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Definitive data and analysis for the mobile industry

Economic benefits of using the 3.3-4.2 GHz for IMT

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Rationale and
Methodological note

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Economic benefits model

GSMA Intelligence has developed an economic model that estimates the economic benefits from allocating the 3.3-4.2 GHz (the "3 GHz range") to IMT:

- **Conservatively, the model only consider benefits to urban population**. Due to its technical characteristics, it is expected that this is going to be the primary use of the band. It is nevertheless possible that the 3 GHz range can be also used to expand mobile connectivity in rural areas.
- Given the significant increases in data demand expected in the coming years, our model assesses the benefits of 3 GHz spectrum allowing the building of **more efficient networks**.
- While technological innovation and 5G will increase spectrum efficiency, **current spectrum availability may not be enough to fully satisfy growing traffic demand**, requiring densification levels beyond MNOs existing investment cases.
- A "base case" of **200 MHz** of 3 GHz spectrum is considered, with benefits calculated for two alternative cases with greater spectrum availability in the 3 GHz range for IMT (**500 MHz** and **900 MHz**).
- The study **does not** consider the costs to mobile operators from the use of 3 GHz, nor any potential costs to existing or other potential users of 3 GHz frequencies.

Economic benefits model

The cost savings from lower BTS costs are assumed to be passed on to consumers: price-sensitive demand is higher in the expanded 3 GHz scenario as a result of the lower costs. This has a direct impact on mobile operators and the larger mobile ecosystem.

The increased number of mobile broadband subscribers also has a knock-on impact through the economy, including the larger regional economy and its productivity rate.



Baseline scenario: No additional 3 GHz frequencies allocated to IMT

Demand for mobile data is rapidly increasing

↓

Large part of global urban subscribers currently reliant on mobile broadband delivered over a limited amount of spectrum

↓

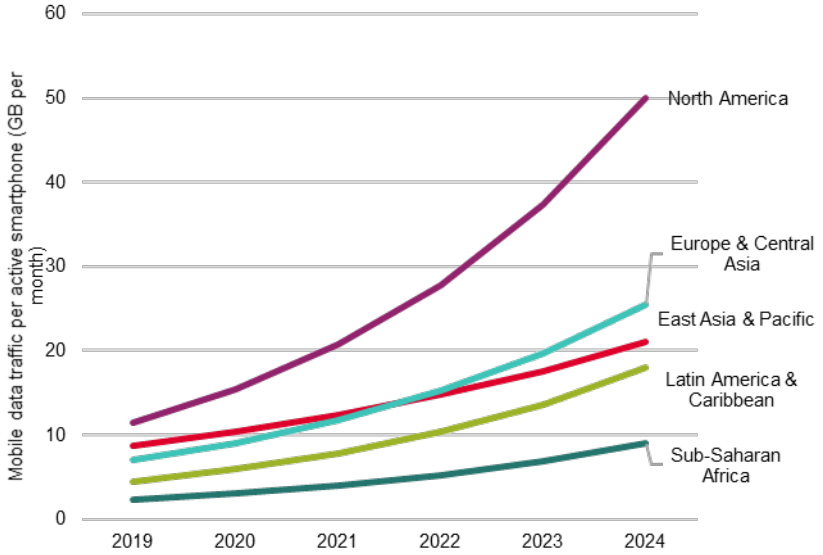
To meet future demand for data, significant densification of BTS required

↓

Mobile broadband for urban subscribers becomes commercially unviable (or very expensive)

↓

Stagnant take-up of mobile broadband, lower economic productivity.



Source: Ericsson 2019

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Main scenario: More 3 GHz spectrum allocated to IMT

Demand for mobile data is rapidly increasing

Large part of global urban subscribers currently reliant on mobile broadband delivered over a limited amount of spectrum

To meet future demand for data, significant densification of BTS required

Mobile broadband for urban subscribers becomes commercially unviable (or very expensive)

Stagnant take-up of mobile broadband, lower speeds, low economic productivity.

