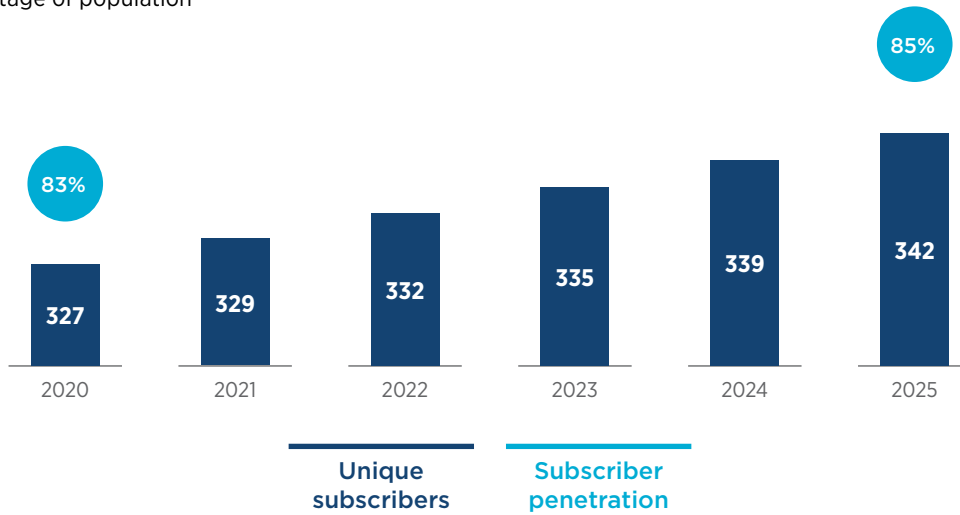


Figure 2

### North America's unique mobile subscriber penetration rate is among the highest in the world

Million, percentage of population



## 1.2 5G adoption begins to accelerate

Figure 3

Source: GSMA Intelligence

### 4G adoption has peaked, while 5G momentum builds steadily

Percentage of connections (excluding licensed cellular IoT)

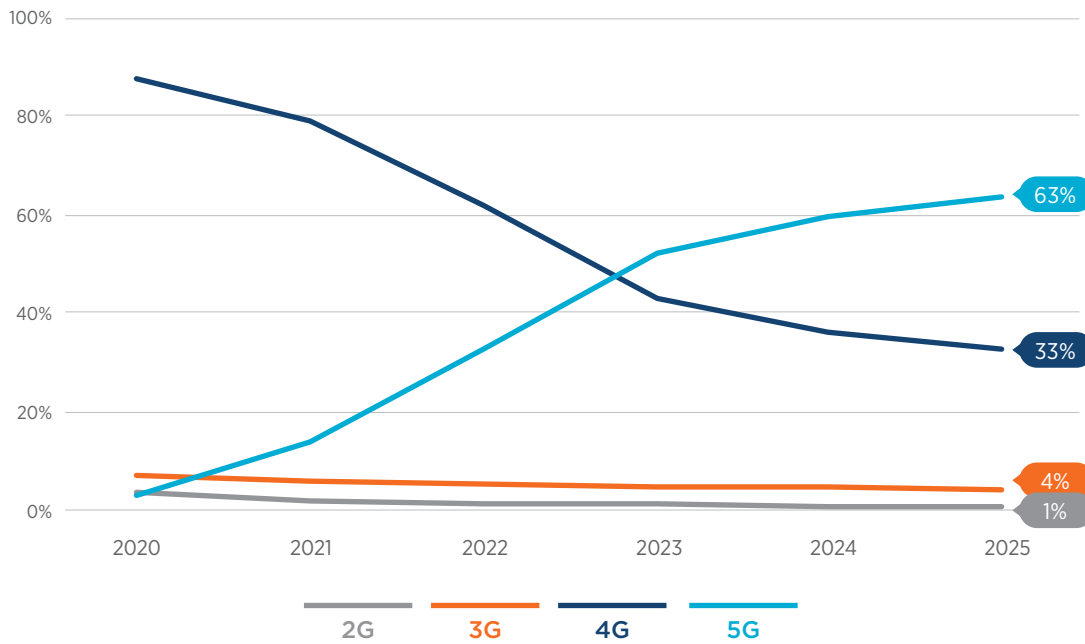
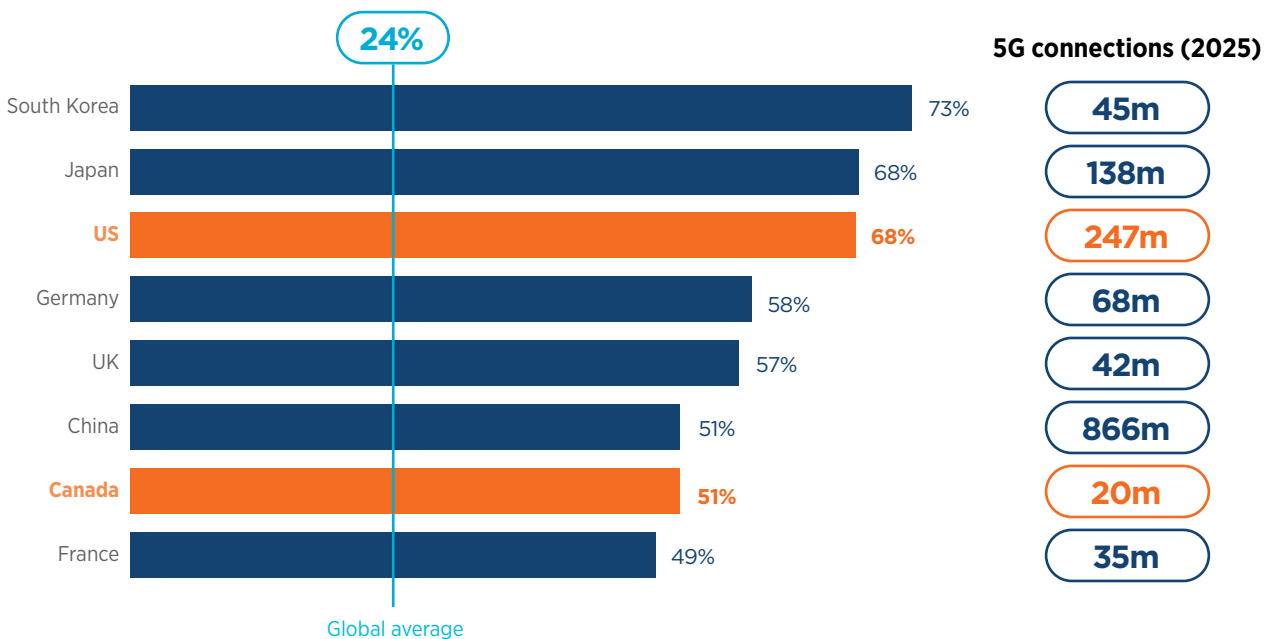


Figure 4

Source: GSMA Intelligence

### The US and Canada will be among the leading markets in terms of 5G adoption

5G adoption in 2025 (percentage of connections)





## 1.3 Consumers go digital

Figure 5

Source: GSMA Intelligence

**Mobile internet adoption is already high in the US and Canada, but there is headroom for growth in several Caribbean markets**

Mobile internet users (percentage of population)

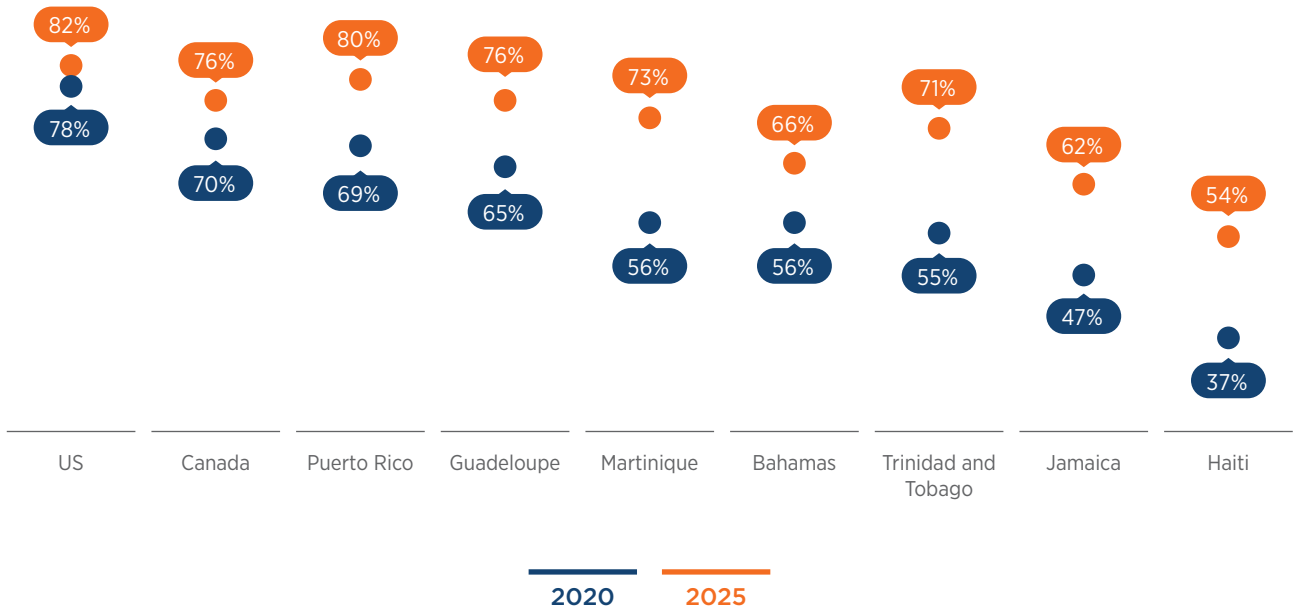
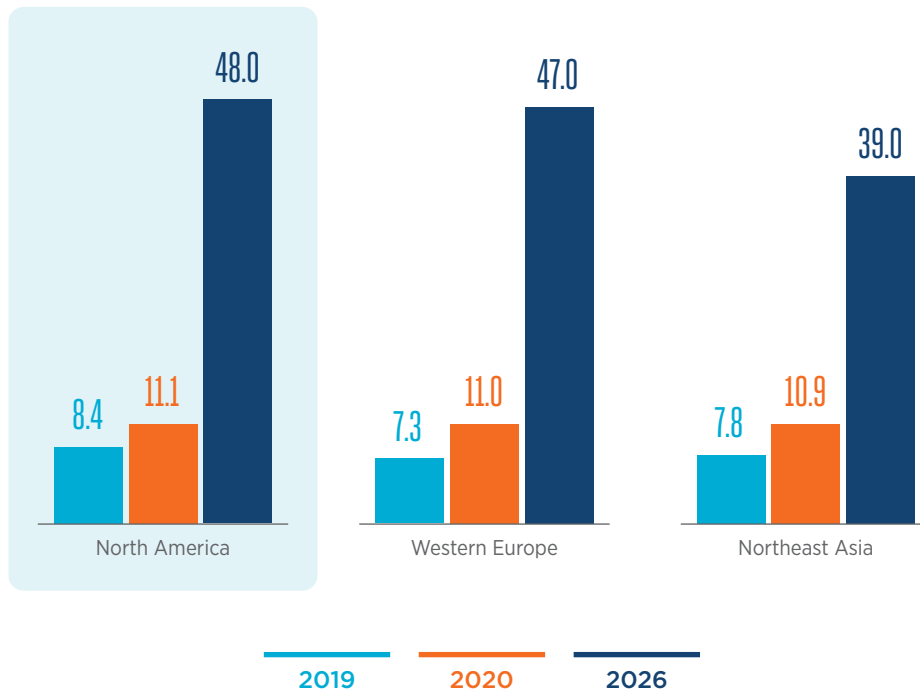


