This project analyzed optimized waste transportation flows from two supply centers (New York and New Jersey) through four depots to a growing set of landfill destinations.

Three scenarios were modeled: one with seven landfills, one with eight, and one with nine. The one with six landfills was analyzed on a previous assignment.

As landfills were added, the system adapted by distributing waste more evenly, reducing pressure on depots, and maintaining low transportation costs.

The results demonstrate how increasing infrastructure flexibility (more landfills) improves efficiency and supports sustainable waste management.
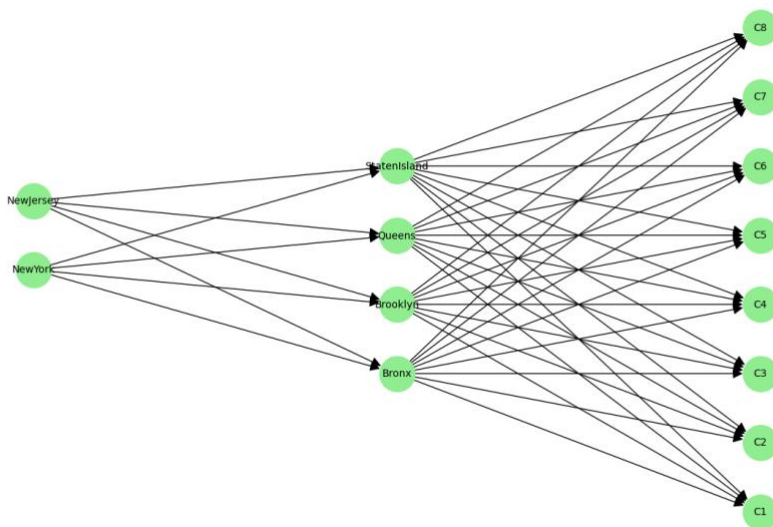
1. Network Diagram

Variation 1 (C1,C2,C3,C4,C5,C6,C7)

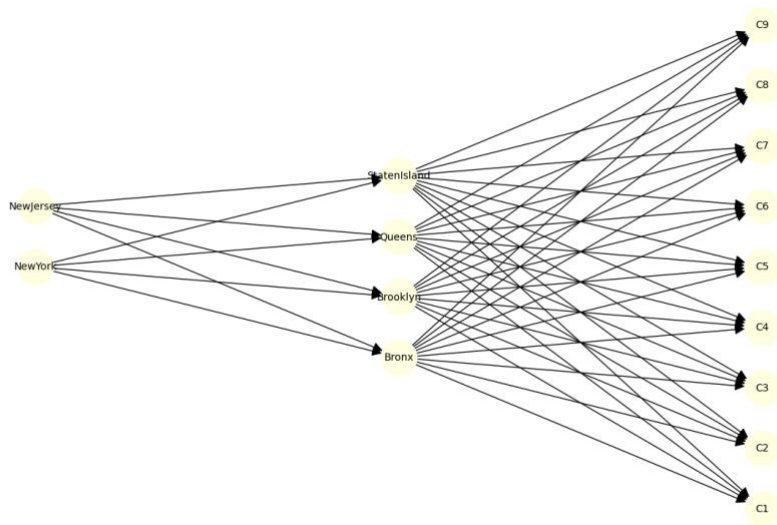Network Diagram - Variation 1
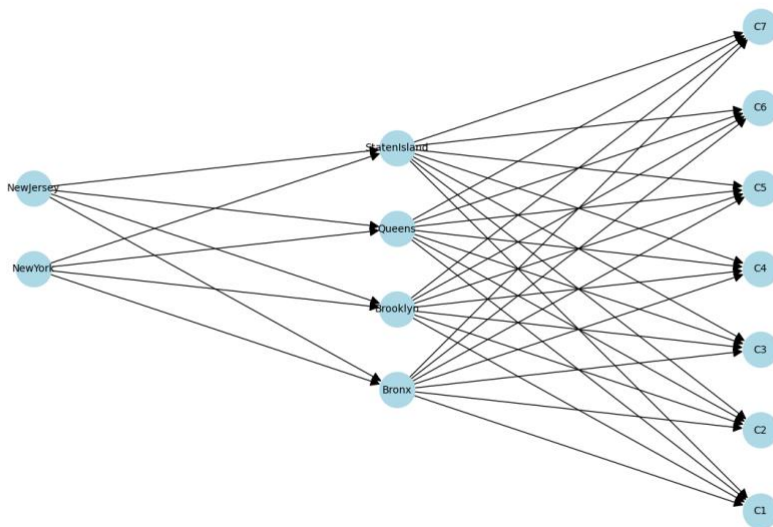
Variation 1 (C1,C2,C3,C4,C5,C6,C7,C8)

