The 4th Budapest metro line
Wasteful plans from the past

Urban and Suburban Transit Association

2006

Contents

Executive summary: Metro 4 – the worst underground alternative for Budapest

The planned new metro line of Budapest has been on the political center stage since 1990 so that in the meantime not a single metre of tunnel has been constructed. The plans, however, are even older: the majority of them were created in the 70's. This way, it is not very surprising that the new line in its currently planned form does not fulfill the requirements put towards the modern metro line of a contemporary metropolis. Behind the huge costs that have already risen HUF 400 billion (EUR 1.6 billion) even before the beginning of any construction work, there is a metro line that does not fit either into the structure of the existing Budapest public transportation network or into the reasonable future development scenarios thereof.

Problems to be solved

The largest problem in Budapest is congested vehicle traffic which results in big traffic jams during the whole day on some bottleneck roads in the city causing a significant amount of air pollution and noise, while adding a lot of extra time spent with travelling, which can be expressed as economical loss. Most of the traffic comes from the suburbs and the commuter belt: while the modal split value is fairly good in the downtown (above 60%), it decreases as we move towards the suburbs and to the commuter belt (around 35%).

Currently, living in the inner city is not suitable for most of the people chiefly because of the high air pollution, the noise and the crowded streets. This problem can be easily seen in the statistics: during the last 10 years, Budapest has lost more than 10% of its population, while the surrounding areas have gained about 15%. Of course, nearly all of the missing population works in the city as before, which causes massive traffic jams, especially on the incoming roads.

A bad solution with negative economical value

Metro 4 is planned to be relatively short, connecting two major railway terminals with a heavy metro line. The western terminus is relatively close to the city limit, but even this end is far from the outer limit of the traffic jam zone, so to use the metro, one has to struggle through 15-30 minutes of traffic jam. Unfortunately, most of the suburbs are not reached by the new metro line, while the commuter belt is completely out of scope, meaning that the new metro line will be unable to give an alternative to the areas which generate most of the existing traffic.

As a result, passengers who can travel from the suburbs to the city center using a single line in the present system will have to change mode because of the new metro, and so the main public transport axis of Budapest will be more difficult to access from many districts. Because of the required changes and the relatively slow and short metro, it is very unlikely that a huge amount of time can be gained by using the metro compared to the present tram and bus system.

This way the new metro line can provide better service to only a small part of the public, so it is highly possible that it will not attract the expected (most probably overestimated) traffic. This effect, multiplied by the previous (insignificant time savings) results in a shockingly poor economical value. The net present value is most likely below HUF –200 billion, while *the cost-benefit ratio is below 0.5*.

Because of the facts above, the official plans of metro line 4 were often disputed among professionals in the previous 10-15 years. The feasibility study of metro 4 was completed in 1996. Some parts of the study were already obsolete in 1996, others have been rendered obsolete by technical development as well as the economical and social changes since then.

The alternative solutions

In contrast to the current plans, a state-of-the-art rapid transit line would give much higher quality of service than the present Budapest network giving direct access of the inner Budapest area to passengers from the suburbs or the commuter belt.

An alternative solution was presented by the Metro 4+ Team. The core idea was to use the existing railway network in the suburbs, while connecting the two (eastern and western) parts using the newly built underground tunnel. Another study made at the Budapest University of Technology concluded the same, stating that the project can only be successful economically if it is extended by using the railway system. This is not a big surprise: the planned metro 4 tunnel could easily be converted into a railway tunnel connecting two major railway terminals of Budapest, effectively forming a railway-compatible east-west underground backbone, which would unify the separate railway links, forming an efficient system.

According to our study and the BUTE study mentioned above, heavy rail compatible solutions would increase costs by ~30%, but the income would be approximately 2.4 times bigger.

On the other hand, if the goal is to find a solution for the inner Budapest area, LRT solutions should be studied, as they are far more cost effective. The so-called “Project Karolina” is one of the many possible LRT solutions, solving a widely extended set of inner-city problems yet requiring only about 25% of the planned metro 4 costs.

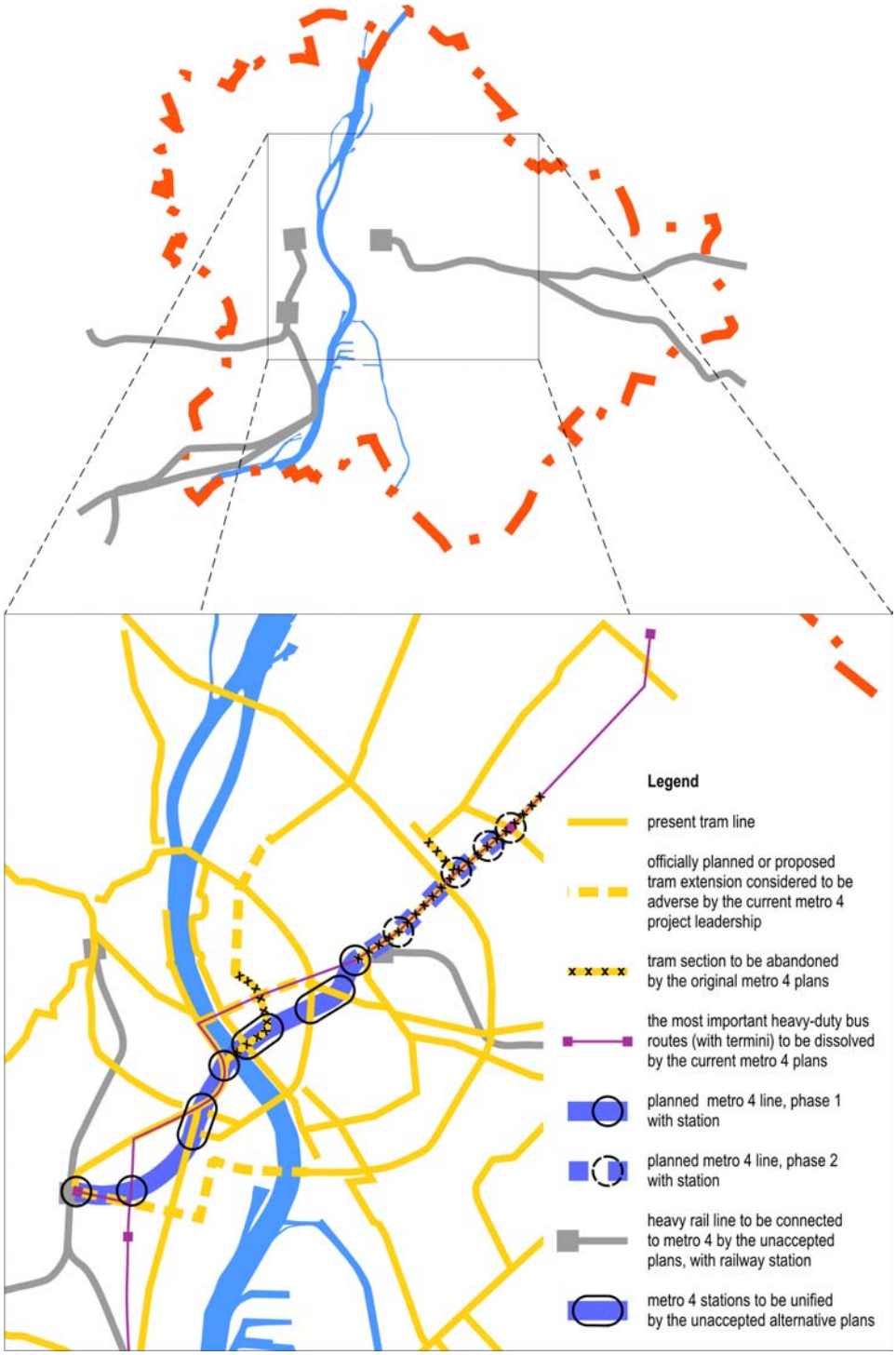
Disputes on project funding: EIB vs. Cohesion Funds

It is well known that the European Investment Bank (EIB) granted a loan to the metro 4 project. However, this declaration cannot be translated to a Commission Decision for the project automatically, because of the different points of view of the two institutions. The European Investment Bank is a profit-oriented financial corporation, thus its primary goal is to secure the return of the granted loan. As the metro 4 project was guaranteed by the Hungarian government, the aspects of transport and regional policy were less relevant for the bank, as long as it fits the relevant law. However, it is remarkable that a bit earlier the World Bank rejected to fund the project, most likely because of those conceptional problems and the insufficient economic indicators, which are presented in this paper.

Contrary to the EIB, the European Commission considers not only the financial security but also the goals of the Cohesion Fund established in the Maastricht Treaty. The main target of the Cohesion Fund is to allow the development of infrastructure in the less developed EU member states without overburdening state budgets. In the case of this project, this goal cannot be achieved, as the majority of the Cohesion Fund usable for public transport investments in Hungary between 2007 and 2013 will be committed to a single, large but misguided metro project.

Regulation 1084/2006/EC allows the support of urban and suburban public transport projects besides the classical target group of the TEN network projects. The new target is to support projects that assist creating liveable city structures with sustainable public transport and economy. Unfortunately, the planned metro 4 is unable to achieve these goals as it is sustainable neither in economic (negative

NPV), nor environmental (no significant traffic reduction) nor social (conserves regional differences) aspects.



