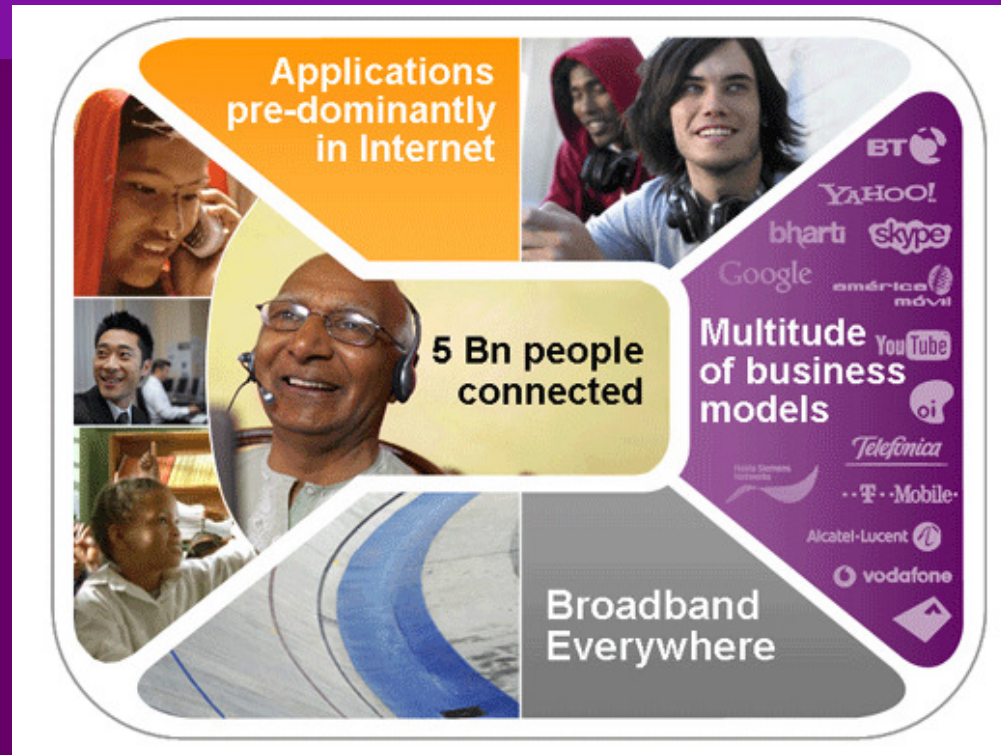


Research and Action Agenda for a National Broadband Initiative - Technological Developments

16th April, 2010
New Delhi

Ajay Ranjan Mishra
Global Head Services Innovations & BD
Nokia Siemens Networks

Our common vision: The world connected in 2015



Universal access to information and communication technologies boosts the economic and social development of nations

