Application of Cost-Benefit Analysis in Assessment of Railroad Projects; a Case Study: Gorgan- Mashhad Railroad (Iran)

Saeed Arabtaheri

Department of Economic, Payam-e-Noor University, Gorgan, Iran
arabtaheri@yahoo.co.uk

Abstract: The history of growth and development in developed countries indicate that transportation has an important role in economic growth of these countries, such that most scientists and specialists of economic affairs believe that the transportation industry is the axis of growth and development in Europe and America. In Iran, also, transportation has been introduced as the key to development, and among the different routes of transportation, railroad has an important role in this respect. Considering the large volume of required investment for railroad projects, it is evident that scientific studies are needed to evaluate whether or not these project are economical. In this study, we have used the method of cost-benefit analysis and concluded that establishment of Gorgan-Mashhad railroad is economical.

[Saeed Arabtaheri. **Application of Cost-Benefit Analysis in Assessment of Railroad Projects; a Case Study: Gorgan- Mashhad Railroad (Iran).** Journal of American Science 2011;7(8):671-678]. (ISSN: 1545-1003). http://www.americanscience.org.

Keywords: Cost-Benefit Analysis; transportation; economic; development

1. Introduction

Having access to markets is an important point in the capability of a region to have a successful performance in the integrated network of world trade. Owing to the role they play in the facilitation of access to the site of companies, enterprises, and also households, transportation vehicles and systems are so important. Transportation is considered as the most important determinant factor in industrial locating. In any economic system, either advanced or primitive, there are some degrees of necessity for transportation of materials, goods, man, ideas, or innovations, since all economic activities of man are not gathered in one place. Investment in transportation can have long-term and extensive environmental and socioeconomic effects. Therefore, the decisions related to policy making and programming for transportation mostly lead to outstanding effects on economic development, through influencing on consumable costs and the state costs, employment opportunities, consuming the resources, efficiency, quality of local environment, price of real estates, the economic potentials, and wealth accumulation.

Advancement and development of countries is accompanied with an increase in the volume, inputs, and outputs of the economic system, which relies on the development of transportation system. Developed industrial countries depend extensively on remote raw materials to maintain the flow of production on the one hand, and on the other hand having the greatest effort to achieve global markets.

Thus, the international transportation of goods is so extensive. From the structural point of view, transportation network is so complex, such that transportation is an objective necessity for global economy as well as political powers. Transportation is defined as carrying goods, passengers, or ideas from one place to another place. After the end of World War II, most governments and local authorities tried to improve their transportation communications with other regions. The main communication route among the regions is railroad and the regions that have such communication routes enjoy a higher level of regional development compared with other areas. Thus, most regions try to establish this route to improve their communication with other centers and also benefit from its economic effects.

The inter-city routes and highways between different regions are the next important route of communication between different areas that facilitate the access of different regions. Technological advancements and transportation of goods by tracks have led to flexibility in the flow of goods distribution and several new centers for economic activities have been created in small towns.

Moreover, air transit has developed new communication. However, because of its specific properties, railroads have maintained its position as a powerful route of transportation.

It is stated that railroad industry requires great investments and the industry observes specific regulations and it has a bad reputation in resistance against changes. However, in comparison with other transportation systems, railroad transportations have many advantages. For instance, we can point to some of its advantages such as safety, travel comfort, low

costs, fuel consumption providence, lower air pollution, high capacity in carrying passengers and goods, and less land occupation.

Establishment of Gorgan-Mashhad railroad is one of the state projects to expand the railroad system of the country, which as an essential infrastructure can improve the socioeconomic state of the northern part of the country.

Considering the positions of Mashhad (as the second metropolitan area of the country), and Bojnurd and Gorgan (as the capital cities of the northern Khorasan and Golestan provinces), along with some other important cities such as Ghuchan, Shirvan, and Gonbad, establishment of a railroad network in the northern part of the country seems to be necessary.

