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A Project Research Presentation on:

PREDICTION OF RUNOFF AND SEDIMENT YIELD OF OYUN RIVER.

BY

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PRESENTATION OUTLINE

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INTRODUCTION

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- Due to the rapid global urbanization, the natural land covers are tending to be impervious and degrading the natural environment which increase runoff and peak flows that cause flash flooding, affect water quality and other water related problems (Dientz, 2007).
- Storm water is a form of water generated as a result of all forms of precipitation such as rain, sleet, or melting snow. In an ideal situation, only a small percentage of storm water becomes surface runoff.
- This runoff usually flows into the nearest stream, creek, river, lake, or wetland. Runoff can cause problems like erosion of stream banks, flood increase and reduction in water quality (Agouridis et al., 2013

INTRODUCTION Cont'd

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- However, the use of pipeline drainage system has usually caused an increase in the discharge and velocity of runoff which poses danger to the downstream part of the water bodies in form of flooding.
- It is quite noted that the generated runoff carries along sediments which have great impacts on water quality, water reservoir capacity, and agricultural productivity of such area (Gyamfifi et al., 2016).

PROBLEM STATEMENT

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- The Oyun River Watershed faces challenges such as increased runoff, flooding, and sedimentation due to urbanization and deforestation.
- These issues impact water quality, aquatic habitats, and infrastructure. There is a need for a comprehensive study to predict runoff and sediment yield to inform sustainable watershed management practices

AIM AND OBJECTIVES

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Aims;

- The aim of this study is to predict runoff and sediment yield in Oyun River Watershed.

objectives are:

- To develop a hydrological model of Oyun River.
- To predict runoff and sediment yield in the Oyun River Watershed using the Soil and Water Assessment Tool (SWAT).
- To evaluate spatial variations of sediment yield and runoff.

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JUSTIFICATION OF PROJECT

- The study on predicting runoff and sediment yield in the Oyun River Watershed using the SWAT model is vital due to its environmental and socioeconomic significance. It will help maintain hydrological balance, support ecosystems, and ensure water supply for Ilorin's domestic, agricultural, and industrial needs.
- By understanding and managing runoff and sedimentation, the study aims to preserve water quality, protect habitats, and enhance agricultural sustainability. It addresses the impacts of rapid urbanization, providing insights for sustainable urban planning and infrastructure development.

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SCOPE OF THE STUDY

- The scope of this project on predicting runoff and sediment yield in the Oyun River Watershed, was carried out using the SWAT model and also include defining the study area, collecting and analyzing hydrological and geospatial data, and setting up the SWAT model. It will simulate runoff and sediment yield, and provide recommendations for sustainable watershed management and urban planning.
- Additionally, the project involved engaging with local stakeholders to raise awareness and ensure the implementation of recommended practices.

LITERATURE REVIEW

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S/N	TITLES	AUTHOR(S)	CORE FINDINGS	RESEARCH GAPS
1	Comparison of soil erosion models used to study the Chinese Loess Plateau	Pengfei Li, et al. (2021)	The study compared various soil erosion models and found that certain models performed better in specific conditions.	The study identified the need for integrating more field data to improve model accuracy and the requirement for long-term monitoring data.
2	Rainfall-Runoff Modeling and Its Prioritization at Sub-Watershed Level Using SWAT Model: A Case of Finca'aa, Oromia, Western Ethiopia	Seifu Kebede Debela, et al. (2020)	The SWAT model was used to prioritize sub-watersheds based on runoff potential, showing variability in runoff and sediment yield across different sub-watersheds.	The study noted the need for more detailed spatial data and the integration of land use changes over time to improve model predictions.

LITERATURE REVIEW

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S/N	TITLES	AUTHOR(S)	CORE FINDINGS	RESEARCH GAPS
3	Assessment of Sediment Yield Using SWAT Model: Case Study of Kebir Watershed, Northeast of Algeria	Kamel Khanchoula, et al. (2019)	The SWAT model accurately simulated sediment yield in the Kebir watershed, identifying critical areas prone to erosion.	Highlighted the need for better calibration techniques and more precise input data to enhance model performance.
4	Using SWAT Model to Determine Runoff, Sediment Yield in Maroon-Dam Catchment	Nasrin Zalaki-Badil, et al. (2022)	The SWAT model was effective in predicting runoff and sediment yield, emphasizing the impact of land use changes on hydrological processes.	The study called for the inclusion of more recent climate data and the need to account for human activities affecting runoff and sediment yield.

