

Civil Eng. Casimir Hantz.
Civil Eng. Arch. George Blancard

The REVISION
of the defective placed and too expensive
route of the “second underground line” of
the METRO IN WARSAW.

Warsaw, February 2008.

Table of contents .

1. Introduction.
2. The impasse invest-situation with the build continuing of the METRO IN WARSAW.
3. The require research of the Vistula river bed it's characteristic and convince time for the of the engineering works with the tunnels of the "Second Underground Line" of the "Shallow METRO IN WARSAW.
4. Historical warning of the engineering crossings the Vistula river in Warsaw.
5. The key places in capital of Poland for contemporary town development and METRO build.
 - 5.1. The optimal position for the engineering crossing the Vistula river.
 - 5.2. The city development plans
 - 5.3. The region topography of the river crossing itself and of the city-section METRO line.
 - 5.4. The river bed.
 - 5.5. The idea diagram of the structure of the engineering crossing under Vistula river.
6. The comparison of the both solutions: the "uneconomical, up to now solution", and the "economical, anticipated" here.
 - 6.1. The "river section" under Vistula river in Warsaw.
 - 6.2. The "city center section" and it's mutual tie together with the "pedestrian PROMENAD"
 - 6.3. The new rational order of the METRO IN WARSAW building, as the investment for the whole town.
7. The conclusions

The drawings.

- N0. 114 \ 115 (pl \ En) The engineering crossing by the "Shallow Metro" under Vistula river in Warsaw.
- N0. 116 \ 117 (pl \ En) The comparison of the both solution of the "Shallow Metro" in the city section of the town. .

1. Introduction.

On the first sight, one can see a faulty route of the “II-d line” of the METRO IN WARSAW, proposed by Town Authority: unbelievable devious and doubled the existing dual railway PKP.

The dual railway PKP, that is the double-track of the long-distance trains line and the suburban double-track line for short-distance trains. The dual “Diameter Line PKP” with railway station CENTRALNY, ZACHODNI (west station) and WSCHODNI (east station), which have to be treated as the main railway line Paris – Berlin – Warsaw – Moscow.

The suburban line has now, an railway character only, instead of city traffic character too, and needs now a modernization and far-sighted rebuild for metro-similar line (MSKM-I).

The wholly lack of search of the other, alternative solutions by town’s BPRW (The Planning Office for Warsaw Evolution), causes the above mentioned faulty route of the “II-d line” of the METRO IN WARSAW. An faulty route, seems to be now, like a second-class bus route, instead of first-class traffic route for strategic thoroughfare on 100 years. It has caused to disregard the polish Transport Ministry postulate, regarding “EURO-2012” program , to connect new National Sports Ground “STADION NARODOWY with the town and with the railway station “DWORZEC CENTRALNY PKP” by existing, but modernized line.

The Second Metro Line in Warsaw, on the parallel destination W-Z (east-west) cross Vistula river, shouldn’t connect with it, because has other place, other aim, and because constitute an important metro traffic idea program, for capital and for other big town in Poland. In the future, many big town need the “UNDERGROUND” investment too. But now Warsaw need an experience in realization the engineering crossing the big river instead of hasty, propagandist effects.

Such a mining concern the difficult river crossing along faulty “town route” (along ŚWIĘTOKRZYSKA ROUTE).

The Vistula river needs careful prepare to cross the river with tunnels and time for necessary research. For reasonable course between both mainly centers. The centers existing and just planed in Left-bank and Right-bank Warsaw.

The lack of correct evaluation the traffic situation to be seen in Warsaw now (e.g. the omit the station A.12. and A.16.), bring to arise impasse situation : unfortunately there is still not known where and how build the metro far away.

In general it seems there isn’t sensible now, to build an new very complicated tunnel under the river, instead of modernize existing objects, which are suitable for rebuilding by low cost and which can satisfy the traffic needs (in JEROZOLIMSKIE avenue) in the near future (e.g. about 10 years).

