SNS COLLEGE OF TECHNOLOGY

An Autonomous Institution Coimbatore – 35

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DEPARTMENT OF AGRICULTURAL ENGINEERING

19AGE308
WATERSHED PLANNING AND MANAGEMENT

Objectives of watershed management

- The different objectives of watershed management programmes are:

1. To control damaging runoff and degradation and thereby conservation of soil and water.
2. To manage and utilize the runoff water for useful purpose.
3. To protect, conserve and improve the land of watershed for more efficient and sustained production.
4. To protect and enhance the water resource originating in the watershed.
5. To check soil erosion and to reduce the effect of sediment yield on the watershed.

Objectives of watershed management

6. To rehabilitate the deteriorating lands.

7.To moderate the floods peaks at down stream areas.

8.To increase infiltration of rainwater.

9.To improve and increase the production of timbers, fodder and wild life resource.

10.To enhance the ground water recharge, wherever applicable.

Importance

Watersheds are important because the surface water features and stormwater runoff within a watershed ultimately drain to other bodies of water.

It is essential to consider these downstream impacts when developing and implementing water quality protection and restoration actions. Everything upstream ends up downstream.

We need to remember that we all live downstream and that our everyday activities can affect downstream waters.

Runoff potential estimation of Anjana Khadi Watershed using SWAT model in the part of lower Tapi Basin, West India

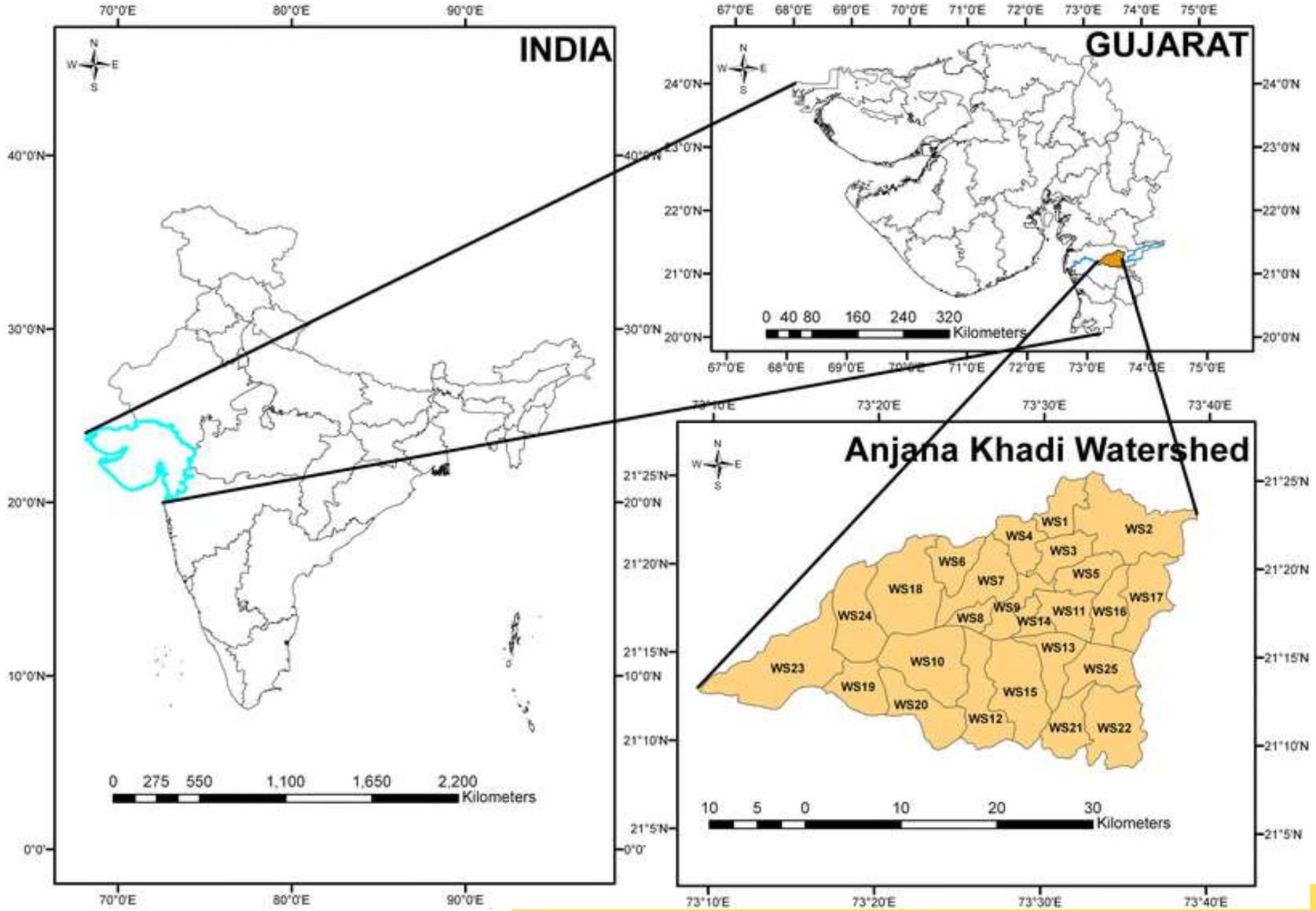
•Anjan a Khadi watershed is situated at downstream of Ukai dam, covers 836 km^2 area and consists of 25 micro-watersheds. Water drain from the Anjana Khadi to Tapi River is one of the responsible factors for flooding at Surat city.

