

# THE POTENTIAL OF UNUSED RAILWAY AREAS

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**ABSTRACT.** Railway transportation faces many of the issues that are related to standard brownfields – due to changing technologies and industries, more effective systems (of traffic control in this case) and evolving needs many of the areas are actually no longer necessary for proper function of the railway. That is especially prominent in the case of railway stations, where a significant number of the stations use just a portion of their available tracks, buildings and areas (for example for unloading or repair). The remaining areas are sometimes sporadically used, but more effective and conscious management of the station could fairly easily lead up to the release of these areas for another, more useful function for both the city and the station. This paper will explore the differences between “standard” brownfields and unused railway areas like the typical ownership structure, particular location within the city and the effect station has on the city structure, composition and topography of the areas or the fact that railway areas are most often never really fully abandoned and they do continue to serve in some, albeit diminished capacity. Paper also aims to map out how much of the railways areas are underused or unused in Czech Republic (country with highest rail network density in the world). This paper will then recommend the best ways to use and revitalize them and it will show some successful examples of revitalization projects from all around the world.

**KEYWORDS:** Railway, unused, brownfield, revitalization.

## 1. POTENTIAL OF UNUSED AREAS

Finding solutions of the problem of unused areas, resp. brownfields have long been recognized worldwide as essential for the healthy sustainable development of cities. The use and revitalization of brownfields is one of the answers to the fundamental problem of undesirable and unsustainable growth of cities in the suburbs and the related occupation of land. There is a shift in land perception, when it is now generally considered to be one of the finite resources with all the consequences that follow (there are also opinions that the land is actually one of the most valuable finite resources, as it is a source of livelihood not only for humans, but also for other organisms). The revitalization of unused areas is closely related to current issues of urbanism and spatial planning, namely suburbanization and the so-called urban sprawl (uneconomical, often unconceptual and parasitic development in the suburban landscape). The development of unused railway areas has the potential to dramatically reduce this phenomenon and in addition, it has many advantages over building on the so-called “greenfield” – such as the use of above-standard connections to existing transport and technical infrastructure of the city, healing “wounds” in the urban fabric, suppression of the barrier effect of railway, remediation of contaminated soils and thus the improvement of the environment, etc. The development of unused areas also addresses their negative impact on the surrounding area, whether in the form of a direct impact of architectural and urban degradation of the environment or barrier effect,

or in the form of an indirect effect such as the fall of property prices, an overall outflow of funds from the territory potentially leading to an increase in unemployment, an increase in vandalism and crime or a degradation of the aesthetic taste of the population. For not completely abandoned, only not fully utilized railway areas, these indirect consequences are usually less noticeable than for traditional brownfields, but they are certainly not negligible.

As a result, the development of unused land has a double basic justification – it not only helps to solve the problem of new development, but also reduces the negative impact of the unused land itself. Here it is necessary to emphasize the lesson from practice that many negative processes can be reversed – for example, a gradual outflow of funds from a neglected area, where a quality pilot revitalization project can (and often does) serve as a catalyst for a significant change in the whole area (the best-known example of this approach in the field of railways is the famous High Line Park in New York).

## 2. SPECIFICS OF THE UNUSED RAILWAY AREAS

First, it is necessary to define what we consider to be unused railway areas and what separates them from the usual term – brownfields. Brownfields are defined by CzechInvest as:

“A property (land plot, building, complex) that is disused and neglected and may even be contaminated. Brownfields are remnants of industrial, agricultural,

residential, military or other activities. A brownfield cannot be used effectively and appropriately without undergoing a process of regeneration.” [1].

Calling unused railway areas brownfields would therefore be potentially problematically misleading, as it gives a wrong impression of a narrower focus only on completely disused and abandoned railway areas (because this is how brownfields are generally perceived, at least in the minds of the general public). However, it should be noted that the issue of revitalization of unused railway areas of course shares much in common with the issue of brownfield revitalization. For the purpose of this research the use of the term “unused railway areas” is proposed which gives a needed clearer idea of the character of these areas with no ambiguity. Unused railway areas are then defined as follows:

“These are railway areas that haven’t been in use for long time or that are used very inefficiently (i.e. although they are sporadically used or railway operates there still to some extent, by more rigorous application of the principles of modern railway operation these areas could easily be released without detriment to the railway function).”