A sketch of the planned metro 4 line, the related network issues and their location within Budapest

Introduction

The fourth Budapest metro line – in its currently planned form – does not fulfill the requirements put towards the modern metro line of a contemporary metropolis. Behind the huge costs that have already risen to HUF 400 billion even before the beginning of any construction work, there is a metro line that does not fit either into the existing structure of the Budapest public transportation network or into the reasonable future development scenarios thereof. This planned line does not integrate with either the suburban railways or the city's tram system, while integration between public transit modes, especially when new infrastructural elements are built, is a basic requirement throughout the world. As a result, passengers who can travel using a single line in the present system will have to change transport mode because of the new metro, and the main public transport axis of Budapest, the *Rákóczi út*[1] will be more difficult to access from *Zugló, Újpalota* or *Kelenföld*. The hardly useful metro line can provide better service only to a small part of the public, so it will not attract the expected traffic. Thus, the current surface transit network would have to deteriorate drastically to make the passengers use the new metro line and ensure the desirable load. Otherwise, the uneconomical and worthless nature of the fourth metro line will be evident.

In addition to the structural problems of the line, the high cost involved will swallow up other financial resources from other projects of Budapest, or even the whole of Hungary, retarding the development of its public transit infrastructure for years. In the next seven years' financial cycle, there will be no way of modernizing or extending the Budapest tram system, the existing metro lines or the suburban rail traffic. Even the maintenance of the existing system could face troubles, due to the lack of financial support.

Even though it is an investment into rapid transit, the current conception of the fourth metro line has absolutely nothing to show for the development of regional public transport in the greater Budapest area. Due to the limited scope of usability, only a very short (ca. 2 km) section of the line (*Móricz Zsigmond körtér – Kálvin tér*) will have a load large enough to necessitate a metro line, and already today, the first phase of the project (the *Kelenföldi pályaudvar*[2] *– Keleti pályaudvar* section of the line) has negative economic ramifications. The planned second phase (the extension under *Thököly út* from *Keleti pályaudvar* to *Bosnyák tér*) is even less reasonable, the peak load factor of this section cannot be raised above 30% even if the entire nearby surface system is eliminated. The politically motivated intentions to extend the line (to *Újpalota* at the eastern end and to *Gazdagrét* and the boundary of Budapest to the west) sound even more hollow in the light of real economic and traffic data concerning the base two phases of the investment. So the construction of the fourth metro line according to the present plans is tantamount to pouring public funds into an uneconomical project at an extremely hard time for an already struggling Hungarian economy.

The financial support coming from the EU cohesion and structural funds could easily be used for other projects, regardless of metro 4. Having no undesignated resources, it is extremely irrational for Hungary to spend almost the whole of its available public transit development resources (the funds retrievable from the EU in the 2007-2013 cycle will be no more than EUR 1.5 billion) on such a questionable investment, suspending almost every other, much more well-grounded investment in public transit, e.g. the *North-South Regional Rapid Transit Line* of Budapest, the tram extensions of Budapest and other Hungarian cities, the *Aquincum* bridge of Budapest or any investment into suburban railways.

[1] Every object (location, public transit route, etc.) mentioned in this paper is explained on a map at the end of the document.
[2] pályaudvar = railway terminal

In contrast to the current plans, a state-of-the-art rapid transit line would give much higher quality service than the present Budapest network, giving direct access to the inner Budapest area for passengers travelling from the suburbs or the commuter belt. The passenger time saved and the new users attracted this way could ensure the economical efficiency of the investment. Building a metro line that does not reach the outskirts or the commuter belt and so does not bypass the traffic jam zone is simply making it incapable of becoming the backbone of a usable and attractive P+R system and feeder network.

Naturally, a modern rapid transit line built after redesigning may not reach all of its targets, but a system reaching the suburban areas can be constructed gradually. Nevertheless, the main requirement that must be fulfilled by the most costly basic section of the line (the tunnel between *Kelenföldi pályaudvar* and *Keleti pályaudvar*) is the extensibility at reasonable costs. The current plans contain too short platforms at stations, too narrow a clearance in the tunnel and maximum incompatibility with the existing heavy rail network (reached at both termini since they are under existing railway stations), making a region-wide service impossible; and in addition to this, the base section of the line – for the maximum competition with means of surface transportation – contains too high a frequency of stops that is rather inconsistent with the characteristics of a rapid transit line.

Basic questions concerning the traffic of the line

Is metro 4 a rapid transit backbone line or not?

In a metropolitan area like that of Budapest, the ideal public transit network functions basically at two levels: the local level and the level of the transit backbones of the whole area. The backbones carry passengers from the outskirts of the main city and the suburbs to the inner areas very fast and provide quick, high-capacity connection between the main transit hubs of the inner city. Such an archetypical rapid transit backbone line will be the so-called *North-South Regional Rapid Transit Line* (publicly known as metro 5) planned for Budapest. The other, local level of public transit network has typically – but not exclusively – lower-capacity lines that reach all parts of the city, provide a wide range of direct connections via a tangled route structure and dense stop layout, as well as ensure efficient service on shorter trips.

The current plans of metro 4 aim to unify the tasks of the two levels, yet providing both kinds of service through a single line necessarily means a paradox. The short intervals between stops (the shortest ones being slightly longer than 300m), the planned maximum vehicle length of 80m and the hardly extensible line make a backbone service impossible by a slow average speed, providing inadequate capacity and keeping the termini far from the suburbs. The unnecessary extra stations also mean a significant excess in costs. Functioning as a local-level line is yet again problematic because the metro stations are under the ground, so they are still difficult to reach, thus leaving the surface network the ideal means of serving shorter trips. All in all, the present plans of metro 4 contain building a stripped-down rapid transit line serving the tasks of the currently well-functioning surface network and making it impossible to extend the line to function as an agglomeration-wide rapid transit backbone.

The functionality of the other two[3] metro lines in Budapest could easily be reached by a slight alteration of the current plans. Applying vehicles long enough (at least 120m) and the unification of three low-traffic stations with their neighbours (*Bocskai út – Móricz Zsigmond körtér*, *Fővám tér – Kálvin tér*, *Rákóczi tér – Köztársaság tér*) would not have a major impact on the costs – or would even lower them – at the same time achieving higher passenger comfort. Nonetheless, reaching only the quality level of Budapest's old heavy metro lines is not satisfactory when a brand new line is built.

More passengers have to change more times

It can be stated almost surely that the currently planned form of metro 4 will not get any extensions, not even in the distant future, since extending the already underused main section with new sections, that will be as expensive as the main section itself while attracting less traffic, seems to be only a political promise that will never be kept. Thus, after completing the first phase (the main section of the line) and maybe the extremely uneconomical but planned second phase (the extension from *Keleti pályaudvar* to *Bosnyák tér*), metro line 4 will remain a torso for at least several decades, and there will be not a single suburban citizen who will be able to actually take real advantage of it. Moreover, converting the surface lines of the outskirts (e. g. tram line 47 and express bus line 173) to feeders of the new metro line will mean serious loss of quality to their passengers.

[3] Since the Millennium Underground Line of Budapest called 'metro 1' is more of an underground tramway than a fully-fledged metro line, the city has actually two 'real' metro lines now.

The connection from *Újpalota* to the city center demonstrates this loss of quality, as an example. Using the present transit network, the *Újpalota* citizen takes the express bus 173 from its terminus, for example, and after a 23-minute-ride, reaches *Nagykörút* (the Greater Ring, the edge of downtown Budapest) at Balah Lujza tér (the 23 minutes needed for the ride can be guaranteed even during rush hour with a minimal extension of the bus lanes of the route). After the opening of the first and second sections of the metro 4 – according to the present plans –, the same passenger will ride the feeder bus for 11 minutes to Bosnyák tér (the terminus of the second section of metro 4), will spend ca. 2 minutes getting to the metro station and taking the metro, after an average wait of one minute, for 5 stops taking him or her in ca. 10 minutes to the underground station below *Nagykörút* at *Rákóczi tér*. In this way, this passenger 'gained' an extra minute of travelling and an extra forced change at *Bosnyák tér*; so instead of the direct connection in 23 minutes, he or she got 24 minutes and a change. The service provided would deteriorate even more if he or she wanted to change to a line available only at *Blaha Lujza tér* but not at *Rákóczi tér*, if his or her destination was near *Blaha Lujza tér* (which plays a much more central role than *Rákóczi tér*) or if the passenger wanted to reach the inner city which is on the route of express bus 173 as it is, but will not be reached well by metro 4. A similar future predicament threatens the inhabitants of the areas near tram line 47 in the southern part of *Buda*.

Of course, the services provided by the present public transport network of the affected area should be improved and are to be developed, but forcing the passengers of the present surface lines to an ill-functioning metro line and thus providing quality loss through expensive investments cannot be the chief public transit development goal of Hungary in the next few years.

Economical evaluation

The official current plans of metro line 4 are often disputed among professionals, since they are nothing else than the continuation of the obsolete practice of the 1970's in the 21st century. However, there has been little dispute about the economical concerns of this investment up to now. The Urban and Suburban Transit Association (VEKE[4]) wants to fill this gap by investigating thoroughly the feasibility study of metro 4 and revealing the dubious points.

