

DOI: 10.62897/COS2023.1-1.69

SUSTAINABILITY ASSESSMENT OF HUNGARIAN CYCLING INFRASTRUCTURE INVESTMENTS

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The popularity of cycling and the development of cycling facilities has grown significantly in recent years all over the world. Numerous governmental funds and tenders help local authorities in Hungary to implement transport and tourism projects concerning the improvement of the bicycle infrastructure. In the 2014-2022 programming period, Hungary has made the development of cycling infrastructure in Hungary a top priority, with a twofold objective: to facilitate the movement of commuter cyclists and to improve the background and framework for recreational and tourist cycling. Every successful application and investment had to have some kind of sustainability element. The research will use the Hungarian tender database summarising the data of the cycling infrastructure tenders implemented during the 2014-2020 period to show the extent to which these investments meet the sustainability criteria described in the tender and the sustainability criteria of the National Cycling Plan for the period.

1. Introduction

The sustainability of transport is a global objective, particularly in view of the significant growth in urban populations and the transport sector's contribution to environmental pollution (Bencekri et al., 2021). In recent years, many countries have focused on solving the problems of urban traffic and the environment through the introduction of environmentally friendly means of transport (Ku et al., 2021). In the European Union and its Member States, public thinking on transport, transport systems, and infrastructure investment has undergone a major transformation over the last two decades (Oldenziel, 2016). As a result, the idea of sustainability has become a major factor in strategic thinking, which must guide developments from the planning stage through to construction and maintenance (Bruno, 2022). Among sustainable transport modes, cycling has been given the highest priority alongside public transport among the transport systems eligible for support in the European Union. Between 2014 and 2020, €2 billion has been allocated for cycling improvements in EU Member States. More than 7 % of this amount, 151.7 million Euro, was spent in Hungary. A large share of this funding was for road investments. In the case of Hungary, the amount of so-called explicit spending, also known as infrastructure investments, was 106.7 million EUR (Buczyński et al., 2022). With the right policy, planning and investments, demonstrable changes in vehicle use can be achieved (Ingeborgrud et al., 2023; Meng, 2022). The expected impact of investments is taken as a basis for ex-post impact assessments when assessing the use of grant funds. These can be explicit, measurable outputs, such as the percentage change in modal split, but they can also be complex and soft elements that are difficult to measure, such as changes in attitudes towards cycling (Abadi-Hurwitz, 2018).

In the following, narrowing down the focus of the research, a sustainability analysis of the official cycling investments is presented by analysing the main data and output indicators of the successfully completed TOP and VEKOP projects in the 2014-2020 programming period. To this end, it is necessary first to review

the conceptual framework and the professional context in which the success and sustainability criteria of the proposals can be defined. The EU legislation will be reviewed, and the main development cornerstones of cycling concepts and strategies in Hungary will be presented. After presenting and analysing the baseline data of 450 completed projects, the sustainability analysis of 20 projects in cities with county status will be presented, and finally, after summarising the experiences, sustainability recommendations for the next planning period will be formulated.

1.1. Strategic framework for transport development

According to the OECD definition, sustainable transport is transport that does not endanger public health or ecosystems and meets mobility needs consistent with (a) use of renewable resources at below their rates of regeneration and (b) use of non-renewable resources at below the (OECD 1997). After the theoretical framework was established, the idea became part of the European Union's strategic planning and was applied as a horizontal principle in economic development. The European Commission launched the ten-year strategy, Europe 2020, on 3 March 2010. As stated in the strategy's subtitle, it aims at a "smart, sustainable, inclusive growth" with greater coordination of national and European policy:

- Smart growth: developing an economy based on knowledge and innovation.
- Sustainable growth: promoting a more resource-efficient, greener and more competitive economy.
- Inclusive growth: fostering a high-employment economy delivering social and territorial cohesion (European Commission 2010)