Allocate 3 GHz frequencies to mobile to increase urban capacity

Significantly less densification of BTS required for future demand for mobile data

Cost savings will be passed through to consumers, decreasing price, increasing the number of subscribers and finally allowing greater economic productivity

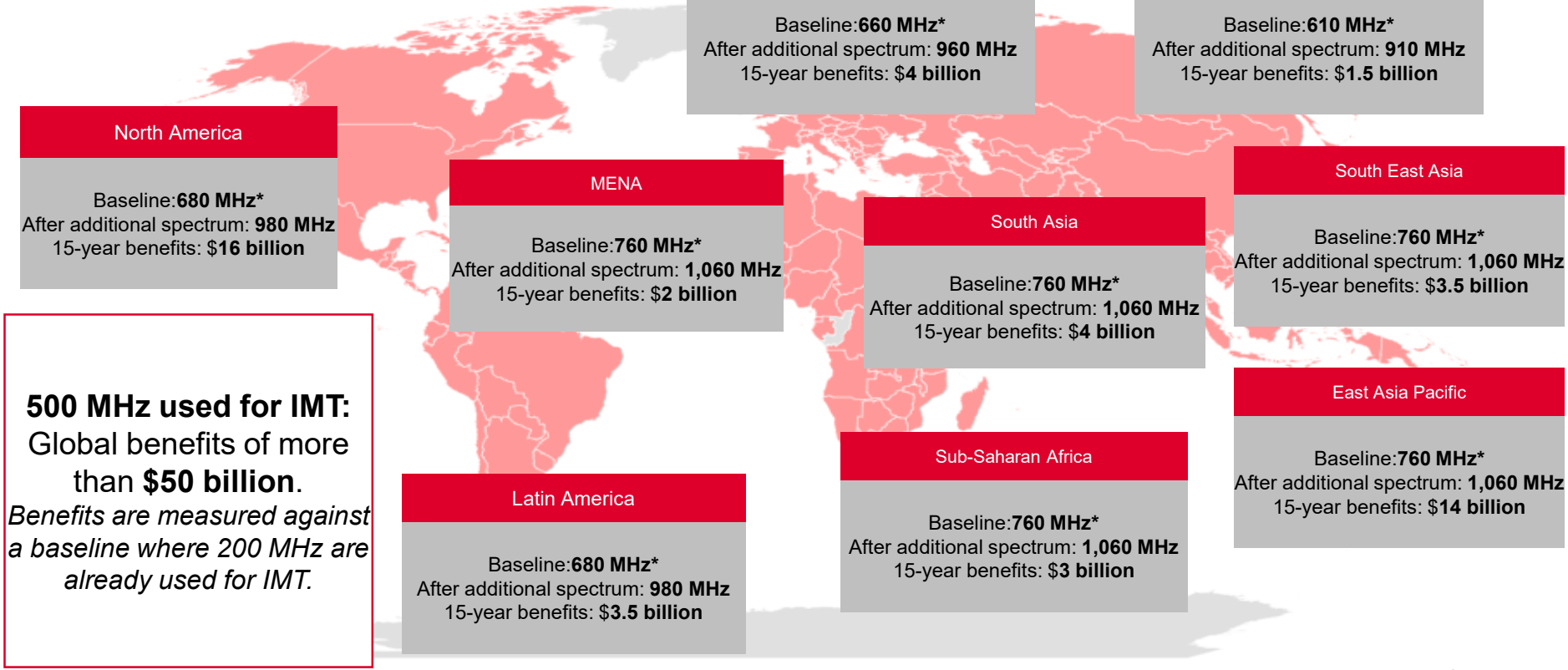
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Economic impact assessment

Scenario analysis – 200 MHz (base case), 500 MHz and 900 MHz



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North America

Baseline:**680 MHz***
After additional spectrum: **980 MHz**
15-year benefits: $**16 billion**

Europe & Central Asia

Baseline:**660 MHz***
After additional spectrum: **960 MHz**
15-year benefits: $**4 billion**

CIS

Baseline:**610 MHz***
After additional spectrum: **910 MHz**
15-year benefits: $**1.5 billion**

MENA

Baseline:**760 MHz***
After additional spectrum: **1,060 MHz**
15-year benefits: $**2 billion**

South Asia

Baseline:**760 MHz***
After additional spectrum: **1,060 MHz**
15-year benefits: $**4 billion**

South East Asia

Baseline:**760 MHz***
After additional spectrum: **1,060 MHz**
15-year benefits: $**3.5 billion**

East Asia Pacific

Baseline:**760 MHz***
After additional spectrum: **1,060 MHz**
15-year benefits: $**14 billion**

Sub-Saharan Africa

Baseline:**760 MHz***
After additional spectrum: **1,060 MHz**
15-year benefits: $**3 billion**

