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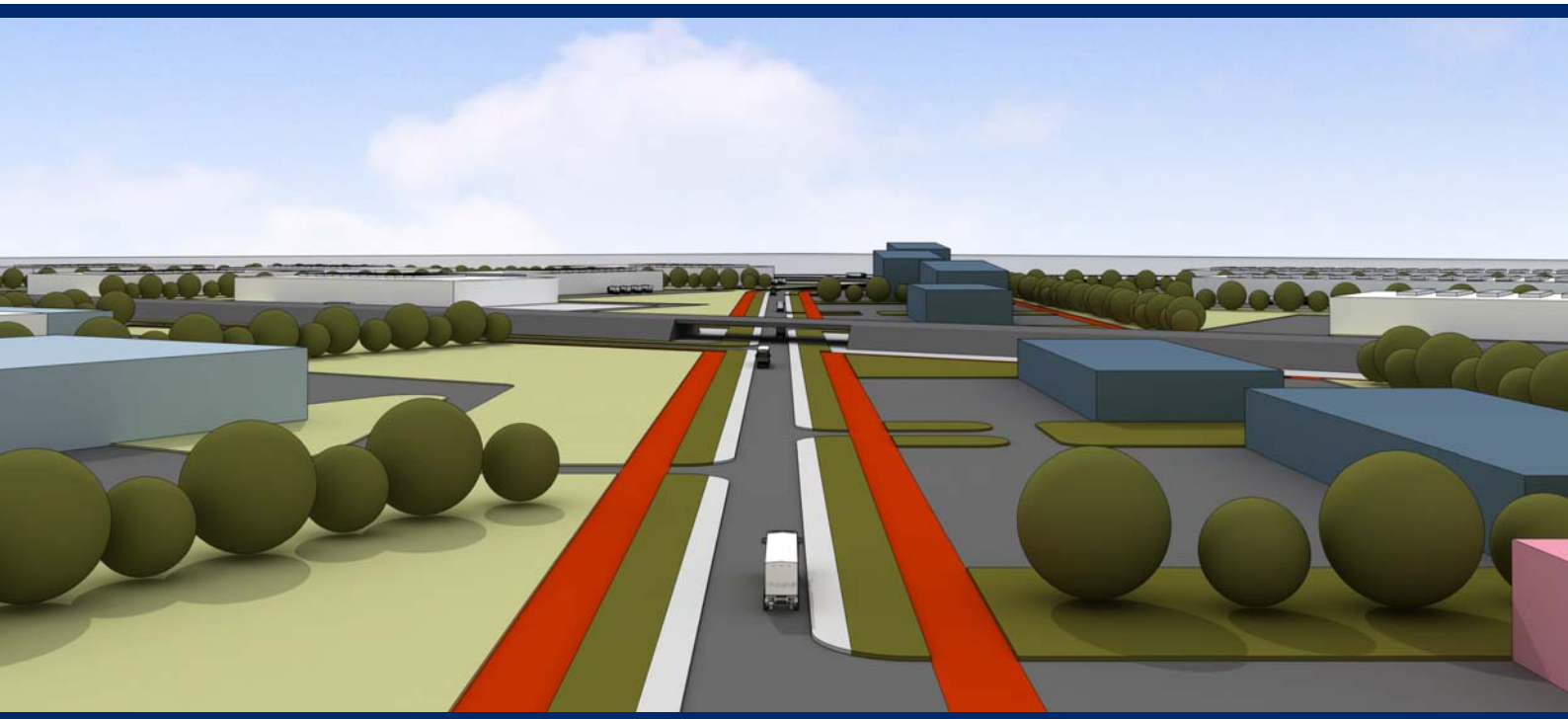

INDUSTRIAL PARK TROSTYANETS: DUE-DILIGENCE & CONCEPTUAL DESIGN REPORTS

2010

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INDUSTRIAL PARK TROSTYANETS: DUE-DILIGENCE & CONCEPTUAL DESIGN REPORTS

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Trostyanets, Ukraine

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1. Introduction

This due-diligence report has been made in the framework of USAID LINC Project, Ukraine as an input for conceptual design of the potential development of the industrial site in Trostyanets. As a source of information has been used:

- Presentation on the city development done by city major Mr. Yurij Bova
- Site visit, July 15th, 2010 (+33°C, clear) guided by city major
- Interview with the city specialist for electric energy and water supply and sewage water discharge and treatment
- Phone call with the city specialist on gas supply
- Various maps and text sources describing the city (city master-plan, strategic plan, others….)
- Visit of the production lines of Global ABC
- Maps with indicative drawings of the infrastructure on site

The group of experts of the LINC project Ukraine has executed the site visit on July 15th, 2010. The participants present during the interview and the site visit:

- Karel Barinka – architect
- Olha Kolisnyk – investment promotion specialist
- Roman Proskurenko – translator and interpreter
- Radim Gill – project manager

2. Location of the city from national and regional perspective

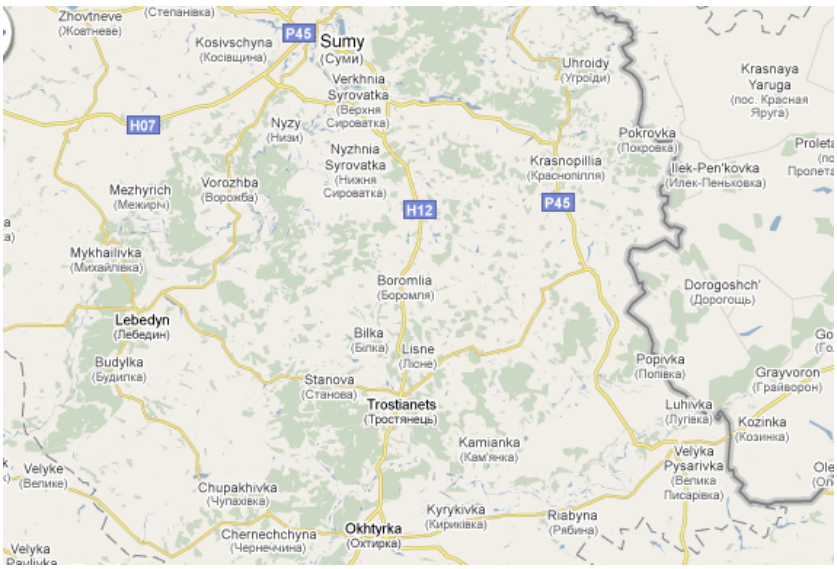
The city of Trostyanets belongs to Summy region. Regional city of Summy is located on the North from Trostyanets and it is accessible by car within 1 hour drive. Trostyanets - taking into account national perspective – is a part of North-Eastern region of the country, close to the city of Charkiv and closer to Russian – Ukrainian border which is accessible by car in approx. 1 hour drive.