The feasibility study was completed in 1996[5]. Some of the basics of the study were already obsolete in 1996, others have become obsolete thanks to technical development as well as the economic and social changes since then.
The most evident errors:

- The most advantageous heavy rail compatible alternatives were excluded from examination from the start. Thus, the feasibility study takes only the concerns of the inner areas of Budapest into account; even those concerns were handled in a defective way. The problem of the outskirts and the suburbs was neglected as well as the framework of a possible transit alliance between the Budapest and the suburban providers, which could handle the problem of the heavy road traffic from the suburban area effectively. In brief, the problems of the city of Budapest, its outskirts and the suburbs do not appear as a whole in the study.
- The LRT alternatives to the metro line are more cost-effective because they provide the limited metro 4 services at a far lower cost – as it is written (!) in the preamble of the study –, but they were excluded from examination with no explanation given for that omission.

False economic data – the metro line has a negative economic value

According to the results of the feasibility study, the net present value of the metro line is ca. 100 million euros, the cost-benefit ratio is 1.34 if 'slow' economic growth is considered; this means an average of 4% GDP growth between 2000 and 2020. The higher GDP growth scenario uses 6% as the average GDP growth rate (section D, table 16.). Since the higher GDP growth scenario proved to be unreal, calculations with it may be discarded.

Calculating back from the results gives that the study uses 12.2 million euros a year as the revenue from the passenger time saved (this comes from the division of a total revenue of 394 million euros by the number of years[6]). In the calculations, the years of the construction (1996-2005) have been subtracted from the whole of 40 years, this gives 32 years to achieve the total of 394 million euros. Taking the average wages from the feasibility study, the annual revenue can be converted to passenger time; the annually saved passenger time thus amounts to 15 million hours. Taking into account that weekends and holidays do not make a full day's traffic, the annual saved time should be divided to 300 days. Since the feasibility study gives 474,000 trips as the daily traffic of the metro 4 line, the daily average saved time of one ride on the metro is 6.4 minutes. This seems to be way too optimistic

[4] Urban and Suburban Transit Association = Városi és Elővárosi Közlekedési Egyesület (VEKE)
[5] The last publicly available official copy of the feasibility study (only in Hungarian) resided at http://www.metro4.hu/images/downloads/49_megvalosit.zip. Since it disappeared, the archive at http://www.sztaki.hu/providers/metro4/megval/tanulmany/index.html should be used.
[6] Dividing the total revenue with the number of years is only an approximation, but since the real wages growth rate and the real interest rate is nearly equal, this approximation is quite accurate.

compared to a well-organized variant of the present surface network, but can be accepted as a first rough approximation.

Further significant revenue is expected from cutting back the surface network, notably from partially stopping bus routes 7, 73, express 7, express 173 and tram routes 47, 49, thus discontinuing the service on a 2 km long section of the tramway network. Since downtown destinations are not well reached by the metro line and the threatened tramway section is a necessary part of the Budapest public transit network (moreover, an extension has been planned to it recently), the changes of the bus and tram services should not be as drastic as it is expected and thus the cost saved there will be far lower than the predicted value.

The officially estimated total cost of the first section (*Kelenföldi pályaudva*r – *Keleti pályaudvar*) of metro 4 is over EUR 1.15 billion (about HUF 300 billion) according to current figures[7]. Because of the 'usual' cost overruns and because the additional costs of bad organization will almost surely increase the total cost, this can be regarded as a minimal estimate for the investment necessary for the infrastructure and vehicles of the first section. This is the cost that must be at least balanced by the revenue coming from the passenger time saved.

To recalculate this, the value of time in 1996 must be raised according to the inflation rate (136% for the Hungarian forint) and real wages growth (150%) between 1996 and 2006 that gives a value of HUF 530 an hour in 2006, which equals to EUR 2.1. Using the above-mentioned daily saved time (15 million hours) and the 32-year active lifespan of the investment, the recalculated total revenue of metro 4 is EUR 1 billion[8] and the cost benefit ratio is 86%. All in all, the net present value of the metro 4 project is below zero even if we use the traffic load, passenger time and cost figures provided by the official metro 4 project team and only correct them according to the changed economical environment.

False data about the passenger time saved

To calculate the real economical value of metro 4, one must deal with the fact that a value of 6.4 minutes for the average passenger time saved on the line is highly overestimated. The recent changes of buses 7, 73, express 7, express 173 resulted in a great improvement in average speed and accuracy without any investment, and these bus lines can get even slightly better by extending the existing bus lanes on *Thököly út* and near *Újpalota*. These changes made the express 7 and express 173 buses only slightly slower than the planned metro, making the saved passenger time lower, so the expected 6.4 minutes saved time cannot be achieved on average but only on the longest trips spanning almost the whole metro line. On the other extremity, the average passenger time spared is strongly lowered by the negative saved time of the shortest trips (where access time to the stations is crucial) or the forced extra changes (from downtown and the suburban areas).

[7] According to the „Metro Act" (on the common funding of the metro line by the Hungarian state budget and Budapest) and data from the metro 4 project team, the first section of the line will cost HUF 236 billion = EUR 950 million, plus the costs of 'some metro-related surface investments' (at least EUR 200 million).

[8] (32 years) · (300 days / year) · (474 000 passengers / day) · (0.1067 hour / passenger) · (EUR 2.1 / hour) = EUR 1.02 billion

At an accurate recalculation, every minute lost from the average passenger time saved decreases the net present value of the metro line by EUR 160 million (HUF 40 billion). Sample economical values for different average amounts of passenger time saved are shown in the table below:

Average passenger time saved per trip (minutes)	Net present value of the metro 4 (millions of EUR)
10	400
7	-76
6,4 (official)	-172
6	-240
5	-400
4	-560
3	-720

Taking a quick look at the possible time saved on different directions, it can be stated that the average passenger time saved cannot get above 5 minutes a trip. If we use this value as an upper boundary, we see that the economical value of the metro line is at most two thirds of the investment, its net present value is EUR –400 million (HUF –100 billion).

Taking realistic values for the average passenger time saved makes the slightly negative net present value of metro 4 even worse, at least one third of the investment costs will be lost and never regained.

False data about the expected load

Besides the economical calculations and the passenger time data hidden in them, the only performance indicators published in the feasibility study are the traffic loads of metro 4 and the concurrent lines crossing the river Danube (lines over *Erzsébet* bridge, *Szabadság* bridge, *Petőfi* bridge and *Lágymányosi* bridge). These figures are presented in a scenario with the metro and in another without it projected into 2020. Since the traffic intensities in the scenario without the metro are the same as the present values, the study keeps the total load of the whole public transit network constant (i.e. the grand total number of trips via public transit will not change) which is a plausible circumstance for the calculations.

There are two more concurrent directions missing from the data. The users of bus 139 + metro 2 and the users of heavy rail from southwest + metro 2 cross the Danube and are potential users of metro 4. The loads of these directions can be calculated from the number of commuters in official public databases.

		buses 7, 73, 7E, 173E	other buses of Erzsébet bridge (5, 8, 78, 112)	tram 47	tram 49	trams 4 and 6	Lágymányosi bridge	bus 139 + M2	railway + M2	bus 12	attracted to M4 in total	expected traffic load of M4 (study)	discrepancy
daily traffic in both directions		*93495*	*32768*	*53913*	*54234*	*96506*	*14915*	21000	18410	*10060*		*297813*	
passengers in the stronger direction in the rush hour		*5610*	*1966*	*3235*	*3254*	*5790*	*895*	1300	1800	*604*		*20847*	
officially expected attraction to M4	%	*77*	*16*	*100*	*100*	*34*	*50*	100[9]	100[9]	*23*		*100*	
	daily 2 dir.	*71991*	*5243*	*53913*	*54234*	*32812*	*7458*	21000	18410	*2314*	*267374*	*297813*	*10,2%*
	strong dir., rush hour	*4320*	*315*	*3235*	*3254*	*1969*	*448*	1300	1800	*139*	*16778*	*20847*	*19,5%*
realistically estimated attraction to M4	%	77	0	20	80	10	0	75	50	23		*100*	
	daily 2 dir.	71991	0	10783	43387	9651	0	15750	9205	2314	163080	*297813*	45,2%
	strong dir., rush hour	4320	0	647	2603	579	0	975	900	139	10163	*20847*	51,3%

table 1

Directions in the public transit network that cross the Danube and compete with metro 4, and their load
Officially expected changes and realistic rough estimates[10]

As it can be seen from the table, the discrepancy between the officially expected and the realistically estimated traffic load of metro 4 consists of two parts.

First, there are a number of passengers that come from nothing, that cannot be accounted for with the decreasing load of the concurrent directions. Since the total load of the public transport network without the metro is constant, this must be the number of passengers changing from their own cars to public transport encouraged by the new metro line. This is far beyond optimism since the new metro line is nothing more than a substitute of some tram and bus lines in the inner city. It is not capable of giving anything as attractive to either a downtown car user or a suburban car user that would make him or her leave the car and switch to public transport. The number of people changing from car to public transport on account of the metro will be actually about zero, or concerning the quality downgrade given to a large number of passengers, it may be even a significant negative number that is very hard to estimate. Expecting a large number of passengers switching from private cars to the new metro is particularly unrealistic when we have to consider a metro line that does not reach the suburbs and gives no option to organize a viable P+R (park and ride) system based on it.

This first part of the discrepancy, the "traffic coming from nothing" is 10% of the expected daily load of metro 4 and 20% of the load in the rush hour.

