

Project activities and methods

Activity 1

- Household data: All households of Gilachari union were mapped using GPS (global positioning system) as part of a longitudinal study in 2009. Malaria mosquito larval collections have been undertaken in breeding sites in the study area. Household level monthly malaria incidence data from Jan 2009 to Dec 2010 will be used for the analysis.

Activity 2.

- Digital Terrain Model: A 5 meter resolution Digital Terrain Model (DTM) will be derived from Map Mart. In this DTM, elevation across the landscape will be recorded in 5 x 5 m grid-cells. The resulting georeferenced DTM will be used for terrain analysis to develop flow direction, flow accumulation, drainage line, catchment, and watershed delineations.

Activity 3

- Hydrological model: A model will be developed that is capable to simulate overland flow, ponding and evaporation from open water bodies. The numerical implementation of the model will be supported by using existing terrain analysis computing procedures offered by TopoToolbox. Inundations will be estimated from runoff patterns and local topography. Finally, the decay of inundations by evaporation will be modeled using the Penman-Monteith equation.

Activity 4

- Runoff module: A runoff module designed for IDRISI Taiga to calculate runoff amount and routing for single or multiple rainfall events on a hill slope and small catchment scale will be prepared. Runoff will be routed by identifying pathways connecting lower lying neighbors in a digital elevation model.

Activity 5

- Statistical analyses: The resulting hydrological model (Activity 3) will be jointly analyzed with malaria incidence and entomological information (Activity 1). A 2 kilometer buffer will be created around inundation areas as malaria mosquitoes usually do not fly longer [25]. Households within and outside the buffer zones will be compared for their proximity to water bodies. In this study wetness, rainfall, land surface temperature and land use data will be used in predicting risk of malaria. Risk factor and time series analysis will be applied using STATA 11.