

PAPER • OPEN ACCESS

Railway tourism in providing the sustainable and smart population mobility

To cite this article: Ye Kovalenko-Marchenkova *et al* 2023 *IOP Conf. Ser.: Earth Environ. Sci.* **1269** 012021

View the [article online](#) for updates and enhancements.

You may also like

- [View Learning Organization in a Situational Perspective](#)
Tao Pan, Tao Hu and Juan Geng
- [A Method for Verifying the Behavioral Consistency between Public Business Process and Private Business Process Based on Environment](#)
Yitong Chen
- [A study on key factors that influence employee retention according to employees working in DLF IT park- Chennai](#)
Ms. J. Annie Velma, Dr. Neeraja Vijay, Mr.A. Victor Valan Arasu et al.



245th ECS Meeting • May 26-30, 2024 • San Francisco, CA

Don't miss your chance to present!

Connect with the leading electrochemical and solid-state science network!

Deadline Extended: December 15, 2023

Submit now!



Railway tourism in providing the sustainable and smart population mobility

Ye Kovalenko-Marchenkova¹, L Martseniuk² and Natalya Andryeyeva³

¹ Dnipropetrovsk State University of Internal Affairs, 26 Gagarina ave., Dnipro 49005, Ukraine

² Ukrainian State University of Science and Technologies, 2 Lazaryana str., Dnipro 49010, Ukraine

³ State Organization "Institute of Market and Economic & Ecological Researches of the National Academy of Sciences of Ukraine", 29 French Boulevard, Odesa 65044, Ukraine

E-mail: kovalenko.marchenkova@gmail.com

Abstract. It is emphasized that the transport infrastructure significantly affects the choice of a tourist to travel to a specific destination. Within the mainland, it is recommended to use rail transport for travel as the most competitive in comparison with other modes of transport. The advantages and disadvantages of the organization of tourist railway trips are summarized. The main factors affecting tourists' desire to travel by railway at different levels are highlighted. Examples of the organization of tourist trips by railways are given. Directions for providing services in the organization of railway tourism are proposed.

A scheme for constructing a schedule is provided, which allows you to determine the break-even point of the organization of tourist railway trips along a specific route. It is recommended to divide all costs of the company, which will be engaged in the organization of railway tourist transportation. At the same time, contingent and fixed costs, in turn, were divided into: contingent and fixed costs that take into account tourist transportation in general and contingent and fixed costs that directly depend on the structure of the tourist train.

1. Introduction

Tourism is one of the world's industries that is developing very rapidly, it is the tourism industry that increases the volume of tourist arrivals from year to year. During the coronavirus pandemic in 2020 and 2021, tourism suffered some losses due to restrictions related to the coronavirus disease, as many countries' borders were closed and people were advised to limit all movement.



