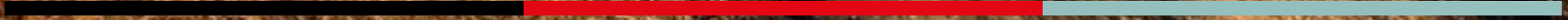




Closing the Coverage Gap:
How Innovation Can Drive Rural
Connectivity





Contents

- **Introduction and context**

- **Innovation in:**
 - Base stations
 - Backhaul
 - Energy
 - Business models

- **Wrap-up**





10

Y E A R S O F

MOBILE FOR DEVELOPMENT

Our team looks back at a decade of change and discusses
what's next in our evolution

www.gsma.com/mobilefordevelopment/10yearsofm4d



GSMA Connected Society Programme

The GSMA Connected Society Programme works with the mobile industry and key stakeholders to increase access to and adoption of the mobile internet, focusing on underserved population groups in developing markets.

Our Approach:

Insights

- Industry leading research, data and case studies
- Mobile Connectivity Index and Coverage Maps

Support

- Innovation Fund for Rural Connectivity
- Digital skills projects

Advocacy

- Capacity building with regulators and policy makers
- Convening National Dialogues for Digital Transformation in key markets



Addressing key obstacles to adoption



Accessibility: Facilitating access to network coverage, handsets, electricity, agents and formal IDs



Affordability: Tackling affordability including handsets, tariffs, data and transactions fees



Usability and skills: Improving usability of handsets and services and building digital skills and awareness



Safety and security: Enhancing security and safety by addressing harassment, theft, fraud and data protection



Relevance: Promoting local, relevant content products and services



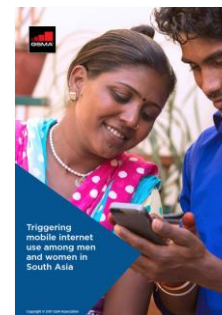
Triggering mobile internet use in cote d'Ivoire and Tanzania



