Delft University of Technology, The Netherlands
Master of Architecture, Urbanism and Building Sciences
Master Track of Urbanism, Research group: Design as Politics
**Krzysztof Pydo, 4328523**
research mentor: Marta Relats
design mentor: Birgit Hausleitner

# CIRCULAR ECONOMY
## *in the* CITY OF THE LOOPS

THESIS PLAN:
modeling an urban utopia aware of resources scarcity

13th January 2015

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# 1. PREFACE

This is a Thesis Plan for the graduation project at the Faculty of Architecture of Technical University in Delft, the Netherlands.

The document consist of the process and planning of the master project. The final version of the document will be presented at the P2 assessment review. The Thesis Plan is written during the MSc3 semester of the Urbanism graduation track.
The content of this research would not have been possible without the feedback of Marta Relats, Birgit Hausleitner, Wouter Vanstiphout, Lidewij Tummers from TU Delft, Paweł Jagło, Maciej Twaróg involved in promoting Nowa Huta and Michał Stangel from Silesian University of Technology in Poland. Thanks for the time and dedication.

**IMPORTANT:**

The master thesis bases on low probable scenario, whereas Polish Government cannot handle upcoming socio-economic changes in the next decade. Though, most of the research and design decisions are undertaken on the basis that Polish politicians will maintain their nearsighted approach. The scenario is based on real data.

What can happen?

Due to further mass migration of polish labor to the western european countries, Poland will lose millions of workers in the next few years. Simultaneously, the country will face demographic decline due to 1,3 kids born per couple and serious ageing of population. The “welfare” system bursts at the seams already today, creating several month queues for specialists in hospitals, borrowing money for retirement funds without a plan of repayment. Public debt is growing, together with administration and bureaucracy. 5% of national budget goes to servicing the public debt, 2% for the administration. An army of officials is growing every year tapping to a million employees in public administration, that is over 6% of total employees (1 out of 15 working adults). The system that is highly inefficient is still working, but what if the bubble breaks? Recent research reveals that more than a half Poles currently have no savings and live from one month to another... Can we live without a PLAN-B, whereas the “PLAN-A” is vague and unspecified?

# 2. TABLE OF CONTENTS

# 3. INTRODUCTION

The following thesis plan is a part of the research of the Design as Politics Studio. The studio is "exploring, researching and defining boundaries, commonalities and tensions between the fields of politics and design". The second edition of the studio focuses on the aspect of "government as a player in the social forces" and its expression in built environment. The underlined issue of the studio is a great input of government political and worldview expression which occurs through architecture and urban planning. Also, the growing demand of the societies claiming more influence on their environment. (Studio Guide, 2014, p.5)

Graduation Studio 2014/2015: New Utopias on the Ruins of the Welfare State, argues that Modern Architecture is strongly connected to the Welfare State (Studio Guide, p.6). This thesis addresses the problems of the ruin of the Welfare State in Nowa Huta located nearby Kraków in Poland. "The largest and the most ambitious of all the socialist cities of 'People's Democracies', dwarfing all others in size and national political significance" (Lebow, 2013, p.3), Nowa Huta together with Lenin Steelworks was a symbol of the former communist domination across the Eastern Europe. "Unfinished Utopia" of Nowa Huta planned in 1949 as an independent city to neutralize importance of traditional Kraków (Lebow, p.14), already in 1951 became its part. Although being a flagship investment and a milestone in building socialism in Poland, the prior planner's and politician's concept, step by step revealed its weaknesses and the failure of the ideology behind it. (Lebow, p.40). Though the above mentioned shortcomings, the settlement for one hundred thousand people (Fig. 1, Fig.2) and steelworks, which was supposed to produce one and a half million tonnes of steel per year (Lebow, p.3), has been successfully constructed. In the following years Nowa Huta became a subject to expansion of Kraków and got lost in its shadow (Fig.3, Fig.4).

Fig.1. Model of utopian Nowa Huta settlement. An example of well implemented concept of "urban unit" invented by C. A. Perry, source: archirama.muratorplus.pl

Fig.2. "Unfinished Utopia" as a house for over hundred thousand of steelworkers. Most of them came from village, source: archirama.muratorplus.pl


Fig.3. 1965: Nowa Huta as the settlement for steelworkers under administration of Kraków (own work)


Fig.4. 2015: Nowa Huta became a bedroom of Kraków with the identity constructed in opposition to the later one (own work)

# 4. THE RUIN OF THE WELFARE STATE

It has been 65 years after the first shovel was stuck into the ground to build Nowa Huta. Within these years the city already accommodated four generations in its social realistic architecture housing buildings. During this period **the settlement has encountered many social problems (Fig.5, Fig.6), the environment has been seriously strained (Fig.7), cars have dominated the public space, architecture and its components have worn out (Fig.8, Fig.9), population has started to decline (Fig.10) and age, moreover the state of insecurity has increased and the steel industry reduced production (Fig.11)** (Local Program of Nowa Huta Revitalization, p.7-8). Last, but not least, **the political aspect of Nowa Huta gradually has been belittled. The location become a ruin calling for drastic change.**

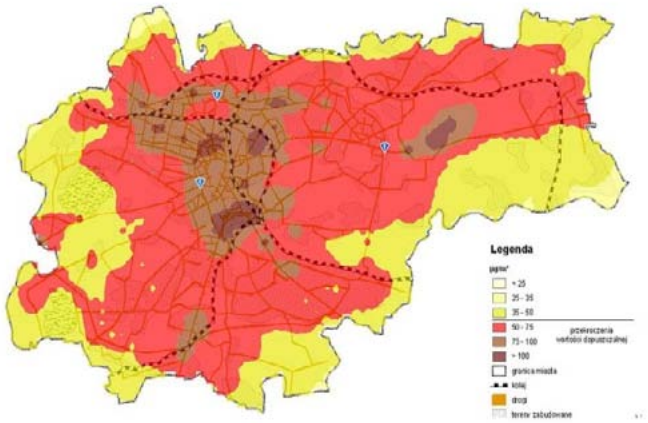



Fig.7. Air Pollution over Kraków and Nowa Huta. Red and brown areas indicate exceeding limit values. Source: Lesser Poland Air, Monitoring; http://monitoring.krakow.pios.gov.pl/iseo/