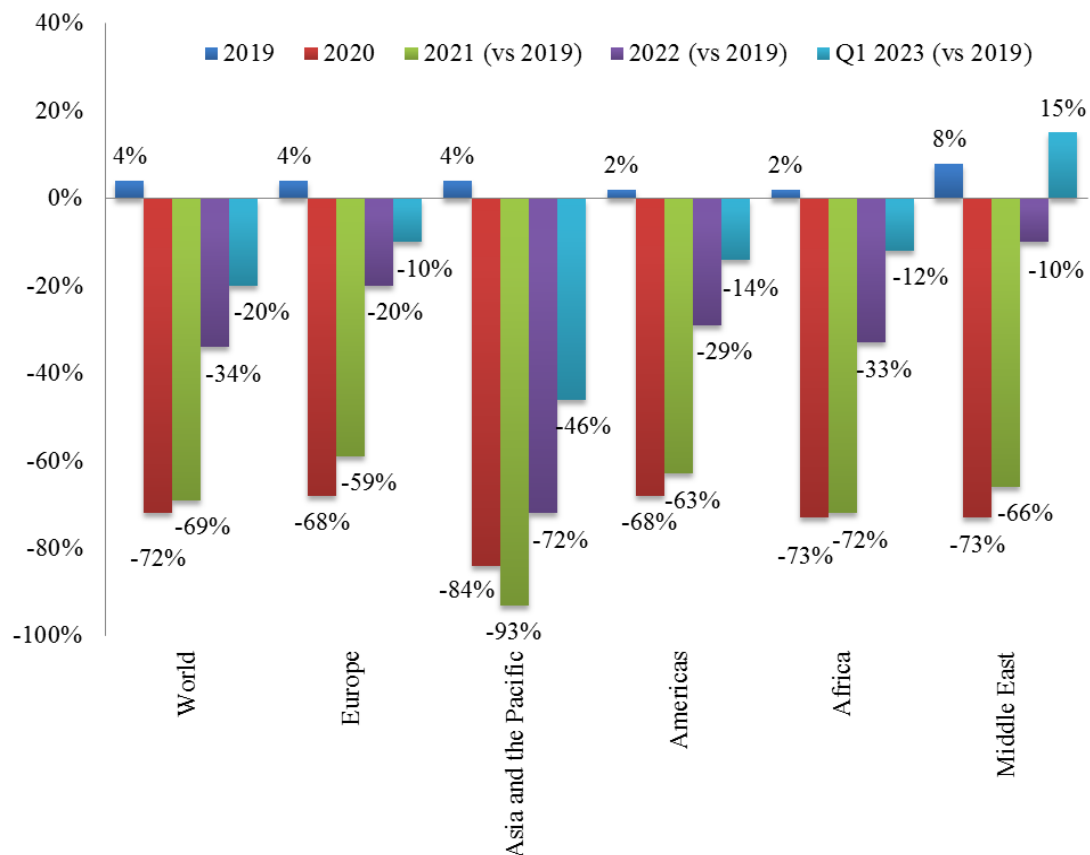


Fig. 1. Trends in the international tourism industry [1]

It is necessary to pay more attention to the development of sustainable tourism, as well as to use "green" technologies during the organization of tourist trips - starting with the movement of tourists and ending with their overnight stay (if these are hotels, then preferably with "zero" emissions), food or visiting certain places [2].

Green tourism is becoming quite popular, the manifestations of which are observed both in rural and agritourism. European states have developed and are successfully implementing Concepts for the development of green tourism. They take into account the peculiarities of the traditions of each nation, aim to preserve the ethno-cultural and architectural heritage, the natural and historical habitat, and the revival of spiritual values and lifestyle.

Green tourism is basically any form of tourism that uses ecological management methods and is focused on preserving nature and promoting the sustainable development of the planet. This is a kind of alternative to traditional commercial mass tourism. Usually, tourists who choose to travel in this way consciously take responsibility for the preservation of the environment.

As for railway tourism, it can be said that it is more "green" in comparison, for example, with automobile tourism, because it produces significantly less emissions into the environment.

2. Literature review

An important issue for the development of tourism is the training of modern specialists [4].

Transport is an important component of the tourist infrastructure [5]. Transport services significantly affect the development of tourism [6, 7]. Scientists prove the deep impact of transport infrastructure on the development of regional tourism [7]. Many empirical studies have confirmed the positive impact of railways on income [8].

In our opinion, the most convenient way to organize the movement of tourists within the mainland is by rail transport. It is railway transport that has many advantages compared to road transport, for example, independence from weather conditions, accuracy of the timetable, comfortable beds, affordable cost, environmental friendliness and others. In accordance with the Sustainable Mobility Strategy of Europe [9], in the near future it is planned to raise the volume of passenger transportation by railway and the transition of this type of transport to more modern technologies with zero emission of harmful substances. Taking this into account, we believe that rail transport can become a key means of transportation, and when organizing rail tourism – also a place to spend the night, while tourists will significantly save their money compared to staying in hotels [10].

Railway tourism is a trip organized by railway on a specialized railway vehicle by individuals (duration from 24 hours to one year, or less than 24 hours, but with an overnight stay on the train), for recreational, educational, professional-business, religious and other purposes purposes, but this trip is not related to paid activity [11].

In the article [12], scientists substantiated that railway tourism is a tool for increasing the revenue of railways by increasing the volume of passenger transportation. In their opinion, railway tourism is a type of economic activity that is related to the provision of a whole range of tourist services for the transportation of tourists in modern comfortable trains with specialized carriages (hotels, restaurants, buffets, salons, etc.) for a specified period of travel of different widths track (broad or narrow) in combination with other services provided by legal entities and individuals engaged in tourism services (for example, tour operators; travel agents; entities engaged in excursion activities; motor carriers; restaurants; coffee shops; hotels, apartments etc.).

Vintage railways are one type of heritage site. According to the authors in the article [13], industrial railways and their attributes, which can be interesting for modern tourists to visit, can be included among the heritage sites.

Supporters of railways argue that their development creates opportunities for heritage preservation, provides recreational opportunities for local residents and attracts tourists to their regions [14].

Tourism and transport complement each other [15], and railways play a key role among land transport options in influencing tourist arrivals. An increase in rail transport services contributes to the intensive development of tourism [16]. Research by scientists shows that the choice of a tourist is influenced not only by transport accessibility, in this case the availability of railways, but also by several additional factors (availability of architectural and other objects) [17]. In China, the development of high-speed railways contributed to the increase in tourist mobility [18]. Empirical results of other scientists show that the railway has a positive effect on the arrival tourists [19].

The study [20] pays attention to the organization of railway tourism, highlighted that railway tourism has some advantages compared to other types of transport for tourists and emphasize the prospects for the development of railway tourism.

The author in the study [21] substantiates the need to preserve railways as a historical heritage and notes that there is a demand among tourists for tourist trips on ancient railways. At the same time, the authors from Spain, having studied the impact of high-speed railways in Spain, came to the conclusion that not only transport accessibility is important for the tourist, but also the availability of the tourist destination itself [22]. Sometimes it is important for a tourist to visit a specific location, and it does not matter what type of transport he uses to get there.