Compared to standard brownfields, unused railway areas also differ in the following specifics:

**The role of the railway** Railway played an important role in the development of the cities through which it passed. It affected both their industry (by connecting it to national and international railway network and thus facilitating the transport of materials and resulting products), as well as the economic situation of the city itself (overwhelmingly positively) and its urban structure. The specific location of the railway and especially the station had a major impact on the direction and manner of subsequent development of the urban structure. The track as a linear (and in the case of larger mainly freight stations also area) barrier often determined the development zones, but also affected the functional structure of the city. Railway and significant expansion of industrial areas was often connected, when in some cases special sidings (or even their network) were introduced into individual factories. In many cases, railways and railway stations were built at a considerable distance from the existing city for technical and economic reasons, however, this mostly became a major impulse for the development of the city towards the station, which was soon absorbed by the urban structure. The result was often a de facto shift in the position of the station from the suburbs to the inner parts of the city, when the station sometimes reached the central positions of the newly formed districts. The arrival of the railway to the city was also one of the impulses leading to the demolition of the medieval fortifications. The stations at this time functioned as new symbolic (but also very much actual) gates, entrances to the city. They became the new starting

points of the main flow of visitors and passengers in the city. The builders of the station buildings were usually aware of their importance (especially in the golden era of network construction in the second half of the 19<sup>th</sup> century) and reflected it with a representative architectural design of the station buildings. The structure of the city reacted to this in many respects in a similar way, as if it were a city gate. The protection zone of the track according to the law also plays an important role. The railway is also a significant element in landscape, whether in the form of the track itself or civil engineering works and modifications such as notches, embankments, retaining walls, tunnels, galleries or bridges. And again, it should be mentioned that it effectively forms a linear barrier in the landscape. This effect is more noticeable (to some extent also spatially, but above all functionally) the stronger and faster the operation on a particular track is. Single-track local railways thus form a somewhat delicate barrier and are relatively easy to cross (by people and animals), on the other hand, the corridors of interstate trains (not to mention high-speed lines) are practically insurmountable and thus significantly divide the landscape. Similarly, the aesthetic effect of the railway in the landscape varies, where some elements such as viaducts can generally be considered as an interesting and distinctive local feature, however, a large freight station is not as a positive element in the landscape from any point of view.

**Great transport infrastructure connections**

Most of these areas, by the logic of their function, have a very good connection to public transport, sufficient parking areas and are very well connected to the road infrastructure.

**“Strategic” interests of the state** In some cases, the state may be interested in maintaining the selected line even though the operation has not been carried out on it for a long time and the line is pretty much abandoned. Reasons are usually to ensure the state’s defenses.

**The nature of the area** Considering the size of the areas, there is a minimum of buildings and objects in general, most of the area consists of tracks.

**Dimensional character** Usually longitudinal or strongly longitudinal shape. Thanks to obvious technical parameters, railway forms an uninterrupted linear barrier.

**Ownership structure** With a few exceptions, there is one, maximum two owners, which greatly simplifies the revitalization process. In the Czech Republic, for example, there are typically two owners, the state-owned České dráhy (especially some railway stations and the land below them) and the national Správa železnic (SŽ) (everything else) – considering those are state companies, it makes the possible different future use of these areas by the cities easier

and more feasible. After the public sale of part of the railway properties, some unused railway areas fell into the hands of private owners (mostly small family houses for railway personal, warehouses and land in the vicinity of the railway lines). An exception is sidings in industrial areas, which have private (and therefore often very confusing) ownership.

**Railway station architecture** The station buildings were very often, by their nature, built with an emphasis on high representativeness. In the cases of the most important stations, original architecture was usually applied (to this day with a very high aesthetic value), at other stations, standardized buildings were designed and built.