Instead, the new traffic artery has to be build quietly, on the base of the most recent recommendation of the ITA (International Tunnel Association), regarding people safety in the underground rooms.

The recommendation which in Poland should has to be think over, in order to achieve their own idea about the METRO arrangement, adjusted to the local conditions. Just then would have sense the help of foreign specialist.

Now there is necessary to change the order of metro objects building so, to make up for the traffic delay with new rational way on the east-west destination (W-Z).

Exactly this change suggest the “Economic METRO IN WARSAW (the edition from September 2007), supplemented now with the technical and the economical comparisons of the two different solutions.

This comparison proved the twice as big cost of the “Uneconomic II-d line” to the Economic METRO IN WARSAW as the “line DLM “ (see point 6.), and caused the REVISION.

The dominant solution has to be now the modernization the underground and ground object in JEROZOLIMSKIE avenue and barely then, the building the new Metro Line – DLM.

2. The impasse invest-situation with continuation building of the METRO IN WARSAW.

As a result of reject by the town and the railway authorities the essential modernization and reconstruction many underground and ground objects in JEROZOLIMSKIE avenue, arise an impasse invest-situation with building the METRO IN WARSAW.

The proper reconstruction is necessary there, in order to ensure, on the one hand the regular, secure trip through the town, for PKP transit (in north tunnel) and local passengers (in south tunnel), and on the other hand to guaranty the additional, sporadic arrival at STADION NARODOWY, by metro-similar line (MSKM-I in south tunnel) the sport fans.

For deadline 2012 year, the far-reaching reconstruction of the “Diameter Line PKP” give such a possibility, in contradiction to new “II-d metro line”. The different reconstruction in JEROZOLIMSKIE avenue will be admittedly difficult for execution and for inhabitants. It clear however the present and future transport situation. It will also reduce the contemporary costs (through the postpone the building of the new second metro line).

One has to convert the existing suburban line into the metro-similar line, through build the new stations : MUZEUM NARODOWE, POWISLE, STADION (over Wybrzeże Szczecinskie), and JAGIELLOŃSKA, as well as rebuilding the existing stations: ŚRÓDMIEŚCIE , CHAŁUBINSKIEGO, PLAC ZAWISZY and (partial) DW. ZACHODNI.

First of all however, have to be constructed the detour-railway-line MSKM II+III. The route, on which don't are tunnels, but is to construct the new bridge on existing pillars.

The reject of the “Diameter Line” reconstruction and “SMKSZ – system” (Municipality track system) introduction, make impossible a quick and cheap arrangement of the capital transport and condemn the town, on to the building just now (prematurely) the expensive “Second Metro Line”. Condemned also to leave over, the powerful obstacle in the shape of, the Diameter Line Tunnel, which blocked the capital development. The faulty opinion about contemporary invest-situation by town authority and it's advisors, made now a deadlock.

The bad situation arise also, with planning the new second metro line, regarding very complicated, exceptional time consuming, the procedure for preparing the river cross. The procedure with the geo-hydrology research for the river cross and for the DLM-line route. All this facts made now the necessity of the REVISION like in the title.

3. The require research of the Vistula river bed, it's characteristic, and convince time for the beginning of the engineering works with tunnels for the “Second Line” of the “Shallow Metro” in Warsaw.

The river Vistula crossing by two tunnels of the “Second Line” of the “Shallow Metro”, require careful, several years research to come to optimal solution. The river exceptional capricious, unforeseen behave and with the weak perishable bottom. A river in which can stand out the culmination of the unfavorable phenomenon physical – atmospheric, i.e. long lasting frost and next a rapid violent flood. The annual phenomenon of forming the new temporary isles or the new current in the new places. This prove evidently about the bottom incline to move sandy layers of soil and form the isles and the unstable bottom. The cohesion-less layers, firmly watered, but with the unknown thickness. When such a quiet annual phenomenon change to dangerous element, then the safety of the tunnels would be threaten. The search of the river bottom cross, has to show on which depth the both tunnels won't be treat for tunnel menace . It can be however difficult and in short time even impracticable. Seeing that, necessary is to research all layers ,in which will find the both tunnels, in order to determine the degree of loosen and watered soil layers. Because the tunnels have to be check

on the uplift as well. Earlier however, to be determined the place of the crossing. Now, the crossing is controversial, but will be fixed on the SAS-AXIS – we hope - regarding the costs. The economic, optimal placed route along SAS-AXIS, compared with two time more expensive route along Świętokrzyska street, show this evidently.

