Grant agreement no. 243964

QWeCI

Quantifying Weather and Climate Impacts on Health in Developing Countries

D5.4.e – Report on implementation of real-time data logging system for disease incidence monitoring

Start date of project: 1st February 2010 Duration: 42 months

Lead contractor:	ICTP
Coordinator of deliverable:	UNIMA
Evolution of deliverable	
Due date :	M18
Date of first draft :	M20
Start of review :	M20
Deliverable accepted :	M20

Project co-funded by the European Commission within the Seventh Framework Programme (2007-2013)		
Dissemination Level		
PU	Public	
PP	Restricted to other programme participants (including the Commission Services)	PP
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

D5.4e) Report on implementation of real-time data logging system for disease incidence monitoring

1. Introduction

This report aims to outline the plans and their implementation concerning the wireless link to remote clinics in southern Malawi in order to assess the potential of the technology to aid real-time health data collection and disseminate forecast information, as per the DOW of QWeCI.

2. Health information collection in Malawi

As discussed in D6.2c report, a considerable effort to understand the existing methodology to monitor disease incidence in Malawi was made, as well as make contacts with the relevant stakeholders in order to ensure that the pilot study work contributed to the overall strategic health plan of the Malawi government. These efforts are reported elsewhere (e.g. D6.2c), but to place the WIFI work into context an overview is repeated here. The main stakeholders that were contacted and are involved in the project are

- The Ministry of Health (MoH)
- The national malaria control programme (sub-programme of the MoH)
- BAOBAB (an NGO that assists the MoH in health database work in southern Malawi)
- The national meteorological agency

The present method of data logging involves local clinics compiling daily paper reports which are then collated to monthly data at a regional level. This medical information is summarised and forwarded to the Ministry of Health. This traditional way of collecting data has proven drawbacks, as it takes a significant amount of time for the decision makers to be aware of the current trends in disease incidence, especially in remote locations. Apart from submitting invalidated data, some information can be lost as paper reports are lost enroute to the collection facility. Consequently, a number of projects and institutes have been established that assist the government in collecting data through the use of computer networks. Key players in this field are BAOBAB and Health Information Systems Program (HISP – runs under the Ministry of Health). BAOBAB collects patient level data while HISP collects more comprehensive data of a health facility ranging from drug stock to number of cases of particular disease.

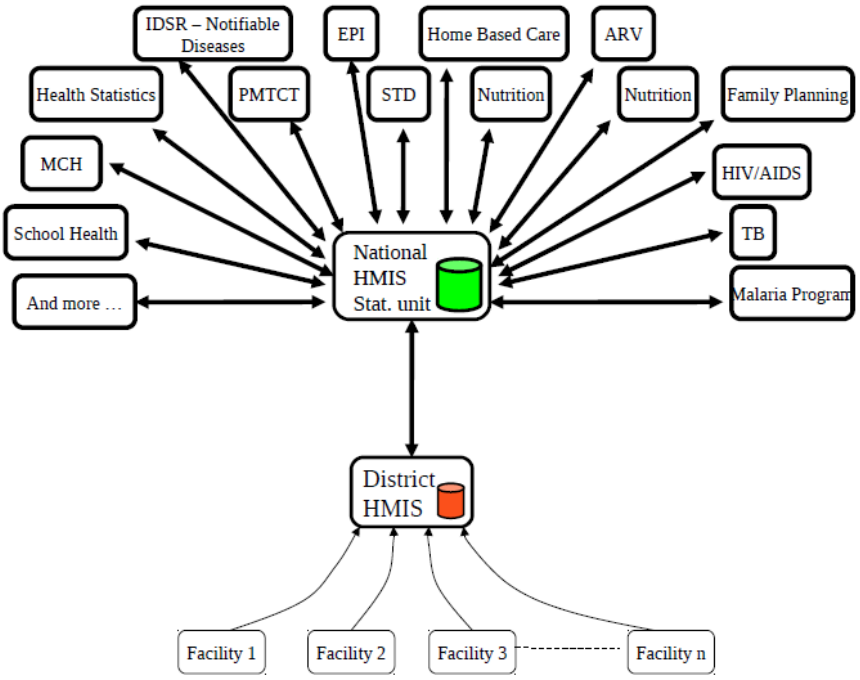


Figure 1 Figure 1: HISP Model of integration of Health Management Information System – moving away from paper based system

3. *The Malawi WIFI backbone*

The WiFi backbone was deployed from Blantyre to Mangochi through Mpingwe and Zomba, covering about 162km as outlined in the QWeCI DoW. The main objective of this QWeCI project component was to assess the potential of this long distance wireless technology for disease monitoring and forecast dissemination to rural clinics. The original link was installed prior to the QWeCI start, but due lack of maintenance was not operational at the outset of the QWeCI project.