**Contamination** Railway operation causes some typical organic and inorganic contamination of the site. The sources are mainly waste from lubricating oils and condenser fluids, the transport of petroleum derivatives, metal ores, fertilizers and various chemicals or the use of herbicides [2]. The most frequently detected contaminants along railway lines are metals, pesticides and components of crude oil or fuels (petroleum products). These chemicals are associated with standard track operation and are likely to be found anywhere along the track [3]. The three most important types of contaminants are polyaromatic hydrocarbons (PAHs), heavy metals and polychlorinated biphenyls (PCBs) (to some extent) [4].

**Terrain** The railway is usually located on a very flat terrain without sudden breaks, there is a minimum of vegetation in the track area.

### 3. EXTENT OF UNUSED RAILWAY AREAS IN THE CZECH REPUBLIC

Research of the railways in the country was carried out which aimed to identify how many unused railway areas are located in the Czech Republic and what revitalization potential is hidden in these areas.

The analyzed sample is based on the SŽ document “Program of reconstruction and revitalization of passenger stations for the years 2018-2022” [5], which was then manually supplemented with some important stations, which were not originally included in the document (because no investment was planned in those buildings in 2018-2022) and several larger freight stations. The final sample was then 712 stations (604 from the original list of SŽ, 108 added). In the Czech Republic in 2021 there are a total of 2 612 railway stations and stops. There are 1 082 railway stations and 1 530 stops (typically only a shelter) [6]. The analyzed sample of railway stations therefore makes up about 66 percent of all railway stations in the Czech Republic. The sample is therefore not exhaustive, however, due to the fact that most of the remaining stations are mainly stations in smaller and very small cities

and villages, it is clearly sufficiently representative to identify the overall extent and potential of unused railway areas in the Czech Republic.

The analyzed parameters in the research includes, for example, the position of railway areas within the city, the size of the city, the size of railway areas (number of buildings, tracks, sidings) and especially the revitalization potential of these areas. It is based on the categorization according to the economic profit analysis from the USA that is used today in the Czech Republic for categorizing brownfields [7]. This categorization was slightly adapted to focus on railway areas and their revitalization potential. The evaluation is qualitative, it is an expert evaluation of many factors, such as the position of the railway area in the city, its connection to other forms of transport, the size of the city itself (and thus its economic strength), composition and location of existing functions in the city and its civic amenities (looking for possible deficit that could be solved by the revitalization of the railway area), the size of the unused railway area (number of the buildings, number of tracks or empty part of the land formerly used for unloading material), its character (building or area) and its location within the station, architectural the quality of the buildings, what the rest of the station looks like and how it is used, how intensive traffic on the track takes place (according to the number of passengers), what the neighboring buildings look like and what is their function or where the development of the city can be expected (because the revitalized railway areas could for example play an important role as a central linking element there). An important monitored factor is also the existence of other unused areas (brownfields) within the residence, such as not fully used castle, representative factory buildings or large farms (in a smaller cities or villages), in short buildings where higher priority of possible revitalization projects can be expected (whether from urban, cultural or aesthetic point of view). It is necessary to mention that some things are not part of the research although they do matter – for example, how many spaces in the station are successfully rented in the long run or where, for example, the station staff lives. Those information are too detailed for the purpose of this research which was to get a general idea of the extent of unused railway areas in the country, not to evaluate any particular railway are in great detail.

As the Figure 1 shows, the research found that in the Czech Republic, 74 percent of the analyzed stations are located in cities of less than 10 000 inhabitants. The majority (57 percent) of stations are located in central positions within the city and as much as 65 percent, or about two thirds of all stations are located in the inner parts of the cities. This proves the assumption that large number of railway areas do have a very important and prominent position within the city. Only 12 percent of the stations are located in an external position, in an area outside of the city.

