Africa’s TV White Space Opportunity

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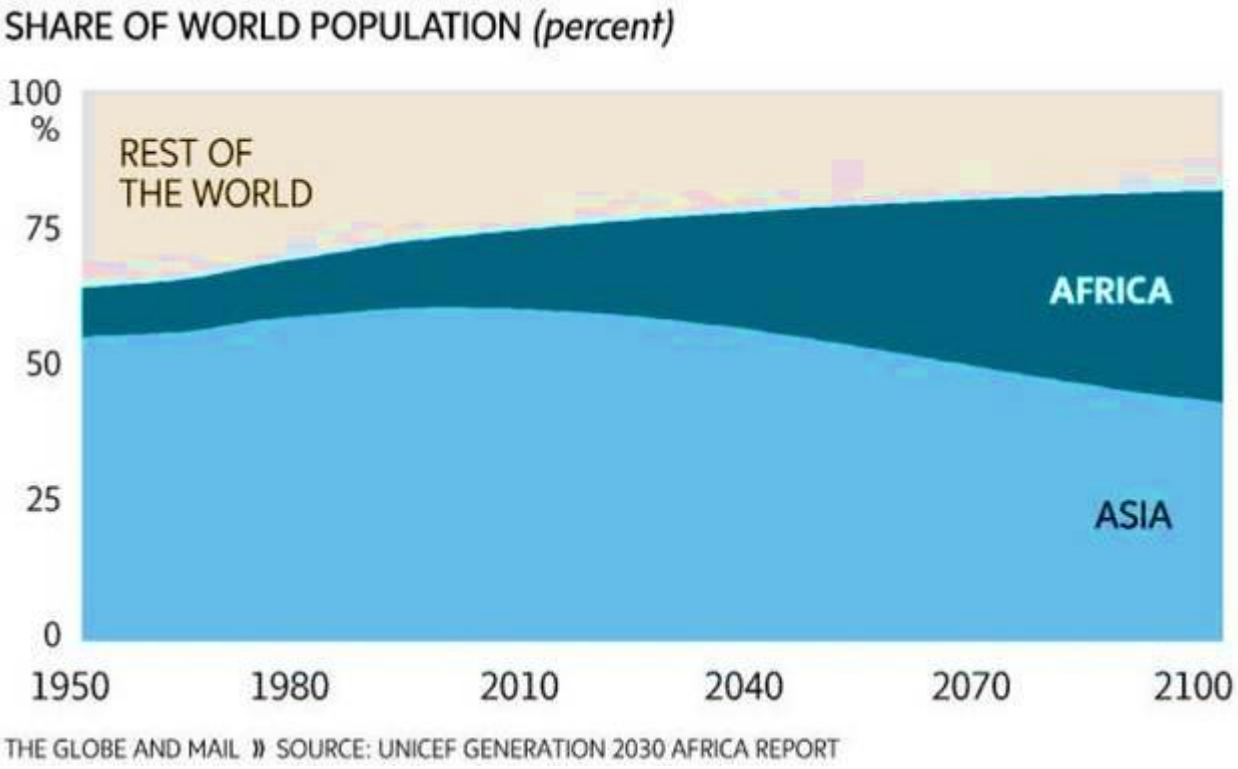
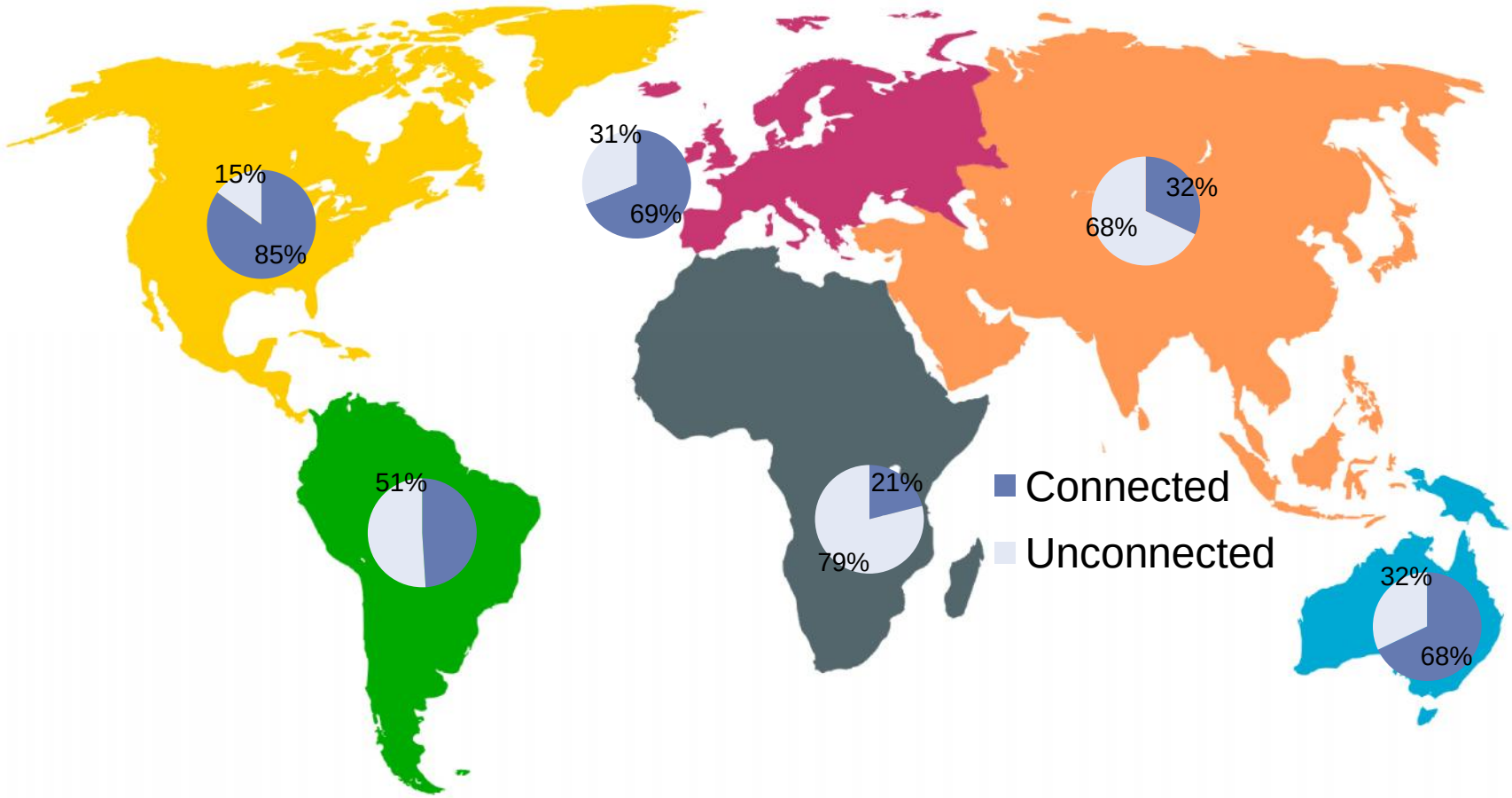
An African future

