Feasibility analysis for revitalisation of unused rail infrastructure

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Abstract. Abandoned railway stations were constructed to serve as a railway stations but have fallen into disuse, because of different circumstances. Many rural stations and lines were closed with the introduction of new bus services, and also due to increased popularity of cars. Some of them were converted and now they have new functions. The purpose of this article is to introduce the concept of reinvention of rural stations in YOUMOBIL project with emphasis on feasibility of reinvention projects. Article gives an overview how is a typical feasibility study organised. Other parts of this document explain the specifics of YOUMOBIL feasibility studies, good practice of reinvention of disused railway infrastructure and example of YOUMOBIL reinvention pilot project in Brezno. YOUMOBIL makes a valuable contribution, helping rural communities get the most from their abandoned stations, turning stations and their surroundings into welcoming, thriving, and safe gateways and hubs. Working with the rail industry towards improvements, such as better pedestrian and cyclist access, supporting intermodality, running events, workshops or other activities encourages people to use public transport, and support the local community.

1. Introduction

There are many abandoned (or disused) railway stations or other rail structures in the world, which were constructed to serve for rail transport, but fell into disuse. There could be various circumstances when this occurred. A railway company may have gone bankrupt, the station was closed due to the failure of economic activity including insufficient number of passengers, or there were different operational reasons such as replacement of the rail line. Stations were also often relocated along the route of the line to new location usually nearer to the centre of population. Many rural stations and lines began to close in the past with the introduction of new bus services, and of course the increased popularity of the cars. Other lines and stations never lived up to the expectations of their operators, because they were badly sited, away from the towns and villages that were designed to serve and this also led to a rapid decline in passenger numbers.

Many former railway lines, railway buildings or rail carriages were converted and now they have new functions. In rural areas, especially in UK, former railway station buildings are often converted into private residences. Examples include the stations on the closed Didcot, Newbury or Southampton Railway in England. Example from Mayfield represents a conversion of the original ticket hall of Mayfield Station on the Cuckoo Steam Railway Line built in 1880 (figure 1) [1]. Also many former railway carriages have found a new life off the rails, being ingeniously reused as holiday homes, or as cafeterias and restaurants. Despite their derelict state, some of them have potential to be transformed into an incredible project. The property in figure 2 is located in the country of Central Otago region in

New Zealand. It is remote, with no access to city power or water supply, capturing rain water and generating all of its power from a small solar system.

Figure 1. Railway station converted into private house, Mayfield, UK, Source: [1].

Figure 2. Railway carriages converted into private house, New Zealand, Source: [2].

Former rail lines were repurposed as managed nature reserves, trails or other tourist attractions such as Bystrická Cycling Route which ranks among the longest tourist cycling routes in Slovakia. It was built on the former rail line on the narrow gauge historic forest railway (figure 3). There are also many abandoned and neglected buildings other than rail ones in rural areas. Countryside represents the picture of each region and country. Its image and structure were created historically and are continuously changing. In the past, countryside was predominantly inhabited by farmers. Overall picture of a countryside is now based on both nature and residential, farming and industrial buildings and infrastructure.

Figure 3. Cycling route on the former forest rail line, Slovakia, Source [3].

Today, people working in the cities and towns often move to the countryside and also both small and larger industries are being more and more established in these parts of country. Both the design and layout of residential, farming and industrial buildings, alongside with technical and green infrastructure, create a special rural environment that affects both social and environmental conditions of rural life. Rural buildings and their properties can be also reutilized in tourism, based on the protection and the valuable reutilization of popular rural architectural heritage with potential interest for tourism purposes.

