DEA-Based Efficiency Evaluation of Road Rescue and Relief Bases of Yazd Province Red Crescent Society

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introduction

- 16500 killed in road accidents in Iran just in the last year 2016.

- 313000 injured in road accidents just in the last year 2016.

- Road accidents is the main cause of preventable death in Iran.

- During new year's holiday 20th may-2th April, travel and road accidents raises

- Iranian Red Crescent Society has established many road rescue and relief bases for helping people

- In Road rescue and relief bases, there are rescue equipment and vehicle, ambulances, nurses, rescuers and drivers

Data envelopment analysis (DEA)

- **Improving inefficient bases for better services**

- Data envelopment analysis (DEA) is a nonparametric method in operations research and economics for the estimation of production frontiers[clarification needed]. It is used to empirically measure the productive efficiency of decision-making units (or DMUs).

- As we don't want to increase our output (injuries,…) so we used **CCR input-oriented model** to find inefficient bases and decision to changing inputs (human resources, rescue equipment , …)

data

- for every Bases during the holiday we have theses information:

- number of accidents, death, injured, visitors, human resources(nurses, rescuers, drivers, staff), vehicles (ambulances, rescue vehicles, other)

- We gathered our information from our volunteers and staff in different cities in the Yazd province daily and recorded in a database

inputs and outputs definition in DEA model

param eter	*title*	
X1	*Human resources (person/day) including doctor, nurse, rescuer and driver*	*Input*
X2	*viechles (viechle per day) including ambulance and rescue viechle*	
Y1	*Number of treatment injured and*	*output*
Y2	*People who refer to the bases*	

DEA data for DEA solver software

	output		input	
	Refer to base	Injured treatment	Viechles per day	Human resources per day
Ardakan 1	100	14	82	155
Ardakan 2	-	6	15	75
Ardakan 3	7	4	41	155
Tabas 1	95	15	93	155
Tabas 2	54	3	93	155
Tabas3	31	14	30	75
Mehriz	24	13	93	155
Abarkuh	-	-	30	60
Taft	10	15	15	75
Bafgh	54	9	15	75
Meybod	76	2	30	60
Ashkezar	15	4	15	60
Yazd	-	-	30	75

Result from solving DEA CCR input based

No.	Base name	Base type	Efficiency	Rank
1	Tabas 3	Temporary	1	1
2	Taft	Temporary	1	1
3	Bafgh	Temporary	1	1
4	Meybod	Mobile	1	1
5	Tabas 1	Fixed	.7923	5
6	Ardakan	Fixed	.7904	6
7	Ashkezar	Mobile	.4490	7
8	Mehriz	Fixed	.4421	8
9	Ardakan3	Temporary	0.4	9
10	Tabas 2	Fixed	0.3140	10
11	Ardakan 2	Fixed	0.1431	11
12	Abarkuh	Temprory	0	12
13	Yazd	Temporary	0	13

conclusion

- Only four relief road bases (three temporary ones and mobile bases) among 13 achieved a high level of performance and two bases were also zero. It shows bases with high performance are located in proper place.

- Also clarified Bases with low or zero performance are located in an improper place. roads those bases located didn't need any base and human resources and equipment could be distributed in other places.