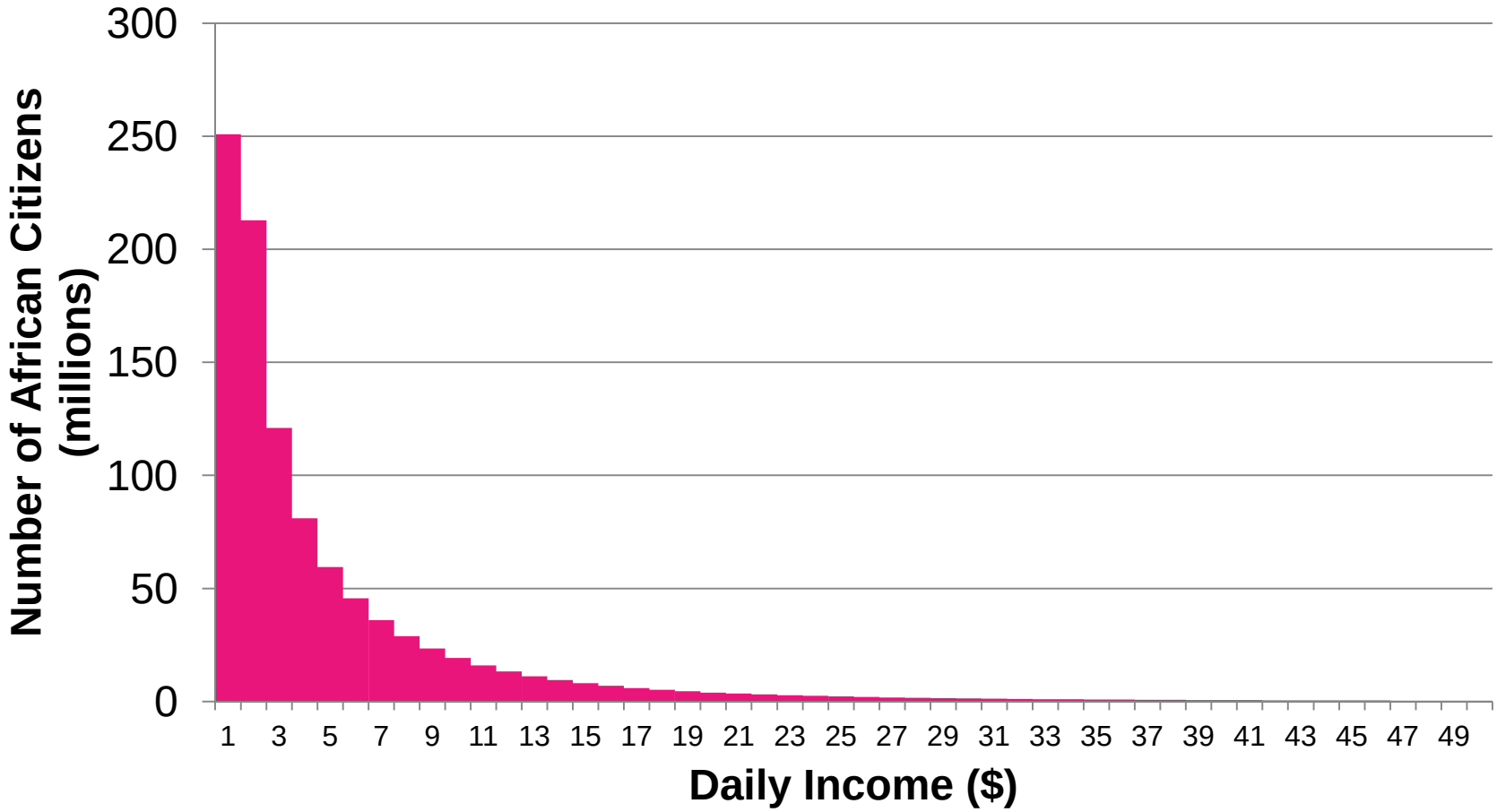


The risk of a lost generation



Source: ITU

Low African incomes…

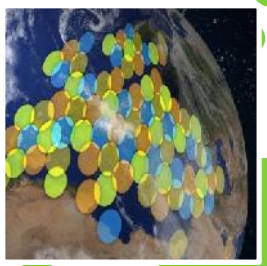


Source: Thanki 2012

…and expensive technologies

Fibre

Costs for digging can vary from $7.50 to $150 per metre



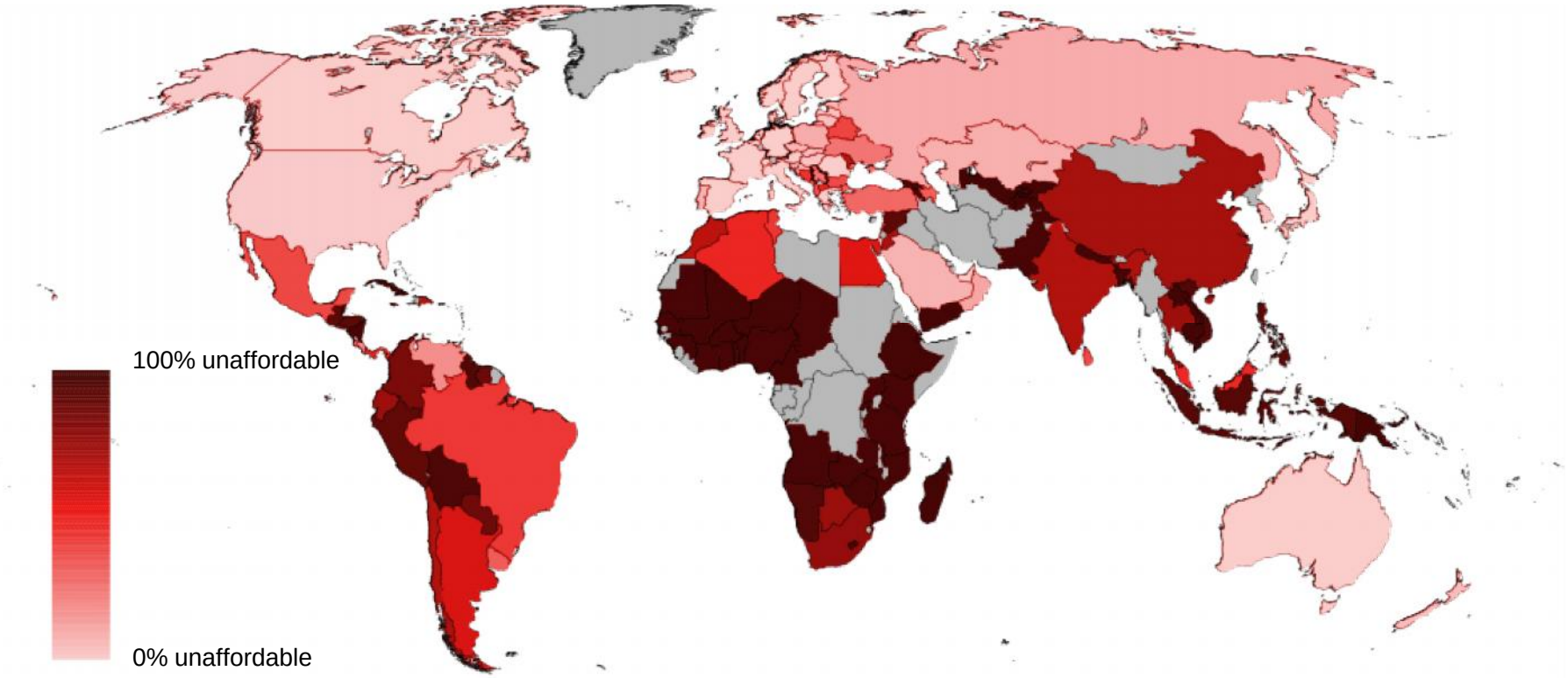
Satellite

Eutelsat's, KA-SAT cost €350 million for a capacity of 90 Gbps

Mobile

A base station can often cost over $250,000 to build

Paint a poor picture for affordability



Even mobile, the cheapest of the three technologies shown previously remains terrifically unaffordable for most Africans

