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|  | **United Nations Environment Programme**  **World Conservation Monitoring Centre** |

MISSION REPORT

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| **Distribution:** | **Name of person(s) that undertook mission:** Corinna Ravilious, CCB, Miguel Torres, Informatics, Brian O’Connor and Andy Arnell |
| CCB  Informatics  Science  Barney Dickson  Jon Hutton  Maxwell Gomera  Tim Johnson | **Period (including travel days):** 17-21 September 2013 |
| **Projects:**  2650E (CCB), 06310E (Informatics), 00008.D8.A (Science) |
| **Institution(s) or Meeting(s) and Venue(s):**  FOSS4G, East Midlands Conference Centre, Nottingham 2013  The Global Conference for Open Source Geospatial Software |
| **Main Person(s) contacted:**  Paul Ramsey (Boundless), Jeffrey Johnson (Boundless), Georges Thierry Handja (Rainforest Foundation, UK), Peter Wells and Hugo Martin’s, Lutra Consulting, Paolo Cavallini (QGIS Project Steering Committee), Anita Graser (QGIS Project Steering Committee), Jeroen Ticheler (Geocat), Suchith Anand (Nottingham Geospatial Institute), Jonathan Moules (Warwickshire County Council) and Lucy Bastin (Aston University, Birmingham). |
| **File(s):**  URL link http://2013.foss4g.org/welcome/ | **Objective(s):** (1) Increasing institutional knowledge on Open-Source mapping (2) Make new contacts to increase support network for open-source (3) Understand how to build plugins and geoprocessing models in the open source desktop environment for QGIS (required for ongoing and upcoming CCB projects) |

**Brief summary of the meeting:**

FOSS4G is the annual gathering of Open Source Geospatial Developers, Users and Leaders, an international conference, this year held in the UK. The CCB programme also presented a poster map in the conference online map gallery demonstrating the work undertaken in Tanzania using Open Source QGIS software. The first two days of the conference were a programme of workshops providing the opportunity to learn how to use particular open source technologies and software. In parallel to these the Association for Geographic Information (AGI) was also running its annual meeting and participants of FOSS4G were able to attend presentations here. CR attended these additional days with specific requirements to gain knowledge for the development of procedures and tools for the UNREDD capacity building work for both this year and next year. Thursday-Saturday were main Conference days were attended by CCB, Informatics and Science which consisted of presentations and some additional training workshops.

**Useful workshops attended:**

* ***Spatial Data analysis with GRASS GIS***

<http://grass.osgeo.org/documentation/tutorials/>

CR attended. This provided some useful background to using the GRASS geoprocessing environment but the session was too short to learn anything in depth. There are still some complexities about the GRASS folder structures and data formats that make it more difficult to use than some of the alternatives such as QGIS. It is clear that grass has a powerful geoprocessing envroment (a similar type of model building environment to ArcGIS)and is very good at ensuring ‘clean’ topologically correct data but depending on how stable the new geopocessing environment is in QGIS 2.0 it is worth exploring the accesss to GRASS functionality through QGIS 2.0 in the first instance.

* ***QGIS Plugin Development with PyQt4 and PyQGIS***

CR attended. This training workshop was extremely useful in guiding users through the steps of creating a plugin (tool) for QGIS. This knowledge is extremely useful for the CCB programme in our work with countries requiring Open Source GIS tools and solutions. A plugin could be as simple as adding a tool to do a simple command or a string of processes. Without the training it was difficult to get started on developing these tools as there are a number of software packages required for developing a plugin and this workshop walked through the steps from creating a skeleton plugin, running and debugging it and designing the plugin interface. Some further knowledge of programming in python would be helpful. Participants were also pointed to further online resources and tutorials (included in the workshop training materials provided).

* ***A complete Open Source web mapping stack (introduction to OpenGeoSuite)***

<http://workshops.boundlessgeo.com/suiteintro/>

CR attended. This workshop was great for a beginner to learn the different requirements for creating web mapping applications. It gave a good overview of building an opensource web mapping application starting with building a simple opensource database in PostGIS to setting up a web mapping service using GeoServer and Geowebcahe with a user interface using Open layers and GeoExt. This was just one example method for creating web mapping applications in opensource.