•Present work is focused on flooding potentiality of Anjana Khadi micro-watersheds using the soil and water assessment tools (SWAT).

•IRS P6 LISS III and Shuttle Radar Topography Mission (SRTM) C band radar data is used for preparation of various input file like land use/land cover, slope, drainage and watershed boundaries in GIS environment.

•SWAT model is used to simulate the runoff for the monsoon of 2006.

Location map of Anjana Khadi group of 25 micro-watersheds



Introduction

•A watershed is a hydrologic unit which produces water as an end product by interaction of precipitation and the land surface.

•The quantity and quality of water produced by the watershed are an index of amount and intensity of precipitation and the nature of watershed management.

•In some watersheds the aim may have to harvest maximum total quantity of water throughout the year for irrigation and drinking purpose while others may have objective to reduce the peak rate of runoff for minimizing flooding effect and reduce the soil erosion.

• Hence modeling of runoff is essential for sustainable development .

Methodology

- computer-modeling techniques assist scientists and engineers for delineation and parameterization of watersheds by help of geographic information system (GIS) and remote sensing (RS) technology

•soil and water assessment tool (SWAT) is the most recent one , and is used successfully for simulating runoff, sediment yield and water quality of large basin

•to test the capability of the model in determining the runoff of the watershed, AVSWAT2000/X with ArcView GIS version 3.1 interfaces was selected for the present study.

• The main objective of the present study is to derive the parameters required for runoff modeling using geospatial technique and estimate the runoff potentiality of Anjana Khadi micro-watersheds.

•High amount of water discharge in short time period from Anjana Khadi to Tapi River may be one of the major factors of flooding at Surat city. In present work, to map the flood potential of Anjana Khadi micro-watersheds, soil and water assessment tools (SWAT) model in GIS environment is used and by using the results, surplus amount of water in Tapi can be gauged and will be obliging to protect the city against flood.

SWAT model

•SWAT model is computationally efficient, uses readily available inputs and enables users to study long-term impacts

•The SWAT model is a distributed parameter continuous model developed by the USDA-ARS .