Improving regional transport connections is a key factor in touristic demand [23]. Scientists from Mauritius [24] investigated the role of transport infrastructure in the general development of tourism and determined its significant impact. Scientists from Spain analyzed the impact of the creation of the Spanish network of high-speed railways on tourism competitiveness and found that the construction of high-speed railways is able to equalize the seasonality of tourist flows, contributing to the even visitation of tourist locations throughout the year.

The main purpose of our the article is to analyze the feasibility of organizing railway tourism in the world; summarizing the advantages and disadvantages of the organization of tourist railway journeys; highlighting the main factors that influence at different levels the desire of tourists to travel by

railway; development of directions for the provision of services in the organization of railway tourism, as well as development of a shortened conditional version of the organization of railway travel, which provides for movement, overnight accommodation, food and excursion services for tourists during the railway journey. In addition, the scientists plan to depict a graph construction scheme, which allows to determine the break-even point of the organization of tourist railway trips along a specific route with a certain number of rolling stock.

3. Results

Within the mainland, tourists can use road or rail transport to organize tourist trips. It is transport, that is, a mobile vehicle, that is a source of atmospheric pollution. According to the data released by experts, 90 % of environmental pollution is caused by road transport, and less than 2 % by railway. Railway transport is much more environmentally friendly than road transport, because most railways are electrified, and the rest of the railways, according to the Smart Mobility Strategy of the European Union, is planned to be converted to units with zero emission of pollutants [25].

Tourist transportation by railway can be organized on both wide (1520 mm) and narrow gauge (1435 mm) [26]. There are many examples of the successful operation of tourist railways, where success does not depend on the width of the track, because the organizers of tourist trips by railway, whether broad gauge or narrow gauge, try to organize the trip in such a way and in such a specialized rolling stock to attract as many tourists of different categories as possible.

Both state and private railways can organize railway trips independently, as well as in cooperation with private entrepreneurs. They must provide for the following: provision of safe and comfortable conditions for passengers during movement, organization of overnight stays on the train, organization of meals on the train, organization of meals outside the tourist train, organization of leisure time on the train, organization of leisure time outside the train, organization of transfers by other modes of transport to venues excursions and other provision important for a tourist (for example, the services of a translator, a doctor, medical insurance, etc.).

The main advantages of railway tourism are shown in Figure 2.

