

## **Introduction**

Incidence or exacerbation of negative and harmful effects of transportation as one of the core parts of the country in recent years has been considered by most experts and planners. For example, the density of vehicles on urban streets and high consumption of fossil fuels, will remind the problem of finishing this kind of energy and also spreading the environmental damaging emissions. In this regard statistics show that by 2025, energy consumption and greenhouse gas emissions in the transportation sector in 2000 will be expected to double. Furthermore, on average, about 500 thousand people a year in developing countries, die prematurely due to air pollution of transportation. Although several studies in other countries have been conducted on various aspects of sustainable transport, but this issue has been considered in our country recently. In this study, more emphasis on dynamic system model of transportation, display and evaluate multiple scenarios change over the next few years. To this regard, we attempted to use system dynamics models, carrier transport in (Mashhad, Iran is one of the metropolises) is simulated. The structure of this paper consists of seven sections in the literature review is performed related to sustainable urban transport.

According to the approach paper, the parameters are given in this section. Then, the research methodology, principles and elements of models explaining the dynamics of the system and the dynamic model of sustainable urban transportation and its subsets are described. Then, the results of the study indicate that between the years 1388 and 1408 exacerbated the challenges and difficulties of transport are shown. Then, the introduction of the policy of sustainable development in the transport sector 20 scenarios to assess Mashhad Urban Transport over the next 20 years were assessed using diagrams be purchased. Finally, the city's planning model to optimize the parameters of sustainable transport transportation is provided.

## **Materials and methods**

After explaining the concept of sustainable transportation and its parameters, then the introduction of a comprehensive, efficient and comprehensive evaluation of the sustainability of transportation is performed. In recent decades, several models have

attempted to show how the behavior and performance of various systems. Among these models the dynamics of the system in comparison with other models of causal relationships and feedback. Allowing for the variables and parameters in terms of delay or non-uniform effects over time, as long as a suitable method for the evaluation.

Elements forming causal loop diagrams involving the independent variables (causes), dependent variables (Handicapped) and the arrows indicate the direction of the causal link between the forms is shown in figure (1). In Figure 1 the variable X as the independent variable and the dependent variable Y is defined.



Figure 1. Relationship between the independent and dependent variables; Reference.

The important thing is that always means a positive cycle of good development and is not stable and According to the desired index, negative cycles may be desirable in planning and policy making. According to the definition of system dynamics models, then system dynamics method and the modeling process are discussed. First assign a picture to describe the conceptual model are found. This stage of the model is important, because any choice of parameters and relations between them, indicate the desired model study will assess policies. Then, based on the conceptual model developed flow mechanism causal relationships between variables are presented. To represent causal relationships among the various elements of a system in which feedback loops are formed, the causal loop diagrams are used. These diagrams can communicate with the other elements of a system are described in other systems and evaluate multiple hypotheses and multiple attempts to solve complex problems. In the final stage, which is called the development of a dynamic system model, all variables must be specified dimensions and units of measurement. Then, the mathematical relationships between specific functions and data required being collected in the case study. If you do not have access to some variables used in the mathematical model and finally simplified mathematical relationships among variables in a system dynamics simulation software that.