Figure 6

Source: Ericsson

## North America is a regional leader in terms of mobile data usage, due to high uptake of 4G and unlimited data plans

Data traffic per smartphone (GB/month)



### Operator content strategies: build, buy or partner

Video remains the main driver of mobile data traffic. However, operators are assessing their content strategies in light of the investment levels in original content now needed to run successful global streaming platforms – on top of those for building 5G and fibre networks.

In May 2021, AT&T and Discovery Inc announced a deal in which WarnerMedia would be spun off and merged with Discovery's full content and distribution assets to create a new company. Pending regulatory approval, AT&T will receive \$43 billion and relinquish executive management control. While this marks a strategic shift for AT&T three years after buying Time Warner, it does not sound a death knell for telcos in media. Rather, it reflects the challenges in attempting full vertical integration compared to licensing and bundling.

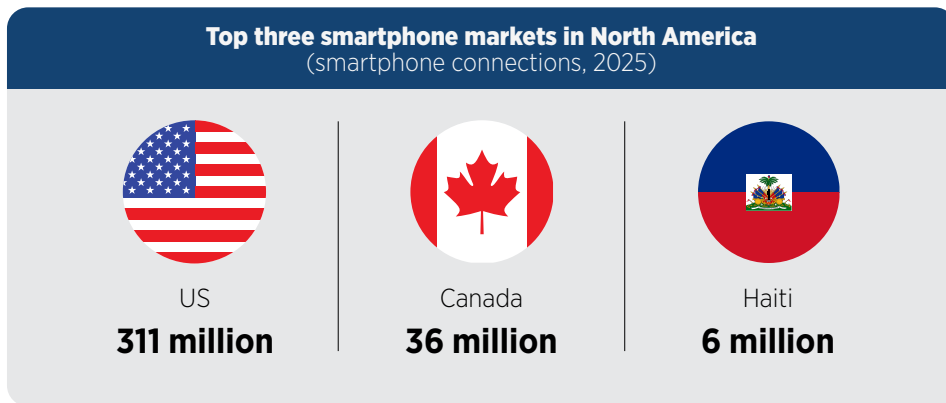
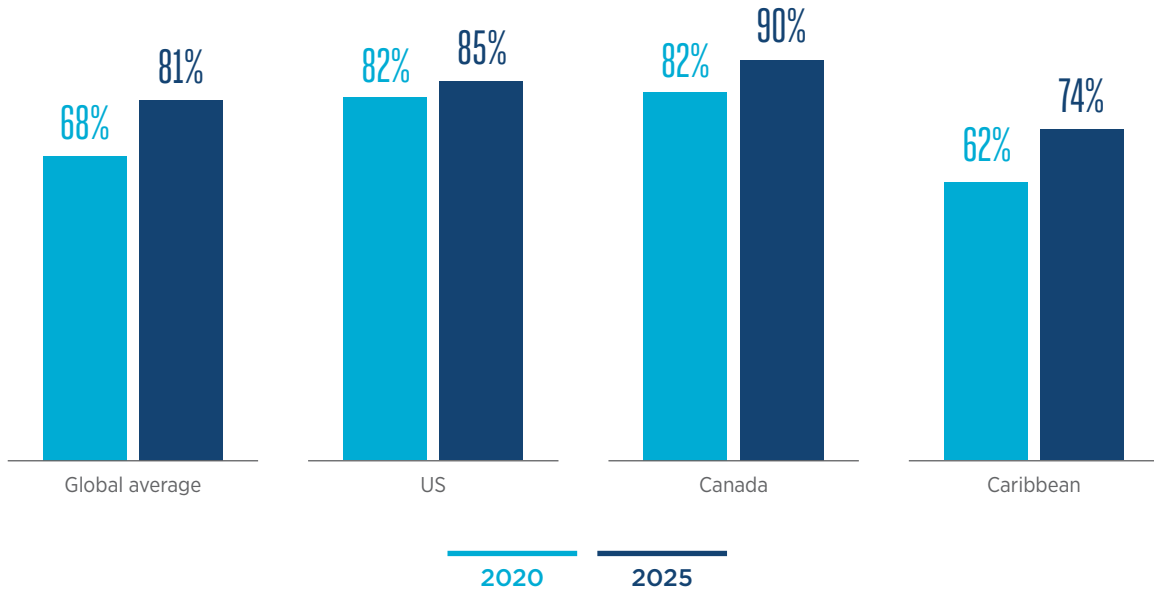
Many of the interesting content experiments we see involve partnerships with sports leagues, music promoters and others such as gaming tournaments, which showcase the power of 5G networks (through VR and AR, for example). AT&T (NBA, WNBA), Verizon (NFL) and T-Mobile (Zyter, a digital health platform) all have active partnerships that exemplify the value of differentiating through network quality and 'experiential' content. This, rather than big-ticket M&A, is more likely to be the future.<sup>1</sup>

1. [Coming full circle: AT&T agrees WarnerMedia spin-off deal with Discovery](#). GSMA Intelligence, 2021

Figure 7

### Smartphone connections in North America will reach 360 million by 2025, with adoption rising to more than 8 in 10 connections

Percentage of connections (excluding licensed cellular IoT)





## 1.4 A more positive revenue outlook as 5G capex rises

Mobile revenue growth fell sharply in 2020 due to loss of roaming revenue, lower handset upgrades and discounts to support vulnerable customers. However, the financial outlook is upbeat: revenue growth should rebound sharply in 2021, helped by

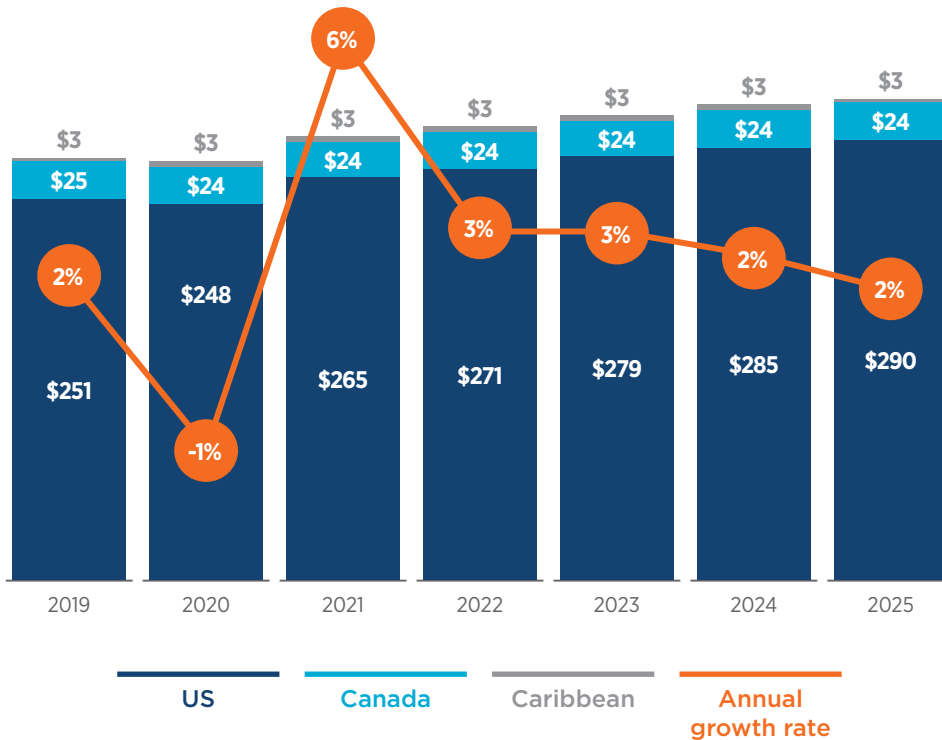
the annualisation of the Covid-19 impact and the growing take-up of 5G smartphones and service plans. The shift towards higher-tier unlimited mobile data plans across the region should provide a further boost to revenue.<sup>2</sup>