2. YOUMOBIL reinvention projects in glance

YOUMOBIL is a project funded by Interreg Central Europe programme (2019 - 2021). There are partners from Slovakia, Italy, Germany, Croatia, Poland and Czech Republic in the project consortium, who face the same key development challenges including economic and labour market decline, peripheralisation and a deepening urban-rural divide. Project aims at enhancing the passenger transport system for young people living in rural areas and their access to the European and national transport networks. Poor mobility options other than the own car is among the most frequent reasons why young people choose to leave their native rural area and to migrate to larger cities or even beyond, intensifying the demographic change troubling most rural areas in Central Europe. Moreover, public transport and related infrastructures suffer from a rather poor image among Central European youth. YOUMOBIL partners therefore network with rural areas' local youth in piloting demand-driven novel service features, exploit the potentials of transport management through interfaces for mobile devices, and to explore how youth initiatives can reinvent disused rail infrastructure to enhance the attractiveness and image of public transport. This article is concentrated on reinvention of abandoned railway structures.

YOUMOBIL pilot projects support such reinvention and also social capital of when old railway infrastructure is converted to centres of rural community life. Recent experience has demonstrated that reinventing railway buildings and surrounding areas can create popular places with special character where people enjoy working, living, free time spending and visiting. Such reinventions represent opportunities both for conservation and development, to work together and transform the environment and public space for the communities that live and work there. Five rural or peripheral railway stations were selected for reinvention in partners' countries. Before technical development and implementation of reinvention project feasibility study (analysis) must be done to determine the viability of an idea how to reinvent unused railway infrastructure, such as ensuring project is legally and technically feasible as well as economically justifiable.

Stefan Zemp et al. [4] identified several generic functions of railway stations: linking catchment area and transport network, supporting transfer between modes of transport, facilitating commercial use of real estate, providing public space, and contributing to the identity of the surrounding area. Therefore, reinvention or redevelopment calls for the integration of many different objectives and common understanding among the multiple stakeholders with potentially conflicting interests. When divergent perspectives are concerned, reinvention not only poses technical challenges, but also significant social challenges. In YOUMOBIL project partners focused especially on two functions, providing public space and identifying surrounding area. Before preparation of feasibility study partners organised series of workshops with the aim to build consensus among the local youth and relevant stakeholders sharing the same aim of making rural stations as access points to the PT network more attractive through different actions driven by local youth.

Pilot sites were chosen together with local decision-makers, PT service providers or owners of the addressed sites, together with YOUMOBIL partners acting rather as facilitators and guides, and local stakeholders and youth initiatives acting as driving forces. Following good practices overview collected in form of the report, how local communities revitalised disused rail infrastructure for the well-being of the local society, YOUMOBIL partners facilitate concerted action of local stakeholders, foremost young people. In all partners' region adaptive reuse development is planned, where an existing railway station building is used, in whole or in part, or disused as a basis for a new facility. Activities were launched in the form of a series of local workshops during autumn 2019 and spring 2020, where visions were elaborated and selected and a strategy, and an action plan prepared. Focus was especially on local youth' interests.

The main objective of the series of workshops was to bring relevant people or groups together and provide a structure to make a good start on planning for revitalisation of selected sites in partners' regions. In total three workshops were organised. In visioning workshop different visions for future use were explored and critical factors identified. Inspiration was drawn from examples of best practice collected. Workshop participants defined a list of visions representing the possibilities for new use of facility at partners' sites. It was discussed which demand exists for this type of facility in a given site

and surrounding rural region, and what type of spaces might best accommodate this demand understanding the community context. During strategy workshop participants together agreed on one vision and elaborate a strategy for its achievement, including identifying necessary actors and resources. During action workshop tasks assigned to different actors, and funding potentials were analysed. Once partners have found information about regional context, potential users' requirements and stakeholders' interests, it was then necessary to assess whether projects are also feasible from different perspectives.

3. Common criteria for feasibility analysis

Reinvention of unused railway infrastructure has its specifics; therefore, several attempts have been made in consortium to identify the critical success factors of such projects. Common criteria for organising feasibility study were defined. The purpose was to help partners to organise and elaborate feasibility studies, and set up common criteria how to do that. Partners were recommended to use modified feasibility tool called TELOS, an acronym for the five key areas that are needed to consider in an analysis: Technological (or Technical), Economic, Legal, Organizational (or Operational), Scheduling, described below (figure 4). The TELOS model was first presented in 2007 by James A. Hall [5] and later adopted across a huge range of settings, because it offers a simple way to consider the most important issues related to feasibility.

