Supply Chain Modelling and Design

Case Study 1 Brief

Recycling is an important and complex activity in *Country A*. To enable timely operations, the country is divided into 10 sectors and recycling operations are commenced simultaneously in each sector. The recyclable garbage is collected from public bins, loaded into trucks, and transported to recycling sites. Each site can accommodate different amounts of recyclable garbage because of its available land size at the facility. The annual capacities for five recycling sites are given in the table below (in megatonnes):

	Recycling Site				
	1	2	3	4	5
Capacity	30	25	20	18	15

Each recycling site is installed with facilities that have different recycling efficiencies, which are summarised in the table below (in percentages):

	Recycling Site				
	1	2	3	4	5
Efficiency	30%	35%	40%	50%	60%

The cost of collecting and transporting recyclable garbage primarily depends on the distance between the sectors and the recycling sites. The following table summarises the distances between each sector and each recycling site (in kilometres):

Recycling Site

Sector	1	2	3	4	5
1	4.6	1.9	6.6	10.0	12.6
2	3.2	2.8	11.2	12.3	11.9
3	1.9	3.9	5.0	12.7	11.6
4	3.5	4.9	6.1	11.1	12.0
5	2.0	4.2	2.8	10.7	11.9
6	5.7	6.6	8.8	10.4	8.2
7	6.5	8.4	13.4	8.4	7.7
8	7.3	8.1	7.0	10.3	6.6
9	4.2	5.5	8.9	10.1	9.7
10	4.3	8.8	9.6	8.1	11.2

Using historical data, the country estimates the annual volume of the recyclable garbage for each sector in the coming year shown in the table below (in megatonnes):

Estimated Recyclable Garbage

1	2	3	4	5	6	7	8	9	10
5	8	10	15	7	9	6	13	6	4

It will cost approximately $123,249 to move one megatonne of recyclable garbage one kilometre. The management would like you to design a solution that simultaneously maximises the amount of recyclable garbage and minimises the transportation cost. They consider maximising the amount of recyclable garbage to be three times as important as minimising the transportation cost.