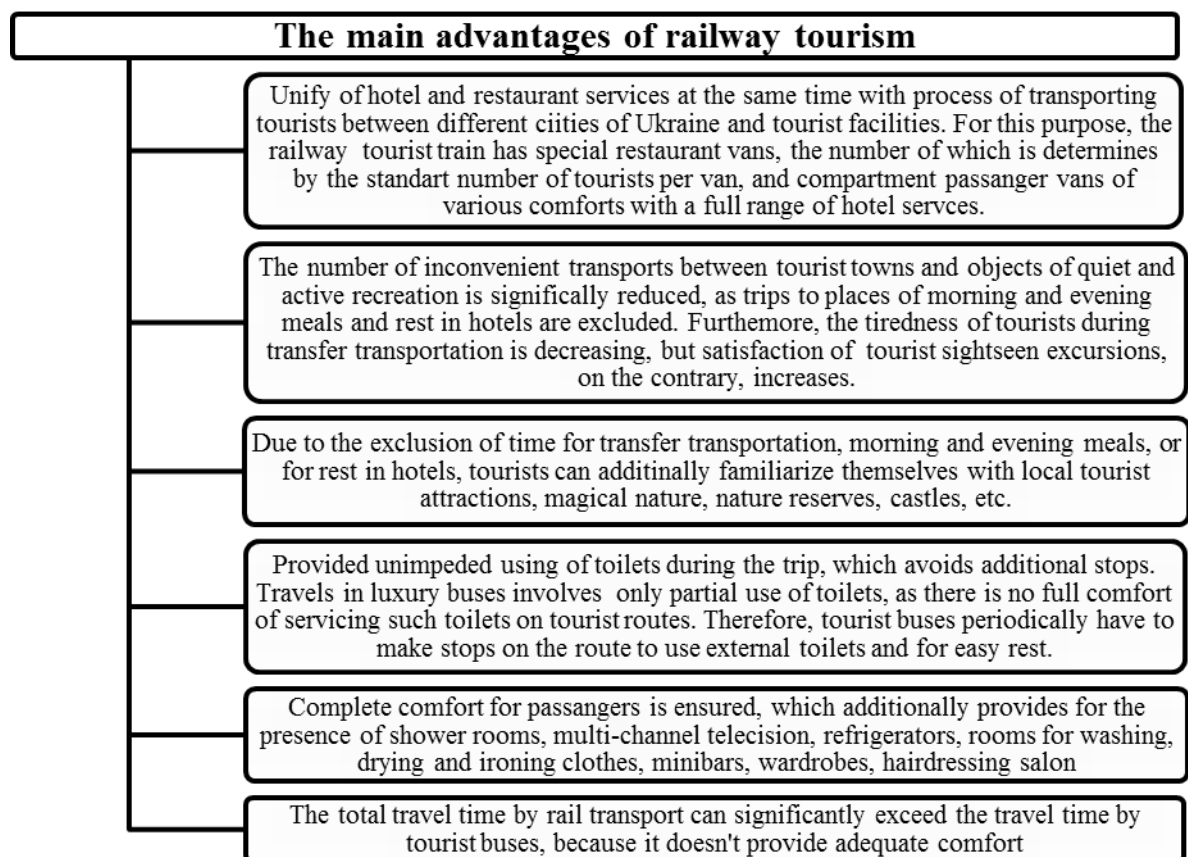


Fig. 2. Key advantages of organizing railway tourism

Next, we consider it appropriate to cite the main factors influencing at different levels the desire of tourists to travel by railway.

Yes, at the macro level, it can be the following factors:

- security;
- level of development of transport infrastructure;
- level of development of tourist infrastructure;
- environmental factors;
- the image of the tourist railway;
- at the meso-level it is:
- the presence of competition in other types of transport regarding the organization of this or that trip, visiting this or that tourist object;
- the paying capacity of the tourist;
- cultural level of the tourist, his awareness in general;
- the reaction of the local population to the visit of tourists to their area.

Sound suggestions for determining tourist routes and planning income from them are given in researched scientists.

Figure 3 shows the directions of service provision in the organization of railway tourism.

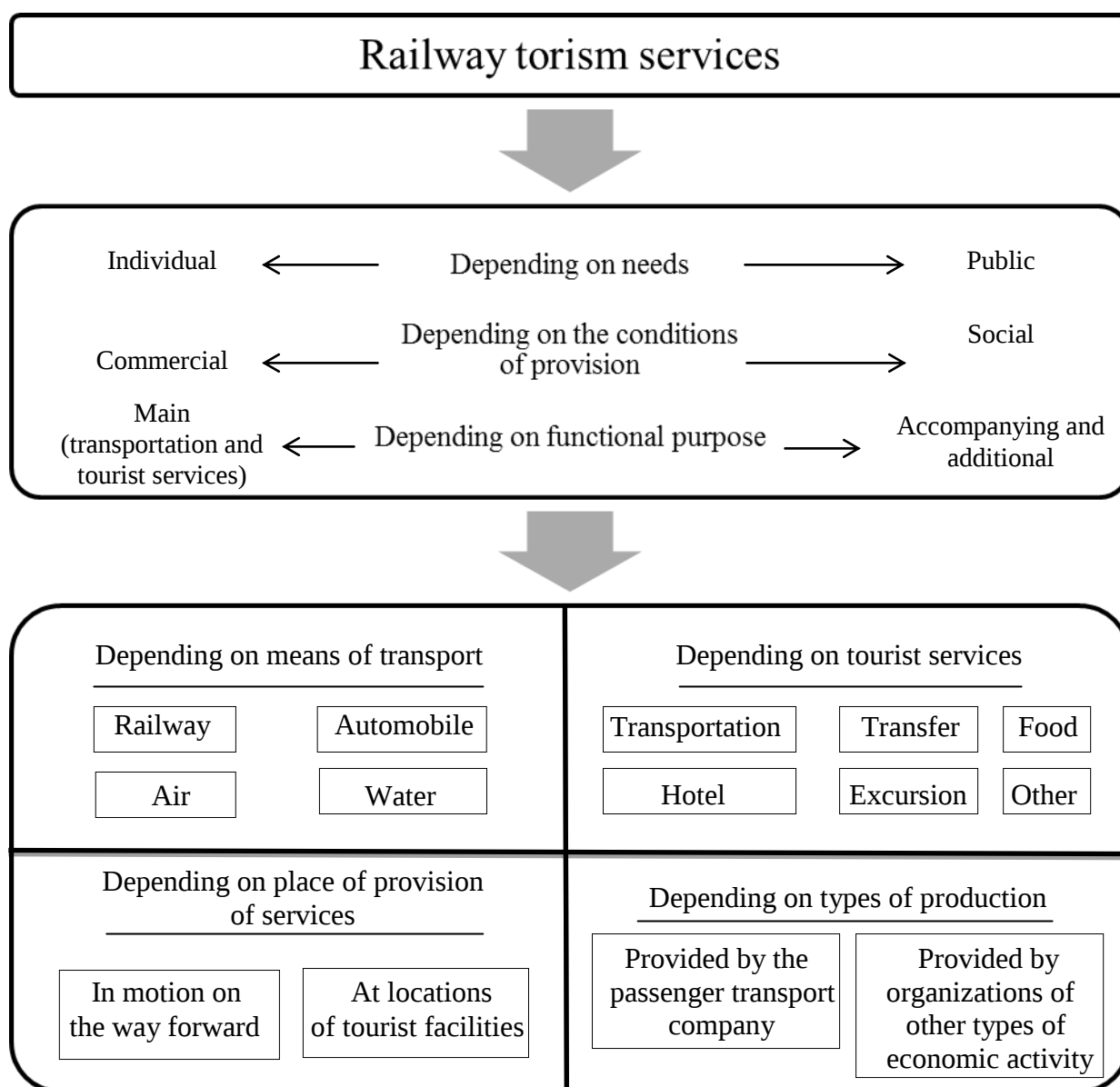


Fig. 3. Directions of providing services in the organization of railway tourism

Figure 4 shows a shortened conditional version of the organization of a railway trip.

