

Appendix A: Nomenclature

Indices and Sets

m	<i>metrics as CAPEX, OPEX, CO2</i>
tm	<i>major time period as years</i>
j	<i>type of technology</i>
i, i' (<i>alias</i>)	<i>zone/cell/district/region</i>
t	<i>minor time period as fraction of a single day</i>
r	<i>type of resources (material or energy)</i>

Continuous Variables

$P(j, i, t, tm)$	<i>production rate of technologies</i>
$Q(r, i, i', t, tm)$	<i>flow of r from i to i'</i>
$IM(r, i, t, tm)$	<i>import/export of resource</i>
$RS(r, i, t, tm)$	<i>net surplus of r in i in time period t of tm</i>

Integer Variables

$INV(j, i, tm)$	<i>number of units of j invested in time tm</i>
$N(j, i, tm)$	<i>number of tech j in district i in tm</i>

Binary Variables

$YQ(r, i, i', t, tm)$	<i>if the transportation of r from i to i' has been built or not</i>
$YIM(r, i, t, tm)$	<i>if the import/export of r in district i is allowed or not</i>

Other Parameters

Z	<i>the objective function</i>
$ObjWt$	<i>objective function weights</i>
$VM(m, tm)$	<i>total value of m in major time period tm</i>
$VIJ(j, m)$	<i>technology investment coefficient in m</i>
$VPJ(j, m)$	<i>technology process coefficient in m</i>
$VQ(r, m)$	<i>transportation coefficient per km of r/m</i>
$VI(r, m)$	<i>import value of r/m</i>
PHI	<i>hours assigned for a year</i>
Q_{max}	<i>max flow of resources</i>
IM_{max}	<i>max import/ export flow of resources</i>
$MU(j, r)$	<i>rate of r production per unit production of j</i>
$X(i)$	<i>X coordinate of i, in km</i>
$Y(i)$	<i>Y coordinate of i, in km</i>

Math Formulas

$$dist(i, i') = \sqrt{(X_i - X_{i'})^2 + (Y_i - Y_{i'})^2}$$

abs(x)

absolute value of x