Network Diagram - Variation 2

Variation 1 (C1,C2,C3,C4,C5,C6,C7,C8,C9)

Network Diagram - Variation 3

C9
C8
C7
C6
C5
C4
C3
C2
C1

StatenIsland
Queens
Brooklyn
Bronx

NewJersey
NewYork

2. Dashboards

Variation 1 (C1,C2,C3,C4,C5,C6,C7)

FLOW		
From	To	Flow
New York	C1	100,000
New York	C6	40,000
New Jersey	Brooklyn	100,000
New Jersey	Queens	110,000
New Jersey	Staten Island	80,000
New Jersey	C7	50,000
Brooklyn	C2	20,000
Brooklyn	C4	70,000
Brooklyn	C5	10,000
Queens	C5	110,000
Staten Island	C3	80,000
		770,000

COSTS				
From	To	Unit Cost	Flow	Total Cost
New York	C1	1.20	100,000	120,000.00
New York	C6	1.20	40,000	48,000.00
New Jersey	Brooklyn	0.50	100,000	50,000.00
New Jersey	Queens	0.70	110,000	77,000.00
New Jersey	Staten Island	0.40	80,000	32,000.00
New Jersey	C7	1.80	50,000	90,000.00
Brooklyn	C2	0.70	20,000	14,000.00
Brooklyn	C4	1.20	70,000	84,000.00
Brooklyn	C5	0.70	10,000	7,000.00
Queens	C5	0.70	110,000	77,000.00
Staten Island	C3	0.40	80,000	32,000.00
			770,000	631,000

Variation 2 (C1,C2,C3,C4,C5,C6,C7,C8)

FLOW		
From	To	Flow
New York	C1	100,000.00
New York	C6	40,000.00
New Jersey	Brooklyn	100,000.00
New Jersey	Queens	110,000.00
New Jersey	Staten Island	80,000.00
New Jersey	C7	50,000.00
New Jersey	C8	50,000.00
Brooklyn	C2	20,000.00
Brooklyn	C4	70,000.00
Brooklyn	C5	10,000.00
Queens	C5	110,000.00
Staten Island	C3	80,000.00
		820,000.00

COSTS				
From	To	Unit Cost	Flow	Total Cost
New York	C1	1.20	100,000	120,000.00
New York	C6	1.20	40,000	48,000.00
New Jersey	Brooklyn	0.50	100,000	50,000.00
New Jersey	Queens	0.70	110,000	77,000.00
New Jersey	Staten Island	0.40	80,000	32,000.00
New Jersey	C7	1.80	50,000	90,000.00
New Jersey	C8	1.90	50,000	95,000.00
Brooklyn	C2	0.70	20,000	14,000.00
Brooklyn	C4	1.20	70,000	84,000.00
Brooklyn	C5	0.70	10,000	7,000.00
Queens	C5	0.70	110,000	77,000.00
Staten Island	C3	0.40	80,000	32,000.00
			820,000	726,000.00

Variation 3 (C1,C2,C3,C4,C5,C6,C7,C8, C9)