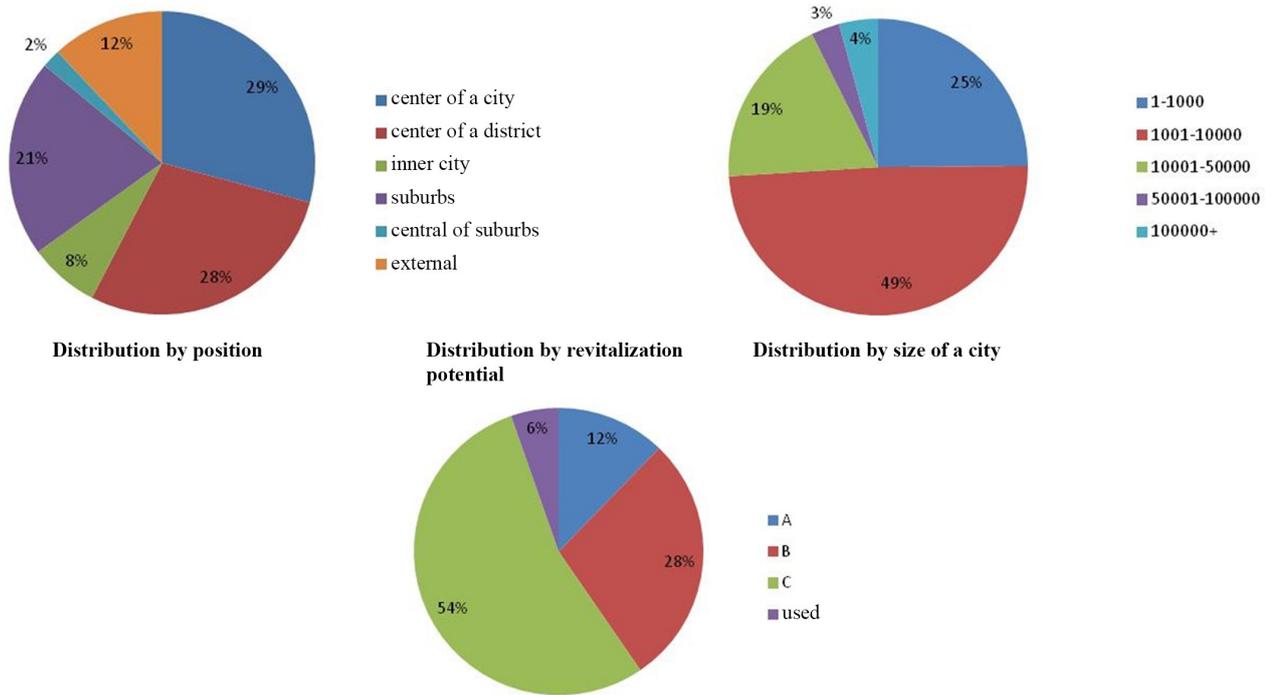


FIGURE 1. Distributions of railway areas (author’s research).

Revitalization potential could be identified in as many as 40 percent of stations (288 stations), 87 stations have a high potential A (revitalization of these areas is appropriate and recommended) and 201 stations have a potential B (revitalization of these areas is possible).

It is interesting to note that the highest number of stations with a high potential for revitalization (rating A) is located in the smallest cities with a size of less than 1 000 inhabitants. That is partially caused by the uneven character of the analyzed sample and the railway station network in Czech Republic, where sizable portion (25 percent) of stations is in towns under 1 000 inhabitants. Other reason is the fact that the revitalization potential evaluation scales with the size of the city – for example transforming part of the unused train station into a local cafe with small gallery plays a significant role in the life of a small town, but doing the same project in a big city would have negligent effect and therefore the investment would not be warranted.

Another important thing to note is the fact that for cities larger than 10 001 inhabitants, there is usually a 60–72 percent probability that their railway areas will have a revitalization potential. In comparison, in cities with a size of less than 1 000 inhabitants the probability of a revitalization potential is only around 34 percent.

