Socio-Economic Benefits of 5G

The importance of low-band spectrum

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Digital Equality

Low-band

470-694 MHz

Harmonisation

3.5 GHz

3.3-3.8 GHz

Expansion

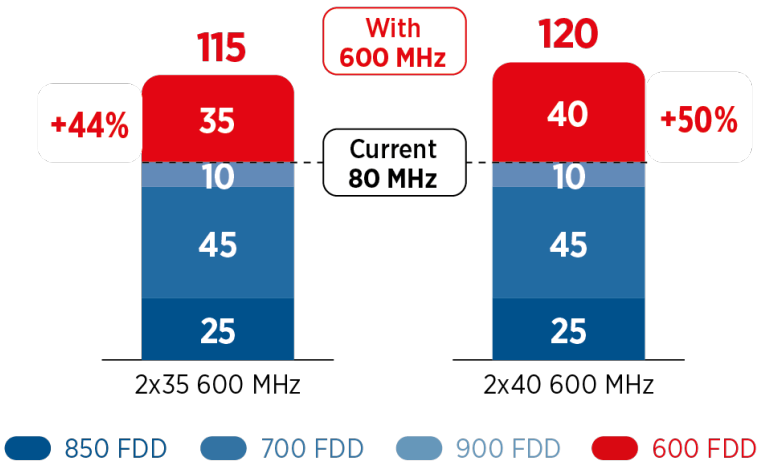
6 GHz

6.425-7.125 GHz

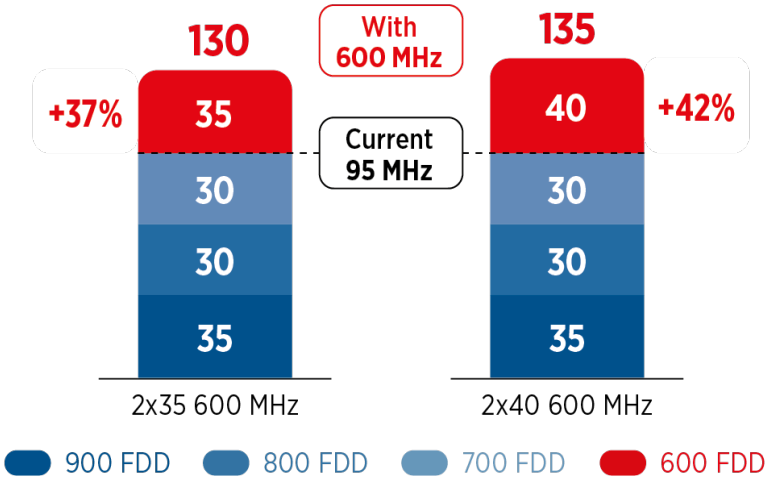
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Why More Low-Band Spectrum?

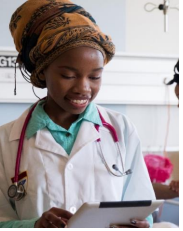
LatAm and APAC

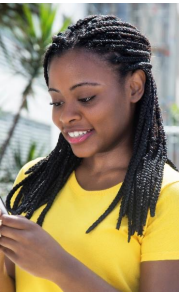


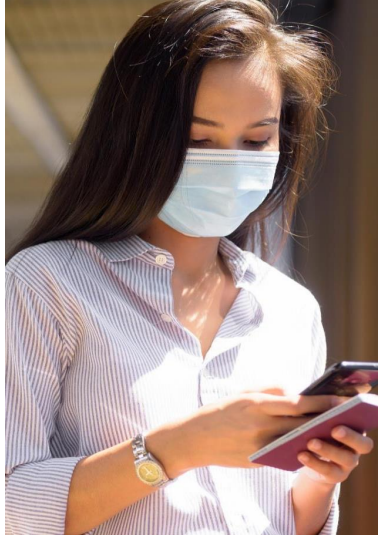
EMEA



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Digital Equality

Low-band

470-694 MHz

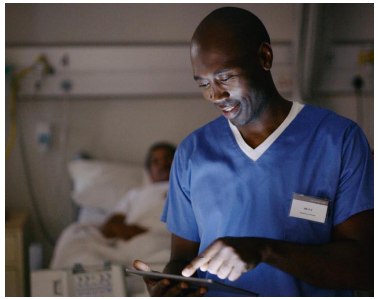
We don't turn back.

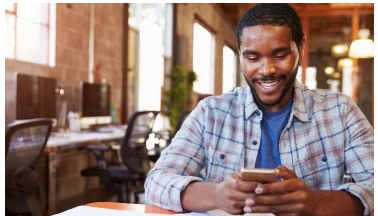
We leave no one behind.

We pull each other up

- Obama









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Socio-Economic Benefits of 5G: The importance of low-band spectrum