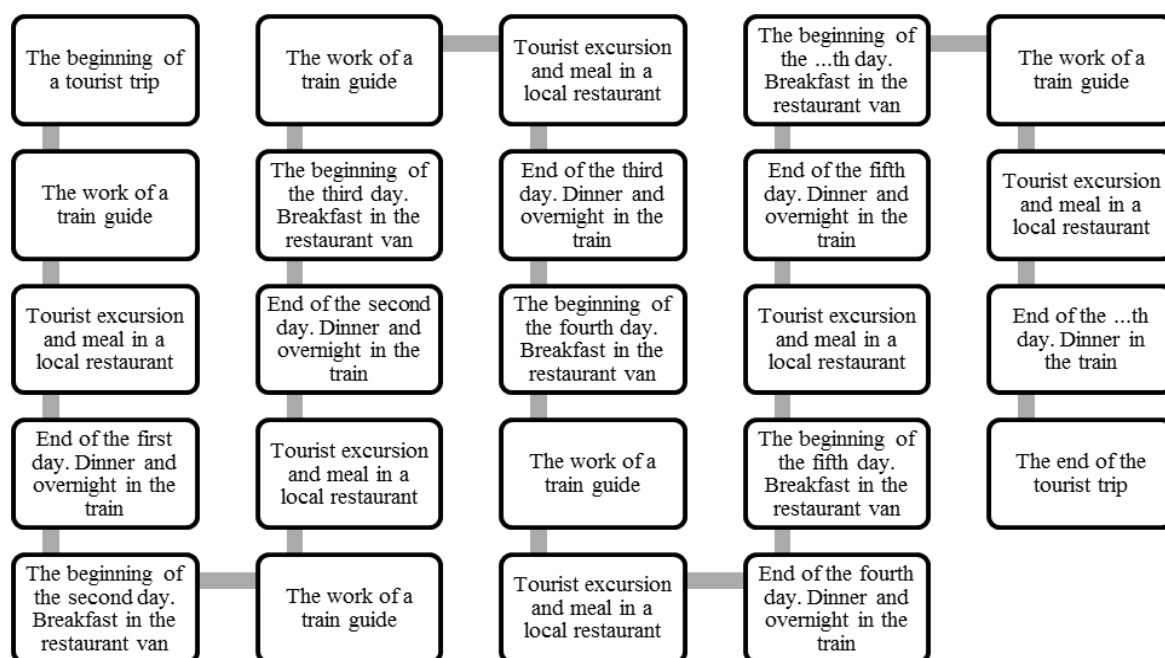


Fig. 4. Shortened conditional version of the organization of a railway trip

As we see, overnight stays for tourists, as well as meals, may be organized in combined way: both on the train itself and outside of it.

We agree with scientists whose studies [27] emphasize that railways can play a significant role in developing the attractiveness of a tourist destination and can act as a catalyst for territorial branding.

In addition, tourists may be attracted to rail tourism by the desire to have an unforgettable, and for the youth to get a new experience of traveling by train, especially on a retro train [28].

Given that state railways do not always have free funds for the organization of railway tourist transportation, private investors may be interested in investing in railway development projects in the context of tourism. It is clear that any entrepreneur wants to make as much profit as possible from his activity as soon as possible. In addition to such important indicators as the payback period, the rate of return and the internal rate of return, we believe that when organizing tourist railway transportation, the investor needs to know the level of break-even, that is, he must know exactly under what conditions (what is the composition of the tourist train, what is its frequency, what is the route and other indicators) the break-even point will be reached [29]. This is necessary for the investor to accurately determine for himself whether it is possible and whether it is advisable to organize tourist railway transportation in a specific region, on a specific route. An important question is the following - what number of passengers should be transported during a conditional period (for example, in a year), so that the investor does not incur losses?

To determine the break-even point, it is advisable to build a corresponding graph. In advance, you need to make calculations according to the analysis of "costs – volume of activity – profit" [30].

It is important to determine all possible costs and divide them into two categories – conditionally fixed and conditionally variable. It is clear that conditional-fixed costs will not change, and conditional-variable costs will depend on the volume of tourist transportation. At the same time, contingent and fixed costs, in turn, were divided into: contingent and fixed costs that take into account tourist transportation in general and contingent and fixed costs that directly depend on the structure of the tourist train.

