OSHW and FOSS4G for an online water valet

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Abstract

Malwatu Oya basin in Northwestern Sri Lanka is subject to intense rainfall. Cascade systems of reservoirs, being interconnected are less informed about actual incoming run-off, especially with high intensity rainfall is hitting various part of the watershed.
A first step to support the water management effort of the irrigation department is to intensify the raingauge network, and increase the temporal reporting frequency. A combination of Open Source Hardware (OSHW) and Free & Open Source Software (FOSS) is being used to created a royalty-free, cheap raingauge design, with full control of on-board data collection and statistics. An online connection is then established.
A second step is to bridge the actual reservoir management tools and hydrological tools used to incorporate real time raingauge information as customized on-board the instruments. Some calibration/validation work will be needed to absorb the higher intensity information and its real time update/rerun.
This research explores the means used so far and the challenges ahead, whether on the OSHW, FOSS, FOSS4G, scientific modeling and the human part in making this Open Source vertical integration possible.

GDAL/OGR, Python, QGIS, GRASS GIS, Arduino

Arduino Weather Stations

An Arduino OSHW weather sensors shield (`www.sparkfun.com/products/12081`) is being investigated to provide very low cost, tailored solution to spatially distributed, high-temporal weather information.

The actual evaluation prototype is under finalization, with 1 year storage of 21 weather parameters and statistics at 5 minutes interval. Two rain gauges are tested, including a higher accuracy one, because of the critical need of rainfall knowledge in decision-making in Sri Lanka.

Figure 3: Weather sensors

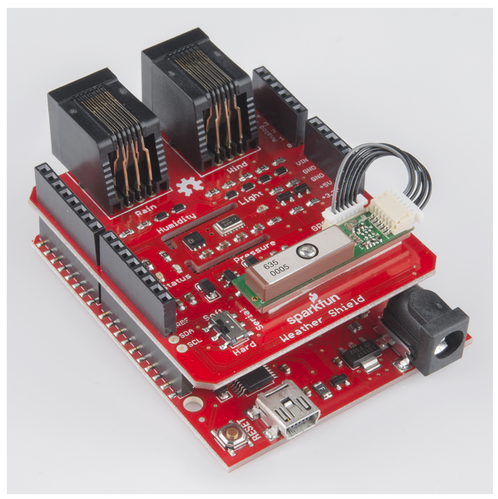

Figure 2: Arduino weather station

Irrigation Department in Malwatu Oya

The irrigation department in upper reaches of Malwatu Oya is in need of more regular and distributed rainfall information. We have installed two prototype Arduino weather stations within their custody, and are going to set up 3 more in the coming months.

Further investigations are starting for the use of a GSM connection, permitting to upload directly to a WebGIS, connected to a hydrological model for cumulative re-analysis of conditions in Malwatu Oya river basin, providing improved calibration/validation procedures in spatial and temporal dimensions. Hydrological modeling will be more robust, and timely to enhance decision-making on water storage management and risk alleviation.

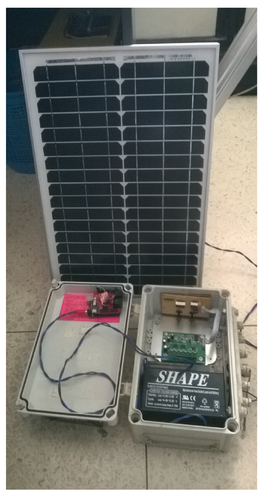

Figure 4: Arduino weather test station in Irrigation field office

References

[1] Pearce, 2013. Physics Today, 66(11):8-9
[2] Neteler & Bowman & Landa & Metz, 2012. Environment & Modeling Software, 31:124-130
[3] Chemin, 2012. Chapter 19, DOI: 10.5772/23571 (`http://bit.ly/16qJOep`)

`www.iwmi.org` `www.mrt.ac.lk/tcp/osgeosl.html`

Lanka Rainwater Harvesting Forum

The Lanka Rainwater Harvesting Forum is in need of assessing rainwater harvesting wells recharge. We are building 10 prototype Arduino weather stations within their Institution, with a WMO certified raingauge from Davis.

LRWHF will place 10 weather stations systems in selected schools where demonstration rain water harvesting system are been constructed in the drought prone areas. The district selected for placing the weather station are Kilinochchi, Mullativu, Ampara, Moneragala, Budulla, Vavuniya and Mannar. The schools where they are placed will join in monitoring the weather data, they will also maintain the stations and report and breakages and repairs to LRWHF.