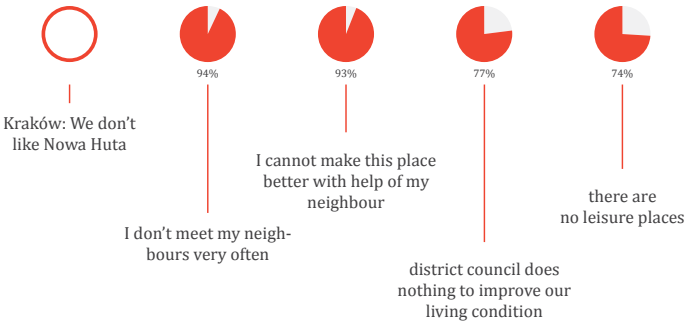



Fig.5. Public opinion surveys indicate that citizens of Nowa Huta are unwill to interact with neighbours and think negatively about the possibilities to change the place, (own work based on Jagiellonian University, Safety in Kraków - Report, 2008)

Fig.8. Majority of the buildings in Nowa Huta have not been restorated yet since construction in 1949-1955, source: gazeta.pl

Fig.9. Citizens judge the quality of living in the district through the quality of public space, source: gazeta.pl

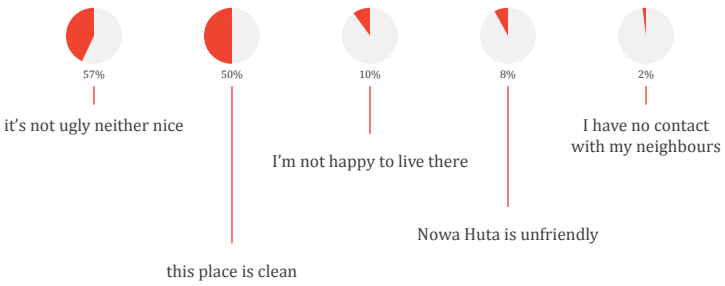



Fig.6. The same report reveals that the most of the people is quite happy to live in the area regardless of the poor conditions (own work based on Jagiellonian University, Safety in Kraków - Report, 2008)

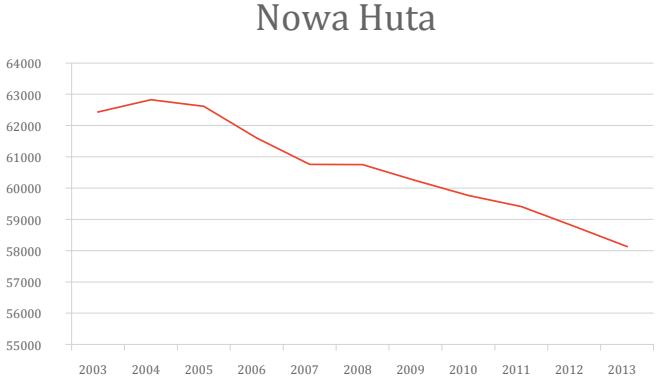



Fig.10. Population in Nowa Huta and surroundings is declining and aging. (own work based on Kraków, StatKrak; http://msip2.um.krakow.pl/statkrak/view/show/start.asp?tab=n_info&id=1)

# 5. PROBLEM STATEMENT AND ANALYSIS
# 5.1 IDENTITY AND CIVIL SOCIETY

Nowa Huta since early beginning has been the area of economical and social experiment. The 6 year plan of industrialization of Poland, in which Nowa Huta was playing an important role, brought changes to the post-war polish landscape. (Jezierski, Leszczyńska, 1994). Most of the working class that builded Nowa Huta housing and steelworks, stayed in the city and got the job in the steel factory (Fig. 14).

Workers that came from overcrowded rural areas after 1949, were the greatest substance to shape a new human - homo sovieticus (Fig. 13) that comply with the requirements of Soviet Union. According to that assumption, the society in the eyes of authorities shall be submissive to the party and accept collective work that is given. It shall avoid taking initiative and responsibility, be opportunist, demonstrate lack of crictical thinking and respect communist symbols (Fig. 15) (Marciniak, 2010).

Imposition of the identity onto Nowa Huta citizens, stored in social realistic architecture, cult of labor work, lack of worship places and ultimate submission, have never been achieved. Mass protest in 1960 to prevent a from demolition a cross, the symbol of the catholic church (Fig. 12), war state in 1981-83 (Fig. 16, Fig. 17) and solidarity movement that helped to change the system in 1989 (Fig. 19) demonstrate that the faith and wish to live freely were stronger than the system.

Despite of Solidarity Movement, the society is not acting in public space nowadays. Lack of initiative and blaming the authorities on every fail in the urban tissue is a common practice. Civil society does not exist yet in Nowa Huta. Also, the identity is undefined and mainly constructed on the opposition to Kraków. (Jagło, 2014)

Fig.12. 1960's fights to defend the cross,
source: wszolek.salon24.pl


Fig.13. 1968, Arranged assembly of the People's Party support, photo: Piotrowski

Fig.14. 1970's, Steelworkers end their change, source: nowahuta-tuitam.blogspot.com

Fig.15. 1973, Ceremony of unveiling Lenin Monument,
photo: Maciej Sochor

Fig.16. 1980, imposition of martial law, source: zawszepolska.eu

Fig.17. 1982 Street fights in Nowa Huta, photo: Stanisław Markowski

Fig.18. Queues to grocery shop as the commonness of socialistic system, source: wp.pl