For each of the priority themes, the Commission has proposed a total of seven flagship initiatives to stimulate progress. In this case, the Flagship Initiative: "Resource efficient Europe", which sets out actions at both European and national levels to modernise the transport sector and promote energy efficiency, is relevant to the theme under consideration. In Hungary, the strategic background to the programme referred to in the introduction is summarised in the National Development and Spatial Development Concept, the fifth development priority of which is the implementation of local and regional development measures to promote economic growth. In addition, the link between transport development and the Europe 2020 strategy is established by the National Transport Infrastructure Development Strategy (3K-Nemzeti Fejlesztési Minisztérium, 2014), which aims, inter alia, at strengthening resource-efficient modes of transport, in particular by increasing the use of walking, cycling and, where the benefit-cost ratio is appropriate, rail and waterborne transport. The strategy is Hungary's transport policy strategy and, therefore, the defining document of Hungarian transport policy for the period 2014-2050. Cycling investments, if they contribute to the creation of a coherent European or national cycling network, are considered to be among the investments with high benefits but limited feasibility.

During the 2014-2020 programming period, Hungary has made cycling infrastructure development in Hungary a top priority, with a twofold objective: on the one hand, to facilitate the movement of professional cyclists (within and between settlements), and on the other hand, to improve the background and framework for recreational and tourist cycling (European and national networks). The two objectives are not necessarily always the same.

In the above-mentioned period, four sources of funding have been used to invest in cycling infrastructure in Hungary in the field of sustainable transport:

- a. TOP-3: Transition to a low-carbon economy, especially in urban areas;
- b. TOP-6: Sustainable urban development in cities with county rights;
- c. VEKOP-5: Supporting energy efficiency, smart energy use and renewable energy use;
- d. GINOP-7: Tourism.

The Operational Programme for Territorial and Urban Development (TOP) two types and the Competitive Central Hungary Operational Programme (VEKOP) mainly included investments important for professional

cyclists, where the main implementers were all municipalities, while the Operational Programme for Economic Development and Innovation (GINOP) supported cycling development for tourism, where the applicants and implementers were very diverse, both municipalities and municipalities. In the following, only investments in professional tourism will be evaluated, in which case the interventions can be compared.

1.2. Background on Cycling Developments

It is clear from the above that the conceptual and strategic background for cycling development, with a focus on sustainable transport investments, was well developed, both at the European and national levels. This was the spirit in which the calls for proposals were launched. However, a number of elements were still missing at that time to make the interventions understand and work in a systemic way.

Cycling investments have already been made in Hungary during the 2007-2013 programming period, but they were not accompanied by an approved cycling development document, so most of the investments were ad hoc. To overcome these shortcomings, several development documents were prepared during this period. First of all, the Cycling Roundtable, a group of cycling organisations in Hungary, wrote a concept paper in 2013 to draw the attention of the Hungarian government to the need to spend cycling resources as efficiently as possible in the next programming cycle (Kerékpáros Kerekasztal, 2013). Cycling-focused documents were prepared in connection with the National Transport Infrastructure Development Strategy. The most important of these is the National Cycling Concept and Network Plan, which emphasises the networked nature of cycling infrastructure and called for the development of missing network elements as its main objective. These included tourist and professional cycle routes. It also set out an important framework for future development. The horizontal positioning of cycling as a sustainable mode of transport in further developments and the definition of strategic targets were addressed in the 2014 Cycling Development Programme, entitled Cycling for pleasure, which included decision preparation and feasibility studies to prepare priority cycling investments and to examine the possibilities for maintaining the existing network. This included the elements of the cycle paths that could be integrated into the professional network evaluated in this study (3K, 2015).

The programme put forward six sets of measures, one of which was to develop and maintain infrastructure. In the field of infrastructure, the document set the following objectives for the period under review. 21 cycling-friendly town centres, created through the integrated and complex development of smaller towns and villages, where the new elements meet the needs of cyclists, including accessibility, safety and comfort. The creation of 500 kilometres of cycle-friendly facilities, including the development and improvement of regional cycle networks and cycle-friendly transport links. The rebuilding and renewal of existing but outdated network elements is also addressed here. A total of HUF 30 billion is planned to be spent on the two objectives, and a total of HUF 92 billion on the overall development programme.

