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Author: Mr. Sackdavong MANGKHASEUM
Kyushu Institute of Technology, Japan, mangkhaseum.sackdavong742@mail.kyutech.jp

Prof. Akitoshi HANAZAWA
Kyushu Institute of Technology, Japan, hanazawa@mns.kyutech.ac.jp

CATASTROPHIC DAMAGE FROM DAM COLLAPSE POST-FLOOD USING SENTINEL-1 AND SENTINEL-2 DATA WITH GOOGLE EARTH ENGINE AND RANDOM FOREST ALGORITHM

## Abstract

Floods are considered to be one of the greatest natural disasters that take human lives all around the world, cause people to refuge from their homes and settlements, and also cause huge damages to the infrastructure which requires a large cost to rebuild and rehabilitate. Mapping of the inundated region is crucial for determining the flood extent, deployment of emergency response teams, and assessment of damages and casualties. On 23 July 2018, a saddle dam of the Xe Pian-Xe Namnoy hydropower project in Attapue Province of Lao PDR had been collapsed, unleashing a wall of water and debris. The flood submerged entire villages, destroyed homes, crops, livelihoods, and killed dozens of people. In this paper, we aim to find out the areas affected by the flood after the dam failure leveraging Sentinel-1 synthetic aperture radar (SAR) and Sentinel-2 optical datasets in google earth engine (GEE). The google earth engine (GEE) is a cloud-computing platform, that enables scientific analysis and visualization of geospatial datasets using advanced machine learning algorithms and satellite images. The training samples were manually categorized into six classes for the ground truth data on the Sentinel-2 images especially in land use and land cover types such as permanent water, flooded area, flooded vegetation, urban area, bare land, and agricultural land. The results of this paper were evaluated by (i) calculating a confusion matrix; (ii) analyzing Sentinel 1 post-flood data, (iii) analyzing Sentinel 2 post-flood data, (iv) data fusion of Sentinel 1 and Sentinel 2 post-flood data with spectral indices are performed with Random Forest (RF) supervised classification method leveraging google earth engine (GEE). This paper on catastrophic damage from dam collapse post-flood will be a key factor for further investigation in decision making to handle the flood forecasting issue and the advantage of using machine learning technique and satellite images will be very crucial for flooding mapping and flood damage assessment to develop the risk mitigation efforts in Lao PDR. **Keywords:** Flood mapping, Dam collapse, Synthetic aperture radar, Satellite optical data, Data fusion, Random Forest, Google Earth Engine, Xe Pian–Xe Namnoy hydropower (Lao PDR)