* ***Introduction to PostGIS***

<http://workshops.boundlessgeo.com/postgis-intro/>

<http://s3.cleverelephant.ca/postgis-workshop.zip>

CR attended. The Centre’s spatial database has been created using an open source database (PostGRESQL and PostGIS) with ESRI software installed on top to ensure compatibility with the ESRI tools. This workshop was directly relevant and included training on loading data into the PostGIS database, spatial queries run directly on a PostGIS database using the pgAdmin tool, spatial indexing for improved performance and looking at geometries and geography within the database. It was useful training for perhaps automating some geoprocessing that would normally require desktop GIS. All the training materials are provided online in the above mentioned link.

* **Spatial Analysis with QGIS and Sextante**

<https://github.com/volaya/sextante-manual/tree/master/sphinx/source>

CR attended. This workshop was actually an introduction to the new geoprocessing environment in the newly released QGIS 2.0. The Sextante plugin is now fully integrated into the core QGIS software). QGIS 2.0 was released at the conference and this workshop used the online materials to demonstrate the new capabilities of the geoprocessing environment and demonstrated the link to other open source software particularly well. The geoprocessing capabilities from other open source software that can be accessed through QGIS 2.0 include SAGA, GRASS and for remote sensing the ORFEO tools. CR discussed with Paolo Cavallini the possibility of integrating FAO’s Open Foris Geospatial Toolkit tools with the outcome that the best approach would be to put Paolo Cavallini in touch with Anssi Pekkarinen (FAO) as it appeared that it might be a fairly easy task but too complicated for a non-developer.

**Useful presentations attended:**

*Note: All FOSS4G presentations have been placed online at* <http://www.youtube.com/playlist?list=PLWW0CjV-TafaBjkroiOxcQw8NdOQ_fhu2>

* ***Cartographic Design princlples (AGI talk - Christopher Wessen, Ordance Survey)***

<http://christopherwesson.azurewebsites.net/wp-content/uploads/2013/07/CartoDesign_Principles.pdf>

CR attended. This was a really good talk. A good overview of things to consider when creating a map and may be useful for those who are less cartographically minded who are creating maps. Actual presentation given not available online yet but same content presented in this pdf.

* ***Improve your cartography – 10 more tips for better on-screen maps (Warren Vick, Europatechnologies Ltd***)

CR attended. As above

* ***Mapping for Rights Georges Thierry Handja (Rainforest Foundation, UK (RFUK) and Peter Wells , Lutra Consulting)***

CR attended. An interesting talk on participatory mapping efforts <http://www.mappingforrights.org/> that links well with CCB work in the Congo Basin work. RFUK supported by Lutra Consulting are mapping the presence, land use and rights of indigenous peoples and other forest-dependent communities in the Congo Basin. We have been in touch in the past but have not managed to link our work with their data collection efforts on indigenous communities. Mapping is ongoing and not complete for whole Congo Basin but 2 territories in DRC mapped and may be a useful example subset. RFUK not involved in REDD but there might be possibility to use some of their data if used in right way– maybe just the village locations. Have suggested inviting him to UNEP-WCMC to talk more with LG, BD, BM about our work in the Congo Basin.

* ***Open-Source software for Land cover Mapping from Remote Sensing Data (Pieter Kempeneers)***

BOC and AA attended. The results of an IEEE International Geoscience and Remote Sensing Symposium (IGARSS) competition on using open-source tools for landcover mapping of a typical land cover/land use classification problem were presented. The current contest involves two datasets – a hyperspectral image and a LiDAR derived Digital Surface Model (DSM), co-registered and both at the same spatial resolution (2.5 m). For the contest, a total of 15 pre-defined classes must be distinguished. In this study, two open-source software tools were used:

* Orfeo toolbox ([http://www.orfeo-toolbox.org](http://www.orfeo-toolbox.org/)) offers both a graphical and command line user interface
  + Pktools ( <http://pktools.nongnu.org>) uses a command line interface under Linux

The LiDAR and hyperspectral datasets were concatenated but not fused. A Support Vector Machine (SVM) Classifier was used and found to be a suitable method to manage the ‘curse of dimensionality’ in hyperspectral datasets, i.e. classification problems arise where training data are limited with respect to the dimensionality of the input data (there were ~150 spectral bands in the hyperspectral dataset). Overall, the solution presented was promising and based entirely on open-source tools, easily competing with solutions based on commercial software. Low accuracy characterised a portion of the image where cloud shadow was present. This is a complicated problem that requires more time to manage.