Moreover, establishment of this network would make the communication of towns in the northern parts of these two provinces with other provinces possible. In future, establishment of Sari-Bandar-e Anzali railroad would provide a safe railroad route between the northeastern and northwestern parts of the country. Moreover, this railroad would communicate the towns in north part of the northern Khorasan province and its capital, Bojnurd, to Tehran. Regarding the direction of the route along the boundary of Iran-Turkmenistan, this route can serve as a communication road among the towns in the northern parts of these two provinces and Turkmenistan and be considered as a route parallel with east-west corridor.

2. Methodology

Cost-benefit analysis is one of the most important analyses of economic assessment.

The history of cost-benefit analysis (CBA) shows how its theoretical origins date back to issues in infrastructure appraisal in France in the 19th century. The method quantifies all costs and main benefits of the project. The major strength of cost-benefit analysis is that the method considers the costs and benefits of different alternatives of the project in a relevant framework. Therefore, the results are presented as a range of the choices that are converted into comparable values.

The cost-benefit analysis provides a protocol (a set of defined concepts) for estimation of the effects of suggested policies on the effectiveness, which can help us determine whether or not the expected results (outcomes) are beneficial for people. This analysis has become a common method in evaluation of public projects; for instance, construction of a new urban highway, construction of a new airport in site A or B, making decision on issuing a certificate for further excavation of minerals, or environmental assets. These are the decision for which cost-benefit analysis can be employed. In fact, one of the interesting aspects of cost-benefit analysis is its applicability in many different areas.

Besides, cost-benefit analysis is a fundamental and technical theory in neoclassical wealth economy, which is consistent with the patterns of neoclassical sub-economy and emphasizes on the role of prices in assigning the resources, and is widely used in economic evaluation of projects.

According to the United Nations Organization, cost-benefit analysis is defined as a method for evaluation of desirability of a project through comparison of the incomes of the project with its costs, where the prices are transformed into current values with an appropriate official decrease.

Cost-benefit analysis is providing a practical solution for determination of desirability of the projects from the viewpoint of their effects during the time and also their range of action in different industries and regions. To achieve this, the costs and benefits should be calculated and determined.

This is the method of identifying, describing, and evaluating the factors that should be addressed in a rational and economic decision, and in fact, it requires some modifications in the concepts of current cost and benefit, which reflects the objectives, bases, and social constraints instead of individual constraints, in evaluation of investment projects.

However, it should not be ignored that cost-benefit analysis as a method for information flow is progressive. Thus, in spite of the problems that are encountered because of scarcity of required statistics or because they need predicting the application, this analysis is the most useful framework for evaluation of projects and programs related to development of resources.

One of the advantages of employing cost-benefit analysis is the help of this method in removing the need for centralization of decision making centers in the economy. Even if the public sector is small, no central government would be able to make decisions on the number and types of required public projects just by relying on the current information. The presence of a decision making center for calculation of costs and benefits of each investment project is essential. Therefore, to facilitate the improvement of cost and benefit determination of a project, decentralization of decision making centers is necessary.

Accordingly, cost-benefit analysis is a practical method for assessment of the profitability of projects. For better fulfillment of the method, the current and future conditions of the community should be carefully evaluated. Many projects that are

not currently useful for the community may be so advantageous in future.

In general, it should be mentioned that the need for cost-benefit analysis roots in the viewpoint that the following items should be observed in any investment in public sector:

a) Considering the complete set of social costs and benefits resulted from a project in the national economy,

b) Valuation of inputs with respect to the costs of their final social opportunity and also outputs with respect to their final social value,

c) The future decrease in costs and benefits which were correctly evaluated according to the social reduction rate.

Cost-benefit analysis is not a theory by itself; rather it is technique with the aim of providing a set of appropriate and systematic theoretical regulations and methods for directing public sector investments. It is usually fulfilled to help establishment of policies in a specific framework. According to R. Sagon and A. Williams, employment of cost-benefit analysis provides a framework for public decision making, which will lead to more responsible decision making.

A private investor does not mostly evaluate the non-economic and social aspects of his desired project. For a private investor, if he knows his goals, it would be easier for him to select one project among different ones and all he needs to know is that which project satisfies his goals in the best way.