Figure 8

Source: GSMA Intelligence

### Revenue is expected to recover in 2021 following the pandemic-related slowdown

Billion



2. For more detail, see [Region in Focus: North America, Q2 2021](#), GSMA Intelligence, 2021

Mobile operators in North America will invest \$300 billion in their networks between 2020 and 2025, of which 98% will be dedicated to 5G. The deployment of C-band (3.7–4.2 GHz) spectrum will be a key driver of this spend,<sup>3</sup> providing a valuable middle ground between capacity and coverage for 5G networks. Operators have revealed details of their deployment plans:

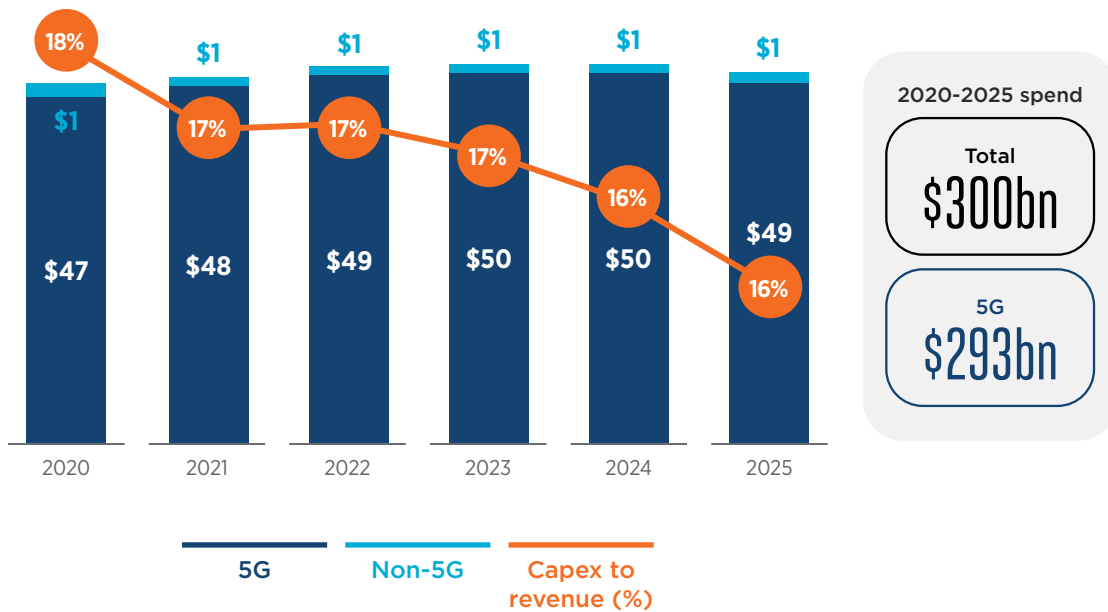
- **Verizon** intends to reach 100 million people with C-band services by March 2022, rising to 250 million by 2024.
- **AT&T** aims to reach 70 million people with C-band services by the end of 2022, rising to 200 million a year later.
- **T-Mobile** intends to deploy C-band spectrum to supplement its 2.5 GHz footprint in select urban and suburban areas.

Figure 9

Source: GSMA Intelligence

### Capex to peak in 2023 as C-band rollouts gather pace

Billion



3. The C-band spectrum auction was completed in early 2021; however, the spectrum is currently being used by satellite companies. It will be vacated in two phases, ending in December 2021 and December 2023.





**02**

# **Key trends shaping the digital landscape**



## | 2.1 5G: prospects remain strong in North America

North America is a global leader in 5G network deployment, applications development and commercialisation. Operators continue to collaborate with other 5G stakeholders, including enterprises, equipment vendors, universities and municipal councils, to develop 5G applications across several sectors of the economy.

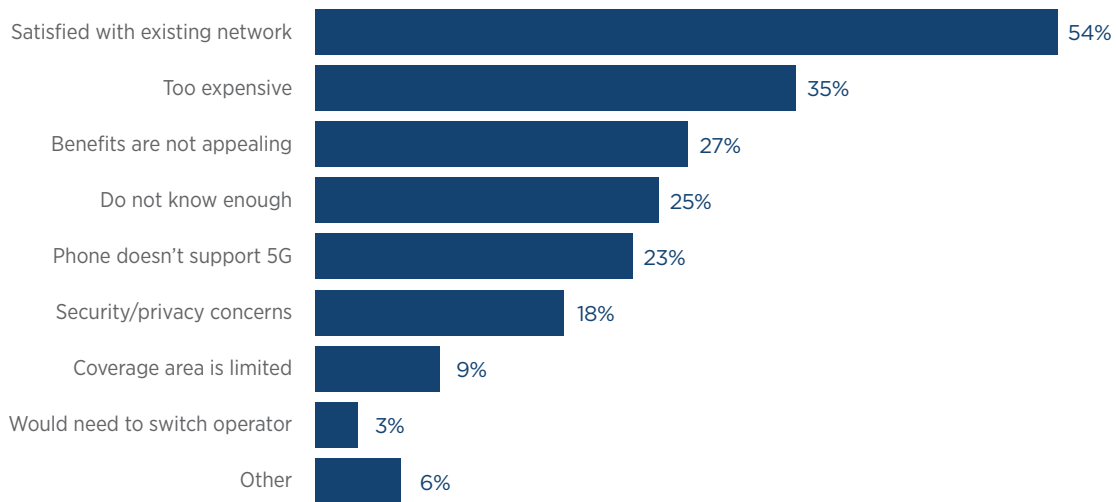
The consumer segment is seeing rising 5G adoption, helped by the arrival of the 5G-capable iPhone 12 and the easing of lockdowns, resulting in people

returning to cities for work, entertainment and other social activities. For example, Verizon has disclosed that the share of 5G-capable devices on its mobile network rose to around a fifth of total connections at the end of June 2021. For most consumers, enhanced broadband connectivity remains the primary use case for 5G. However, there is growing demand for immersive content, which leverages 5G's high-bandwidth and low-latency capacities to deliver better experiences for consumers.

Figure 10

### Satisfaction with existing networks is the top 5G barrier in North America, highlighting the challenge for operators to show the value of 5G to consumers

Which of the following explains why you have decided not to upgrade to 5G when it is available?



#### FWA to gain traction

One of the most interesting potential applications of 5G is in providing access to home broadband, through fixed wireless access (FWA). This hybrid approach combines aspects of traditional mobile and fixed-line delivery methods. FWA has been around for more than a decade through the 3G and 4G eras; however, adoption has remained relatively limited compared to other fixed options. 5G enables a larger addressable opportunity for FWA, with the technology allowing operators to offer customers larger data bundles and faster speeds thanks to 5G's enhanced capabilities.

Recent developments show growing interest in the FWA market among operators:

- Verizon plans to expand and extend its mmWave 5G network with C-band spectrum, enabling FWA services to up to 50 million households by 2024. This is more than three times the 15 million households currently reached by its Fios FTTP service.
- In April 2021, T-Mobile announced the launch of its FWA-based Home Internet service. More than 30 million homes have access to the service, including around 10 million homes in small towns or rural areas.
- In March 2021, AT&T started offering 5G fixed wireless for business customers. AT&T has cited fixed wireless as one of the three main pillars of its approach to 5G for business, alongside mobile and edge computing.
- Bell Canada's Wireless Home Internet (WHI) service, which operates in small towns and rural locations in Atlantic Canada, Québec, Ontario and Manitoba, will be enhanced with 5G capability later in 2021. Rogers and fixed wireless specialists (e.g. Xplornet) have also announced plans to deploy 5G FWA services.



## A consensus that 5G must monetise enterprise verticals

While the provision of eMBB to the consumer market has been the core proposition in early 5G deployments, B2B is the largest incremental opportunity in the 5G era considering the raft of digital transformation projects underway across different industries. Much of the enterprise opportunity for operators will rely on 5G SA networks being installed. This is already happening across North America, with T-Mobile US becoming the first operator in the world to launch a nationwide 5G SA network in August 2020. Other operators in

the region are expected to make similar moves in 2021 and 2022.

The move to 5G SA allows networks to break an underlying service connection with LTE and brings a number of enhanced functionalities. The result is an improved ability to support use cases for IoT (machine type), network slicing and URLLC while delivering a simplified network architecture and the cost optimisation that follows. These capabilities will prove crucial to scaling IoT services in the 5G era.

## Operators step up private network deployments

As operators search for new revenue sources, private networks have become a near-universal offering, driven by the demand for networks with greater levels of control, customisation and security. The majority of commercial deployments have been on LTE technology, although 5G private networks are emerging as a solution to address issues around latency, reliability and density, among other enterprise requirements. This has been borne out by recent developments.

For example, Verizon recently announced the launch of On Site 5G, the operator's first commercially available, private 5G network solution in the US. Further, Rogers for Business launched a managed solution for wireless private networks in March 2021, providing large enterprises with a dedicated on-site wireless network platform.

To unlock many of the private network applications linked to the long-term vision of 5G, mmWave spectrum will prove crucial, due to its high throughput and network capacity. For instance, AT&T is building a mmWave private 5G network for the Ellison Institute, enabling applications such as 3D tumour imaging.

## Riding on the mmWave

Most 5G launches globally so far have relied on 3.5 GHz spectrum, with very few exceptions. But the US is one of those exceptions; its first commercial 5G network was launched using mmWave (24 GHz and above) spectrum. Today, the US market is a global leader in the use of mmWave spectrum for 5G, supported by the Federal Communications Commission (FCC) making mmWave spectrum available for mobile services earlier than in most countries.