Fig.19. 1982-89 Solidarity Marches in Nowa Huta,
source: solidarnosc.krakow.pl

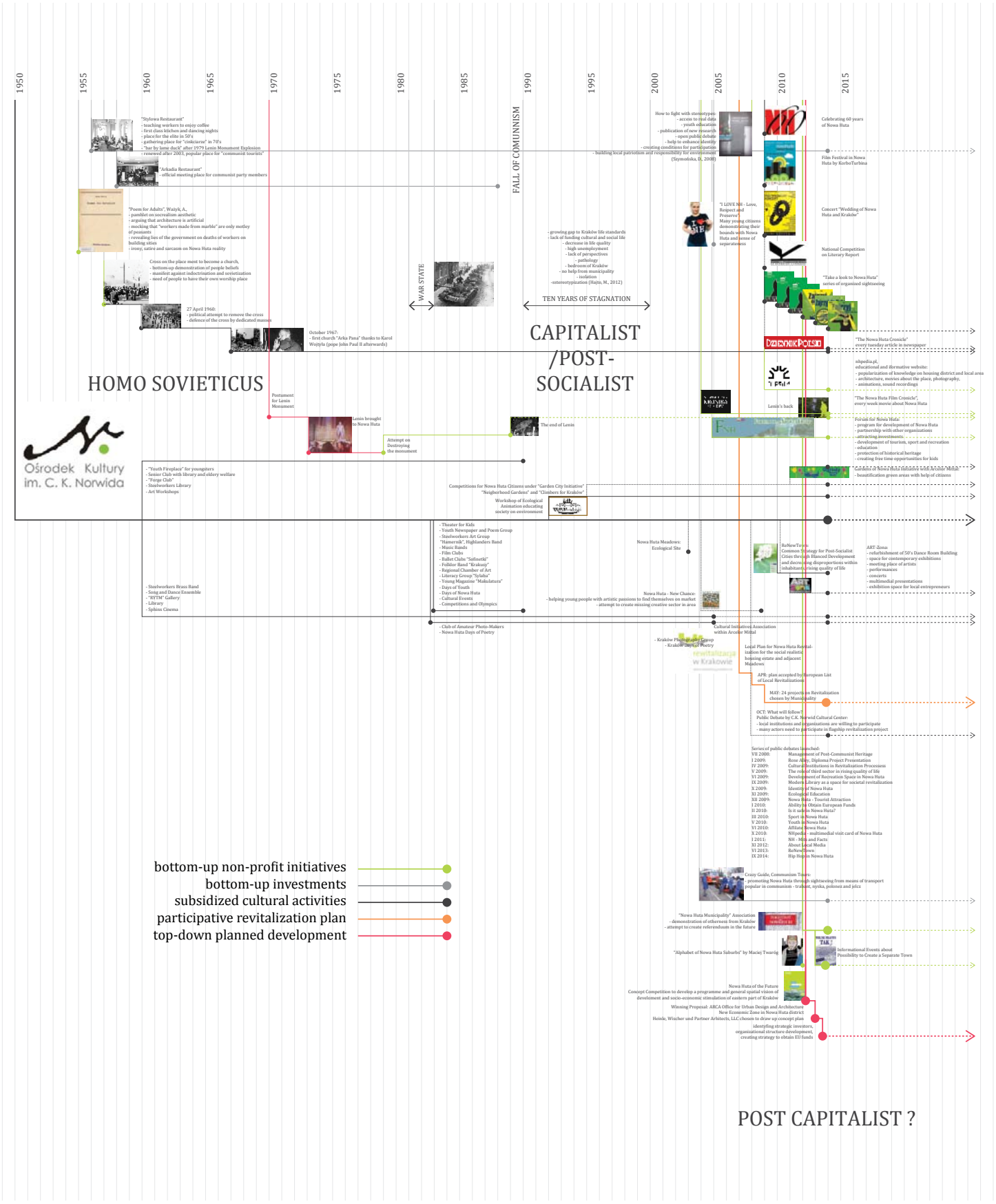



Fig.20. Mapping quest: finding identity of the place. Frequently neglected communist heritage passed into 10 years of stagnation in order to meet sprouting civil society. The civil society takes various forms in Nowa Huta. From completely bottom-up activities (green lines) such as Magistrat Nowohucki that tries to fight for Nowa Huta independence, to bottom-up private companies (gray) that promotes the place and take the material advantage of existence of monumental communist architecture. Activities organized around Norwid Cultural Centre (black lines) formed in 1950 and still evolving into new contemporary shape. Finally, partially participative Local Revitalization Plan (LRP) (orange line) shows combination between top-down plan for revitalization and bottom-up public consultations, whereas (red line) Nowa Huta for the Future becomes clearly a political statement that addresses and involves no citizens, but large, anonymous investments. source: own work, based on Lebow, 2013., Hajto, 2013., Szymońska, 2008., nhpedia.pl, forumnowejhuty.org, magistratnowohucki.blox.pl, okn.edu.pl

# 5.2. STEELWORKS

Steelworks (pol. huta) was the only reason that Nowa Huta (pol. new steelworks) was constructed. It was also, the largest employer between 1956 until 80's. "The Kombinat" (other name of steelworks) organized work, housing and cultural events in Nowa Huta, producing 6,5 millions of steel in the peak moment (Jagło, 2013). Starting from 1976, the steel crew has declined in number as well as the steel production (Fig. 11).

The disappearance of the main employer created many socio-economical problems. After 1989, when it was clear that the steelworks will not come back to the old heydays, people of Nowa Huta started to be marginalised. Steelworks came through the series of adverse transformations into capitalistic industry and finally was bought by the international steel tycoon: Arcelor Mittal. After huge reductions, the steelworks has reached a small stabilization. Nonetheless, steel production still declines and **factory is aiming to cut off unnecessary grounds** that need to pay taxes for. The future is revealing **gradual disappearance of the steelworks** (Jagło, 2013).

Nowadays, steel factory produces rough steel elements such as wires, steel plates, rods, profiles, train tracks etc. The basic steel elements are mainly exported, but also flow to the local businesses that processess the steel into more complex components, such as building reinforcement, fences, facade elements, steel containers, blacksmith elements, springs, steel grids, railings etc (Fig.23).