Approx. road distances[1] are listed bellow:

- to Kyiv: 366 km (main international airport in the country, EU and overseas flights)
- to Charkiv: 149 km (nearest international airport, EU flights)
- to Summy: 59 km regional metropolis of Summy region)
- to Poltava: 120 km (regional metropolis of Poltava region
- to Belgorod: 209 km (nearest major city in Russia)
- to Ukrainian – Russian border: 78 km (border crossing Velyka Pisarivka)

However Summy is regional metropolis, Trostyanets has some links to the South and South-East too (Ochtyrka, Poltava as well as Charkiv). The matter of major importance is the railway station in the city and the railway line leading through Trostaynec from Charkiv to Summy. At following scheme the position of the City of Trostyanets within the Summy region is shown.

[1] Source: Freytag and Berndt, 1:1 000 000, Ukraine-Moldova



Trostyanets is rather small-sized city located in beautiful hilly landscape which not typical for Ukraine. Sloped terrain with fresh and green forests, small lakes and creeks creates wonderful natural surroundings of the city and attracts tourists. According to the indications of the representatives of the city approx. 22,000 inhabitants are living in the city today.

The economy of the city is positively influenced by Craft Foods Ukraine (CFU) investment into the former chocolate factory which is now producing various food/drinks goods. Thanks to this FDI case the Trostyanets belongs to most economically powerful and efficient city of that size at Ukraine. It should be stated as well, that the municipal economy is heavily depended on CFU operations and in such sense rather vulnerable.

The nearest international airport with regular direct flights from/to the countries of EU or Europe is Charkiv from where also flights to Kyiv are run on daily basis. Due to quite good transport conditions it takes approx. 2 hours by car to reach the airport in Charkiv.

International airport in Charkiv after reconstruction in 2012 (source: http://hrk.aero.en)

Not taking into account typical holiday destinations (Antalya, Sharm-El-Sheikh, others…) and destinations within the former Soviet countries, the best connections (almost all of them on daily or on working daily basis) have following business destinations in Europe:

- Kyiv (UA): daily

- Moscow (RU): daily
- Vienna (A): daily

The Charkiv airport is operated in public-private partnership and it is located in the South-East part of the city of Charkiv. Nowadays the international airport is in large-scale reconstruction which includes the construction of the brand new terminal (capacity up to 800,000 pass/year), reconstruction of the existing one, build-up of a new runway and repairs of the airport terminal facilities. New terminal will be equipped with aviation safety facilities bringing more convenient movement for disabled people and with completely recovered airport infrastructure as well as with other auxiliary services. After completing of the reconstruction, international airport Charkiv will become the first airport in Ukraine which will operate the brand new luggage handling system. A temporary terminal is just developed to be ready for the purposes of air-transport within the European football Championship in 2012.

3. Location of the site from municipal perspective

The site for establishment and development of the industrial park is located on the western edge of the city in the distance of approx. 2 km from the city center. In fact there is not single site. The overall area which was investigated is limited by various technical infrastructure and its protection zones. As a conclusion several sub-sites (as a basic property portfolio for establishment of industrial park) could be identified within the target area. The sites are very well accessible by cars via regional road from Trostyanets to Lebedyn. This road represents the northern border of the site. The site is partially in the ownership of the city and partially ion the ownership of the region. The borders between the city and region are shown at the site analysis drawing. There is also small local (partially paved/unpaved) site road leading from the regional road Trostyanets – Lebedyn to the south of the development area.

Small site road, North-South direction. Low and high voltage air cables. Broadcasting tower in the background

4. Size and visual characteristics of the site

The site which was investigated during the due-diligence has overall size of approx. 90 ha. The site is sloped from South to North. While northern parts are more les flat, southern part is rather sloped. An altitude difference was estimated by experts approx. 25 m.

As shown above, a lot of technical infrastructure is limiting the site. At southern edge there is broadcasting tower visible. Quite intensive greenery and forests exist on southern border of the area. Just behind the southern border there is a hospital camp located. From the first view it is clear that southern parts of the area can hardly be developed for pure industrial purposes (due to: slopes, environmental protection of the forests, city hospital in the neighborhood)

Agricultural production on site

With the exception of technical infrastructure and its facilities (low/high voltage electric air cables, broadcasting tower, water reservoir tower, transformer station, gas reduction station) there are no other buildings or constructions on site. The area is partially exploited for agriculture production.

Sloping of the site and access roads determine the start of the development in the northern parts and continue towards the South. Development plan at southern parts have to be more environmentally friendly.

5. Transport infrastructure

5.1. Roads

Trostyanets is located directly at the road of national significance No.: P17/E 577 connecting two regional metropolis Poltava and Summy.

The regional road Trostyanets – Lebedyn No.:T1913 connects the city centre and the industrial area with the national road No.: P17/E 577.

The site itself is accessible by small partially paved road of estimated width up to 6,0 m.

5.2. Railways

The nearest railway station is located just in the city centre. Trostyanets represents important rail-station at the railway from Charkiv to Summy. The area of future industrial park is not connected to the railway line.

6. Technical infrastructure

6.1. Gas – capacity and network

The gas reduction station (GRS) is located directly on site. Station transforms high pressure gas line (of Dn 273) to middle pressure lines of various diameters to almost all directions within the site and city. Estimated consumption of the industrial park was indicated by experts during the site visit (details pls refer to conceptual design report). It was stated by city representatives that capacities of the gas reduction station is sufficient. Coming gas has a pressure that varies around 12,0 - 6,0 MPa and GRS can be used as a connection point of gas for the development of industrial park. Location of the GRS is shown at site analysis drawing. Anyway the gas pressure stability is always an issue at Ukraine (particularly in winter months) and should be verified carefully further.

6.2. Electric energy – capacity and network

The transformer station (TS) 110/35 KV is located directly on site. It was stated by the city specialist that for the first phase of development this TS can give up to 10 MW of electric power. That is sufficient for the development of approx. 10 ha of industrial park. For next stages an upgrade of the TS should be required. Upgrade would ensure the supply of the electric energy in 1st category (supply with 24 hours guaranty). Total capacity of the TS after upgrade would reach approx. 2 x 25 MW. The costs of upgrade was estimated by city specialist for 3,5 mil. UHA.

6.3. Water – capacity and network

It was stated by the city specialist there are 3 sources of potable water (artesian wells) available on site or in immediate distance from the site. There is also water reservoir tower located directly on site. Its location is shown at the site analysis drawing. According to statement of the city officials there is a water capacity reserve of 22m3/hour in the existing tower. This amount is sufficient to serve the development of the first 10 ha of industrial site for productions which are not heavily depended on water (light manufacturing, assembly, and similar…). It was confirmed as well that tower can be the connection point for water for the development of the park. Increase of water capacity is possible via drilling new wells. It was estimated by city officials to increase the capacity for 120m3/hour would cost approx. 200-300 K of UAH.