Unused railway areas with rating A (great revitalization potential) have an average of about 13 tracks and a median of 9, an average of 10 sidings and a median of 5, an average of 9 buildings, a median of 4, therefore they are rather large stations. Rating B railway areas then have an average of about 11 tracks and a me-

dian of 7, 7 sidings and a median of 3, an average of 7 buildings, a median of 4, which are medium to large stations. A typical station in the analyzed sample has an average of about 8 tracks and a median of 5, an average of 5 sidings and a median of 3, an average of 5 buildings, a median of 3. This information indicates that stations with revitalization potential are usually large and therefore highly likely to have large unused areas within them, which represents a significant revitalization capital for individual cities. Unsurprisingly, the highest number of stations with a high potential for revitalization is in central positions within the cities or at least their districts. By correlation calculations (using Pearson correlation coefficient) of the different parameters of the research, it turned out that the most significant factor in evaluating the revitalization potential was the position of the unused railway area within the city (which seems rather logical) and the number of buildings. An important finding is although the fact that no parameter has proven to be a major factor that would dramatically affect the evaluation of revitalization potential. The evaluation thus proved to be really multifactor and it is therefore necessary to monitor all of the set parameters.

The research proved that there is a large number of unused railway areas in the Czech Republic with revitalization potential. These areas – taking into account their characteristics within the cities – represent a huge potential for improving the quality of life of local residents (e.g. as additions to civic amenities or as new public spaces) as well as a large treasury of areas and buildings which are owned by the state and are not used to their full potential.

#### 4. POSSIBILITIES OF FURTHER USE

For any city, a quality revitalization of unused railway areas is absolutely essential, because as the research analysis has shown, these areas often play an important role in its entire structure. It is highly desirable to find solutions that allow these areas to be used meaningfully and re-integrate them into the fabric and life of the city. In general, it is also appropriate to reduce the barrier effect of the railway as much as possible (by reducing the number of tracks, building footbridges, underpasses, etc.) and try to maximize the permeability of the area (freeing up unused tracks, making them a public space preferably). Also, the current assumption in the field of architecture and urbanism also applies that it is always better to use already built-up areas and existing buildings than to build new ones on open green areas (whether in terms of urban context, architectural-historical continuity or in terms of sustainability).

It must be emphasized that the physical destruction of railway areas should always be preceded by careful consideration, as such action is against the European Union's transport policy, in particular the Marco Polo II program (concerning the transfer of freight from congested roads to railways or waterways). However, many railway areas are decidedly unused and cannot realistically be expected to be re-used efficiently, in those cases it makes great sense to consider another use that will be more beneficial for the city (and, after all, also for the station itself).

It is understandable that the size of the city and its budget (or the financial possibilities of SŽ or other railway carriers) significantly affects the possibilities of revitalization and thus the choice of further use of freed unused railway areas. However, it is still necessary to keep in mind that the use of these areas is in most cases the most financially viable way to supplement or enrich the network of civic amenities, as it is state property after all, where it can be expected (with the support of respective state authorities) there could be a gratuitous or at least very advantageous transfer of real estate into the ownership of the city.

One of the possible ways of utilization of unused railway property is also its active lease (targeted at desirable functions), either by the city or SŽ (in coordination with the city and its vision). This applies, of course, mainly to buildings. An interesting option is also in justified cases the waiving of the lease for a definite period of time (e.g. for state or non-profit organizations or interest groups). In this way, it is possible to support, for example, clubhouses serving local communities, fitness and health groups, groups for children, necessary missing services such as barbershop, surgery, library, but also commercial activities such as start-up offices or social programs such as social apartments for young families or flats for the necessary professions (typically teachers, doctors). This can effectively serve to rather cost-effectively kickstart local community life.

Many possibilities for further use can also be quite minimalistic – it is understandable that a 3000 city will not have enough funds to renovate the building into a modern, elegant Hamburger Bahnhof-style gallery, but sometimes a somewhat simple and industrial, yet functioning gallery (or cultural hall etc.) can be created by just cleaning the building, possible wiring or plumbing done very cost efficiently visibly along the walls and repair of the roof (if necessary). Similarly, other creative ways of saving can be used – instead of reconstruction (for example of the former storage hall), the building can ideally drop part of one or more walls (at the very least the parts underneath the windows) and create an unusual generous outdoor shelter which can be used, for example, for outdoor seating or as a roof for holding markets. The costs of such projects are, of course, fundamentally different from a complete reconstruction with repair of the facade, all surfaces, replacement of windows and roofs, and many examples from around the world but also in the Czech Republic show that such areas have their specific charm, work very well and they usually find their users.