**Resource such as steel is entirely recycled, but there is no industry that refurbishes steel elements on a larger scale, tries to reuse them or upcycle, so that the energy needed to melt the steel is not wasted.**

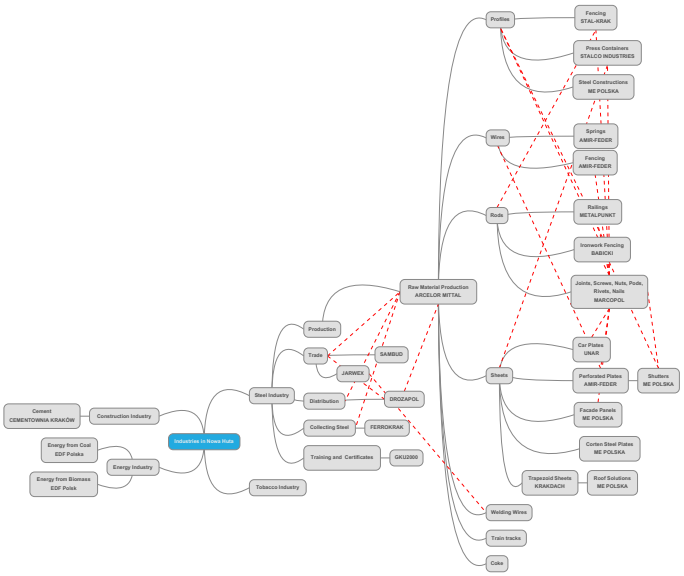



Fig.22. Mindmapping as the method to visualize steel flow in Nowa Huta (own work)

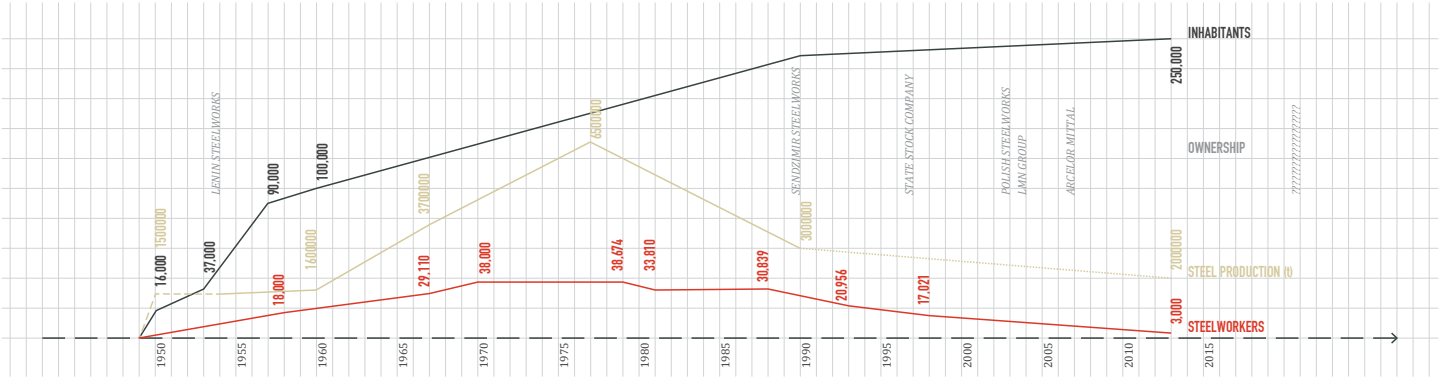



Fig. 11. Decline of Steel Industry in Nowa Huta. (own work based on infromation from: Lebow, K., 2013; Jagło, P., 2013)





Arcelor Mittal

size: +++++
http://poland.arcelormittal.com/
2005 (1956)
local, national and international export
producing rolled steel sheets, profiles, rods, wires, welding wires, train tracks, coke


UNAR

size: +----
http://unar.pl
1991
national production of car steel plates

Drozapol

size: +----
http://www.drozapol.pl
1993
distribution of steel elements

FerroKrak

size: +----
http://www.ferrokrak.pl
2002
managing steel scrap

Stal-Krak

size: +----
http://stal-krak.pl
2005
prefabrication and montage of steel reinforcement in housing and industrial buildings; 1000 tonnes monthly

Sambud

size: ++---
http://www.sambud2.com.pl
1991
trade and simple treatment of steel
300 000 tonnes per year

Stalco Industries

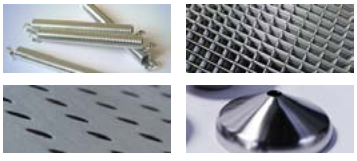
size:
++++--http://www.stalco.com.pl/
1995
clients from western europe, middle-east
producing press-containers

JARWEX

size: +----
http://www.jarwex.pl/podstrona.php?id=1
2001
trade of steel welding tools

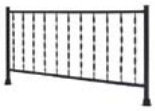
Bobicki Blacksmith

size: ++---
http://www.bobicki.pl/pl/
1987
ironwork, metaloplastics, conservation of steel monuments



AMIR-FEDER

size: +----
http://www.macro-jet.com
2012
distribution of perforated steel, springs, bottoms, steel grids



Metalpunkt

size: +----
http://www.metalpunkt.pl
regional production of steel railings

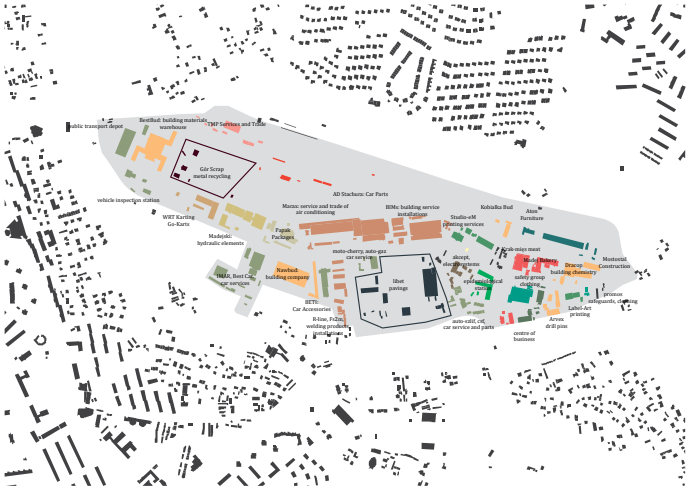
ME Metal Engineering Polska

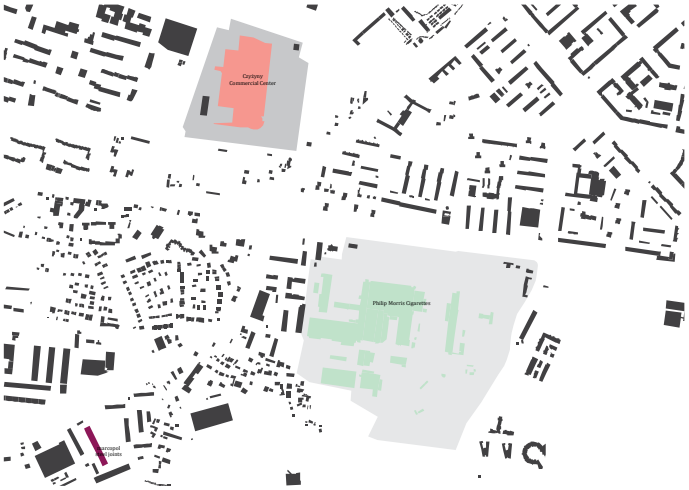
size: ++---
http://www.me.com.pl/
1984
preparing elements for architectonic solutions from steel