Left: the long link layout

Right: ICTP and UNIMA teams Restoring the link November 2010

in

4. *Groundwork required*

i. Backbone restoration to Mangochi – November 2010

As the link was not operational, the first major task of QWeCI partners ICTP and UNIMA was to bring the link back online (photographs right show work in progress). The installations and upgrades to restore the link for this purpose were conducted by the ICTP/UNIMA technical team in November 2010 over a two week period. In addition, the team further assisted in building the technical capacity of network engineers at Malawi Polytechnic and College of Medicine (COM), who are now in charge of maintenance works.

ii. Site survey for clinics

Prior to the November 2010 visit, a number of rural clinics in Mangochi district that could be potentially linked to the wireless network were identified by the Malawi team. These were finally introduced to the members from ICTP and University of Liverpool during the in November 2010, and a list of priority was drawn up to connect these facilities according to a number of factors. These included:

a) Line of sight to main communications tower for feasibility of connection

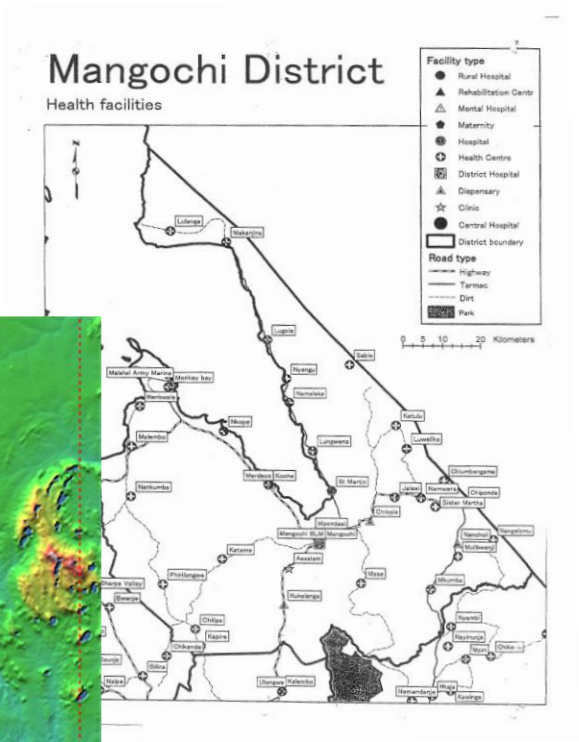
b) Reliability of local power supply

c) Size and operational status of the facility

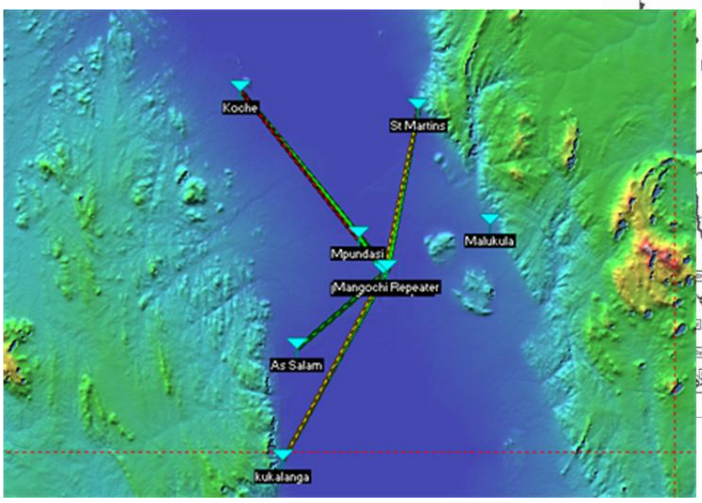
d) Demonstrated interest by the clinic's directors to participate in the pilot scheme

During the visits it became clear that the availability of a concise brochure explaining the aims of the QWeCI project would have facilitated the introduction of the project. In addition, some regional facilities were visited without appointment, while this was nevertheless successful, would have benefitted from improved planning and dialog prior to the ICTP/UNILIV visit taking place.