The both, different route-studies have showed it in mutual independent way. This independent study compared: the “Economic METRO IN WARSAW” and the “II-d Metro Line” – prospects and method of building”(see monthly INŻYNIERJA I BUDOWNICTWO 7\8 – 2007).

4. Historical warnings of the engineering crossing the Vistula river.

This is a story about building different bridges on Vistula river in XVI – XX century (yet not written). The wooden bridges, the wooden platform on the skates, or the huge steel framework supported on the caisson pillars. The bridges which turned out to be perishable, but not only because of the war, but also because of the river itself. The river located on the frontier of the two climate: the European and the Asian. The moderate and the continental climate, where the heavy frost sometime come can last long time, then the river can be entirely frozen, and the spring thawing block the bottom with the ice. Especially in Warsaw because between the protected banks. The ice blocks, together with the flood, can be treat for shallow placed tunnels.

Therefore the river remain unforeseen variable, capricious and for tunnel dangerous: can be calm during several years, and suddenly after exceptional frosty winter and violent thaw, not here but in Tatra or in the Carpatiens, change in Warsaw into destructive element. The element which destroyed with easy the medieval bridges. And in modern times, force the builders to use new material and the pioneer method of build. It concern all pillars and spans every bridge. The spans which have to get big range to help the flow of the ice floe downstream. The pillar itself need special foundation regarding the unstable river bottom, and need apply the pioneer caisson method. But the caisson method show fatal for the workers. Fatal, because it need the work under compress air, which cause the caisson-diseases. Now the caisson method is replace by the big-diameter pile.

The Warsaw's inhabitants are especially impressed on the “Bad Traditions” concerning the Vistula crossing. The traditions consolidated now by people, after the unsuccessful attempt to build the tunnels below the river for the “deep metro”, under the “compress air method”. The fatal build way and for the military aims, instead of civil purposes, during the times of the “fraternal help”. The help for the Polish People Republic according to the Soviet Union military idea, in years 1951 – 1954.

The collapse of the military idea of the “deep metro in Warsaw” with it's Vistula crossing, bring to stop this investment for about a quarter of the century. Although it was later some other trials to build metro on the W-Z direction again for military purpose as railway connection on the “Tunnel W-T”, in town quarter TARGÓWEK (1954 – 1960), as well as along Świętokrzyska street (1975 year), but happily unsuccessful.

The negligence of the research, has between other things, cause the engineering and the planning problems now, e.g. the office BPRW idea of the two river crossing, instead of one only, and other example given by the Town Authority idea not to use existing railways for EURO-2012, but arrange the quick build of the “II-d metro line” with the new tunnels. The key-arrangement for the quick build is in the JEROZOLIMSKIE avenue however.

The signatory have a hope yet, that this study help to overcome all obstinacy, and change the METRO IN WARSAW idea.. The idea with Vistula crossing and PROMENADA together with DLM line, as well as the idea of the use railways for the metro.

More information about the Vistula crossing by the “deep metro” and the ancient bridges, one can find in the publication of the “Design Chamber of Building” WIADOMOŚCI, number 10,11,12, year 2000, in the article titled “From the Warsaw history cards”

5. The key places in capital of Poland for the contemporary continuation metro building and the town development.

5.1. The metro “river section” for the Vistula engineering crossing

On the surface of the town area in Left-bank Warsaw exist only one good place for the Vistula crossing with the “Shallow Metro”. The crossing with the tunnels safety itself and with the effective line DLM and the place suitable for the surrounding area. For example for the green surrounding under the scarp, or for both town centers. The scarp supported by ancient embankment of the road snail of the KAROWA street.