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March 2023

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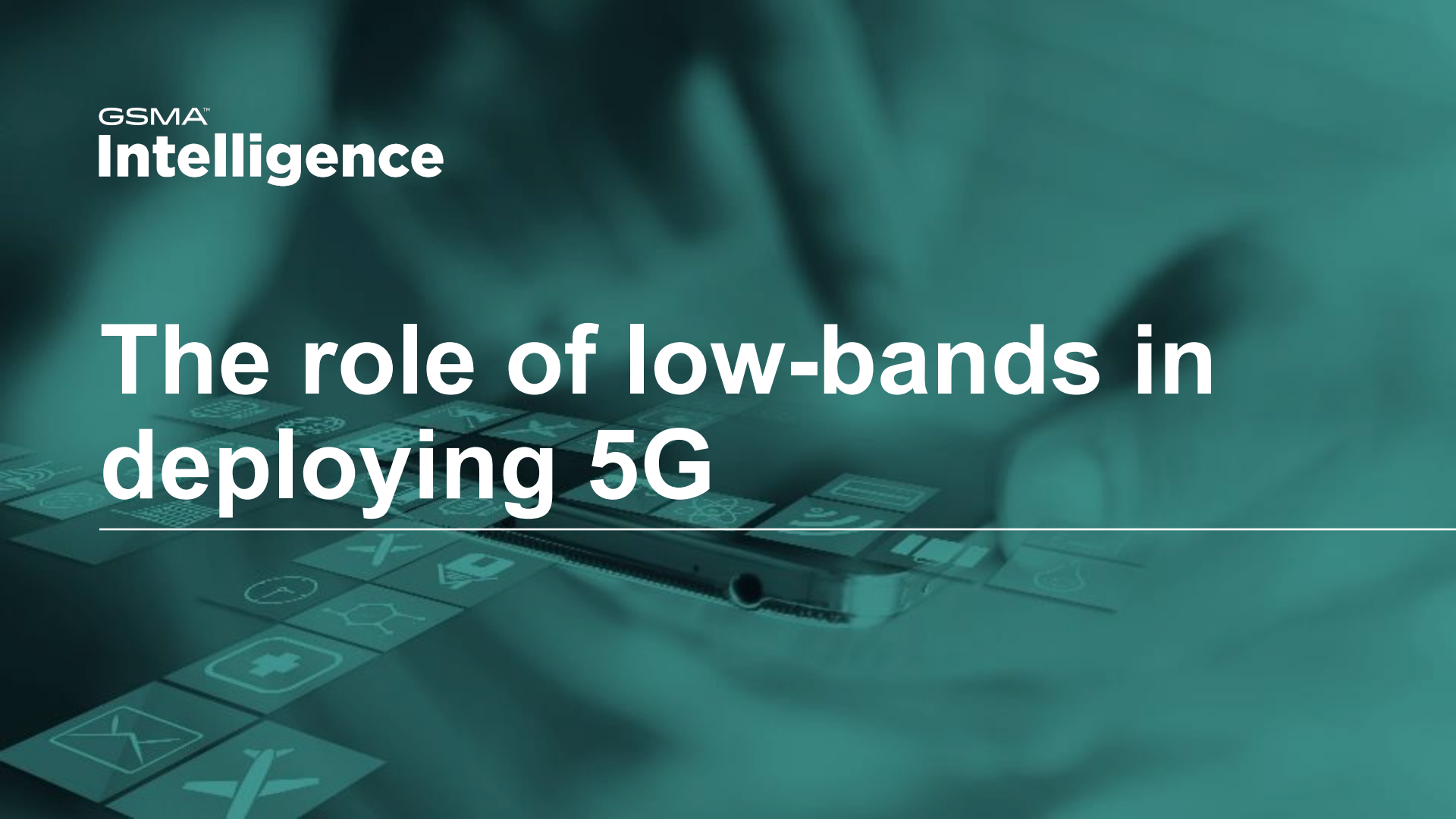
Report Objectives

- Highlight the role and importance of low-band spectrum for 5G coverage and service quality
- Quantify the economic benefits that low-band spectrum is expected to generate
- Carry out a cost-benefit analysis of sub-1GHz assignment options, in particular between mobile and broadcasting



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The role of low-bands in deploying 5G



Role of low-band spectrum for 5G

- Low-band spectrum serves two important requirements for 5G deployment

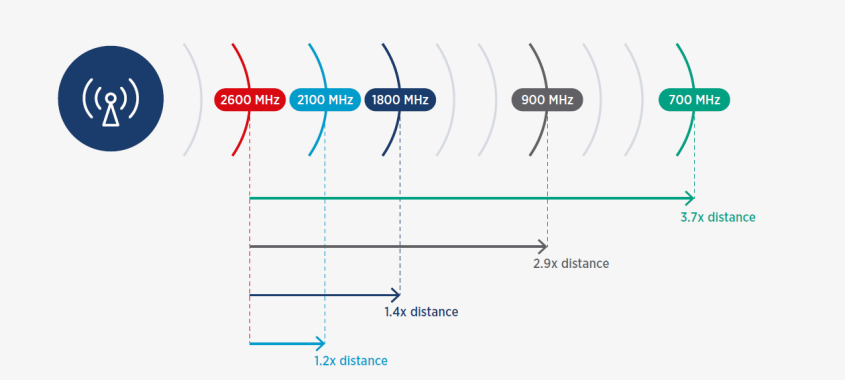
  1. Its superior propagation characteristics means it is well-suited to providing coverage in rural and remote areas

  2. It can penetrate buildings and serve built-up areas, providing necessary ‘deep’ indoor coverage and capacity in urban areas as well

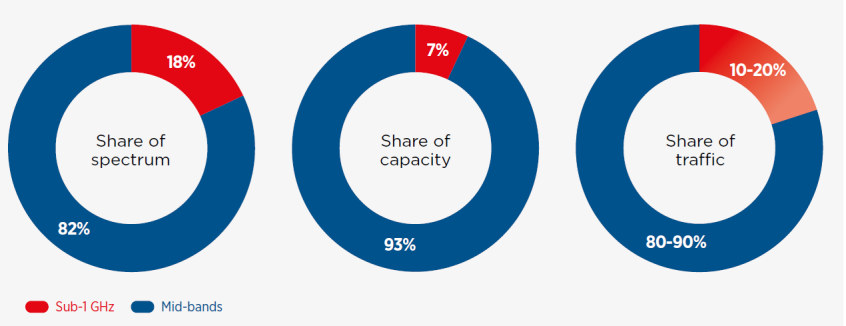
- A certain amount of 5G demand can therefore only be met with low-band spectrum.