6.4. Sewage network and WWTP

Existing city WWTP is located approx. 500 m from the northern boundary of the selected site. Location is shown at the site analysis drawing. Its existing capacity represents 2.800 m3/day of sewage water. According to statement of city officials its current loading is approx. 1.000 m3/day. The capacity reserve represents 1.800 m3/hour and it was confirmed that existing WWTP will be the point of discharging of sewage water from all of the industrial park area.

As for the sewage network there is some not-used lines of sewage. A discussion of their functionality has been ongoing during the visit. Finally it was agreed and recommended to develop new gravitation sewage network on site, to collect all sewage water in lowest point of the site and than via pressured sewage line to connect new sewage system with existing WWTP.

7. Other significant findings on site

The site is very limited by various protection areas of technical infrastructure (electric air vires, underground gas-pipes and sewage lines. Based on experts estimation protection areas have been taken into account and kept in conceptual design. Anyway more detailed measurement is strongly

recommended. Moreover following additional studies have to be executed to make the investors entry on site as smooth as possible:

a) detailed cadastral and topography mapping with the measurement of altitudes and facilities on site
b) detailed investigation/mapping and passportization of the old facilities hidden underground
c) technical study to verify the capacities and connection points of the all kind of required technical infrastructure
d) outputs of all studies (graphical parts) **must be** in digital .dwg or .dgn format which are internationally recognized

It can be expected that this process will take 10-12 months but for successful future development of the industrial park in Trostyanets it is essential.

Conceptual Design Report

Trostyanets, Ukraine

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1. Development motto and vision

1.1. Global trends and assumptions

Proposed development plan generally assumes that FDI companies (especially productive investments) thanks theirs mobility and theirs need to permanently seek the most effective cost conditions to compete at global markets will move some of theirs operation from Western or Central Europe more to the East. It is also assumed that this move will take place within next 10-15 years and all parts of Ukraine will play a significant role as potential "hot spots" in Eastern Europe which will be able to accommodate the spatial requirements of the expected FDI movement. It is obvious that the most prepared sites will be in focus of investors first.

The development/ experience from central Europe tells that for the location of FDI investors the size of the city doesn't matter. What matters from spatial point of view are logistical relations, nature and structure of regional economy and the ratio between the economical power of the city and size of the site. This relation has been analyzed in the framework of that project and the outputs of the analysis are included in attachment No.1.

From the long-term perspective expected continuous growth of the Ukrainian national economy will generate higher demand for more advanced business and production infrastructure that will be searched by domestic Ukrainian producers and exporters as well. It is estimated that this domestic demand for advanced industrial accommodation will be higher in already industrialized agglomerations and significant transport nodes where many indigenous as well as international businesses are already well established. That's the case of Trostyanets.

1.2. Local development specifics and pre-conditions

Extremely successful FDI case in food industry (Kraft Jacobs Suchards) and excellent commitment of the municipal government in Trostyanets should be the main drivers of the development of the industrial park in Trostyanets from local perspective. The government in Trostyanets is well aware of the vulnerability of mono-profiled local economy depended on huge but single FDI case. City government led by its mayor tries to prepare the platform for higher diversification of municipal economy. This way of development thinking is hidden in the background of the Trostaynec´s government activities towards the establishment of industrial park.

Trostyanets is an administrative center of Trostyanets district. The city belongs to the category of small towns. The territory of the city is town is 2663.03 hectares and population is 22.100 people. In the catchment area of the industrial park in Trostyanets (bordered by isochrone of accessibility of 40 min) major cities Ochtyrka and partially also Lebedin are located. Together with many smaller villages inside the catchement area a sufficient "buffer" of the available labor force (above 50.000 inhabitants) is identified.

Municipal government plays very active role in the process of local economic development stimulation and support. Within the process of strategic planning the city identified main reasons why investors should come into Trostyanets:

- city opened for partnership
- Trostyanets is Ukrainian leader if FDI inflow per capita (it is intended to maintain that position and finally even to strengthen)
- satisfaction of existing businessmen with quality of work force
- railway node in the city
- support of the city during permission procedures
- facilitation of the discussion between local businessmen and the regional government
- next development of research institute and scientific center (existing research in timber industry)
- available site with infrastructure easily accessible

As stated above, Trostyanets is small sized city where beautiful nature and landscape creates good condition for living and for tourism development. Investment of Kraft Jacobs Suchards is very good evidence of competent and co-operative city government and proof of advanced business environment. Existing land bank with almost all infrastructure connections on site or in immediate proximity of the site as well as railway node in the city represent promising opportunities to attract both indigenous and foreign investment.

The overall size of the land available is quite large for immediate start. Anyway the site as whole is relevant for the establishment of the industrial park of local/regional importance. Industrial park can be in some parts combined with commercial development (so called shared services center in northern part) and with the functions of science technological parks (southern part). Due to limitations of the site by various protection areas a step-by-step development was taken into account when making this concept.

The conceptual plan is prepared on the land, which was declared as the ownership both the city and the region. Property demarcation line is highlighted in site analysis drawing. For the purposes of conceptual design it is assumed there is an agreement between the city and the region on transfer of that land into the full city ownership. Typical industrial park of local/regional importance in Central Europe has following spatial parameters:

- 20-40ha of flat site, no physical barriers and old damages on site
- at least 50 K of inhabitants in the catchment area (up to 40-45min. accessibility by car/bus)
- no legal-ownership obstacles
- site can be divided it into the parts/sub-sites (5-15ha) with different owners and future exploitation – flexibility
- sub-sites are able to accommodate the industrial productive halls of various size (from 1.000 – 8.000 sq.m or their flexible spatial combination)
- all business premises in the industrial park are single buildings-halls
- concrete plot offered to concrete investor should be able to accommodate the extension of investors production facility in any time of the project life-cycle – that means that initial development planning shouldn't be too intensive
- step-by-step development ensuring the flexibility and adequate reaction for changing demand
- up to 10 km to national road network
- special estates on site (multifunctional centre as a minimum with some potentially shared services: copying, legal services, catering, retail-in it)
- landscape and advanced environment for science technological part
- infrastructure available just on the borders of the site/sub-sites
- decentralized PMU (park management unit) is recommended but not necessary – could be provided by city specialist on centralized basis from city hall

As a conclusion of this chapter it can be stated that the site in Trostyanets has almost all features of successful local industrial park with visible regional ambitious.