Accelerating affordable smartphone ownership in emerging markets



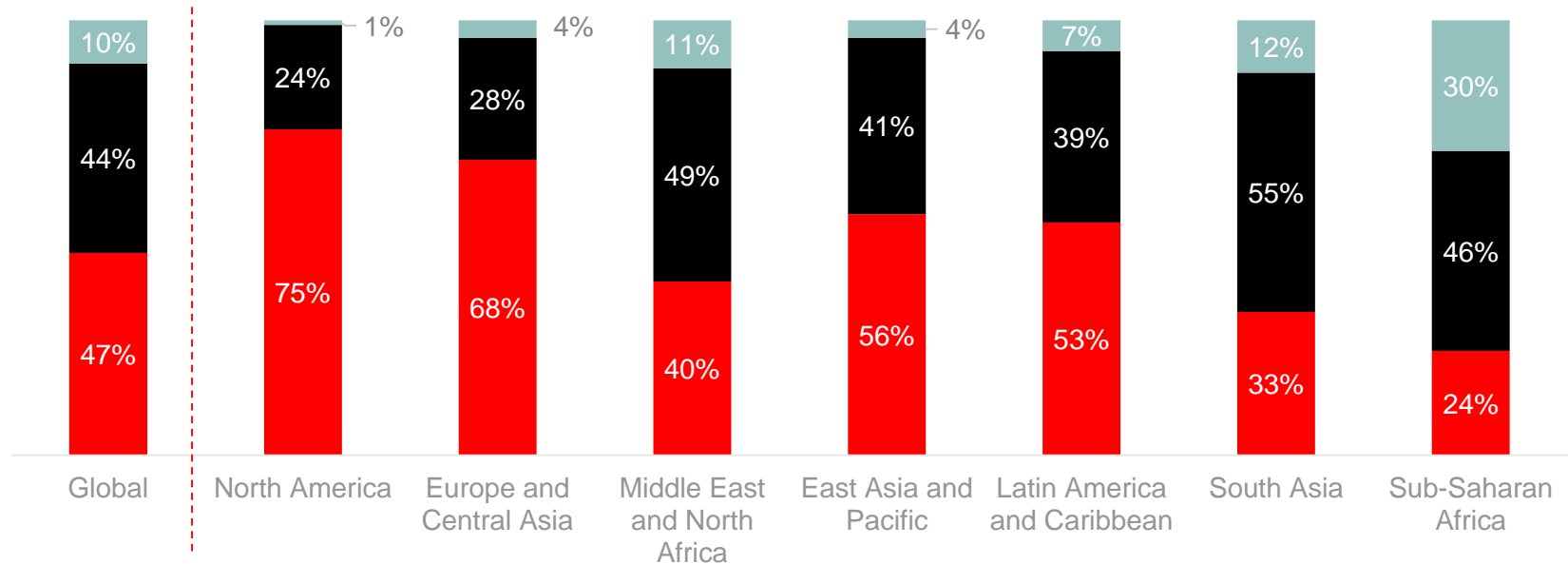
MISTT: Tigo Rwanda pilot evaluation



Triggering mobile internet use among men and women in South Asia



The Coverage Gap: 750 million people do not have mobile broadband coverage

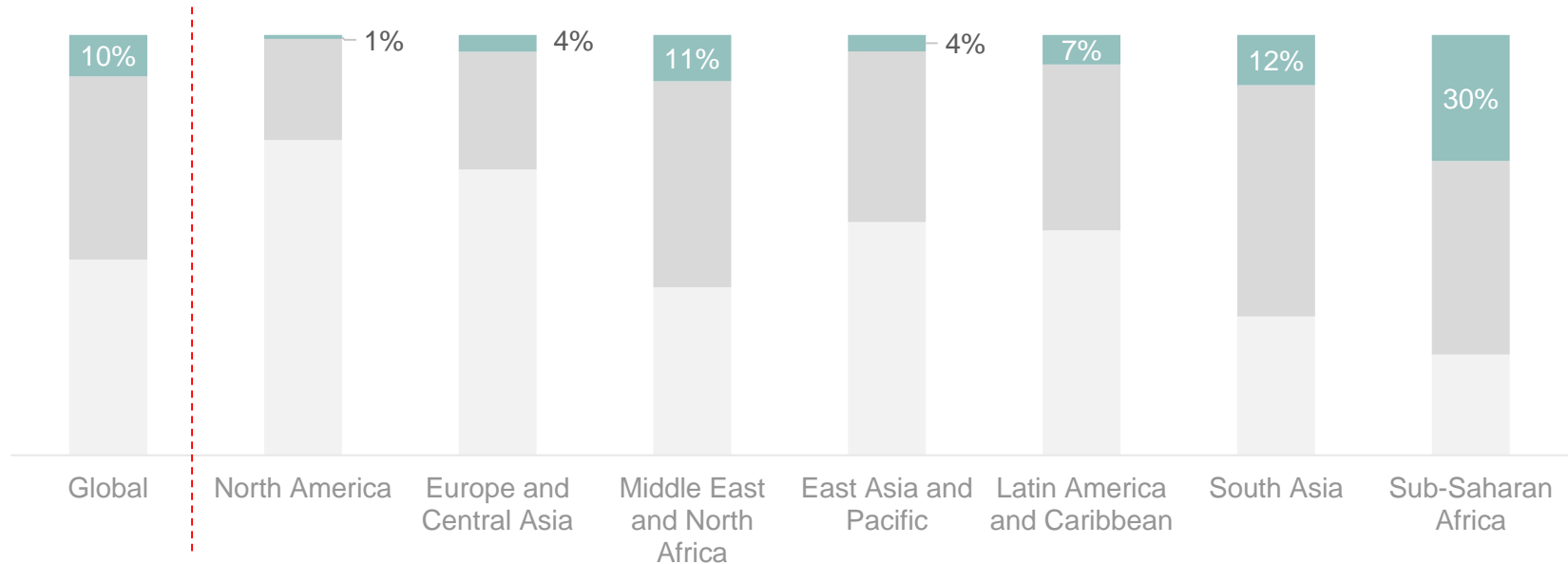


Data: GSMA Intelligence

■ Connected ■ Usage gap ■ Coverage gap



In Sub-Saharan Africa 300 million people do not have mobile broadband coverage

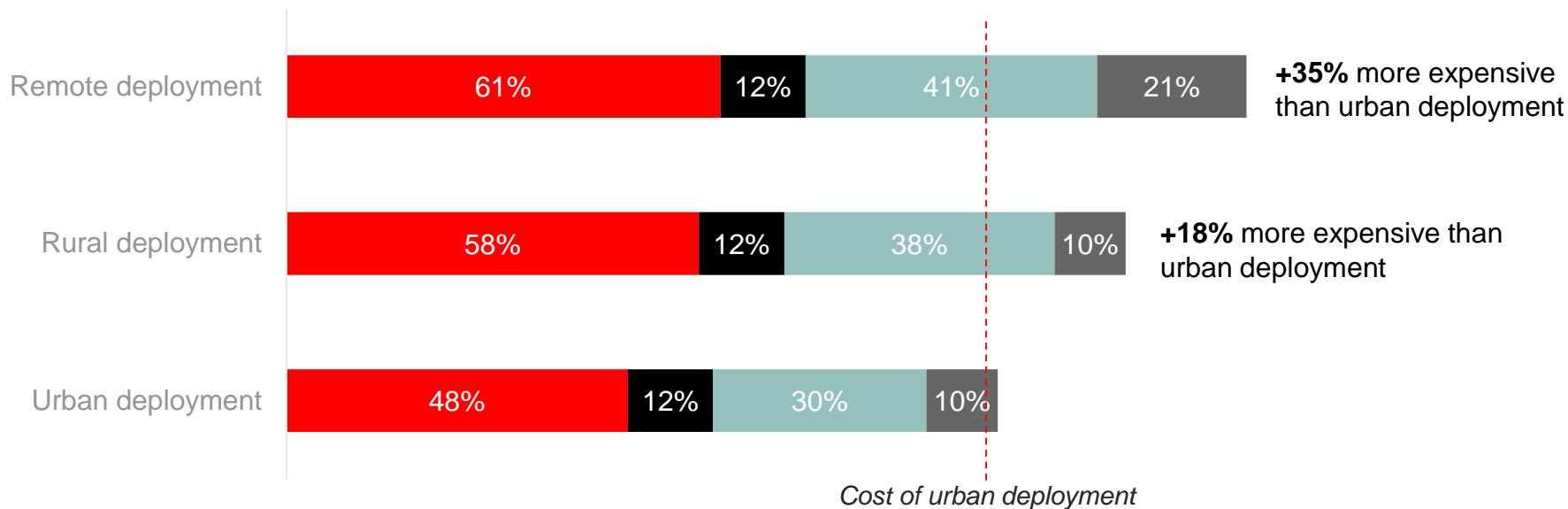


Data: GSMA Intelligence

■ Connected ■ Usage gap ■ Coverage gap



Mobile broadband rollout is increasingly an economic, not technical, challenge



Data: Annualised cost of mobile coverage sites in rural and remote locations (relative to urban), by major component. All figures are GSMA generalised benchmarks, taken from GSMA Intelligence data.

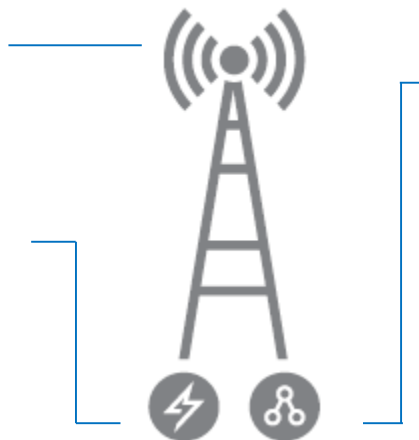
■ Tower and civil works ■ Active network costs ■ Power ■ Backhaul



Priority areas for innovation in infrastructure are base stations, backhaul technologies, and energy

Base stations can be very expensive – often requiring transporting materials and undertaking extensive civil engineering.