In 2016, a government commissioner for cycling issues in Hungary was appointed to coordinate and oversee the development process.

In order to facilitate the applicants' planning work, the promoters were asked to prepare a local cycling network plan similar to the national and county cycling network plan methodology. The completed plans were then presented to a planning jury, where the good practices and key guidelines presented in the development materials were examined.

2. Cycling development projects 2014-2020

A total of 482 applications are included in the application summary document examined. Of these, 32 were terminated contracts, which, for some reason, were not implemented. The contracts for the 450 projects that entered into force were concluded between 2016 and 2021 between the managing authority and the applicant municipalities (although the period under review is the planning period 2014-2020, the first contracts were postponed by two years due to the tendering and evaluation of the calls for proposals, and the COVID situation hampered further work). A preliminary evaluation of sustainable proximity applications was already carried out in 2021, courtesy of the Főmterv (Főmterv, Collectivo, 2021). The evaluation discussed cycling programmes separately, but a large proportion of the investments were not yet completed, so a final evaluation and analysis of indicators was not possible.

2.1. Main features of the applications

In Hungary, cycling development projects have been paid for under three funding schemes (VEKOP, TOP, GINOP). The present study only looked at the tenders for cycling infrastructure for public transport (TOP, VEKOP), while the tenders for tourism, often involving complex improvements (GINOP), were not reviewed.

The word sustainability is only used in the title of the proposals implemented for smaller municipalities in 98 out of 450 proposals.

The total amount to be disbursed was HUF 156 billion, of which HUF 145.5 billion was actually paid for completed projects. This is almost one and a half times the amount projected in the programme mentioned earlier. 346 municipalities were awarded a grant during this period, the vast majority of which (297 winners) managed one project during the application period. Only the capital, the county capitals and larger cities deviated from this. Figure 1 shows the distribution of projects implemented, where the size of the circles increases with the number of projects implemented. One city with county status has the highest number of successful projects, with a total of 13 cycling proposals, ahead of the capital. The average amount paid per project was HUF 323 million.

When looking at the average investment, the highest value investments were made in the county capitals, where the integration of cycle paths into the existing urban access system required complex interventions. In nominal terms, the investments with the highest value, in addition to such internal investments in the cities of county status, were those where the applicants undertook to link two municipalities. Most projects were carried out in smaller towns and villages during the period under review. However, the value of the investments varied significantly, with smaller investments in villages, where 27 % of the total amount allocated was used, compared to 41 % in towns (Table 1).

