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# ECONOMICAL METRO IN WARSAW

Warsaw, September 2007.

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The "Economical METRO IN WARSAW" embraces the whole area of the capital in order to carry out this "Undertaking" as fast as possible, but in a gradually way, according to the "Urban traffic railway system – SMKSZ",

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**1.Introduction.**

**1.1.The currant impasse situation for the continuation of building and designing the Underground in Warsaw.**

It isn't common knowledge now where and how to continue the Underground building in Warsaw's city on the east-west direction (W-Z). It still exists a burning ,fundamental problem of existing suburban railway conversion into METRO-SIMILAR line under JEROZOLIMSKIE avenue. .The line, where now the insufficient repair of the main construction has blocked indispensable works. The underground works: new bottom foundation of the both tunnels and new "metrosimilar" station MUZEUM NARODOWE, as well as on earth, - the new street KOPERNIKA – FRASCATI with it's tunnels under "DE GAULL – Rondo – works.

The "Second Metro Line – DLM" incorrectly placed under ŚWIĘTOKRZYSKA street, is irrational. It ought to be placed as far as possible from the existing, suburban "Diameter Line PKP", and as near as possible to city route "TRASA WUZET". It means optimal along urban axis "OŚ SASKA" in Left-bank Warsaw and under "SOLIDARNOŚCI" avenue in Right-bank Warsaw. .What is more, during realization such an faulty line it would cause an long time traffic chaos in center of the town.

For this reasons the DLM – Line has to be changed into an optimal route. It means in the town center under road snail KAROWA street –the most low part of the scarp – across KRAKOWSKIE PRZEDMIEŚCIE avenue, under "TOKARZEWSKIEGO street, under PILSUDSKI PLAC and garden axis OGÓD SASKI and below PROMENADA of streets GRZYBOWSKA + SIEDMIOGRODZKA. But in right-bank Warsaw under SOLIDARNOŚCI avenue instead of under the river harbour PORT PRASKI..

Now the impasse situation rely upon the separate, incompatible activity of the town and railway Warsaw's authorities. The present circumstances need instead, such an integration, that on the town's area the railway needs would be subordinated to the town needs The discrepancy between both authorities is unacceptable because it has already caused many bad solutions e.g. in the region of "DWORZEC GDAŃSKI", which has lately contributed to a half year closure of the suburban railway line in the city. But in the near future, it can predict the closure of thoroughfare railway i.e. in the north tunnel of the "Diameter Line PKP"..

**1.2**. The postulated, new invest idea, it's range economic and professional approach to question.

The new METRO-idea for the capital will bring to the town considerable transport advantages and can accelerate the "Undertaking" realisation on the whole area of the capital, if took into consideration below mentioned factors:

**1.2.1.** The contemporary "SMKSZ" – system, concerning the existing METRO line (N-S), and some other MSKM lines (W-Z),can involve on 10 years all town transport needs of all capital area, all districts, (except historic district), of all sorts of transport facilities. But for the future, in order to become a rely improvement, the town transport in Warsaw, there has to be anticipated a proper extension, which considers vital factors. Consider simultaneously many different factors, namely : the terrain topography, the underground geo-hydrology, the safety of execution and use, the capital primacy, the ecology and the evolution perspectives.

However now, regarding to a lot of obstacles, the most important is the building sequence of main objects in "SMKSZ" – system. The building sequence, which has to be compatible with "Underground build-art" and a.m. "System", in order to be transporting effectively.

**1.2.2.** The METRO – idea has to be build cheap i.e. maximal make use of existing railway net in Warsaw, i.e. .railway lines, which run via city, especially via JEROZOLIMSKIE avenue. Where indispensable are the modernisation of both tunnels and the building of the new METRO.SIMILAR station "MUZEUM NARODOWE", but also carry out a new arrangement of all stations on the suburban "Diameter Line PKP" in plan, or in profile.

**1.2.3.** One should tidy up and subordinate all underground traffic object to new international requirements concerning the people's safety in underground rooms. Hence, the necessity of building an escape gallery for passengers from trains of both tunnels. The necessity in the event of fire or breakdown. The gallery. added to correct the both integrated tunnels.

**1.2.4.** The METRO ( DLM ) has to get an easy access for all inhabitants, i.e. the comfortable way from street's walkway to metro platform itself. The safety connection via HDRP ( the "Hall in swap station for passengers which change the trains ) in town centre, and "on traffic lights" outside city. In this regard the METRO- route and all stations have to be as near the surface as possible. The METRO – route under PROMENADE along streets GRZYBOWSKA + SIEDMIOGRODZKA, should be as shallow to the surface level, as possible ( minus - 10 m ) and be treated as a main artery of the town : the underground METRO artery and on the surface level the PROMENADE.

**1.2.5.**The arrangement of metro lines in Warsaw, on the East –West direction should already during planning time ,to overcome the " bad traditions" concerning Vistula river crossing in last century (see report "Streszczenie", dated 10.11.1999 with historic facts about Prussian and Czar-ian occupation of Warsaw in XVIII and XIX century, see Literature p.2.). The versatile, professional approach to the problem can help to find the proper solution in XXI century. The solution, which considers below specified factors:

**1.2.5.1.The terrain topography.**

For the town, divisible on the Left-shore Warsaw and Right-shore Warsaw one should take into consideration the basic economic rules of metro lines. The rules being results of terrain shape, i.e. the relationship between tunnel depth and tunnel place nearby Vistula river, it's bottom, valleys and of the Warsaw's WYSOCZYZNA MAZOWIECKA scarp.

The problem is, that for „open method building", all stations of the DLM line, have to be placed shallow, regarding to terrain surface.
Placed, as an rational way for profile design. Rational placement means: deep under the river i.e. it's unstable bottom and it's indispensable interval to the tunnel (tunnel key)carcass,deep under the scarp with remove tendency, but at the same time shallow under crossing station's spot. It is necessary, regarding to the intersection of crossing stations, where the DLM tunnels in crossing station have to be over and not under the PLM tunnels ( see scheme No 113, and study design p.4.3.6. ).
Instead, the basic economy rule for Rightbank Warsaw is, the limitation of tunnels generally. It means an limitation for DLM – line, regarding the possibility to short the line and to use in maximal way the existing railways for METO-SIMILAR lines with stations, which should be inside existing embankments , (see schemes No 107 – 110)

**1.2.5.2. The shield tunnels under the river.**

On the route of tunnels under the river one should recognise, before the design, the soil water level during summer, winter and flood time, regarding to violent increase water pressure. The pressure increase, expected on the shield face during tunnel bore, as well as prospective presence of the big after glacial granite blocks with 5 m diameter. The average TBM shield can't overcome it. Furthermore the tunnel's route one should tie up with the huge, temporary assembly common chamber for the group of shield machines and for the future steady chamber for the platform hall of metro station (B.4.-"TARGOWA").
The group of shield machines will have 150 m length and intersection (10+10).10 = 200 m2 and have to be on the depth of "metro – rail – head ". All this things are indispensable for the choice of the suitable sort of the TBM-EPBS shield machine and for the a.m. common chamber location.
The shallow placed the two end-chamber are necessary in Rightbank Warsaw, nearby the crossing stations..

**1.2.5.3. The metro public utility in the city.**

The important thing is, that all metro stations in the city, and also all MSKM stations, have to have an easy access for inhabitants. The easy access, thanks to a short way from the sidewalk to the underground platform, according to SMKSZ – system: the short arrive – corridor, the short of stairs, escalators, lifts and inclined ways. All this, in order to reach the metro carriage, fast and easy. Necessary is the comfortable entry to the wagon ( carriage ) from the platform. The gap between the floor of the wagon and the platform edge has to be a small one: 15 cm +- 1 cm, as a standard for all metro and metro-similar lines. The indispensable standard, which has been disregarded by "PKP" on all suburban railways till now.
Instead, for tunnel condition breakdown, ought to be organised an escape path for tight shield tunnel of PLM and for the MSKM-I tunnel, which don't keep the railway build-extremity as in existing tunnels under JEROZOLIMSKIE avenue. Hence, arises now a necessity to build the additional security arcade along both tunnels. The new underground arrangement with the proper, anti fire ventilation system and with the escape gallery.