Energy represents a sizeable and ongoing cost for network operation. In many rural areas, a reliable power supply may not be available.



Backhaul connects users to the core mobile network. Fibre-optic cabling can often be too expensive for rural deployments, whilst satellite and microwave technologies also have limitations.



Our approach



Expert interviews with senior and technical stakeholders



Secondary research



Analysis of over thirty technologies

- *Illustrative, not exhaustive*



Supported by:



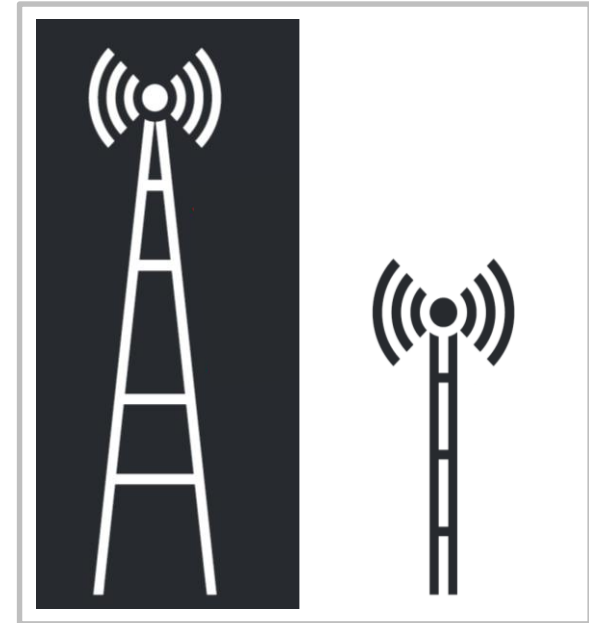


How Innovation Can Drive Rural Connectivity: Innovation in base stations



Innovation in base stations is relatively advanced

- Nearly 14 million base stations have been installed around the world – both macrocells and small cells
- Macrocells are a difficult investment in rural locations
- We need to avoid creating, reinforcing, or exacerbating the digital divide: suitable handsets need to be available for those living within the footprint of a network.





Simplified, light, and modular base stations can be cheaper and less complex to deploy



Photos: Huawei, Ericsson, Kuha.io



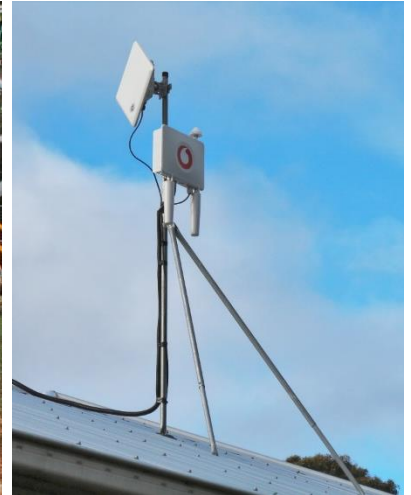
Simplified, light, and modular base stations can be cheaper and less complex to deploy



Photos: Huawei, Ericsson, Kuha.io



Simplified, light, and modular base stations can be cheaper and less complex to deploy



Photos: Huawei, Ericsson, Kuha.io



More radical, wide-area coverage, solutions have the potential to help close the coverage gap



Photo: Altaeros

A large, illuminated, spherical structure made of fiber optic cables, resembling a globe or a large-scale network diagram, set against a dark background. The structure is composed of numerous thin, glowing fibers that form a complex, interconnected web. The fibers are arranged in a way that creates a sense of depth and movement, with some fibers appearing to converge towards the center and others radiating outwards. The overall effect is that of a dynamic, three-dimensional network. The background is dark, which makes the glowing fibers stand out prominently. In the bottom right corner, there is a small, faint watermark that reads "© 2014 GSMA".

