Compost LP Formulation

i : Index of county $(1, ..., n)$
j : Index of facilities $(1, ..., m)$

$$CO_2e = \sum_{i=1}^{n} TC_i S_i + \sum_{i=1}^{n}(1 - \sum_{j=1}^{m} s_{ij})W_i \cdot f + \sum_{j=1}^{m}(1 - \sum_{i=1}^{n} d_{ij})TC_i \cdot g + \sum_{i=1}^{n}\sum_{j=1}^{m} h \cdot D_{ij} s_{ij} W_i$$

$$Cost = \sum_{i=1}^{n}\sum_{j=1}^{m} d \cdot D_{ij} s_{ij} W_i + \sum_{i=1}^{n}\sum_{j=1}^{m} e \cdot L_{ji} d_{ji} TC_i$$

subject to:

$I_j \leq F_j$
$TC_i \leq C_i$
$\sum_{j=1}^{m} s_{ij} \leq 1$
$\sum_{i=1}^{n} d_{ij} \leq 1$
$0 \leq s_{ij} \leq 1$
$0 \leq d_{ij} \leq 1$

where

D_{ij} : distance to haul to facility j (f_j) from county i (c_i)
L_{ji} : distance from f_j to c_i working land
W_i : Waste available in county i
F_j : Intake capacity of facility j
C_i : Amount of output county i can take in (based on amount of land)

s_{ij} : proportion of W_i to send to f_j
d_{ji} : proportion of facility f_j output to send to c_i working land

and

S_i : sequestration potential per ton (?) compost applied in county c_i
c : conversion factor of waste into compost (%)
f : emission factor for waste left in county ($\frac{CO2_e}{ton}$)
g : emission factor for compost stranded at facility ($\frac{CO2_e}{ton}$)
e : cost to haul away from facility to land ($\frac{\$}{ton \cdot mi}$)
d : cost to haul to facility from county ($\frac{\$}{ton \cdot mi}$)
h : transportation emission factor ($\frac{CO2_e}{ton \cdot mi}$)

Intake for each facility is sum of the proportion taken in from c_i for $i = 1, ..., n$
$I_j = \sum_{i=1}^{n} s_{ij} W_i$

Output of each facility is equal to intake converted into compost
$O_j = c \cdot I_j$

Total compost applied in each county is the sum of the proporion of output from f_j for $j = 1, ..., m$
$TC_i = \sum_{j=1}^{m} d_{ij} O_j$