However, in social cost-benefit analysis, income of the project is not the true index for social costs, and since social costs and benefits are different from the individual ones, investment decisions on the basis of commercial benefits may lead to a series of wrong decisions with respect to social wealth, which should be observed by the government.

The main guideline for cost-benefit analysis can be summarized in the following five stages:

1) Determining all the outcomes related to a specific decision that is linked with public policies,

2) Estimation of the monetary value of all these outcomes, such that the value of cost flow and assignable social benefits can be obtained,

3) Estimation of the current pure value of these costs and benefits using a decrease rate,

4) Comparison of the current pure value of costs with the current value of benefits in a general ratio of cost-benefit,

5) Selection of the items in which the cost-benefit ratio is smaller than one and then selection of the choice with the least ratio of cost-benefit.

Studies on estimation of load and passenger demand

- Evaluation of load demand:

Carrying goods is one of the main reasons for establishment of railroads. In fact, railroad is the safest and most economic route of carrying goods in large distances.

The main exported goods of Khorasan province are brimstone, urea, and میلگرد, and the main imported goods are corn, ironware, and gasoline. The weight of exported and imported goods of the province were 6978 and 6888 thousands of tons, respectively, and in the same year, 8593 thousands of tons of goods were transported in the province.

The main exports of Golestan province are wheat, potato, and chipboard, and the main imports are cement, gypsum, and corn. The amount of imported and exported goods were 2473 and 2519 thousands of tons, respectively, and 678 tons of goods were transported in the province.

Transit load demand:

Most specialists believe that Iran has a great potential for transit of goods, which is be considered as export. Some countries such as Turkey, Bulgaria, Germany, and Netherlands that are in the route of goods transit have special advantage and thus earn a large amount of income through transit of goods.

Similar to the above-mentioned countries, Iran is located in the route of goods transit and also in the route of Baltic, Caucasian, middle Asian, and Slav countries, and thus has an outstanding position in this respect. Thus, the country can have a better performance in this respect.

In the transit sector, most transported goods in the descending order were fuel materials (730,000 tons, 17%), cotton (523,000 tons, 13%), foods (273000 tons, 7%), constructional materials (236,000 tons, 6%), and vegetable oils (203,000 tons, 5%). Moreover, the main origin of most transits was the United Arab Emirates (40%), and the main destination of most loaded transits was Afghanistan (22%). The most active boundaries in imported transits were Bandar Abbas (1,744,000 tons, 42%), Serakhs (1,140,000 tons, 27%), and Bazargan (569,000 tons, 14%).

It should be noted that besides the 4,183,590 tons of transited goods in the country, 3,885,041 tons of oil materials were imported in the SWAP framework in Neka and Noushahr ports. Thus, the 12-month statistic of the total transit in the year 2003 was 8,068,631 tons, which was increased 68.81%, compared with the time period of the past year.

Of the 4,183,590 tons of goods transited in Iran, the share of railroad and road were 28% and 72%, respectively.

During the 12 months of 2003, 730,000 tons of oil materials (17%) and 3,454,000 tons of non-oil materials were transited through Iran.

Concerning the transit load demand for Gorgan-Mashhad axis, we can consider the goods from the origin of Turkey, Iraq, and Azerbaijan to Turkmenistan, and vice versa as the potential transit of the route. In this respect, we could have 236,337 tons of transited goods in this axis.

- Evaluation of passenger demand:

Carrying passengers is one of the main goals of railroad establishment. Here, by considering the statistics of road passengers and calculating an appropriate absorption rate, we would predict the number of railroad passengers.

Costs of the project

- Costs of fulfillment of the project:

The costs of fulfillment of the project are the costs from the initiation of the preliminary studies to the end of establishment and operation of the railroad. Thus, the costs can be classified as follows:

- The costs for preparation of executive maps and application of the route,
- The costs for buying the lands and removing the obstacles in the surrounding of the rout,
- The costs of executive steps of the project,
- The costs of providing and installing the signs,
- The fees of consultant supervising engineers, senior supervisors, laboratory, research, and qualitative controls, and
- The costs of transportation vehicles.

The costs of fulfillment of the project were presented in table 1.