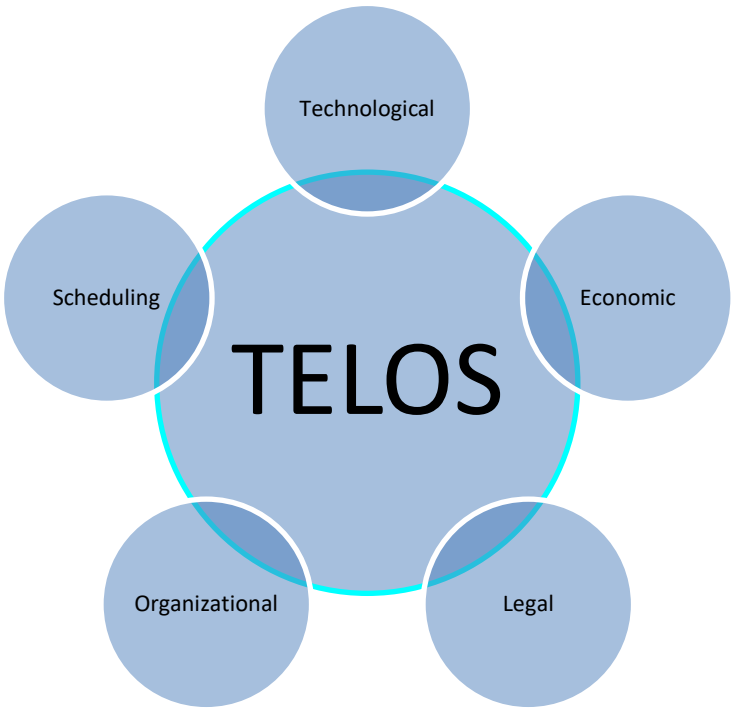

Figure 4. TELOS tool structure

Technical Feasibility focuses on the technical resources available to the organization and determine whether they meet enough capacity, converting the ideas developed during workshops into real project. Because YOUMOBIL revitalisation projects will be implemented by organisation outside consortium, a technical feasibility part of the study will assess only the basic details of how organisation responsible for project implementation should intend to bring project idea into reality. It should validate an idea, strategy and approach. The analyst must find out whether it is possible to develop the project given the current technical resources.

Economic Feasibility. Once the technical feasibility is established, it is important to consider the monetary factors also. Economic feasibility of the proposed project is carried out, involving typically a cost/benefits analysis determining the viability, cost, and benefits associated with a project before

financial resources are allocated. There are two elements to the funding challenge: capital to redevelop the station, and revenue for the operation and maintenance. It is also necessary to ensure the sustainability of the project. In YOUMOBIL project it was recommended to develop also pro forma operating model for future to estimate operating revenues and expenses. In case of reinvented stations, it can be considered that revenue would come from 'earned' income through e. g. ticket sales for different events and services, space rental, and other ancillary income. It is anticipated that the remaining budget would be secured through a combination of rail operator, municipality or region support, grants and other contributions. There may however be an element of commercial activity within a plan.

Legal Feasibility. This assessment investigates whether any aspect of the proposed project conflicts with legal requirements like e.g. zoning laws. This assessment of the applicable legal framework includes the identification and analysis of pertinent laws and regulations that may affect the project.

Operational feasibility is mainly concerned with issues like how project will be operated, if it is developed and implemented. The essential questions that help in testing the operational feasibility of a project could be following. Are the users not happy with current state? Will then they welcome the change and the new project? Have the users can be involved in the planning and development of the project? Will the system effect the users in considerable way? It is also recommended to prepare operating plan, describing how such a facility would be owned, managed, and operated. As a project which accommodates significant civic activity, it makes sense that the ownership of facility would remain in public hands. However, other options exist for its operation including enter into an operating agreement with an existing or new established non-profit organization, hiring a commercial firm to operate, or operating by municipality or rail transport operator.

Scheduling Feasibility. This assessment is very important for project success; after all, a project will fail if not completed on time. In scheduling feasibility, an organization estimates how much time the project will take to complete.