Source: Thanki 2012

The power of the unlicensed experiment

Access by licence

- Express permission needed to access the spectrum
- Fluid markets in licences are not emerging…spectrum ownership concentrating

Access by rules

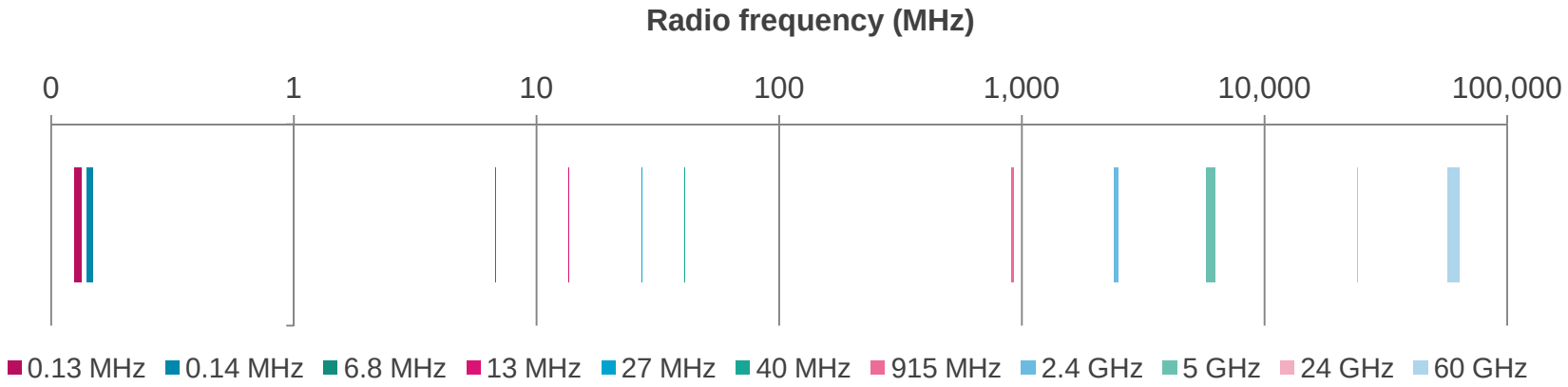
- Regulator sets minimum rules of the road
- Huge investment in a range of open and proprietary standards

unlicensed spectrum *guarantees spectrum access*

- "managing infrastructure resources in an open manner…catalyzes innovation and…facilitates…positive externalities…that might be stifled under a more restrictive access regime."[1]