DESCRIPTION OF STUDY AREA

- Oyun River, a prominent waterway located in Kwara State, one of Nigeria's 36 states, meanders through a diverse landscape, traversing several local government areas including Ifelodun, Irepodun, Asa, Oyun, and Ilorin East.
- This river, with its extensive network and intricate ecosystem, plays a pivotal role in shaping the geography and livelihoods of the region's inhabitants.
- Its waters serve as a vital resource for agriculture, providing sustenance to local communities and contributing significantly to the state's economic activities

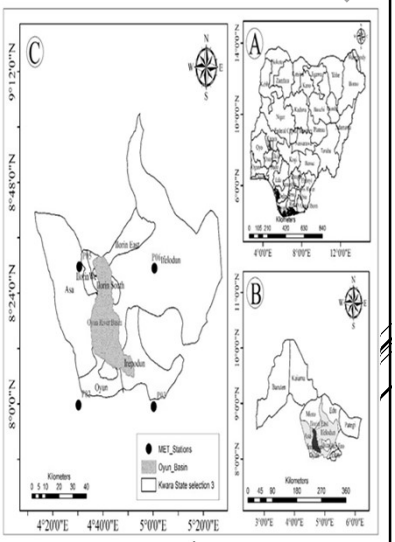
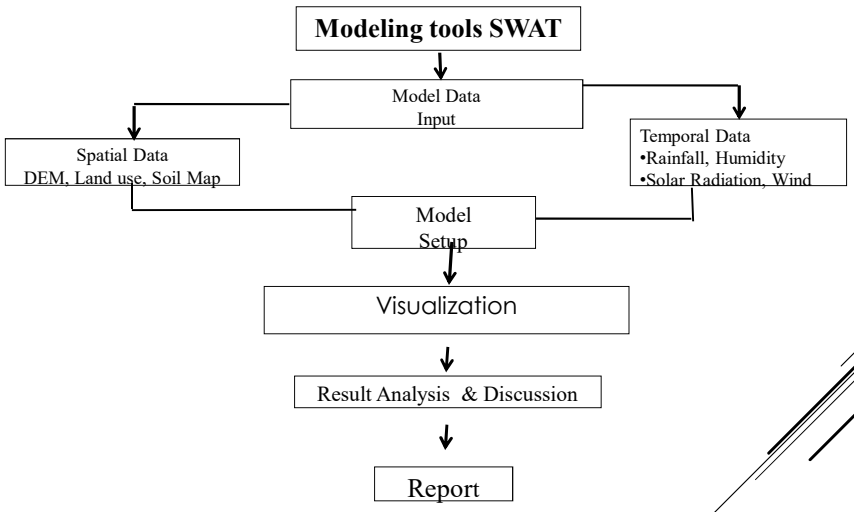


Fig 1:map of the study area

METHODOLOGY



METHODOLOGY Cont'd

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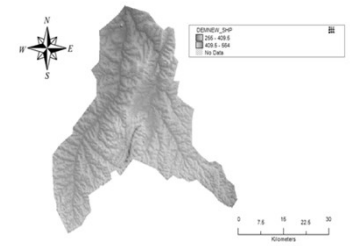

Fig 2

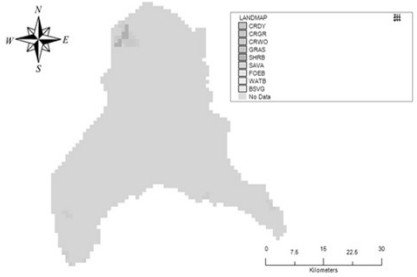

Fig 3

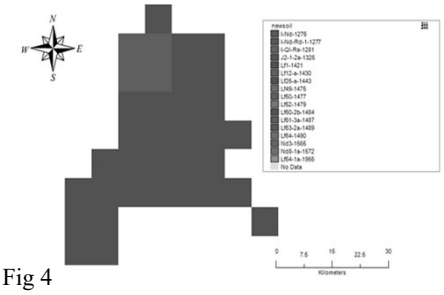

Fig 4

Fig 2: DEM of the Study Area
Fig 3: Land Use of the Study Area
Fig 4:Soil Map of the Study Area

RESULTS AND DISCUSSIONS

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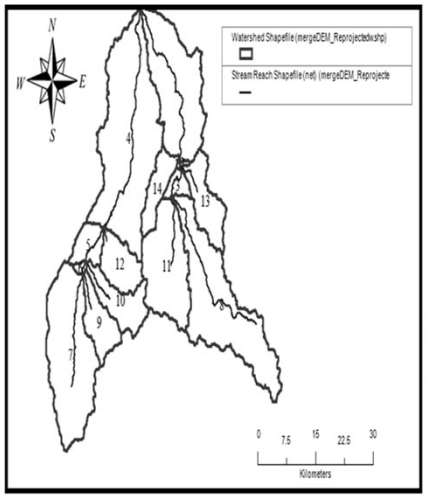
- The hydrological model was created in M using the SWAT Tools extension for catchment and river delineation. The basin consists of 14 sub-basins, covering a total area of 1721.92 square meters. Each sub-basin functions as a smaller catchment area within the larger basin.