US operators have plans to expand their mmWave footprints in 2021 and beyond. In March 2021, Verizon

announced it expects to build 14,000 additional mmWave sites by the end of 2021, while AT&T unveiled plans to expand its mmWave network to 40 cities and 40 venues, including airports in partnership with Boingo. US Cellular and C Spire are also weighing up mmWave deployments. Furthermore, US Cellular achieved sustained average download speeds of 1 Gbps over a distance of 7 km in a recent mmWave FWA trial, while C Spire is testing spectrum in the 28 and 60 GHz bands for FWA use.

Source: GSMA Intelligence

Figure 11

### A key benefit of mmWave spectrum is the amount available, allowing massive capacity to be delivered to support new use cases

Average bandwidth per operator



Besides spectrum availability, mmWave 5G services benefit from an expanding network equipment and consumer device ecosystem. All major network equipment vendors now offer mmWave products

and support the development of innovative solutions, while consumer adoption has been boosted by the launch of Apple's mmWave-capable iPhone 12 series in 2020.

## 2.2 Telco of the future: operators accelerate network transformation strategies

With the commercialisation of 5G and the introduction of mobile network innovations such as open RAN, edge networking and network automation, we are beginning to see what the telco of the future could look like. As a result, operators' decisions on network transformation strategies are now more important than ever. Such decision-making is important to the operators, their network infrastructure suppliers and the customers who will rely on the networks of tomorrow.

In North America, revenue generation and customer experience are driving operators' network transformation efforts, with cost-cutting less of a concern. This is in contrast to other advanced regions, such as Europe, where operators see customer experience, opex savings and new revenues as nearly equal priorities. North American operators are four times more likely to see revenue-focused activities as their primary network transformation strategy goal than their European counterparts.



Figure 12

Source: GSMA Intelligence Operators in Focus: Network Transformation Survey 2021

## Revenue generation and customer experience remain the priorities for North American operators

What is the primary goal driving your network transformation strategy? (Percentage of North American operators)

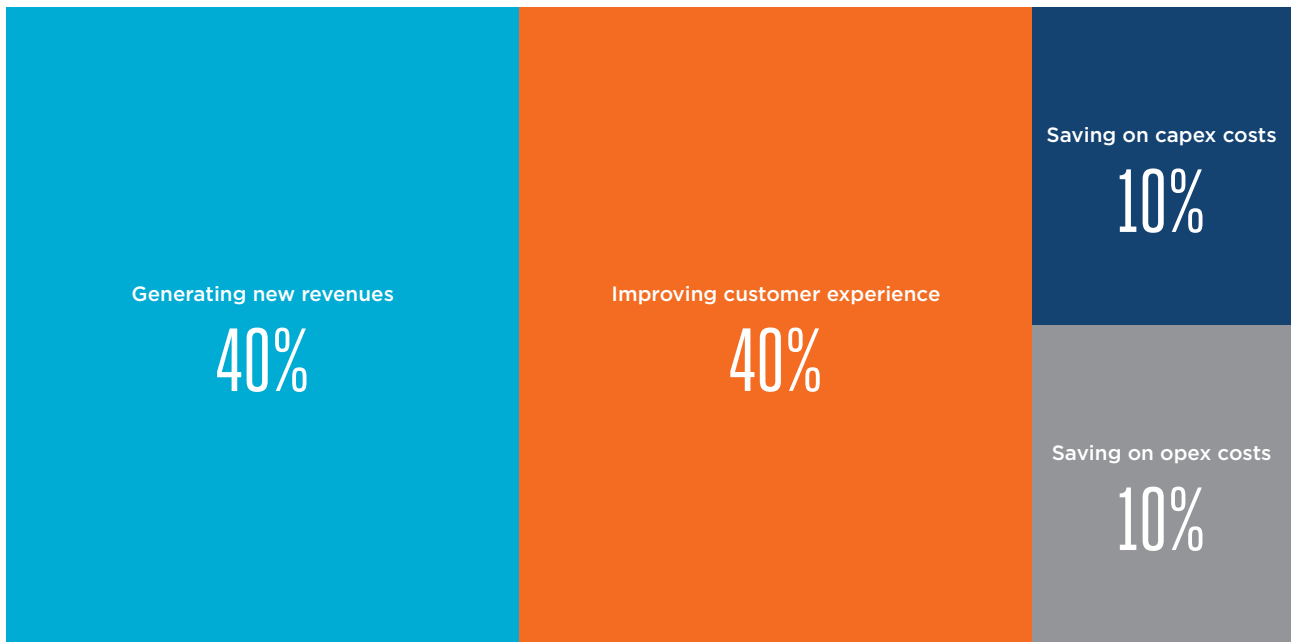


Figure 13

Source: GSMA Intelligence Operators in Focus: Network Transformation Survey 2021

## 5G coverage and open RAN top RAN priorities, while virtualisation investments and security are crucial for the core network

Considering your 5G radio access network/5G core and service network, which areas of investment are most important for delivering successful 5G services? (North American operators)

### Top ranked priorities for 5G investment

#### RAN

1. Wide-area 5G coverage
2. In-building 5G coverage
3. Open RAN

#### CORE

1. Virtualisation investments
2. Networks security upgrades
3. Edge computing



As is the case in other regions, wide-area coverage is the top 5G RAN investment priority. North American operators are investing heavily to ensure broad coverage, which is critical for making 5G available to as many potential end users as possible. In the US, the 5G networks of AT&T, T-Mobile US and Verizon each cover more than 230 million people. The priority for operators across the next few years will be deploying C-band spectrum to deliver greater 5G speeds and capacity in more locations. However, operators are still waiting for this spectrum to be cleared.

Open RAN has also emerged as a top RAN priority for North American operators: only in Latin America is open RAN ranked higher in terms of 5G investment priorities. Open RAN is a particularly appealing choice for greenfield operators, as they can avoid the challenges of integrating open technologies around legacy networks. In the US, new mobile entrant Dish

Network has formed a strategic collaboration with AWS to build a cloud-based, 5G open RAN. Open RAN interest in North America is also being sparked by the growing influence of US open RAN vendors, such as Altostar, Mavenir and Parallel Wireless. These companies have all announced significant customer acquisitions in 2021 as they continue to support open RAN deployments around the world.

Virtualisation investments rank as the top priority when it comes to core networks. Operators have been moving to virtualised core functions for years. From the start, it was clear that this would be a long-term journey. 5G, however, represents another opportunity to move this transformation forwards. This is important as operators have yet to fully realise the promised benefits of virtualisation, such as reduced costs and accelerated service innovation. Closer collaboration with cloud providers could help to change this.



### AT&T moves 5G mobile network to Microsoft's cloud

In June 2021, AT&T announced that it will move its network to Microsoft's Azure for Operators cloud, starting with its 5G core. As part of the strategic alliance, Microsoft will acquire AT&T's intellectual property and technical expertise relating to network cloud technology.

Previous tie-ups between mobile operators and cloud providers have largely concentrated on moving IT and back-office functions to the public cloud. Therefore, AT&T's decision to move its core network to Microsoft cloud is a significant step and represents one of the biggest commitments yet by an incumbent operator to run a mobile network on public cloud technology. It also reflects the complexity of virtualising network assets and the value that webscalers can bring. For Microsoft, acquiring AT&T's network cloud technology and talent means it is in a strong position to help other operators accelerate, or kick-start, their network transformations.

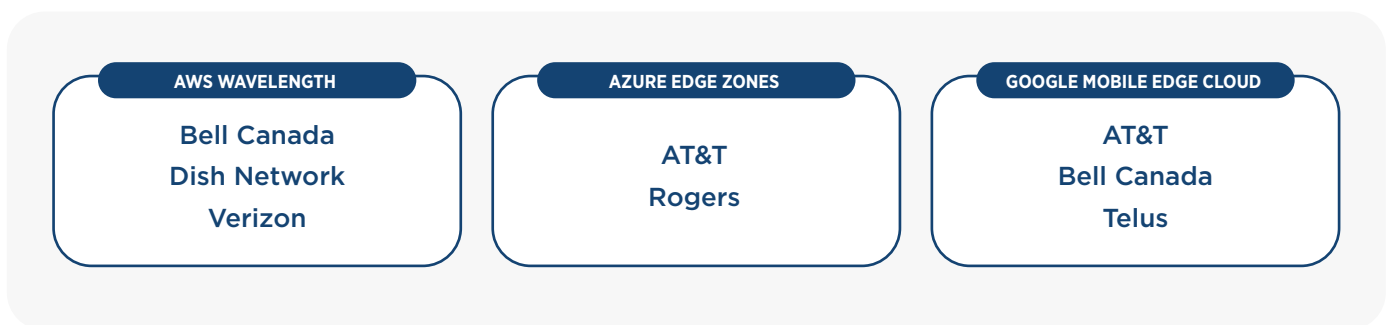
Operators are also teaming up with cloud providers at the network edge. These partnerships have several potential benefits for mobile operators in their efforts to create new customer experiences and use cases for 5G and mobile edge computing solutions. These benefits include reduced costs, accelerated

R&D and the opportunity to leverage existing relationships between major cloud providers and enterprises. As a result, several operators already have a multi-cloud strategy in place and partnerships with more than one cloud provider.

Figure 14

Source: GSMA Intelligence

### Examples of operators collaborating with cloud providers to boost edge credentials



However, partnerships with cloud vendors are not the only route to edge success.<sup>4</sup> T-Mobile US is collaborating with Lumen Technologies to allow access to Lumen's Edge Computing platform over T-Mobile's 5G network. Further, T-Mobile US and

Telus are part of the GSMA's Telco Edge Cloud (TEC) initiative, formed in March 2020, which sees 25 operators working together to identify commercialisation models and performing trials with enterprises.