Table 1- Summary of the establishment costs of Gorgan-Mashhad railroad

Section		Cost (10^9 Rials)
Engineering searches		27.5
Surveillance, higher surveillance, experiments and qualitative controls		178.5
To own estates		105
Run	Bed construction	1209
	Upper construction	1212
	Bridge	385
	Tunnel	215
	Stations	335
	guidelines	457
Buying fleets		802
Total		4926

The prediction of operation and maintenance costs of the axis, including the different details of the costs during the project in different years and with different methods of repair and maintenance, and putting the project into operation are provided in the annexed table.

a) Costs of repair and maintenance of the railroad:

Repair and maintenance operation consists of the three major sections of current maintenance, improvement, and repair of the route.

b) Costs of repair and maintenance of the fleet:

The costs consist of the annual costs of repair and maintenance of locomotives and load wagons.

c) Costs of operation:

The costs of operation consist of:

1: human force/ operation force costs, and

2: costs of fleet fuel and oil

The income of the project

a) Benefits from fuel consumption providence (diesel and oil).

Table 2- K and n values for UIC formula

	Bed construction - technical buildings - buildings	Upper construction	Guidelines and communications	Fleet
K	0%	7%	1%	3%
n	50	35	35	30

Through changing people's behavior, railroad transportation will lead to less frequent use of automobiles and thus improved environmental condition. Providence in fuel consumption is not only an advantage of the project, but also one of the necessities of fulfillment of the project; since by a decrease in the amount of non-renewable resources and the growth in their consumption, a serious providence in oil products and searching for practical methods in this respect are inevitable.

As transportation sector is the largest consumer of fuels, replacement of road transportation with railroad transportation will be an efficient method in fuel providence. Employing this approach, a significant providence in fuel consumption will be achieved and people will enjoy its advantages.

With regard to the amount of providence, various studies have been carried out. According to the director of Iranian Environmental Protection Agency, the fuel consumption in road transportation in Iran is 9.3 folds of that of the railroad transportation.

In 2003, the means of transportation in Iran were as follows: 116 million passengers by bus and 9.99 million passengers by minibus and cars. Thus, 52%, 44%, and 4% of passengers were carried by buses, minibuses, and cars, respectively.

Now, considering 15, 18, and 60 ml of fuel consumption for each person-km with bus, minibus, and car, if the passengers who travelled by province or local railroads, travel by road vehicles, then fuel consumption for buses, minibuses, and cars in 2012 will be 9226, 3475, and 1053 m3, respectively, and in total it will be 13755 m3. This is while the consumed fuel of passenger locomotives will be 5119 m3, and thus 8636 m3 of fuel providence will be achieved. The mentioned providence will be 7583 and 1053 m3 in diesel and gasoline, respectively.

- Fuel providence in load fleet:

The diesel consumption in trucks is 25 ml per km-tons of loads. Therefore, in 2012, 42437 m3 of diesel will be consumed. This is while the consumed fuel of the railroad fleet will be 12566 m3, which shows 1053 m3 fuel providence.

- Total fuel providence:

The total consumed fuel in road transportation will be 55138 m3 of diesel and 1053 m3 of gasoline, which is in total 56191 m3.

The total consumed fuel regarding the main, maneuver, and standby locomotives will be 20288 m3. Thus, 34850, 1053, and 35903 m3 of diesel, gasoline, and total fuel providence will be achieved, respectively.

- Value of fuel providence:

Considering the price of each liter of gasoline and diesel to be 2700 rials (international fuel prices), the value of fuel providence will be 89 billion rials. This can be regarded as one of the benefits of the projects.

- Oil providence:

In general, oil consumption in railroad transportation is 1.1% of the fuel consumption. But in road transportation, the oil consumption is about 2% of the fuel consumption. Therefore, using railroad transportation, 0.9% providence in fuel consumption multiplied by the fuel providence coefficient in railroad will be achieved. The road fleet for transit of goods and passengers that is replaced by railroad transportation in 2012 would use 1124 m3 of oil, and considering the 355 m3 of the consumed oil by the railroad fleet, 769 m3 of oil providence will be achieved.