GKU 2000

size: +----
http://www.gku2000.pl
2000
welding trainings, certificates

Fig. 23. From rough steel products to more complicated assembly and processing.
There are several companies that find their profits in producing close to the steelworks. (own work)





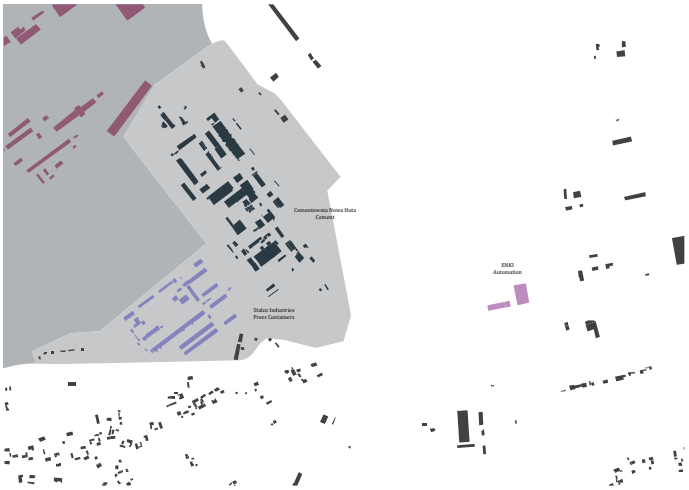



Fig. 24, 25, 26, 27, 28. Mapping as a method to research a variety of existing industries in the area. Many of them is a resultant from existence of large industry as steelworks. (own work)

# 5.3. REINDUSTRIALIZATION

Global trends to reindustrialize the western world bring a question of industry sector in Poland, that against the worldwide processes, retreats (coal mining, steelworking, shipbuilding). From 1525 factories built during communist period, since 1989, 424 was closed. Polish industry nowadays bases on production of subcomponents and fabrication of imported assemblies. That structure does not create conditions to be competitive or innovative (pressmix.eu).

**About reindustrializing cities (Nawratek, 2012):**

1) **industry in cities will create multistructure society** which is able to sustain its living and stabilize materially
2) **building factories is more important than creating entertainment and cultural buildings**; the later will not replace factories, never
3) **allowing informal housing is needed**
4) **polish young generations are very creative and productive, polish cities shall be more open to realization of their ideas**
5) **the city shall not be designed for middle-class since the middle class does not develop in Poland**
6) recreation links between industrial processess and the city is needed
7) new wave of economical solutions is coming: **circular economy, cradle-to-cradle, synergy in the city**
8) people in Poland are too "eyes fixed" into Western Europe and tends to copy thoughtlessly the solutions from those countries
9) fulfilling needs of middle-class shall be replaced by creating alternative systems

The concepts indtroduced by Krzysztof Nawratek are very sharp, reasonable and specific. The urbanist knows Eastern Europe realities thoroughly. He predicted that Rem Koolhaas plan for middle-class realm in Riga will be a total flap due to lack of enough middle-class citizens, that is related to a distinctive gap within industry sector. What stops Polish industry to become more competitive?

**KRZYSZTOF NAWRATEK**, born 1955, architect, urbanist, Ph.D. of Technical Sciences. Graduated in Silesian University of Technology in Poland. Lecturer in Riga University in Latvia and Plymouth University in the UK.

http://www.funbec.eu/teksty.php?id=206

# 5.4. UNFRIENDLY ECONOMY

The transformation from central planned economy to the free market was a great challenge for the young Polish State. The country is succesfully chasing the Western level of life, nevertheless the chase is redeemed with unstable job market and mass emigration.

**The capital market after 1989 can be described in several points (Gadacz, 2003., Michalkiewicz, 2012):**

1) **capital and money are in the certain area until it is profitable for the owner**; it creates unstable future and avoid capital accumulation; the same as in colonial countries
2) **investors do not care about future generations and the area around** the factory since they do not live there
3) **success** in that system is not in finding yourself, but rather **in winning a competition of adapting to current conditions**
4) **ethics and quality of work is very low**, only management class is invulnerable and does not respect rights of workers
5) **people are working overhours**, without benefits, sometimes on weekends, since huge competition on the job market
6) access to the market is dictated by **corruption and relations with administration**
7) those who do not belong to the relation network and achieve significant success are cut off by the state apparatus (e.g. Roman Kluska, Optimus)
8) **Young people** who cannot stand the harsh conditions **emigrates**
9) **30% of national income is produced in gray zone** in conspiration against authority
10) **public debt is growing to sustain inefficient social security instruments**

Restoring friendly market for the local capital and labour is first step to undergo. An economical shift from supporting large corporations to small and middle-size entrepreneurs is needed, before reorganizing heavy industry.

**TADEUSZ GADACZ**, born 1955, philosopher, prof. Assoc., Collegium Civitas lecturer. Published: Freedom and Responsibility. Rosenzweig's and Lévinas Critics of Hegel Spiritual Freedom (1990), Philosophy of Human as the Philospohy of Fate (2000), Learning God Cognitively (2000), About the Skill of Life (2002).

http://www.miesiecznik.znak.com.pl/gadacz573.php

**STANISŁAW MICHALKIEWICZ**, born 1947, lawyer, academic teacher, eseist, publicist, politician and writer. Oppositionist in PRL.

http://www.michalkiewicz.pl/tekst.php?tekst=2584

# 5.5. ON THE COUNTRY BACKGROUND

Poland as the most of the countries in Europe is approaching population decline and aging in the next decades (Fig.29). Nowa Huta like the rest of the country, experiences the problem of mass labor emigration to the Western Europe.