1.3. Development vision and its main parts

The global development vision is to develop a flexible and attractive enough local or regional industrial park with the working abbreviation **iPT (Industrial Park Trostyanets)** with total size 78,23 ha. iPT should play significant role accommodating the needs of both indigenous and FDI companies seeking stable and committed local government and reasonable conditions for the establishment of their production basis in Trostyanets.

Due to the local specifics (sufficient local sources of water, existing forest research institute, large forests all around the city and municipal economy focused on food processing industry) it seems to be realistic to further develop wood/food processing industry as well as the light machinery especially for the food processing segment. The typical industrial facilities and halls can be combined with the buildings of science technological park with advanced landscaping and with the other commercial functions in shared services center (catering, retail, reprography, office accommodation).

Taking into account that successful concept is flexible concept and simultaneously taking into account above mentioned vision, its translation into the language of physical parameters could be introduced as follows:

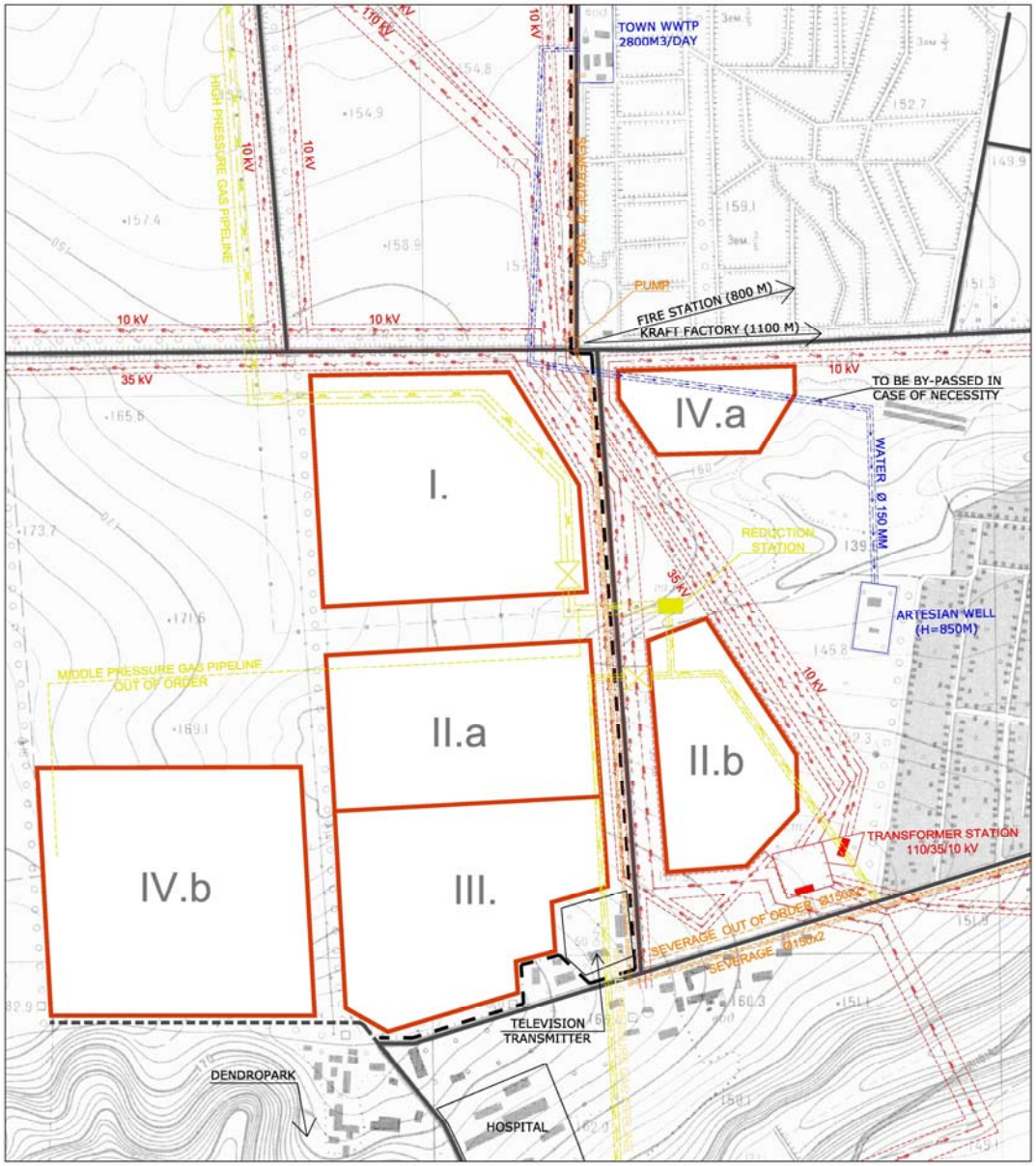
- To start with the development of the infrastructure connections within the **phase I** (the area just adjacent the road T1913 on the north of the site) and to assign and to promote the **phase I** for the development of the light manufacturing, small-medium sized storages, assembly or wood processing industry.
- To assign and to promote the site of **phases IIa** and **IIb** for attraction of investors for small-medium sized businesses in various branches (food processing, wood processing, strages, others)
- To assign and to promote the site of **phase III** for the development of more advanced business infrastructure with high demand for quality of environment (examples: re-location or extension of existing research center, development of the new research centers, business incubators, laboratory, software development offices and similar…)
- To assign and to promote the site of phase **IVa** for attraction of the investors (or to involve the city own investment) for the development of "shared business services center". That idea is based on fact that fully occupied industrial park is generating demand for following services and functions: office accommodation, retail, catering, legal services, accounting services, reprography, and others commercial services which were not developed when building just industrial premises. If **iPT** is managed by city itself than Project Management Unit is usually located here as well.
- To keep the site of phase **IVb** as a development reserve (no particular concepts currently proposed) and depending on level of success (which will influence the level of future demand) of science technological park to extent that or to develop that site for other purposes based on combination of business, commercial and residential functions.

2. Development phases

A site with total area less than 80 ha has been divided for step-by-step development in phases. At this stage, (with data currently available) we assume that development will follow the direction from north to south, mainly due to the transport infrastructure accessibility, proximity of the city center and due to the sloping of the site as well.