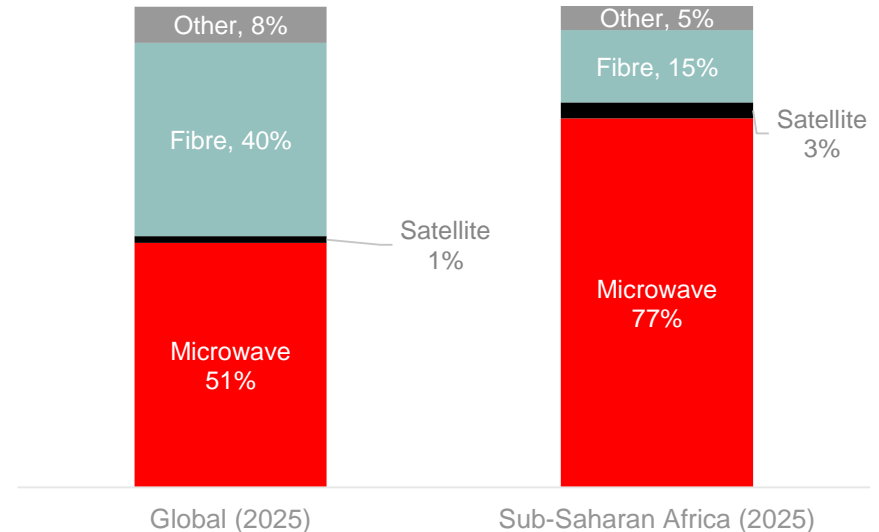
How Innovation Can Drive Rural Connectivity: Innovation in backhaul



Innovation across all backhaul solutions is important for rural mobile internet coverage

- Operators have a wide range of backhaul tools, but only some are feasible in rural areas
- Microwave and satellite dominate, but they remain expensive and complicated to deploy...
- ...But there is significant potential to improve their role and effectiveness for rural connectivity.

Composition of backhaul technologies, by region (2025)



Data: ABI research



The potential for innovation in backhaul technologies is slightly longer-term...