**1.2.5.4. The metro-line arrangement (M+MSKM+TSB).**

Line's arrangement in "SMKSZ"-system. The metro line DLM in the city, has to be as near the surface as possible, especially under PROMENADA along GRZYBOWSKA and SIEDMIOGRODZKA streets. This DLM ran along "SAS"- axis, have to be preceded by modernisation existing railways into the MSKM II+III line, which help rebuild the MSKM-I line as an economic main idea of the whole "Undertaking", and as a people security idea for existing tunnels in the city.
The obstinacy of town authority concerning the DLM placement, as well as journalist obstinacy, concerning the information bloc, about the placement problems together with the investment priority of existing tunnel rebuilt in JEROZOLIMSKIE avenue, lay down a base of impasse situation for continuing the "The economical Underground in the capital".
The people mass traffic in METRO or in METRO-SIMILAR lines shouldn't be nearby itself, but in the proper distance. The interval between two station on the line, make theoretical: 2 x 350 = 700 m. .For the two lines' distance should be: 2 x 700 m = 1400m. For the town with 2 million inhabitants a distance between two stations make such an optimum distance as a double station distance one for the convenient, evenly for the inhabitant transport service.

**1.2.5.5. The capital's primacy.**

One should care about the capital. It's external appearance, as the Poland's capital and primary town, making a benefit from metro building. Especially along the "Kings Route" from the Castle to square
" PLAC TRZECH KRZYŻY" (and farther to WILANÓW palace), because many of state's and capital's objects are there, i.e. along KRAKOWSKIE PRZEDMIEŚCIE and NOWY ŚWIAT streets. This is a reason to build there new stations: METRO – station „UNIWERSYTET – B.5.",by ŻEROMSKI-square and METRO-SIMILAR station "MUZEUM NARODOWE" on the "JEROZOLIMSKIE avenue' crossing.
The solution of "MUZEUM NARODOWE" station, should have an breaking, crucial meaning for the capital. For it's location in the city centre, for the underground solutions of the both tunnel's construction with new foundation, of the new grade lines ( vertical alignment ) in both tunnels and for the new arrangement of the "Kings Route" .A new arrangement, consisting the change of the existing two way street "NOWY ŚWIAT" in the two one way: "NOWY ŚWIAT" street and one way "KOPERNIKA" street.
It makes a possibility for different traffic organisation we need in summer and winter (see p.6.3.7. and 6.3.10.,as well as "Literature" p.4;5;9;12;17.).

The changes in the underground need the two level of " Muzeum Narodowe" station i.e. the "Switch Hall HDRP" in level "minus one = -1", and the "Platform Hall" in level "minus two = - 2",with new grade line of the MSKM-I line tracks ( See station design p.6.3.7. of the "List of study elaboration").
However the main attention ought to be drawn to the care about the town presence along SAS-axis over DLM line. But later, after the a.m. new traffic artery arrangement And now to rebuild the "PILSUDSKI square" with new special monument for "POLISH FLAG", according to an idea, presented in the letter addressed to the "Architect Association in Polish Republic – SARP (See p. 6.4.4.in the "List of Appeals).

**1.2.5.6. The advantages of the" PROMENAD TOGETHR WITH METRO ", as a new capital's traffic artery in LEFTBANK WARSAW.**

The PROMENADA just over "the METRO –line DLM", along "Grzybowska and Siedmiogrodzka" streets, i.e. in the geometrical middle of Warsaw, creates the most attractive traffic artery and walkway avenue in the capital..
A "walk commerce route" and at the same time a " rapid people mass transport". The traffic artery, which change not only the town appearance, but also the liking of inhabitants. It appear an satisfaction from living in the big town with an extraordinary, ecological life standard, very popular in Europe, but underestimated in Warsaw till now. The traffic artery on east – west direction, which change the city appearance from PLAC ŻELAZNEJ BRAMY till a new PŁOCKA - WAWELSKA avenue on the north – south direction N – S. This "PROMENADA + METRO route", open a new opportunity of commerce and town transport. It release the traffic extension on the WUZET route, i.e. on the too narrow route with it's :bridge, viaduct, and "WUZET- tunnel, under the Castle Square". There is an incorrect common: pedestrian traffic, wheel traffic and tram traffic together.
Furthermore it brings in the future the possibility to build a new road crossing over the Vistula river CPD (the central, capital route for river local crossing), and it's roads and tunnels connections to the MARSZAŁKOWSKA street, along the ŚWIĘTOKRZYSKA and KRÓLEWSKA streets.
Instead, the new walk-commerce enterprises along "PROMENADA+METRO" artery, increase it's turnover in comparison with another objects beyond such an arrangement.

**1.2.5.7. The crossing station.**

The crossing station of the both metro lines PLM and DLM ,it means "OŚ SASKA" on the PLM and „MARSZAŁKOWSKA" on the DLM (the crossing station in short: A.14.bis \ B.6) ,under the square "PLAC ŻELAZNEJ BRAMY, change not only a bad planned run the whole "DLM-line" in the city, but also the crossing station itself. The dangerous enlargement of a planed south head of the existing station "ŚWIĘTOKRZYSKA – A.14." with a new "west head "under existing tunnels PLM , and under the very active street crossing, is highly irrational.
Instead, the crossing station on the "SAS"- axis, resolves the problems economically, correctly and in a pro-exploitation-way as a difficult object. The many level underground object, which thanks the shallow location of "DLM – tunnels" and "SMKSZ-system" give a possibility to build stations without stopping metro trains in "PLM –tunnels" during the whole building times of this main object. Building in a way, which remove this main object to empty square" PLAC ŻELAZNEJ BRAMY".(instead of building under the MARSZAŁKOWSKA \ ŚWIĘTOKRZYSKA streets crossing).
Instead , the location of the "UNIWERSYTET-B.5"station, deep under the road snail of "Karowa" street don't change it's picturesque environment those region .The special, skilful mixed method "open ditch – mining", make station execution easy. Easy, thanks to boring the rout tunnel as a separate construction with TBM shield and the platform hall also as a separate construction but with "open ditch method", (see drawing No 91,and p.6.3.6.).
The location of the huge start chamber for horizontal boring, with "bentonit shield" machine type TBM EPBS. The machine use for tunnel driving under the river, under the both valleys, under KAROWA and TOKARZEWSKIEGO streets, under the "SASKI OGRÓD"-garden till the "PLAC ŻELAZNEJ BRAMY square. It means till crossing station "A.14.BIS \ B.6." in "LET BANK WARSAW", but from the assemble, temporary chamber of the station "TARGOWA – B.4" in "RIGHTBANK WARSAW".. This height economic way of crossing the river gives a key solution for the whole "Undertaking". As well as for the whole capital because DLM – line, preceded by metro-similar lines (theMSKM-I line after the MSKM II+III lines) solve together with PLM – line the people mass transport problem in the town, thanks to the double net of metro lines and thanks to whole lines net (the PLM+MSKM+DLM+TSB lines)in the capital area. It means also for the whole capital because of the costs reduction, thanks to the realisation of the "ECONOMICAL METRO IN WARSAW ".

**1.3.** The capital needs now a lasting will and determination to carry out the whole "Undertaking".
For the effective realisation of the "ECONOMICAL METRO I N WARSAW", indispensable are now a big discount of costs and the lasting determination of the government and the municipality authorities to do this "Undertaking" fast. But do in gradually way and based on a good invest idea (unfortunately as yet it isn't).
An invest task very costly, but in Warsaw especially expensive, regarding unrulyVistula river crossing. There is a special situation which needs a special activity in order to cover the metro building idea with realistic plans. The plan at the same time economic and foresighted. Hence the rule of limit the metro passes under the river and supports the passes over it. It means that the river passes have to be numerous but cheap. Cheap, means the"two- level" bridges, instead of the two " one-level" bridges and the metro limit to the "one line" only. The DLM-line with the rational run: deep, safety under the whole river- bottom but shallow under the surface in height of "WYSOCZYZNA MAZOWIECKA, where is the town centre.

The a.m. activities have to be lead by a professional institution. The many-years metro building shouldn't depend from the town authority, but like in Paris, Vienna or Berlin from the independent mutual company, e.g. three subject share company: the government ,the municipality and the private associations. The company with a rotary leadership and professional advisors. The advisors, that prove with competence of tunnel building in town conditions.

**2..The contemporary obstacles, which slow down this "Undertaking".**

On the Warsaw's area exist lot of the obstacles which have to be removed or overcome, in order to carry out the metro idea fast and cheap. The idea which causes the development of the capital and improves the current traffic conditions. Improve not only on North – South direction, but especially on East - West direction on the basis of existing "First Underground Line – PLM" and on the basis of "SMKSZ-system" ( Urban Traffic Railway System). The system which requires in first – turns modernisation the "Diameter Line PKP", and in second-turns the building of the "Second Underground Line – DLM" however not now, but in most favourable time.

