

Linear Programming Applied to Humanitarian Operations Management

Following a major natural disaster, such as an earthquake, a large-scale wildfire, a flood, or a hurricane, an international humanitarian aid agency needs to distribute essential resources to several affected regions. The agency has several logistics centres located in different areas of the country and has limited resources available to respond to the emergency. The main resources available are, for example, drinking water; food; medicines; temporary shelter kits; hygiene supplies, etc. There are several affected regions, each with different needs and different levels of severity.

The objective is to determine how to allocate the available resources in order to minimise operational costs while ensuring minimum levels of humanitarian assistance.

Example

Consider that the international humanitarian aid agency has 3 logistics centers C1, C2, C3. Each logistic center has a certain available quantities the resources R1, R2, R3, R4. And the several affected regions are H1, H2, H3, H4, H5, H6.

Available quantities of resources (in some adequate measure)

	R1	R2	R3	R4
C1	20 000	15 000	10 000	18 000
C2	25 000	20 000	12 000	10 000
C3	18 000	15 000	10 000	9 000

Minimum Demand (in the same adequate measure)

Market	R1	R2	R3	R4
H1	10 000	8 000	5 000	4 000
H2	12 000	9 000	6 000	5 000
H3	8 000	7 000	4 500	4 000
H4	15 000	10 000	7 000	6 000
H5	10 000	8 000	6 000	5 000
H6	7 000	6 000	4 000	3 500

Transportation Costs (for each adequate measure)

From → To	H1	H2	H3	H4	H5	H6
C1	0.10	0.20	0.25	0.40	0.45	0.05
C2	0.20	0.10	0.15	0.35	0.30	0.25
C3	0.35	0.30	0.25	0.10	0.08	0.40

Considering only transportation costs in the objective function, subject to the constraints: (i) capacity limitations and (ii) demand satisfaction; for these data the value of the optimal solution is 20090.