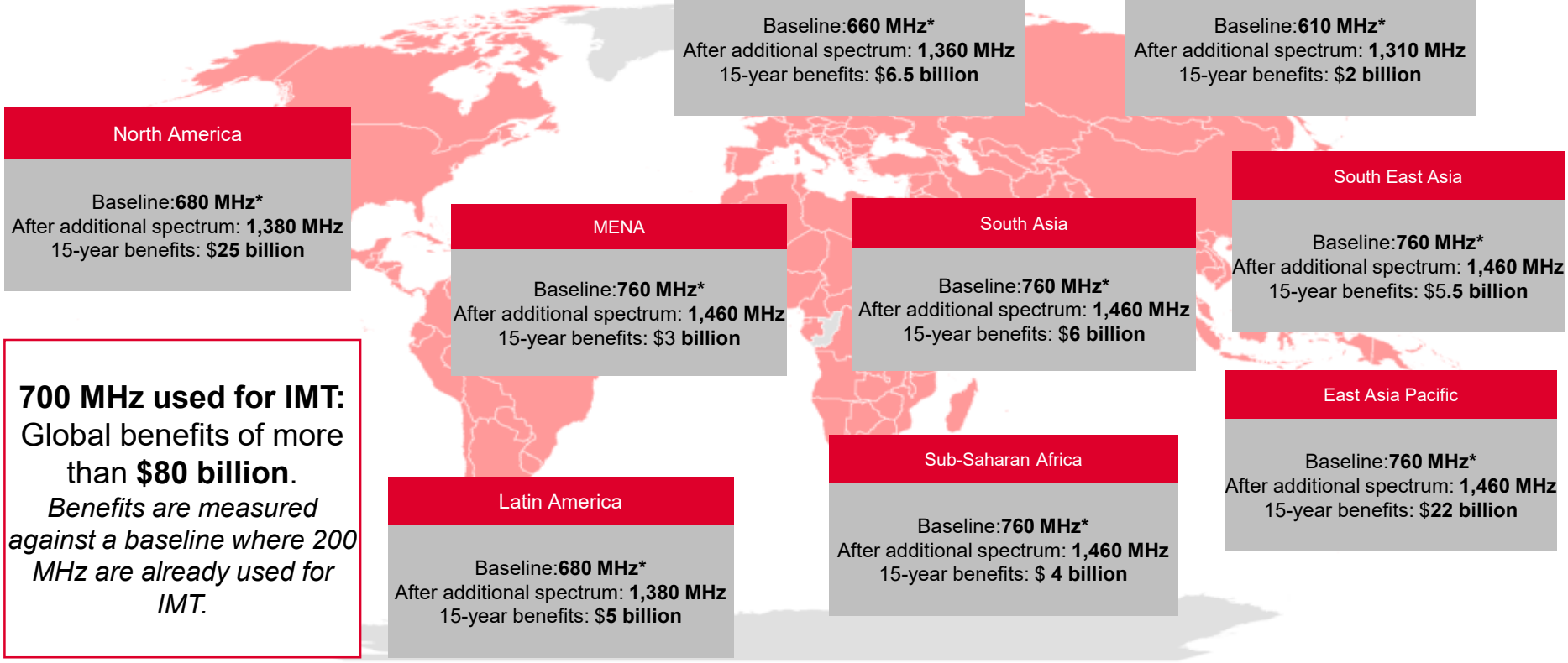
Latin America

Baseline:**680 MHz***
After additional spectrum: **980 MHz**
15-year benefits: $**3.5 billion**

500 MHz used for IMT:
Global benefits of more than **$50 billion**.
Benefits are measured against a baseline where 200 MHz are already used for IMT.

*Only above 1 GHz spectrum considered. 2300 MHz band not included. Includes 200 MHz in the C-band. Sum may not add up due to approximation.

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Europe & Central Asia

Baseline:**660 MHz***
After additional spectrum: **1,360 MHz**
15-year benefits: $**6.5 billion**

CIS

Baseline:**610 MHz***
After additional spectrum: **1,310 MHz**
15-year benefits: $**2 billion**

North America

Baseline:**680 MHz***
After additional spectrum: **1,380 MHz**
15-year benefits: $**25 billion**

MENA

Baseline:**760 MHz***
After additional spectrum: **1,460 MHz**
15-year benefits: $3 **billion**

South Asia

Baseline:**760 MHz***
After additional spectrum: **1,460 MHz**
15-year benefits: $**6 billion**

South East Asia

Baseline:**760 MHz***
After additional spectrum: **1,460 MHz**
15-year benefits: $**5.5 billion**

East Asia Pacific

Baseline:**760 MHz***
After additional spectrum: **1,460 MHz**
15-year benefits: $**22 billion**

Sub-Saharan Africa

Baseline:**760 MHz***
After additional spectrum: **1,460 MHz**
15-year benefits: $ **4 billion**

Latin America

Baseline:**680 MHz***
After additional spectrum: **1,380 MHz**
15-year benefits: $**5 billion**

700 MHz used for IMT: Global benefits of more than **$80 billion**.

Benefits are measured against a baseline where 200 MHz are already used for IMT.