## **Finding and results**

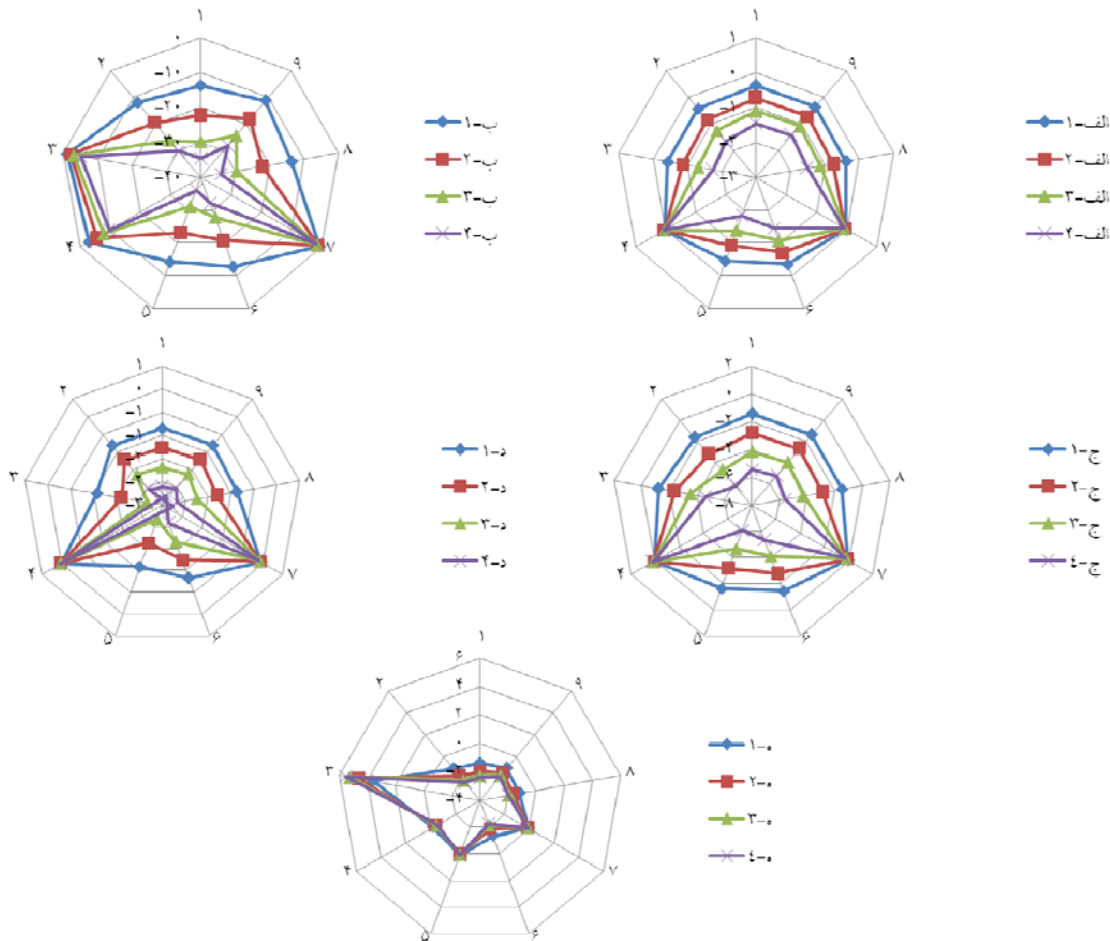
To assess the sustainability of freight transport in Mashhad, carrying five policy goals and strategies According to the sustainable transport is introduced. Scenarios to assess the dynamics of the system as a result of the 9 indicators and models from 1388 (base year) and 1408 (year of the project) has been investigated. implement this policy include increasing the utility, march of time, loss of old cars, old cars reduced, Teleporting and the quality of public transport vehicles is. For each policy, 4 and thus study identified a total of 20 scenarios (scenarios A.1 to the E-4) have been investigated. System software by entering values in the dynamics scenarios, the results of each scenario over the next 20 years (1388 to 1408) have been obtained.

To compare the scenarios in Mashhad, Iran, in 1388 and 1408 index values are considered. Be purchased using the diagram is depicted in Figure 2. In this way, all 20 scenarios within 5 years of the project are listed in the policy domain. In each plot, the characters of which there are nine axes.

Table1. Policies and the use of scenarios for evaluating sustainable freight transport in Mashhad, Source: The authors

Scenario	quantity	Scenario	Quantity	Scenario	quantity	Scenario	Unit	Initial value	Unit	Variable	Policy
A-4	0.25	A-3	0.2	A-2	0.15	A-1	0.1	0.05	Percent	Change the way of travel to walking	Walking increased desirability
B-4	2.35	B-3	2	B-2	1.6	B-2	1.3	1	Person	Average passenger in vehicles	The development of rally policy
C-4	0.006	C-3	0.005	C-2	0.004	C-1	0.003	0.002	Percent	Car overthrowing rates	Decline in old cars
D-4	0.25	D-3	0.2	D-2	0.15	D-1	0.1	0	Percent	Reduce occupational trips	Tele-working Policy
E-4	9	E-3	8	E-2	7	E-1	6	5	–	Improve the quality of bus travel	Increase the quality of public transport

Fig 2. Comparing the relative amounts (in percent) from 1 to 9 of the 20 scenarios (scenarios A-1 to E-4) Source: Authors.