Right: MoH maps marking governmental, NGO and CHAM clinic facilities in Mangochi province.



Below: Line of sight calculations for suitability of Wireless connections for priority clinics



iii. Connection of clinics

After the November visit, efforts were made to continue the work to connect the local clinics. This was hindered by two factors, both technical and political. In the period from January 2011, the economic and political situation in Malawi, encompassing severe fuel shortages and wide-spread and often violent demonstrations which even involved the UNIMA campus itself, severely restricted movement of UNIMA staff! It should be noted that the QWeCI proposal did envisage the potential for such disturbances in the QWeCI proposal and DoW (see last item in table in section 1.3.4, *risks and contingency management*, although the risk was deemed low since all three pilot countries had had low levels of incidences of violent demonstration prior to the project submission.

In addition, ongoing technical problems with interference on the backbone also slowed progress, which were eventually resolved by the UNIMA staff working with the ICTP team remotely.

Despite these above concerns delaying the initial progress, the UNIMA team were able to establish the link connects two health centres in the district of Mangochi;

a. Mangochi Hospital

b. St Martin's Hospital

Other rural clinics are expected to be connected as well in due course.

It should be highlighted that the successful completion of this part of the project implies that the local clinic of St Martin's now also has access to broadband internet, revolutionizing the information access, and also increasing communication options with district and central health facilities. To this end, VoIP phone with video options are being configured for installations at the rural clinics. This added service will further bridge the communication gap that exists between the health facilities in Malawi. Through this medical specialists will easily interact and consult with more experienced doctors when need arise.

iv. Monitoring of service

Furthermore to assist the technical team in monitoring the status of the WiFi link, an online management service has been set up (see Fig.2). However, this service uses a public IP address that is also shared with other services at UNIMA-COM; as such this reduces the reliability of the engineers to track the health of the link, and so far it does not include the capacity to monitor the final link stage to the local clinics themselves. Therefore, better techniques to combat this challenge are being examined. Nevertheless, independent monitoring of the St Martin's link (the remote clinic of the two) shows reliability to be high.

