Appendix: Nomenclatures for variables and parameters

$f^{\pm}$ = net system cost (US$);

i = waste management facility, i = 1 for landfill 1, 2 for incin-erator, and 3 for landfill 2;

j = district, j = 1, 2, 3, 4, 5;

r = transfer station, r = 1, 2, …, 6;

k = planning period, k = 1, 2, 3;

L_k = the length of period k (day);

h = waste generation level in district j, h = 1, 2, 3;

m = expansion option for waste management facilities, m = 1, 2, ..., 6;

$\eta^{\pm}$ = recycling rate at transfer station r (% of incoming mass to transfer station r);

$T_{ijk}^{\pm}$ = regular waste assigned to facility i from district j during period k (t/d);

$T_{irk}^{\pm}$ = regular waste from transfer station r to facility i during period k (t/d);

$T_{jrk}^{\pm}$ = regular waste from district j to transfer station r during period k (t/d);

$M_{ijkh}^{\pm}$ = excess waste by which the regular waste loading ($T_{ijk}^{\pm}$) is exceeded (t/d);

$M_{irkh}^{\pm}$ = excess waste by which the regular waste loading ($T_{irk}^{\pm}$) is exceeded (t/d);

$M_{jrkh}^{\pm}$ = excess waste by which the regular waste loading ($T_{jrk}^{\pm}$) is exceeded (t/d);

$TR_{ijk}^{\pm}$ = cost of shipping regular waste from district j to facility i during period k ($/t);

$TR_{irk}^{\pm}$ = cost of shipping regular waste from transfer station r to facility i during period k ($/t);

$TR_{jrk}^{\pm}$ = cost of shipping regular waste from district j to transfer station r during period k ($/t);

$MR_{ijk}^{\pm}$ = cost of shipping excess waste from district j to facility i, $MR_{ijk}^{\pm} \geq TR_{ijk}^{\pm}$ ($/t);

$MR_{irk}^{\pm}$ = cost of shipping excess waste from transfer station r to facility i, $MR_{irk}^{\pm} \geq TR_{irk}^{\pm}$ ($/t);

$MR_{jrk}^{\pm}$ = cost of shipping excess waste from district j to transfer station r, $MR_{jrk}^{\pm} \geq TR_{jrk}^{\pm}$ ($/t);

$OP_{ik}^{\pm}$ = cost of treating regular waste at facility i during period k ($/t);

$OP_{rk}^{\pm}$ = cost of treating regular waste at transfer station r during period k ($/t);

$MP_{ik}^{\pm}$ = cost of treating excess waste at facility i during period k, $MP_{ik}^{\pm} \geq OP_{ik}^{\pm}$ ($/t);

$MP_{rk}^{\pm}$ = cost of treating excess waste at transfer station r during period k, $MP_{rk}^{\pm} \geq OP_{rk}^{\pm}$ ($/t);

$FE^{\pm}$ = residue rate of waste treated at incinerator (% of in-coming mass to incinerator);

$FT_k^{\pm}$ = cost for shipping regular residue from incinerator to the landfill during period k ($/t);

$MT_k^{\pm}$ = cost of excess residue from incinerator to landfill dur-ing period k, $MT_k^{\pm} \geq FT_k^{\pm}$ ($/t);

$RE_{1k}^{\pm}$ = revenue from incinerator due to regular waste loading during period k ($/t);

$RM_{1k}^{\pm}$ = revenue from incinerator due to excess waste loading during period k ($/t);

$RE_{2k}^{\pm}$ = revenue from recycling during period k ($/t);

$RM_{2k}^{\pm}$ = revenue from recycling due to excess waste loading during period k ($/t);

$TL_i^{\pm}$ = cumulative capacity of landfill i (t);

$LC_i^{\pm}$ = daily capacity of landfill i (t/d);

$TE^{\pm}$ = treatment capacity of incinerator (t/d);

$TT_r^{\pm}$ = treatment capacity of transfer station r (t/d);

$W_{jk}^{\pm}$ = random waste-generation rate in district j during period k (t/d);

p_{jh} = probability h related to waste generation in district j;

$FLK_{ik}^{\pm}$ = capital cost of expanding facility i in period k (US$);

$EC_{mk}^{\pm}$ = expansion option of facility i in period k, m = 1, 2, …, 6;

$Y_{imk}^{\pm}$ = 0-1 binary variables for identifying whether or not ex-pansion of facility i needs to be undertaken in period k.