From the point of view of costs (and, after all, the time of implementation), this minimalist approach can be applied to practically all possibilities of further use, including the creation of new public spaces. The areas can be done attractive, for example, by adding (as a kind of technical artifact) a parked wagon, which with minor modifications can easily serve as an interesting gazebo, or a lockable storage for a refreshment stand. Former loading area doesn't have to be repaved, it could be just creatively painted over using colors for marking roads, creating visually striking fun patterns, labyrinths or improvised "sport fields". Interesting and attractive in the case of revitalization of unused railway areas does not always mean costly, it could be inspired by the ideas of "tactical urbanism", have a clear vision and consistent emphasis on low cost and finding ways to achieve it (e.g. looking for possible cooperation with local schools or sponsoring local companies).

In general, practically all stations in the Czech Republic should ideally expand their range of services and shops (for which it is sensible to use those areas and buildings within the station that are not currently used effectively) and follow the global trend aimed at improving the quality of travel for passengers. One has to remember, that even today, for a large number of people, the station is still the gateway to the city, first point of entrance, and as such should be, if not (for financial reasons) representative, then at least lively and interesting.

One thing that should be noted is that the station buildings were very often, by their nature, built with an emphasis on high representativeness. The station architecture is quite specific and even most laymen are able to identify the station purely by its appearance. For practically all stations it is true that to this day