**2.1.** The natural obstacles.

The town at the Vistula river has the leftbank part on the height - "MAZOWIECKA WYŻYNA" - , and rightbank part on the wide after glacial valley. In such a manner appear two cities, considerable remote ( 2 km ) . The two uneven parts and cities. In LEFTBANK WARSAW exist many historic attractive objects, with a representative character. The RIGHTBANK WARSAW does not have these features. The considerable distance between two cities make up an significance , natural obstacle for traffic integration. Regarding a.m. facts the next, new river passes should be numerous but cheap..

**2.2.** The artificial obstacles.

This obstacles divide on existing, expected and even planned.

***** The existing obstacles make many outdated railways and roads objects e.g. the both railway tunnels of "Diameter Line PKP, and the bad integrated together, as well as bad deployed all it stops, under JEROZOLIMSKIE avenue, as a very important object in strict city.

Also the main route TRASA WUZET is already outdated, because it is too narrow for the common traffic "tram + wheel traffic", especially in the tunnel under the Castle Square - PLAC ZAMKOWY. Similarly narrowas the PONIATOWSKIEGO viaduct and bridge with the separated tram track and irremovable historic towers. Hence, the future inevitable building of the new local river-pass "CPD" ( River Crossing Central Route ) along ŚWIĘTOKRZYSKA axis.

Instead, the existing irremovable, railway double-tunnel with the international tracks for long distance trains and with the local tracks for suburban trains i.e. the north-tunnel and the south tunnel of "Diameter Line PKP", need a sweeping change.

In addition exist by this "Line", the two other objects which need to be removed, or to be rebuilt: the blindly ending station WKD –WARSZAWSKA KOLEJ DOJAZDOWA, and the negligent halting place the end station WOLA on the girdle railway OBWODICA GDAŃSKA, also blindly ending.

* The unexpected obstacle for the metro, which occur lately, is the railway station "WARSZAWA GDAŃSKA – PKP", where the railway authority refused the project of a "Complex Switch Stations" and now the passengers of the suburban railway and town facilities (trams and buses passengers) don't have safety connection to the metro station A.17.- DWORZEC GDAŃSKI on the PLM line.

It is a long time since the town authorities have neglecting the building of the metro statios "A.12. PIĘKNA, and A.16. MURANÓW" on PLM line. Those mistakes accompany the town's authority during the crossing station bad location (too nearby to the "A.13.CENTRUM –station"). This mistake make till now an obstinacy of town authority with crossing station location .under a ŚWIĘTOKRZYSKA axis, instead of along the OŚ SASKA axis, and under the square PLAC ŻELAZNEJ BRAMY.

The metro crossing station make now the great prestige and propaganda question in Warsaw, instead of an economic one.

The new arrived obstacles will be now the neglected former railway objects in the region "WARSZAWA GDAŃSKA – PKP" (compare "study elaboration p.6.3.5.)

* The biggest obstacle however would be now the remaining in town plans an location of the "Second Underground" under Świętokrzyska street. The location exceptional disadvantageous for town future because with irrational crossing station building idea. Likewise irrational as other objects on this route: in bad place in the plan, or in bad height on the profile, what should refuse this solution since a long time.

To remember once more: the anticipated stations POWIŚLE and PRAGA CENTRUM, deep under river water level, the station NOWY ŚWIAT, situated too deep (for "open ditch method" ) from necessity, being result of track slope and demolition volume on the surface, the crossing station "ŚWIĘTOKRZYSKA \ MARSZAŁKOWSKA "with complicated junction of the two head-chambers under street crossing, cause a traffic chaos on the surface, are those examples.

The part of this stations is in general without any need. For example: an anticipated station "Praga Centrum" on the "bad-DLM-line" can be replaced by JAGILLOŃSKA and STADION stations on the MSKM-I line, an anticipated station "Nowy Świat"- replaced by the"UNIWERSYTET. station", an anticipated crossing station Świętokrzyska \

Marszałkowska - replaced by the "OŚ SASKA \ MARSZAŁKOWSKA", a "rondo –ONZ" - replaced by the "JANA PAWŁA DRUGIEGO station ",a "Dworzec Wileński" replaced by the "TARGOWA station", etc.

What a pity that for " 4 – kilometre long tram-track" in JEROZOLIMSKIE avenue, the town authority didn't take into consideration the "1 – kilometre long tram track segment" over existing railway tunnel foresee to rebuild by "open ditch method" indispensable for "Diameter Tunnel" of lines PKP + MSKM-I . It causes now an additional obstacle and increase of the costs.
All this obstacles being the result of the " as if final", but in reality defective run of the "Second Underground Line". The defective run accepted by the town authority without longitudinal profile analysis.
Instead, the comparative design ( No 94.had been supplied in June 2002, see 6.3.6.).

**3.The location of the railway net and the arrangement of metro and metro-similar lines on the whole capital area in an economical, special, system – SMKSZ ( Urban Traffic Railway System ).**

**3.1.**The existing town railways and it's significance for the whole "Undertaking".
For the system as mentioned above, exist in Warsaw, in a most part negligent now the railways, which fit to be rebuild on the metro-similar lines because they run through the city and at the same time through the main railway stations "DWOREC ZACHODNI, CENTRALNY I WSCHODNI", but the stations on the separate thoroughfare. From south side stick to it the subway with many stops which amount can increase by the 3 additional stops: "CHAŁUBIŃSKIEGO, MUZEUM NARODOWE, JAGIELLOŃSKA and can receive two new branches to the airports OKĘCIE and MODLIN by the new metro-similar lines MSKM-II, suitable extend.
Parallel to the thoroughfare exist the subway with some stations, which amount increase from 6 to 9 as mentioned above. On the "DE GAULL – rondo" can be build the metro-similar station "MUZEUM NARODOWE" along JEROZOLIMSKIE avenue and crossing the "NOWY ŚWIAT street = Kings Route". The new underground station with comfortable HDRP- room ( passenger switch room for trains swaps).
The HDRP rooms are now anticipate for all stops of the "Metro-similar" MSKM-I line, along JEROZOLIMSKIE avenue for the reason to make facilities in train swaps between different lines, as follows:

- ŚRÓDMIEŚCIE -change with metro PLM and metro-similar MSKM-I + tram W-Z
- CHAŁUBIŃSKIEGO –change with metro-similar MSKM-I,tram N-S, tram W-Z, PKP,bus station MZA
- PLAC ZAWISZY –change with MSKM-I, tram N-S,and tram W-Z.
- DWORZEC ZACHODNI –change with MSKM-I , MSKM-II , TSB- airport, Wilanów, Praga,tram N-S, bus station PKS + MZA, WKD- Grodyisk, and EUROPA – bus station.
- MUZEUM NARODOWE change with tram W-Z and lot of bus MZA lines.
- POWIŚLE (over „Wsłostrada + Solec")
- STADION (over " Wybrzeże Szczecńskie „street )
- JAGIELLOŃSKA change with tram N-S, PKS-bus station .
- DWORZEC WSCHODNI, change with tram N-S, tram TSB to AIRPORT , WLANÓW district and PKP..

From the "East Railway Station run on the embankments the tracks in 4 different destinations (GDAŃSK, BIAŁYSTOK, TERESPOL and LUBLIN).
From "West Railway Station run on terrain or in trenches the tracks in 3 different destination (KRAKÓW, SKIERNIEWICE ,SZCZECIN).
On the north border between city and periphery exist the ring railway OBWODNICA GDAŃSKA with the river "bridge by Citadel", which can be connected by MSKM-II line with station DWORZEC ZACHODNI. Connected, by special "collect- tunnel " TUNNEL ZBLOKOWANY" (MSKM-II + Tram + street Płocka-Wawelska + TSB.
Seeing it from the point of view of the metro it is important that the new arrangement of the lines (M+MSKM drawing N0 107 ) has the proper switch equipment ( HDRP ) on crossing with the other lines. Only than there will be an intensive exchange of passengers and the double metro-line (M+ MSKM) will be filled useful and safe. Without colliding switches it will serve the traffic of the whole capital area, all towns district and the important parts of the periphery.
The arrangements, that contribute to basic traffic change in the city through following investments

PRIMO - safety, rational Vistula crossing with tunnels, but let alone very end of the whole "Undertaking" and "SMKSZ – system building, because
SECUNDO - come before existing railway Vistula crossing, on the "Diameter line PKP" axis.
TERTIO - pro-ecological realisation of the new, common artery for METRO with underground traffic and for PROMENAD with pedestrian traffic
QUATRO – many underground halls for passengers separate destination movement ( HDRP ).