The supported scarp will be also the convenient place for location the station “B.5.- UNIWERSYTET” of the line DLM. Location on the “shallow” depth (minus “-10 m”), thanks the profile of the KAROWA street. The location in the native soil, but under the embankment and outside the existing, ancient viaduct “MARKIEWICZA”.

The depth, which allow the realization of this station by new method. It means, the mixed “mining – opening” method, which took place in the town earlier. Earlier means by execution the station “A.15. RATUSZ- ARSENAŁ” in year 1998. Although then, as far as without use of the method advantages.

For station “B.5. UNIWERSYTET” anticipate is, the station building with mixed “opening-mining method” means, the both tunnel execution by “mining shield method”, and the station itself by the “opening method”. The important station area, over the platform edge, will be protected with special arrangement by the reinforced concrete slab and by the special tubing. It allow the change the part of the tunnel lining dismantling into the special tubing. The change under a.m. protected slab.. The “Platform Hall” with the protection slab, over the joint structure and with the HDRP-room will connect the tunnel and the station. (see drawing N0 115 \ 116). The “Platform Hall length 120 m, in the level “minus -2”, and the HDRP-room (the Hall of Switch Distribution), in the level “minus -1”.

Also in the Right-bank Warsaw exist only one good place to arrange economic the “Shallow Metro” with it’s station “B.4. TARGOWA”. The station foresee as the assembly chamber also, in reason to arrange the start in turn the TBM-EPBS shields.. The big chamber (150 x 20 x 15 m) on PGS level (PGS = rail head). It allow for that, the good located station “B.4” on the wide sector of the SOLIDARNOŚCI avenue, between the JAGIELLOŃSKA and the TARGOWA streets.

Therefore exist only one good place for Vistula river crossing, namely the line jointed the both “river stations”, i.e. the “B.4 “ and the “B.5”.

The DLM route under Vistula river has to be, from Right-bank Warsaw lengthen in Left – bank Warsaw, till crossing station of the both lines PLM+DLM on the square PLAC ŻELAZNEJ BRAMY as crossing station “A.14 .bis \ B.6”, (bis = encore). The square, which is on the SAS-AXIS, it means simultaneously over the “Second Metro Line – DLM”. The line, which reasonable evade the street “Świętokrzyska” foresee as an essential reserve for the future route of the CPD. The vehicular road CENTRALNA PRZEPRAWA DROGOWA ” = the CENTRAL ROAD PASS (with double level bridge) = CPD, over Vistula river.

The DLM line, together with the existing “W-Z route” (TRASA WUZET), nearby the SAS-AXIS, solve the transport problem in ancient city. The problem of the people mass movement and local, vehicular traffic. Solve, because connect both town centers with the shortest way and minimum journey time. Reduce also the investment expenses for modification and restructuring (impossible for widening but possible for traffic modification) the two bridges: the ŚLĄSKO DĄBROWSKI. bridge, and the PONIATOWSKI bridge.

5.2. The development of the capital.

The route given above, contribute the development of the capital through the main artery arise in Left-bank Warsaw (PROMENADA + DLM), and main avenue arise in Right-bank Warsaw.(TYSIĄCLECIA avenue), with rapid tram (TSB) on the „South Tangent Route „ (PTK), as well as thanks the above mentioned routes: the “W-Z route” and “DLM-Line”.

5.3. The region topography of the neighbourhood of the river crossing and the DLM route.

This neighbourhood constitute historic centre of the left-bank town, especially the Old Town and the Royal Castle. Instead, the river in this spot narrow and divide the town on two uneven parts. Divide and will divide further, because there are few bridge-connections and no idea to change this lack. But in the future the both city centre could be integrated by new “double level” bridge and route “Świętokrzyska”, along CPD.

