Towards Sustainable Broadband Communication in Rural Areas

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Abstract. As part of the development of a general strategy, we present a framework for the establishment of sustainable broadband communication in under-served areas of developing regions often described in terms of low population density, low purchasing power, intermittent power supply, and lack of competent human resources. Due to an increasing political awareness of the importance of ICT for development, not least due to the explosive expansion of the mobile phone networks, such regions are getting more attention also regarding broadband infrastructure. Our research includes experimental validation of a community networking approach based on affordable high-performance, low-effect technologies focusing on pilot projects in Tanzania.

Keywords: Community networks, Broadband Networks, Developing regions, Rural Areas, economics, sustainability.

1 Introduction

There is an increasing awareness of the importance of Information and Communication Technologies (ICT) for development, including both mobile access and broadband communication infrastructures. There are clear indications that this awareness is now affecting mainstream planning of development activities of key institutions. ITU has formulated a broadband vision: “Build broadband networks and everything else will follow”[1]. The 2009 world bank report on Information and Communication for Development observed a correlation between broadband connections and the economy of a region[4].

Although there is no reason to believe that the societies and citizens in developing regions have different communication needs than those in developed regions, the broadband penetration in developing regions, especially Africa, is very poor compared to developed world[2]. There are many reasons for this: first, the often under-developed policies and regulatory frameworks create political risks adding to the commercial risks. Second, there is a lack of supporting infrastructures, such as optical fibre networks, electrical power and developed supply chains. Third, the traditional business models used by most network operators and service providers lead to high perceived commercial risks.

There is a misconception that communication networks and services will be provided by commercial markets, if only there is a demand. This may be true
in densely populated areas of developed regions. It is, however, definitely not true in developing regions nor in sparsely populated areas of developed regions. We argue that for developing regions to catch up, public investments have to be used as drivers. Although most national budgets are strained, there is currently the opportunity to take advantage of the commitment of the developed world to support efforts leading to the Millennium Development Goals (MDG) [3].

To achieve this, we propose the creation of self-sustained local area broadband islands serving local communication needs, even if there are currently no, or only narrowband, external connections due to the unavailability or too high price of uplinks. This kind of networks are easy to build and increasingly found in many under-served areas. We use the term “local” and “community” networks interchangeably to refer to district or municipal networks. Also, broadband in this paper is referring to high speed connectivity within the local network, not necessarily the uplink.

We demonstrate, in a case study, that financial and operational sustainability can be achieved for communication networks in rural and remote areas, given that a proper environment exist. Our methodology is based on both own and related academic and professional work as well as the evaluation of implementations specific to a project in Tanzania.

The organization of the rest of the paper is as follows. Section 2 highlights related work in this area. In Section 3, we discuss the framework required to create a sustainable broadband networks in under-served areas. Section 4 is a presentation of how we applied the framework into a running project in Tanzania. A summary and conclusions is provided in Section 5.

2 Related Work

We have found no previously published work taking a holistic approach that is similar to ours. Previous studies address specific issues, relating to either technology [11,15], application [13] or environmental challenges [12] in under-served areas. We will discuss two references that closely relate to our work.

Gillett et al. [14] observed that certain geographical areas and populations lag behind others in terms of Internet access. The author noted that municipals can contribute in different roles to accelerate broadband in such areas, such as a broadband user creating a demand, as policy-maker defining the rules, financial supporter and infrastructure developer. In our experience, due to the fact that most municipals in developing countries rely completely on the central government for their budget and policies, we believe that municipals in these areas can facilitate broadband mainly by being consumers of broadband services in their own work procedures and as fall-back producers of broadband services in a utility branch as long as there is no or little commercial interest to provide such services.

Munir et. el. [5] proposed three steps to follow when deploying a Municipal Wireless Networks: step 1: identifying goals, stakeholders and governing policy; Step 2: designing the infrastructure and securing funding; and step 3: actual