**Remote Sensing-Based Risk Assessment Indexing of Potential Threats to Drinking Water Sources**

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***ABSTRACT***

Drinking water sources may encompass several potential hazards originating from urban locales, industrial zones and commercial districts. This study presents a comprehensive approach for assessing and identifying the potential risk sources of freshwater in the vicinity of drinking water sources. Leveraging *high-resolution satellite imagery*, water bodies and their proximal surroundings are precisely mapped utilising *semantic segmentation* methodology. An open-source dataset comprising high-fidelity images paired to corresponding label masks is employed for training endeavours. The dataset is transmuted into *Torch format* to adapt it for training. The custom dataset is then employed to train pre-trained *PyTorch models*, including *DeepLabV3Plus* and *PSPNet*, which are specifically designed for semantic segmentation tasks. The efficiency of the trained models is assessed through *Dice Coefficient* yielding a metric of 0.64, indicating promising efficacy in delineating water bodies and their surroundings. The segmented image is subjected to *object optimization* through the application of the *Region Line Primitive Association Framework*. The weights of risk sources are ascertained through *Analytic Hierarchy Process*. Thereupon *Risk Assessment Index* is computed through allocation of scores and weights to various identified risk sources in segmented image. This process facilitates a comprehensive evaluation of the safety level of the drinking water source environment. Hence by leveraging satellite imagery and image processing techniques a systematic method is created to identify the risk sources around the water body thus promoting environmental sustainability.

**Keywords:** Analytic Hierarchy Process, Drinking water safety, Satellite imagery, Semantic segmentation, Risk assessment.