The wheel- route CPD will connect the existing town centre of the Left-bank Warsaw, with the future centre of the Right-bank Warsaw along TYSIĄCLECIA avenue, the both parts of the capital. This is a reason of the reserve area for CPD now. The divided capital, where the quantity of the traffic connection is small one and now no idea to change it without the CPD. The capital need now this idea.

The Vistula valley topography show, since many years, the wide spread of water at right-bank, which remaining are the river harbour basin. The basin which can be the reserve in case of the flood. But don't be the convenient place for tunnel building there, regarding watered soil condition, as the worst in the all the town area. .

Other water wide spread of the river, down and up the tow, don't influence over the tunnels..

5.4. The river bottom.

The Vistula river flow rapid in it's bottom nearby WYSOCZYNA MAZOWIECKA SCARP (distance about 200 m).The river bottom along the left-bank, is reinforce by the stone-concrete embankment and right-bank reinforce by the soil-stone embankment only. The bottom itself is sandy and unstable as the weak, cohesive-less, after-glacial soils. Almost each year the river current change it's place and look for a new one. Such a river is danger for the shallow placed tunnels. Danger especially in case of the packing of ice.

On the route of tunnel crossing, the water level is usually on the high 77,5 m (over see level), right-bank on 84,5 and the dam 4,5 m above. The left-bank get 85,0 m, the scarp base of WYSOCZYNA MAZOWIECKA 84,0 ,and it 's edge 100,6-114,0. The streets of Right-bank 84,8 – 85,2 m and in the Left-bank Warsaw 106,0 – 114,0 m.

The build upon of the scarp (sometimes even on the edge) is compact, but with the exception of the ŻEROMSKI square nearby KAROWA street, and it's road snail.

The build upon of the middle part of the SAS-AXIS is associate with town authority intention of the SAS PALACE reconstruction by PILSUDSKI SQUARE. The square, which is on the SAS AXIS too, but under which run very deep the both tunnels of the DLM line.

On the east side of the square, the “Economic METRO IN WARSAW” foresee the monument of the “Polish Flag”. The monument, which hide in it's inside the metro ventilation system.

This, three object mark out on the surface, the SAS-AXIS: the entertainment pavilion for entrance - exit over the main metro crossing station by ŻELAZNEJ BRAMY square, the above mention monument and the pavilion of the “UNIWERSYTET” station. As well as marks the underground main artery for mass people movement in both direction. The people movement in the capital on the east-west destination (W-Z) , i.e. on the “Second Metro Line – DLM”.

In the near time necessary is , to make priority with the crossing station of the both lines. The key station of the both section of DLM line : the section of Vistula crossing, and the section of the town centre arrangement under PROMENADE. Both this sections have got special

solutions and need special treatment. The river crossing section need special “bottom” soil research for arrange the “Shallow Metro” river cross, and the town centre arrangement need the special traffic artery, along GRZYBOWSKA street, for the future capital centre . But now it is necessary to become real with the “Shallow METRO IN WARSAW”, and arrange the ground and underground restructuring in JEROZOLIMSKIE avenue.

5.5. The idea diagram of the engineering crossing structure under the Vistula river and the objects under the PTOMENAD for the “Shallow Metro” in Warsaw.

After the settlement in plan and in profile the correct course of the “Second Metro Line” - DLM below SAS-AXIS, one should settled the construction itself, i.e. the safety run of the TBM-EPBS shield machine to drive the tunnel between Vistula stations “B.4 – B.5.” The tunnel driving suitable to the local conditions. It mean, on the one hand according to existing physical requirements of the geo-hydrology environment, in which find place both tunnels, and on the other hand find place for the effective arrangement of the switch station and the city section of the line.

The construction idea is shown on the drawing No 114 (pl) \ 115 (en), and presented chronologically below.

1*(primo).

In the room of the feeble, after-glacial soils, (near 2 m below river bottom),one has to replace it with the heavy concrete, lay down between the steel shed-pile cofferdam (LARSEN-WAND) in the river. The slab with the wide, which cover the both tunnel tub of the metro line.