Over 2 millions, that is over 9% of country labor force (Fig. 31), spend at least 3 months abroad working below the level of acquired education. Together with the fact that the public debt is growing worryingly (Fig.30), the economical future of the state is in danger.

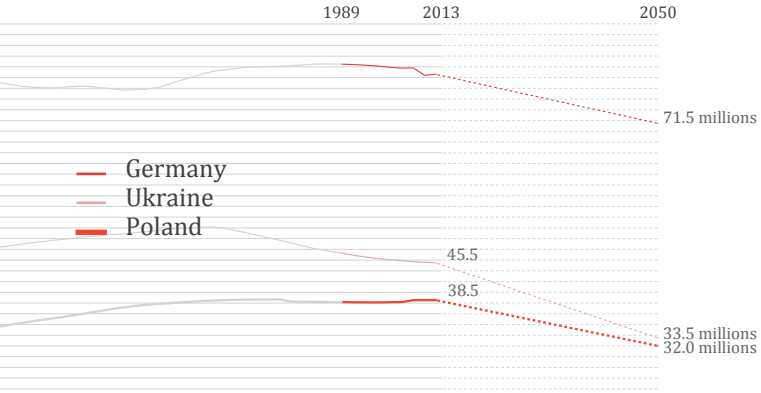



Fig.29. The population of Poland will decrease considerably in the next 35 years. (Eurostat, 2013)

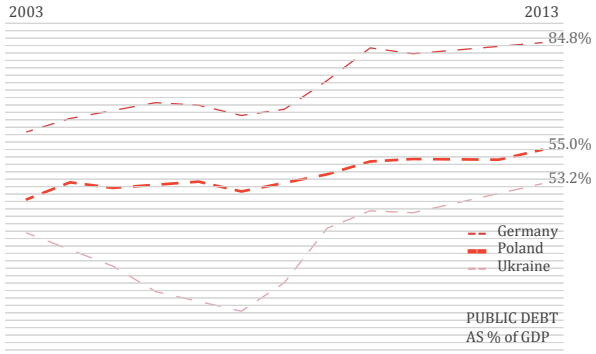



Fig.30. Growing Public Debt will cause in the future problems with GDP development and the solvency of pensions (Statistical Yearbooks, 2013)


Fig.31. Since entry to the European Union, Poland records unceasing outflow of citizens. Estimates shows that over 2 mln of Poles are staying abroad for longer thean 3 months!

# 5.6. SENTIMENT OVER PRL: DISAPPROVAL FOR STATUS QUO

According to the survey of CBOS (office for analyzing public opinion) 44% of people who knows PRL (People's Republic of Poland), misses that period.

**About sentiment for PRL (Jeran, 2010):**

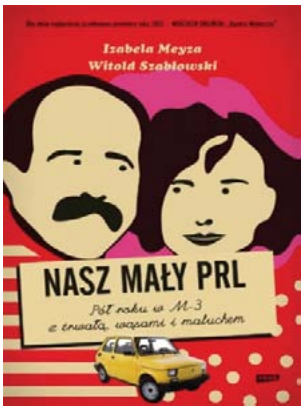
1) what we went through is always better than what we have now
2) **people can find everything in shops today, opposite to PRL, but they cannot buy it.** It is even more frustrating
3) our purchasing power is stronger, but there is more and more to buy
4) **we have more to envy; social inequality is larger nowadays; social exclusion exists**
5) because of goods shortage in PRL, people inside families helped each other and took care of themselves, in opposition to the present

**AGNIESZKA JERAN**, born 1978, sociologist, academic teacher, writer

http://www.pomorska.pl/apps/pbcs.dll/article?AID=/20100326/REPORTAZ/431931277

Ministerstwo Śledzia i Wódki in Bielsko-Biała

The boardgame of year 2012
Kolejka (the Queue)




happening: half year in PRL

Lorneta z Meduzą in Katowice


Polska Kiełbaska dla Ludu

communist tours in Nowa Huta
in cars from previous system

cloth branding back from PRL

students refurbishing "saturator"

Fig.32. Sentiment over PRL has brought a new set of cultural and entertainment entrepreneurs that bases their stylistic on the old PRL times. Many of that activities demonstrates boldly, that the contemporary identity of Poland is build to the great extent on the Soviet pop-culture.

# 5.7. CASE STUDY: OSTALGIA IN DDR

**Ostalgie**
A German term referring to nostalgy for the pace and specificity of life in the former Eastern Germany. Suddenly, after transformation of 1989, many amenities originally produced in Soviet Union disappeared from the storefronts and were replaced by Western products. Today in Berlin, the heart of former DDR, the sentiment comes back becoming a great tourist attraction.

Is Nowa Huta able to profit from tourist on the same extent?



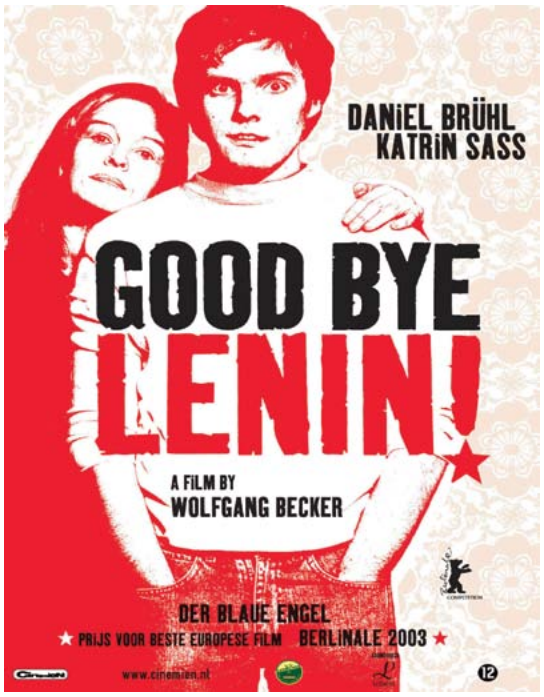





Fig.33. Berlin succesfully became a place for communist tourism.
Museum of DDR, Museum of Berlin Wall, Berlin Wall itself, or souvenirs referring to the earlier era are important tourist attractions.