FLOW		
From	To	Flow
New York	Staten Island	40,000.00
New York	C1	100,000.00
New York	C6	40,000.00
New Jersey	Brooklyn	100,000.00
New Jersey	Queens	110,000.00
New Jersey	Staten Island	40,000.00
New Jersey	C7	50,000.00
New Jersey	C8	50,000.00
New Jersey	C9	50,000.00
Brooklyn	C2	20,000.00
Brooklyn	C4	70,000.00
Brooklyn	C5	10,000.00
Queens	C5	110,000.00
Staten Island	C3	80,000.00
		870,000.00

COSTS				
From	To	Unit Cost	Flow	Total Cost
New York	Staten Island	0.40	40,000	16,000.00
New York	C1	1.20	100,000	120,000.00
New York	C6	1.20	40,000	48,000.00
New Jersey	Brooklyn	0.50	100,000	50,000.00
New Jersey	Queens	0.70	110,000	77,000.00
New Jersey	Staten Island	0.40	40,000	16,000.00
New Jersey	C7	1.80	50,000	90,000.00
New Jersey	C8	1.90	50,000	95,000.00
New Jersey	C9	2.00	50,000	100,000.00
Brooklyn	C2	0.70	20,000	14,000.00
Brooklyn	C4	1.20	70,000	84,000.00
Brooklyn	C5	0.70	10,000	7,000.00
Queens	C5	0.70	110,000	77,000.00
Staten Island	C3	0.40	80,000	32,000.00
			870,000	826,000.00

3.   Examine the set of landfill flows for all three scenarios. Do you observe any patterns?

   - As more landfills are added (C7, C8, C9), the waste flow becomes more distributed.
   - Some depots (Bronx, Brooklyn, Queens, Staten Island) shift their flows toward the newly added landfills.
   - Transportation costs decrease slightly or stabilize because more options exist to send waste on cheaper routes.
   - Depots heavily loaded with flows in Variation 1 become less stressed by Variation 2 and 3, because the system has more outlets to balance the load.