Phase	Area (ha)	Proposed general function	Not recommended
Phase I	17,48 ha	small-medium enterprises with light manufacturing and assembly or logistic operations in machinery, electronic industry or wood processing industry	heavy machinery, production and next processing of metals, all segments of chemical industry
Phase IIa	13,01ha	small/medium-sized mixed productive investment in food processing, wood processing or dry buildings materials production and storage	heavy machinery, production and next processing of metals, all segments of chemical industry
Phase IIb	8,37 ha	small/medium-sized mixed productive investment	heavy machinery, production and next processing of metals, all segments of chemical industry
Phase III	14,84 ha	science-technological park, business incubators, business offices for accommodation of research centers or SW development teams and companies	all industrial functions producing increased level of noise or air-pollution
Phase IVa	4,05 ha	shared business services, commercial development	heavy machinery, production and next processing of metals, all segments of chemical industry
Phase IVb	20,48 ha	development reserve (its concept to be drafted after evaluation of the phases I-IVa)	any industrial functions
Total	**78,23ha**		

Shape of each part as well as its position in the framework of the whole site is shown at following scheme. It can be seen also substantial limitations by protection areas of technical infrastructure. In many cases there has been hesitation regarding location or functionality of the underground facilities identified. It is strongly recommended to make detailed measurement and mapping of all underground construction before the real start of development process.



3. Spatial development framework

However the total size of the overall site is quite large, its zoning and development planning is limited by various protection areas dividing site into smaller parts and other limitations. So that the development design is made taking into account mainly following parameters:

- air high-voltage cables
- sloping of the site
- proximity of the forests
- proximity of hospital area

- good accessibility from the North (via road T18913 Trostyanets-Lebedin)
- difficult accessibility from the South
- gas-pipes and gas reduction station on site
- existing transformer station on site
- existing water reservoir and existing water mains on site
- existing WWTP
- environmental limits
- environmentally friendly concept
- spatial and time flexibility

Phase I spatial development framework description:

Since the combined (small-medium scale light manufacturing and assembly operations, storages) operations are expected to be accommodate within the phase 1, the scale of the potentially developed premises is adequate and flexible. The site of phase I should be structured into at least 3 sub-sites with the proposed size from 4-8 ha as shown in the drawing site plan. It should accommodate industrial premises (halls) with gross floor area up to 7.500 sq.m. It is necessary to have proposal also for smaller halls 900-1000 sq.m. of gross floor area. All industrial building within the phase I are assumed as single storey buildings. It is also important to keep some reserve spaces for the future extension of individual facilities if necessary. As a key factor of success with the iPT it is essential to attract so called anchor investor[2] at the site of phase I. This is usually understood as to have promoter of the future development towards the South.

Phase II spatial development framework description:

Within phase IIa-IIb even smaller plots should be offered to accommodate various type of coming investors. It should be noted that it is easier to join plots than to divide the single plot. Also due to the size of the city and municipal economy still rather small-sized mixed productive investment are expected. Spatial demand can vary from very small plots to medium sized areas. Totally 4 plots with the size 2,85 – 7,53 ha are offered within phases IIa and IIb. Single storey buildings are expected as well and spatial reserve is kept. It is assumed that sites of phases IIa and IIb will be developed after completion of the phase I. Revenues from phase I should be re-invested into preparation of the phase II in order to minimize the demand for external sources.

Phase III spatial development framework description:

Site of phase III (in immediate proximity of forests and with hospital area hidden in the greenery) is intentionally zoned in such a way to be able to accommodate the needs of more advanced business infrastructure with strong noise and air-protection limits (business offices, incubators, laboratories, SW development house and similar. A single site for the development of rather buildings than halls with total size of 17,48 ha is proposed. Buildings are expected with max. 2-3 storeys. A site is adjacent to green area of forest and it is rather hilly which helps to create nice conditions for working. At the picture aside an example

[2] Anchor investor is often used term for strong enough enterprise with sound brand, both from indigenous or from foreign companies. The profile of anchor investors usually predetermines the profile of the park as whole.

of similar development (offices, SW development houses, incubators and research centers) in immediate touch with deep forest in the outskirt of the city) from the City of Ostrava, Czech Republic is shown. It is expected that development of the site III will come after sites of phase I and II are already fully occupied. The development of the site of phase III should definitively distinguish the industrial park in Trostyanets from other similar business infrastructure in the country. It should also support the profile of Trostyanets as a responsible city which accepts advanced environmental protection and standards.

Phase IV spatial development framework description:

A special development framework is proposed for the small sub-site IVa. It is only 4,05 ha big and there is existing water main alongside the northern boundary of the site which might be relocated or by-passed. On the other hand the value of the site is its location with immediate access to the city center and immediate access to all sub sites at iPT. It destinates this site for accommodation of so called shared services centre facilities. In general – office buildings with max. 4 storeys should be allowed here. This place together with already developed site of phase I should create the main gateway into the new space dimension of future iPT. In such a way the development of phase IVa assumes the advanced level of demand for shared services from fully developed and occupied iPT.

Finally there is a spatial development reserve identified in the concept. It is marked as IVb and its size is 20,48 ha. Its next development is fully depended on the success and type of investors located at sub-sites of phases I-IVa. Therefore any concrete concept is not proposed yet. But generally the zoning of the IVb should be very similar to toning of phase III with exclusion of industrial premises and with higher support of commercial and mixed business infrastructure (business services + office accommodation)

Czech cities and sites spatial analysis

In the framework of this chapter also a thorough spatial analysis of more than 40 industrial sites in Czech Republic has been made. To achieve have comparable outputs consultant focused at sites in the cities smaller or equal 25.000 inhabitants. The results of analysis are shown in the attachment No. 1 of this report inclusive unique map material. As a conclusion of that analysis which can be used as an arguments for the development of iPT it can be stated following:

- consultant generally believes that there is a relation between the size of the city and its economical power to properly develop and long-term maintain the industrial parks of different size
- for the category of cities 20.000 – 25.000 inhabitants[3] is (in Central Europe) the most typical industrial park with size between 12,0 – 25,0 ha which represents approx. from 2%-9% of total city area[4]
- however the map inputs are not showing spatial situation on-line it is clear that some of Czech sites developed at the beginning of 21st century are in 2010 still not fully occupied

[3] As a typical comparable representants consultant considers examples of the cities of Vyskov, Blansko, Havlickuv Brod, Zdar n. Sazavou, Krnov, Louny – for details pls refer to attachment No.1. Of course there is also exceptional example of the city of Koprivnice with industrial site with more than 80 ha or village Nosovice where Hyundai developed its own factory at the site with more 100 ha. These exceptional examples had not been taken into account.

[4] Compare:

phase I-IIb=38,86 ha

phase I-IVb=78,23 ha

Trostyanets territory=2.663,03 ha

ratio=(38,86/2.663,03) * 100 = 1,4%

ratio=(78,23/2.663,03) * 100 = 2,9%

Conclusions:

Taking into account different spatial and economy scale of Ukraine and countries in Central Europe we can state that sub-sites I-IIA-IIB with the total area 38,86 ha (of that some parts can be un-built-able) represents sufficient and flexible enough platform for the development of industrial park in Trostyanets.

