

# **Reflections on ICT projects in rural areas from the Meraka Institute – South Africa**

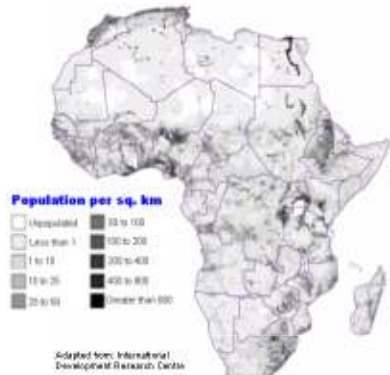
David Johnson

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# Problem space of Africa

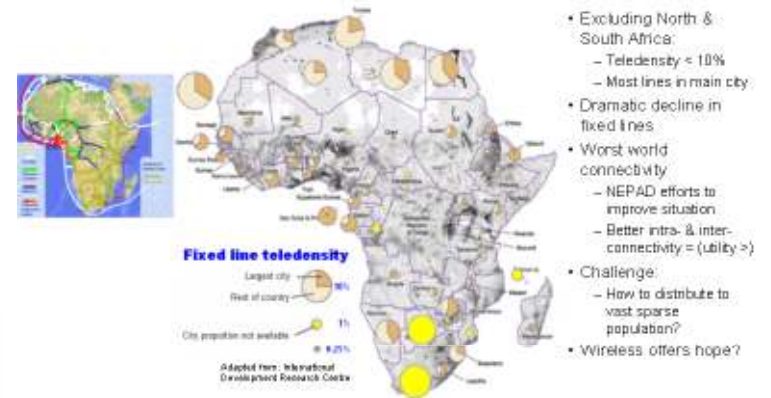
Target: 450M rural unconnected Africans



Electricity distribution

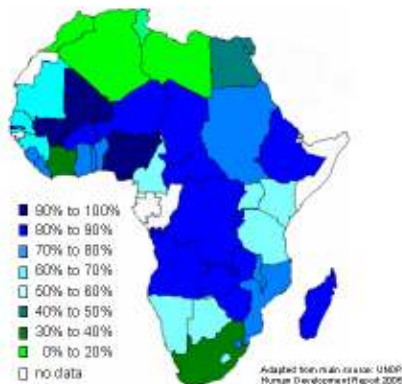


Fixed line teledensity: concentrated in main cities

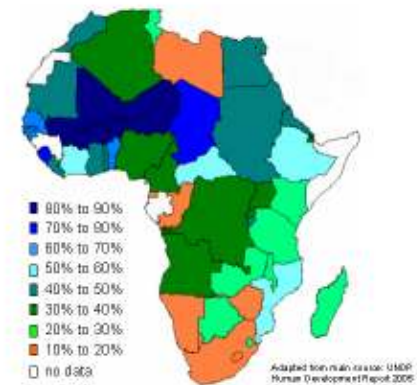


- Excluding North & South Africa:
  - Teledensity < 10%
  - Most lines in main city.
- Dramatic decline in fixed lines
- Worst world connectivity
  - NEPAD efforts to improve situation
  - Better intra- & inter-connectivity = (Utility ->)
- Challenge:
  - How to distribute to vast sparse population?
- Wireless offers hope?

Very high poverty: living on < \$2/day (PPP)



Very high adult illiteracy! Thus, broadband.



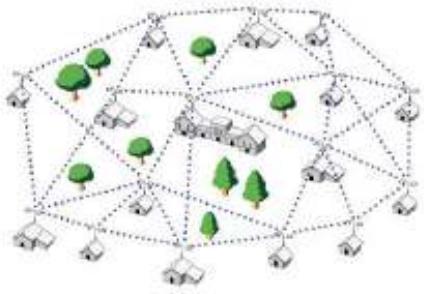
# Community-built philosophy



- Self-help Community Networks
  - Balance De-skilling technology and up-skilling local entrepreneurs (still want local innovation)
  - Local installation, operation, maintenance and support
  - Local innovation, e.g. local “manufacturing” of a can antenna
- Freedom of the airwaves
  - Using un-licensed frequencies
  - Policy in many countries prevents self-provision of infrastructure or charges very high license fees



# Community-built philosophy



- Wireless mesh network technology
  - Auto-configuring and self-healing networks
  - Infrastructure with lower capital investment barriers
  - Lower power consumption and possibility to run technology off renewable energy sources
- (New) business models
  - Models where the revenues are contained within a village, or new revenue flows into the village - local village telco