Conditional variable expenses should include expenses that are directly proportional to the number of transported tourists and are related to: meals for tourists during the trip in the restaurant car (in our case, the figures are conditional – \$553,000); expenses for accommodation in hotels, if there is such a

need and if an overnight stay on the train is not possible, for example, when organizing tourist railway transportation on narrow-gauge tracks, which involves the use of narrow-gauge rolling stock, in which it is quite difficult to organize full sleeping places (\$1,746,000); service to tourists on various excursions, including bus or even helicopter or water transfers (\$606,960). Together, in our example, conditional variable costs are equal to \$2,905,960 [31].

Conditional fixed expenses that take into account tourist railway transportation as a whole include expenses related to maintenance, service, and repair of railway infrastructure and rolling stock (\$1,287,380); wages of employees (\$236,208); payroll (\$51,965.); materials (\$370,080); other expenses (\$200,000). In total, contingent and permanent expenses, which take into account tourist transportation as a whole, are equal to \$2,145,633.4 [32].

Conditional and fixed costs, which depend on the structure of the tourist train, include costs related to the equipment, maintenance and service of passenger tourist cars: wages for equipment, maintenance, service and repair of passenger cars (\$24,480,000); payroll (\$5,385.6); materials for equipment, maintenance, maintenance and repair of passenger cars (\$38,000); other expenses (\$50,000) [33].

In total, conditional and fixed costs, which depend on the structure of the tourist train, amount to \$117,865.60. Since these costs make up an insignificant amount – only 2 % of the total amount of costs and 5 % of the total amount of conditional costs, they can be displayed in the figure as a straight line parallel to the x-axis [34].

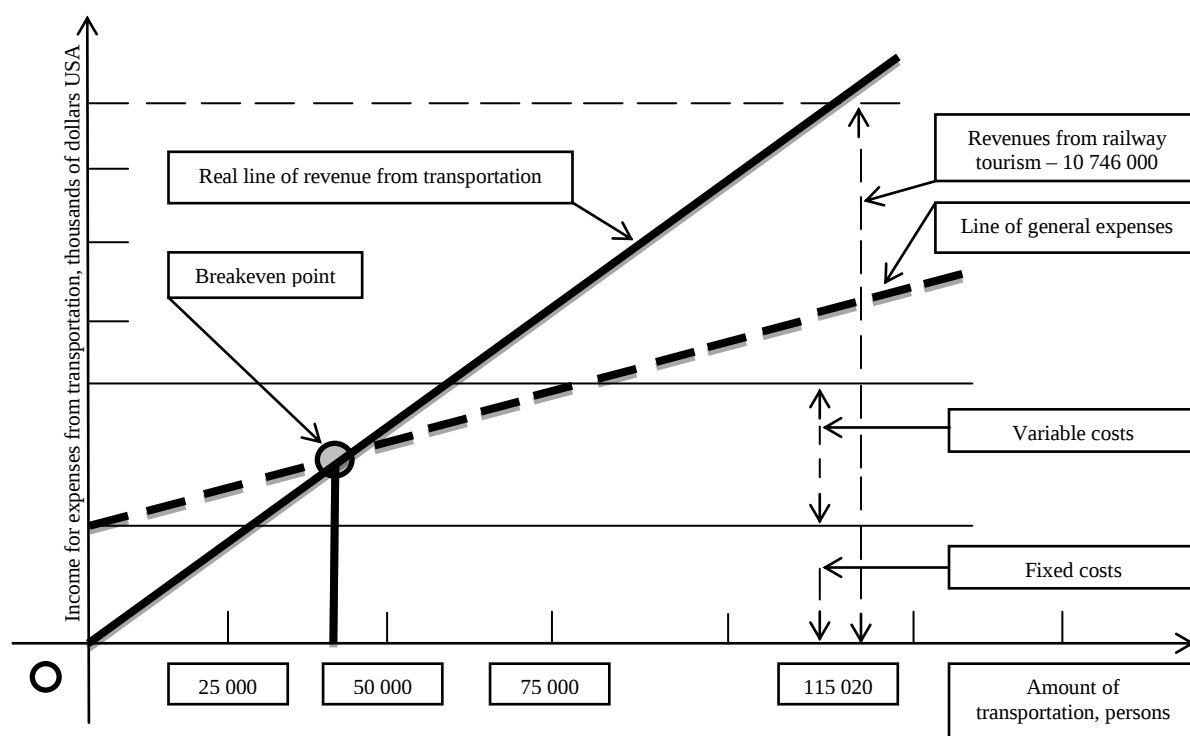


Fig. 5. Construction of a conditional break-even schedule of tourist railway transportation

Construction of the break-even schedule of tourist transportation was done as follows. On the horizontal axis, we plotted the forecast values of the number of transported tourists during the conditional calculation year – 115,020 thousand people. From this point, we build up a segment parallel to the vertical axis, the value of which is equal to contingent and fixed costs, namely

\$2,263,499. Then we add a segment above, the value of which is equal to variable costs, namely \$2,905,960 [35].