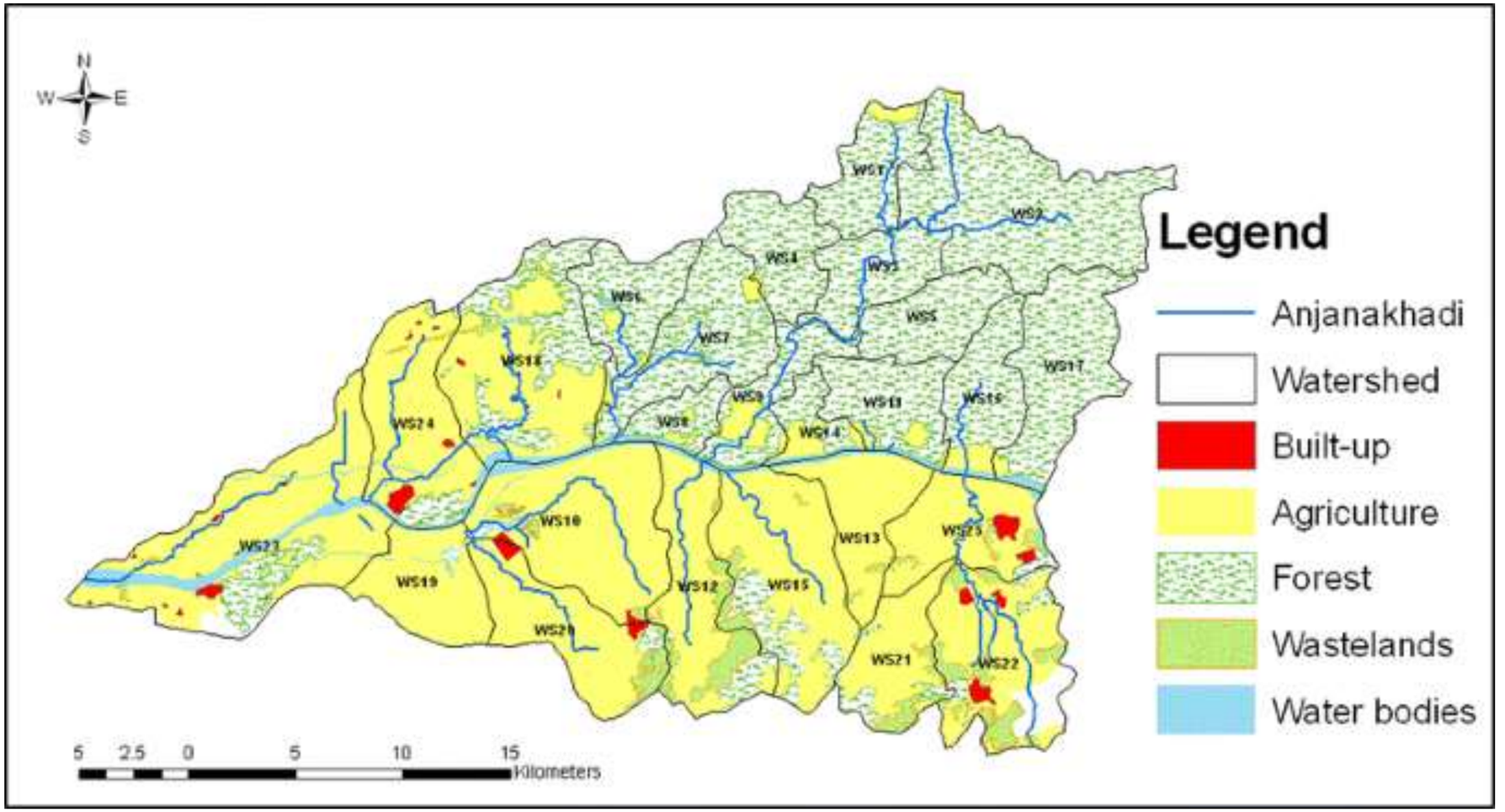
•The major advantage of the model is that unlike other conventional conceptual simulation models, it does not require much calibration .

•In the model, a watershed is divided into a number of sub-basins based on a given digital elevation model (DEM) map.

• Within each sub-basin, soil and landuse maps are overlaid to create a number of unique hydrologic response units (HRUs).
• The hydrologic component of SWAT is based on the following water balance equation:

$$\mathrm{SW}_t = \mathrm{SW}_o + \sum_{i=1}^{n}(R_{\mathrm{day}} - Q_{\mathrm{surf}} - E_a - W_{\mathrm{seep}} - Q_{\mathrm{gw}}) \quad (1)$$

where SW_t is the final soil water content ($\mathrm{mmH_2O}$), SW_o is the initial soil water content ($\mathrm{mm\ H_2O}$), t is time in days, R_{day} is amount of precipitation on day i ($\mathrm{mm\ H_2O}$), Q_{surf} is the amount of surface runoff on day i ($\mathrm{mm\ H_2O}$), E_a is the amount of evapotranspiration on day i ($\mathrm{mm\ H_2O}$), W_{seep} is the amount of percolation and bypass exiting the soil profile bottom on day i ($\mathrm{mm\ H_2O}$), Q_{gw} is the amount of return flow on day i ($\mathrm{mmH_2O}$) (Jain et al.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Agriculture
Forest
Wastelands
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Kilometers

Conclusions

•This study indicates the SWAT is an efficient tool for modeling and to simulate the runoff from Ajana Khadi watersheds.
• Input data like DEM, watersheds, soil, slope, land use/land cover generated through RS and GIS data is quite applicable to run the SWAT model as well other hydrologic models

•. This study suggested that predictions of the inflow through analysis of micro-watersheds are very important for flood hazard mitigation and mapping.

•Such undesirable conditions must be taken into consideration and can be utilized to save the Mandvi, Songadh, Ukai, Puna and Surat city against flood.

• For effective mapping of the flood potentiality and vulnerability, there is need of more river and rain-gauge stations. The runoff prone area delineated through this study can be placed under land-use regulation to limit the flood damage potential in those areas

•. The policy holders and government should emphasize on these areas in terms of building regulations and codes. Rules related to no development or even removal of existing developments can be introduced, especially after flood damages. In addition, the presented result will be helpful for development of advance flood forecasting system , for preparedness of disaster relief packages and therefore should be integrated with current system which will in turn reduce the flood damages and human lives.