Development recommendation for sites of phases III-IVa-IVb should be understood as *conditionally based* in order to achieve as much space/time flexibility and to promote differentiation in the park regarding the specific local conditions.

4. Infrastructure development needs, requirements and assumptions

The energy demand and consumption has been calculated for following development stages and parameters:

Phase	**Size** (ha)	**GFA/site size** (%)	**Gross floor area of production and business facilities and storage halls** (sq.m.)	**Estimation of people employed**[5] (person)[6]
Phase I	17,48	22%	39.300	260 - 350
Phase IIa	13,01	28%	37.400	200 - 260
Phase IIb	8,37	22%	18.700	130 - 170
Semitotal I - IIb	*38,86*		*95.400*	*580 - 780*
Phase III	14,84	40%	60.000	2.0007
Phase IVa	4,05	118%	48.000	1.5008
Phase IVb	20,48			
Total	**78,23**		**203.400**	**4.083**

Other design assumptions for all phases 1-3:

- All sites are considered "semi dry sites" as for the consumption of water. There is not expected "on water based" production (paper/pulp production, iron/steel production, chemical industries and similar branches heavily depended on potable and industrial water)
- All productive investment has no special and extremely high demand as for the gas and as well as for the electric energy. The small/medium-scale manufacturing/assembly and storage operations are expected only.

[5] rounded-off

[6] assumptions based on experience from Central Europe

- logistic, warehousing and less labor intensive productions: 15 person employed/ha
- assembly, electronic, light machinery, processing: 20 persons employed/ha

[7] expert estimation

[8] expert estimation

- All municipal sewage water of developed iPT will be properly treated in the existing WWTP which is located approx. 500 m from the northern part of the iPT site. If some production facility in the future will produce industrially polluted water, the special industrial WWTP has to be located at iPT site or at investor's own site.
- The capacity of some municipal energy sources (particularly gas) has not been clarified exactly within the due-diligence phase. In chapters bellow the calculation of the overall required capacity is made. The City of Trostyanets as a promoter/investor of the basic infrastructure of iPT should investigate further, where the available capacity can be found and connected.

4.1. Gas

Demand for gas						
Formula	**Qmax= size (ha) x average relative consumption in m3/hour**					
	ha	avg estimated consumption m3/hour,ha	number of working hours	number of working days	flexibility adjustment factor	approx. estimated total demand for gas m3/year[9]
Phase I	17,48	60	8	260	1,2	2.617.800
Phase IIa	13,01	60	8	260	1,2	1.948.400
Phase IIb	8,37	60	8	260	1,2	1.253.500
Semitotal I - IIb	*38,86*					*5.819.700*
Phase III	14,84	40	8	260		1.234.700
Phase IVa	4,05	40	8	260		337.000
Phase IVb	20,48	40	8	260		1.704.000
Total	**78,23**					**9.095.400**

Conclusion

Total expected consumption of gas at iPT as a whole can overreach 9,0 mil. m3/year (future: all phases fully developed). For the industrial part of iPT without phases III-Iva-IVb which are rather office type of development the estimated consumption of gas is approx. 5.819.700 m3/year. Potential connection point for gas is the existing gas reduction station which parameters (gas pressure, pressure stability, volume available) have to be verified against calculated amount of demanded gas. Anyway, according to statement of city officials it is assumed that estimated volume of gas/year should be in the existing GRS available with grand reserve. Final solution should be investigate further and discussed with the distributors of gas in the city.

[9] rounded-off

4.2. Electric energy

Demand for electric energy						
Formula	**Qmax= size (ha) x average relative consumption in KW/ha**					
	ha	avg consumption KW/ha	number of working hours	number of working days	flexibility adjustment	total demand for gas MW[10]
Phase I	17,48	100			1,1	1,93
Phase IIa	13,01	100			1,1	1,43
Phase IIb	8,37	100			1,1	1,10
Semitotal I - IIb	*38,86*					*4,46*
Phase III	14,84	80			1,1	1,31
Phase IVa	4,05	60			1,1	0,27
Phase IVb	20,48	60			1,1	1,35
Total	**78,23**					**7,39**

Conclusion:

The potential connection point for the electric energy is the existing transformer station located just on site which is able to give 4 MW immediately after the start of the development. Total expected consumption of electric energy at fully developed iPT site (future: all sub-sites fully developed) should not reach 10 MW. Within this calculation a flexibility factor 1,1 was taken into account. Expected consumption of phases I-IIa-IIb in pure industrial part of the iPT is bellow 5 MW. It should be remarked that supply of electric energy in 1st category (24 hours guaranty) is currently not possible. It is clear that:

a) for the beginning of the development source of electric energy is here with reserve (but with no 24 hours guaranty)

b) upgrade of existing transformer station should be planned for fully developed site in the future to ensure increased demand of electric energy and guaranteed all-day supply

[10] rounded-off

4.3. Water

Demand for water (not industrial)						
Formula	Qmax= size (ha) x average relative consumption in l/s, ha					
	ha	avg consumption l/s, ha	number of working hours	number of working days	Flexibility adjustment	total demand for water l/s[11]
Phase I	17,48	1,2			1,1	23,10
Phase IIa	13,01	1,2			1,1	17,20
Phase IIb	8,37	1,2			1,1	11,00
Semitotal I - IIb	*38,86*					*51,3*
Phase III	14,84	0,6				8,90
Phase IVa	4,05	0,6				2,40
Phase IVb	20,48	0,6				12,30
Total	**78,23**					**74,90**

Conclusion:

Connection point for water is the existing water tower reservoir located on site which (according to city officials) is able to give at least 22 m3/hour of water for iPT needs. This should be enough for the provision of water for phases I and II at more than 17 ha site. Total consumption of water at fully developed iPT site (future: all sub-sites fully developed) could reach above 70 l/s (which gives above 250 m3/hour). According to the city professionals there are extremely sufficient underground sources of water available. Final solution should represent the drilling of 2 new artesian wells - each with the capacity of approx. 125 m3/hour. Final remark should be made regarding the fire water. It is usual at the territory of industrial parks to have certain reserve for fire water in amount of at least of 6,0 l/s. Ideal solution is independent pipe network with fire water at sufficient pressure. According to statement of city officials there is independent fire water pipe in Trostyanets with the pressure 2,5 atm. This can not been verified during the site visit and should be clarified further as well as final technical solution for delivery of water to iPT. Last but not least – water situation of Trostyanets seems to be significantly better than in other Ukrainian cities studied so far. It can be recommended to promote iPT as a business infrastructure where also "semi-wet" or "semi-dry" productions can be accommodated without substantial risks in supply of water.