The total segment constructed in this way is equal to the total costs of transporting tourists by tourist train in a conditional calculation year – \$5,169,459. Through this point and the point of intersection of the line of constant costs with the vertical axis, we draw a line of total costs (bold dotted line). If we then draw a straight line from point 0 at the origin of the coordinates to a point equal to the value of revenues from transportation of the forecast number of tourists, then as a result we will get a line of conditional revenues from transportation (shown in bold in the figure) [35].

The point of intersection of the revenue line with the line of total expenses for transportation is the break-even point, that is, the point at which the amount of income from the transportation of tourists is equal to the amount of total expenses (indicated by a ring) and in our case is \$3,103,038 and corresponds to the number of 33,216 tourists per year.

Here, an important final value is precisely the required number of transported tourists per year, at which the break-even level will be reached. The investor can conduct marketing research and orient himself to which segment of tourists should be directed in terms of advertising campaign and from which wagons of comfort class to form passenger tourist rolling stock.

4. Conclusions

Traveling by tourist trains is quite popular in many countries of the world. Considering the steady demand from potential tourists and the orientation of railway transport towards the sustainable development of society, the transition to environmentally friendly technologies, we believe that governments, investors and scientists should pay attention to the development of railway tourism. The advantages of railway trips: security escort, independence from weather conditions, environmental friendliness, compliance with the traffic schedule, comfortable sleeping places, the possibility of traveling for persons with disabilities, availability of compartments for 1 or 2 persons (after the coronavirus disease and as a result, fear of getting sick with any other diseases, tourists want to have as little contact as possible with outsiders, they prefer this type of movement where contact with other people is minimal), the work of a restaurant car, where food is provided for all tastes - from vegans to meat eaters, from children to adults, from sick to healthy, as well as the availability of the necessary amenities during the trip (Internet, television, safe, air conditioning, compartment heating, lighting, and others). The development of railway tourism will mean the modernization and restoration of not only tourist, but also transport infrastructure in the region where railway travelling will be organized. As a result, not only tourists will benefit from this, but also local residents in the form of developed modern infrastructure and additional income for local budgets. The disadvantages of railway tourism, on the one hand, include the limitation of the tourist route by the trajectory of the railway tracks, but at the same time, we indicated earlier that railway tourism is not just a journey only by train, it is also travel to places of visit or recreation by other means of transport, so this is a debatable drawback; the limitations of the number of carriages in a tourist train can also be attributed to the disadvantages, but here, depending on the demand, the organizers of tourist railway trips can vary the composition of the train, including or excluding certain classes of carriages, as well as assigning additional flights for tourist trips (provided the necessary rolling stock is available composition). A scheme for constructing a schedule is provided, which allows you to determine the break-even point of the organization of tourist railway trips along a specific route with a certain number of rolling stock. It is recommended to divide all costs of the company, which will be engaged in the organization of railway tourist transportation, into conditional variable and conditional fixed. Determining the minimum number of tourists that needs to be transported during the conditional period is an important value, which will help the investor to determine the conditional break-even point and subsequently increase his profit.

