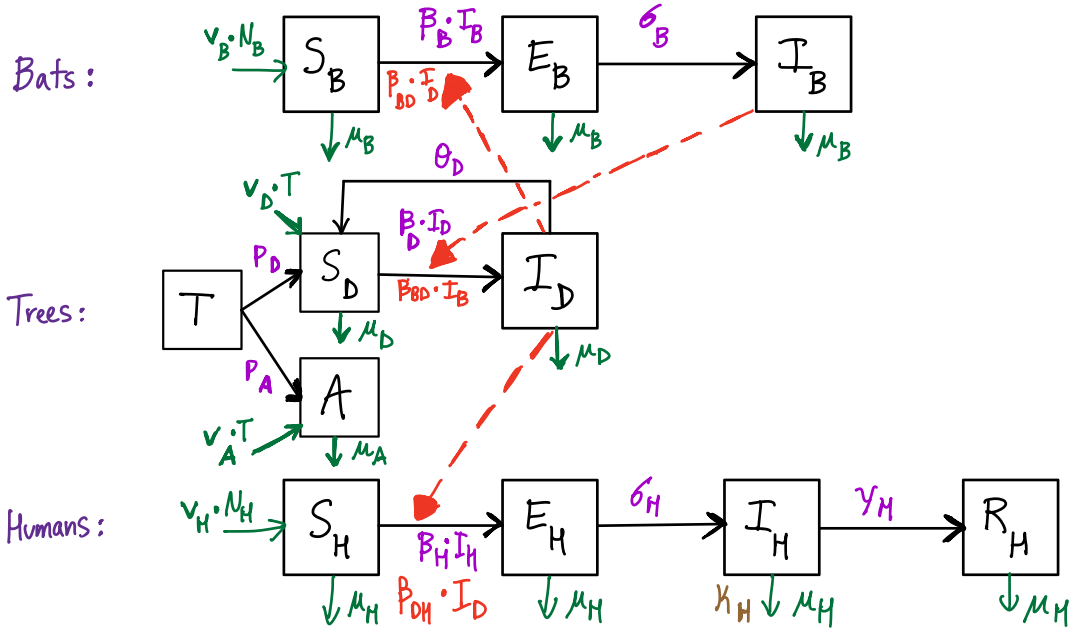

Bats

S_B : Susceptible bats

E_B : Exposed bats

I_B : Infectious bats

v_B : Birth rate of bats

μ_B : Death rate of bats (natural)

β_B : transmission coefficients among bats

β_{BD} : transmission coefficient from infectious bats to susceptible date palm trees

σ_B : 1/latent period in bats

Trees

T : total # of trees in area of interest

S_D : # of susceptible date palm sap trees

A : # of alternative tree species

$T = S_D + A$

I_D : Infected date palm sap trees

μ_D : rate of date palm tree death

μ_A : rate of alternative tree death

v_D : rate of new date palm sap trees

v_A : rate of new alternative trees

p_D : proportion of date palm sap trees among all trees (T)

p_A : proportion of alternative trees species among all trees (T)

β_D : Preference coefficient for bat feeding on date palm sap trees

θ_D : rate of infected date palm trees becoming susceptible (1/time of sap pot replacement)

Humans:

S_H : Susceptible humans

E_H : Exposed humans

I_H : Infectious humans

R_H : Recovered humans

β_H : transmission coefficients among humans

β_{DH} : transmission coefficient from Infectious date palm trees (sap) to humans

σ_H : 1/latent period in humans

γ_H : Recovery rate in humans

v_H : birth rate of humans

μ_H : death rate of humans (natural)

κ_H : Nipah case fatality rate

$$\frac{dS_B}{dt} = V_B N_B - \beta_B I_B S_B - \beta_{BD} I_D S_B - \mu_B S_B$$

$$\frac{dE_B}{dt} = \beta_B I_B S_B + \beta_{BD} I_D S_B - \sigma_B E_B - \mu_B E_B$$

$$\frac{dI_B}{dt} = \sigma_B E_B - \mu_B \cdot I_B$$

Bats

$$\frac{dS_T}{dt} = -P_D \cdot T - P_A \cdot T$$

$$\frac{dS_D}{dt} = V_D T + P_D \cdot T - \mu_D \cdot S_D - \beta_D \cdot S_D \cdot I_D - \beta_{BD} \cdot S_D \cdot I_B + \theta \cdot I_D - \mu_D S_D$$

$$\frac{dS_A}{dt} = V_A T + P_A T - \mu_A A$$

Trees

$$\frac{dI_D}{dt} = \beta_D \cdot S_D \cdot I_D + \beta_{BD} \cdot S_D \cdot I_B - \theta \cdot I_D - \mu_D \cdot I_D$$

$$\frac{dS_H}{dt} = V_H N_H - \beta_H I_H S_H - \beta_{DH} \cdot I_D \cdot S_H - \mu_H S_H$$

$$\frac{dE_H}{dt} = \beta_H I_H S_H + \beta_{DH} I_D S_H - \sigma_H E_H - \mu_H E_H$$

$$\frac{dI_H}{dt} = \sigma_H E_H - \gamma_H I_H - \kappa_H \cdot I_H - \mu_H I_H$$

$$\frac{dR_H}{dt} = \gamma_H I_H - \mu_H R_H$$

Humans