



Small cells around the world: an analyst's perspective

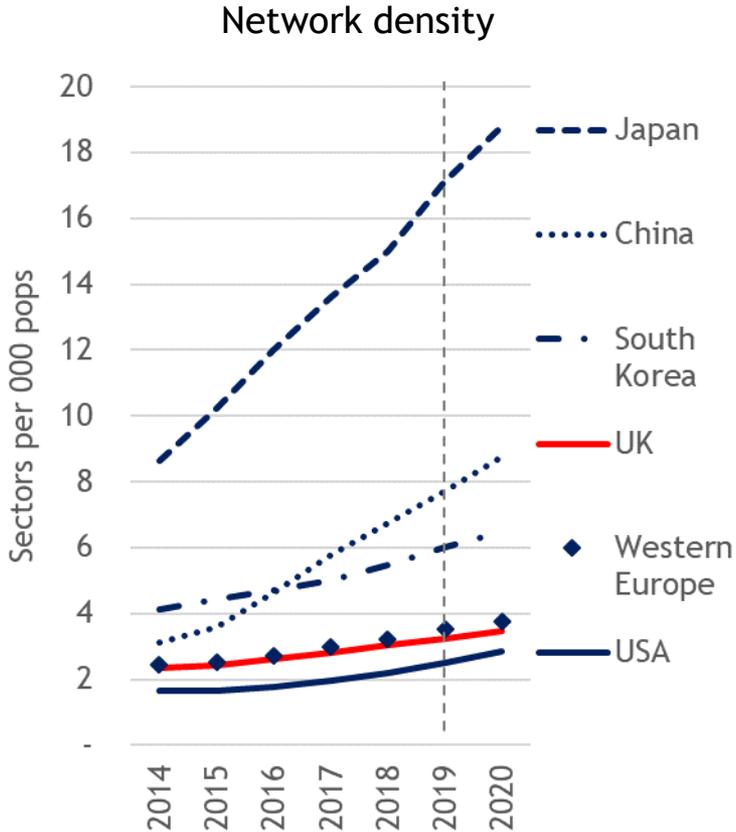
Cambridge Wireless, Smart Cities & Small Cell SIG

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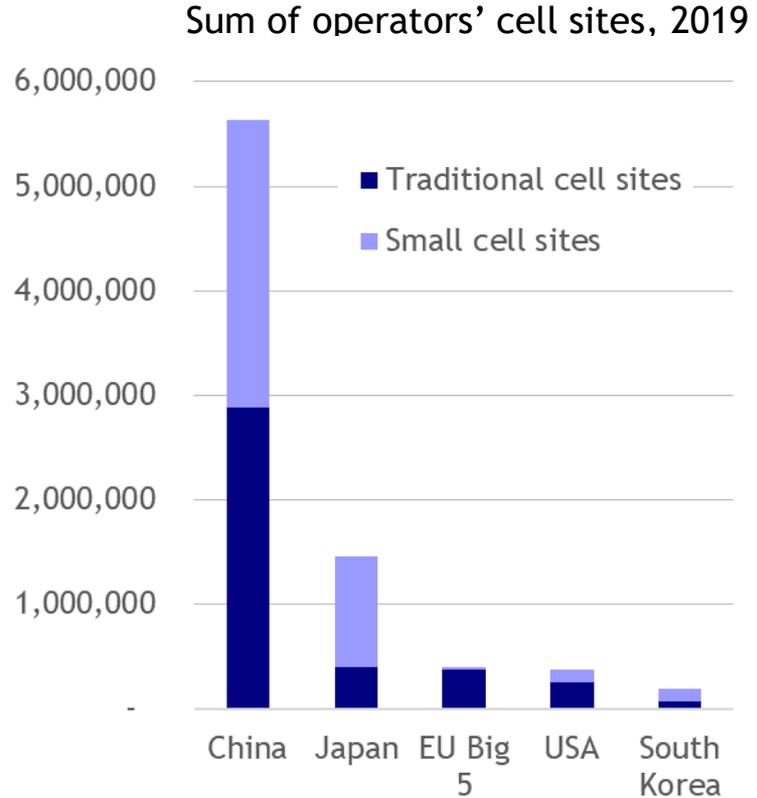
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Context: Huge variation in network density around the world

Less than three sectors per 1,000 people in the US
Seventeen sectors per 1,000 people in Japan.



The absolute numbers of cell sites show the importance of China and Japan



What is behind these striking differences?

What is needed for large-scale small cell deployment?

Drivers

- A technology problem
e.g. China Mobile TD-SCDMA
- A spectrum shortage
e.g. Jio (India)
- An inherited asset
e.g. PHS networks in Japan
- High-usage (capacity pressures)
e.g. S Korea, Verizon and AT&T
in major CBDs
- Propagation constraints
e.g. Sprint 2.5GHz,
VZ and AT&T mmWave
- Enthusiasm for convergence
e.g. Altice USA
- Fear of being left behind
e.g. China Unicom, China Telecom

Enablers

	Minimal bureau- cracy	Cheap backhaul	Low (or zero) attachment fees
China	✓	✓	✓
Japan	✓	✓	✓
S Korea	✓	✓	✓
Sprint/ Altice (USA)	✓	✓	✓
India	~✓~	✗	✓
Most US and EU situations	✗	✗	✗

European operators have lacked both the drivers and the enablers for widespread small cell deployment. US operators see several drivers but have faced material obstacles.