4. [Cloud formations: operator-vendor partnerships feature heavily in outlook for edge](#), GSMA Intelligence, 2020

## 2.3 IoT: Covid-19 drives enterprise digitisation

Covid-19 resulted in considerable disruption to the IoT market in 2020, mostly due to the economic uncertainty caused by the pandemic, leading to IoT projects being put on hold or postponed. The overall proportion of US companies that have started but not finalised their IoT project (including proofs of concept (PoCs)) increased from 8% in 2019 to 17% in 2020.<sup>5</sup>

That said, there is also significant upside potential in the long term. The pandemic has increased the urgency of enterprise digitisation among many firms as they look to boost productivity and efficiency, which will escalate adoption of IoT, AI and 5G, among other technologies. According to the GSMA Intelligence Enterprise in Focus Survey 2020, those

US enterprises that have existing IoT projects are more committed than before: only 10% of those that have already deployed IoT solutions state that they have no further IoT plans, compared to 20% in 2019.

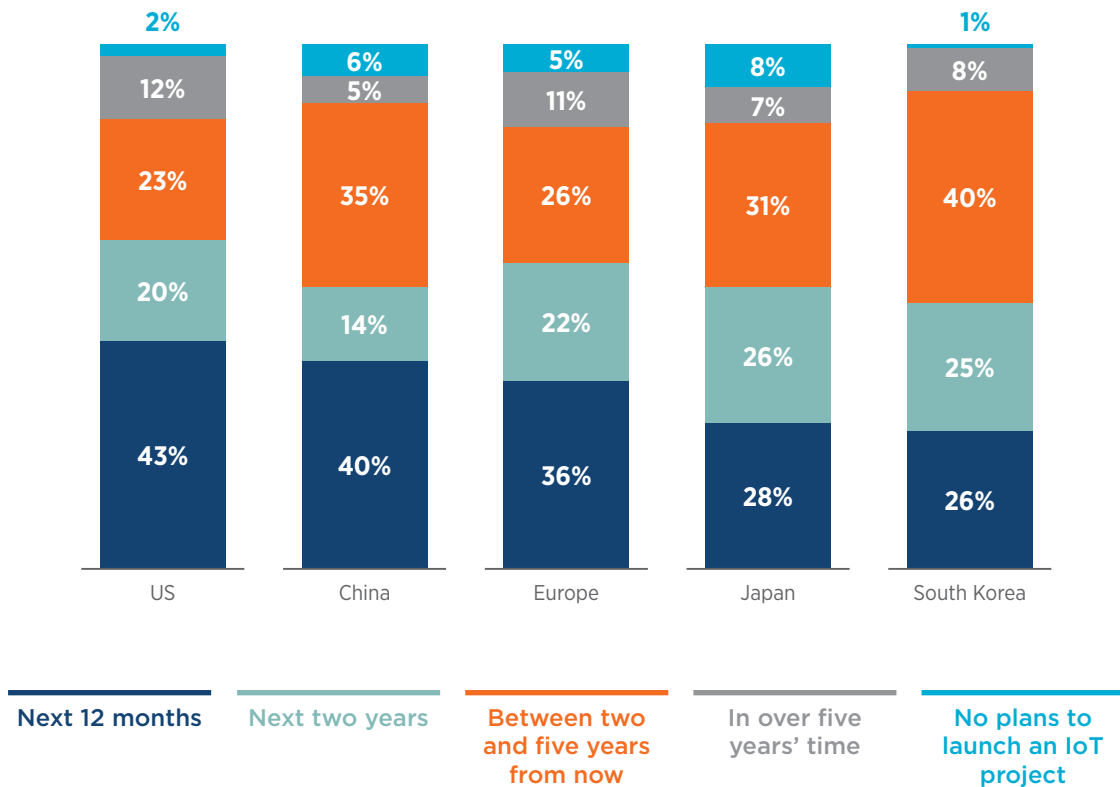
There is also still a significant degree of urgency to IoT deployments. In the US, around two in five companies plan to deploy IoT within a year, with one in five targeting deployments within two years.<sup>6</sup> Nevertheless, some companies remain hesitant to commit to IoT rollouts in the short term, indicating more careful planning and a lack of faith in the return to normal soon. There also continues to be challenges around integration, security and cost when it comes to IoT deployments, which could hold back demand further.

Figure 15

Source: GSMA Intelligence Enterprise in Focus Survey 2020

### The urgency to deploy IoT projects is stronger in the US than in other countries

When do you expect to next deploy an IoT project? (Percentage of enterprises)



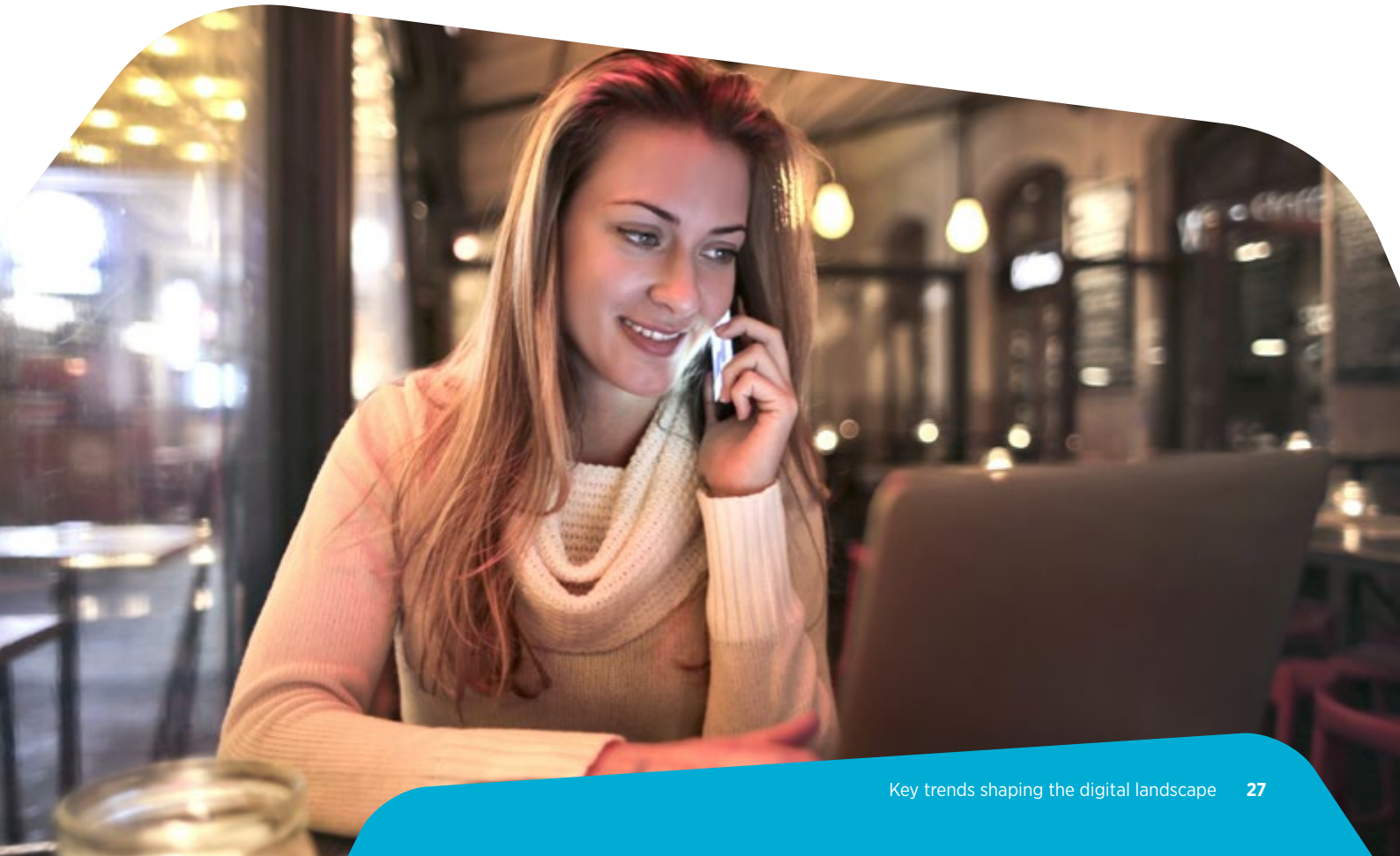
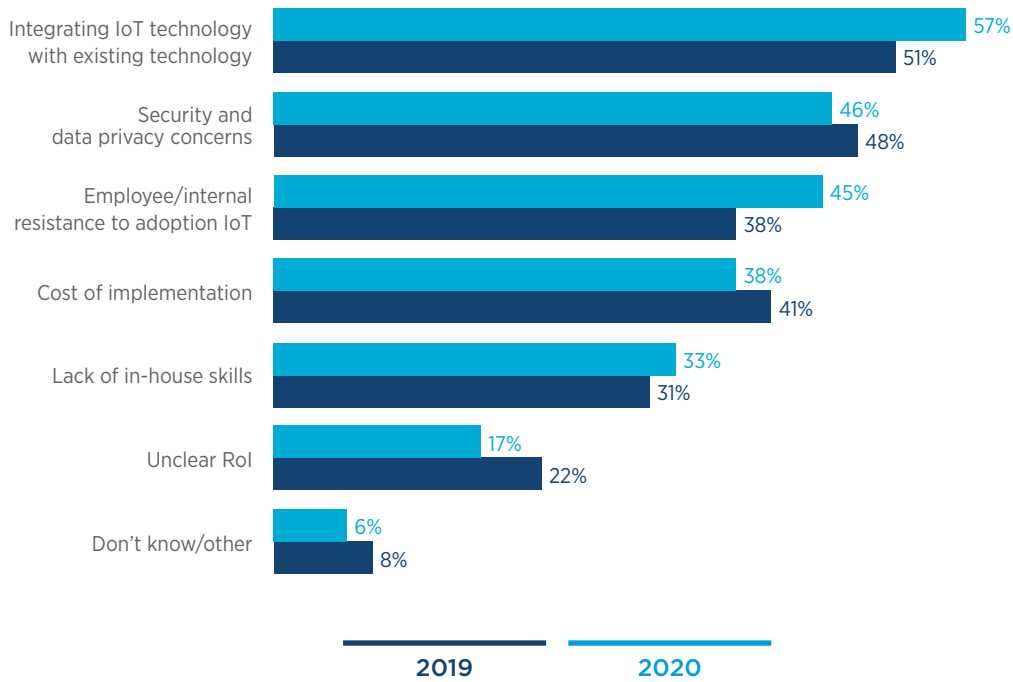
5. GSMA Intelligence Enterprise in Focus Survey 2020  
 6. Enterprises speak: IoT gets real, GSMA Intelligence, 2020