Second, the major part of the discrepancy comes from unrealistically optimistic attraction rates. For example, the attraction from the 'other buses' of *Erzsébet* bridge, will be surely 0% (instead of 16%), and shifting one third of the load of trams 4 and 6 on *Petőfi* bridge or half of the public transit load of *Lágymányosi* bridge to metro 4 is also too optimistic (actually, the latter bridge will attract passengers

[9] Since the two directions using metro 2 are not dealt with in the feasibility study, the expected attraction rate from these two directions cannot be retrieved. Supposing that it was 100% puts the discrepancies from these two directions in the second part of total discrepancy; supposing any ratio below 100% is putting a fraction into the first part (the traffic from nothing), the total discrepancy is the same in any case.

[10] The data read from the feasibility study and the data calculated directly from it, without estimations are typeset in italic.

from the metro when tram 1 is extended over it). Regarding the passenger times of the different concurrent directions, the following rough estimates seem to be realistic for the attraction rate from them:

- 0% from the other buses crossing *Erzsébet* bridge (buses 5, 8, 78 and 112),
- 50% from the total traffic of trams 47 and 49 (these passengers will shift mainly from tram 49, but the distribution of attracted traffic between trams 47 and 49 is irrelevant now),
- 10% from the trams crossing *Petőfi* híd (trams 4 and 6),
- 75% from bus 139 + metro 2,
- 50% from the heavy rail + metro 2 direction.

After summing up the realistic estimates for the attracted traffic intensities, it turns out that the passenger load of metro 4 at a cross section under the Danube is 51% lower than expected in the rush hour, and the daily metro 4 traffic crossing the Danube is 45% less than it is forecast by the feasibility study.

If calculated with the official average saved passenger time (6.4 minutes per trip), every ten thousand trips per day mean an additional EUR 22 million (HUF 5.5 billion) in the economical value of the metro 4 line. So, the net present value depends on the daily number of trips in the following way:

Number of trips (thousand trips a day)	Net present value of the metro line (millions of EUR)
500	-112
474 (official)	-172
450 (-5%)	-220
425 (-10%)	-280
380 (-20%)	-376
330 (-30%)	-480
285 (-40%)	-580
237 (-50%)	-684

The above corrections to the traffic load of the metro line show that the actual daily number of trips on the line will be 45% lower than the official estimate. Using this result, the net present value of the project is EUR –632 million.

Applying both the correction in the average passenger time saved (5 minutes instead of 6.4) and in the traffic load (only 55% of the officially expected daily number of trips), yields a net present value below EUR –800 million (HUF –200 billion) meaning that the aggregated revenue of the currently planned metro line is only one third of its cost. Even if we consider the inaccuracy of the estimations we used, it is more than likely that the aggregated revenue of the metro 4 project is well below the half of the costs.

Fictional savings on operating costs

The economic value of the new metro line is further lowered by the operational costs saved, which is expected to be rather high – not estimated but mentioned in the feasibility study – but it is actually a large negative sum in total. These expected savings come mainly from a radical cutback on the tram system: the original plans contain stopping route 49, shortening route 47 and thus turning down the service on the downtown section (ca. 2 km of track) of these two tram routes. These cutbacks were

officially revoked by Budapest, making the dominant part of the operational savings disappear. A similar but smaller problem arises as far as buses 7, 73, 7E, 173E are concerned. The necessary capacity of these bus routes may be much higher than it was expected by the designers of metro 4 to provide a satisfactory service to passengers having downtown destinations not on the metro 4 line or to those living in the suburbs reached by these buses. Operating the new metro line and the remaining surface network was expected to be cheaper than the present network (that may be already too optimistic), but if quality service is a goal in this project, the operating costs of the new network will be even higher than now.

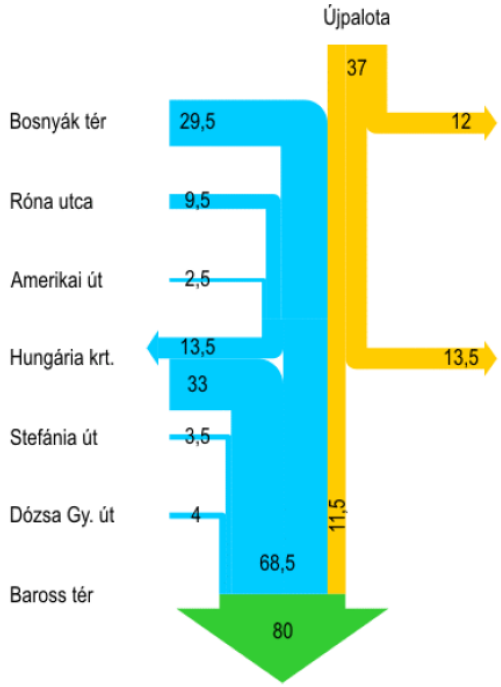
This error at the calculation of operating costs shows once again the chief structural problem of the current metro 4 plan: covering the operational costs of the metro line from saving on the surface network of the inner city creates greater difficulties and a quality drawback than the benefits of the metro line. In general, substituting downtown trams and buses with a stripped-down metro line will not give a quality solution for the public transit issues of a modern city, and no satisfactory results in any way.

The economic indicators of the second phase of metro 4 are even worse

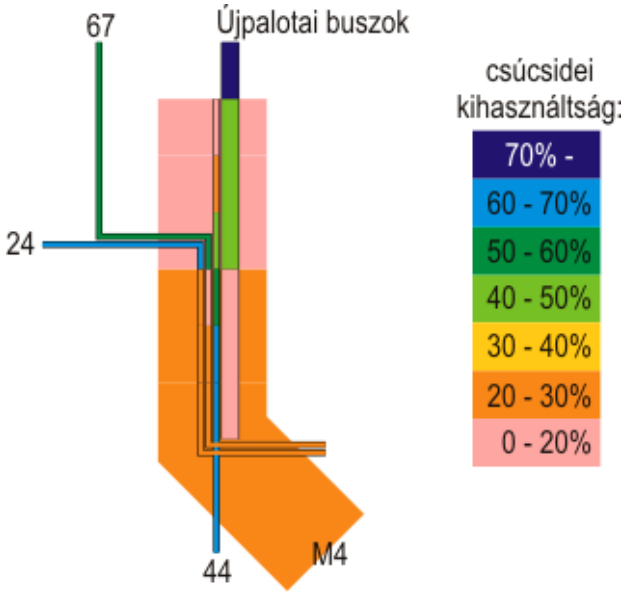
Only one extension to the first section (*Keleti pályaudvar – Kelenföldi pályaudvar*) of metro 4, an extension from *Keleti pályaudvar* to *Bosnyák tér* is likely to be built in the future. This section is not examined in the feasibility study nor in this paper, but since it is backed by strong political intentions and often treated together with the first section as a whole (e. g. in the 'Metro Act' of the Hungarian parliament), there should be given a quick overview of its even worse economic performance.

The second section costs about an additional EUR 400 million but its load factor is even lower than that of the first section. With a quality surface network over this section, along *Thököly út*, according to our calculations[11], the load factor at peak cross-section of this section could be about 25% and it cannot be raised to 30% even with the total disintegration of the nearby surface network. It should be noted that in spite of the small amount of forceable additional metro load, the planned surface public transit system of *Thököly út*, by the current plans, will be as deterrent as it is possible. The suspended tram routes of the area will not be restarted and the buses coming from mainly *Újpalota* will be cut at *Bosnyák tér*, the terminus of the extended metro 4 line.

[11] The calculations were carried out at the request of the responsible committee of the Budapest local government.



Traffic flows in the *Thököly út* area
(based on a study favouring metro 4, the numbers show daily passenger traffic in both directions)



Load factors in the rush hour on the second metro 4 section and on the restored *Thököly út* area tram system cooperating with it[12] calculated from the above flow intensities (line thicknesses show capacity, colours represent load factor, tram number 44 is the successor of bus number 7 in the future).
We note that the calculated peak load factor of all the three tram routes (which are officially 'undesirable') is near or above 60% – even without a quality LRT service to *Újpalota*.

[12] The calculations were based on a tram network that fits into the present surface network with minimal alterations (every showed route was supposed to operate with 9 minutes' headways and vehicles with a capacity of ca. 150 passengers), and they hypothesized keeping the express bus service from the direction of *Újpalota* as a quickly achievable network after the reconstruction of the *Thököly út* tracks. The Hungarian terms on the figure are: *Újpalotai buszok = buses of Újpalota* and *csúcsidei kihasználtság = load factor in the peak interval*.

The magnitude of the cost of metro 4 section 2 is well-illustrated by the fact that at lower costs one could build a new state-of-the-art surface LRT line from *Újpalota* to downtown Budapest and across the Danube over *Erzsébet híd* which could solve the problems of *Újpalota* in a short term, give a reliable and comfortable direct connection to the inner parts of Budapest, and as a 'side effect' it would handle the traffic of the main surface public transit axis of Budapest in an unbeatable way.

Summary

Using the traffic load data of the metro 4 feasibility study and correcting the data of the economic environment only, it can be shown that the metro 4 project in its currently planned state gives no satisfactory additional value to the Budapest public transport system, in other words it is an economical failure.

Correcting also the traffic-related data (time savings and passenger load) gives more disappointing results; the project is completely unfounded as its aggregated revenue is well below the half of its cost. The currently planned line is inadequate as a development measure for the Budapest public transit network, and because of its magnitude as well as the poor economical circumstances, it can easily have almost fatal effects on the economy of Budapest.