# Peebles valley mesh network – South Africa

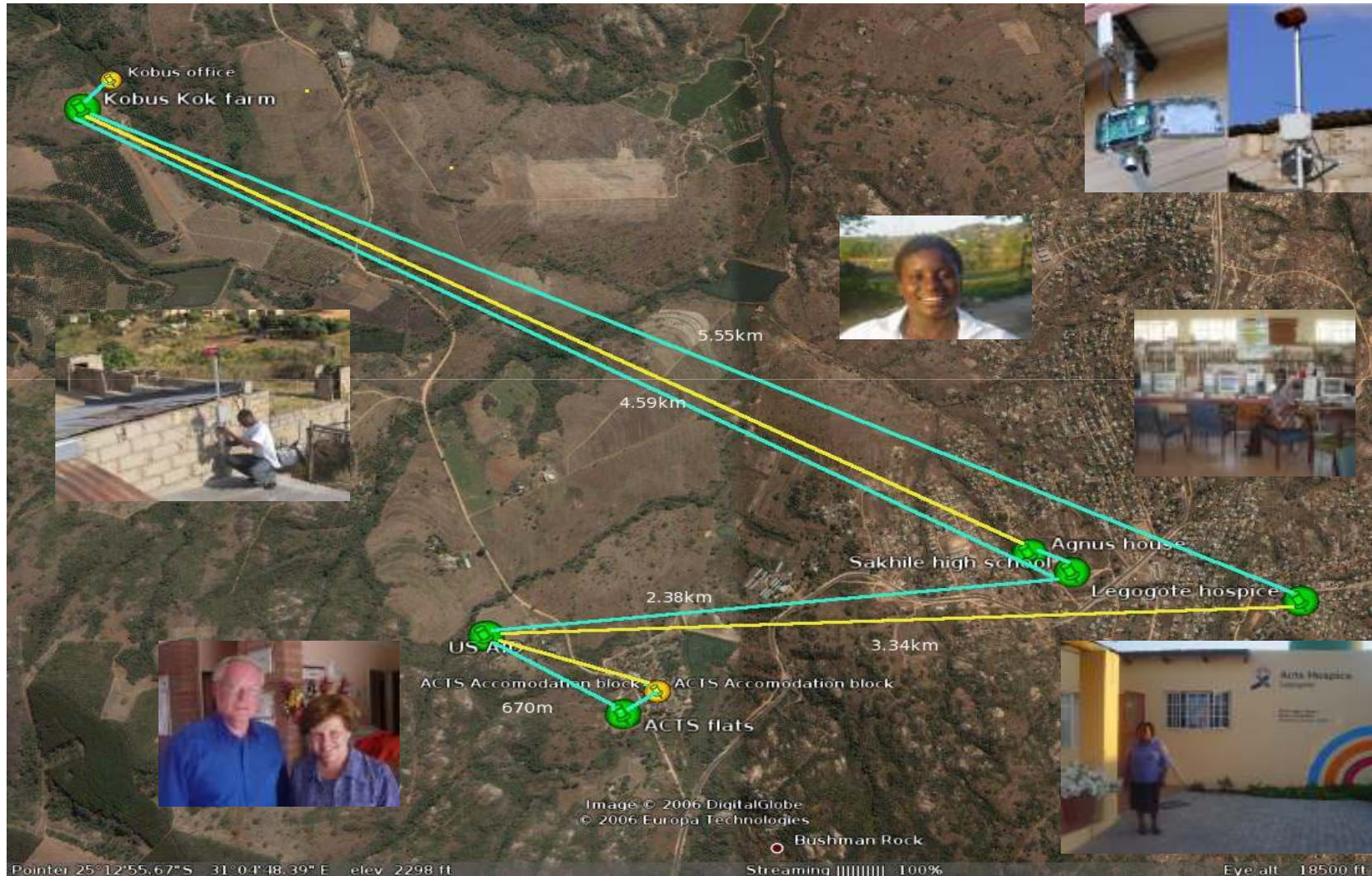


# Peebles valley mesh



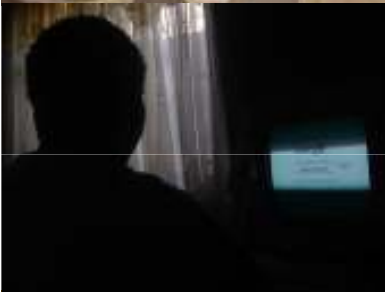
- 15 km from nearest town
- Funded by IDRC to explore rural mesh
- 9 nodes deployed over an area of 15 square kilometres
- Internet - 2GB capped VSAT link – used spare capacity
- VoIP between clinic and hospice to save \$400 per month
- Very limited ICT skill base in the area
- All initial skills to build network came from outside