However the a.m. arrangement in Warsaw has to be generally maximum economical, but particularly for the Vistula crossing. It means, that on the east-west destination ( W-Z ) a.m. arrangement there need to be two- level bridges instead of one-level bridges, which are about.two times more costly.

The above described lines network, together with "METRO SECOND LINE" transfer from "Świętokrzyska" street to "SAS – axis", lead to a considerable costs reduce, in spite of works widen on the whole town area. Costs reduce by half and building-time period by decade.
Achieve reduction in the maximal way, by using the existing town railway lines for the MSKM lines. As well as set aside, the "DLM- line" building.
Similar reduction ( by half ) succeeds after the whole "Undertaken" is finished, when complete length of the MSKM lines will be 75 km, according to the "SMKSZ – system".

**3.2. The transition stage of the "Undertaken"**

This is the period of time from beginning the modernisation of existing railway lines into MSKM – lines, till the end of suburban line reconstruction, according to "SMKSZ – system".
In "Rightbank Warsaw" anticipate for this time period a zero volume of tunnel building for metro, but maximal volume for metro- similar lines. The lines with stations inside existing embankments.
In "Leftbank Warsaw instead, anticipate a minimum volume of tunnel build (for PLM), but also a maximum volume for MSKM- lines, especially along JEROZOLIMSKIE avenue. But here, after previous` modernisation existing circular railway "Gdańska + Praska" into MSKM-II (it's middle part), and MSKM – III, which involve a new bridge on the old pillars, along existing "Railway bridge by citadel".
Generally then ,one should limit now tunnel buildings and try to build some new two – level bridges with MSKM -IV line ( North bridge) + wheeled traffic, or TSB – tram line (South bridge) + wheeled traffic.
Separate, but very effective question will be the arrangements to construct the crossing station of both lines PLM+DLM on the PLAC ŻELAZNEJ BRAMY square. The delay of the DLM-line construction by 10 years let now to intensify the reconstruction of the neglected main construction of unit tunnels under JEROZOLIMSKIE avenue, and modernise the whole "Diameter Line PKP" . The modernisation, which between other things, gives guarantee for a prompt end for EURO -2012 new station "STADION" building, because it will be connected with the modernisation of existing lines over the river and not with build ing new tunnel under the river for the doubtful DLM.

**3.3. The final stage of the "Undertaking"**

It will be the building period of the "Second metro line –DLM" under Vistula river, along "SAS –axis ", as well as extension the MSKM-II line to the airports OKĘCIE and MODLIN.
Furthermore, in this period of time succeed the accomplishment of the crossing station ( A.14.bis\ B.6) and city modernisation , that is "MARSZAŁKOWSKA street" rebuilding by tram liquidation, and by building the neglected metro station "A.12.- PIĘKNA" and "A.16.MURANÓW". Next should be to modernise the "WUZET-route" by tram liquidation on the ŚLĄSKO—DĄBROWSKI bridge and in the WUZET-tunnel as well as along whole "Marshall street's string" from MICKIEWICZA till BATOREGO transverse streets.

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**4. The program of activity, based on the "SMKSZ – system"(Urban Traffic Railway system).**

The route of the "Second Metro Line – DLM" under Vistula river has to be anticipate economic and rational as far as possible. Anticipated rational not only in the plan , but especially in the profile, because of the unruliness river bottom, but also tunnel building method for metro stations in the city and in the near of the river. The station amount should be therefore limited – only 3 stations instead of 6 – in order to keep the station building idea by "open ditch method", regarding costs reduction. Before the longitudinal profile tunnel is to be fixed, the minimum depth between river bottom and tunnel key is to be establish.. But some other things to be establish too. E.g. scarp position, taking in consideration unstable soil conditions position, for the "UNIWERSYTET – station" location and not under, but over the existing tunnels of PLM-line in the crossing station location.
Also before longitudinal profile has to be made a decision about "DLM – line change of route" instead of " bad route under ŚWIĘTOKRZSKA street" into "SAS – axis "optimal route. The route closer to ŚLĄSKO – DĄBROWSKI bridge, closer to Old Town, and straight out under "GRZYBOWSKA-SIEDMIOGRODZKA" route of PROMENAD. All this for the reason to be in optimal distance to transport efficient MSKM-I line, and for the idea to postpone the DLM-line realisation by a minimum of 10 years.
In the Rightbank of Warsaw the change of " DLM-line route" under SOLIDARNOŚCI avenue,(instead of river harbour PORT PRASKI ) would radically reduce the costs after it's shorten to KONDRATOWICZA street, and thanks to use of existing railway track and embankments to MSKM objects ( mainly it's stations location).
Instead, already now one has to transfer the traders from the "EUROPA JARMARK" in the stadion "DZIESIĘCIOLECIA"on the new terrain "STARE BRÓDNO", nearby east end of the "DLM-line" so, to make building the "Stadion Narodowy" possible and it's metro-similar new station STADION, too.

The invest –program of the "ECONOMICAL METRO IN WARSAW" should be in the capital as follows:
* First of all MSKM-II + MSKM-III, in order to modernise whole MSKM-I line, this is among other things stations: MUZEEUM NARRODOWE, STADION and JAGIELLOŃSKA, and also crossing station "PLM \ DLM" on the square "PLAC ŻELAZNEJ BRAMY".
* Thereafter, the "Second Metro Line –DLM", but first of all from the west-end till the crossing station of both lines "PLM \ DLM " under the temporary end of the "PROMENAD" along "Grzybowska + Siedmiogrodzka streets.
* The crossing station under the square PLAC ŻELAZNEJ BRAMY.

Following, after the 10 years break, the east part of DLM-line from station "SZWEDZKA" till "KONDRATOWICZA" street.
Just after that building one after another the both tunnels from special, common chamber of "TARGOWA" station. Both tunnels have to be bore from a.m. common chamber against the fall, till separate dismantle chamber placed in garden "OGRÓD SASKI", nearby crossing station, eastward from PLM - line.
Build under the river, but precede with the stations "A.12 PIĘKNA" and "A.16.MURANÓW" during city modernisation. The "Marshall street" modernisation throughout tram-bottom liquidation, especially along ''BULWAR WARSZAWSKI" instead of existing PLAC DEFILAD parking.
* The above mentioned arrangements should be in future a model for other big towns in Poland , generally regarding to use existing railway lines for the town traffic modernisation and an example for river crossing in KRAKÓW and GDAŃSK under Vistula, or under Odra river in WROCŁAW and SZCZECIN.

**5.The conclusions.**

**5.1.The general conclusion.**

The life of motorised people and citizen without a car , in big town agglomeration became a world wide problem, regarding the ecology. In this regard both communities should receive the suitable urban lasting arrangements. The arrangement, which separate both communities and propose the advantages for both sides. But also the law and duty, chiefly in regard to the urban traffic by the suitable solutions, as a "scheme of ABC arrangement" for agglomeration. The solution, which limit urban collisions on squares, streets and walkways during the mutual use by cars and by pedestrians.

**A.)**The fasten of the a.m. idea in the constitution

The urban facilities for travel in the agglomeration occur in the world as a controversy, difficulties-solved problem, as a result of violent evolution of the motorised life in XX century. An uncontrollable motorised life till now, which constrained on the majority citizens without a car – at least 2\3 inhabitants of every metropolis – the giant allowances. The inadmissible allowances but truly exist. For example the walkways are taken by cars parking, the promenades are taken for the monstrous overpasses and the air in the city is changed in smog with continuos rumble of cars in it. The allowances by a poor reaction from the town authorities as a rule, and by underestimating that phenomenon in e.g. European Constitution from the side of democracy states, in spite of it concern the majority of each society. This majority would be still harm without suitable care in Constitution.

**B.)** The coexistence of the metro and the motorised life in the city.

The problem of this coexistence is the current need of each metropolis. Therefore it should have a durable and rationale solution based on the needs, liking and mentality of the inhabitants. Each man experiences the motorised life in an different way, depending of sex, age, and the culture which brought him up. However, occur also the some mutual features: the desire of rest and the necessity of sleep in silence and safety, but also the next day desire of action. The motorised life can't offer this. Instead the big towns offer all this, and give out to the inhabitants, but unevenly. They offer more to the already motorised inhabitants than to the ones who are less motorised, which to be seen day by day in the city centres, with overflow of cars, e.g. in excessive motorised America Boston or Asia Tokyo. Instead in Europe practise are from years the "pedestrian zone", mainly in historic city centres. And there, it is really different. There, the city centre belong to the pedestrians, because there is no entry for vehicular traffic. That's just what we need: the pedestrian zone which should be a basic idea for contemporary space town zoning for metropolis: planning the closely joined themselves metro and promenade.