[11] rounded-off

4.4. Sewage water

Sewage water calculation						
Formula	**Qmax= size (ha) x average relative consumption in l/s, ha**					
	ha	avg consumption l/s, ha	number of working hours	number of working days	Flexibility adjustment	total demand for water l/s[12]
Phase I	17,48	1,2			1,1	23,10
Phase IIa	13,01	1,2			1,1	17,20
Phase IIb	8,37	1,2			1,1	11,00
Semitotal I – Iib +10%	*38,86*					*56,43*
Phase III	14,84	0,6				8,90
Phase IVa	4,05	0,6				2,40
Phase IVb	20,48	0,6				12,30
Total + 10%	**78,23**					**82,39**

Conclusion

The assumption that all water which is brought into the site must be treated properly by sewage system and WWTP has been used for the calculation. There is a municipal WWTP in the distance of 500m from the iPT site. According to city officials the current loading of WWTP is 1.000 m3/day while current overall capacity is 2.800 m3/day. The capacity reserve is 1.800 m3/day. Taking into account that fully occupied site of phase I will produce some 25 l/s of sewage water (which approx. 740-750 m3/day with 8 hours shift) it can be stated that existing free capacity in WWTP is sufficient for the development of phases I-IIa-IIb which is more than beginning. To serve fully developed site of iPT will require increasing of the current capacity of WWTP. Fully develop site of iPT (all sub-sites developed) will produce approx. 2400-2.500 m3 of sewage water per day ((formula: (82,39 x 3660 x 8)/1000). If there is no other development projects in the city in coming years this would lead to increase of WWTP capacity by 700-750 m3/day. Final remark: all industrial water from iPA must be treated in WWTP. It is assumed, that no industrially polluted water is included in the total amount calculated above. Such water must be treated properly by investors themselves in the framework of theirs own projects on site.

4.5. Surface water

Calculation of surface water for phaseI-IIa-IIb

Q_{max}= size[13] phase I-IIa-IIb (ha) x 0,6 x 60l/s = 38,86 x 0,6 x 60 = 1.400 l/s

Qtotal= size total (I-IA-IIb-III-IVa-IVb) x 0,6 x 60 l/s = 78,23 x 0,6 x 60 = 2.820 l/s

Conclusion

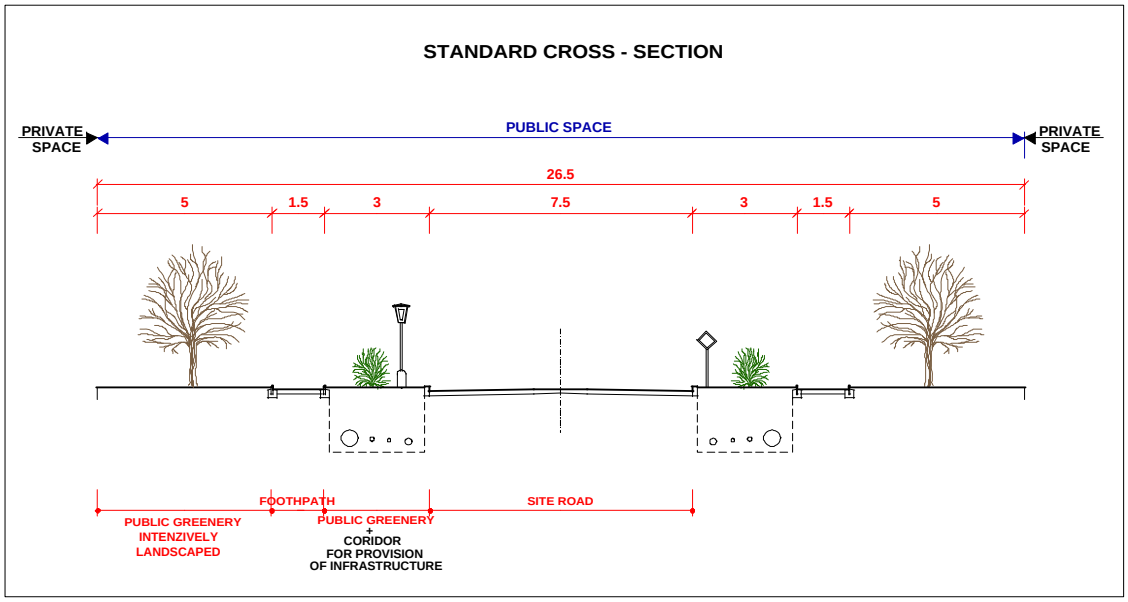
The paved and built-up areas will be large, so that amount of discharged surface water ib case of heavy rain-fall can be enormous. This water should be treated properly. A partial retention (up to 5.000 m3) of the surface water could be created on north of the site in the form of retention lake, which will also have positive impact on visual characteristics of the park. This retention

[12] rounded-off

[13] Size of the paved parking places + paved roads + paved footpaths + total size of the roofs of the production facilities and other buildings, approx 60% of the size of site is considered as a built-up area

facility is designed in such a way to be able to collect rain-fall water from sites I-IIa-IIb created by 50-60 min of heavy rainfall. Another part of surface water must be treated by the investors at theirs site themselves. The other surface water has to be connected with the closest surface sewage or to take of the site via natural way trough the northern boundary. It is expected that after the retention the volume of surface water from fully developed iPT (all sub-sites developed) still can represent some 300 l/s and will be treated out of the site with the gravitation pipes with Dn 600 - 800mm to the nearest natural water-flow.

4.6. Standard cross-section



Conclusion:

To keep the flexibility of future development and to achieve future ability to maintain public space within the industrial park properly following spatial configuration of cross-section is proposed. Depending on local road standards, other local safety regulations and other local rules there can be slight modification of the width of the road or width of the footpath itself. Depending on location of the road "in the middle of iPT" or "at the edge of iPT" both-sided footpath would be changed to "single-sided" one. The so called "public space" highlighted in blue" on the picture above usually remains in public ownership and it is maintained by city itself.

5. Bill of development quantities

The table bellow shows roughly and provisionally the development quantities that should be the matter of public investment on sites of phases I-IIa-IIb-III-IVa-IVb. The breakdown of quantities into the phases is done according to expected approx. ratio 22:17:11:19:5:26 taking into account the sizes of different phases. It is assumed the city will get the land based on free of charge transfer. Another assumption made is the public sector will be responsible only for back-bone infrastructure and public spaces development; the other investment on sub-sites would be the matter of private investment.

In reality the breakdown of quantities would be the most likely different, but for the conceptual thinking in the current stage of development it is sufficient: It provides the city with the clear picture of investment needed for initial development. It offers also the background for calculation how to share the

initial costs among the investors or tenants of different phases. Final remark: there are not included any additional investment actions realized out of[14] the development site iPT in the bill of quantities.