Sources: 1) Frischmann

A tiny amount of the spectrum is for licence-exempt usage

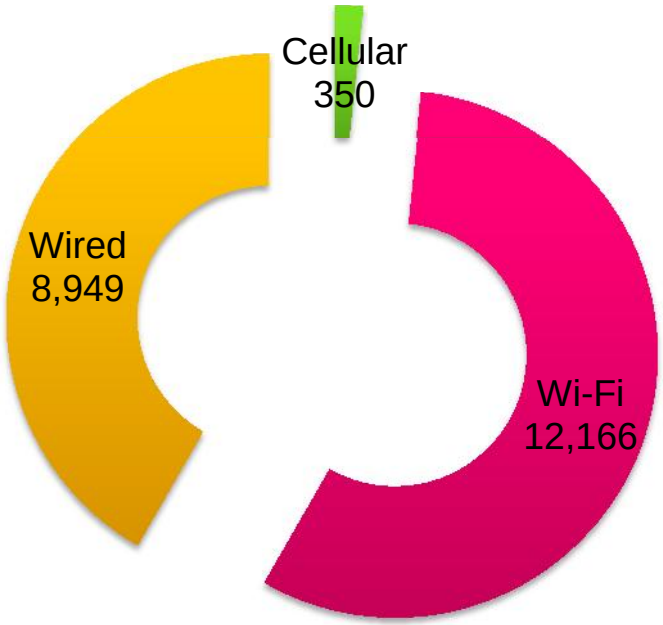


But the success of the usage of this spectrum is extraordinary

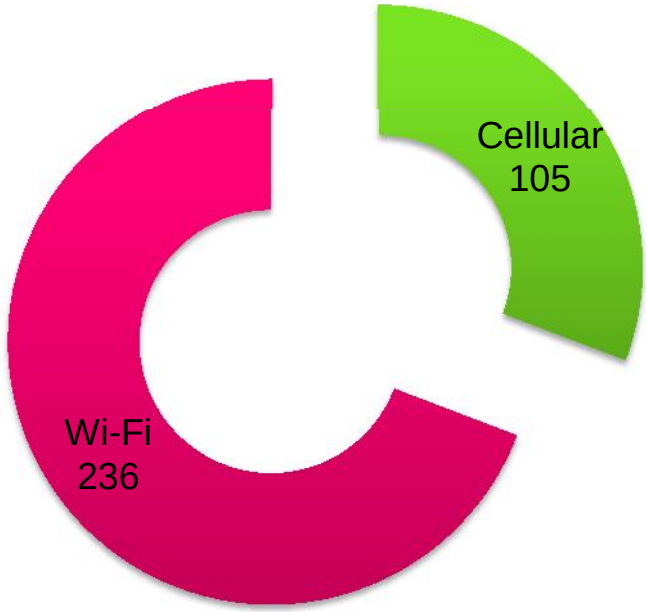
Source: Thanki 2009

Most of the world's data is carried on licence-exempt spectrum

Traditional PCs and laptops (PB/month)