**C.)** Visual effectiveness of the city centre..

The contemporary city should offer for inhabitants the attractive, ecological arteries with effect architecture on the PROMENAD surface and simultaneously, but in underground, an efficient arrival or departure by METRO on the route "periphery – centre" or reverse . In addition some underground spaces for parking, but under the surface too.

**5.2. The capital's conclusion.**

In the capital of Poland, the problem of continuing the building of the metro doesn't look profitable, but just now there is the chance to repair former neglects and planning faults. The repairs with still the same way: maximal use of the existing railway and the "SMKSZ- system". The system which is based on many studied works and elaborations. The elaborations transmits gradually during 10 years to the Office of President of Warsaw Capital ,in many works, appendix, appeals and now in this typed edition titled "Economical METRO IN WARSAW".
In Warsaw a fast modernisation of the town transport is necessary, especially on the east-west direction.
The actions on this parallel directions "W-Z" would be much more difficult then on the up to now direction "N-S", which is proved above. In this regard all actions on this directions should be taken with
greater determination then we can see our selves now as witnesses. But they have to be realistic, so by the maximal taken advantage of those, witch exist in the town and be fit to adaptation or modernisation, but at the same time should respect the capital's development to assure already now an "primacy" for the town. The historic primacy on the square PLAC MARSZAŁKA JÓZEFA PIŁSUDSKIEGO and along the "Kings Route"-DROGA KRÓLEWSKA". As well as contemporary primacy on the modernised all MARSZAŁKOWSKIE streets , without the tram rail track in Leftbank

Warsaw over PLM line, without the tram rail track in Rightbank Warsaw along SOLIDARNOŚCI avenue, but with the new metro-similar tram along TYSIĄCLECIA avenue ( TSB-tram on the PTK-route).

**5.3 The Warsaw's conclusion.**

The metro building continuation in Warsaw founded now an impasse situation as a result of false investment idea and an unrealistic plan .In the first place it is necessary to modernise the existing suburban railway, along JEROZOLIMSKIE avenue retaining the tunnels of that place, but after the supplement of it's main construction. The rebuilding should embrace all the stops along JEROZOLIMSKIE avenue. An relatively easy rebuilding, which give the valuable visual and transport effects for Warsaw's inhabitants.

Instead the "Second Underground" under ŚWIĘTOKRZYSKA" street has to change the route on to the optimal route along "SAS-axis".

The priority of rebuilding the JEROZOLIMSKIE avenue and tunnels, before building the new "DLM – line" is to be a consequence of necessity to ensure the safety for people in the underground. But arise also from "EURO- 2012".

Current impasse situation need then in Warsaw the new railway objects subordinate to become to the metro or metro-similar needs and in this way could better serve to the society.

The changes being result of a.m. postulate, can now be systematicly brought in, by the new town authority, but for all the time it should be lead by an independent, professional joint-stock company with advisors from Polytechnic in Warsaw and AGH in KRAKÓW. It can be e.g. the THREE-PILLAR COMPANY (state-council-private).

Civil Engineer Casimir Hantz
(former project manager of the "Second Metro Line" in Warsaw)

Civil Engineer George Blancard
(former designer of several stations of the "First Metro Line" in Warsaw.)

Warsaw, September 2007.

**6.** The enclosures ( drawings, schemes, and lists).
**6.1.** The map of METRO and METRO-SIMILAR lines, TRAM lines, as well as METRO-SIMILAR-TRAM lines. Drawing No 107 (in two languages).
**6.2** The scheme of metro lines arrangement; version:

* Polish, drawing No 108
* English, drawing No 109

NUMERACJA RYSUNKÓW - NUMBERING OF DRAWINGS

| | | | | |
|---|---|---|---|---|
| **1.** | Mapa linii | The map of lines | 107 | |
| **2.** | Układ docelowy linii do 2017. roku | The final arrangement of lines till 2017. | 108 | 109 |
| **3.** | Układ przejściowy do 2012. roku | The transversal arrangement till 2012. | 110 | 111 |
| **4.** | Układ porównawczy lokalizacji | The comparison of lines location. | 112 | 113 |

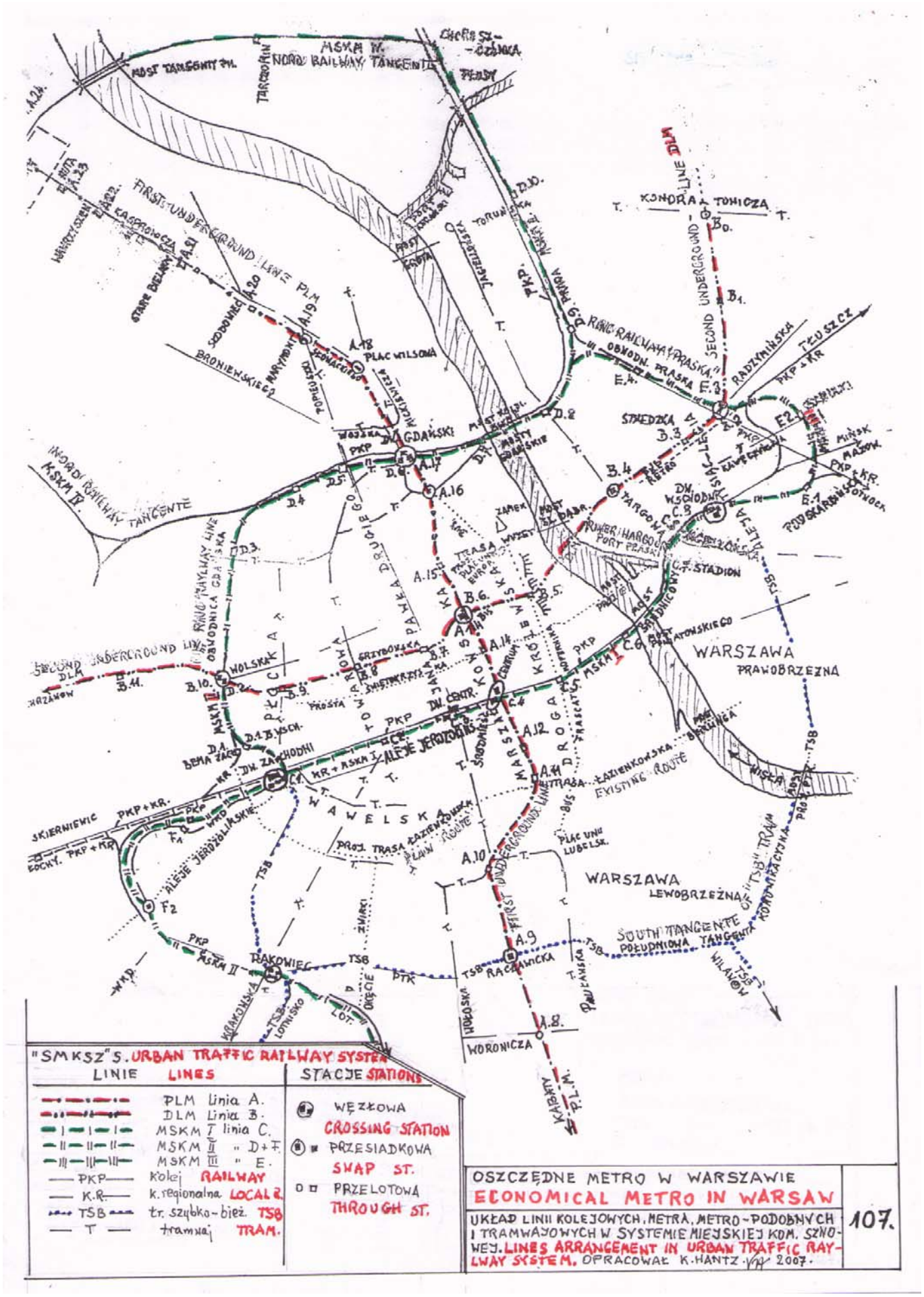
**6.3.**The list of study works titled "Over the priority for Warsaw as the capital".
**6.3.1.** "Where to be build the crossing station of both metro lines PLM \ DLM (switch station) complex and how the whole "Second Underground Line". should look like. Edition from AGH ( Mining – Metallurgy - Academy) "Underground '98 ".
**6.3.2.** The basis study work, titled "Over priority for Warsaw's traffic transport and metro solutions", together with CPD (River's pass with center road crossing ). Edition from November 1999.
**6.3.3.** The appendix No1.The METRO-SIMILAR TRAM on the South Traffic Tangent – PTK as a basis to the study work . Edition from May 2000.
**6.3.4**. The appendix No 2. The switch stations complex DWORZEC GDAŃSKI. Edition from September 2000.
**6.3.5.**The appendix No 3 The METRO – SIMILAR Railway Line = MSKM; TARCHOMIN – DWORZEC GDAŃSKI – OKĘCIE. Edition from January 2002.
**6.3.6.** The postulates and ideo-gramm, concerning the station DWORZEC WILEŃSKI and river Vistula crossing with metro tunnels. Edition from July 2002.
**6.3.7.** The appendix No 4: "METRO- SIMILAR – line MSKM-I of Warsaw on the left and on the right side ,by the rebuild existing lines under JEROZOLIMSKIE avenue, together with the rebuild of both tunnels and building a new station MUZEUM NARODOWE on the suburban line. Edition from February 2003.
**6.3.8.** The abbreviate version of the appendix No.4. Edition from July 2003.
**6.3.9**. The appendix No 5. " The thrifty METRO line, and METRO-SIMILAR lines in the North Districts of Warsaw. Edition from 2004.