Figure 16

Source: GSMA Intelligence Enterprise in Focus Survey 2020

### Top three challenges among enterprises remain the same, with employee resistance on the rise

Which of the following challenges did your organisation face in deploying IoT-based solutions?  
(Percentage of US enterprises)



## Covid-19 introduces new considerations for enterprise verticals

Covid-19 has affected virtually all sectors, and none more so than healthcare. To enhance service delivery and improve efficiency in the delivery of medical supplies amid increased demand and social-distancing requirements, healthcare service providers have relied on digital technologies to a greater extent than before. IoT underpins many digital health products and solutions for consumers and enterprises, as well as new ways of treating patients remotely. Mobile operators are playing a key role in deploying new technologies. In Canada, for example, Telus enables healthcare providers to observe and support patients virtually through its Home Health Monitoring solution.

Additionally, the pandemic is reshaping cities and driving interest in new technologies, including video surveillance systems, remote asset monitoring and touchless delivery. To address these opportunities, North American operators are building new channels to market, partnerships and ecosystems. For

example, AT&T and JBG Smith are working together to create the first 5G smart city “at scale” in the US. With the selected city in Northern Virginia already a hub for the defence and cybersecurity industries, both parties are confident that this new initiative will act as a springboard for further innovation in the smart city sector.

There is also renewed interest in IoT solutions in the manufacturing sector, in order to improve supply-chain resilience and boost production speed and flexibility. During the pandemic, factories have had to adjust production levels to match demand through the use of digital tools such as cloud, IoT and analytics. To support digitisation, the number of smart manufacturing IoT connections are expected to triple between 2020 and 2025 in North America, reaching 306 million – the fastest growth rate of all the enterprise IoT verticals.

### **Verizon builds robotics expertise to support manufacturers and other businesses**

Verizon has announced the launch of Robotics Business Technology, a new business unit focused on enterprise solutions for aerial drones and ground robotics. The new division will leverage Verizon’s 5G and mobile edge computing capabilities to provide connected robotics solutions to enterprises across various sectors, including manufacturing, logistics and utilities.

Since the acquisition of Skyward in 2017, developing drone technology and use cases has been a focus for Verizon. This move further strengthens its business proposition in the wider space of robotics – an emerging use case for 5G. Creating a dedicated business unit should also help drive focus and innovation as enterprises increasingly look to robotics and associated analytics to digitise their operations.

### Growing IoT revenues beyond connectivity

While IoT revenues in North America will double by 2025 to almost \$300 billion, this is 16% lower than what it would have been without the pandemic, as the slowdown in economic activities and disruptions to supply chains will reverberate over the next few years.<sup>7</sup> Revenue from connectivity has been

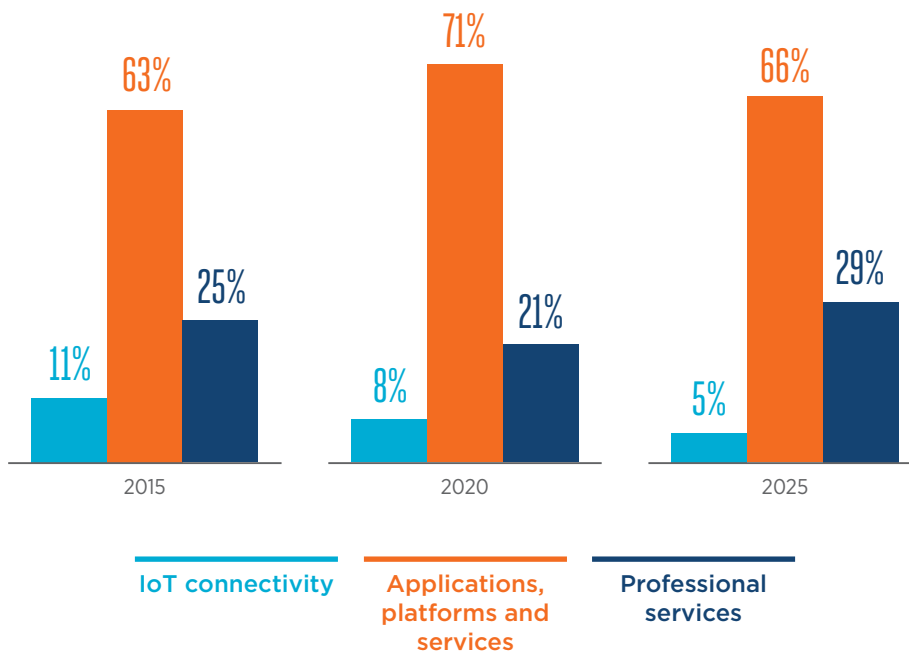
less affected than other IoT segments, with the main impact being a slower realisation of the 5G opportunity. However, commoditisation continues to limit connectivity pricing, leading operators to pursue opportunities higher up the IoT value chain.

Source: GSMA Intelligence

Figure 17

### Connectivity needs to be bundled with services

Percentage of total IoT revenues in North America



Some operators are looking to position themselves as end-to-end IoT orchestrators. For example, Verizon provides a curated ecosystem of hardware, software, design services and vertical solutions that addresses the needs of small and large enterprises via Verizon Marketplace. Others are looking to grow revenue beyond connectivity through value

co-creation and partnering with clients to solve problems via accelerators, testbeds, hackathons and R&D labs. For instance, T-Mobile US is a founding partner of the 5G Open Innovation Lab, alongside global tech players, including NASA, Intel, Microsoft and academic institutions.

7. [IoT revenue: state of the market 2020](#), GSMA Intelligence, 2021



**03**

**Mobile  
contributing  
to economic  
and social  
development**



### 3.1 Mobile’s contribution to economic growth

In 2020, mobile technologies and services generated 4.4% of GDP in North America, a contribution that amounted to around \$1 trillion of economic value added. The mobile ecosystem also supported more than 2.1 million jobs (directly and indirectly) and made a substantial contribution to the funding of the public sector, with more than \$100 billion raised through taxes on the sector.

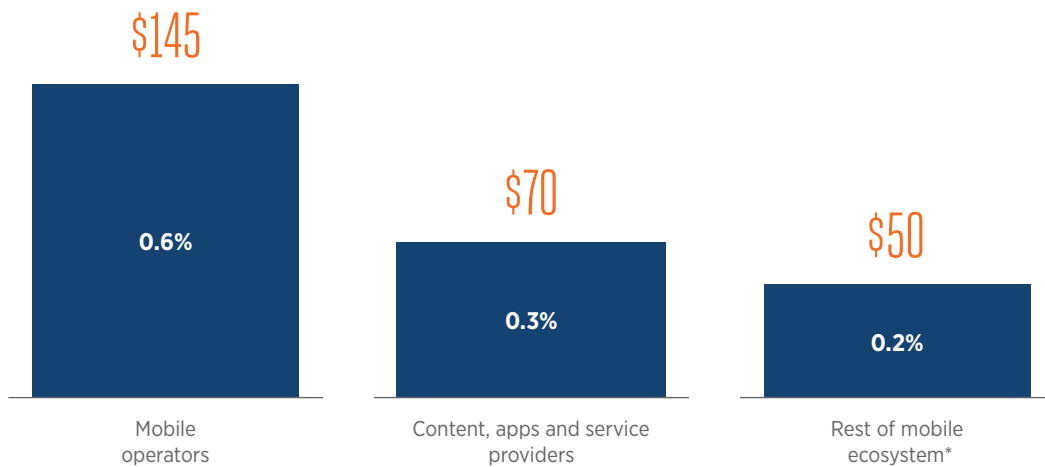
By 2025, mobile’s contribution will grow by \$100 billion (reaching almost \$1.1 trillion), as the countries in the region increasingly benefit from the improvements in productivity and efficiency brought about by the increased take-up of mobile services.