The concrete slab should careful replace the weak. It mean, the concrete lay down successively from artificial islands with steel fence. The cover fence with above mentioned the outside LARSENWAND, and lay down the concrete in the inside fence also as the LARSENWAND. One point to do, this part of works in haste, during autumn low water level in the river (VIII, IX, X month).

2*(secundo).

After execution the concrete slab for the both tunnel and cover it by heavy stone soil, one can start to drive the south tunnel under the river. The tunnel driving below the protective slab, should be complex one. It mean by the simultaneously tunnel-face exploit and the concrete, or the cast iron tubings lining. The lining modified in place of the station UNIWESYTET, where it be supplement with the special lining, necessary for the station. Besides, the shield itself has to be modified, regarding rapid increase of the water pressure (by hidden soil water), and by the change of the knives in case of meet an granite boulder. . The installation the TBM-EPBS machine set, should be in the assembly chamber anticipated in the place of the future “Platform Hall”, of the station “B.4. TARGOWA”, and dismantling in the relatively small chambers in “Ogród Saski” (SAS GARTEN)

3*(tertio).

Independently from the east part of the DLM line and the engineer Vistula crossing, one can start to build the city centre part of the DLM line between existing the PLM line and the existing railway circuit line, MSKM-II. This is the special part of the line, regarding it’s central position, which need special solution i.e. mutual complement each other aims: the masse people transport in metro, and the ecological people walking area along PROMENAD without wheel traffic, but with underground stations and underground parking- lots. The GRZYBOWSKA + SIEMIOGRODZKA streets with most attractive business building on the surface, as well as the most attractive metro transport in the underground.

4*(quatro)

The “Second Metro Line”, and it’s crossing ,under the river, shouldn’t have the priority of the realisation , because now the more urgent is, the arrangement of the restructuring the underground objects in JEROZOLIMSKIE avenue, and ground objects in NOWY ŚWIAT street, as well as the all suburban stops rebuild along the JEROZOLIMSKIE avenue for the metro-similar line MSKM-I.

6.The comparison of the both solutions: the economic solution anticipated and suggested here, and the uneconomic incomplete solution, still planed by the town authority.

The comparison concern mainly the differences of route of the line and the invest-expenses for both routes: the defective, expensive route along ŚWIĘTOKRZYSKA-PROSTA streets (for II-d metro line), and the optimal inexpensive route, along GRZYBOWSKA-SIEDMIOGRODZKA streets (DLM-line).

The lines which have to connect both city centre in proper way and by minimal investment outlays.

Meanwhile, the “II-d metro line” don’t meet this demands. For example it connect needlessly the closed river harbour PORT PRASKI, in the Right- bank Warsaw with the over-investigated Świętokrzyska street in the Left-bank Warsaw. Furthermore don’t connect straight ahead, but by the winding course, wrong for the rapid metro passengers.

The comparison of the both solutions and the both investment outlays, pose now the key problem of the METRO IN WARSAW and the sense of it’s “second line”, building.

6.1. The “river section” for the Vistula engineering crossing

The “river section” has to serve the “Shallow Metro”. It mean has to be shallow under the river bottom in spite of soil conditions.

The idea scheme of the engineering crossing by the two tunnels of the DLM-line under the Vistula river is shown , on the drawings N0 114 (pl) and 115 (an), and costs comparison in the Table N0 I..

The comparison concern the both routes: the economical route along KAROWA street and the SASKI OGRÓD (as SAS AXIS route), and the uneconomical one, along ZAJĘCZA + KONOPCZYŃSKIEGO streets (as II-d line, along ŚWIĘTOKRZYSKA route).

The both tables are work out, on the same base of unit prises of the BPRW- office (The Office for the Development of Warsaw), in a study titled “Metro transport-serve for city centre of Warsaw”, dated December 2005 (Table 14.1. the unit costs for II-d, and III-d metro lines, page 54). The cost comparison for the two idea of the “Vistula river crossing “..