**6.4.**The list of Appeals under the repetitive title : "The Appeal to institutions, which are or should be more interested in a real effection of the "Undertaking METRO IN WARSAW".
**6.4.1.**The Appeals 1-5. The collection of appeals to different institutions of the capital. The appeals in the order to accelerate the metro building in Warsaw according to a.m. way (in Appendix and in Appeals ).
Especially according to the Appeal N0 6 and Appeal N0 7,concerning existing tunnels under JEROZOLIMSKIE avenue, and concerning DLM location along "SAS – axis", instead of "Świętokrzyska" street.
**6.4.2.** The Appeal No 6.
The appeal for existing tunnels under JEROZOLIMSKIE avenue. During the integration – works of the pre-war North-tunnel with the .after-war South-tunnel let to weaken the main construction of the both tunnels, i.e. foundations of the retaining walls and walls itself.
This appeal carries the idea of the repair and reinforce of the both tunnels construction: bottom foundations and strained walls strengthened. As well as the place arrangement, for indispensable urban new objects i.e. KOPERNIKA – FRASCATI street and walk- way passage , but also for the underground railway clearance along both tunnels – if necessary. Edition from May \ August 2005 .

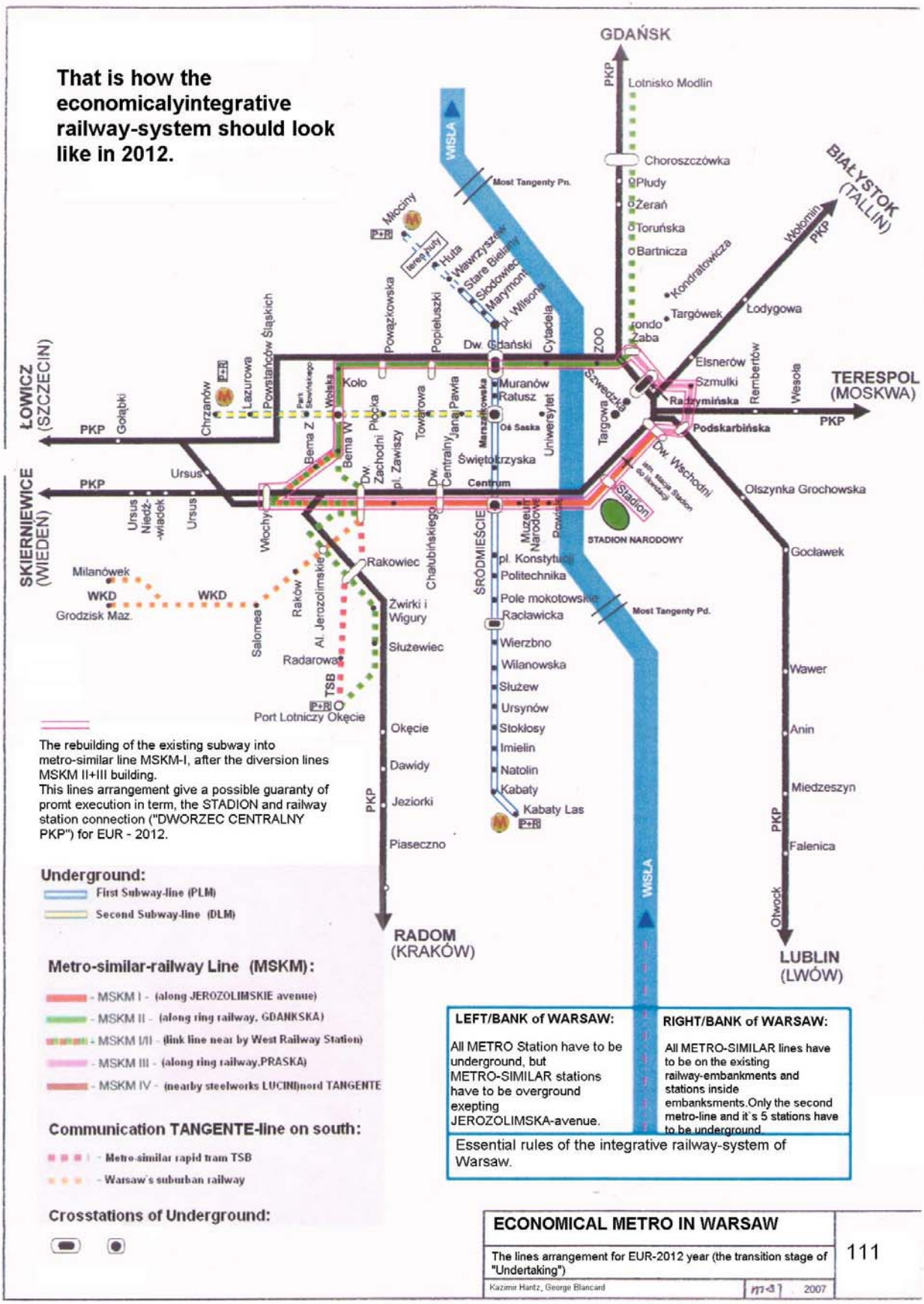
**6.4.3.** The Appeal No 7.
It is an appeal for additional security arrangements for both existing tunnels. The arrangeme0nts, which will ensure the security for passengers and the renovation possibility for installations :the escape path and the gallery .
In this regard appears now the necessity of main underground objects sequence execution, at first MSKM-I line after that, DLM line. Edition from April \ May 2006 .
**6.4.4.** The Appeal No 8.
The appeal to state and capital authorities and to society of "Architect Association of Polish Republic SARP", concerning the ".MARSCHALL PIŁSUDSKI square". The appeal which calls on to use the "DLM- metro line", for an attractive arrangement of the "Polish Flag" there. The letter with the details, one sent off to "SARP": 26.10.05.
**6.4.5.** The Appeals in form of "Open Letter" to the press and the capital authority for supporting the town traffic facilities between the railway station and STADION NARODOWY for "EURO – 2012". The Appeals dated June 2007.