# 5.8. ECONOMY OF SHORTAGE IN PRL

People missing the old times led the research to the question. What was the economy of PRL? The central steered production was inefficient and led to shortages in supply. In that conditions multicycling of resources, characteristic to circular economy promoted nowadays by EU, was inevitable. Images below (Fig. 34, Fig. 35) demonstrates an album of solutions that was created when the resource scarcity appeared. Though, the 44% of Polish Society are missing circular economy or the youth time? Is there a value of having less material objects, but more time?

**BOMIS - OFFICE FOR REDISTRIBUTION OF WASTE:**
National Institution, **mediating between enterprises** interested in getting rid of byproducts and the others which wished to purchase. From 70's and 80's selling defective products to everyone interested.


**SMALL REPAIRS (REPASACJA):**
Hand-made **repair** of women stockings between 60's and 80's because of the high price of a new pair. Very popular **one-person business**, allowed by communistic state.

**SMALL VENDORS (CINKCIARZE):**
Cinckiarz (eng. change cash), a person in PRL who illegally exchanged currencies. A type of **one-person firm.** Even if working in black market, unoficially not chased by the law.

**SMALL PRODUCTION AND SERVICE:**
Another type of **one-person enterpreneurship. Manufacturing and repeairng of daily use-objects** such as umbrellas, shoes was hard in soviet time, nevertheless possible. Products often were c**ycling between consumer and producer,** who gained experience over time.


**SMALL CRAFTMANS:**
Locksmiths, watchmakers, goldsmiths etc., were small, often family enterprises with specific type of craftsmanship, taughted across generations. Still visible on the market, slowly displaced by cheap mass production .

**KLUB RUCHU - CLUB OF READERS, BOARD GAMERS:**
**Common place** for people interested in reading books, watch tv or play board games. Based on **sharing** devices and objects. Creating bonds in society. Popular especially in countryside.

**CZYN SPOŁECZNY - ARRANGED BOTTOM-UP:**
**"Bottom-up activity" arranged by the state.** Usually managed and performed in free-days. Often believed to be superfluous, wished to create "a national spirit".

Fig.34. Circular Economy in PRL. Inevitable effect of central steered market. (own work)

**SATURATORY:**
Movable device saturating a liquid with gas. Popular in summer, belonging to former folklore. Characteristic for staurators was the use of **multi-use** glassess. After transformation, disapperead from lanscape due to appearance of cheap bottled gas water. Recently reappeared in Łódź City.

**(PGR) State Agricultural Farm:**
Forced by Soveit Government **collective farming.** Relatively unefficient and subsidized by the government. Bankrupt suddenly after fall of communism.

**SPOŁEM:**
**Common Consumers Cooperative.** Established in 1868. Having patriotic character during the time of annexation of Poland between 1795 - 1918. During the communism time, gathering 61 680 members and 676 shops. Having monopol on many articles like Pepsi-Cola, cuban oranges, "Safety Soap" etc. Between 1984 - 1993, number of shops drastically decreased to 166 and 3 329 members, to reach 69 shops and 1 024 members in 2010. Cooperative even today is a**iming towards helping local communities** and succesfully works within different political systems.

**BARY MLECZNE (Milky Bars):**
Snack Bar created in interwar period. Widespread in postwar time. In Milky Bars one can find traditional dishes, mainly vegetarian, based on diary products. Most of servings consisted of flour, eggs, groats, rarely with meat. Characterized by **low prices** (three times lower than in restaurants) calculated adequatly to one cent. Supported by government, so that the **poor citizens can afford it**.


**BADYLARZE:**
Negative term describing **private entrepreneur (farmer)**, who delivered local communities **articles of first necessity**. Their activity was strongly connected with existence of the **economy of shortage.**


**ZAPIEKANKI:**
**Local Fast-Food** created in 70's, popular in PRL. Zapiekanka is a bread with topping as mixed mushrooms and onions covered with cheese.

Fig.35. Circular Economy in PRL. Inevitable effect of centrally steered market. (own work)

# 5.9. QUESTION OF CIRCULAR ECONOMY TODAY

To become familiar with the circular economy concept check Appendix A: Review Paper.

Innovation, that is necessary to create the circular economy system, is on a very low level in Poland. Within 28 EU countries Polish Innovation Index places the country on the 24th position.

Poland bases its energy policy mostly on non-renewable energy sources. Only 11,9% of energy is renewable, mostly extracted from biomass giving Poland 19th position in EU (Fig. 37). Domestic Material Consumption in total, places the country on the 3rd place in Europe with 685 790 000 tonnes in 2013 which is 10,3% of the whole EU while being 6th most populated country with 38,5 millions people - 7,6% of the whole EU. (Eurostat)

The economy of Poland is recycling 72% of industrial waste. The rest which is 31 360 000 tonnes is landfilled. The domestic waste is smaller in amounts and oscillates around 9 600 000 million tonnes - 246 kg per citizen that is only a half of European average (Fig. 36, Fig. 38).

From the waste that can be reused, 45% percent is landfilled and from what can be recycled, around 60% is not preserved. From electrical waste 1 out of 3 kilograms is collected (GIOŚ, 2014) (Fig.39, Fig. 40).

The stage of waste recycling in Poland, that is the main factor creating circular economy is on a low level nowadays.

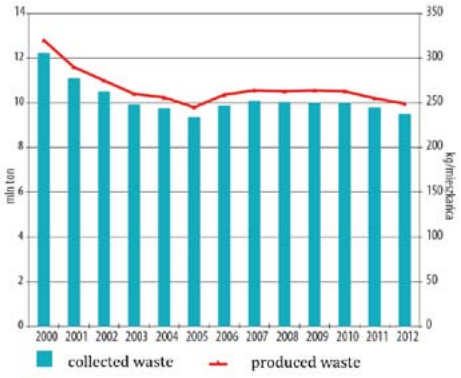



Fig. 36. Household waste production and collection
source: (GIOŚ, 2014)

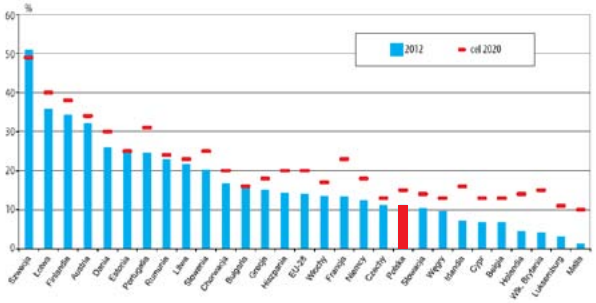



Fig. 37. Percentage of renewable energy in EU
source: (GIOŚ, 2014)