# Peebles valley mesh connectivity





# Peebles valley mesh-observations



- Instant messaging vital link between skilled and unskilled
- Connectivity helped people to find jobs
- Installing Linux reduced maintenance burden – no viruses
- Users unplug mesh nodes when not used
- VoIP for doctors not used because phone not private
- Connected school computer lab failed
  - lab locked after school hours
  - no local champion.
- Very susceptible to email hoaxes and spam

# Peebles valley mesh - challenges



- Network built and planned by outside skilled specialists
  - hand over to local champion has been challenging
- When locals are skilled they usually move to cities
  - Well-paid jobs
  - Prefer modern lifestyle
- Operating this kind of network can be illegal
  - Often a grey area – policy needs interpretation
  - Businesses are scared of breaking law
- Internet supplied by VSAT is too expensive
  - Rural networks have to be bridged back to cities where Internet is cheaper
- Limited available free bandwidth difficult to manage

# Macha Linknet - Zambia



# Macha Linknet

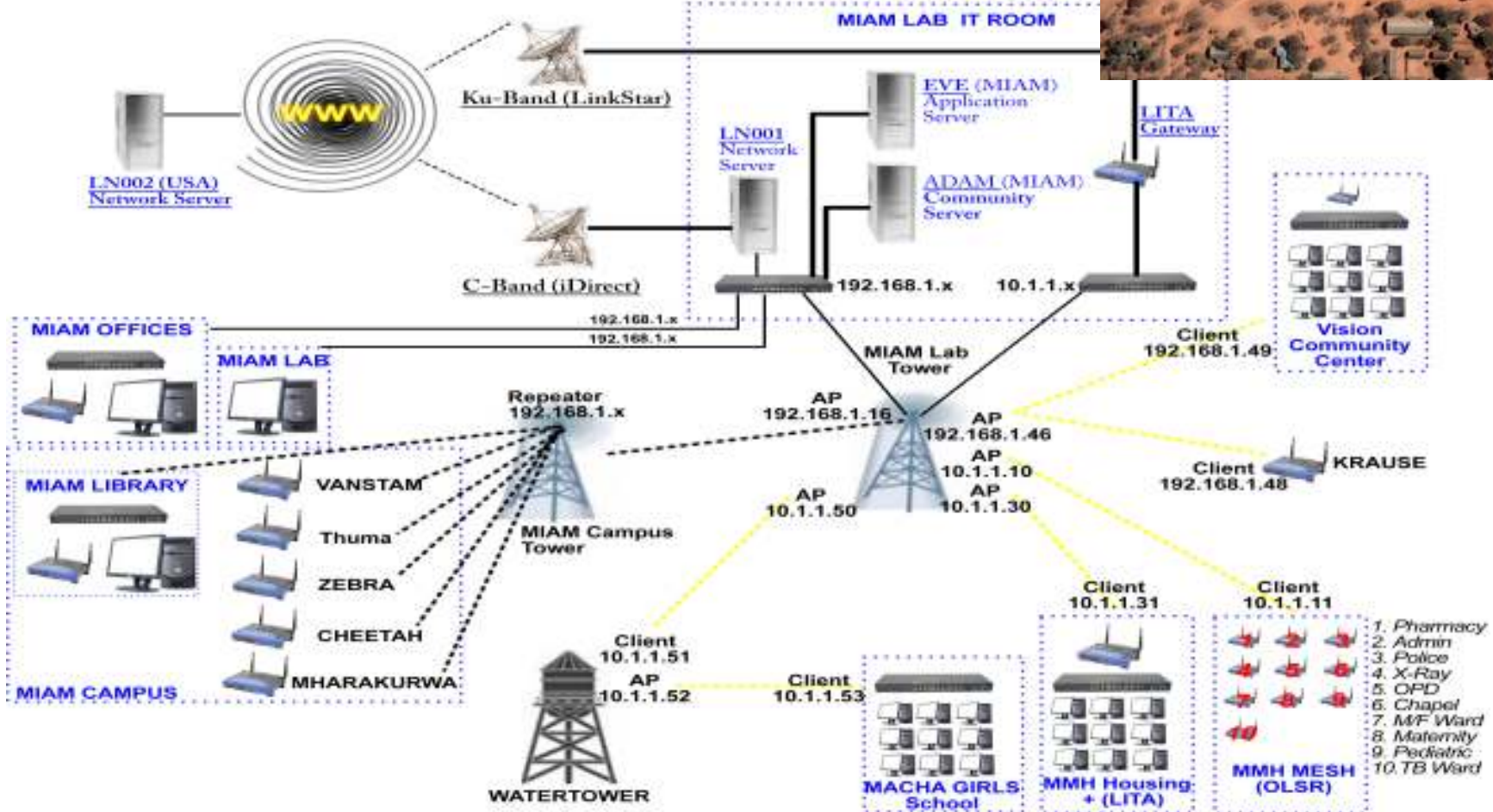


- 75km from nearest town and 350km from Capital city
- Linknet has provided Internet to Macha since 2004
- Cellular Operators saw no market in the area and didn't install a mast until last year – Linknet created market.
- A mesh network was explored as an extension to network after seeing the Peebles mesh project
- Some good ICT skills base has been built but networking skills are limited
- Strong champion exists who is pushing the boundaries of what's achievable in rural areas

# Macha Linknet network



Macha Network Topology  
01/11/07



# Macha Linknet – observations



- Internet has been pre-requisite for development
- Connectivity helped local farmer have cash crop
  - researching sunflower farming on the Internet
- Brought extra employment opportunities
  - Employed by capturing data from 700,000 documents for a USA-based company
- Improved HIV care
  - deployment of online health management systems
- Local champion very active in growing and improving the local ICT services
- Distance learning possible at some Universities
  - Locals can stay in a rural area but still be educated through good distance learning Universities

# Macha Linknet – challenges



- The environment is very harsh on electronic equipment
  - Power supplies fail due to voltage spikes
  - High temperatures and dust shorten the life of sensitive electronics
- Internet bill for Macha is \$1700 per month