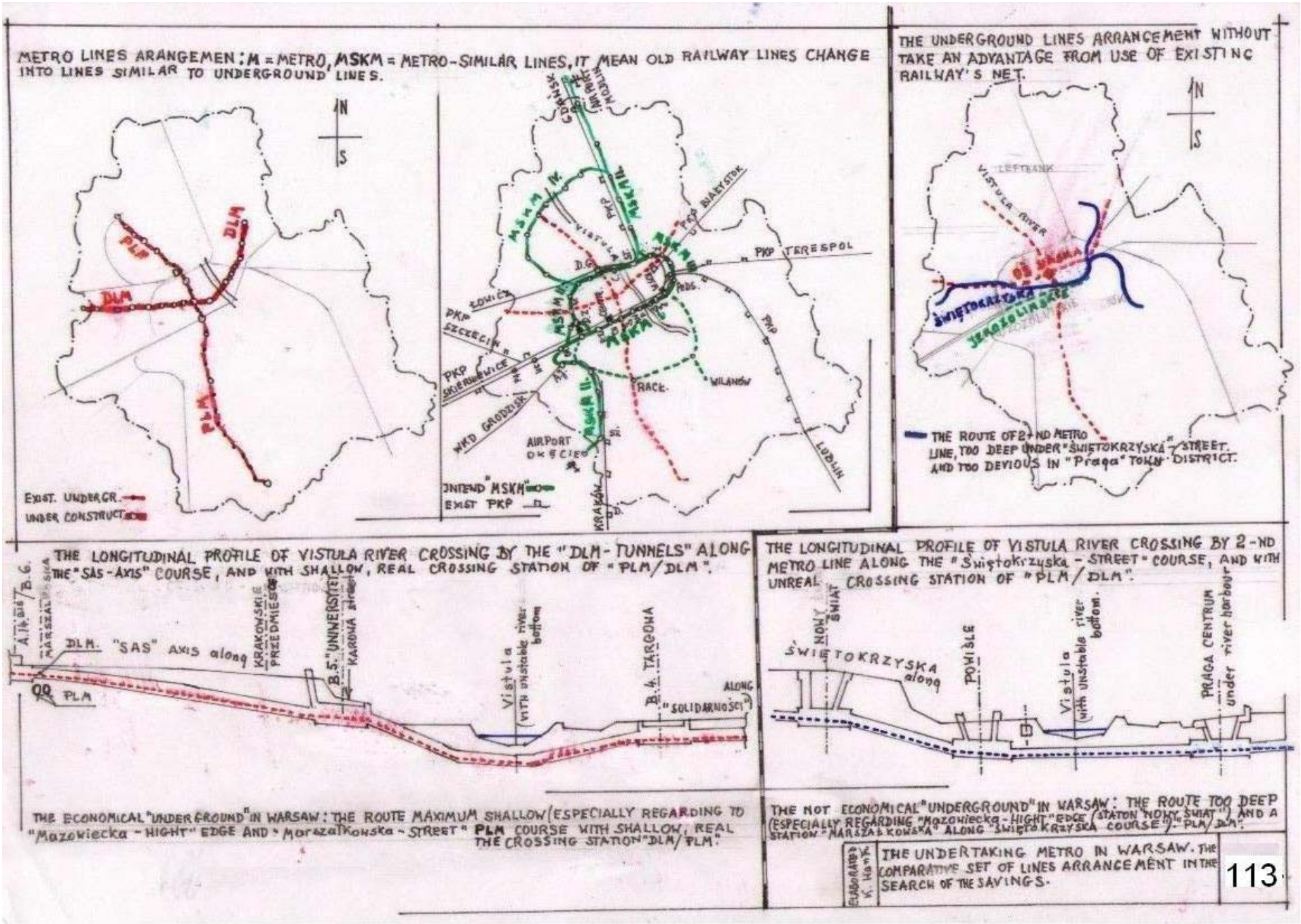
**6.5.** The explanation to both lists (i.e. concerning "study works" and "appeals")
**6.5.1.** The enclosure "study works" (6.3.) includes works, which concern key objects for urban traffic facilities in Warsaw. Such an object is "Diameter Line PKP", and especially it's tunnels under JEROZOLIMSKIE avenue: North Tunnel for long distance trains and South tunnel for suburban trains.
Now the Second Underground Line location is also a key problem in Warsaw anticipate unreasonable line under ŚWIĘTOKRZYSKA street, nearby the suburban railway, instead of reasonable one along "SAS – axis". The key problem being the result of mutual dependent of this both lines, as the two main lines ( M+MSKM ) on east – west direction, see drawing N0 111 \ 112.
The engineering solutions with the metro DLM-line along "SAS – axis" are being refused by the town athority for many years. Refused as an controversy, though it is an idea from communist times. And is improper for contemporary times and citizens. The town authorities unfortunately impose itself now insufficient repairs in existing tunnels under JEROZOLIMSKIE avenue. Unfortunately, by negligence of passenger safety in case of a fire, or a terror attack.
**6.5.2.** The enclosure "appeals" ( 6.4.)includes the appeals being the result of town authority obstinacy. Town authority, which refused many calls of METRO proper realization IN THE CITY. According to "The appeal to the institutions, which are or should be more interested in a real realization of the "Undertaking METRO in WARSAW". Instead, they try to hide the problem and try to force their own plans in a monopolistic way.
**6.5.3.** Now the authors of this "computer work" hope for the change of the situation and will build in Poland the "Economical METRO IN WARSAW " faster, cheaper and better. Especially this part of the "Undertaking" is the needed for people's security in the underground rooms (see Literature p. 21) and is indispensable for the "Euro-2012" ( PKP connection with STADION NARODOWY by MSKM-I line).
**6.5.4.** In order to help the changes and the new idea understanding, one enclose the comparative arrangement for the metro line in Warsaw, in Polish and English languages, drawings No 112 and 113.

**6.6** The comparison of economical and uneconomical arrangement of metro lines location ( M + MSKM) of the whole undertaking (in polish and english language) for final 2017 and transversal 2012 times.


MSKM W.
NORD RAILWAY TANGENTE
MOST TANGENTY PN.
TARCHOMIN
CHORZ SZ-CZYNKA
FIRST UNDERGROUND LINE PLM
KASPRZAKA
STARE BIELANY
SZDOWIEC
A.20
A.19
A.18
PLAC WILSONA
BRONIEWSKIEGO
MARYMONT
MOCZYDLISZCZA
POTOCKA
TORUNSKA
PKP
TARGOWEK
MOST GDAŃSKI
GDAŃSKI
A.17
A.16
D.1
D.2
D.3
D.4
D.5
D.6
D.7
D.8
D.9
D.10
D.11
RING RAILWAY TANGENTE
KSKM IV
SECOND UNDERGROUND LINE DLM
OBWODNICA GDAŃSKA
WOLSKA
B.10.
B.11.
GRZYBOWSKA
B.8
B.7
B.6.
A.15
A.14
A.13
A.12
A.11
A.10
A.9
A.8.
TRASA PLAC EUROPY
TRASA WYBRZEŻE
ZAMEK
MOST SOBIESKIEGO
MOST ŚLĄSKO-DĄBR.
PORT PRASKI
STADION
WARSZAWA PRAWOBRZEŻNA
WARSZAWA LEWOBRZEŻNA
MOST ŚWIĘTOKRZYSKI
MOST POŁ.
MOST ŁAZIENKOWSKI
MOST GRUNWALDZKI
MOST ŻOLIBORSKI
MOST BEMA
MOST ŚLĄSKO-DĄBR.
MOST ŚLĄSKI
MOST ŚLĄSKO-DĄBR.
MOST ŚLĄSKO-DĄBR.
MOST ŚLĄSKO-DĄBR.