- Value of oil providence:

Considering the price of each liter of oil to be 16500 rials, the value of oil providence will be 13 billion rials.

- Total value of fuel and oil providence:

The total value of fuel and oil providence achieved by replacement of road transportation by railroad in 2011 will be 100 billion rials.

The total value of fuel and oil providence in the coming 20 years is estimated to be 4167 billion rials.

b) Ticket sales or transit fare:

The fare of railroad that is obtained from the passengers and owners of goods would be obtained by road drivers, if railroad is not established. Thus, the income of railroad is achieved at the cost of a decrease in income of other sectors. In other words, the fare obtained by railroad sector is not social benefit; rather it is a replacement of incomes.

Hence, in calculating the social benefits of the projects for public projects, we should only consider the benefits that were not achieved with any other sectors before the implementation of the project and they would be achieved through application of the project and not only the change of combination of benefits and incomes that are currently present in the society. To this end, we have removed the railroad fares in evaluation of the social benefits of the project.

According to the specified fees, the obtained income by transportation of goods and passengers will be as follows:

Passengers:

The total route in the coming 20 years: 890 billion rials,

Goods:

Import and export in the coming 20 years: 1479 billion rials,

Transit in the coming 20 years: 777 billion rials,

Local transportation in the coming 20 years: 3122 billion rials, and

Loading in the total route in the coming 20 years: 5377 billion Rials

c) Decreased road accidents:

Each year, road accidents cause great losses to different countries. According to the World Health Organization, more than one third of the victims of accidents in the world are from third world countries.

Almost one percent of the national gross production of our country is wasted due to ignorance of the safety of the country's traffic. According to the estimates, the cost of road accidents in Iran is almost 340 billion Toman annually. This is while, the emotional stress of injured and families of victims of road accidents and the negative effect of these stresses on their socioeconomic performance is not included in the calculations, otherwise the loss would be much higher. In most cases, trucks and other heavy vehicles directly and indirectly play a major role in occurrence of road accidents.

Establishment of the aforementioned railroad would result in a significant decrease in the number of trucks, trailers, and minibuses on the road, and consequently the number of accidents and their costs. According to the studies of the comprehensive Iranian transportation project, establishment of railroad would decrease the costs of road accidents by 40%.

According the transportation model across the country, the basis of the calculations was as follows:

- Number of passengers of a car: 3 persons,
- Number of passengers of a minibus: 17 persons
- Number of passengers of a bus: 20 persons, and
- Mean weight of a truck load; 11 tons.

In 2002, inter-city load and passenger road transportation was 83.603 billion tons-km and 51.950 billion person-km, respectively. The number of travels was 12.851 million of vehicles, and the

number of travels of loading trucks was 14.872 million. The mean distance passed by passenger transportation vehicles and loading vehicles were 222 and 485 km, respectively. Thus, in 2002, 10058 million vehicle-km were transported.

The loss of road accidents in 2002, which led to 21 thousands deaths and injuries, was almost 7800 billion rials. Thus, the loss per one million vehicle-km was almost 775 million rials.

With regard to the mean number of passengers in public vehicles as 18 persons and the mean loading weight of trucks to be 11 tons, and considering the estimated loading and passenger in Section C and the length of the route to be 585 km, in 2012, we would have 161 million vehicle-km of transportation. Then, considering the 775 million rials loss per one million vehicle-km transportation, the safety value in 2012 will be 125 billion rials.

D- Scrap remaining after the project:

At the end of projects, usually some instruments will remain that are completely worn out and they are sold as scraps. Since the life of some other instruments and facilities is longer than the general duration of the project or as they were bought during the project, at the end of the project they are still usable and can be sold as used materials or be used in similar projects. Regarding this project, it can be noted that all remaining scrap is ironware, because the major portion of locomotives and passenger wagons and all parts of the loading wagons and rails are made from iron. Considering the instruments that can still be used, at the end of the project they will be valued by the direct line depreciation method.

