Technical Note – Revised land cover type mapping utilising GeoEye image data, Vostok Island, Republic of Kiribati

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SPC Land Resources Division provided funding resources for Kataebati Bataua’s participation in the vegetation mapping of the islands of the Republic of Kiribati.

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Revised Land Cover Type Mapping
Utilising GeoEye Image Data
VOSTOK ISLAND

GeoEye image data of Vostok Island

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Table of Contents

1 INTRODUCTION ......................................................................................................................... 3

2 THE SATELLITE IMAGE DATA .................................................................................................. 4

3 AREA ANALYSIS AND COCONUT RESOURCE ....................................................................... 4

4 INTERPRETATION OF LAND COVER CLASSES ....................................................................... 6
   4.1 The Visual Interpretation .................................................................................................... 6
   4.2 The Land Cover Classes ..................................................................................................... 6
      4.2.1 Shrub .......................................................................................................................... 6
      4.2.2 Forest .......................................................................................................................... 7
      4.2.3 Scattered Palm .......................................................................................................... 7
      4.2.4 Water Bodies .............................................................................................................. 8

5 APPENDICES ............................................................................................................................. 9
   A Abbreviations ....................................................................................................................... 9
   B Data Storage ......................................................................................................................... 10
1 Introduction

The vegetation mapping for low lying islands started at SPC/SOPAC as an initiative related to the FAO programme Monitoring Assessing and Reporting (MAR) in Tuvalu. In 2009 a monitoring system was established in the Agriculture Department in Kiribati and initial training was provided through SPC/SOPAC. The Agriculture Department worked together with the Department of Environment and the Lands Department on the vegetation mapping task. Kiribati – like Tuvalu at a later stage – expressed additional reasons to map the vegetation of their outer islands. They explained the importance of mapping the coconut resource because accurate figures are required to attract bio fuel related projects. Spatial and statistical information of the coconut resource is also required to be able to start regeneration activities as most coconut palm stands are getting senile. Another important reason to map the vegetation is the food security of low lying islands where the Agriculture Department needs to know the available amount and condition of pandanas, coconut and bread fruit to support management of this natural resource. Finally, the vegetation cover is supposed to be documented to be able to record any changes through a re-mapping at a later stage. It is presumed that the impact of climate change will be visible through vegetation changes which refer especially to mangrove vegetation.

SPC Forest and Trees finances one position at SPC-SOPAC’s GIS&RS section currently filled by Kataebati Bataua from Kiribati who continues the vegetation mapping to support the mapping in Kiribati’s Environment, Lands Department and Agriculture Department.

All mapping is based on visual interpretation at 1:5,000 working scale. The mapping is based on geo-coded very high resolution image data (GeoEye). The geo-location accuracy is not at 1:5,000 scale levels; there can be a linear shift, which can be corrected as soon as reference image points are established. If a geo-location correction will be applied, the area calculation will not be effected.

Currently there is no area subdivision of Vostok Island. This will be done if the official boundaries are delivered by the Lands Department in Kiribati.
2 The Satellite Image Data

The interpretation is based on GeoEye image data providing 50 cm spatial resolution and colour. The colour contrast enhancement is limited due to the limited number of spectral bands and the merge process between colour and panchromatic image channels. The image data was recorded between 15th April 2011. VHR image data is recorded in tiles whenever the satellite passes the target area and has free onboard storage capacity. This image was recorded as Two tiles only; however, it had to be split into tiles to be handled by the GIS software.

The image data set was purchased as geo-coded in UTM WGS84 zone 5.

3 Area Analysis and Coconut Resource

The area analysis was carried out in Access as area database. The actual area calculation for every polygon was performed in GIS environment and afterwards the MapInfo table was copied to Access.

17 hectare or 94 % of Vostok Island are covered by vegetation where 6 % or 1 hectares of Vostok Islands have non-vegetation cover where 1 hectares are water bodies.