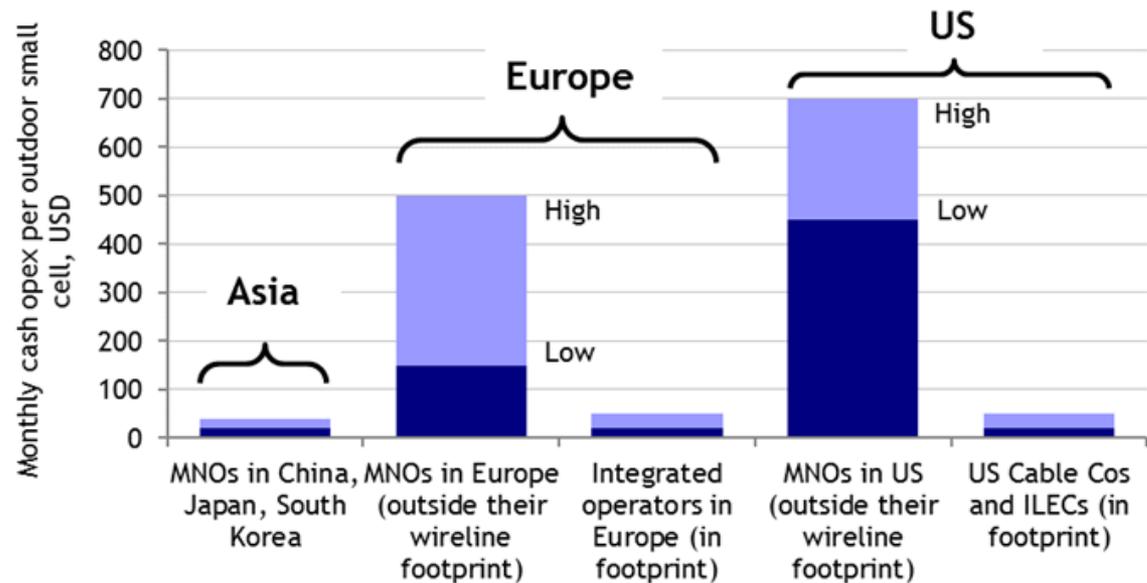
'Soft obstacles' and high costs are barriers to EU and US small cells

No issues with small cell siting or backhaul in Japan



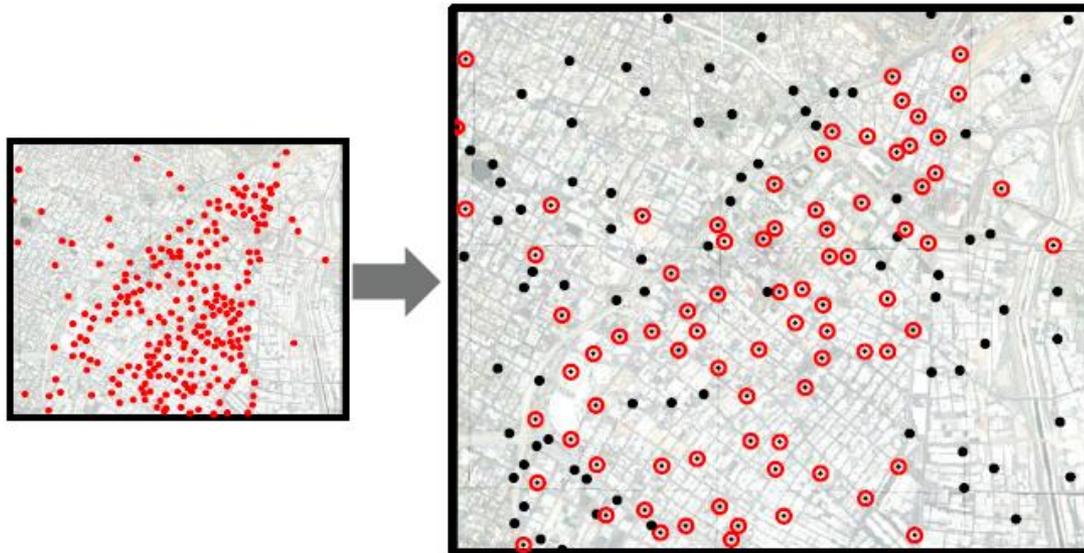
Source: Google Streetview

Cash opex for small cells - current estimated ranges, USD/month

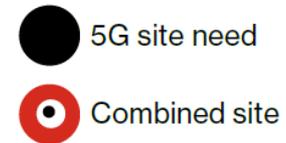


European and US operators seem to be more focused on alternatives to small cells - adding to spectrum holdings, increasing spectral efficiency and improving propagation (massive MIMO)

Could 5G actually *reduce* urban network density?