Bill of quantities									
Item No.:	**Item**	**Unit**	**phase I**	**phase IIa**	**phase IIb**	**phase III**	**phase IVa**	**phase IVb**	**total**
			17,48 ha	*13,01 ha*	*8,37 ha*	*14,84 ha*	*4,05 ha*	*20,48 ha*	*78,23 ha*
			22%	*17%*	*11%*	*19%*	*5%*	*26%*	*100%*
1.	Purchase of the land	ha	0	0	0	0	0	0	0
2.	Public paved site roads w. 7,6 m incl. road signs	sq.m	3.595	2.777	1.797	3.104	817	4.250	16.340
3.	Public parking places incl. road signs	sq.m							
4.	Public footpaths w. 1,5m incl. orientation system	sq.m	1.072	829	536	926	243	1269	4.875
5.	Public green strips w. 3,0m incl. landscaping	sq.m	2.145	1.658	1.073	1.853	489	2.532	9.750
6.	Public green barriers	sq.m.	only as one figure						55.000
7.	Backbone infrastructure - gas network incl. sub-connection points, Dn 150-200 mm	m	363	280	182	313	83	429	1.650
8.	Backbone infrastructure - water network inc. sub-connection points, Dn 300mm	m	363	280	182	313	83	429	1.650
9.	Backbone infrastructure - electric network incl. sub-transformer station	m	363	280	182	313	83	429	1.650
10.	Backbone infrastructure - sewage network incl. sub-connection points, Dn up to 600 mm	m	473	366	237	409	108	557	2.150
11.	Backbone infrastructure - surface water network/drainage incl. sub-connection points, Dn up to 800 mm	m	473	366	237	409	108	557	2.150

Another table bellow shows the bill of quantities regarding the land to be sold to investors and the land alongside the back-bone infrastructure which should remain in public ownership.

[14] E.g. mainly: road crossing, roundabouts, bridges, necessary upgrade of the existing WWTP, necessary upgrade of the existing transformer station, necessary upgrade of the existing gas reduction station , necessary upgrade of the existing water sources and other similar additional investment projects caused by development out of site territory. To assess and to quantify this investment seriously a more detailed study is needed.

Bill of quantities – land for sale v. land to remain in public ownership									
Item No.:	**Item**	**Unit**	**phase I**	**phase IIa**	**phase IIb**	**phase III**	**phase IVa**	**phase IVb**	**total**
			17,48 ha	*13,01 ha*	*8,37 ha*	*14,84 ha*	*4,05 ha*	*20,48 ha*	*78,23 ha*
			22%	*17%*	*11%*	*19%*	*5%*	*26%*	*100%*
1.	Land for sale to investors	ha	17,48	13,01	8,37	14,84	4,05	20,48	78,23
2.	Land to remain in public ownership (roads)	ha	0,36	0,28	0,18	0,31	0,08	0,42	1, 63
3	Land to remain in public ownership (footpaths)	ha	0,11	0,08	0,05	0,09	0,02	0,14	0,49
4	Land to remain in public ownership (green road strips)	ha	0,21	0,17	0,11	0,19	0,05	0,25	0,98

6. Development costs

The table bellow shows approximately the cost of in-site initial development that should be spent by public sector to ensure the standard requirements of the investors coming to the park.

Bill of quantities - initial public investment					
Item No.:	**Item**	**Unit**	**number of unit all sub-sites fully developed**	**unit price[15] (EUR)**	**total price (EUR)**
1.	Purchase of the land	ha			n.a.
2.	Public paved site roads incl. road signs	sq.m	16.340	60	980.400
3.	Public parking places incl. road signs	sq.m			n.a.
4.	Public footpaths incl. orientation system	sq.m	4.875	30	146.250
5.	Public green areas incl. landscaping	sq.m	9.750	15	146.250
6.	Public green barriers	sg.m	55.000	5	275.000
7.	Backbone infrastructure - gas network incl. sub-connection points, Dn 150-200 mm	m	1.650	120	198.000
8.	Backbone infrastructure - water network inc. sub-connection points, Dn 300mm	m	1.650	210	346.500
9.	Backbone infrastructure - electric network incl. sub-transformer station[2]	m	1650	150	247.500
10.	Backbone infrastructure - sewage network incl. sub-connection points, Dn up to 600 mm	m	2.150	250	537.500
11.	Backbone infrastructure - surface water network/drainage incl. sub-connection points, Dn up to 800 mm	m	2.150	250	537.500
	total EUR				**3.414.900**

[15] Based on approx. Central European unit prices, level 2009-2010. To be recalculated according to local price level with inclusion of all additional investment specified in the text above.

It can be estimated that approx. 60% of total costs should be spent to open sites of phases I-IIa-IIb. In other words: the investment of slightly above 2,0 mil. EUR (plus additional investment out of the site as decribed above in the text) leads to achievement of more than 380.000 sq.m. of fully serviced flat site ready on sale.

7. Feasibility report, risk analysis and follow up actions identification

The aim of this chapter is to identify the potential risks of possible development and propose a combination of measures to minimise them. The risks are evaluated only from the point of view of the technical and environmental aspect. There are certainly other risk portfolios at business, political, institutional and organisational level, but these are not managed in this concept.

No. :	**Specification of risk**	**Level**[16]	**Proposed measures**
1.	High level of groundwater and lack of information about that.	C	Perform hydro geological survey with the aim of mapping out the detailed places with incidence of groundwater and if necessary proposing drainage measures. Cost these measures and include them in the budget.
2.	Less information on parameters of gas supply (pressures, stability/instability, gas capacities available, others…..) in the city	B	Discuss total consumption of the park and possible methods for connection with administrator of town gas pipelines. Include additional investments in the budget if necessary.
3.	Air/Noise pollution	C	For specific cases of industry air and noise spread study might be required to avoid the pollution and negative impact for the hospital area and forest area on the south. When making that the prevailing direction of the wind should be taken into account.
4.	Pollution of surface water	B	Before discharge into a river, rain water from paved surfaces should be pre-treated in a waste water treatment plant (sand traps and oil removers).
5.	Soil contamination	C	Any possibility of local soil contamination must be eliminated by organisational regulations and construction alterations in the industrial areas of the intention. Build and adhere to system for handling waste.
9.	Potential risk of contamination of groundwater.	A	Foundations should correspond to hydrogeological conditions. All the functional areas of the industrial site must have paved surfaces. Substances harmful to water should be stored in special purpose areas only in the necessary amounts.
12.	Industrial accidents	B	Prepare accident measures plan for the park management and require accident planning from all investors entering the iPT

[16] Level A: highest risk category (project as whole is jeopardized if proposed measure is not taking into account properly)

Level B: risk still important, but lower than level A

Level C: lowest risk