Figure 18

Source: GSMA Intelligence

#### The North America mobile ecosystem directly generated more than \$260 billion of economic value in 2020, with mobile operators accounting for the vast majority

Billion, percentage of GDP



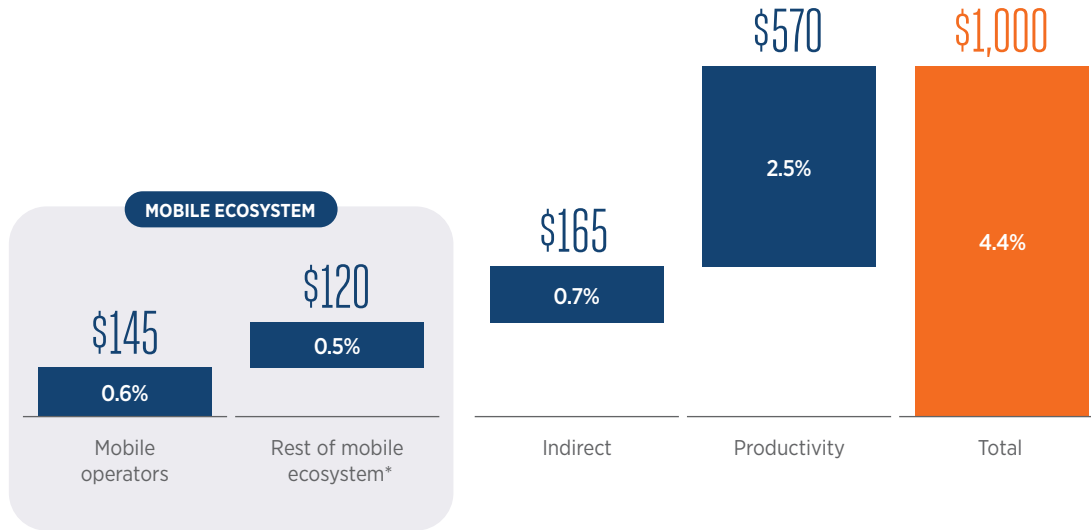
\* Rest of mobile ecosystem category includes infrastructure providers, device manufacturers, and distributors and retailers

Note: Totals may not add up due to rounding

Figure 19

**Additional indirect and productivity benefits in 2020 brought the total contribution of the mobile industry to the regional economy to around \$1 trillion**

Billion, percentage of GDP



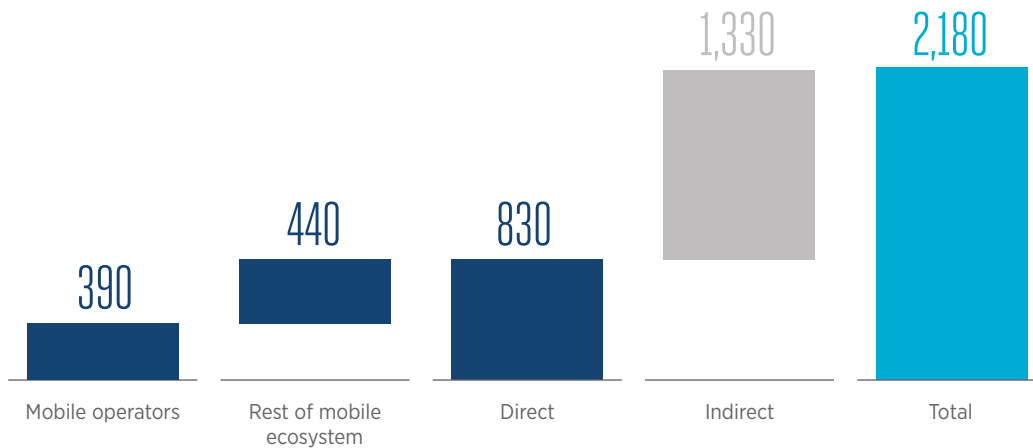
\* Rest of mobile ecosystem category includes infrastructure providers, device manufacturers, distributors and retailers, and content, apps and service providers

Note: Totals may not add up due to rounding

Figure 20

**In 2020, the mobile ecosystem directly employed more than 800,000 people in North America and supported another 1.3 million jobs indirectly**

Jobs (thousands)



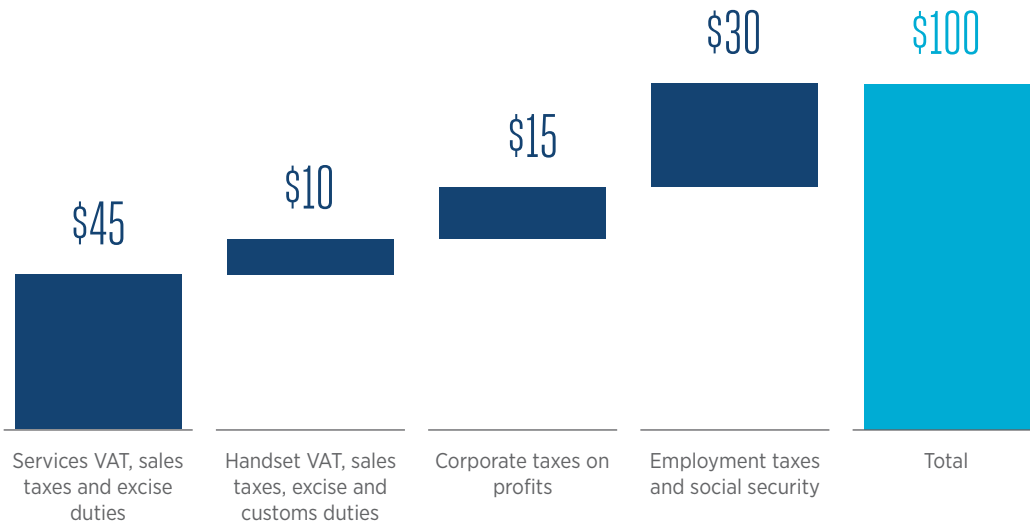
Note: Totals may not add up due to rounding

Figure 21

Source: GSMA Intelligence

**In 2020, the mobile ecosystem contributed more than \$100 billion to the funding of the public sector through consumer and operator taxes**

Billion



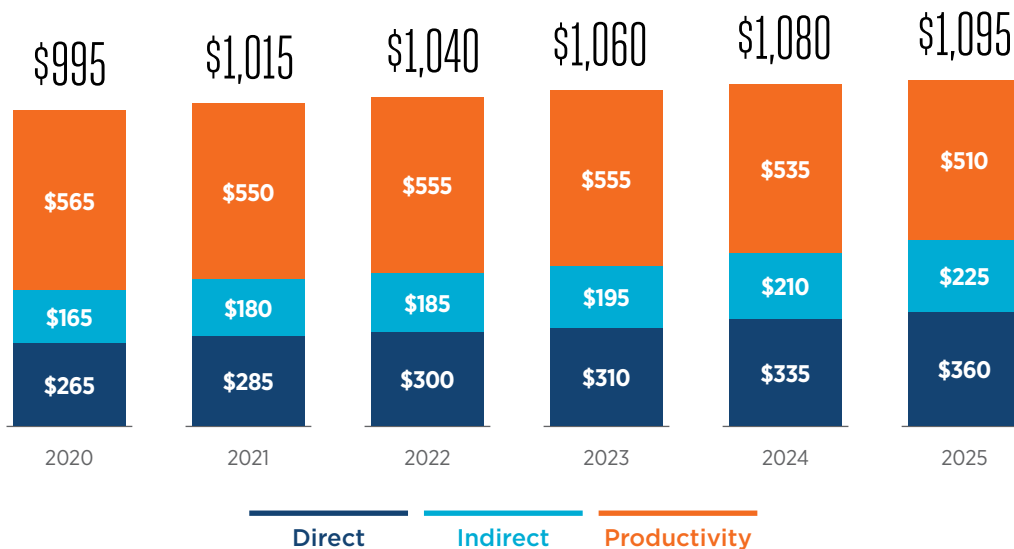
Note: Totals may not add up due to rounding

Figure 22

Source: GSMA Intelligence

**Driven mostly by continued expansion of the mobile ecosystem, the North America economic contribution of mobile will increase by \$100 billion by 2025**

Billion



## 3.2 Mobile supporting digital inclusion and addressing social challenges

### Covid-19 reinforces the importance of mobile to achieving the SDGs

Six years have passed since the launch of the UN Sustainable Development Goals (SDGs) and the mobile industry stepped forward and committed to the 17 Goals. Every year since, the GSMA has measured the impact of the mobile industry across all SDGs. In North America, the sector scored highest on SDG 9: Industry Innovation and Infrastructure, thanks to extensive mobile network coverage and high take-up of mobile services.<sup>8</sup>

The vital role that the mobile industry plays has come into sharp focus during the pandemic. With lockdown restrictions and social distancing measures in place, people relied on mobile networks to stay connected and access life-enhancing services, reflecting the importance of mobile connectivity to societies and economies everywhere. For example, mobile operators supported the shift to remote working by removing data limits and waiving overage fees to keep customers connected. This has been supported by longer-term initiatives, such as introducing new service plans and bundling connectivity with video conferencing tools and security applications. For example, T-Mobile introduced T-Mobile Collaborate, which bundles collaboration tools with mobile connectivity, while AT&T launched a new 5G FWA service aimed at home workers.

In addition, several North American mobile operators offered customers free content, zero-rated access or additional data, in order to support students and their families during the pandemic: AT&T committed \$10 million to support students in need with free hotspots and data plans; T-Mobile increased the data allowance to 20 GB/month for free to schools and students using its EmpowerED digital learning programme; and Verizon tripled its monthly data allowance for Verizon Innovative Learning Tier 1 middle schools. This demonstrates the sector's ongoing commitment to using mobile technology to support SDG 4: Quality Education.

Mobile health solutions are also playing a growing role in achieving SDG 3: Good Health and Well-being. In North America, mobile operators are providing connectivity and devices to new hospitals, testing sites and vaccination centres to aid frontline workers. As the Covid-19 pandemic continues to cause major disruptions to health systems, operators are developing new solutions to deliver healthcare services remotely. For example, Telus partnered with Babylon Health to launch a free app that gives users the ability to schedule virtual appointments with doctors, as well as run any symptoms of illness through a chatbot symptom checker.

8. [2020 Mobile Industry Report: Sustainable Development Report](#), GSMA, 2021

Figure 23

Source: GSMA Intelligence

## Mobile's impacts on the SDGs in North America, 2020

### Highest SDG scores



Despite the changes in traffic levels and patterns during the pandemic, mobile networks in North America showed notable resilience, emphasizing the investments in network capacity by operators and the importance of mobile networks to SDG 9.

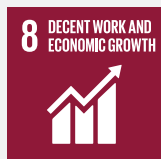


The total number of IoT connections in North America continued to grow in 2020, increasing by 120 million to reach 2.9 billion connections. This helped increase the industry's impact across several SDGs. For example, providing innovative solutions for the utility sector, which reached 150 million IoT connections in North America at the end of 2020, contributed to the industry's impact on SDG 6.