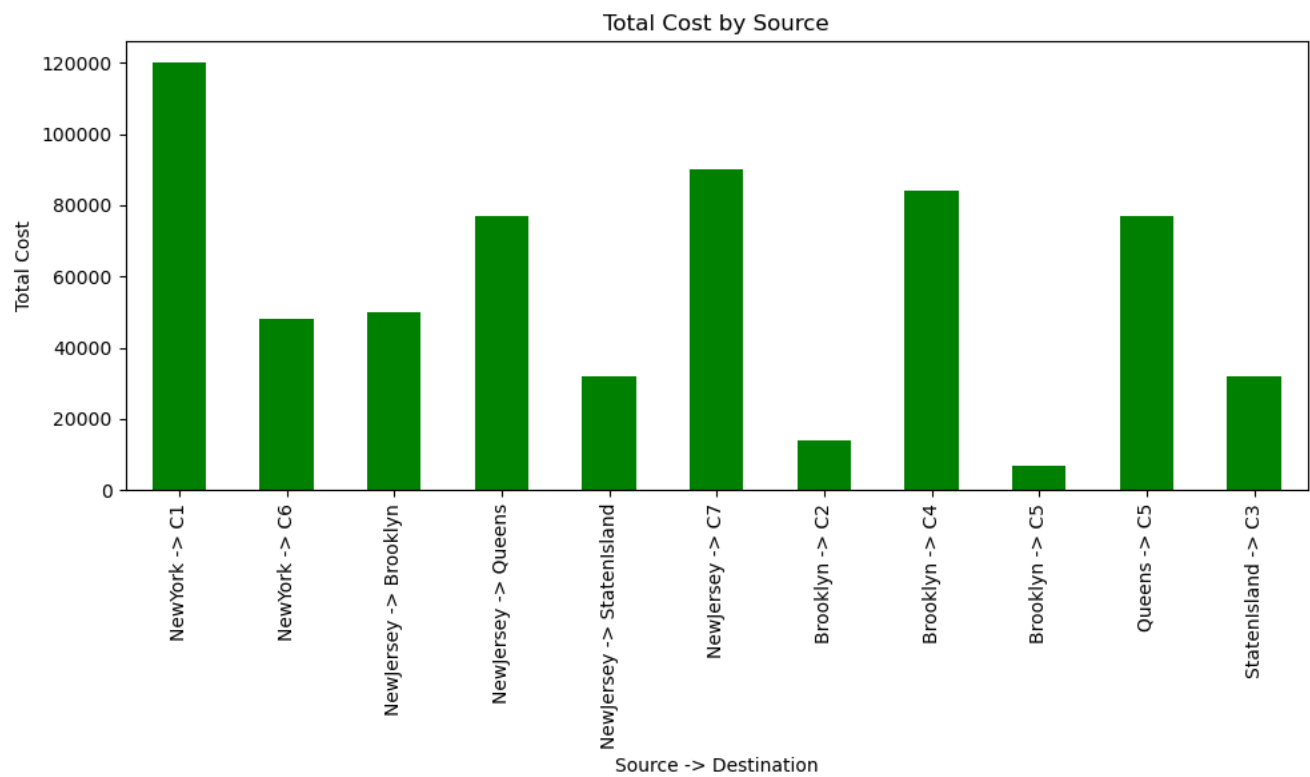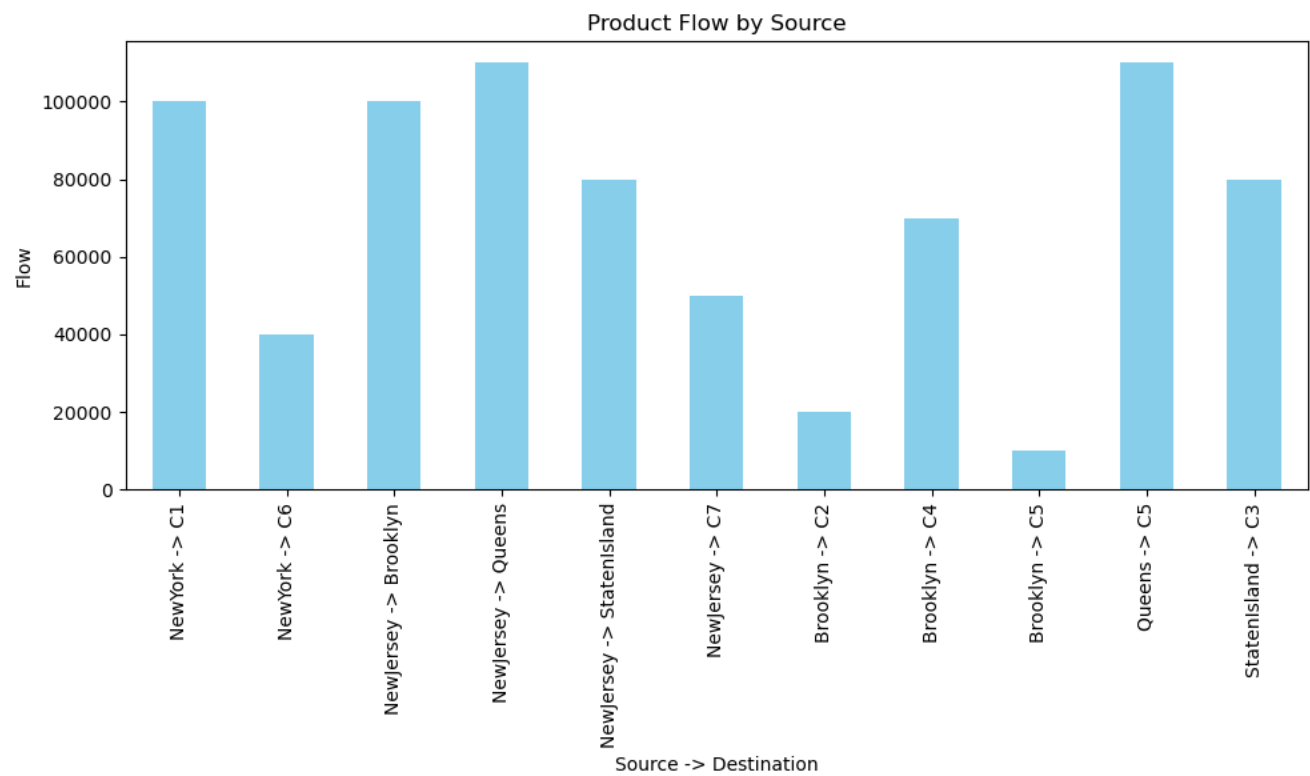4.   Explain the results of the dashboards in layman's terms (plain language).

