

The Critical Role of Geospatial Information in climate change adaption planning in the Mulanje Massif

I first visited Malawi in November 2005. The UN had declared many districts emergency relief zones. There were long queues at the feeding stations. Many were starving. The previous Spring had witnessed the worst rains for decades and the maize harvest had failed. Malawians rely on rain-fed water to survive. Poor rains had led to this catastrophe.



Malawi has been lucky in the last 3 years. The rains have come and the maize has grown. A warming climate will change that. Higher temperatures and less rainfall will impact water flow down the Shire river, affecting the water intakes that Blantyre relies on. Even now the city can go for days without water. The future is not looking good. Water scarcity will increase. Blantyre has to find alternative water supplies. It has its own reservoir but no water has come from it for a long time. Silt has blocked up

the reservoir filters. Deforestation, a warming climate and unpredictable rain patterns paint a difficult future for Malawi.

Lack of geospatial information makes it difficult to plan effectively though. By Geospatial Information I mean anything that can be connected by geographic location. Topographic maps are an obvious example. In the UK our maps are continually updated. This benefits the economy by £100 billion per year. All professionals involved in planning and maintenance rely on these map. However its benefits are spread much wider. The integration of GPS technology with maps has given us car navigation systems.

Google maps shows us the location of the nearest ATM or Italian restaurant. Map based rail and road networks tell us how long it takes us to get between destinations. Mobile phones, broadband technology and wireless free systems make information easy to access anywhere in the UK. We take it for granted. Its become a normal way of life. It makes living easier.

In contrast take a look at one of the web based maps for Malawi. To say the information is sporadic is a huge understatement. A few major roads, international boundaries, major towns, some villagers, not much else. Many of Malawis maps are 45 years old. The population has increased by 9 million since then. How can you carry out proper planning if you don't know where the people area?



Geographic Information Systems allows us to analyse trends from current and historic map information and associated metadata to create new information that would otherwise be missed. For example the Forestry Commission have factored in climate change predictions to assess the affect of existing forestry in Scotland - eg increased forest fires, drought stress, increased prevalence of pests and diseases, and have developed recommendations about species suitability and growth potential. All the major challenges faced in the world today like climate change have a critical geospatial properties. Because the Geospatial Information is sporadic, out of date and unreliable in Malawi we cannot do this effectively.

We do know the climate is going to change but how will it impact on the population at a local level? Lets take a look at the Mulanje Massif as an example. Its a granitic outcrop 50 km south-west of Blantyre, 650 square kilometres in area, towering 2000 plus metres above the surrounding plains. It rains on the top more than the west of Scotland, up to 3m in places each year.

During the rainy season the water pours down the sides, causing flooding in the lower lying areas. Over 1 million people in the surrounding plains rely on its water for drinking. They are supplied by a network of pipes connected to a series of intakes positioned up the side of the Massif. Gravity supplies water to villages up to 60km away

To better plan adaption strategies and to maximise the Massif's water resources we need reliable Geospatial Information. What do we have just now? Some of the rivers have stations to measure flow rate. This is vital to determine seasonal and annual variability, to see the affects of climate change. Unfortunately no data has been collected since 1999. We have 45 year old small scale topographic maps, geological maps and some bio-diversity maps. There is little else.

What information do we need? Pipe metadata - precise position and heights of the gravity fed intakes and seasonal flow rate into them. We need to know the location of the pipe network. Back in 2005 Oxfam were rehabilitating the network in the Mulanje area. The pipes had silted up due to low water flow and the villagers had no fresh water. Considerable time was spent finding the pipes so they could be cleaned out. Reliable and current GI would have enabled them to plan contingencies and prevent that from happening. We need weather stations scattered throughout the plateau together with river monitoring stations on the plateau, at the base and the gravity fed intakes.

We need detailed and current large scale topographic maps. These should form the base mapping for the GIS. Other geospatial information can then be incorporated and we can plan adaption strategies. The topography at the plateau level is perfect for small reservoirs. In Scotland we use our hills to great effect, gathering water for drinking and for Hydro Electric Power. Could we do the same with the Massif?



Scottish professionals can help Malawi in its water resource management. We can use our skills in satellite technologies for instance to gather geospatial information rapidly and cost effectively. Our universities have many experts in climate modelling and water resource management. SEPA use remote measuring technologies for their flood water monitoring system. Solar panels charge the batteries at the stations. Data is transmitted automatically to their HQ in Perth. Computer softwares



allow detailed analysis. Our skills, combined with current and reliable Geospatial Information will help maximise the Massif's considerable water resource potential.

We could examine a possible gravity fed pipe to Blantyre for instance and assess the potential of a series of reservoirs filled up during the wet season; examine systems to ensure sustainable water flow to the gravity fed intakes; maybe a flood management system along the Ruo rivers just like we have on the Tay.

Water is Life in Malawi. Back in 2005 relief agencies were in full flow with their emergency food supplies. The District Water engineer in Mulanje pointed to the top of the Massif and said to me he couldn't understand why reservoirs couldn't be built up there. It would solve so many problems. He pleaded with me to help. I promised I would try. **The IDF needs to re-prioritise water as a matter of urgency so that Scotland can help Malawi better adapt to climate change.**

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