- This means **assigning sufficient amounts of low-band spectrum is critical to address long-term 5G demand**

Coverage comparison by band



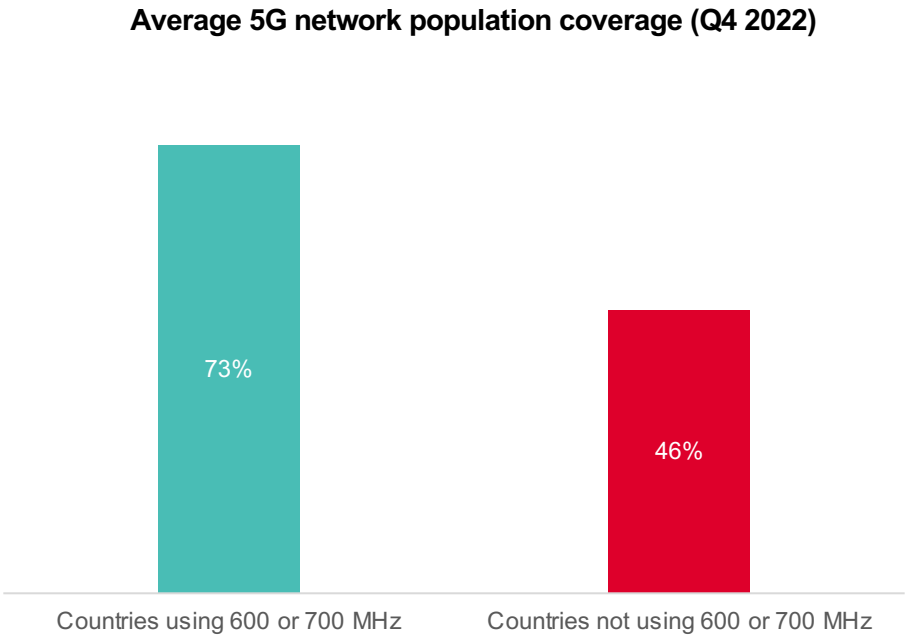
Sub-1 GHz share of spectrum, capacity and traffic



Source: Coleago

Using 600/700 MHz increases coverage

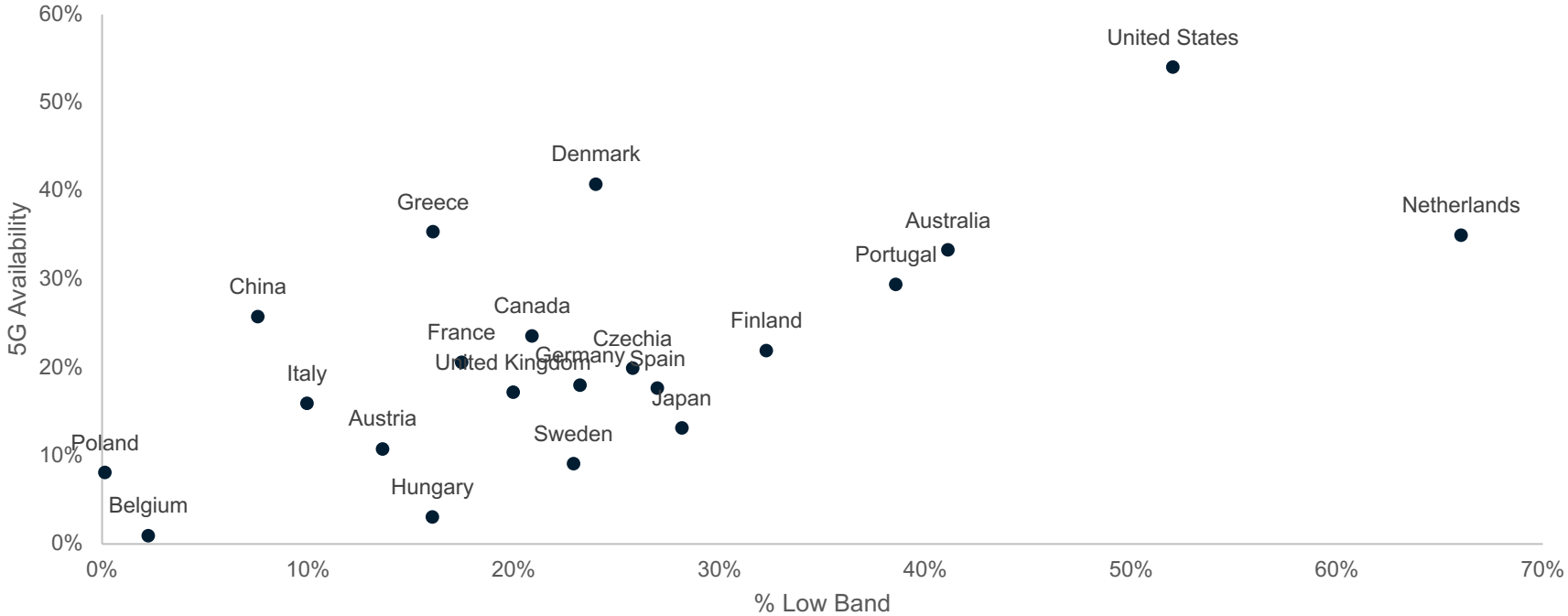
- The 700 MHz frequency band has been the most commonly used low band for 5G – with the exception of North America, where the 600 MHz band is used.
- At the end of 2022, operators in almost half the countries with 5G were using the 600MHz or 700MHz bands
- Countries that have deployed using the 600 or 700MHz band have typically been able to deploy 5G more quickly



