$$\frac{dS_i}{dt} = -\beta S_i \sum_j C_{i,j} \frac{I_j^{SC}}{N_j}, \quad I_j^{SC} = I_j^{SC1} + I_j^{SC2}$$

$$\frac{dE_i}{dt} = \beta S_i \sum_j C_{i,j} \frac{I_j^{SC}}{N_j} - \kappa E_i$$

$$\frac{dI_i^{SC1}}{dt} = \rho_i \kappa E_i - \gamma_C I_i^{SC1}$$

$$\frac{dI_i^{SC2}}{dt} = (1 - \rho_i) \kappa E_i - \gamma_R I_i^{SC2}$$

$$\frac{dI_i^C}{dt} = \gamma_C I_i^{SC1} - \gamma_R I_i^C - \nu I_i^C$$

$$\frac{dR_i}{dt} = \gamma_R I_i^{SC} + \gamma_R I_i^{SC2}$$

$$\frac{dD_i}{dt} = \nu I_i^C$$