YOUMOBIL feasibility study aims to objectively uncover the strengths and weaknesses of a proposed reinvention project, opportunities and threats present in the actual environment, the resources required to carry through, and the prospects for success. The common template was prepared to define the common standard for feasibility study (table 1).

Table 1. Template for standard feasibility study and Location Analysis for YOUMOBIL projects.

Name of reinvention project	Suitable name for the project.
Order party	Entity ordering the study.
Author/s of the study	Qualified external expert or company.
Date and place	Date and place of study preparation.
Introduction	The Introduction section of the feasibility study provides a general statement about the overall objectives and content of the document and information sources. It is short introduction describing the project of reinvention, its purpose and benefits, details on stakeholders and users, results expected. This section also introduces the project vision and its origins (workshops with local youth).
Site and location analysis	This section provides brief analysis of the project location. The information can be organized under the following heads: • Site (building), history and current site conditions • Location Overview • Location Assessment and Accessibility in local or broader context. Author visits the site, checks the accessibility and presence and availability of various services related to the project. At this level, the concern is also whether the proposal is legally feasible. It determines whether there are any conflicts with legal requirements.

Table 1. cont.

Alternative solutions	List of the alternatives to the proposed solution with their short description. This section describes the alternative solutions that have been considered during workshops and compares them to the proposed solution. Analysis of alternatives, highlighting the key differences between solutions.
Proposed solution	Description of proposed solution. Why the preferred solution was selected? Does the recommended approach satisfy the requirements of youth community, stakeholders, building owner, and PT operator? Is it a practical and viable solution? An overview of the proposed solution's functionality and features.
Impact	Impact of solution on the organization and young rural community including different benefits (with emphasis on non-monetary ones). Definition of values justifying the proposed solution.
SWOT analysis	A SWOT analysis likely involves many of the same elements as a feasibility study itself. The goal is the same – to determine the viability of the reinvention project. When looking at project Strengths, author should primarily consider what makes the project special and strong. This could include any unique characteristics of the project. Weaknesses – what aspects could potentially hold project back? (A lack of financing, experienced staff, or other attributes that could stop achievement of the project objectives) Opportunities – factors outside the project which could put project in a better position to succeed. Threats are the inverse of opportunities.
Resources	Identification of all the resources, technical, inventory, financial and human that will be needed to complete the project. E.g. determination of project's requirements of construction such as reconstruction of building, internal design, etc. Determination of project's requirements of skilled labour or managerial and financial labour. This section of the feasibility study also provides a comparison between the value of the proposed solution and its costs. Estimation of required investment, operational and maintenance costs.
Cost-benefit analysis	Cost Benefit Analysis (CBA) is mostly used to decide whether or not project should go ahead, or to decide between different solutions. It involves working out the total potential costs and benefits of a project, and then translating these into monetary terms. However many benefits/impacts are non-monetary. In other words, they cannot be numerically measured, or they may be too complex to measure, for example social or environmental benefits.
Timeline and project process	Framework for implementation of the project including milestones (Gantt chart recommended for visualization).
Operational analysis	Operational analysis including information on future reliability, maintainability, usability, sustainability, affordability, etc. Information of this section should be organized under following heads: operator decision, staffing issues, various operating models, maintenance issues, and other operational issues. This part is required if the project development will be a part of portfolio of the developer – facility owner or another entity. If the process is to reinvent unused railway infrastructure for community (perhaps also by community, or other entity), then a study determining how the new facility will operate in a way that is useful to its users. How well a proposed project solves the problems, and takes advantage of the opportunities identified during scope definition and SWOT analysis?
Conclusions and reflections	The findings of the feasibility study, a brief description of pros and cons for the reinvention project.