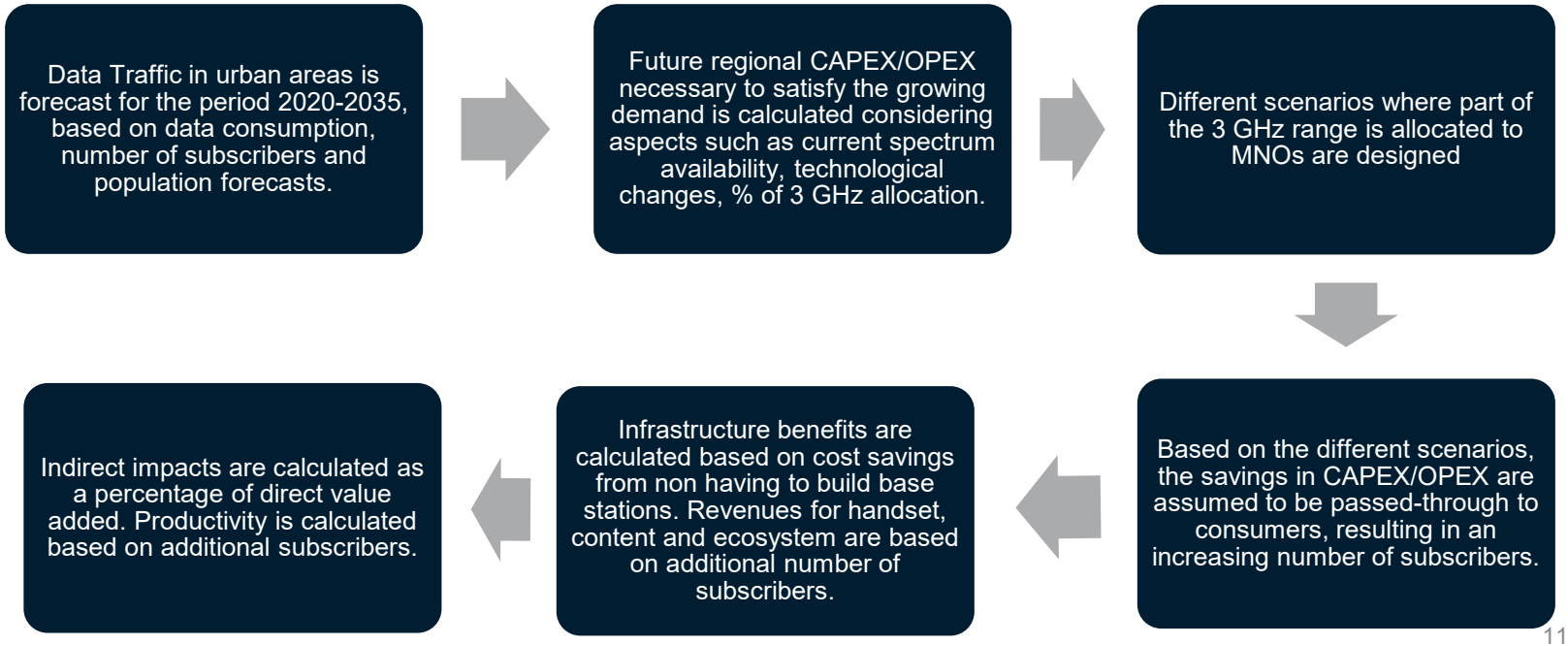
*Only above 1 GHz spectrum considered. 2300 MHz band not included. Includes 200 MHz in the C-band. Sum may not add up due to approximation.

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Annexes

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Annex 1: extended description of modelling stages



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Annex 2: Technical assumptions, global