Fiq 5;boundaries of each sub-basin.

RESULTS AND DISCUSSIONS Cont'd

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Subbasins	FLOW_INcms	FLOW_OUTcms
1	223.86	164.78
2	2.63	109.48
3	19.58	93.61
4	392.60	178.88
5	40.52	86.79
6	4.94	63.72
7	249.95	50.09
8	280.23	56.13
9	64.60	12.95
10	75.04	15.04
11	170.53	34.18
12	67.79	13.59
13	77.38	15.51
14	52.28	10.47

Table 1: Summary of Flow in and Flow out of the Subbasins

Subbasins	SED_INtons	SED_OUTtons	SEDCONCmg_kg
1	2697453.74	2312698.60	7080.74
2	1682327.34	1673002.63	9548.95
3	1497807.03	1442632.43	9751.91
4	3066514.45	2426235.75	6259.84
5	1551948.58	1480801.35	9326.02
6	1076378.85	1060726.62	10868.35
7	824505.04	824108.18	12511.15
8	725316.06	724080.71	11316.05
9	238441.88	238423.87	14382.32
10	350899.0	350854.2	19018.7
11	723114.1	722998.9	17102.2
12	303016.0	303013.8	14430.2
13	233228.2	233199.4	13862.8
14	140895.1	140892.4	12179.5

Table 2:Summary of Sediment in. Sediment Out, and Sediment Concentration in the Subbasins

RESULTS AND DICUSSIONS Cont'd

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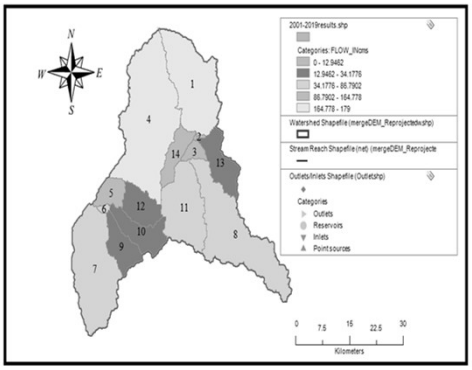

FIG 6: FlowIN Spatial Variation Map

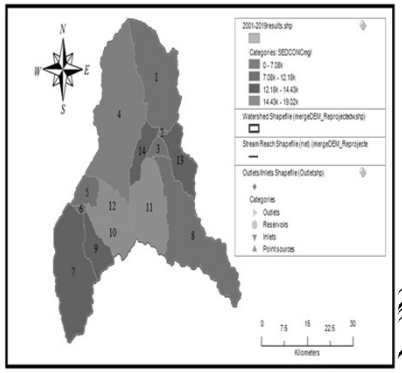

FIG 7:FlowOUT Spatial Variation Map

CONCLUSIONS

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Based on the result of the research work, it was concluded that:

- The hydrological model developed for the Oyun River using the SWAT tool has proven effective in predicting runoff and sediment loadings throughout the watershed.
- The flow analysis reveals significant spatial variation across the subbasins, with subbasins 1, 4, 7, and 8 contributing the highest inflows. In several cases, such as subbasin 2, low inflows paired with high outflows suggest additional inputs from upstream or lateral sources. Discrepancies between flow-in and flow-out in many subbasins indicate potential internal storage, groundwater recharge, or human-induced withdrawals.
- Sediment analysis shows that larger subbasins carry higher sediment loads due to greater catchment size and flow, while smaller subbasins like 10 and 11 exhibit the highest sediment concentrations, indicating localized erosion. This variation highlights both widespread sediment transport and specific erosion-prone areas, underlining the need for targeted soil conservation and watershed protection measures.
- The spatial analysis identified key sub-basins, particularly sub-basin 4, as areas with the highest risk of sediment accumulation

RECOMMENDATIONS

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The following are the recommendations based on the outcome of this study:

- Implement improved waste management practices at the abattoir to minimize the discharge of organic waste into the river. This should include the installation of proper waste treatment facilities and regular maintenance.
- Involve the local community and stakeholders in conservation efforts by raising awareness about the impact of abattoir activities on water quality, which could encourage better waste disposal practices.
- Establish an ongoing water quality monitoring program that focuses on sediment and nitrate levels in the river. This will help detect any sudden changes in loadings and enable timely interventions.
- Further research can be done to explore the effects of different land use scenarios and climate change projections on sediment and nitrate loadings in the river.

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THANKS FOR LISTENING