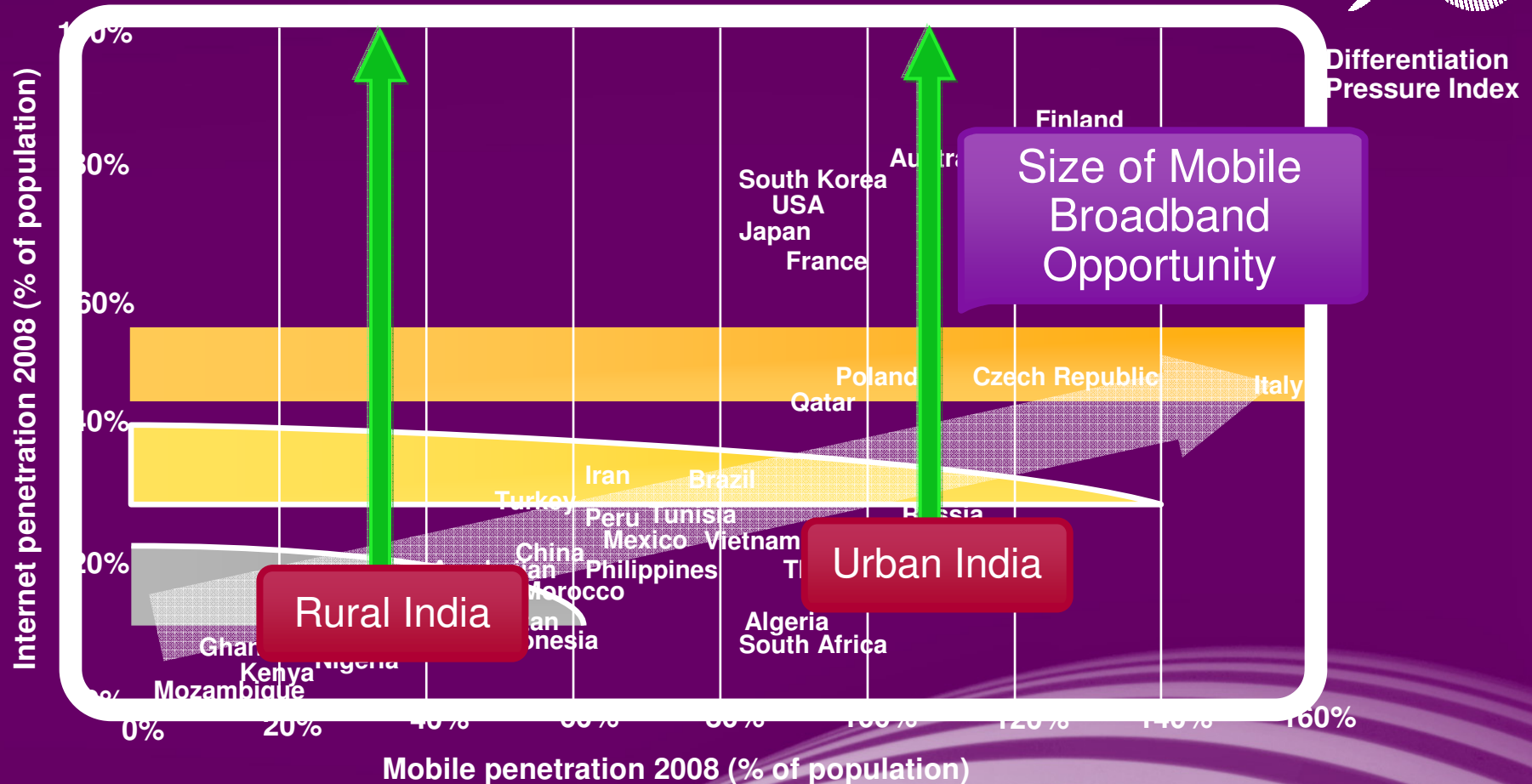
Universal access requires consumer understanding



Source: Marja-Liisa Viherä (adapted)