<table>
<thead>
<tr>
<th>Vegetation Cover</th>
<th>Area (ha)</th>
<th>% Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest</td>
<td>11</td>
<td>64.7</td>
</tr>
<tr>
<td>Settlement</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Shrub</td>
<td>5</td>
<td>29.4</td>
</tr>
<tr>
<td>Scattered Coconut</td>
<td>1</td>
<td>5.9</td>
</tr>
<tr>
<td>Coconut Plantation</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Dense Coconut</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Mangrove</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Sum Vegetation</strong></td>
<td><strong>17</strong></td>
<td><strong>100.0</strong></td>
</tr>
<tr>
<td>Water Body</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Bare Land</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Not clear</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Sum None Vegetation</strong></td>
<td><strong>1</strong></td>
<td><strong>100.0</strong></td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>18</strong></td>
<td></td>
</tr>
</tbody>
</table>
Figure 02: Land cover type map Vostok Island.
4 Interpretation of Land Cover Classes

The stratification and delineation of the land cover classes is based on on-screen visual interpretation.

4.1 The Visual Interpretation

The digitising was performed with a zoom factor of 500 m where 1 cm screen distance represented 10 m in the field. The zoom factor of 500 m was the optimal display to separate coconut palm from other vegetation types.

At 1:10,000 scales, 1 cm on the map represents 100 m in the field. A quarter of hectare (50 x 50 m) is shown 25 x 25 m. This was agreed as the smallest mappable unit for vegetation outside the village areas.

Even with the limited geometric accuracy (described in the chapter "Image Data", will not affect the area accuracy as even if the image data has to be shifted the shift is normally linear and the polygons will not be distorted.

4.2 The Land Cover Classes

This chapter describes the land cover and the interpretation key.

4.2.1 Shrub

Shrub is vegetation under 5 meters in height. The vegetation type “shrub” looks green but does not shows the coconut palm texture or the texture of planting rows. The surface appears smoother than coconut stands.

Figure 03: Shrub vegetation on GeoEye images data, Vostok Island.
4.2.2 Forest

The vegetation type “Forest” in the GeoEye image data is visible as a green texture but does not show the coconut palms texture. However vegetation type “forest” is higher than all palms.

Figure 04: Bare land GeoEye image data Vostok Island.

4.2.3 Scattered Palm

Coconut palms have a typical star like shape and this texture allows a separation from other vegetation even if the colour is similar. Figure 05 shows scattered coconut palms within shrub vegetation. Coconut harvest is normally uneconomic in scattered coconut stands. Scattered palm stands have less or equal than 50 coconut palms per hectare. The number of palms per hectare can be counted on VHR image data with sub-metre resolution such like this GeoEye images.

Figure 05: Scattered coconut GeoEye image data Vostok Island.
4.2.4 Water Bodies

Any form of inland water is classified as "water body". The plain dark surface without any texture identifies it. These can be ponds, lakes and swamps.

Figure 6: Water body on image data Vostok Island.
### 5 Appendices

#### A Abbreviations

Table of class names

<table>
<thead>
<tr>
<th>Land Cover Classes</th>
<th>Abbreviation of Land Cover Classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST</td>
<td>Settlement</td>
</tr>
<tr>
<td>Shrub</td>
<td>Shrub</td>
</tr>
<tr>
<td>SCO</td>
<td>Scattered Coconut</td>
</tr>
<tr>
<td>CP</td>
<td>Coconut Plantation</td>
</tr>
<tr>
<td>DCO</td>
<td>Dense Coconut</td>
</tr>
<tr>
<td>WB</td>
<td>Water Body</td>
</tr>
<tr>
<td>BL</td>
<td>Bare Land</td>
</tr>
<tr>
<td>Not clear</td>
<td>Not clear</td>
</tr>
<tr>
<td>MG</td>
<td>Mangrove</td>
</tr>
<tr>
<td>FOR</td>
<td>Forest</td>
</tr>
</tbody>
</table>
B Data Storage

Server GISdata

Data

Countries

KI

Mackean

Flint

Vostok

IMG

VegMapping

AccessData

Report

VectorVegClasses