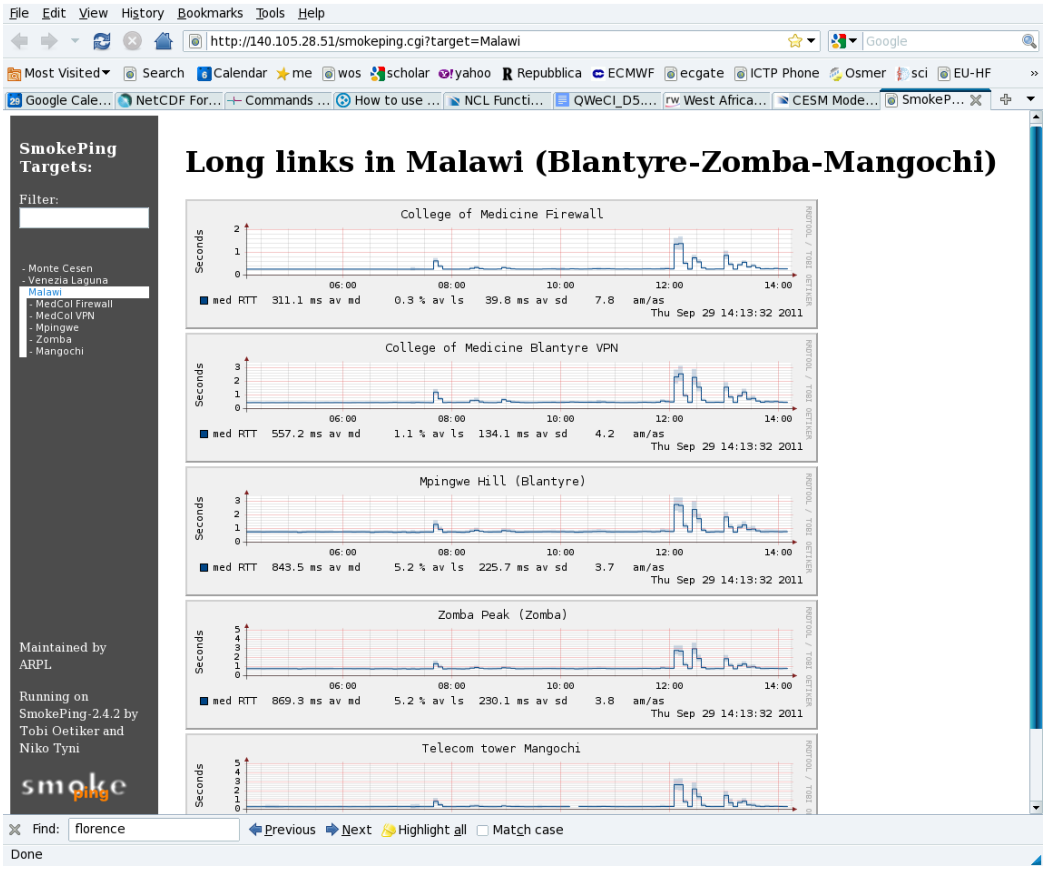


Figure 2: Example monitoring tool for the different stages of the long link from Blantyre to Mangochi

v. Data logging on DHIS2

Through the recommendations made by the Ministry of Health, QWeCI established collaborative relations with Health Information Systems Program (HISP), which is one of the key players that assist the Ministry in collecting data as earlier mentioned. This move was arrived at to avoid replication of efforts. As a result, it was further agreed to connect the QWeCI Wi-Fi system to the HISP national database which is directly linked to the Ministry of Health. The system uses a web based application called District Health Information System (DHIS2) developed in Norway at Oslo University. The package is broad and comprehensively collects every data from health facilities that can assist in decision making of the Ministry's departments. This data can then be viewed, downloaded and analysed from anywhere in the world through the use of internet.

Currently, several health facilities across the country including St Martin's and Mangochi Hospitals are connected to the data bank. Through this, the QWeCI team will have the privilege of downloading diseases trends for further analyses.

On the other hand the HISP team will benefit in collecting data from remote facilities through the initiative done by QWeCI through the use of WiFi technology, as it is still a challenge for the team to reach out to far away clinics.

vi. Training in service

Plans are already in place with the MoH for local training regarding computer use and use of DHIS2 in order to address the sustainability of system.

5. Technical difficulties and concerns

Despite the advantages of digital techniques for easy dissemination of Malaria cases with the use of WiFi technology, the installed infrastructure requires a strict maintenance plan especially after the end of QWeCI project in 2013. Accordingly, some proposals have been put forward concerning ways of sustaining local links through service sharing arrangements with other organizations, as the wireless bandwidth is adequate enough for multiplexing with other traffic. To this end, care has to be taken not to undertake actions that may be deemed to be commercial, since the backbone link relies on the support of the telecommunications industry in Malawi who permit the hosting of the equipment on their towers as part of a not-for-profit facility for the government health. Any actions taken seen as competing with potential customers of the telecommunications industry could jeopardize the link.

As of now a discussion with BAOBAB was done to assist it in transmitting their patient data to their database. Apart from this, much ground work has been done with UNAVCO, a research institute [http://www.unavco.org/] that owns a GPS seismic station in Zomba, [http://facility.unavco.org/data/gnss/mon_search.php?pview=original&parent_link=Monument&con_equ=1&mcode=zomb&country_num=&state_num=&action=&action=View+Results] to carry geosciences related data which all along has been a challenge for the institute to remotely capture for their studies.

6. Summary

In summary, despite technical and political problems impeding initial progress, the pilot project in Malawi concerning the Wireless infrastructure has proceeded well. The following steps have been concluded successfully:

- The backbone connection from Blantyre-Zomba-Mangochi has been restored
- A local site survey for local clinics has been conducted
- The top priority local clinics have been connected to the wireless backbone
- The clinic has been connected to the new DHIS2 health system logging facility and can thus already log their disease incidence to the central database in Blantyre/Lilongwe in near real time.

The next steps will include the connection of the next priority level clinics where possible, and improving the technology required to monitor link reliability. In the meantime, the potential help of forecast products developed in QWeCI to local clinic directors will be investigated – this aspect is reported elsewhere in deliverable 5.4c and d.