Photo: O3b Networks, Loon



...but microwave still has an important role to play

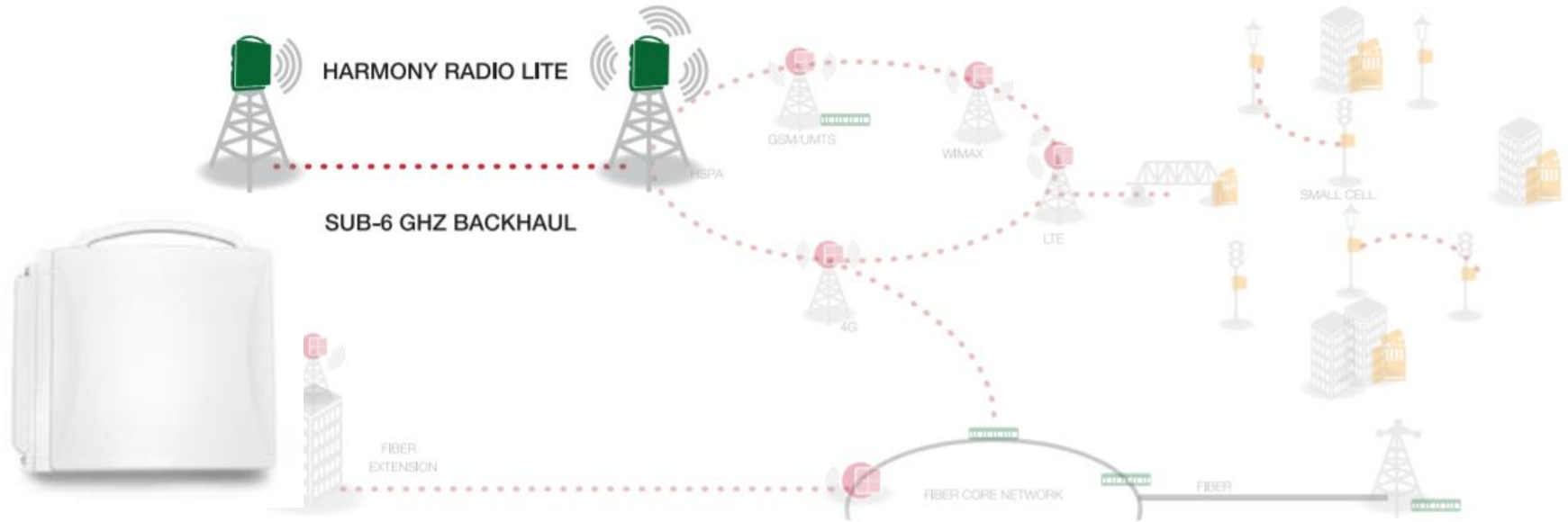


Photo and graphic: DragonWave-X



How Innovation Can Drive Rural Connectivity: Innovation in energy





A reliable, cost-efficient replacement for diesel generators is needed

- Rural sites are often off-grid, with no reliable power supply available
- Diesel generators dominate, however renewable solutions are increasing in prevalence
 - More than 4,000 sites powered by renewable energy operating across the African continent
- Providing reliable, efficient, and cost-effective energy could be transformational.





Fuel cell technology may be an effective solution

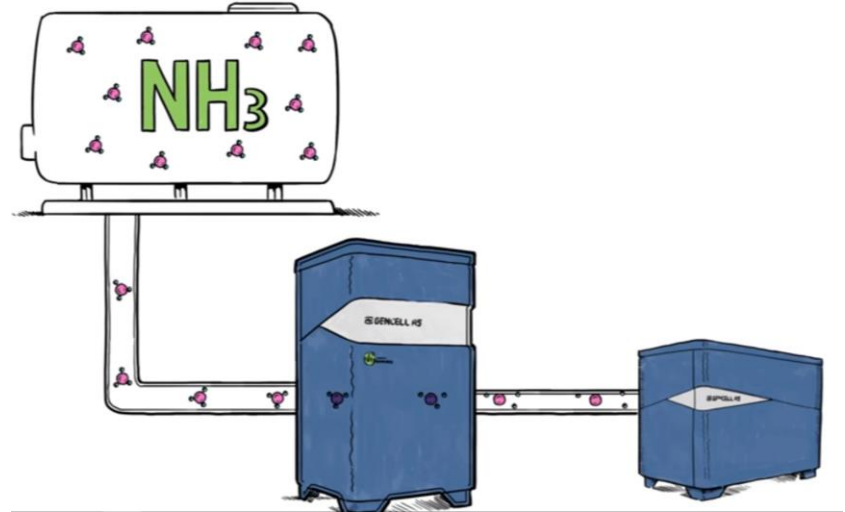


Photo and diagram: GenCell



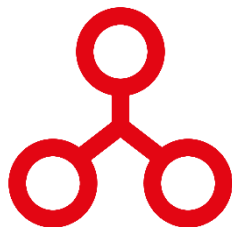
How Innovation Can Drive Rural Connectivity: Innovation in business models



Innovation is also needed in business models



Coverage-as-a-
service
(CapEx)



Coverage-as-a-
service
(revenue sharing)