Market maturity drives operator focus

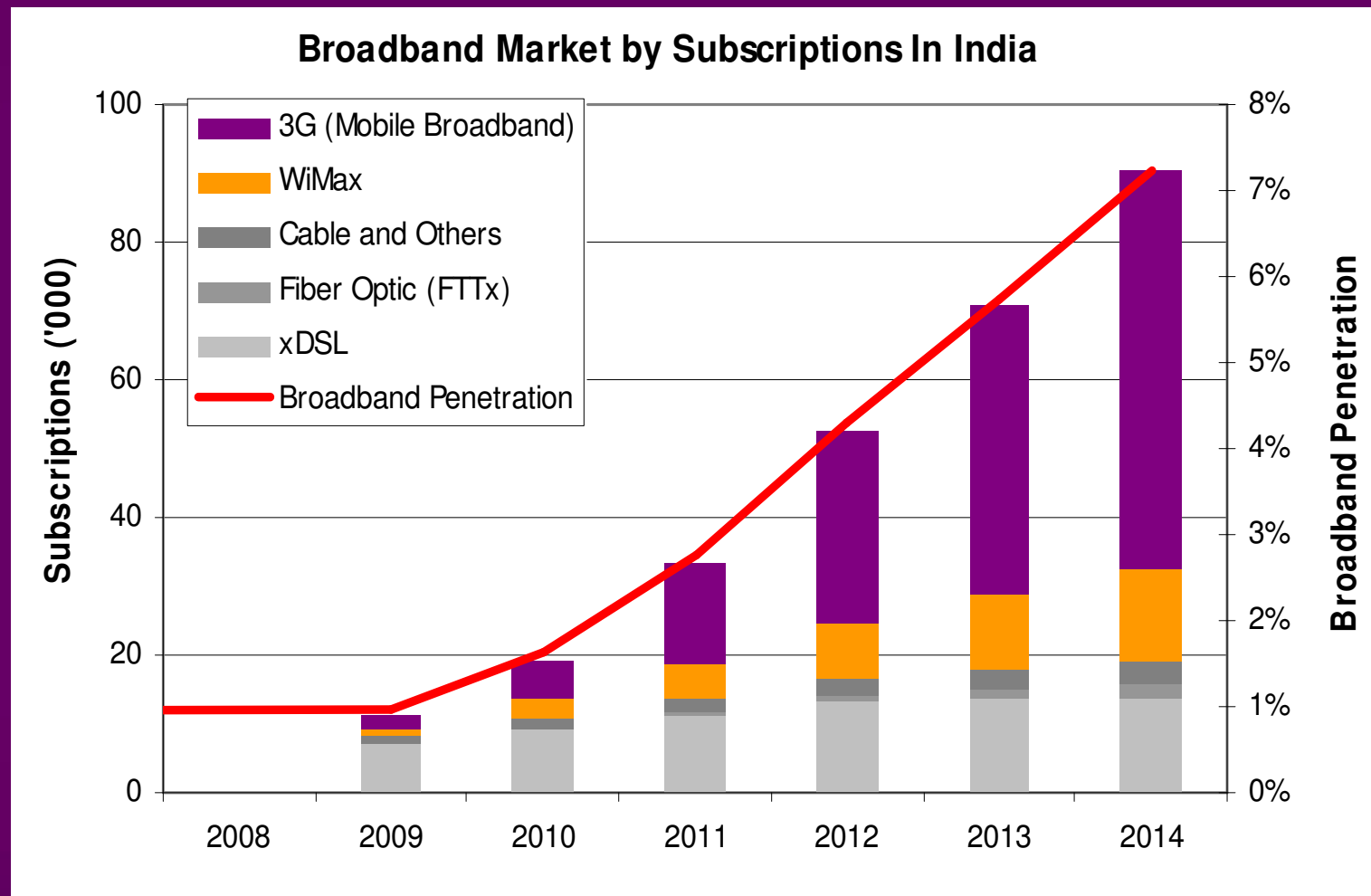


Today's strongest opportunities for growth:

