A modular approach for the assessment of LULC changes around refugee and IDP camps by remote sensing

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Worldwide, almost 60 million people had been forced to flee their homes due to wars, conflicts and prosecution by the end of 2014 (UNHCR, 2015), revealing a rapidly increasing trend over recent years. In many instances displaced populations end up in camps, where limited supply of resources such as building material or fuel for cooking means that displaced populations have to rely on natural resources gathered in the vicinity of these camps. This may lead to conflict with the host community and/or cause severe damage to local ecosystems. Hence, the assessment and monitoring of the local environment is essential to use these natural resources in a sustainable manner.

We propose a multi-stage approach to monitor the environment around refugee and IDP camps based on optical high resolution and very high resolution data. Three broad categories of products are distinguished, with a decreasing degree of automation from +/- fully automatic to semi-automated and expert-based, while the target land use/land cover classes as well as the derived depletion index (see below) are semantically enriched.

Stage 1: Based on time series of calibrated satellite imagery a prior knowledge-based quantization of the colour space into a discrete and finite pre-classification as implemented in the SIAM software (Satellite Image Automatic Mapper; Baraldi et al., 2010) is employed for images with comparable plant phenology. These classes are extractable across difference sensor platforms (cf. Baraldi et al., 2010). Their semantic information is inferior to traditional land cover classes, but is enriched through the analysis of spatiotemporal changes in vegetation cover e.g. using an object-based post-classification change comparison (PCC) approach (Tiede, 2014).

Stage 2: The pre-classification is enhanced to LULC target classes relevant for users in the field (e.g. water bodies, agricultural plots, single trees, forest areas, grassland, etc.) by expert rule-sets in an object-based image analysis (OBIA) environment. Again, spatiotemporal changes are analysed using the PCC method.

Stage 3: The observed spatiotemporal changes of the LULC target classes are evaluated based on the Weighted Natural Resource Depletion (NRD_w) index (Hagenlocher et al., 2012) This index employs weights derived by an expert

weighting exercise to take into account the relative importance of the LULC classes for human well-being and ecosystem integrity as appraised by local experts.

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