The same as in Figure 1 has been determined, the relative values of parameters in scenarios A-4, B-4, C-4, D-4 and E-4 greatest change in the index compared with other scenarios in each politics. In general, most changes in the index values corresponding to scenario B-1 to B-4 and thereafter, the maximum change in scenario C-1 to C-4 Index study are created. For example, in scenario B-1 to B-4 is associated with the development of policies rally will be 3 index (annual consumption of diesel to gasoline-powered vehicles) and 7 index (level of noise pollution in urban areas) has been less volatile compared with the lack of options and other index have been more volatile. Finally, to compare and choose the best scenario of sustainable transportation strategies, and compare the values of all parameters in the scenarios and the negative

of these indicators, the lowest one is selected. In Figure 1 the results are expressed as the picture. As specified in Figure 2, the vertical axis and the horizontal axis relative amounts of study indicators of effective policy scenarios in each group are shown. In this figure, the relative amounts of different colors and indices with each index are shown from top to bottom. For example, in the area of annual production of CO emissions (indicator 6), respectively, scenarios, B-4, C-4, E-4 A-4 D-4, and have had the greatest impact on reducing the index. As a summary, the perfect pattern to reduce the negative impacts of transport policy scenarios in order to take the trekking (B-4), the reduction of old cars (C-4) and increase the quality of public transport (eg -4) are recommended in Mashhad city transportation planning.

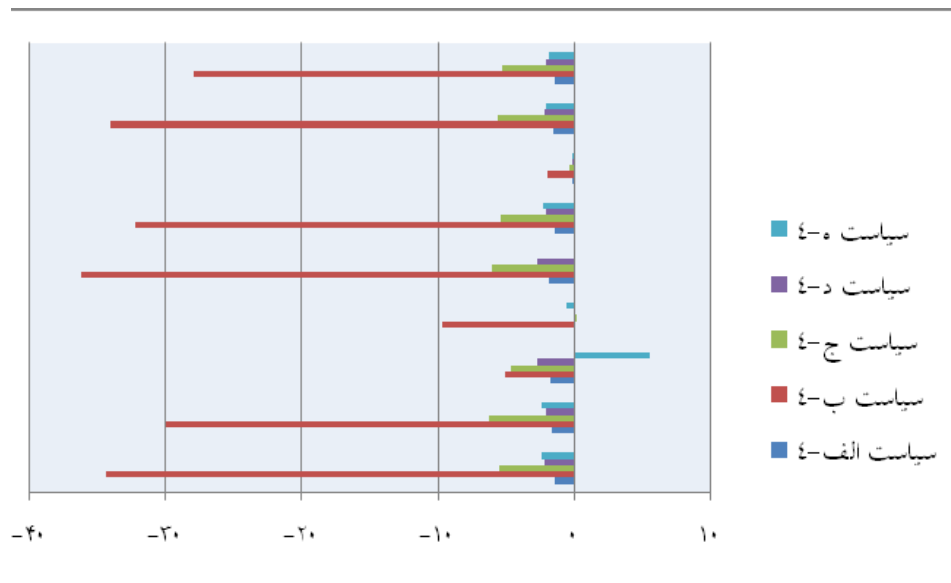


Fig 2. Compare and patterning best scenario for achieving sustainable transportation in the city of Mashhad, Source: The authors.

## Conclusion

With regard to the shortcomings of the static models in transportation planning, transportation, this article carries with it sustainable urban transport system dynamics simulation model is implemented. In the model year 1388 as the base year and the year 1408 as the year of the project is considered. Model results for the 20 year period with 9 transports associated with transporting have been calculated in Mashhad. In the following five basic policies and at each of four scenarios (a total of 20 scenarios) the

model is presented. These scenarios are evaluated by the comparison of the diagrams be purchased indicator results have been achieved. The scenarios have been identified in this assessment, policy development march (B-4), the reduction of old cars (C-4) and increase the quality of public transport means (E 4), and have made the greatest impact to minimize the index of growth within 20 years of the study. The studies that have been conducted in the city of Mashhad, the static models were used for transportation. In this paper, for the first time, the system dynamics model to evaluate sustainability of transportation is used in Mashhad. It is recommended for future studies, that the selection of indicators and more comprehensive policies, such as the development of rail transport systems, other analysis methods to compare the criteria to be used in any scenario. The results of this study seem to be a good model for achieving sustainable transportation provides transportation administrators and program planners to put in Mashhad.