   When new landfills were added to each variation, the transportation system naturally adjusted itself:
   - More landfills meant more choices.
     This allowed the system to distribute waste evenly across all available destinations.
   - Depots handled waste more efficiently.
     Instead of overwhelming specific depots (like Bronx or Queens), the waste was spread out more evenly.
     This reduced pressure on any specific location and kept throughput within safe limits.
   - Transportation costs were controlled.
     The model found cheaper or shorter routes to landfills, and having more options nearby helped reduce or stabilize overall transportation costs.
   - Flexibility improved.
     With additional landfills (C7, C8, C9), the system had more flexibility to redirect waste flows cost-effectively.
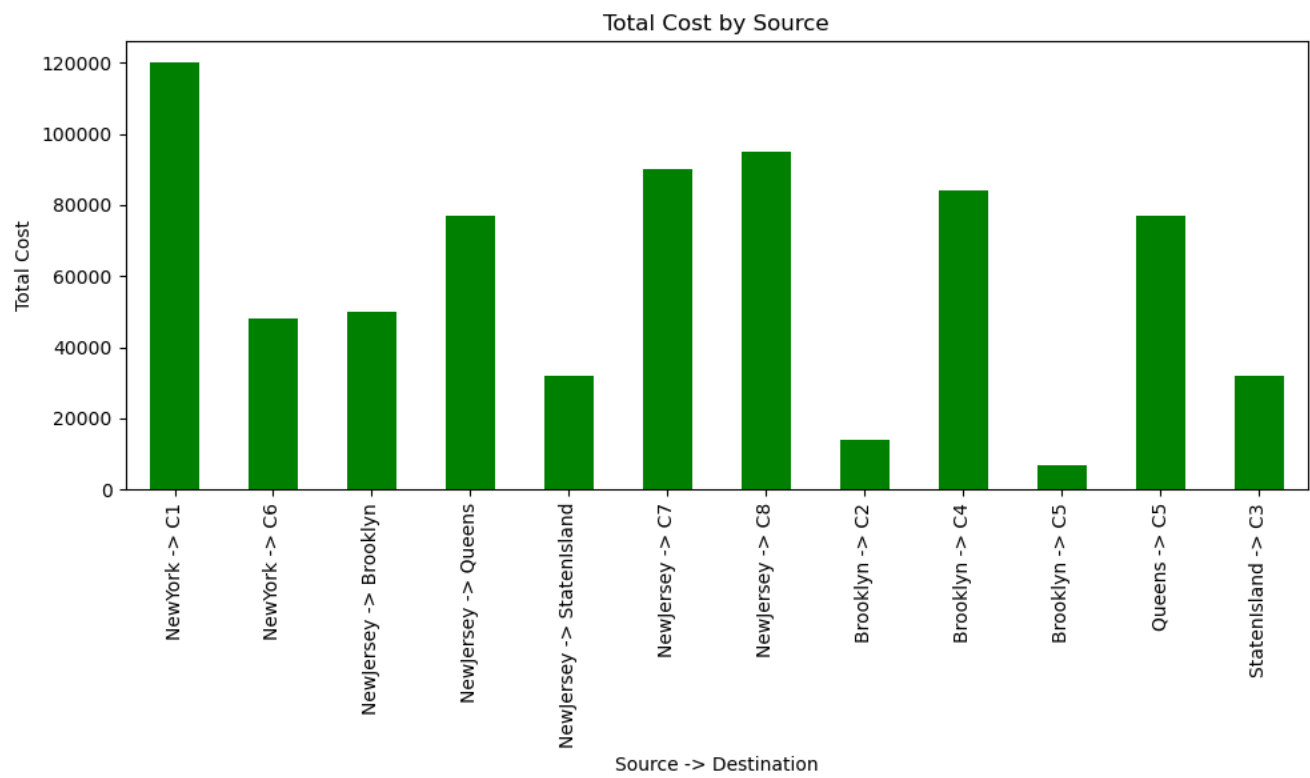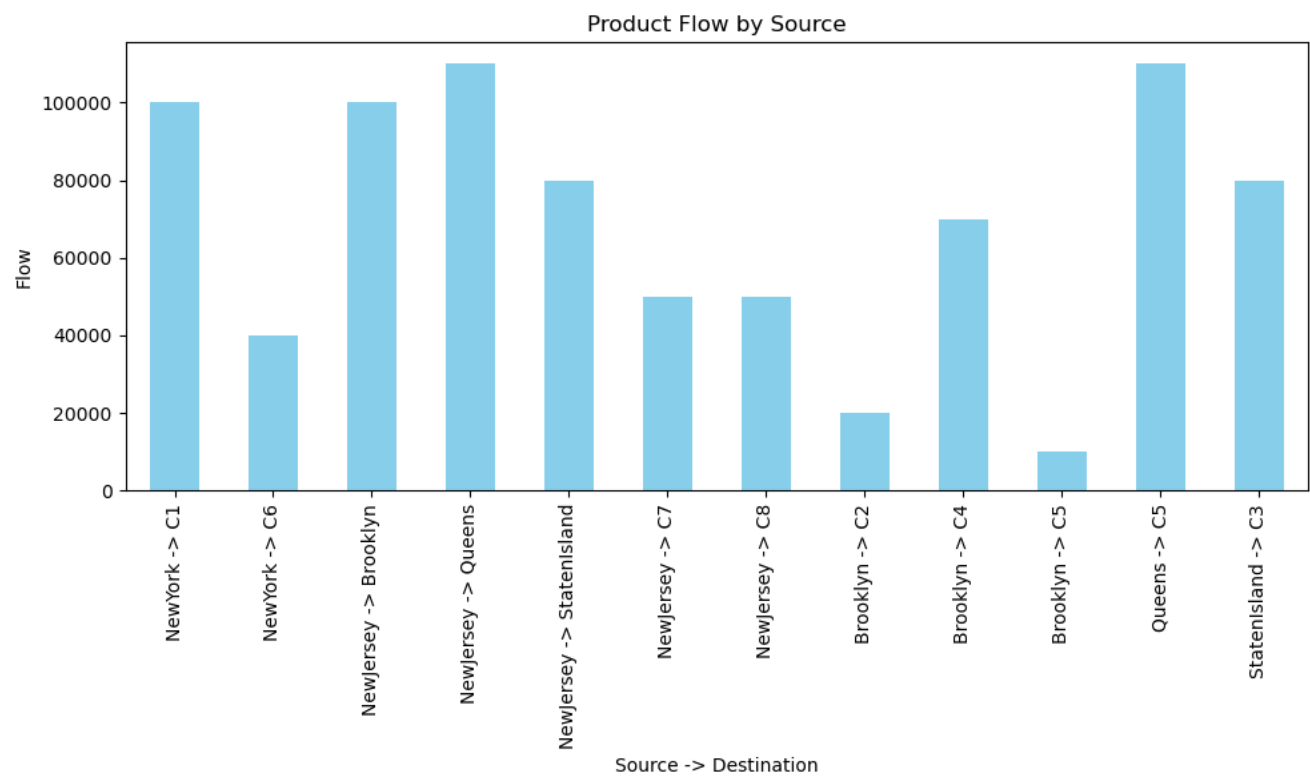
   Adding new landfills helped balance the system better, saved costs, and improved the waste distribution efficiency across the network.

Variation 1

Product Flow by Source

Total Cost by Source

Product Flow by Source

Total Cost by Source

Product Flow by Source

Total Cost by Source