As a consequence, the current plans of the fourth metro line of Budapest should be discarded. There is no reason for the construction of a stripped-down metro line in the inner parts of Budapest with a tram-like stop layout to substitute trams and buses that would create new problems instead of a quality service. An inner city rapid transit line should be a part of an agglomeration-wide rapid transit system, thus ensuring positive economical value as a functional part of a functional structure. The Urban and Suburban Transit Association states that the project should be extended and applied into a systematic reconstruction of the urban and suburban railway traffic of the Budapest region.

The economical value of the metro 4 line can only be positive if it provides new, currently missing connections, if it provides a quality service to its users and if it is utilized to fulfil the requirements expected of a rapid transit backbone line. Only an attractive and effective metro 4 has the sufficient economic value to justify the required costs.

The metro 4 project is in the wrong hands

Economically more effective alternatives rejected

Among other authors, the Urban and Suburban Transit Association has also tried to draw attention to the issues of metro 4. If the main goal of the metro line were not only substituting inner city sections of buses and trams, it could be the best solution for Budapest and its neighbourhood as a robust rapid transit line from southwest to east, an answer to many traffic problems and an economically successful investment.

Such plans from other authors are (the linked documents are in Hungarian):

- Heavy rail compatible metro 4: ÁCS Balázs – ISTVÁN György: *M4+*,
  URL: http://members.chello.hu/g.istvan/;
- An LRT solution for a broadly extended set of inner city problems at a drastically lower cost: BODROG Zoltán – PERLAKI Attila: *Karolina project*,
  URL: http://kvtlinux.lib.uni-miskolc.hu/ali/veevk/Karolina/;
- The newest development plan from the Hungarian State Railways (MÁV) for the suburban traffic of Budapest: a tunnel between the southern and the western railway station (*Déli pályaudvar – Nyugati pályaudvar*).

It is obvious that these concepts, having been published since the appearance of the current metro 4 plans, deal with the at first ignored but economically better-grounded solutions for the metro 4 problem set. Heavy rail compatible solutions for the regional issues can be found among them as well as a far more cost effective (better but cheaper) LRT solution for inner Budapest.

The opinion of the project leaders

The irrational adherence of metro 4 project leaders to the current plans and their lack of reasonability can be illustrated with many of their statements delivered since the publication of the feasibility study on to the present times.[13]

"The LRT alternatives showed the best economical properties having slightly less value but significantly lower costs" (but they were not chosen with no explanation) – these words can be read in the metro 4 feasibility study.

"Answering the objections of Urban and Suburban Transit Association, the metro 4 project leader László Gulyás has said that metro 4 has nothing to do with the problems of the agglomeration, it should give some fresh air to the crowded downtown area by substituting trams and buses." – an interview, 21 July, 2005.

"Heavy rail cannot be an alternative to metro 4, because the travel time of trains between Kelenföldi pályaudvar and Keleti pályaudvar via the heavy rail tracks is 20 minutes, 10 minutes longer than of metro 4." (Excerpt, not literally quoted.) – This is a typical case of intentional confusion. The answer

[13] The original, Hungarian version of this paper contained longer quotations and deeper explanations but this can be omitted with a minimal drawback in demonstrative force.

confuses a tunnel servicing heavy rail compatible traffic with the existing connection that bypasses the downtown area between the two termini of the first phase of metro 4.

"Unifying sections with overhead wire and third rail is technically and economically impossible." (Excerpt from an answer at http://www.metro4.hu) – This is the chief objection against heavy rail compatible metro 4 and needs no refutation since many such 'impossible' systems operate throughout the world.

Serious deficiencies at construction

While the construction of the metro infrastructure (parts of some stations) began only several months ago, many investment projects were supervised by the meto 4 project team as 'developments related to metro 4'. The largest of them was the scandalous reconstruction of *Bartók Béla út* (a main road in southern *Buda*), *Szent Gellért tér* and *Móricz Zsigmond körtér* (two busy squares at two would-be stations of metro 4). Among other problems (e.g. the lack of some building permits) the disintegration of the surface public transport network began by planning inadequate tram stop platforms, obstructing the creation of bus lanes, and a complete failure at designing the road and tram junction at *Szent Gellért tér*. As another part of this scandal, a part of the funds has disappeared without trace.

These 'developments related to metro 4' always contained some intended negative impact on the tram network of Budapest:

- During the above mentioned construction in southern *Buda*, the inner terminus of tram 41 had been moved from *Móricz Zsigmond körtér* to *Bocskai út* (the next would-be metro station but still named *"Móricz Zsigmond körtér"* only in the tram timetable) losing the vast majority of the connections provided by the line. It was mainly the efforts of Urban and Suburban Transit Association that helped to undo this situation (because of the demolition of the old *Móricz Zsigmond körtér* terminus of this tram line, luckily, the changes could only be undone by a significant extension, and now tram 41 runs directly into central Buda, on the tracks of tram route 19).
- During the reconstruction of *Baross tér* (the square in front of *Keleti pályaudvar*), the demolition of the *Thököly út* tram tracks began with the removal of the connection with tram 24, disabling any extension of tram 24 or even bringing its terminus closer to the centre of the square.
- At *Móricz Zsigmond körtér*, a new connection between the tram tracks coming from *Fehérvári út* (south of *Móricz Zsigmond körtér*) and *Villányi út* (northwest of *Móricz Zsigmond körtér*) was planned and prepared but finally omitted due to ridiculous reasons.
- It is widely suspected that the extension of tram route 1 crossing the Danube over *Lágymányosi* bridge to southern *Buda* is obstructed by metro 4 lobbyists although it had been planned for a long time and it would be rather cheap to implement. This extension could be more attractive to many passengers than the metro 4 line.
- Future extensions of tram route 4 in southern Buda were completely disabled by a stairway of a subway passage of the would-be metro station at *Bocskai út*, which has been built as a 'related development' several years ago, never used and partially demolished during the recent construction work at *Bocskai út*.

As the greatest threat to the tram system, the originally planned abandonment of 2 km of track in the heart of downtown should also be mentioned here (with stopping route 49 and cutting route 47 back). As it was written above, this cutback recommended in the feasibility study was withdrawn by the

Budapest local government, but deteriorating or even stopping the service on this tram section is still hanging over the metro 4 project. Another threat of this magnitude is the decision about the abandonment of the *Thököly út* tram routes instead of their reconstruction that would ensure quality local surface service in addition to the planned metro line.

A further illustration of the wasteful construction is the story of *Móricz Zsigmond körtér*, *Bocskai út* and the road section between them. Both future metro stations (*Móricz Zsigmond körtér* and *Bocskai út*) got reconstructed pavements, public utilities and brand new subway passages during the reconstruction work at southern *Buda*, which were partially demolished a few years later, during the recent preparatory work for the two stations. The affected road section as well as the abandoned *Bocskai út* terminus of tram 41 was also demolished. The subway passage at Bocskai út was never used, its only achieved goal was disabling the extension of tram 4.

The recent preparatory work in southern *Buda* had further negative effects. The demonstratively oversized blocked area of construction disables the traffic of southern *Buda* to an unnecessary degree, especially the public transit network which is the major victim of disorganized construction and has been losing passengers rapidly since the beginning of the recent work.

Further preparations for more stations were scheduled for late 2006, nevertheless, they have not begun yet, but in the meantime very worrisome details have come to light. The reconstruction of the *Szabadság* bridge as a further 'related development' will take place during the construction of stations at *Fővám tér* and *Kálvin tér* and since the bridge is not wide, some special solution is needed to bring two tram tracks and two lanes of road traffic over it. The metro 4 project team chose to keep the present limitation of tram vehicle width to 2300 mm without thorough examination. A very expensive yet totally useless 'development' connected to the *Fővám tér* station is the reconstruction and extension of the below-ground tram crossing at the *Pest* side of the bridge. The underpass of tram route 2 will be kept and extended to 300 metres, and thus – together with the restriction on vehicle width over *Szabadság bridge* – it will ensure a limited set of possible routes on the downtown tram tracks and on their extensions (the tram width restriction over the bridge will be effective for the whole city center). Bringing tram route 2 to the surface during the construction of the *Fővám tér* station would be the most practical and the least costly alternative.

The outskirts of Budapest – the location of real problems and real solutions

The most evident sign of the problems that arise in the suburban areas is that while the modal split is above 60% within the inner city, it is well below 40% in the suburban traffic. Large parts of people moving from the city to the suburbs (suburbanization) and rising mobility worsen these problems every year. This set of unsolved problems does not appear in the feasibility study of metro 4.

Defining the problem arising in the outskirts

- The most important problem is the slow and unreliable connection provided by the public transit lines between the outskirts and the city centre. This problem applies mainly to suburban buses but suburban railway lines are affected too.
- Another problem is the lack of comfort. The buses and trains are crowded, only a part of the passengers can be seated. In addition to this, the aesthetic state of the vehicles is rather poor.
- Too many passengers are forced to change transit mode too many times. This problem is worsened by badly designed or outworn intermodal hubs.
- The timetables are often not user-friendly, the intervals between two vehicles are too long and vary too arbitrarily; the times are hard to memorise. This style of timetable does not work well especially for commuters.
- There is no integrated pricing on the different public transport networks of Budapest. The first very short step (a common monthly ticket for heavy rail, suburban buses and urban transit *within* the boundary of Budapest) was taken towards this goal in the last year, but this is far from enough.
- There is no mentionable cooperation between public transit operators. There is no adequate feeder bus network for the suburban railway system, and no integrated timetables exist. When writing about the cooperation between different modes of transit, it should be also noted that no planned and functioning P+R can be found almost anywhere in the entire Budapest agglomeration.
- The services of Hungarian State Railways have become particularly unreliable in the past few years.