TABLE No. I

| No | Line | Station or track route | rail head | L in km | Investment outlays in mln zł | |
|----|------|------------------------------------|-----------|---------|------------------------------|------------|
| | | | | | Unit | For object |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | DLM | Cross station Marsz\Oś Saska | -6 | | 188 | 188 |
| 2 | „ | Track route under Sas Garden | -7 \ -11 | 1,3 | 220 | 286 |
| 3 | „ | Station UNIWERSYTET | -12 | | 215 | 215 |
| 4 | „ | Track route under Karowa \ Vistula | -13 | 1,7 | 220 | 379 |
| 5 | „ | Station TARGOWA | -12 | | 188 | 188 |
| | | | Together: | 3,0 | | 1256 |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|----|---------------|--------------------------------------|-----------|-----|-----|------|
| 6 | II-d. line | Cross station Marsz\Świętokrzyska | -21 | | 400 | 400 |
| 7 | „ | Track route under Świętokrzyska | -24 \ -25 | 0,8 | 550 | 440 |
| 8 | „ | Station NOWY ŚWIAT | -26 | | 400 | 400 |
| 9 | „ | track route under Święt.+Konop | -24 | 0,9 | 550 | 495 |
| 10 | „ | Station POWIŚLE (under Zajęcza) | -18 | | 215 | 215 |
| 11 | „ | Track under river | -13 | 1,0 | 330 | 330 |
| 12 | „ | Station PRAGE CENTER | -18 | | 215 | 215 |
| 13 | „ | Track under building | -16 | 1,1 | 330 | 363 |
| 14 | „ | Station DW. WILEŃSKI | -12 | | 188 | 188 |
| | | | Together: | 3,8 | | 3046 |

The remark. The river Vistula crossing along “Świętokrzyska route” is over twofold more expensive then along “SAS-axis” route : $3046-1256 = 1730$.

6.2 The” City section” of the “Shallow Metro” under pedestrian PROMENAD.

The “City section “ mean the part of metro line under the street without the cars, but with metro tunnels and underground car’s parking lots.. This is the arrangement along GRZYBOWSKA + SIEDMIOGRODZKA streets as PROMENAD to be compare the deep metro along ŚWIĘTOKRZYSKA + PROSTA streets. The streets very noisy, hazardous to health but with tunnels driven by shield with the exception of the stations. The compare the metro line with the “shield tunnel” with the line “without shield” present two fold increase of the invest – expenses for the fist solution.

See the Table N0 II.

TABLE No II.

The cost comparison for the two idea of the “city centre line position” in Left-bank Warsaw.

| No. | Line | Station or track route | Rail head | L. in km | Investment outlays in mln zł | |
|-----|------|-----------------------------------|-----------|----------|------------------------------|--------|
| | | | | | Unit | Object |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | DLM | Station MARSZAŁKOWSKA | -6 | | 188 | 188,0 |
| 2 | „ | Track r from ŻEL.BRAM till JP.II. | -12 | 0,7 | 88 | 61,6 |
| 3 | „ | Station JANA PAWŁA II | -12 | | 88 | 88,0 |
| 4 | „ | Track road from JP.II till Towar. | -13 | 1,0 | 88 | 88,0 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5 | „ | Station TOWAROWA | -12 | | 88 | 88,0 |
| 6 | „ | Track from Towarowa till Płocka | -13 | 1,0 | 88 | 88,0 |
| 7 | „ | Station PŁOCKA | -12 | | 88 | 88,0 |
| 8 | „ | Track from Płocka till Wola | -12 | 0,75 | 88 | 66,0 |
| 9 | „ | Station WOLA | -12 | | 215 | 215,0 |
| 10 | „ | Cross-station stop-off track | -11 | 0,4 | 44 | 17,6 |
| | | Together: | | 3,85 | | 988,2 |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|----|-----------|---------------------------------------|-----|------|-----|--------|
| 11 | II-d.line | Station MARSZAŁOWSKA | -21 | | 400 | 400,0 |
| 12 | „ | Track route from Marsz. till ONZ | -17 | 0,72 | 220 | 158,4 |
| 13 | „ | Station JANA PAWŁA II | -12 | | 188 | 188,0 |
| 14 | „ | Track route from JP-II till Daszyńsk. | -13 | 1,0 | 188 | 188,0 |
| 15 | „ | station TOWAROWA | -12 | | 188 | 188,0 |
| 16 | „ | Track route from Dasz. Till Płocka | -13 | 1,1 | 220 | 242,0 |
| 17 | „ | station PŁOCKA | -12 | | 188 | 188,0 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 18 | „ | Track route from Płocka till Ring.r. | -13 | 0,66 | 220 | 132,0 |
| 19 | „ | Station WOLA | -12 | | 215 | 215,0 |
| 20 | „ | CENTRUM – ONZ Switch-track | -11 | 0,9 | 44 | 39,6 |
| | | Together: | | 3,57 | | 2325,6 |