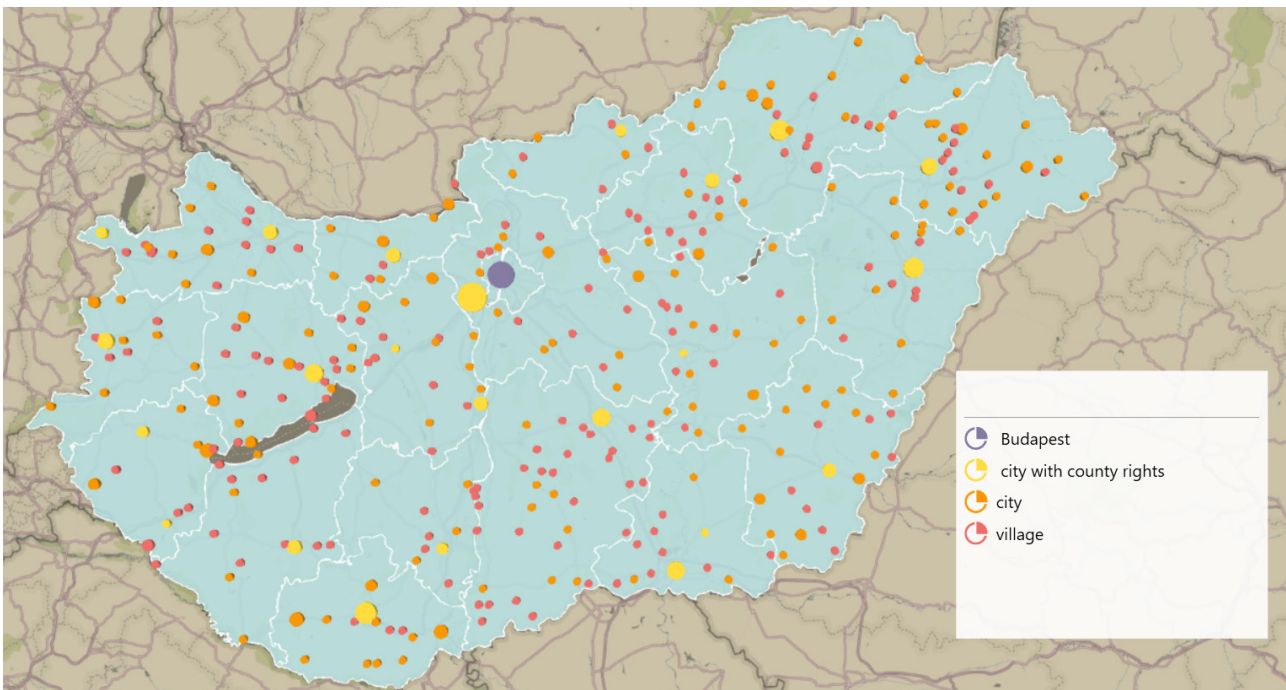


Figure 1: Successful cycling infrastructure-related TOP and VEKOP projects in Hungary in 2014-2020 programming period

Table 1: Distribution of projects between different type of settlements.

	Number of projects	Total amount of payment (bnHUF)	Variance (mHUF)	Mean (mHUF)	Min (mHUF)	Max (mHUF)
Budapest	11	2.2	223.7	215.1	2.3	671.1
cities with county rights	85	44.0	440.7	517.9	23.0	2,050.3
cities	180	59.9	306.9	332.7	10.3	2,260.4
villages	174	39.4	236.8	226.5	4.9	1,378.6
Total	450	145.5	328.3	324.0	2.3	2,260.4

The question arises: what is the relationship between sustainability commitments, the road sections built and reconstructed, and the cost of the projects?

2.2. Applications from a sustainability perspective

For accepted and implemented applications, the sustainable convergence elements were measured by the following output targets of the applicant company, where the target was meaningful for the investment:

1. Length of cycling facilities developed (km)
2. Number of developed cycle-friendly municipalities or parts of municipalities (number)
3. Number of municipalities with road safety improvements (number)
4. Number of new traffic calming zones created (units)

Of the 259 applications included in the research, none of the indicators presented above were met, i.e. the indicator value was either missing or zero. There were 47 applications where one indicator was met, which in most cases meant that the investment was built. More complex investments, with two or three or all four indicators met, accounted for one-third of all applications. Only 25 applications met all four indicators.

In the following, for each commitment, the number of projects that have committed to the indicator in the course of their development and the differences between the number of indicators committed and the number of indicators actually adopted are analysed. Smaller towns and villages are over-represented among the municipalities that have successfully adopted more than one indicator.

2.2.1 Length of cycling facilities indicator

This indicator shows the length of the road type suitable for cycling that has been built in the municipality or between municipalities during the project. The indicator statistics do not break down the facilities constructed into sub-types so that directional separated cycle paths, cycle lanes and cycle tracks are all included, which do not imply the same usability. This indicator was included in 87 % of the applications examined, i.e. 391 projects, the same number of municipalities where infrastructure was to be built or upgraded. The total length of the facilities to be built in the applications would have been 1603 km, with an average of 4 km per municipality. However, the reality is much more dismal, with only one-third of the committed figure, 488 km, representing only 1.2 km of cycle facilities delivered (realistic compared to the 500 km of cycle paths committed in the Cycling Programme).