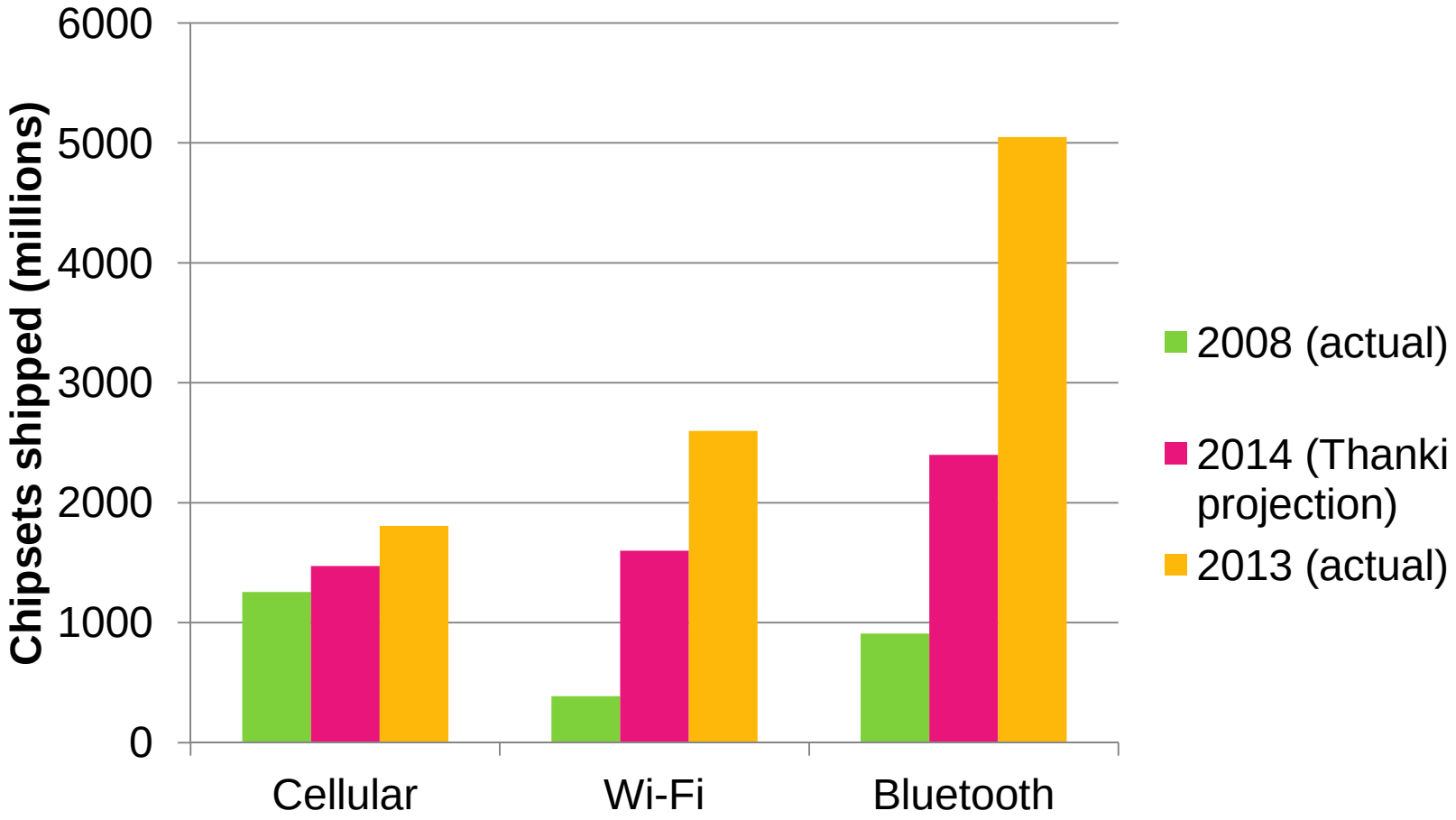


Smartphones and Tablets (PB/month)