Source: GSMA Intelligence

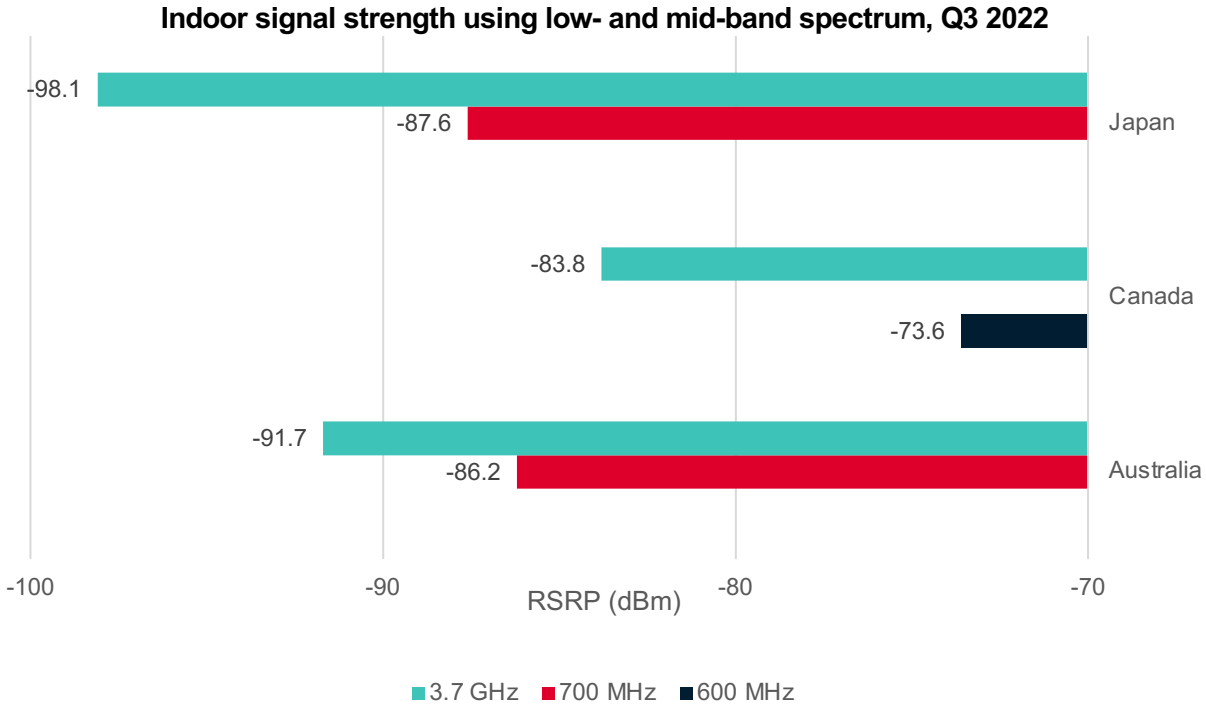
Low bands provide greater 5G availability

5G availability and the use of low-band spectrum, Q3 2022



Note: '5G availability' is the proportion of users on 5G-capable devices who spent the majority of their time on a 5G network on their subscriber (SIM) network in Q3 2022. 'Percentage low band' is the proportion of device scans that are carried out using low-band spectrum (in the 600, 700, 800, 850 or 900 MHz frequencies).
Source: Ookla Speedtest Intelligence®

Low bands provide better 5G indoor quality



Note: analysis based on weighted average Reference Signal Received Power (RSRP) for all consumer scans in Q3 2022 by frequency band in in-building locations in downtown areas in Sydney (Australia), Toronto (Canada) and Tokyo (Japan).
Source: Ookla Speedtest Intelligence®

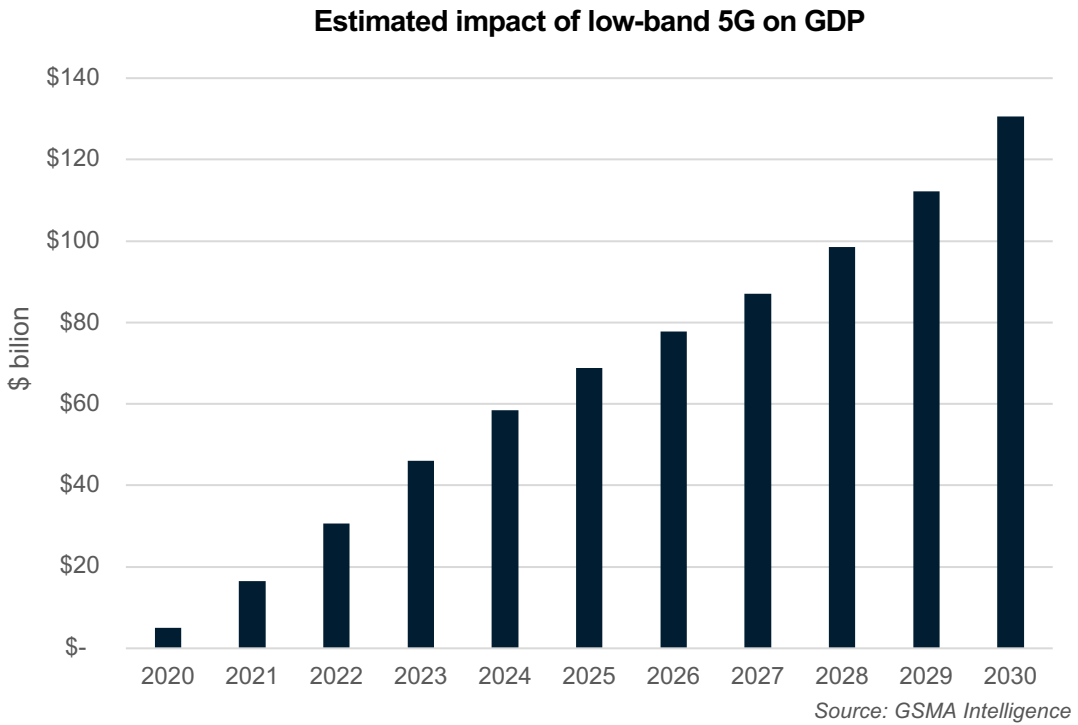
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The socio-economic benefits of low-bands