- Voice for rural population

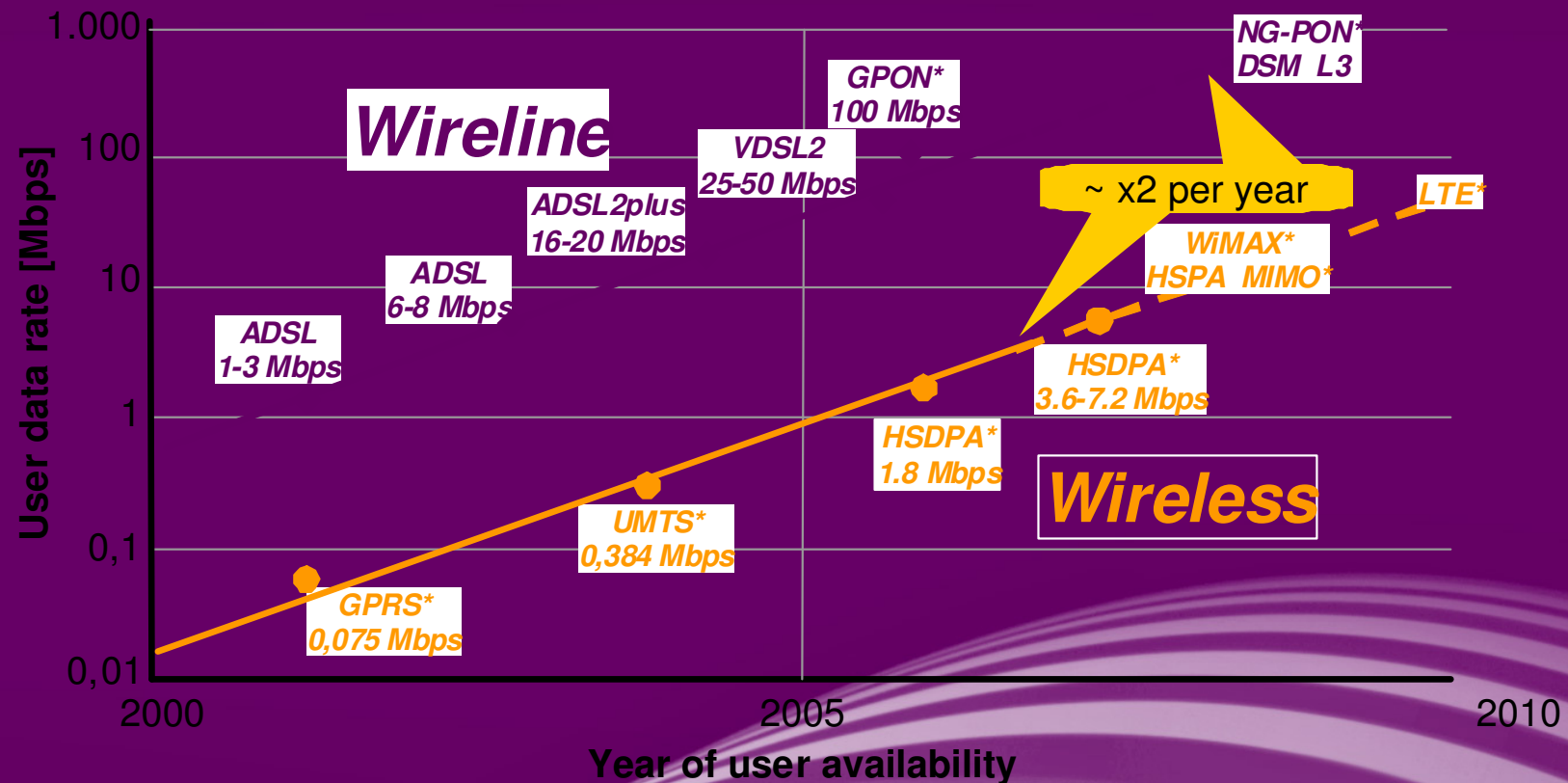
Mobile broadband for urban dwellers

In India as well, Broadband uptake will be driven by wireless



3G/HSPA will drive broadband in India

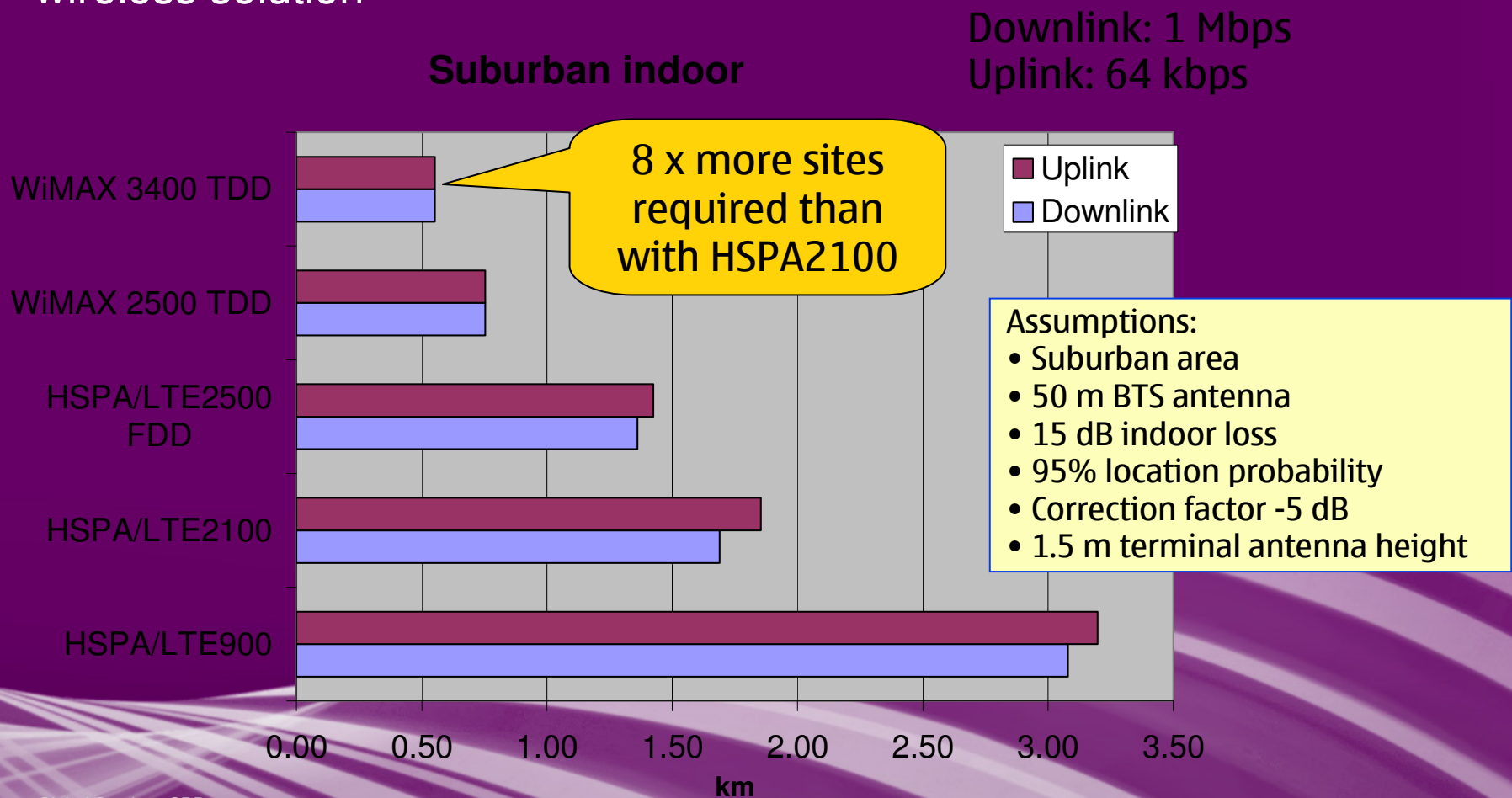
Access CAGR



100% (2x Moore's Law)

Cell Range gets Shorter at Higher Frequency and with TDD

- WiMAX has shorter cell range due to TDD duplexing and higher frequency
- Outdoor fixed antennas can be used to improve the link budget for fixed wireless solution