The successful solutions to these problems found in Western Europe (e.g. the Munich S-Bahn, the RER of Paris, and so on) obey the most important necessary principle: the modern suburban public transit network is not a low-quality instrument for those who cannot afford a car or cannot drive; modern suburban public transit is an attractive alternative to motorized private transport.

The most important elements of solution

The adequate solution to the problems of metropolitan areas is based on integrated rapid transit networks, which have the following properties:

- Suburban lines integrated with urban rapid transit forming a system, good quality transfer hubs
    a. *Integrated rapid transit lines:* unnecessary forced transfers which can be eliminated through connecting different lines are taken out; ideally, every two points of a network containing such lines can be connected with a maximum of only one transfer

    b. *High-quality hubs:* if necessary, transferring between two lines or two modes must not be a torture
    c. *Good access to the outskirts and the suburbs:* direct connection from the suburban centres to the central area of agglomeration, good cooperation with the urban and suburban local networks
    d. *Possibility of quality feeding:* quality feeding through cooperation with local networks and dedicated feeders; robust P+R system built on several (as many as possible) rapid transit stations – concentration of feeder and P+R hubs must be avoided because concentration results in crowded hubs and inadequate capacity
- Cadenced timetables and adequate capacity
    a. Passengers travelling more than 15 minutes should be able to get seated
    b. Timetables that are easy to memorize
    c. Frequent service even in off-peak periods, even at the cost of superfluous capacity, to make public transport attractive
    d. Express connection to the outer zones of the agglomeration
- Fully-fledged rapid transit operation
    a. Vehicles are more dynamic than the average heavy rail trains
    b. Metro-like service in the city center
    c. Reliability, low sensibility to disturbances
- Attractive public transport system
    a. Common fees and pricing, unified communication and marketing to the public
    b. Public services at hubs and stations other than simply accessing the transportation (e.g. shops).

In Budapest, the different forms of rail transit are not treated as parts of a consistent system; the dedicated rapid transit network is only represented in fragments by several metro and separate suburban lines owned by the Budapest public transit operator. Rapid transit *network* planning has never been set as a goal in Budapest. The suburban traffic served by the Hungarian State Railways (MÁV) is executed by ordinary heavy rail trains and express trains that are treated the same way as the other services of MÁV. Both the heavy rail trains owned by MÁV and the suburban lines owned by the Budapest public transit operator have a load beyond their capacity and none of them penetrates into the inner zones of Budapest. The two existing heavy metro lines, that do not reach the outskirts of Budapest, were built as ad hoc gigantic investments, not as parts of a network. Since they do not have close connections with the Greater Budapest suburban area, the feeder network is overcrowded at metro termini, making the necessary transfer to the metro even more uncomfortable for the passengers. This fact makes P+R systems of enough capacity for these metro lines impossible. The dominance of inner-city purposes of the Budapest metro lines was also fatal for the surface network above them, the metro took over their tasks instead of cooperating with the surface transit lines. These mistakes are going to be committed again and will be conserved through the obsolete current plans for metro 4.

Budapest's fragmented rapid transit network

The black and gray lines represent heavy rail (black solid: lines with heavy suburban traffic, grey dash-dotted: sections with no passenger traffic), green lines are Budapest-owned dedicated suburban railways, blue solid lines are the two present heavy metro lines while the blue dashed and dotted lines are the currently planned first and second phases of metro 4. All three modes (heavy rail, suburban rail and metro) are mutually incompatible; the technical parameters of the metro and the dedicated suburban railway lines are, however, quite close to each other.

Cadenced timetables for the suburban trains of some heavy rail lines have already been successfully introduced, and the first steps towards an integrated pricing system for the Budapest-area public transit network have been taken in recent years, but this is far from an intregrated public transit system in the Budapest metropolitan area. The plans of the *North-South Regional Rapid Transit Line* (metro 5 colloquially) conform to the idea of an integrated rapid transit network. However, the other two proposals based on this idea, namely the connection of metro line 2 with the suburban rapid transit line departing from its eastern terminus and the redesign of metro 4 to some compatibility with the connecting heavy rail lines, have not met approval by the authorities, though after performing all these corrections, the gap between suburban rail transit and the metro lines of Budapest would disappear, thereby boosting modal split of commuter traffic.

The population affected by an integrated rapid transit network

The total population affected by an agglomeration-wide integrated rapid transit network can be determined by using the official statistics about commuter traffic in the Budapest area (contained in the 2001 census of Hungary). According to these figures, the number of commuting employees from outside Budapest is 175 thousand. To estimate the total commuter traffic, this number must be increased by the number of the unemployed, the self-employed enterpreneurs, students, and the rapid growth of the population of the commuter belt must be taken into account; thus the number of

commuting passengers easily reaches 300 thousand a day whose large part chooses the peak period for their trip.

There is an additional amount of some 65 thousand commuters, who travel in the opposite direction. The following modes of transport are used by Budapest area commuter traffic[14]:

- 70 thousand passengers cross the boundary of Budapest by the trains of the Hungarian State Railways, of whom 50 thousand are from the suburbs;
- the suburban bus operator Volánbusz carries some 50 thousand passengers crossing the boundary of Budapest daily;
- the lines of the Budapest public transport operator crossing the boundary carry 40 thousand passengers a day from outside;
- 62% of the suburban traffic (some 230 thousand people) crosses the boundary in their own car.

The boundary of Budapest is crossed by 550 thousand vehicles a day (every crossing inbound or outbound taken separately), 400 of them are private automobiles. The number of passengers crossing the boundary of Budapest amounts to 600 thousand, of whom:

- some 300 thousand take the agglomeration – Budapest – agglomeration route,
- and some 70 thousand the opposite Budapest – agglomeration – Budapest route;
- the daily number of passengers coming via intercity and international traffic is some 230 thousand (rough estimate), of whom the personnel of trucks is not negligible (some 100 thousand a day) – these areas of traffic are beyond the scope of this paper, however.

As a low estimate of the traffic figures of the dominant direction, we could state that a daily capacity for 300 thousand passengers would satisfy the needs of metropolitan commuter traffic. This service is used also by the 70 thousand passengers travelling in the opposite direction and some 100 thousand intercity travellers.

The problems of suburban commuter traffic also extend to the commuters of the outer districts of Budapest poorly served by the present network. These districts are:

- the parts of the 3rd district that cannot be served by the suburban railway along the Danube but could be served by the line of Hungarian State Railways heading northwest (some 5 thousand potential passengers),
- the outer parts of district 4 not served by the metro (some 15 thousand),
- the central and outer parts of the 10th district (some 15 thousand),
- the entire 17th district (some 30 thousand),
- the parts of the 18th district in the neighbourhood of the lines of Hungarian State Railways (some 15 thousand),
- the outer parts of the 19th district (some 5000),
- the 22nd district (some 20 thousand).

Including the areas above, the total population affected by an integrated rapid transit network is between 400 and 550 thousand. The daily load of the dominant direction – even with a conservative estimate– is 350 thousand. The majority of these people are commuting by private cars now.

[14] Figures taken from the *Development Plan of the Central Hungarian Region*

The service provided to these people cannot be improved or made attractive through the currently planned metro 4, although this should be the chief goal of the project in the affected eastern and south-western directions. These people are to keep waiting – according to the current plans, for several decades or forever – for a quality suburban transit solution giving them an effective connection to the network backbone lines and main destinations of the inner city area. The resulting heavy road traffic makes life in the overcrowded inner city even harder causing intensifying suburbanization. The vicious circle is closed.

Operational and financial advantages of integrated rapid transit

The effectiveness of size is increased only slightly by integrating rapid transit modes in the Budapest agglomeration, since the parts (metro lines 2, 3, 4, the Budapest-operated dedicated suburban railways and suburban services on the state-operated railways) are rather large on their own. Effectiveness is increased mainly by harmonising traffic on a non-fragmented network.

A large part of the operational costs concerning the Budapest rapid transit services arises at termini and railway stations. In an integrated rapid transit network, these costs are lowered through less technology needed at simple or simpler stations and less time wasted by the trains at their termini. Significant expenses can also be spared by the redundancy of maintaining and operating railway stations overcrowded by suburban passenger traffic.

In the case of metro 4, the redesign in order to develop an integrated state-of-the-art rapid transit service gives relief to the railway stations (*Keleti pályaudvar* and *Kelenföldi pályaudvar* as well as *Déli pályaudvar*) crowded by the traffic from the southwestern and eastern suburbs. In addition to this, the construction of underground termini becomes unnecessary, and sidestepping the tram-like functions of metro 4 in the inner city area makes the line more cost-effective. The trams and buses having all the appropriate functions are not significantly more expensive than the minimal usable surface network in addition to the currently planned metro 4 because, as mentioned earlier, only a rather unusable surface network will make the metro take on tram-like functions.

This integrated rapid transit system is to be made more effective by a uniform vehicle fleet. For example, the operation of the metro 4 line does not require a separate depot for its trains that are able to run over the entire network of Hungarian State Railways.