* ***Machine Learning for Remote Sensing: Orfeo ToolBox Meets OpenCV (Julien Michel- CNES)***

BOC and AA attended. Applying Machine Learning to satellite image processing involves two main steps:

* + Training (model estimation)
  + Classification (applying model-decision)

Orfeo Tool Box (OTB) is built on a C++ template library which has potential application plugins such as QGIS 2.0. OTB uses SVM (libSVM) to perform supervised classification of satellite images. The SVM algorithm can also be used for other applications such as change detection or object detection. An Application Programming Interface (API) was presented to represent a generic machine learning algorithm. Steps to normalise training samples were presented using statistical methods, e.g. scaling all training samples from 0 to 1. The performance of classifiers can also be assessed in OTB using a confusion matrix, Kappa statistics etc. The presentation was quite advanced and heavy on computer programming terminology. However, the possibility of linking OTB with QGIS 2.0 presents opportunities for advanced remote sensing analysis with open source tools which matches the power of current commercial software, e.g. ERDAS Imagine.

* ***CDM & TDS Data Server: Earth & Ocean Sciences Meet GIS (John Caron)***

BOC and AA attended. The THREDDS data server (TDS) (http://www.unidata.ucar.edu/software/thredds/current/tds/)was presented. This is a web server that provides metadata and data access for scientific datasets, using a variety of remote data access protocols (OpeNDAP, NetCDF Subset Service, WMS, WCS). This is an important tool for interdisciplinary data sharing within the various domains of geosciences, e.g. meteorological and earth sciences. The Data Server specialises in NetCDF applications. The core of the server is the Unidata Common Data Model (CDM) which facilitates integration of NetCDF, HDF, and GRIB data into GIS tools. This was an advanced presentation on file formats for use in GIS-based geosciences and how a server like TDS can harmonise formatting to enhance usability and sharing among different end users.

* ***ESA User Services Powered by Open Source (Stephan Meissi)***

BOC attended. This presentation summarised an initiative by the European Space Agency (ESA) to catalog and browse satellite imagery in an open-source online data access service as part of the ESA User Services Next Generation (ngEO). The ngEO catalog contains imagery from GMES and ESA Legacy Satellite Missions and displays browse images via OGC's WMTS and WMS standards. It is entirely based on Open Source software including GDAL, MapServer, EOxServer, and MapCache. Internally the Browse Server supports ingesting and pre-processing of browse images following ESA specifications. This includes browse images whose geographic metadata are supplied either as footprint polygon, regular grid of tiepoints, or pre-georeferenced images. The presentation focused on the design and functionality of the Browse Server. There are currently ~ 18,000 images in the Map Cache. The Map Cache has been enhanced by the addition of a time dimension for time series of satellite imagery. An example demonstration was shown of current imagery in the catalog over mainland Europe.

**Recommendation(s)/Action(s) to be taken:**

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| **Follow up action:** | **Responsible** | **Time-frame (by)** |
| Collate and place useful materials into central location including links to online materials | CR + MT | 8/10/13 |
| Write to Georges Thierry Handja and introduce to BM, LG and BB for further contact or Congo Basin work | CR | 8/10/13 |
| Write to Paulo Cavallini and link to Anssi Pekkarinen (FAO) to discuss potential to link FAO Open Foris Geospatial Toolkit to QGIS Geoprocessing environment | CR | 8/10/13 |

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| **Detailed report** [ ] encl. [X ] N/A. | **Documents** [x ] encl. [ ] list [ ] non | **Date** 15 Nov 2013 |
| **Classification** [X] restr. [] unrestr. | **Signature(s) staff member(s)** | **Signature(s) supervisor** |