- Email spam entering mail server in Macha wastes precious bandwidth
- Managing bandwidth of users difficult
  - there have been some download abuses – problem is solved by confronting people

# Future ideas

- WISP in a box
  - Lower the skill entry level for a local entrepreneur to set up an Internet Cafe or be a gateway provider



# Conclusions for rural connectivity

- Need to find the balance point between de-skilling technology and up-skilling local entrepreneurs.
- A local champion is paramount – getting involved in these sort of projects is going to take caring and dedication.
- Social networking is a great tool for assisting users in rural networks – adopt an African ICT entrepreneur!
- Everything needs to be done to minimize expensive bandwidth usage – install local content like Wikipedia, strip mail overseas, make use of proxies
- Keep lobbying policy makers to allow free infrastructure provisioning especially in areas where operators are scared to tread.

# Questions – rural wireless

- **What is the spark of local innovation**
  - Inward out or Outward in
  - Which has a higher chance of success
- **What degree of freedom is necessary for innovation (Lawrence Lessig)?**
- **Can the economic activity from community built infrastructure in poor/rural areas outgrow that of infrastructure built by large corporations or government**
  - Will this persist or will it always be monopolized
  - How do you continue to keep economic activity local
- **What are the key catalysts to move a society to a knowledge based economy?**
- **Is the mechanical turk principle beneficial in the long term for connected rural areas?**

# Questions – Digital doorway

- **Will the success of non-invasive education be universal**
  - Across which age group?
- **How do children peer learn?**
- **Why the male dominance?**
- **Guided learning vs unguided learning**
  - When is this good/bad?

# Questions – Digital doorway

- **Surprising results in most popular application - how much is peer influence how much is personal choice ... why do users like worm games?**
  - 4479 gnibbles (worms)
  - 3919 xawtv webcam (see themselves on webcam)
  - 3471 gmpayer Fun/Movies/Alien\_Song.mpeg (movie)
  - 2855 tuxmath (maths shooter game)
  - 2345 ktron (worms)
  - 2290 tuxpaint (paint program)
  - 1868 gcompris (education suite)
  - 1843 ktuberling (potato man)
  - 1463 Mindset (school curriculum)

# Web sites with more info

- <http://wirelessafrica.meraka.org.za>
- <http://www.fmfi.org.za>
- <http://linknet.zm>
- <http://www.digitaldoorway.org.za>