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Modeling impacts of climate and land use change on hydropower generation and flood hazard of the Mono River basin, West Africa

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In West Africa, the variability in rainfall and land use changes affects more rivers flow. The impacts of land use change on river basin hydrology are interlinked with impacts of climate change. This climate change often related to global warming is expected to increase the magnitude and frequency of extreme precipitation events [IPCC, 2007] which will lead to more intense and frequent river flooding. In recent years there is an upward trend in flood occurrence in at least some African rivers. Indeed, many countries over West Africa had had catastrophic floods that affected thousands of people with loss of lives, damages to properties. For example, during the year of 2010, flooding was the most one ever observed. The heavy precipitation during October has worsened the flooding situation that Togo has been experiencing since the beginning of the rainy season in the Maritime Region (Togo Red Cross report, 2010). This happen because of the excessive water from Mono River. The flooding has caused extensive damages to property including means of livelihood and houses with thousands of persons rendered homeless and sheltered temporarily in camps and with friends and relatives. On this river, hydropower dam was being built for providing green energy for Togo and Benin countries. As consequence of climate change and land use, it is affecting runoff of the Mono river basin. So this study objective seeks to assess the impact of climate and land use change on flood hazard and hydropower generation in Mono river basin. To attend these objectives two different semi-distributed and distributed hydrological model (s) are required to simulate river basin hydrological system and the future impacts of both climate change and land use on flood hazard and hydropower generation. First of all, SWAT model will allow used to know the hydrological response of all the Mono river basin under climate and land use change and simulate the amount of discharge at the upstream entering in the reservoir for the potential hydropower production. Secondary with LISFLOOD model we will simulate the runoff due to water released by the dam and causing flooding in Mono basin at the downstream. In order to make some projection in the future, WASCAL Regional Climate Model (RCM) data already bias-corrected CORDEX being available will be use under two Representative Concentrative Pathways (RCP 4.5 and RCP 8.5) for future impacts assessment, scenarios models. Moreover, it will help to investigate the response of the hydrology of the Mono River to scenarios of continued land use change and projected climate change and assessing hydroelectric power generation. The output of RCM has a best spatial resolution and these scenarios have been choosing because they are reflecting well the climatic conditions in the study area. The expecting results of this study will be to give some strategic and planning measures for the second dam Adjarala on the same basin. It will also be helpful to formulate adaptatives strategies to correct the negative impacts of [U+FB02]ood on deferments land use activities and hydropower management in West Africa.