4. Reinvention pilot project in Brezno

Brezno is a small district town with a population around 21,000 located in the middle of Slovakia just under the mountains Low Tatras. It is the main access point to Horehronie region and two national parks. Area offers great opportunities in agriculture and tourism. However, the number of people living in Horehronie is still declining, including Brezno itself. Emigration plays a significant role in the overall decline of the population in region. The lack of jobs and the bad economic situation force especially young people to migrate outside Brezno region. The whole area is underdeveloped also in the sense of transport infrastructure and services. One of the main means of "how to get there" is a train. Brezno has two train stations. The main station is combined with the bus station, and located on the outskirt of the town. The train station that is a subject of YOUMOBIL reinvention project is a small station "Brezno mesto" very close to the city centre (figure 5).

Figure 5. Brezno map.

Train station "Brezno mesto" is a property of Slovak Republic managed by Railways of the Slovak Republic, which is the main provider of local rail services. The station is no longer used and only serves as a boarding stop. Building and surrounding area were left as they were built and are in poor condition. Public space - the waiting room on the ground floor has not been used for a long time. First floor is used for rental. In exterior there's one platform with toilets for traveling public and space for buffet/pub. Whole space is neglected and in a need of refurbishment (figure 6-7) YOUMOBIL reinvention plans include complex reconstruction of this property with a library and gallery in the ground floor (space to be designed by local young artists). It will be also used as meeting room for Youth Parliament (figure 8). Another part of ground floor will be exhibition (small railway museum) accessible from the former ticket hall. The exterior of station will be transformed to more pleasant space for travelling and general public by creating community gardens, installation of street furniture and small playground for children. There will be also a bicycle stand (including e-bikes) as a part of a bike-sharing in the town installed.

Figure 6. Train station "Brezno mesto".

Figure 7. Platform in front of train station "Brezno mesto".

Figure 8. Architectural design – "Brezno mesto" train station.

Only a few passengers get off and get on at the stop. The aim of YUOMOBIL reinvention is to change this situation. Brezno municipality – a partner in the YOUMOBIL project wants to make people prefer this stop because of its geographical position close to the town centre and prefer train and bicycles as dominant means of transport.

By making this place more attractive, it will be used more, and people, including tourists, can also visit the sights and other services of the town, or meet with friends there. The associated partner of the project is Cluster Horehronie, which associates several organisations in tourist industry. The main role of the partner is to provide marketing activities and to work with young people participating in the project. Main beneficiaries of the project are residents of Brezno, whole region of Horehronie, young people, passengers and tourists.

5. Conclusions

There are plenty of examples of best practice of adaptive reuses of old railway infrastructure. It is an effective strategy for optimizing the operational and commercial performance of built assets. Adaptive reuse of buildings can be an attractive alternative to new construction in terms of sustainability and a circular economy. The reinvention of railway infrastructure can act as the catalyst to stimulate also revitalisation of whole area and also community life. Municipalities, building owners, architects, developers, builders and entrepreneurs who wish to become involved in rejuvenating and reconstructing a building must first make sure that the finished product will serve the need of the market, that it will be completely useful for its new purpose, and that it will be competitively priced. YOUMOBIL partners who will implement reinvention projects in pilot sites will have to prepare feasibility study to justify the "market" for the recycled project and its viability for future.

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References

[1] Knight F 2018 *Homes in former train stations – in pictures* [Photo] The Guardian https://www.theguardian.com/money/gallery/2018/nov/16/homes-in-former-train-stations-in pictures

[2] Old railway carriage converted into stunning off-grid home. By Living big in tiny house. August 8 2020, retrieved from https://www.livingbiginatinyhouse.com/railway-carriage-home-conversion/. Copyright 2018 by Living big in tiny house.

[3] Cycling route 005, Krásno n. Kys. – Vychylovka. By uknown author. August 8 2020, retrieved from https://www.turistika.cz/trasy/cyklotrasa-005-krasno-nad-kysucou-nova-bystrica-vychylovka-skanzen/foto?id=845391

[4] Zemp S, Stauffacher M, Lang D J and Scholz R W 2011 Generic functions of railway stations—A conceptual basis for the development of common system understanding and assessment criteria *Transport Policy* 18 (2) March 2011 pp 446-455

[5] Hall J A 2019 *Accounting Information Systems* (10th Edition. Cencage learning) p 816