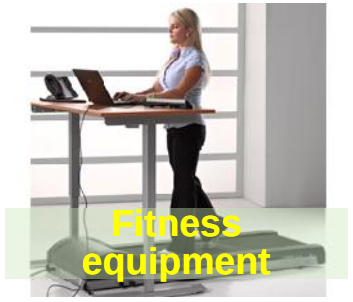
Source: Thanki 2012

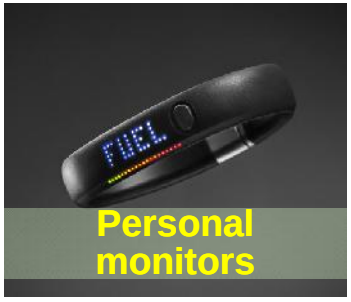
Most devices shipped are licence-exempt



Source: Thanki 2012

Most wireless innovation in licence-exempt spectrum





Source: Thanki 2012

Most wireless innovation in licence-exempt spectrum


Phones

Probes

Walkie-talkies


Point-of-sale terminals

Industrials routers/hubs


Remote monitors


Printers/Office equipment


Automated fleets

Vibration/heat/stress sensors

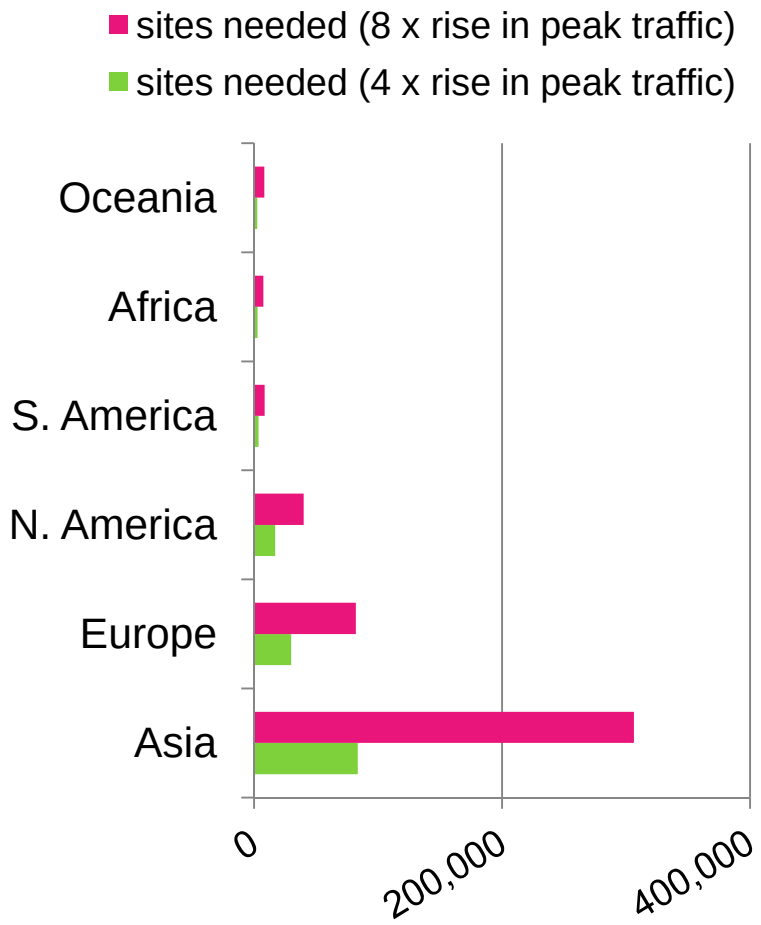

Environmental sensors


Radiation hazchem sensors

CCTV

Source: Thanki 2012

Additional costs of mobile, absent Wi-Fi



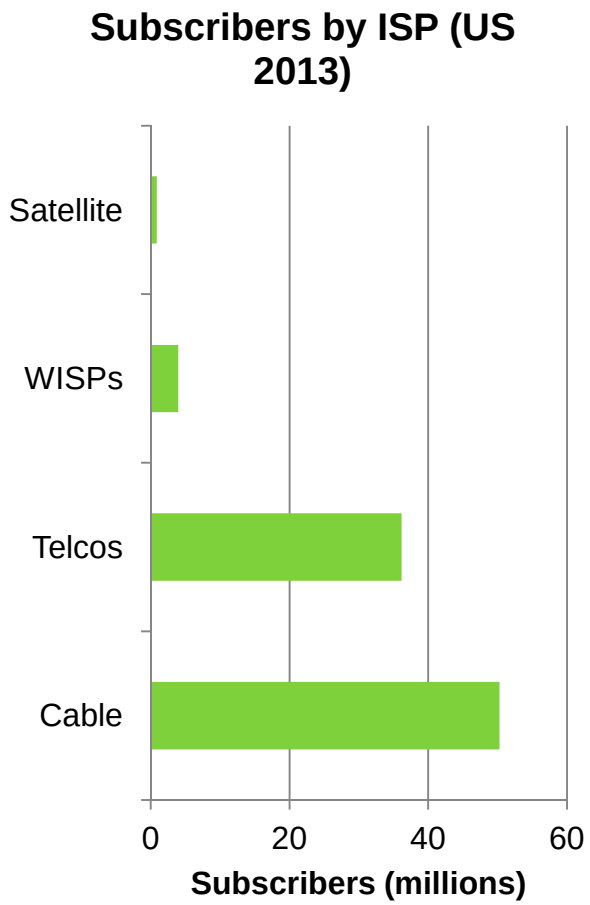
- 140,000 to 450,000 extra sites required
  - (additional 8 – 20% sites worldwide)
  - At a cost of **$30 - $90 billion** (conservative)
- The 2.4GHz band used by Wi-Fi achieves an aggregate spectral efficiency 30x greater than any cellular band