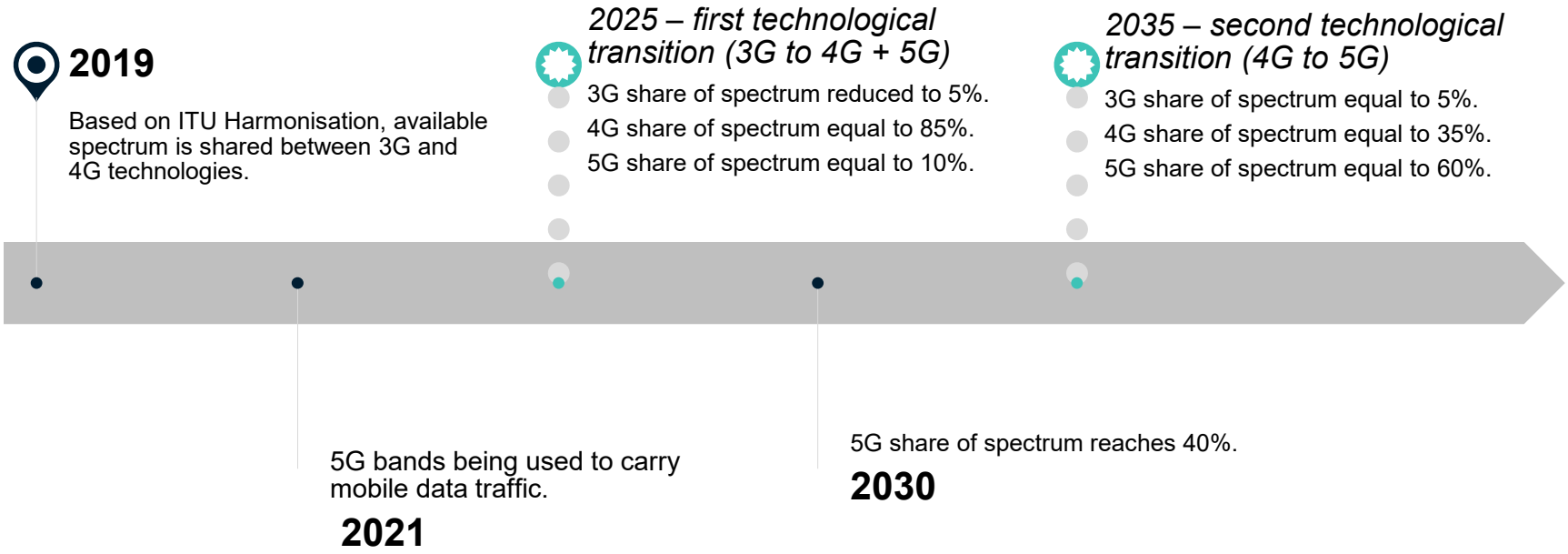
Variable	Value	Source
Spectral efficiency – 3G	1.50	LTE 5G Innovation - 5G Americas/Rysavy 2017
Spectral efficiency – 4G	2.40	LTE 5G Innovation - 5G Americas/Rysavy 2017
Spectral efficiency – 5G	4.80	Estimate based on ITU IMT2000, Nokia and CTIA sources.
Number of sectors	2.50	Mobile broadband with HSPA and LTE - capacity and cost aspects, Nokia Siemens Networks, 2010
Nationwide data traffic distribution factor - urban	0.25	Mobile broadband with HSPA and LTE - capacity and cost aspects, Nokia Siemens Networks, 2010
Load factor	0.70	Mobile broadband with HSPA and LTE - capacity and cost aspects, Nokia Siemens Networks, 2010
Base station asset life, years	8	Mobile broadband with HSPA and LTE - capacity and cost aspects, Nokia Siemens Networks, 2010
Densification factor - 3G,4G	30%	Assumption. It is considered that operators will be willing to expand their current 3G and 4G base stations networks up to 30% of current footprint. Over this limit, it is assumed that operators will stop densifying their networks.
Densification factor – 5G	100%	Assumption. It is considered that operators will be willing to expand their future 5G base stations networks up to 100% of current footprint. Over this limit, it is assumed that operators will stop densifying their networks.
BTS per site	2	Estimate

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Annex 2: Technical assumptions, regional

Variable	Value	Source
Spectrum holding – 3G, above 1GHZ	0 to 120 MHz depending on the region	ITU Harmonisation database. Transition from different technology (3G to 4G to 5G) is accounted for over time
Spectrum holding – 4G, above 1GHZ	190 to 440 depending on the region	ITU Harmonisation database. Transition from different technology (3G to 4G to 5G) is accounted for over time
Spectrum holding – 5G, above 1GHZ	0	ITU Harmonisation database. Transition from different technology (3G to 4G to 5G) is accounted for over time
Base station upgrade	90.000 $ with 4 % year on year decrease	LATAM L Band model
Number of BTS in urban areas	Varies by region	Calculated with GSMAi data
Percentage of total mobile data traffic carried over mmWave by 2035.	13%	Conservative assumption based on previous GSMA study on Socio-Economic Benefits of 5G Services Provided in mmWave Bands.

Annex 3: Assumed technology transition phases



Source: GSMA estimation based on current market uptake and planned auctions.