References

- [1] UNWTO data shows that international tourism arrivals are approaching pre-pandemic levels. 2023. URL : <https://monitor.icef.com/2023/05/unwto-data-shows-that-international-tourism-arrivals-are-approaching-pre-pandemic-levels/>
- [2] Tourism set to return to pre-pandemic levels in some regions in 2023. URL : <https://www.unwto.org/news/tourism-set-to-return-to-pre-pandemic-levels-in-some-regions-in-2023>.
- [3] Leheza Ye 2022 Principles of law: methodological approaches to understanding in the context of modern globalization transformations. *Ius Humani* **11(2)** 57-82.
- [4] Melko L, Uvarova G, Sokol T, Mikho O 2022 Practice-oriented education as a component of professional training of tourism specialists (example of professional disciplines). *Pedagogy and Education Management Review* **2 (8)** 42-50.
- [5] Wang Y, Niu J 2018 Evolution and optimization of China's urban tourism spatial structure: a high speed rail perspective. *Tourism Management* **64** 218-232.
- [6] Khan S, Qianli D, SongBo W, Zaman K, Zhang Y 2017 Travel and tourism competitiveness index: the impact of air transportation, railways transportation, travel and transport services on international inbound and outbound tourism. *J Air Transporting Management* **58** 125-134.
- [7] Khodjaniyazov E S 2018 The importance of developing transport infrastructure for tourism sector in Uzbekistan. *Central Asian Problems of Modern Science and Education* **3 (3)** 151-156.
- [8] Khadaroo J, Seetanah B 2007 Transport infrastructure and tourism development. *Annals of Tourism Research* **34 (4)** 1021-1032.
- [9] Pagliara F, Mauriello F, Garofalo A 2017 Exploring the interdependences between High Speed Rail systems and tourism: Some evidence from Italy. *Transportation Research Part A: Policy and Practice* **106** 300-308.
- [10] Verkhoglyadova N, Kononova I, Morozova Ye, Kubetska O, Kovalenko-Marchenkova Ye 2022 Management of structural changes in the system of economic formation of sustainable development. *Economics. Ecology. Socium* **2** 135-140.
- [11] Sustainable and Smart Mobility Strategy. URL : https://transport.ec.europa.eu/transport-themes/mobility-strategy_en.
- [12] Pshinko O, Martseniuk L, Bobyl V, Kakhovska O 2019 Economic and mathematical models of development of the railway tourism. *SHS Web of Conferences* **67** 36-44.
- [13] Charkina T, Bobyl V, Martseniuk L, Matusevich O, Kershys A 2019 Rail passenger hubs. *Proceedings of the XXIII International Scientific Conference on Transport Means* 999-1003.
- [14] Bhati A, Pryce J, Chaiechi T 2014 Industrial railway heritage trains: The evolution of a heritage tourism genre and its attributes. *Journal of Heritage Tourism* **9 (2)** 114-133.
- [15] Taylor P 2015 What factors make rail trails successful as tourism attractions? Developing a conceptual framework from relevant literature. *Journal of Outdoor Recreation and Tourism* **12** 89-98.
- [16] Pagliara F, Mauriello F, Garofalo A 2017 Exploring the interdependences between High Speed Rail systems and tourism: Some evidence from Italy. *Transportation Research Part A: Policy and Practice* **106** 300-308.
- [17] Dante D M 2023 Does high-speed rail matter for tourism? Evidence from Italy. *Transportation Business & Management* **48** 10-81.
- [18] Delaplace M, Pagliara F, Perrin J, Mermet S 2014 Can High Speed Rail Foster the Choice of Destination for Tourism Purpose? *Procedia – Social and Behavioral Sciences* **111** 166-175.
- [19] Yin P, Lin Z, Prideaux B 2019 The impact of high-speed railway on tourism spatial structures between two adjoining metropolitan cities in China: Beijing and Tianjin. *Journal of Transport Geography* **80** 102-495.
- [20] Shen P, Yin P, Zhang T 2023 The combined effects of high-speed rail and aviation on tourist arrivals in China. *Transportation Business & Management* **48** 100-970.
- [21] Jensen M T, Larsen J 2021 Rail tourism transitions: A sociological framework. *Annals of Tourism Research* **87** 102-992.

- [22] Halsall D A 2001 Railway heritage and the tourist gaze: Stoomtram Hoorn – Medemblik. *Journal of Transport Geography* **9** (2) 151-160.
- [23] Pagliara F, La Pietra A, Gomez J, Vassallo J M 2015 High Speed Rail and the tourism market: Evidence from the Madrid. *Transport Policy* **37** 187-194.
- [24] Boto-Garcia D, Perez L 2023 The effect of high-speed rail connectivity and accessibility on tourism seasonality. *Journal of Transport Geography* **107** 103-546.
- [25] Khadaroo J, Seetanah B 2008 The role of transport infrastructure in international tourism development: A gravity model approach. *Tourism Management* **29** (5) 831-840.
- [26] Martin J M, Fernandez J A 2022 The effects of technological improvements in the train network on tourism sustainability. An approach focused on seasonality. *Sustainable Technology and Entrepreneurship* **1** (1) 1000-1005.
- [27] Pshinko O, Charkina T, Martseniuk L, Orlovskaya O 2022 Hubs as a Key Tool for Improving the Quality of the Service and Development of Multimodal Passenger Traffic. *Transport Problems* **17** (1) 201-214.
- [28] Best train journeys in Australia. URL : <https://www.thetimes.co.uk/travel/destinations/australasia/australia/best-train-journeys-in-australia>.
- [29] 9 Best trains in Africa for exciting travel. URL : <https://seeafricatoday.com/travel-guides/9-best-trains-in-africa-for-exciting-travel/>
- [30] Train & Rail Tours & Trips in Canada. URL : <https://www.tourradar.com/i/canada-train-rail>.
- [31] Ride the rails in style aboard Japan's 10 best tourist trains. URL : <https://asia.nikkei.com/Business/Travel-Leisure/Ride-the-rails-in-style-aboard-Japan-s-10-best-tourist-trains>.
- [32] 5 epic train journeys to take in China. URL : <https://www.lonelyplanet.com/articles/best-train-trips-in-china>.
- [33] Severino A, Martseniuk L, Curto S, Neduzha L 2021 Routes Planning Models for Railway Transport Systems in Relation to Passengers' Demand. *Sustainability* **13** (16) 86-96.
- [34] Koval V, Mikhno I, Tamosiuniene R, Kovalenko-Marchenkova Ye, Gui H 2023 Ensuring sustainable consumption behaviours in circular economy engagement. *Transformations in Business and Economics* **22** (2) 161-177.
- [35] Peira G, Giudice A L, Miraglia S 2022 Railway and Tourism: A Systematic Literature Review. *Tourism and Hospitality* **3** (1) 1-11.