Source: Thanki 2012

The transformational prospect of TVWS

- The existing successes of licence-exempt spectrum have been achieved in higher frequency bands
- TVWS would allow far greater ranges for communication, or a similar range for a much lower power
- Their potential is truly transformational

US WISPs – a model for rural Africa



- U.S. WISPs have 4 million rural subscribers
- "WISPs do this without subsidy…and grew using money generated from the actual business. They don't have 6 figure base salaries and they don't burn through stockholder money to create their golden parachute. Being small business owners they also have a keen sense of the market space and they can react quickly to changes. Their equipment has advanced much more rapidly than other broadband technologies. Today they are capable of delivering 5, 10, 15 and even 20 meg connections to the consumer. They have the lowest cost per home passed of any broadband technology. It's a novel approach to the Telecom business model."

Source: Webster, Brian. "Wireless ISP's (WISP) – the other white heat of the broadband world.", 2011.

Intelligence + Connectivity → novel applications of the future

Connected Vine

- Sensors to check soil moisture, temperature and light intensity information
- Actuators to control drip irrigation system

Connected Bridge

- Wireless sensors monitor structural integrity
- Products in use from Motorola, Innodev, Microstrain etc.

Connected Heart

- Pacemakers and internal defibrillators constantly monitor heart activity
- Can upload information and be programmed wirelessly

Source: Thanki (2012)

Potential of machine-to-machine networks

100 billion machine connections by 2020, if each new interconnection created 1% value of a human connection, value of internet would be $1.4 to $2.2 tn per year[1].

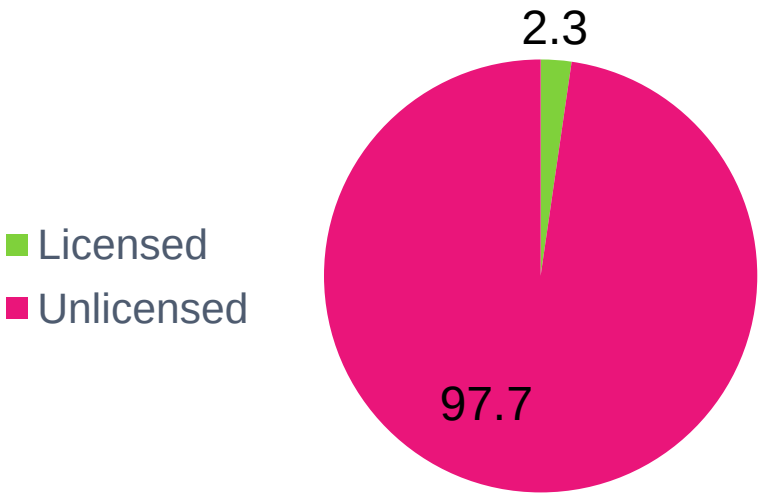
GE estimates the "Industrial Internet" could add $10 to $15 tn to global GDP[2]

Source: 1) Thanki (2012) & 2) Evans & Annunziata (2012)

• Unlicensed spectrum in m2m networks

- Unlicensed technologies will continue to dominate the internet of things
- Cellular not suitable for majority of machine-to-machine applications:
  - Expensive – high cost chipsets and data plans
  - Impractical – high latency and low battery life using remote towers
  - Uniform – 'one size fits all' unlike Wi-Fi, Bluetooth, Zigbee
- Unlicensed access to TV white spaces could enable novel applications
  - Environmental monitoring, smart infrastructure (power and water grids, traffic), automated agriculture
  - Europe already falling behind the United States on the smart grid due to lack of sub-1GHz unlicensed spectrum[2]

Share of machine connections by 2020[1]



Source:1) Thanki (2012) & 2) Benkler (2013)

Africa and its TV White Space opportunity

Enable a new means to connect its citizens to broadband internet

Permit new entrants and novel business models (commercial, public service, community) to the connecting of the continent

Enable African innovators and companies at all scales to invent new services and new applications

Previous work

- Thanki, R. *The Economic Value Generated by Current and Future Allocations of Unlicensed Spectrum,* 2009. http://bit.ly/1zpUWUk
- Thanki, R. *The Economic Significance of Licence-Exempt Spectrum to the Future of the Internet*, 2012. http://bit.ly/1nsdCNB
- Thanki, R. *The case for permissive rule-based Dynamic Spectrum Access*, 2013. http://bit.ly/1qaVJqe