Community
collaboration
deployment model



Energy and
connectivity
business model



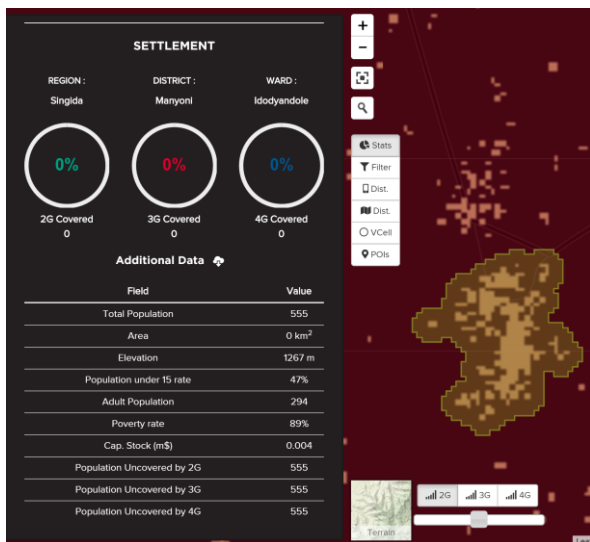
Revenue-sharing and ‘energy and connectivity’ could be particularly relevant approaches

Business models	Commercial Impact	Scalability	Replicability	Overall suitability for rural areas
Coverage as a service (<i>Status quo, CapEx</i>)	High	Medium	Medium	Medium
Coverage as a service (<i>revenue-sharing model</i>)	High	High	Medium	High
Community collaboration deployment model	Low	Low	Medium	Medium
Energy and connectivity business model	High	Medium	High	High

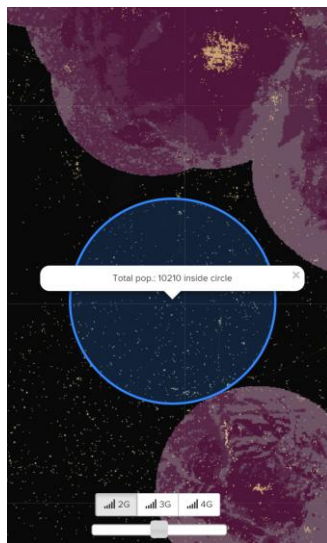


Mobile coverage data can be used to identify sites with economic potential

Find and explore uncovered population settlements with very high granularity



Estimate population for new deployments



- Uncovered areas (white-spots) are not well-known in emerging markets
- GSMA ideally positioned to aggregate and anonymize coverage data
- 2G/3G/4G coverage using radio consistent propagation models across MNOs
- Overlay with accurate population distribution data
- Identifying white-spots and their size in population, operators can better target and increase the ROI of their investments

www.MobileCoverageMaps.com



How Innovation Can Drive Rural Connectivity:
Wrap-up



Wrap-up: one slide summary



Base stations

- **Macrocell solutions are expensive and complex, requiring extensive civil works and maintenance.**
- Innovations that provide lower cost, simplified or modular infrastructure ('light towers') are relatively well developed.
- Wide-area solutions (Altaeros SuperTower, Loon) could be revolutionary, but have not been proven in a commercial setting.



Backhaul

- **Satellite or fibre backhaul can be expensive, whilst microwave can be limited by topology.**
- Innovation potential is longer-term, as current solutions have struggled to deliver rural connectivity in a commercially viable way.
- Next-gen satellites could be the answer, but uncertainty remains. Innovative microwave technology likely to continue to play a role.



Energy

- **Diesel generators are expensive, dirty, and theft-prone – they are OpEx- and CapEx-heavy.**
- Renewable energy solutions, particularly solar, are becoming increasingly common on cell-sites (largely as backup options).
- Cost-efficient and environmentally friendlier fuel cell generators could prove transformative, if suitable supply chains can be established.



Concluding thoughts: innovation is needed to connect the unconnected

- **Innovation can reduce the major cost-drivers that limit or impair mobile internet rollouts**
- Avoid exacerbating the digital divide
- Take a holistic approach to innovation
 - Consider new ways of optimising investment in rural infrastructure
 - Align with wider efforts – in the mobile sector, and elsewhere
- Invest in learning from innovation.



Any questions?

Download the report:

www.gsma.com/mobilefordevelopment/resources/closing-the-coverage-gap-how-innovation-can-drive-rural-connectivity