While the current plans for metro 4 intend to cut costs by disintegrating surface network, the integrated rapid transit solution is able to achieve a real cutback on costs, at times of both construction and operation. Treating the metro 4 project and the planned developments of Hungarian State Railway together as a whole, it is not impossible that building a quality rapid transit line, instead of the currently planned metro 4 torso, is not only incomparably better but also a significantly cheaper alternative – even when that includes providing a quality surface network in the inner city, that is far better than the present one.

Economic figures of the metro 4 line if functioning as an integrated urban and suburban rapid transit line

On a long-term basis, the metro 4 line giving integrated suburban rapid transit service is certainly economically reasonable because synergies between the metro line and the heavy rail infrastructure make it extremely cost-effective and maybe even cheaper than the stand-alone, stripped-down metro 4

line. The much better results at passenger travel times cause cost-savings making the project highly profitable.

According to our estimations[15], the aggregated time spared by the enhanced metro 4 can be as high as two or three times the passenger time spared by a metro line that is currently planned, even if the modal split does not change in the affected regions. Interestingly, the head of the traffic department of the Budapest local government published similar results in 2002, in a Hungarian journal for transportation engineers[16].

The following components of increased revenue are very difficult to estimate but must not be neglected:

- The cost of operation of an integrated rapid transit backbone line cooperating with a quality surface network is actually lower than the present public transit network in the metro 4 corridor; while the operational costs of the stripped-down metro line, the partly disintegrated surface network and the suburban heavy rail traffic giving no direct connection to the inner city are not – as it was demonstrated above.
- It is difficult to estimate how many passengers in the inner city will enjoy the benefits of the really rapid metro line and the high-quality surface network that cooperates with it. The currently planned metro 4 line is deprived of these possibilities from the beginning to ever after.
- Quality public transit services in the metro 4 corridor, both in the inner city and in the suburbs, are actually able to attract users of private transport while a tram-like inner city metro line is not.

An important parameter at the financial planning of metro 4 is that the investment should be realised gradually, so that neither phase would mean a higher financial burden for the Hungarian budget than the current plans. These financial questions depend on the actual content of the new plans and need further discussion, but as a first estimate, it can be stated that the additional costs of the longer station platforms in the tunnel, the wider clearance in the tunnel, the connection with the heavy rail infrastructure and the cost of the additional vehicles needed to serve the agglomeration can be roughly equalled by omitting three stations, by increasing the time intervals between trains in the tunnel, by the non-construction of unnecessary underground termini and by the omission of an unnecessary depot and maintenance technology. Also, the costs spared at Hungarian State Railways have to be taken into account at every stage.

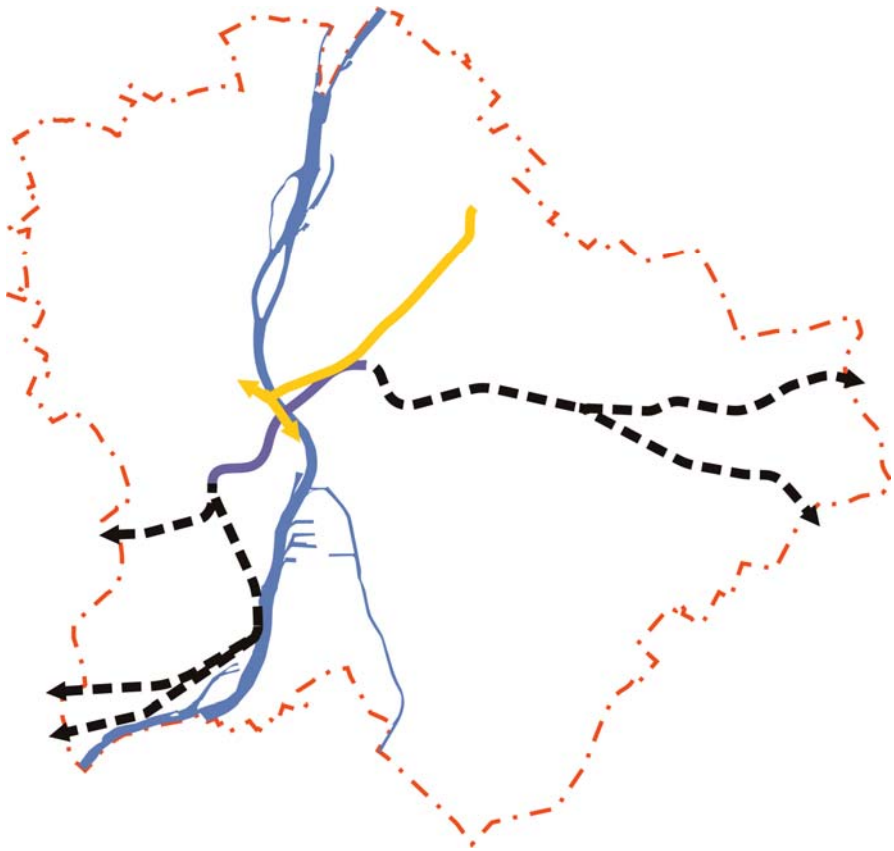
[15] In these rough estimations, the passengers using suburban buses now will spare 15 minutes per trip while the ones using trains can spare 5 minutes a trip.

[16] CSORDÁS Mihály: *A method to rank urban transit development projects* (in Hungarian), Urban Transit (Városi Közlekedés) **2002**/6. The publication was based on a study commissioned by the Budapest University of Technology and Economy

Steps needed towards a fully-fledged metro 4 rapid transit line

Recommended decisions

- The first phase of metro 4 (*Kelenföldi pályaudvar – Keleti pályaudvar*) must be redesigned and the three stations not complying with the requirements of rapid transit must be omitted. The technical details of a heavy rail compatible system are also to be decided.
- The metro 4 project and the suburban projects of the Hungarian State Railways are to be harmonized and partly unified.
- The plans for the second stage of metro 4 (*Keleti pályaudvar – Bosnyák tér*) must be wholly discarded and an LRT line from *Újpalota* to the city center and across the Danube must be planned and constructed – giving its neighbourhood a far higher quality service.



The rapid transit system (blue: tunnel, black dashed: connected surface heavy-rail lines) and the LRT line (yellow) that can be built instead of the stripped-down metro 4

What the politicians should do

Metro 4 as a political program was easily made attractive to the public. In fact, it is nothing more than a hollow political catchword, in reality it is a dysfunctional would-be substitute for trams and inner city buses, having nothing to do with the real transportation problems of Budapest and its agglomeration – as it has been declared many times by the project leader. This is the spirit of the 1970's aiming at quantity instead of quality, treating particular problems taken out of a complex set or even escalating them. Metro 4 in this spirit does not decrease the number of forced changes in the network, does not

bring the downtown area and the suburbs closer, so it neither attracts new passengers to public transport nor manages to keep present ones.

However, the attractive ideal is not compromised when there is a new quality content behind it. Anybody who may get advantages according to the current plans would surely benefit from the extended line too, regardless of the fact that the termini would be pushed out into the agglomeration. All the present and currently planned benefits of the suburban railways are kept the same way. The difference is the large additional benefit achieved through integration at nominal cost. This must be more attractive as a political program even if some delay is necessary for redesign and reorganization.

The Urban and Suburban Transit Association wants to draw policy-makers' attention to the problems of metro 4. What does Budapest need? Does it need a stripped-down yet enormously expensive investment that conforms only to some particular interests but seems to be an economical failure, or does it need an agglomeration-wide systematic solution to the metro 4 issue that solves problems, which seemed to be everlasting, and is at the same time extensible either quickly or gradually?

We should dare to admit the errors of the past and, after a discussion of professionals and experts, the very best, long-lasting solution to the present problems should arise. It is still not too late!