- Leverage existing 4G densification plans beyond dense urban
- 5G mmWave fill in sites in some areas



verizon

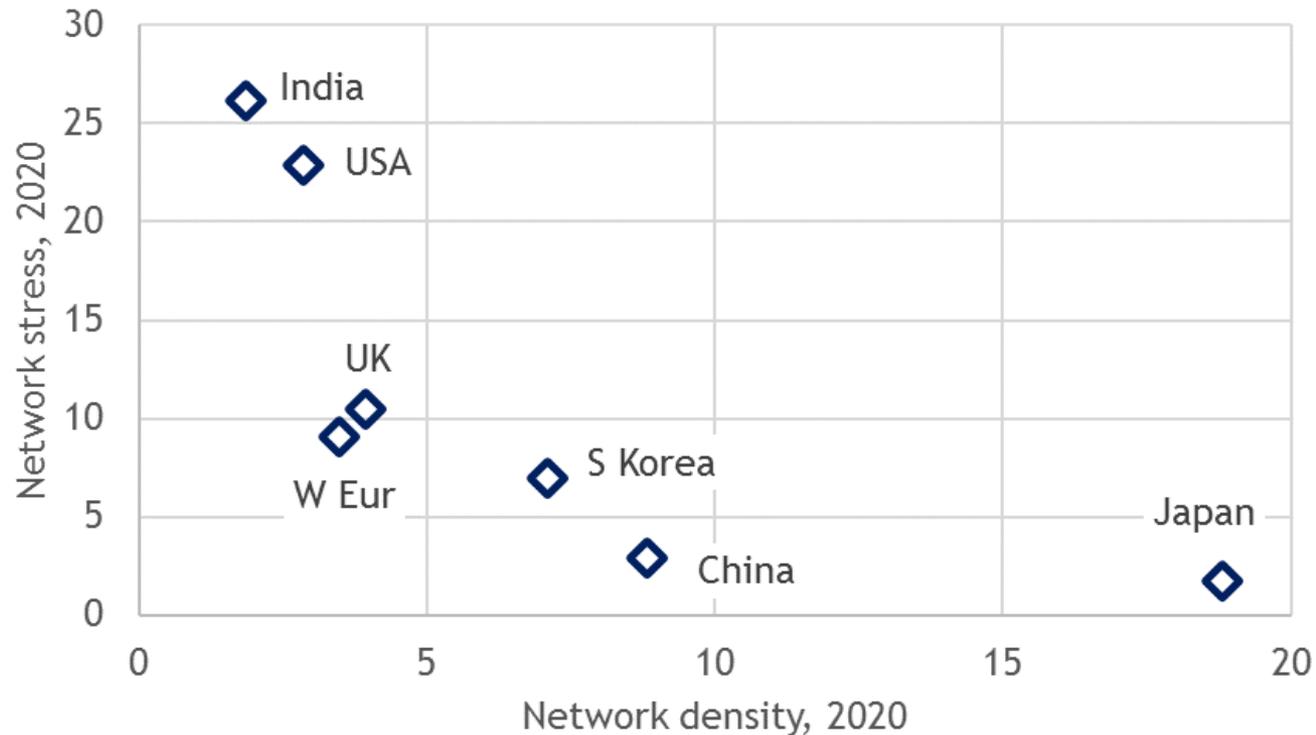
21 May 2018

Verizon showed the possibility of doing without 70% of its 4G small cells in downtown Los Angeles, thanks to the expected boost from mmWave 5G.

Average cell radius in the CBD would be increased from 110 metres to 185 metres - still pretty dense

'Network stress' and network density

Cellular network stress* vs network density (2020)



*Our measure of network stress is 'demand / supply'

'Demand' is 'downlink PB/month'

'Supply' is 'sectors x average DL spectrum in use x average spectral efficiency', giving a nominal network capacity

Whilst this ratio has many flaws, it's the least bad approach we can devise, and we find it useful (if used with care)

Lots of questions . . .

- Will 3.5GHz plus m-MIMO, on existing cell sites, deliver as an alternative to small cells?
- Why are integrated (wireline and wireless) operators so reluctant to add small cells to their existing street poles and cabinets? (BT, DT, Verizon, AT&T, Vodafone Deutschland etc.)
- When will wireless backhaul for small cells arrive to remove the wired backhaul constraints? (US and Europe)
- Is mmWave going to be on the main 5G bandwagon?
(A major driver of small cells if it is)
- Will the ‘municipality vs MNO’ small cell stand-off be resolved in the US?
- Will CBRS be the catalyst for small cells growth in the US?
- If small cells start to ramp up in the US, would Europe tag along?
- Will WiFi 6 and 5G ‘hetnet’ functionality help or hinder small cell prospects?
- . . .

Disclosures

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