Low bands will generate $130bn in 2030

- 5G is expected to generate almost $1 trillion in additional economic value by 2030, equivalent to 0.7% of GDP
- Low-band spectrum will account for around $130 billion of that benefit (14% of all 5G benefits)



Source: GSMA Intelligence

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Relative benefits will be greater in LMICs

North America



GDP contribution
$26bn

Percentage of GDP
0.07%

Latin America and the Caribbean



GDP contribution
$9bn

Percentage of GDP
0.11%

RCC*



GDP contribution
$3bn

Percentage of GDP
0.11%

Middle East and North Africa



GDP contribution
$4bn

Percentage of GDP
0.08%

Asia Pacific



GDP contribution
$62bn

Percentage of GDP
0.11%

Europe



GDP contribution
$26bn

Percentage of GDP
0.08%

Sub-Saharan Africa



GDP contribution
$3bn

Percentage of GDP
0.08%

Source: GSMA Intelligence

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MIoT will drive half of the economic impact

eMBB
Smartphones
Wearables
AR/VR

FWA
High-speed broadband in sub-urban and rural areas

Massive IoT
Complex automation
Collaborative robots
Remote object manipulation



Low-band spectrum will provide eMBB speed coverage in hard-to-reach places (deep indoors, built-up areas) as well as rural areas

Low-band spectrum will provide more widespread and lower-cost FWA connectivity, which could drive provide high-speed broadband in sub-urban and rural areas.

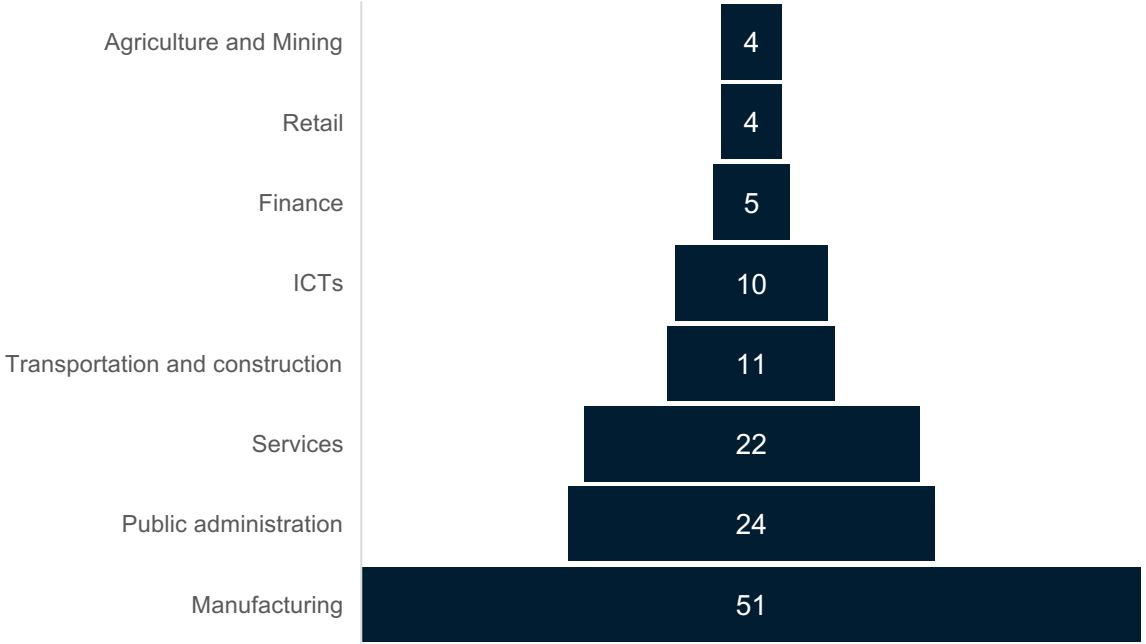
Many IoT use cases (e.g. precision farming) require wide area coverage as well as population coverage. Low-band spectrum is best-suited to providing this, especially where coverage is the main requirement over speed and latency.

Source: GSMA Intelligence

Range of economic sectors will benefit

- The benefits of low-band spectrum are not heavily concentrated in one specific sector
- Manufacturing will drive the greatest benefit but Government administration, the service sector and transportation will also account for a significant proportion of economic benefits
- Benefits also vary by region, for example agriculture is more important in Sub-Saharan Africa and oil and gas industries are important in RCC and Middle East.

Estimated global contribution of low-band 5G spectrum to GDP by sector, $ billions 2030



Source: GSMA Intelligence

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Enhancing the social impacts

In addition to the macro-economic impacts, low-band 5G is also expected to enhance the wider social and environmental benefits that mobile and mobile broadband has been shown to have.