Figure 5: Rainwater harvesting in Mannar

An online water valet

On the 11th November 2014, a Stakeholder meeting for developing a national innovative project (NIP) on *establishing a national climate observatory system* for Sri Lanka. It was agreed that Sri Lanka requires urgently a reliable national system for monitoring the planetary boundaries with a strong bias on networking and information sharing.
Climate observation in Sri Lanka, as in many countries, is in a heterogeneous state. Quality, geography, temporality, sensors and reporting all have multiple systems and standards. At the same time climate data are not publicly accessible. This project aims to make climate observation more uniform and the data publicly available within the constraints of cost, by employing local technology. The data collected will be reported to an online public system where decision makers, practitioners, researchers, students and even farmers can interact with the data, either manually, or using software tools and decision-support systems (models).
The Innovations:

1. Low cost open source customizable hardware
2. High temporal reporting (with a target of every 5 minutes, but can be slowed down to 30 minutes if required)
3. Meteorological sensors which can be customized on demand
4. Unified public online reporting system
5. *Plug and Play* mobile weather stations which are *self-aware* and can automatically record date, time, latitude, longitude and altitude

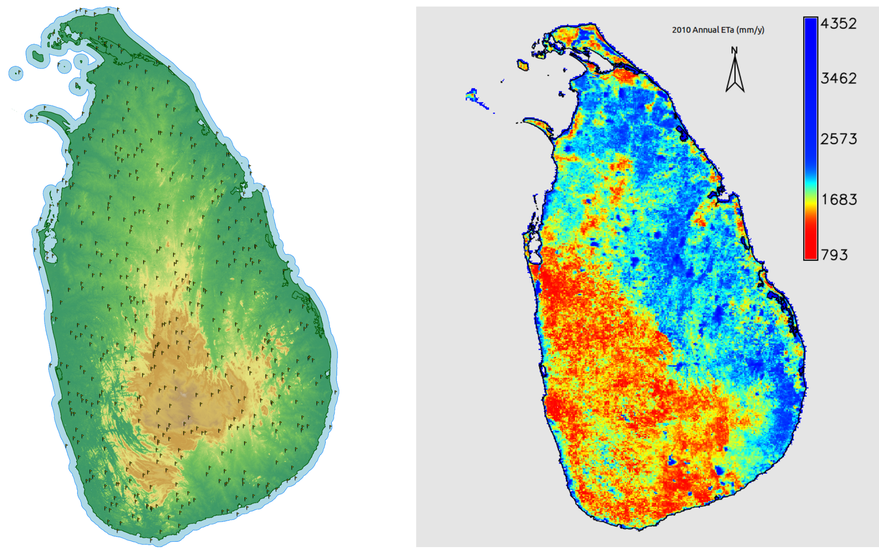

Figure 6: Potential OSHW weather stations in Sri Lanka and a Water Valet output.

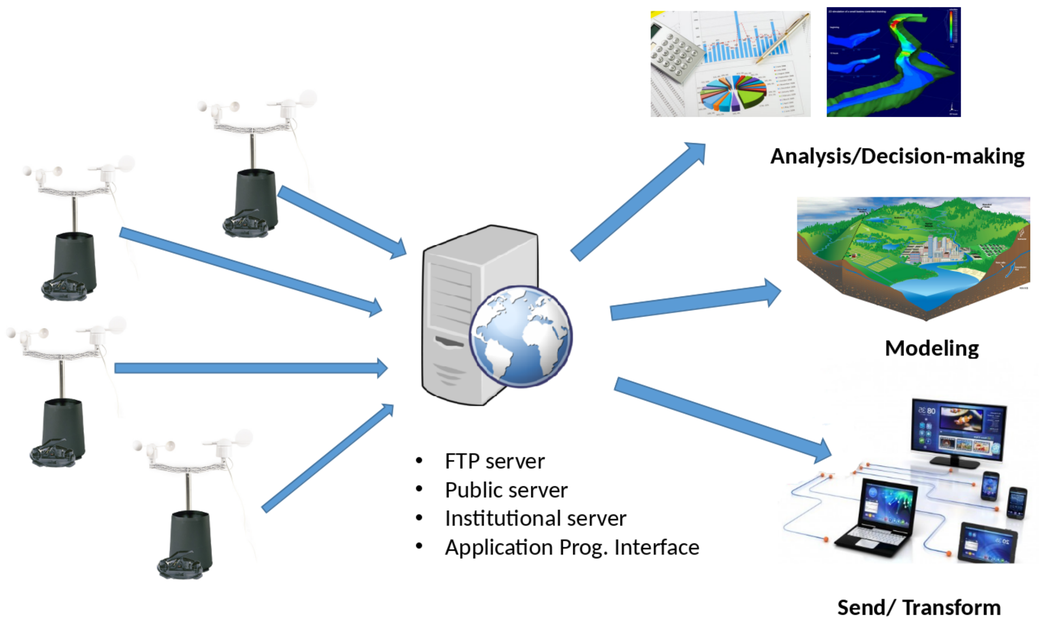

Figure 7: Unified public online reporting system

OSGeo Your Open Source Compass

FOSS4G-ASIA free and open source solutions for geoinformatics