The remark. The sector of City line along “Świętokrzyska route” is over two fold more expensive, then along “GRZYBOWSKA street”: $2325,6 - 988,2 = 1337,4$.

6.3. The new, rational order of the complex investment for the “Shallow METRO IN WARSAW”

Now the restructuring of the existing object in JEROZOLIMSKIE avenue, should be as a priority invest-aim on the first place, and the new metro line, the DLM on the second one. Now it is necessary, regarding to the mass people transport in town centre, and regarding to the people safety in existing, neglected tunnels, along JEROZOLIMSKIE avenue. But also, regarding to the present need of the river crossing with it's bottom investigation, before building the new metro line, subsequently. Reasonable is, to assure this invest task as the complex-idea task for all the area of the capital traffic improvement. The reasonable dealing on it has to be in the professional hands only, because it has the strategic range on the 100 years, and have to be the model for other big towns in Poland.

7. The conclusions.

7.1. The continuing of the “Shallow Metro” in Warsaw.

The “Shallow Metro” already checked to work generally well, on the W-Z direction in the Left-bank Warsaw, as the PLM line, because is right-minded as well in the plan as in the profile. In the plan is without the sharp curve, disagreeable for passengers, and in the profile is near the ground surface, therefore attractive for pedestrians. That’s why the principles of the “Shallow Metro” should be keep on for the Second Metro Line : which has to be with the straight course without the curve and near the ground surface with the pedestrian passengers.

7.2. Advisable is to appoint a new autonomous institution for arrangement the “METRO IN WARSAW” building, as a strip partner organisation to the “Capital’s President Office”, The organisation, which be responsible for preparation, realisation and settle up the building the METRO IN WARSAW, according to the above mentioned in point 7.1. idea.

7.3. After revision the existing, faulty and too expensive solutions of the “II-d metro line”, one should prepare new project for “DLM – line” and for the “Shallow Metro” in all the area of the town (M + MSKM). One have to use in maximum way the existing, now neglected, railway lines for metro – similar lines.

The project put into the public opinion of the Warsaw society, and put forward to the foreign specialist (but which only, to be with the tunnel building experienced in the unusual soil conditions), for metro solutions.

7.4. Immediately accelerate the restructuring arrangement of the existing railway lines in the town centre, in respect of the transport and of the safety needs, especially in the JEROZOLIMSKIE avenue, as well as along it’s indispensable detour lines: MSKM-II and MSKM-III .Accelerate also sport ground the STADION NARODOWY-S.N. The sport ground, which already on the EURO-2012 have to receive 3 stations: S.N.-west; S.N.-main gate ; S.N.-east. However the “S.N.-main gate station” platform to be use during the main event only. Instead of, the other two stations to be use by the inhabitants as usual.

7.5. The arrangement of the transport in the JEROZOLIMSKIE avenue, one should deal now, as priority, because concern the town centre of the capital, as well as the prestigious railway connection the new STADION NARODOWY with: the town railway traffic (MSKM), with the PKP traffic and with the air traffic LOT, on the EURO-2012.