Poverty reduction - mobile broadband reduces poverty, for example during the period 2010-2016 it lifted 2.5 million people out of extreme poverty in Nigeria (GSMA and World Bank, 2020).



Well-being - mobile ownership combined with internet connectivity is associated with an improvement in peoples' happiness and well-being (GSMA and Gallup, 2018).



Education - mobile improves the quality of teaching and learning, and facilitates reading and enhanced literacy. 2.5 billion people worldwide used mobile to improve their education or the education of their children in 2021.



Health – mobile phones are linked to improve health outcomes, including lower maternal and child mortality. 2.1 billion people worldwide used mobile to access health information in 2021.



Environment and climate change – mobile technologies enable carbon emissions reductions that are ten times greater than the carbon footprint of mobile networks themselves.

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Cost-benefit analysis for sub-1 GHz policy options

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Cost-benefit analysis framework

- Given the importance of assigning sufficient low-band spectrum, the study provided a cost-benefit analysis of sub-1 GHz frequency band options based on five country settings
- The benefits of assigning spectrum to IMT are based on mobile network capex and opex savings from having more UHF spectrum
- The costs are based on repurposing DTT and PMSE services to maintain the same output

Demographic characteristics	Broadcast characteristics	Mobile characteristics
— Total population — Urban and rural population distribution — Number of households	— Number of national multiplexes and programmes — Number of broadcast transmitter sites — DTT transmission technology	— Expected 5G penetration (urban and rural) — Spectrum available

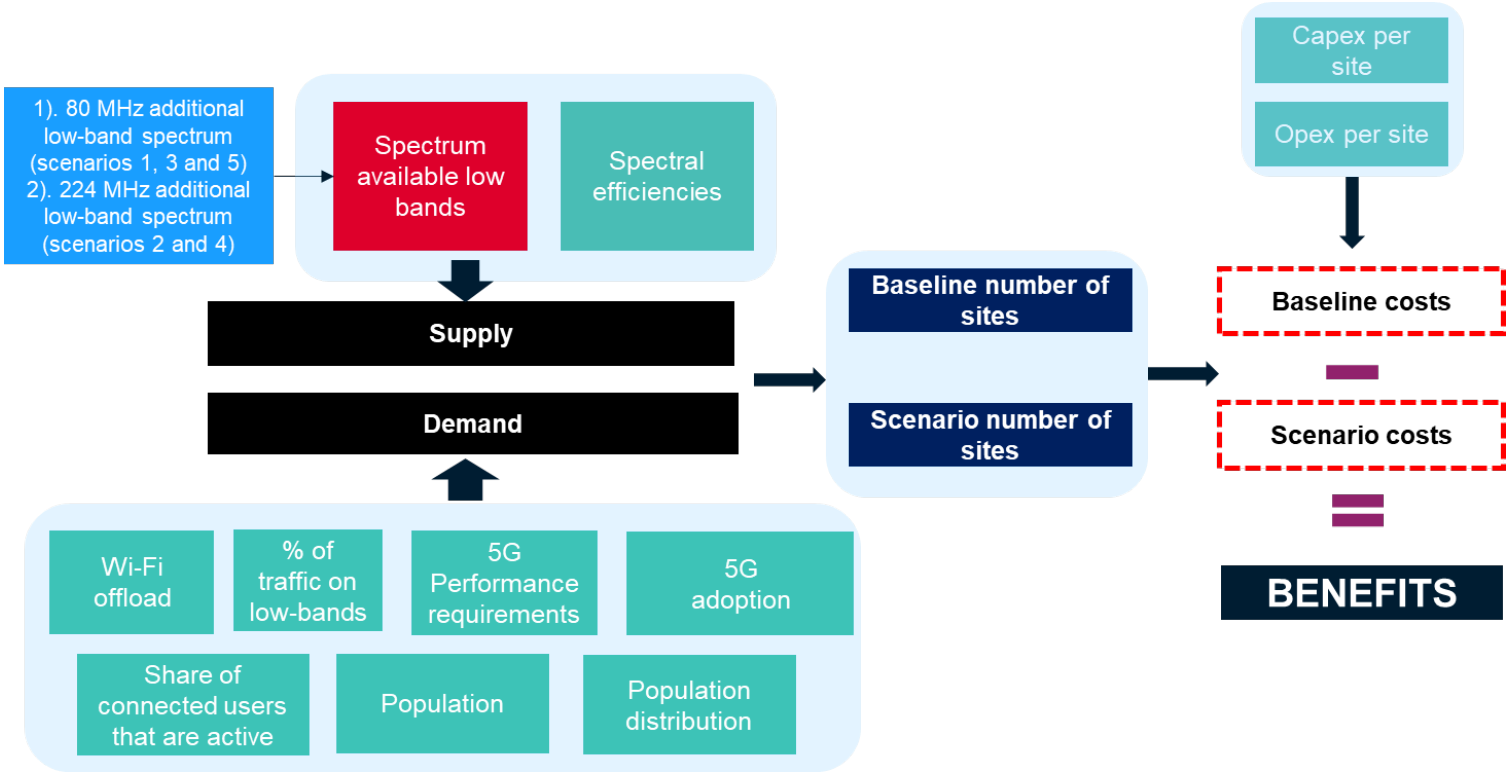
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Applying a CBA to five settings

