

Module 10 – MOLP

Exploratory Data Analysis



A	B	C	D	E	F	G	H	I	J	K	L	M
From	To	Cost_per_unit_shipped	Transportation_method	Congestion_level		Location_id	Location_name	Latitude	Longitude	Supply	Demand	
1	2	22	Wind-powered Ships	87		1	Candyfloss Countryside	37.5	-102.5	8900		
1	3	6	Cargo Ships (Heavy Fuel Oil)	38		2	Dulce de Leche Dunes	39.38	-109.79		1249	
1	4	24	Cargo Ships (Heavy Fuel Oil)	97		3	Marzipan Metropolis	34.98	-86.61		1429	
2	4	18	Diesel Rail	91		4	Milkshake Mire	41.43	-94.98		1511	
2	5	7	Electric/Hybrid Trucks	83		5	Praline Park	33.27	-94.36		1670	
2	6	21	Wind-powered Ships	86		6	Rainbow Sprinkle Summit	40.07	-101.01		1466	
2	7	12	Wind-powered Ships	96		7	Whipped Wonderland	31.72	-103.45		1575	
3	2	19	Cargo Ships (Heavy Fuel Oil)	99								
3	4	15	Cargo Ships (Heavy Fuel Oil)	101								
3	6	20	Diesel Trucks	94								
4	1	16	Diesel Rail	84								
4	2	7	Air Freight	84								
4	3	23	Cargo Ships (Heavy Fuel Oil)	21								
4	6	14	Electric/Hybrid Trucks	81								
5	1	24	Air Freight	70								
5	6	9	Cargo Ships (Heavy Fuel Oil)	72								
6	1	19	Diesel Trucks	105								
6	2	8	Air Freight	99								
6	3	5	Electrified Rail	33								
6	5	11	Air Freight	86								
7	1	16	Electrified Rail	93								
7	3	8	Air Freight	86								
7	5	22	Slow Steaming Cargo Ships	88								
7	6	13	Cargo Ships (Heavy Fuel Oil)	91								

Model Formulation

MIN:

$$22X_{12}+6X_{13}+24X_{14}+18X_{24}+7X_{25}+21X_{26}+12X_{27}+19X_{32}+15X_{34}+20X_{36}+16X_{41}+7X_{42}+23X_{43}+14X_{46}+24X_{51}+9X_{56}+19X_{61}+8X_{62}+5X_{63}+11X_{65}+16X_{71}+8X_{73}+22X_{75}+13X_{76}$$

Model Optimized for Equally Weighted Objectives

Minimize transportation	\$ 211,325.12					
Minimize distance	\$ 96,283.85					
Maximize eco-friendliness	7090.98					
Minimize congestion	11992.02					
Objectives	Totals	Target Value	Deviation	% deviation	Weight	Weighted deviation %
Total transportation Cost	\$ 211,325.12	\$196,581.00	\$ 14,744.12	8%	1	0.075002775
Total Distance Traveled	\$ 96,283.85	\$82,502.03	\$ 13,781.82	17%	1	0.167048212
Eco-Friendliness	7090.984933	6076.00	\$ 1,014.98	17%	1	0.167048212
Congestion levels	11992.01507	11578.00	\$ 414.02	4%	1	0.035758772
MiniMax Variable	0.167048212					

The solution to this problem when finding the MiniMax variable is 0.167.

Model with Stipulation

Minimize transportation	\$ 202,216.94					
Minimize distance	\$ 87,232.67					
Maximize eco-friendliness	7817.98					
Minimize congestion	11578.00					
Objectives	Totals	Target Value	Deviation	% deviation	Weight	Weighted deviation %
Total transportation Cost	\$ 202,216.94	\$196,581.00	\$ 5,635.94	3%	10	0.286698342
Total Distance Traveled	\$ 87,232.67	\$82,502.03	\$ 4,730.64	6%	5	0.286698342
Eco-Friendliness	7817.979128	6076.00	\$ 1,741.98	29%	1	0.286698342
Congestion levels	11578	11578.00	\$ -	0%	1	0
MiniMax Variable	0.286698342					

After altering the weights to match what matters most to me, I put the highest weight on total transportation cost because I feel as though that is the most important to me. I then put a weight of 5 on Total Distance Traveled because that was the next important to me. For the last 2 I left them the same because they are not very important to me in this scenario. This model can be used for many different scenarios and it's one to know.