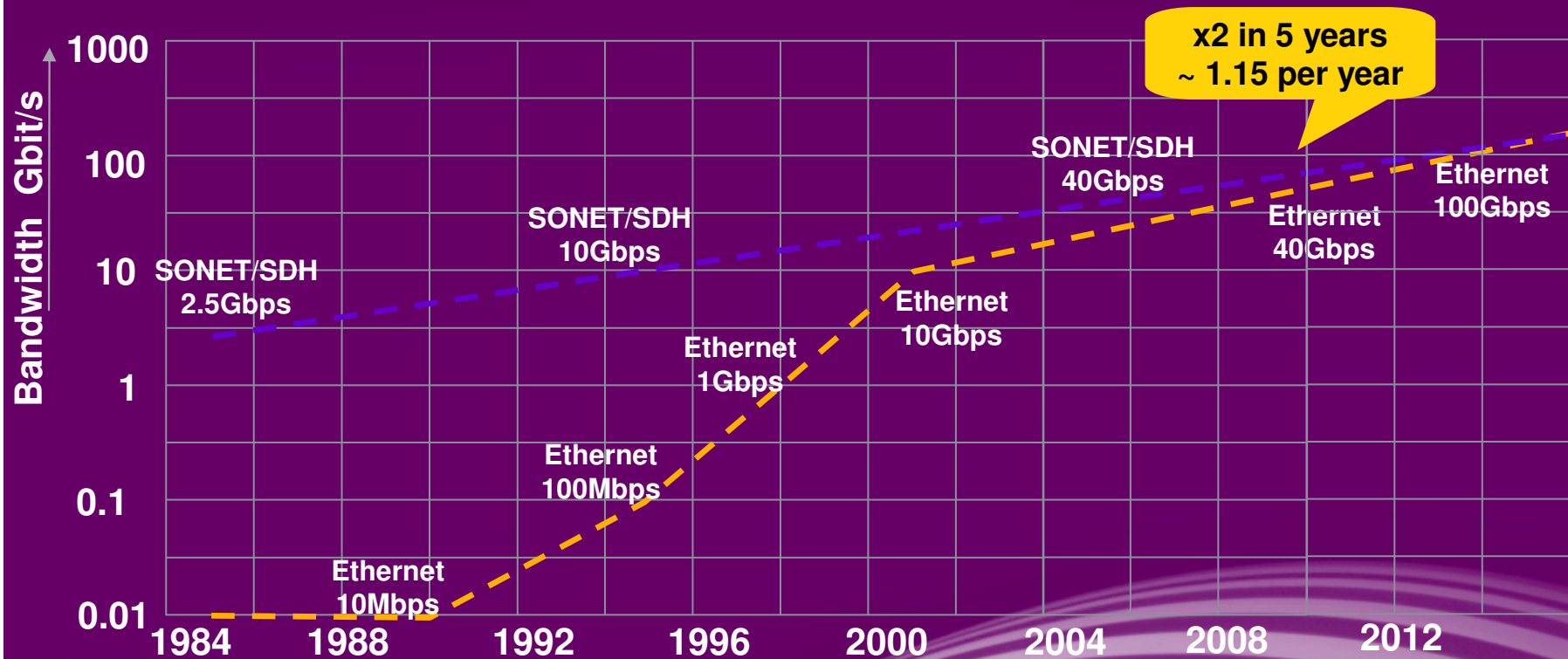


Cost of Broadband deployment in India



- In latest BSNL tender, mobile 3G access network cost per subscriber was depending on area from 110 USD to 120USD.
- Whereas, fixed line cost depends on area much more widely. In dense urban area cost is low, but in suburban and rural area cost will be very high.
- Low frequency gives wider reach in cell radius and lowers initial investments for mobile broadband.
- Government should auction 700Mhz band for rural broadband
- USO = Universal Service Obligation fee like x% of operator revenue can be used for financing rural digital dividend area network build out.

Optical CAGR



< 2008 based on Source: A.R. Inck Analysis

15% ($1/4^{\text{th}}$ Moore's Law)

Summary



Countries missing out on opportunity to add hundreds of billions to their national revenues

Government should auction 700Mhz band for rural broadband

Connectivity increasing but utilisation not

Affordability is the key factor - we need to work on TCO

Key stakeholders need to come together to make this happen.