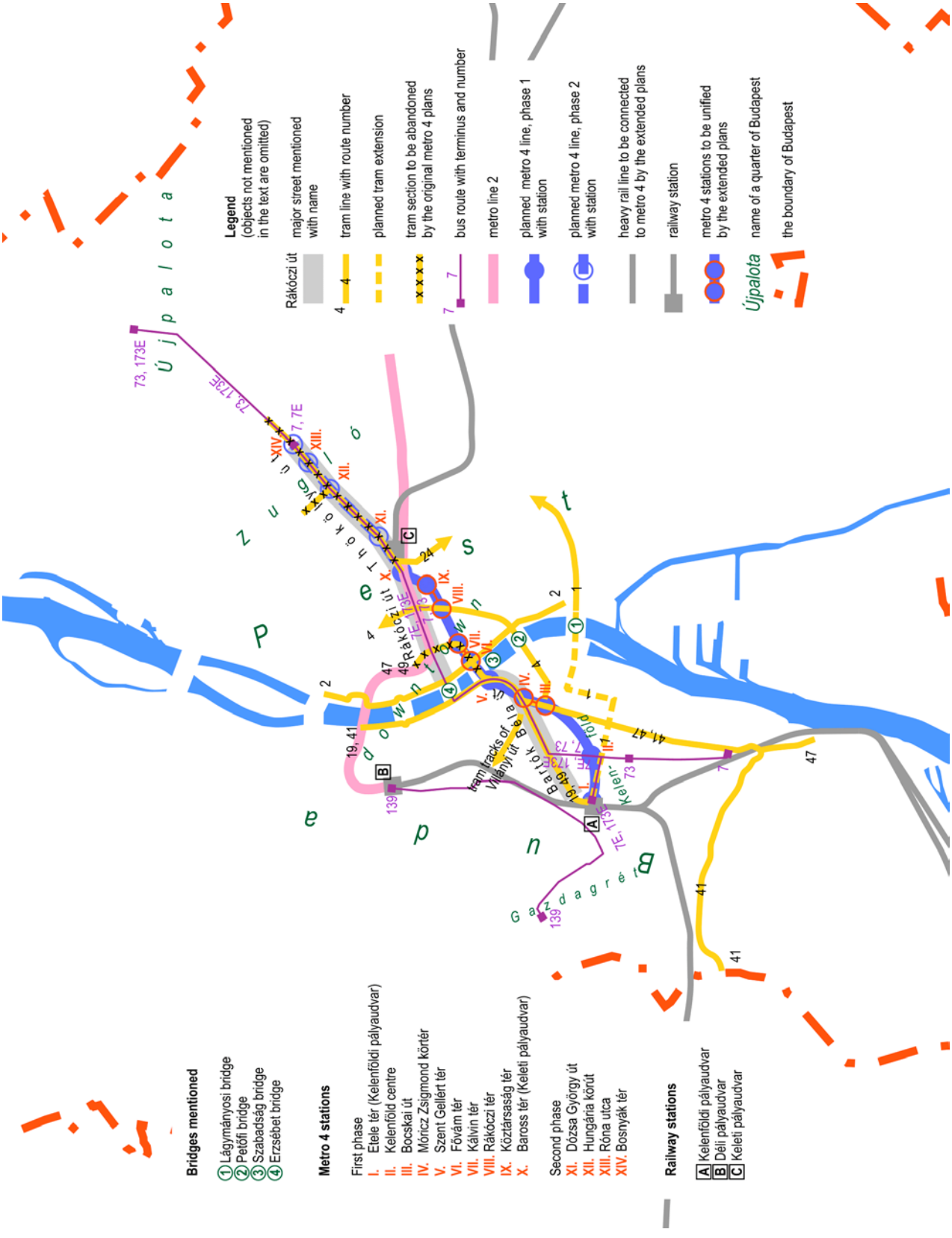
What the professionals and NGO's should do

The representatives and experts of Urban and Suburban Association are looking forward to any dispute and cooperation concerning the problems of metro 4.

We ask the affected professionals to answer the questions raised about the feasibility study of metro 4. According to our present knowledge, the currently planned metro 4 uses public money without minimal effectiveness funding a project that is economically irrational and has more drawbacks than advantages for a vast amount of public money.

Treating metro 4 and the suburban projects of the Hungarian State Railways together as a whole, the surprising result is that building an intergrated rapid transit line in the corridor of metro 4 and providing the surface with a high-quality network is not more expensive – or may even be cheaper – than the original stripped-down metro 4. Recognizing, stating and endorsing this is highly beneficial for Budapest as this project, owing to its magnitude, is able to make the Hungarian capital either prosperous or lagging behind in the sharp competition of urban regions in Central Europe.

Appendix A. A map of the objects (public transit lines, locations, etc.) mentioned



Appendix B. A short list of major events about the metro 4 case

- 1972	The first appearance of a metro 4 proposal, regarded as the direct predecessor of the present plans, in the official development schedule of Budapest.
- 1978	Start of construction work proposed by the 1972 schedule.
- December 1992	The Hungarian government calls for a tender on the construction of metro 4 in connection with the planned 1996 EXPO World Fair.
- 1993	The World Bank refuses taking part in funding metro 4 stating that *„If metro 4 is built, a luxurious device for 10% of the passengers is built forcing 90% to low-level service. This situation would deteriorate much more as time passes by, because all the resources available to maintain and reconstruct the rest of the network would be taken up by the new metro and the fees of transportation would rise."*
- 1994	Cancellation of plans for the 1996 EXPO World Fair by the new Hungarian government after general elections.
- late 1994	The 1992 tender of metro 4 is declared unsuccessful by the government.
- 1996	The feasibility study of metro 4 is released.
- 7. April, 1997	The representative of World Bank (Henk Busz general manager, Europe and Central Asia Region) confirms the results of the 1993 examinations and recommends giving up metro 4 plans (or choose the LRT alternative) in his letter to the mayor of Budapest.
- 1998	An agreement is signed between Budapest, the Hungarian government, the European Investment Bank (EIB) and the Budapest public transit operator (BKV) on funding and constructing metro 4, just before the 1998 general elections. This agreement proves to be invalid and legally unfounded later.
- late 1998	Revocation of the agreement by the new government just after the elections, due to its extremely high costs and legal problems. The local government of Budapest files a lawsuit against the Hungarian government and finally loses (several years later).
- 1999	The first application for an environmental permit of metro 4.
- 15 July, 2000	The foundation of VEKE (Városi és Elővárosi Közlekedési Egyesület – Urban and Suburban Transit Association)
- November 2002	Public dispute in the largest daily newspaper of Hungary concerning metro 4 and its alternatives; both the representatives of the metro 4 project and the alternatives (professionals and civilians) express their views but neither side was convinced by the other. The first publications of Urban and Suburban Transit Association on the metro 4 topic.
- June 2002	Start of negotiations between Budapest, the Hungarian government and EIB on funding metro 4.
- 2002.06.22 – 2002.09.22	First stage of the scandalous major road and tramway reconstruction works in southern Buda, as 'metro 4 related' surface work. Tram route 41 is cut back, some of the work takes place without a valid building permit.
- 2002.09.28 – 2002.09.29	The new terminus of tram 41 is demolished, replanned and rebuilt after being useless for one week (no platform for the passengers at the terminus, two trams derailed because of the sharp curves of the tracks, insufficient connections for alternative or extraordinary usage of the terminus).
- late 2002	The results of the Budapest Technical University study come to light under the name of the head of the traffic department of the Budapest local government. Basically, it states that connecting the metro line to heavy-rail lines would increase costs by about 30% and increase passenger time revenue by 140%.
- 28 January 2003	A talk and public discussion is organized by the Hungarian Scientific Association of Transport about the metro 4 plus proposal (a metro 4 alternative reaching the suburbs and the agglomeration via heavy-rail tracks). As opposition, the basics of the questionable grounds of refutation can be heard here, and the official representatives of the current metro 4 plans remain totally untouched.
- 2003.03.26 – 2003.10.26	Second stage of the 'metro 4 related' works in southern Buda.
- 10 July 2003	The competent authority gives environmental permit for metro 4 (stating that *"road traffic will certainly grow in the metro 4 area, but it is tolerable because of the low emission rates of modern cars"*).
- 23 July 2003	Approval of the Metro Act (on the joint funding of metro 4 phases I. and II. by Budapest and the Hungarian government using the EIB loan) in the Hungarian Parliament.

- August 2003	The Clean Air Workgroup (Levegő Munkacsoport – an environmental NGO of Budapest) files an appeal against the environmental permit of metro 4.
- 1 November 2003	Mainly due to the efforts of VEKE, tram route 41 is extended giving its connections back and leaving its newly rebuilt terminus only for extraordinary usage.
- 25 November 2003	The appeal of Clean Air Workgroup against the environmental permit of metro 4 is rejected by court.
- 4 March 2004	The competent authority (the supervisory authority of Budapest traffic affairs) gives construction permit to metro 4 and orders some minor alterations in layout; the Clean Air Workgroup and NGO's of the houses lying over the metro 4 area appeal against the permit.
- 29 June 2004	The court rejects appeals against the metro 4 construction permit, the plaintiff organizations are charged a relatively high fee for the process.
- October 2004	Call for a tender on the construction of the metro 4 tunnel (first phase) is announced by Budapest.
- 2005	Scheduled completion of phase I. according to the feasibility study.
- 17 January 2005	Building a second exit for the *metro 2* station at Keleti pályaudvar (a would-be station also for metro 4) begins as 'metro 4 related' construction work (not yet finished).
- 2005	The tender for the tunnel construction is successfully closed as well as another tender for constructing two stations.
- 28 February 2006	The court decides in favour of Clean Air Workgroup suing the mayor of Budapest who accused them of *"being responsible for the continuous increase of metro costs because of their obstruction"*.
- 2006	Tenders for three stations are also closed successfully, and the tender of the power supply infrastructure is also closed, it is won by Siemens.
- late 2006	Due to the critical financial state of Hungary, the government decides not to pay for an EIB loan funding metro 4 but to organize the project as an applicable candidate for almost all of the resources awarded to Hungary for public transportation development from the EU cohesion and structure funds.
- 21 August 2006	The construction of two metro stations in southern Buda begins officially (with parts of the preparation having taken place from May, 2006), this is also the date from which the public transit network of southern Buda is only partially functioning. The work proceeds rather slowly due to "technical problems".
- 1 November 2006	The first scheduled date to begin the construction of the tunnel; the construction has not begun yet, the current (third) scheduled date is April, 2007.
- 1 November 2006	This is also the first scheduled date for the construction work of two metro stations downtown Budapest. Construction work has not begun yet and the new scheduled dates remain in obscurity because of funding uncertainities and lack of construction permits.
- 30 November 2006	The original, Hungarian version of the VEKE study (The 4th Budapest metro line – Wasteful plans from the past) is published.
- 14 January 2007	The response of the metro 4 project leaders is published containing questionable refutation and implicit acknowledgement of many VEKE arguments.
- 15 January 2007	The responses of VEKE are published.
- 2009	The scheduled completion of metro 4 phase I. by the Metro Act (not to be fulfilled by the present state of the project).
- 2010	The scheduled completion of metro 4 phase II. by the Metro Act (not to be fulfilled by the present state of the project).