For pavement, superstructure, buildings, bridges, communication signs, and the fleet, the scrap value is calculated by UIC formula as follows:

$$R_m = (V - K)\frac{(1+i)^n - (1+i)^m}{(1+i)^n - 1} + k$$

where Rm is the remaining depreciation value of instruments, buildings, installations, pavements, and superstructures in the desired year m, V is the basic value, K is the recycling value as a percentage of the basic value, i is the interest rate, n is the effective life in years, and m is the year for which the depreciation value is calculated.

Considering the above-mentioned formula, the total depreciation value for the project is 3011 billion rials.

On the basis of the estimations, the project will be carried out in four years.

E) Employment opportunities brought by the project:

The project can lead to some employment opportunities during its fulfillment and operation. Since according to the standards of the Iranian Management and Programming Organization, on average 100 million rials of investment is needed for one employment position, then the value of provided employments (for 660 persons) would be 66 billion rials.

3. Results of economic evaluation of the project

The costs and incomes are provided in Tables 2 and 3.

Table 3- Goods and passenger request of Gorgan-Mashhad

Year	Internal Goods (1000 tones)	Transit goods (1000 tones)	Export & Import goods(1000 tones)	Province passenger (1000 persons)	Local passenger (1000 persons)
1390	1280	185	543	705	716
1391	1348	194	582	723	724
1392	1416	203	621	741	731
1393	1485	213	660	760	738
1394	1553	222	699	779	746
1395	1621	232	738	798	753
1396	1689	241	777	818	760
1397	1757	250	816	838	768
1398	1825	260	855	859	776
1399	1894	269	893	881	784
1400	1962	279	932	903	791
1401	2030	288	971	925	799
1402	2098	298	1010	949	807
1403	2166	307	1049	972	815
1404	2235	316	1088	997	824
1405	2303	326	1127	1022	832
1406	2371	335	1166	1047	840
1407	2439	345	1205	1073	848
1408	2507	354	1244	1100	857
1409	2575	363	1283	1128	866

- Calculation of profitability of the project (without considering the current values):

With regard to the current costs and incomes, this part of the project will lead to 2069 billion rials of economic loss from the national viewpoint, during its life. However, if we consider the inflation rate to be 14%, the profitability of the project during its life will be 21885 billion rials.

- Calculation of the internal return rate:

- The internal return rate, which in fact balances the project from the aspects of income and cost, is 9%.

Table 4- Cost and income fitting (without growth), numbers are in 10^9 Rials

Year	Investment costs	Using costs	Maintenance costs	Buying fleet costs	Costs sum	Direct incomes	Indirect costs	Profit
1386	652	0	0	0	652	0		-652
1387	988	0	0	0	988	0		-988
1388	1078	0	0	0	1078	0		-1078
1389	1434	0	0	354	1789	0		-1789
1390	0	38	22	11	70	128	116	173
1391	0	35	21	20	76	125	112	161
1392	184	34	21	10	249	122	109	-18
1393	0	33	24	10	67	119	107	159
1394	0	31	23	10	64	116	104	156
1395	49	29	22	10	109	113	101	106
1396	13	28	21	27	88	111	99	121
1397	0	27	20	9	56	108	97	149
1398	0	26	19	9	53	106	95	147
1399	95	24	17	9	145	103	93	50
1400	0	24	18	9	51	101	91	141
1401	0	23	39	11	72	99	89	116
1402	0	22	36	9	66	97	87	118
1403	0	21	33	8	62	95	85	118
1404	0	20	14	11	45	93	84	132
1405	0	19	13	8	40	91	82	133
1406	0	19	12	8	39	89	81	131
1407	44	18	11	8	81	87	80	85
1408	0	17	12	8	37	86	78	127
1409	0	17	11	0	28	84	77	133
Sum	4537	503	408	558	6007	2072	1866	-2069