	Setting 1	Setting 2	Setting 3	Setting 4	Setting 5
UHF spectrum scenario	Allocate 80 MHz to mobile (614–694 MHz)	Allocate 224 MHz to mobile (470–694 MHz)	Allocate 80 MHz to mobile (614–694 MHz)	Allocate 224 MHz to mobile (470–694 MHz)	Allocate 80 MHz to mobile (614–694 MHz)
Total population (2022)	8.75 million		12 million		18.6 million
Rural population % (2022)	26%		15%		54%
Forecast 5G penetration in 2030	111%		100%		11%
Number of DTT programmes	51		11		48
Number of national broadcasting multiplexes	5		4		4

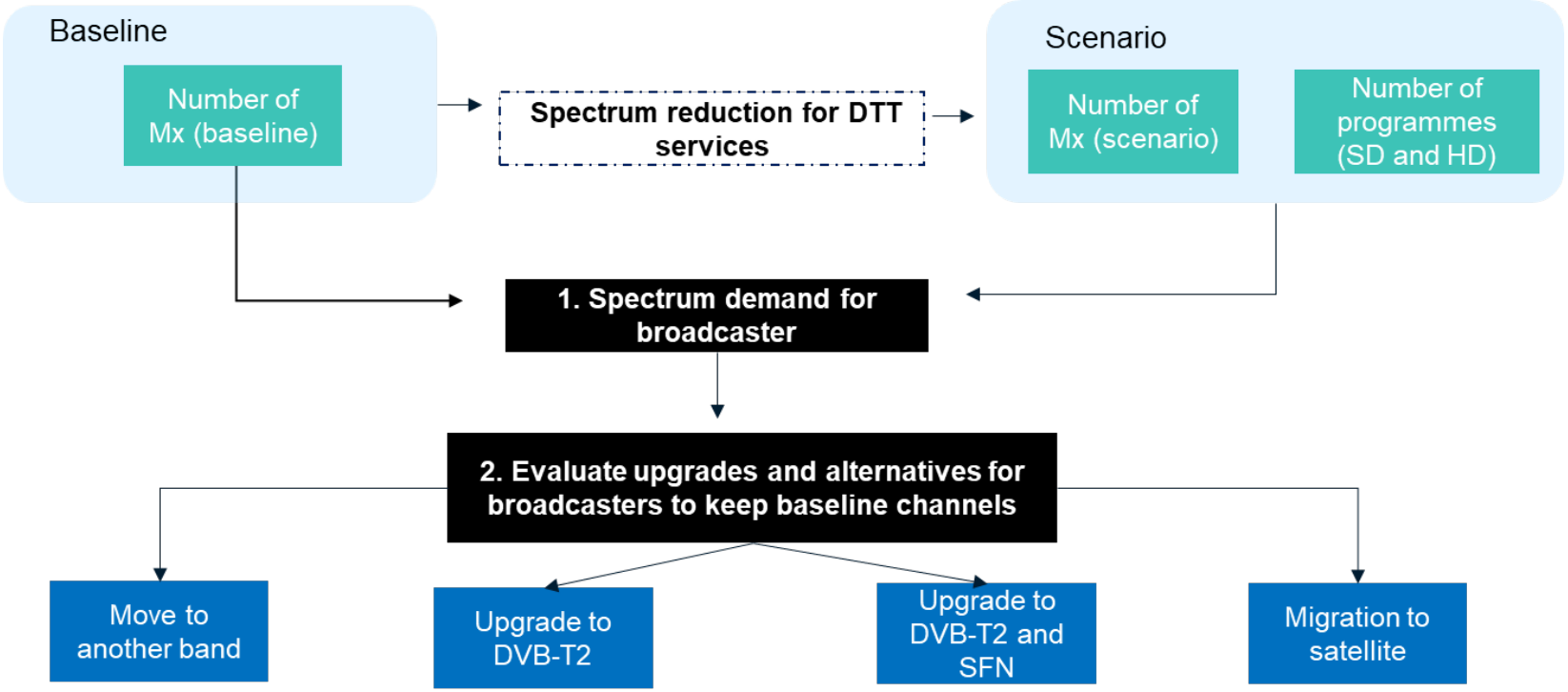
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Cost savings of additional UHF spectrum

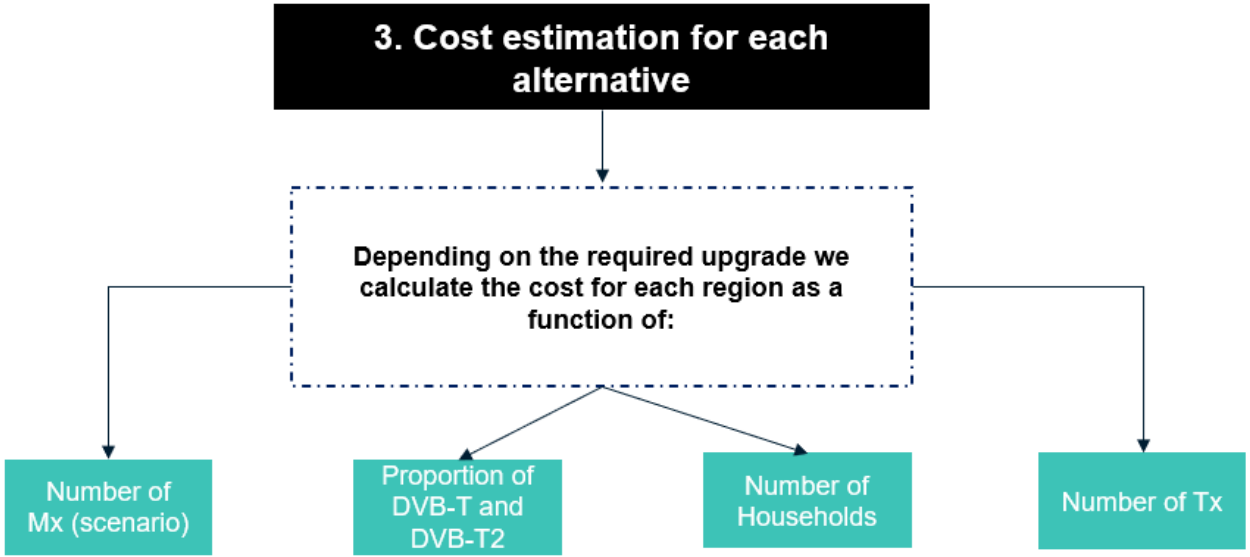


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Broadcast cost methodology and approach (I)