Where no such commitment was made in the first place, or where targets were not met, there are also investments to promote cycling-friendly transport, often to promote safe walking and public transport.

2.2.2 Number of developed cycle-friendly municipalities or parts of municipalities Indicator

Before the investments started, the municipalities drew up a cycling network plan, which identified the areas of the municipalities that would be affected. If it could be demonstrated in the plan that the intervention had made the access routes to the designated municipality or part of a municipality cycle-friendly, the indicator was met. A settlement area is defined as any organic, functional unit within a settlement that includes both residential and traffic-attracting areas. In the case of smaller municipalities, the conversion of the entire section of the national road through the municipality or of the part of the road that could be considered a functional unit (the section between the centre of the municipality and the residential area on the edge of the municipality) was sufficient to meet the indicator. The vast majority of applications, 431, included such a commitment. On average, 1.39 urban areas were identified per application, with the highest value being 7 per application. The final result shows that only 36 % of the commitments were met, with a total of 157 functional municipalities or parts of municipalities that could be considered cycle-friendly being created during the application period.

2.2.3 Number of municipalities with road safety improvements

To meet the indicator, the applicant had to undertake a road safety audit in accordance with the government decree and implement the investment based on the recommendations and findings of the audit. Less than half of the applicants undertook to carry out a preliminary assessment in 215 cases, covering a total of 232 municipalities. Less than half of the numbers committed. 42.6 % were acceptable.

2.2.4 Number of new traffic calming zones created

Traffic counts before and after the works and speed limit signs were used to illustrate the traffic conditions before and after the intervention. If a reduction in the volume and speed of traffic in the zone could be demonstrated, the indicator was acceptable. This indicator was the least frequently undertaken element in the applications, as only 123 of the applications undertook to make a substantial reduction in vehicle traffic by introducing cycling. Although it was committed in a small number of applications, a comparison of the targets and the actual data shows that 55 % of the indicators committed were met, which is the highest of all.

3. Conclusions

From the above, an interesting picture emerges with regard to the sustainability of professional cycling-related investments funded in Hungary in the 2014-2020 programming cycle. Cycling infrastructure investments were also made in the previous programming period, but the period under review was the first seven-year planning period in Hungary, where there was a clear and understandable conceptual background behind the developments and a strategy underpinned programming at the national level for cycling development. The Managing Authority's objectives were clear, and the last three indicators included in the proposals included elements related to the long-term impact of the investments and sustainability. However, the situation was less clear for the municipalities responsible for implementation. In many cases, there is no local apparatus to fully integrate the objectives and recommendations of EU and national strategies at the local level and adapt them to local conditions. It can be seen from the distribution of indicators that in all cases, the primary objective was construction and reconstruction, while the related direct and indirect elements such as cyclist safety, changes in the livability of the settlement or modal split were less important and less achievable.

Furthermore, the applications do not show a transfer of a network approach, as most of the interventions are point interventions. Although methodological guidance was provided for the preparation of the compulsory cycle network plans, which are essential for the assessment of indicators, the quality and depth of the plans varied considerably. In the future, these documents should be standardised and, like other standardised planning materials, should be collected and made available to all for reasons of comparability.

Although increasing the share of cyclists in the metropolitan environment is the most urgent task, it is in relation to investments in these municipalities that the least focus has been placed on sustainability elements

and the demonstration of change in terms of indicators. Similarly, there is a great need to present best practices and exemplary investments.

The 2014-2020 period was a learning period for local-level developers. The strategic objectives of the new programming period have not changed much compared to the previous ones. There is a need to learn from both the experiences and mistakes of the past period.

Acknowledgments

The authors of this article would like to thank the staff of the Active Mobility Department of the Prime Minister's Office for their help

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