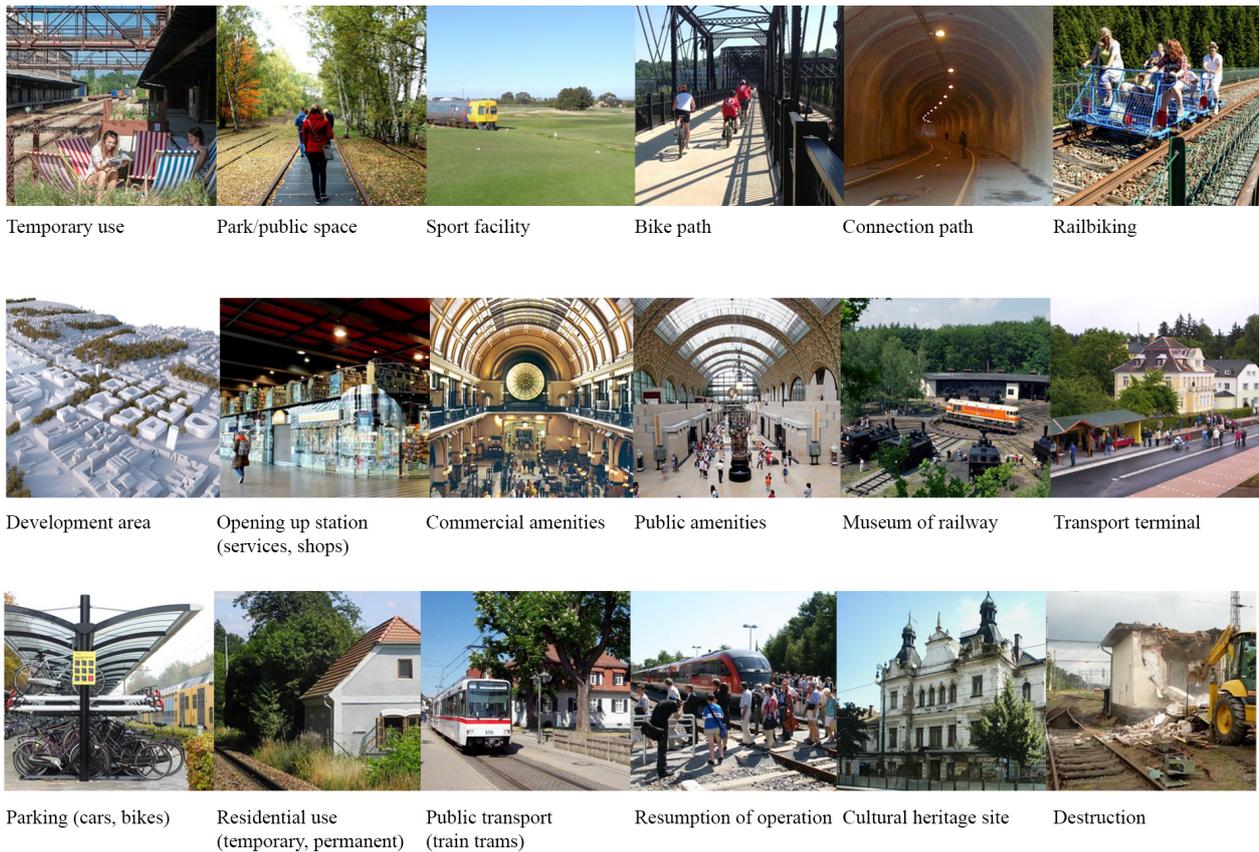


FIGURE 2. Possible new functions of unused railway areas [8].

they stand with great dignity within their cities and are often (especially in smaller cities) one of the most representative buildings in the area. The vast majority of stations were established during the golden age of the railway and therefore an unusual amount of funds was invested in them. By finding new use for these old buildings, the city can relatively cheaply obtain aesthetical and expensive buildings, far more representative than the city would usually have the funds for.

Many of the unused railway areas also pose a significant cultural, architectural or historic value. One of the possibilities is the determination of the building or area (or its part) a cultural monument and thus the provision of monument protection. The selection of railway monuments in Czech Republic was initially somewhat random and was accompanied by many disputes, when the declaration of a monument was cancelled. Now, with the growing public interest in industrial heritage, the situation is slowly improving. In 2021, there are 250 railway areas on the Central List of Cultural Monuments, of which about 124 are stations (out of 1 082 functional stations) [9].

When determining the future function of the unused railway areas, one of the major specifics of these areas has to be taken into account – in vast majority of the station, the operation is still running to some extent. Revitalization projects therefore should work with this factor and use it to their advantage. The worldwide

trend is towards the greatest possible involvement of the station in the daily life of the city, where many of the added or implemented functions improve the quality of life and services of both the neighbourhood and the railway operation itself.

For unused railway areas, the following possibilities for further use should be considered (and in some cases they are mutually combinable or consecutive). The examples shown in Figure 2 come from countries like USA, Germany, France, Australia and Czech Republic.

## 5. CONCLUSION

The research found that in the Czech Republic, the majority (57 percent) of stations from the analyzed sample (of 712 stations) are located in central positions within the city and about two thirds of all stations are located in the inner parts of the cities. Thus proving the assumption that railway areas typically have a very important and prominent position within the city. Only 12 percent of the stations are located in an external position, in an area outside of the city. In 40 percent of stations (288 stations) revitalization potential could be identified. From those 87 stations have a high potential A (revitalization of these areas is appropriate and recommended) and 201 stations have a potential B (revitalization of these areas is possible). Size of a city of course plays a big role in evaluating the revitalization potential of the railway area, where for example in cities larger than 10 001

inhabitants, there is a 60–72 percent probability of a revitalization potential.

Successful revitalizations of unused railway areas have the potential to have a very positive effect on their immediate surroundings and so, in addition to their obvious direct benefit (in the form of, for example, the introduction of a new function to the area), they also have an equally important indirect benefit. It is a practice many times proven that successful attractive projects can start a positive development of the whole area. However, even smaller revitalization projects have a significance that should be utilized. Due to the fact that the vast majority of unused railway areas are state property (whether ČD or SŽ), the use of these areas is in many cases the most financially viable way, for example, to supplement or enrich the network of civic amenities or public spaces. Unused railway areas can be re-integrated into the life of cities, in which they can again play a significant and positive role, which the railways historically always did.

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