Table 5- Cost and income fitting (with 14% growth), numbers are in 10^9 Rials

Year	Investment costs	Using costs	Maintenance costs	Buying fleet costs	Costs sum	Direct incomes	Indirect costs	Profit
1386	981	0	0	0	981	0		-981
1387	1703	0	0	0	1703	0		-1703
1388	2129	0	0	0	2129	0		-2129
1389	3246	0	0	801	4048	0		-4048
1390	0	97	56	28	181	331	300	450
1391	0	105	63	58	227	371	334	478
1392	628	114	71	35	848	414	373	-61
1393	0	127	95	39	260	464	416	619
1394	0	138	104	44	286	519	465	698
1395	248	150	110	49	558	580	519	542
1396	74	165	124	157	519	650	581	711
1397	0	180	136	63	378	727	651	1000
1398	0	197	144	70	411	815	729	1132
1399	836	215	153	79	1284	912	817	446
1400	0	240	185	90	514	1022	917	1425
1401	0	263	449	122	834	1146	1029	1342
1402	0	288	473	114	875	1285	1157	1567
1403	0	317	498	129	944	1442	1300	1797
1404	0	349	240	194	783	1618	1462	2297
1405	0	385	258	166	809	1817	1645	2653
1406	0	425	277	187	889	2041	1852	3004
1407	1159	470	297	212	2138	2293	2086	2241
1408	0	526	349	240	1115	2578	2350	3814
1409	0	582	375	0	957	2900	2649	4592
Sum	11006	5336	4455	2877	23674	23925	21633	21885

Corresponding Author:
Dr. Saeed Arabtaheri
Department of Economic
Payam-e-Noor University
Gorgan, Iran
E-mail: arabtaheri@yahoo.co.uk

References

1. Message transport, Transport and Terminals Organization of Iran, No. 27, July 79
2. Tvdarv, Michael, economic development in the Third World, translation Gholamali Frjary Dr. Vahid Sohrabi, Plan and Budget Organization 1369 Publications
3. Tavalaee, Simin, Introduction to economic geography principles, Publishing Teacher Training University Jihad.
4. Rabbani, M., benefit cost analysis and its application in evaluating resources development projects in developing countries, 1353.
5. Sagvn, Robert and Alan Williams, the basis of cost benefit analysis of the practical translation of Iraqi Mansour Khalili, Tehran University Press; 1372.
6. Statistical Yearbook of Road Transport
7. Statistical Yearbook of Transport
8. Sba Kermani, Majid, regional economy, toward Publishers, 1380.
9. Transportation Industry, No. 189, April 79
10. Kvpahy, Majid, guide scientific evaluation of projects; supplied by the United Nations University Jihad Press, 1368.
11. Report railroad Gorgan, Mashhad Consulting Mtra
12. Proceedings of the second seminar of the first volume of transport
13. Hunt, Diana, theories of economics and development, translation GH release, Nshrny, 1382.
14. Board, T. B. du-Tresor.1985, Benefit- cost Analysis Guide canandian Government publishing center.
15. Boardman, Anthony, David Greenberg, Aidan Vining, and David Weimer. 2005.
Cost Benefit Analysis: Concepts and Practice (3rd Edition). Prentice Hall.
16. Brent, J. Robert, 1990; Project appraisal for developing countries,New York : Harvester Wheatsheaf.
17. Litman, Todd.Evaluating Transportation Economic Development Impacts.Victoria Transport Policy Institute.18 August 2010
18. Litman, Todd. Smart Transportation Economic Stimulation. Victoria Transport Policy Institute.21 April 2009
19. LITTLE, I. M. D. and MIRRLEES, J. A. 1990;Project Appraisal and Planning for Developing Countries (Heinemann, London, and Basic Books, New York)
20. O'Toole, Randal; Does Rail Transit Save Energy or Reduce Greenhouse Gas Emissions?. Policy Analysis no. 615. April 14, 2008
21. Pearce, David, Giles Atkinson, and Susana Mourato. 2006. Cost-Benefit Analysis and the Environment: Recent Developments. Publication of the Organisation for Economic Co-operation and Development (OECD).
22. Vachal, Kimberl and Bitzan, John.2004 ;TRANSPORTATION QUALITY INDICES FOR ECONOMIC ANALYSIS OF NON-ETROPOLITAN CITIES, Upper Great Plains Transportation Institute
23. van der Meulen,RD (Dave), Railway Globalization and Heavy Haul.Railway Corporate Strategy CC, Pretoria, South Africa.2006.

3/5/2011