

**A BI-OBJECTIVE SAFETY BASED SOLID TRANSPORTATION  
MODEL UNDER UNCERTAIN ENVIRONMENT****Das A., Bera U.K.**

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This paper mainly investigate a new solid transportation model with safety constraint under uncertain environment where the unit transportation cost, desired safety and time, the supplies, the demands, the conveyance capacities all are uncertain in nature. While transporting items from its origins to destinations through different conveyances, there are some difficulties/risks to transport the items due to weather complications, bad road, insurgency etc. in some routes. Due to this the total desired safety factor is being introduced. However with the use of inverse uncertain distribution the proposed model under uncertainty converted to its deterministic form by taking expected value on objective functions and confidence level on the constraints. Finally a numerical example is provided to show the application of the model.

**Keywords:** multi objective solid transportation problem, uncertainty theory, weighted mean technique, safety factor.

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**1. Introduction**

Solid Transportation Problem (STP), a general form of well-known traditional Transportation Problem (TP), was stated by Shell [15] in 1955, which deal with the three item properties viz. source, destination and conveyance in the constraint set instead of two items namely source and destination. Later on 1962 Haley [5] present a revolutionary study on STP. So many researchers investigated many models and algorithms for solid transportation problem under both crisp and uncertain environment. Bit et al. [2] presented the fuzzy programming model for a multi-objective STP, Jiménez and Verdegay [6] studied two kinds of uncertain STP, that is, the supplies, demands and conveyance capacities are interval numbers and fuzzy numbers, respectively. In addition, Li et al. [7] designed a neural network approach to formulate bi-criteria STP. Gen et al. [4] gave a genetic algorithm for solving bicriteria FSTP. Recently Baidya et al. [1, 16] introduced safety measure in multi-item solid transportation problem with safety measure.

In transportation problem uncertainty occurs often. The reason behind of this is that, bad weather conditions, changes in the market policy, bad road conditions, like as hilly areas road, sometimes the demand may not fixed or exact etc. So to handle this type of situation the study of uncertain solid transportation is very necessary. There are so many approaches to study the uncertain cases, in our approach we use

## Conclusion

This paper is about a bi-objective solid transportation problem under the uncertain environment where the safety has been taken into consideration. From the results of the proposed model it has been observed that when the safety is considered then the objective value of BOSTP and total transportation time increased by some amount with respects to the objective value and time of transportation without safety. Which is logically justified. Also here we observed that in safety based transportation the total amount of transported goods and the total transportation cost are almost same, but there are some changes in transportation plan compare to the transportation plan without safety. So our conclusion here is that if we make perfect transportation plan then it will be easy and profitable to transport goods from source to destination via conveyance with safety under uncertain environment. We hope this study of uncertainty help the transportation of very important goods like as Petroleum, Coal, and different type of Chemical etc. safely.

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