That is how the economicalyintegrative railway-system should look like in 2017.
GDAŃSK
PKP
Lotnisko Modlin
Tarchomin
Choroszczówka
Płudy
Żerań
Toruńska
Bartnicza
BIAŁYSTOK (TALIN)
Wołomin
PKP
Kondratowicza
Targówek
Lodygowa
Radzyminska
rondo Żaba
Elsnerów
Radzyminska
Szmulki
Rembertów
Wesoła
TERESPOL (MOSKWA)
PKP
Podskarbinska
Most Tangenty Pn.
P+R
Młociny
ŁOMIANKI
Huta
Wawrzyszew
Stare Bielany
Słodowiec
Marymont
pl. Wilsona
Cytadela
ZOO
Dw. Gdański
Powązkowska
Popiełuszki
CHOMICZÓWKA
Koło
Muranów
Ratusz
Os Saska
Marszałkowska
Uniwersytet
Targowa
Szczęśliwicka
Dr. Królowej
Jagiellońska
Stadion
Olszynka Grochowska
Goławek
Wawer
Anin
Miedzeszyn
Falenica
Otwock
LUBLIN (LWÓW)
ŁOWICZ (SZCZECIN)
PKP
Gołąbki
Chrzanów
P+R
Lazurowa
Powstańców Śląskich
Park Sowinski
Wolska
Bema Z
Bema W
Dw. Zachodni
Pl. Zawiszy
Towarowa
Jana Pawła
Dw. Centralny
Świętokrzyska
Centrum
Muzeum Narodowe
Powiśle
ŚRÓDMIEŚCIE
pl. Konstytucji
Politechnika
Pole mokotowskie
Racławicka
Most Tangenty Pd.
Wierzbno
Wilanowska
Służew
Ursynów
Stokłosy
Imielin
Natolin
Kabaty
Kabaty Las
Wilanów
TSB
SKIERNIEWICE (WIEDEŃ)
PKP
Ursus
Ursus Niedź-wiadek
Włochy
Milanówek
WKD
Grodzisk Maz
Salomea
Raków
Al. Jerozolimskie
Rakowiec
Chałubińskiego
Zwirki i Wigury
Służewiec
Radarowa
P+R
Port Lotniczy Okęcie
Okęcie
Dawidy
Jeziorki
Piaseczno
PKP
RADOM (KRAKÓW)
Underground:
First Subway-line (PLM)
Second Subway-line (DLM)
Metro-similar-railway Line (MSKM):
- MSKM I - (along JEROZOLIMSKIE avenue)
- MSKM II - (along ring railway, GDANSKA)
- MSKM I/II - (link line near by West Railway Station)
- MSKM III - (along ring railway,PRASKA)
- MSKM IV - (nearby steelworks LUCINInord TANGENTE
Communication TANGENTE-line on south:
- Metro-similar rapid tram TSB
- Warsaw's suburban railway
Crosstations of Underground:
LEFT/BANK of WARSAW:
All METRO Station have to be underground, but METRO-SIMILAR stations have to be overground exepting JEROZOLIMSKA-avenue.
RIGHT/BANK of WARSAW:
All METRO-SIMILAR lines have to be on the existing railway-embankments and stations inside embanksments.Only the second metro-line and it`s 5 stations have to be underground.
Essential rules of the integrative railway-system of Warsaw.
ECONOMICAL METRO IN WARSAW
The lines arrangement for 2017 year (the final stage of "Undertaking")
Kazimir Hantz, George Blancard
2007
109


That is how the economicalyintegrative railway-system should look like in 2012.
GDAŃSK
PKP
Lotnisko Modlin
Choroszczówka
Płudy
Żerań
Toruńska
Bartnicza
Kondratowicza
Wołomin
PKP
BIAŁYSTOK (TALLIN)
Łodygowa
Targówek
Rembertów
Wesoła
TERESPOL (MOSKWA)
PKP
Podskarbińska
Dw. Wschodni
Olszynka Grochowska
Gocławek
Wawer
Anin
Miedzeszyn
Falenica
PKP
Otwock
LUBLIN (LWÓW)
WISŁA
Most Tangenty Pn.
Most Tangenty Pd.
Młociny
P+R
Huta
Wawrzyszew
Stare Bielany
Słodowiec
Marymont
pl. Wilsona
Cytadela
ZOO
Dw. Gdański
Powązkowska
Popiełuszki
Szwedzka
Targowa
Radzymińska
Elsnerów
Szmulki
Muranów
Ratusz
Marszałkowska
Oś Saska
Uniwersytet
Jana Pawła
Towarowa
Centralny
Świętokrzyska
Dw. Zachodni
pl. Zawiszy
Dw. Centralny
Centrum
Stadion
STADION NARODOWY
Muzeum Narodowe
ŚRÓDMIEŚCIE
pl. Konstytucji
Politechnika
Pole mokotowskie
Racławicka
Wierzbno
Wilanowska
Służew
Ursynów
Stokłosy
Imielin
Natolin
Kabaty
Kabaty Las
Rakowiec
Chałubińskiego
Żwirki i Wigury
Służewiec
Okęcie
Dawidy
Jeziorki
Piaseczno
RADOM (KRAKÓW)
Chrzanów
Lazurowa
Powstańców Śląskich
Koło
Wolska
Bema W
Bema Z
Płocka
Dw. Zachodni
Włochy
ŁOWICZ (SZCZECIN)
PKP
Gołąbki
Ursus
Ursus Niedź-wiadek
Ursus
SKIERNIEWICE (WIEDEŃ)
Milanówek
WKD
Grodzisk Maz.
Salomea
Raków
Al. Jerozolimskie
Radarowa
TSB
Port Lotniczy Okęcie
The rebuilding of the existing subway into metro-similar line MSKM-I, after the diversion lines MSKM II+III building.
This lines arrangement give a possible guaranty of promt execution in term, the STADION and railway station connection ("DWORZEC CENTRALNY PKP") for EUR - 2012.
Underground:
First Subway-line (PLM)
Second Subway-line (DLM)
Metro-similar-railway Line (MSKM):
- MSKM I - (along JEROZOLIMSKIE avenue)
- MSKM II - (along ring railway, GDANSKA)
- MSKM I/II - (link line near by West Railway Station)
- MSKM III - (along ring railway,PRASKA)
- MSKM IV - (nearby steelworks LUCIN)nord TANGENTE
Communication TANGENTE-line on south:
- Metro-similar rapid tram TSB
- Warsaw's suburban railway
Crosstations of Underground:
LEFT/BANK of WARSAW:
All METRO Station have to be underground, but METRO-SIMILAR stations have to be overground exepting JEROZOLIMSKA-avenue.
RIGHT/BANK of WARSAW:
All METRO-SIMILAR lines have to be on the existing railway-embankments and stations inside embanksments.Only the second metro-line and it`s 5 stations have to be underground.
Essential rules of the integrative railway-system of Warsaw.
ECONOMICAL METRO IN WARSAW
The lines arrangement for EUR-2012 year (the transition stage of "Undertaking")
Kazimir Hantz, George Blancard
2007
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METRO LINES ARANGEMEN: M = METRO, MSKM = METRO-SIMILAR LINES, IT MEAN OLD RAILWAY LINES CHANGE INTO LINES SIMILAR TO UNDERGROUND LINES.
N
S
PLM
DLM
EXIST. UNDERGR.
UNDER CONSTRUCT.
INTEND "MSKM"
EXIST PKP
PKP TERESPOL
PKP BIAŁYSTOK
PKP GDAŃSK
PKP SZCZECIN
PKP SKIERNIEWICE
WKD GRODZISK
AIRPORT OKĘCIE
WILANÓW
RACK.
KRAKÓW
LUBLIN
THE UNDERGROUND LINES ARRANGEMENT WITHOUT TAKE AN ADVANTAGE FROM USE OF EXISTING RAILWAY'S NET.
VISTULA RIVER
LEFTBANK
ŚWIĘTOKRZYSKA
JERAZOLIMSKIE
THE ROUTE OF 2-ND METRO LINE, TOO DEEP UNDER "ŚWIĘTOKRZYSKA" STREET. AND TOO DEVIOUS IN "Praga" TOWN DISTRICT.
THE LONGITUDINAL PROFILE OF VISTULA RIVER CROSSING BY THE "DLM-TUNNELS" ALONG THE "SAS-AXIS" COURSE, AND WITH SHALLOW, REAL CROSSING STATION OF "PLM/DLM".
A.14.
B.6.
MARSZAŁKOWSKA
DLM. "SAS" AXIS along
KRAKOWSKIE PRZEDMIEŚCIE
B.5. "UNIVERSITET"
KAROWA street
Vistula (with unstable river bottom)
B.4. TARGOWA
ALONG "SOLIDARNOŚCI"
PLM
THE ECONOMICAL "UNDERGROUND" IN WARSAW: THE ROUTE MAXIMUM SHALLOW (ESPECIALLY REGARDING TO "Mazowiecka - HIGHT" EDGE AND "MarszałKowska - STREET" PLM COURSE WITH SHALLOW, REAL THE CROSSING STATION "DLM/PLM".
THE LONGITUDINAL PROFILE OF VISTULA RIVER CROSSING BY 2-ND METRO LINE ALONG THE "Świętokrzyska - STREET" COURSE, AND WITH UNREAL CROSSING STATION OF "PLM/DLM".
NOWY ŚWIAT
ŚWIĘTOKRZYSKA along
POWIŚLE
Vistula (with unstable river bottom)
PRAGA CENTRUM
under river harbour
THE NOT ECONOMICAL "UNDERGROUND" IN WARSAW: THE ROUTE TOO DEEP (ESPECIALLY REGARDING "Mazowiecka - HIGHT" EDGE (STATON "NOWY ŚWIAT") AND A STATION "MARSZAŁKOWSKA" ALONG "ŚWIĘTOKRZYSKA COURSE") - PLM/DLM".
ELABORATED K. Ho'W.
THE UNDERTAKING METRO IN WARSAW. THE COMPARATIVE SET OF LINES ARRANGEMENT IN THE SEARCH OF THE SAVINGS.
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**6.7**.Literature ( Bibliography) .

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