### Most improved SDG scores



Many North American operators are now disclosing performance and setting targets for emissions reductions. Leading operators in this field have set science-based targets and disclose information relating to climate risk as well. Having these systems in place drives the mobile industry's contribution to SDG 13.



Mobile technology contributes to SDG 8 by allowing firms, especially micro, small and medium-sized enterprises (MSMEs), to become more efficient, access more customers and sell more in non-local markets, which creates jobs for local communities. Mobile can also increase trade and competition by providing consumers with better access to information on products and making it easier to connect them with firms.

## The mobile sector shows climate leadership

North American operators are making strong progress on SDG 13: Climate Action, with mobile at the forefront of efforts to tackle climate change. Mobile became one of the first sectors to set a milestone ambition – to transform the mobile industry to reach net-zero carbon emissions by 2050, at the latest. Following this, the UN’s Race to Zero campaign declared that the mobile industry had made a critical ‘breakthrough’ in early 2021, as more than a third of operators by revenue had committed to achieving net-zero emissions by 2050 or earlier.<sup>9</sup>

Furthermore, at the end of 2020, 80% of operators

by revenue disclosed their climate impacts, while almost two thirds of operators by revenue had set science-based targets to cut their carbon emissions rapidly over the next decade.<sup>10</sup> In North America, several operators have set a science-based target of 1.5°C, which is in line with an ICT sectoral target-setting approach recently developed through a collaboration between the Global Enabling Sustainability Initiative (GeSI), the GSMA, the International Telecommunication Union (ITU) and the Science Based Targets Initiative (SBTi). These targets support the Paris Agreement’s central aim of strengthening the global response to the threat of climate change.

Figure 24

Source: GSMA

### North American mobile operators have set ambitious net-zero targets

| Mobile network operator | Science-based targets* | Carbon neutral target year** | Net zero target year*** |
|-------------------------|------------------------|------------------------------|-------------------------|
| AT&T                    | 1.5°C                  | 2035                         | -                       |
| Bell Canada             | 1.5°C                  | 2025                         | -                       |
| Rogers                  | 1.5°C                  | -                            | -                       |
| Telus                   | 1.5°C                  | 2030                         | 2050                    |
| T-Mobile US             | 1.5°C                  | -                            | -                       |
| Verizon                 | 1.5°C                  | 2035                         | 2040                    |

\* See <https://sciencebasedtargets.org/companies-taking-action>

\*\* Carbon neutral refers to reducing and offsetting carbon emissions from own operations (all Scope 1 and 2 emissions)

\*\*\* Net zero refers to the criteria used by the UN Race to Zero campaign (see <https://unfccc.int/climate-action/race-to-zero-campaign>)

9. "Mobile sector declares climate action breakthrough", Race to Zero, 2021

10. [Mobile Net Zero – State of the Industry on Climate Action](#), GSMA, 2021

Switching to renewable energy will play an essential role in the mobile industry reaching net-zero carbon emissions. Most emissions within the direct control of operators are from electricity and diesel consumption by power networks. North American operators are making renewables commitments; for instance, T-Mobile US is aiming to cover all of its usage with renewable energy by the end of 2021.

Moves to set targets and improve disclosure and performance help to drive the industry's impact on SDG 13: Climate Action, as well as other climate-related SDGs, including SDG 7: Affordable and Clean Energy, SDG 11: Sustainable Cities and Communities and SDG 15: Life On Land.

### **Sustainability financing on the rise**

In May 2021, Bell Canada announced the launch of its inaugural sustainability bond issue, with a C\$500 million offering of 2.2% medium-term notes, maturing in 2028. The offering marked a sustainable finance first for the Canadian telecoms industry and highlights the growing interest from investors in the link between a company's financial returns and its management of environmental, social and governance (ESG) issues.

The fact that institutional investors are increasingly gearing capital allocations with climate covenants is a clear sign that sustainability is very much a part of a new normal in the corporate world. Mobile operators must recognise this and continue to adapt their business practices accordingly in order to secure future investments.



A photograph of three young women of diverse backgrounds looking at a smartphone together. The woman on the left is pointing at the screen. The woman in the middle is holding the phone. The woman on the right is smiling. They are all wearing casual clothing. The background is slightly blurred, showing green foliage.

**04**

# **Policies for digital advancement**



## Designing effective spectrum policy

The speed, reach and quality of 5G services depends on governments and regulators supporting timely access to the right amount and type of affordable spectrum, under the right conditions. To achieve 5G's full potential, access to mid-band spectrum is particularly important, as it offers a balance of coverage and capacity critical to 5G's success.

Revenues from the US mid-band spectrum auction (3.7–3.98 GHz) highlighted this need. It exceeded all price predictions, with \$81 billion spent. The price reflects not only the high demand for mid-band spectrum but also US-specific market conditions. Only 280 MHz of spectrum was available during the auction and no more big chunks of mid-band spectrum are available in the short term, especially as the 6 GHz band has now been opened for unlicensed use. The US isn't the only country where a lack of available mid-band spectrum has had a negative impact on prices and, by extension, 5G's potential.

The resulting investment may also create short-term constraints for operators as they look to invest in upgrading mobile networks. Some operators have borrowed funds to support this spectrum acquisition. Some are also announcing ambitious deployment targets to secure a quicker return on their investments. On the positive side, this may encourage other governments to accelerate the release of 5G spectrum.

The prices paid in the auction ended up being 3.5× higher than the Citizens Broadband Radio Service (CBRS) mid-band auction (3.55–3.7 GHz), underlining the potential of licensed spectrum versus the shared approach offered by CBRS.

While spectrum sharing holds potential, it cannot supplant the need for exclusively licensed mobile

spectrum. The global success of mobile services rests on a foundation of exclusively licensed spectrum, as it supports widespread services and the certainty needed for long-term heavy network investment and high-quality service. However, sharing can play a complementary role to traditional spectrum licensing by allowing mobile services to access new bands where there are no other reasonable alternatives.

To help address the shortfall of mid-band spectrum, the FCC began the auction of an additional 100 MHz (3.45–3.55 GHz) of spectrum in October 2021, with no participant allowed to get more than 40 MHz. The winners have to share the spectrum with the US military in some parts of the country. An auction of another 194 MHz (2496–2690 MHz) of spectrum is also planned.

In Canada, the first auction of mid-band spectrum for 5G resulted in very high spectrum prices. The auction included approximately 200 MHz of spectrum, with 50 MHz reserved for smaller bidders. With the population size taken into account, the price tag per MHz was almost 4× as high as in the international average for this type of spectrum.

As in the US and other parts of the world, spectrum scarcity likely had an impact on the record-setting result in Canada. The number of bidders also limited the amount of spectrum each mobile operator ended up with. More spectrum in the 3.5 GHz range is expected to be made available in 2023 and then in 2025. While those auctions have the potential to help address the current shortage of mid-band spectrum per operator in Canada, the timing leaves a lot of uncertainties. This placed even more pressure on this year's auction and likely drove prices even higher. In the meantime, the speeds Canadian mobile operators can offer will be impacted by this shortfall.

## Accelerating investment and innovation

Motivated by the convergence of several technical, commercial and geopolitical factors, mobile operators are embracing new architectures based on network design principles of virtualisation, cloud computing and network automation. As they adopt new technologies to optimise their systems, operators are also supporting a shift towards open interfaces in the radio access network (RAN). Opening up proprietary elements and interfaces in the RAN will diversify the network equipment and software ecosystem, bringing in new suppliers and additional market competition. Disaggregating the RAN will create new deployment scenarios, spur innovation, facilitate local equipment assembly, enhance security transparency and minimise risks facing the industry as it scales up its networks for the future.

Open RAN is a particularly hot topic for the mobile industry in North America and has caught the eye of regulators looking to encourage competition and innovation in the supply chain. The National Telecommunications and Information Administration (NTIA) plans to conduct open RAN equipment testing to increase familiarity with the equipment and to assess open RAN performance,

interoperability, security and potential economic impact. Moreover, the FCC hosted the Open RAN Solutions Showcase in July 2021 to facilitate discussions between mobile operators and vendors using interoperable, open interfaces.

Despite growing confidence in open and virtualised RAN, there is a recognition that accelerated measures are needed to ensure equipment interoperability, security and reliability, as well as sufficient systems integration capabilities and skills. The mobile industry is undertaking a number of initiatives to address the challenges, principally through wide industry cooperation in international fora and standardisation.

Policy also has a role to play in this evolution, by creating an enabling environment that will support the deployment of new RAN infrastructure. Policymakers can support the transition to mix-and-match RAN infrastructure by funding R&D, providing security assurance and certification, promoting and recognising specifications that enable interoperability, and accelerating 5G network deployment.<sup>11</sup>

## Protecting consumers from nuisance calls

The persistent problem of consumers receiving nuisance calls from automated machines (known as robocalls) is a top consumer protection priority for the US Government, particularly the FCC. Over the last few years, the FCC implemented new frameworks and rules to address illegal robocalls and scams. Furthermore, US operators have been doing extensive work to try and alleviate the harm of robocalls on consumers, including introducing blocking tools, caller-ID technologies and coordinating with federal and state enforcement agencies.

As part of the FCC's Second Report and Order on the subject, the FCC implemented the Foreign Provider Prohibition. Going into effect on 28 September 2021, US intermediate and terminating voice service providers (VSPs) will be prohibited from accepting traffic using US numbering resources from VSPs outside of the US if not registered in the FCC's Robocall Mitigation Database (RMD). To register, foreign VSPs need to certify that they have either implemented the STIR/SHAKEN call authentication standard or another robocall mitigation plan that would prove reasonably effective at stopping robocalls.

11. [Open and Virtualised Radio Access Networks: An Explanatory Guide for Policymakers](#), GSMA, 2021



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