Modelling the runoff with HEC RAS in the urban catchment area of the thalweg of Abobo, northeast of Abidjan district, Côte d'Ivoire (Oral)

Soro Gbombele[1]*, Coulibaly Adama[1], Yéo Yele Djeneba Bintou[1], Kone Domian[2], Soro Nagnin[1]

[1]Laboratory of the Soil, Water and Geomaterials Sciences, Applied Geology Department, University Félix Houphouët-Boigny, 22 Po Box 582 Abidjan 22, Côte d'Ivoire

[2]Directorate of Sanitation and Urban Drainage, Ministry of Hydraulics and Sanitation , 01 Po Box 12666 Abidjan 01, Côte d'Ivoire

**Corresponding author : gbombele.soro55@ufhb.edu.ci*

ABSTRACT

In Abobo, Northeast of Abidjan, rapid urbanization and climate change are increasing soil impermeability, thereby disrupting the hydrological cycle and intensifying runoff and flood risks. This study aims to assess the impact of urban dynamics on runoff in the Thalweg d'Abobo watershed. An integrated methodological approach was adopted, focusing on the morphometric characterization of the watershed, land use assessment, and hydraulic modeling of the main thalweg. The hydro-morphometric parameters of the watershed are calculated with Global Mapper. The dynamics of land use changes between 2016, 2020, and 2024 have been assessed via Google Earth Engine. To simulate runoff, for different urbanization and extreme flood scenarios, the HEC-RAS hydraulic model was used. The results show a watershed with a steep slope and a dense hydrographic network. This promotes a rapid runoff, while its elongated shape gives it a long response time. The evolution of land use between 2016 and 2024 within the watershed showed a gradual urban expansion of 1.48%, a decrease in bare soils by 6.82% and water bodies by 2.61%; and finally, an increase in herbaceous vegetation (4.38%) and tree cover (3.12%). The main regression was partly in urbanized areas, whose surface area increased during the same period, from 37.68% to 39.16%, reflecting a gradual extension of construction and infrastructure. Hydraulic modeling highlighted, for the period 2016-2024, a gradual increase in peak flows of about 4%, flow velocities by 2.27%, and water levels by around 2%, which is accentuated during extreme floods. This simulation of extreme flood runoff also predicts an increase of about 23% in the ten-year flow (Q10) compared to the fifty-year flow (Q50). This study showed that urbanization associated with waterproofing in Abobo significantly alters the hydrological cycle of the Grand Thalweg of Abobo watershed, thereby increasing runoff and flood risks. This information can serve as a decision-support tool for better stormwater management and land-use planning.

Keywords: Runoff, HEC-RAS, Watershed, Flooding, Abobo