Landcover Mapping of Pacific Island States

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ABSTRACT

Land cover maps provides the necessary tools for development planning and management of a territory. The Land cover mapping at SOPAC was initiated and made possible in late 2011 through the SPC and GIZ programme "Coping with climate change in the Pacific Island Region Programme" . The mapping was first done for Fiji on a scale of 1: 50, 0000 for Viti Levu and Vanua Levu. The 1:10,000 landcover mapping is currently underway and is financed by the SPC /USAID " Enhanced climate change, Resilience of Food Production System Project" . The same Project is also financing the 1: 50, 000 land cover mapping of Solomon Islands. The visual interpretation was favored due to several reasons. Firstly, the atmospheric conditions in the Pacific are very different to other parts of the world; in certain areas it is very difficult to get image data that is haze or cloud free. Second and most important, the interpretation is carried by the technical staffs from government departments namely Lands, Forestry and Agriculture, the field technical knowledge is vital in the mapping activity. The interpretation is carried out at the SOPAC Division by the officers as part of on-the-job training. At the end of the training, the imagery and data is used by the government ministry. The interpretation is carried out in map sections which are 10 x 10 km areas, where 12 of the sections cover one map sheet. The interpreter toggles between the natural color , the false color IR, false color IR red edge and the vegetation index. Atmospheric correction and orthocorrection was also performed on the images. Atmospheric correction assisted in reducing the atmospheric differences related to relief and local haze whereas ortho-correction is a geometric image correction which takes a DEM or a digital surface model DSM into account, which is essential to eliminate relief displacements. Visual interpretation was still necessary for parts of the images affected by haze. A Vegetation index of VitiLevu was created and used as a guide during the visual interpretation. Vegetation index is gained from elements of the chlorophyll absorption in vegetation and the reflected by bands or channels that are sensitive to vegetation.Although there are several vegetation indices, the Normalized Difference Vegetation Index (NDVI) was used in this method. For every band combination for every satellite image scene the contrast is enhanced so that the water areas and clouds have low contrast but the land area especially the difference of forest and non-forest is visible with high contrast. This is an interactive process normally performed for the complete scene. The operator delineates specific areas not containing water or clouds and performs a standard deviation contrast enhancement changing the LookUp Table (LUT) for the complete scene but calculated from the selected area. The LUT then contains the transfer parameters which recalculate the original pixel values on the fly for the contrast enhanced monitor display, but does not change the original pixel values. MapInfo the GIS software is not capable to read the LUT and it was necessary to produce backdrops readable by this software. This step was performed in ERDAS which provides a module changing using the LUT transfer the change pixel values to a new file instead of the monitor. The current mapping activity provides a standard baseline to

use in determining effects of climate change on vegetation. With various government ministries and departments involved in the interpretation, this facilitates collaboration and product consistency important for aggregating multi-scale vegetation data from local planning units to regional and national scales. For example in the beginning of the mapping, it was found out that the Department of Agriculture has been mapping the gallery forest as shrubs; this was corrected when liaising with the Department of Forestry. For the first time ever in Fiji, the Department of Forestry and Agriculture are collaborating to produce a same land cover map, after agreeing on a common forest and non – forest boundary. This further facilitates communication and data sharing of vegetation and land cover information between government departments. Very high resolution imagery means more detail and therefore longer time in interpretation. A solution had to be found in speeding up the mapping. As a result, we are currently using image segmentation in ERDAS IMAGINE 2013. However, visual interpretation is still of the process, the polygons produced in the segmentation will be checked and adjusted by the technical officers. A field verification exercise is carried out after analysis in the office, and this allows the interpreter to compare image data and what is really on the ground. The technical officers who have a vast knowledge and experience in field work are also involved in the field verification.

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