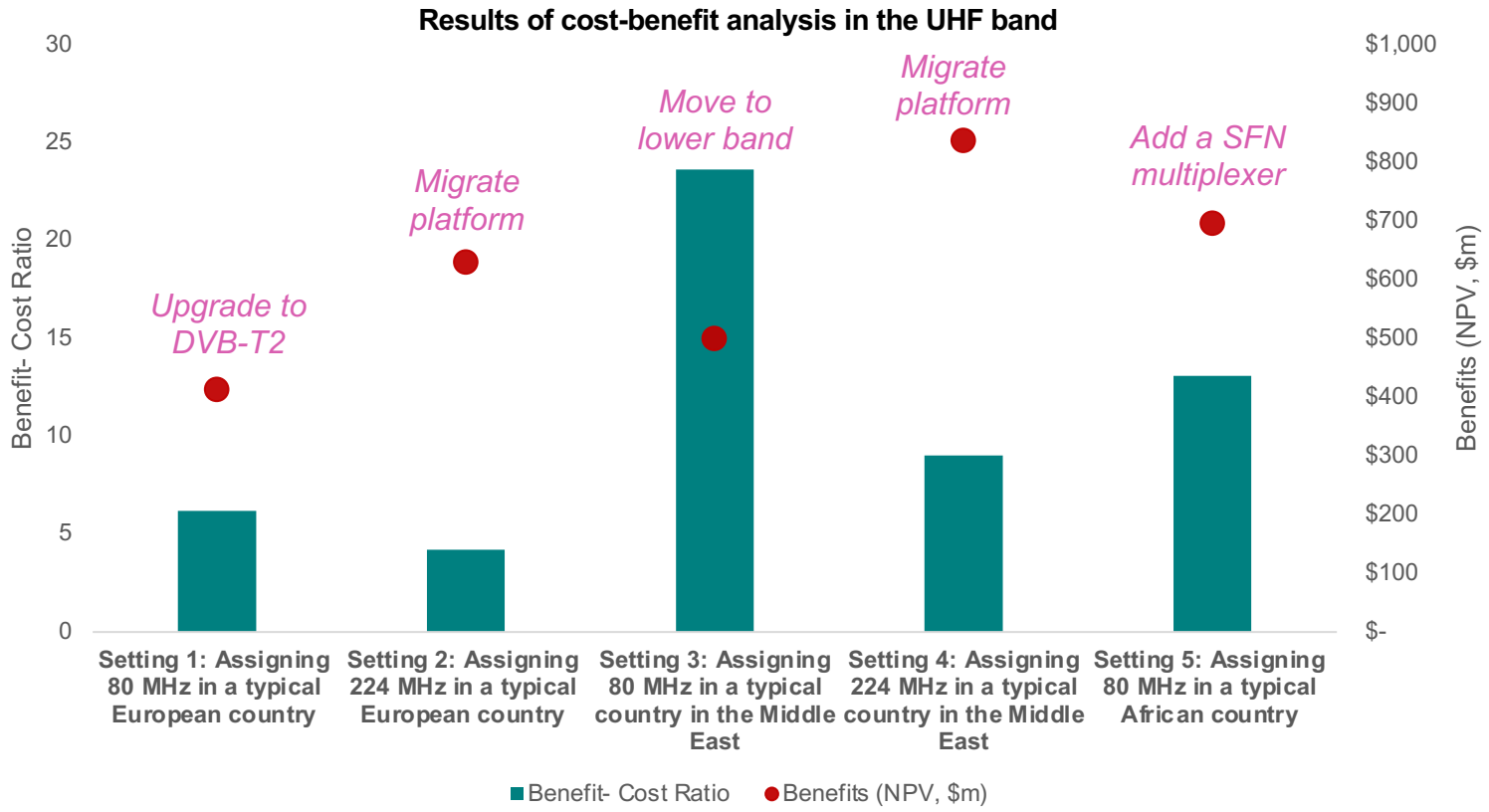


Broadcast cost methodology and approach (II)



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Benefits exceed costs in every setting



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Conclusions

1. Countries with 5G deployments using 600 and 700 MHz bands have been able to offer 5G services that are more widely available and of better quality than those using only mid-bands.

2. Low-bands can enable $130 billion in global economic benefits by 2030, as well as wider social benefits. However, this is conditional on having adequate access to sub-1 GHz spectrum.

3. In each of the settings considered in the cost-benefit analysis, the benefits from assigning additional UHF spectrum to mobile significantly exceed the costs that would be incurred to ensure consumers continue accessing the broadcasting services they demand.

4. A uniform approach to UHF spectrum use across all countries needs to be avoided. Governments should pursue policies that generate the most economic and social value for their populations.

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THANK YOU

For further questions, please contact:

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For the benefit of billions

Mobile is used by over 5 billion people worldwide every day. It creates business opportunities, connects us with loved ones, facilitates healthcare and education, and allows us to enjoy the things that make life worth living.