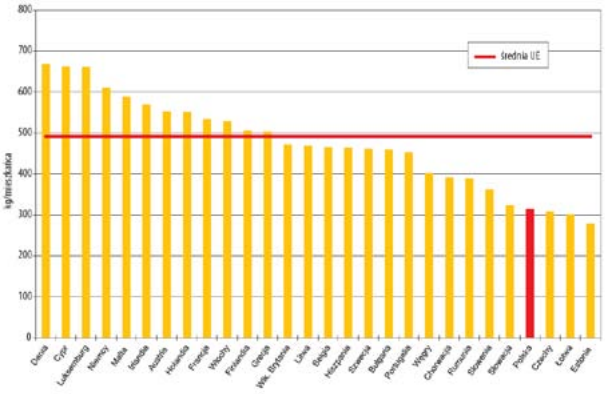



Fig. 38. Waste per citizen in EU
source: (GIOŚ, 2014)

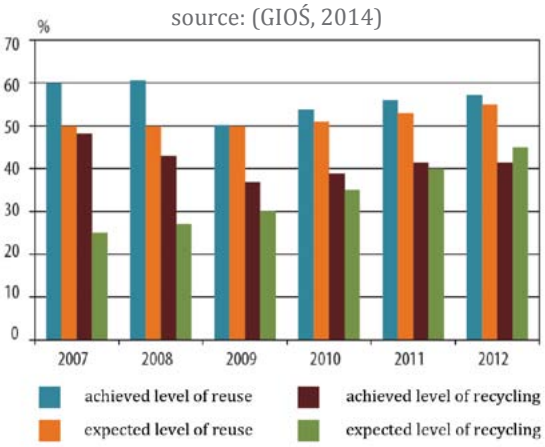



Fig. 39. Levels of Reuse and Recycling in Poland
source: (GIOŚ, 2014)

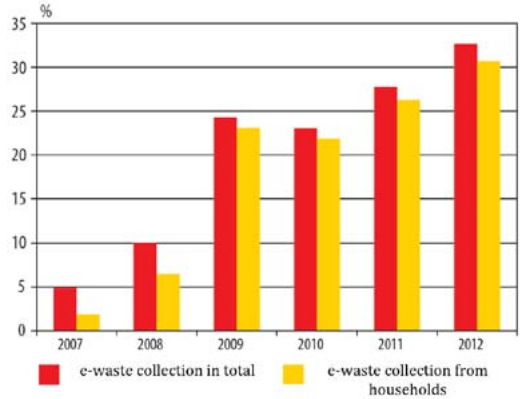



Fig. 40. E-waste collection in Poland
source: (GIOŚ, 2014)

# 5.10. MUNICIPAL SOLUTIONS TO THE PROBLEMS

The custody over Nowa Huta is held by the Kraków Municipality. The city endeavours to analyse the temporal problems of the housing estate, proposing standard solutions and looking for financing of the investment in "various European funds" (Local Program of Nowa Huta Revitalization, p.54). **The plan does not provide solutions for the people to earn a living, rather aims towards beautification of the area.** Public debates about the revitalization plan has revealed that weakness (Fig. 41, Fig. 42). Moreover, the plans that supposed to change the quality of life of the citizens are not widely known and since 2008 **only a few of them are realized due to the lack of funds** (Fig. 43, Fig. 44).

Photo by nchlsft/Shutterstock.

"So we must now, creatively, think to develop altogether; so everything have sense. Not like every man for himself. **I hope that revitalization will not only be about architecture, but of social regeneration.**"

*- participant of public consulations*

**"We cannot only focus on one-dimensional beautification, since the burning issue in Nowa Huta is economic situation."**

- another *participant*

Photo by nchlsft/Shutterstock.

Fig.41, Fig. 42, Inhabitants participating in the public consultation raise important questions for Nowa Huta future conditions. source: LRP of "Old" New Huta"; public debates 7 III 2008; 4 IX 2014

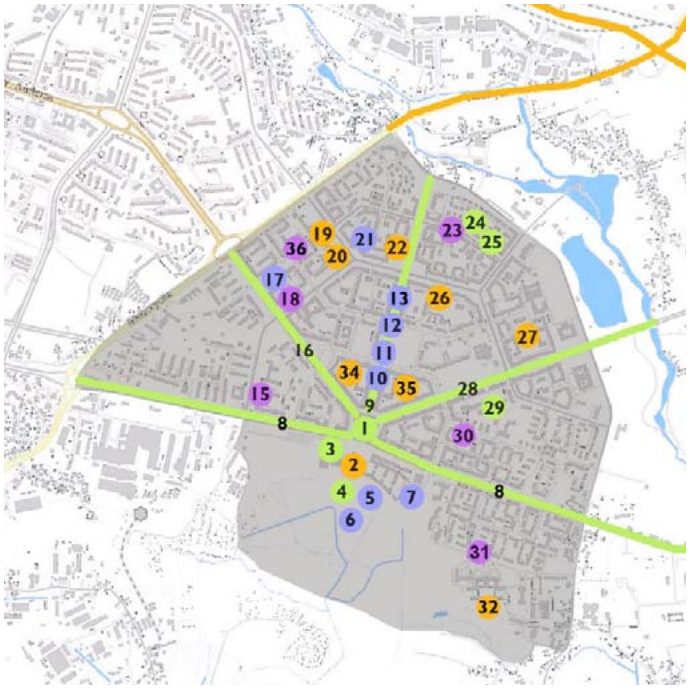



Fig.43. List of projects in Nowa Huta under LRP Program, only few of them have been realized. source: Adamczyk, G., Municipal Revitalization Program for Nowa Huta, IX 2008, p.74

- Do you have the knowledge of any LRP projects for Nowa Huta?

- No.

Fig. 44, 92% of the citizens of Nowa Huta is not familiar with LRP of "Old" New Huta" that is provided for them. Where, between top-down and bottom-up, stays Local Revitalization Program?; public debates 7 III 2008; 4 IX 2014

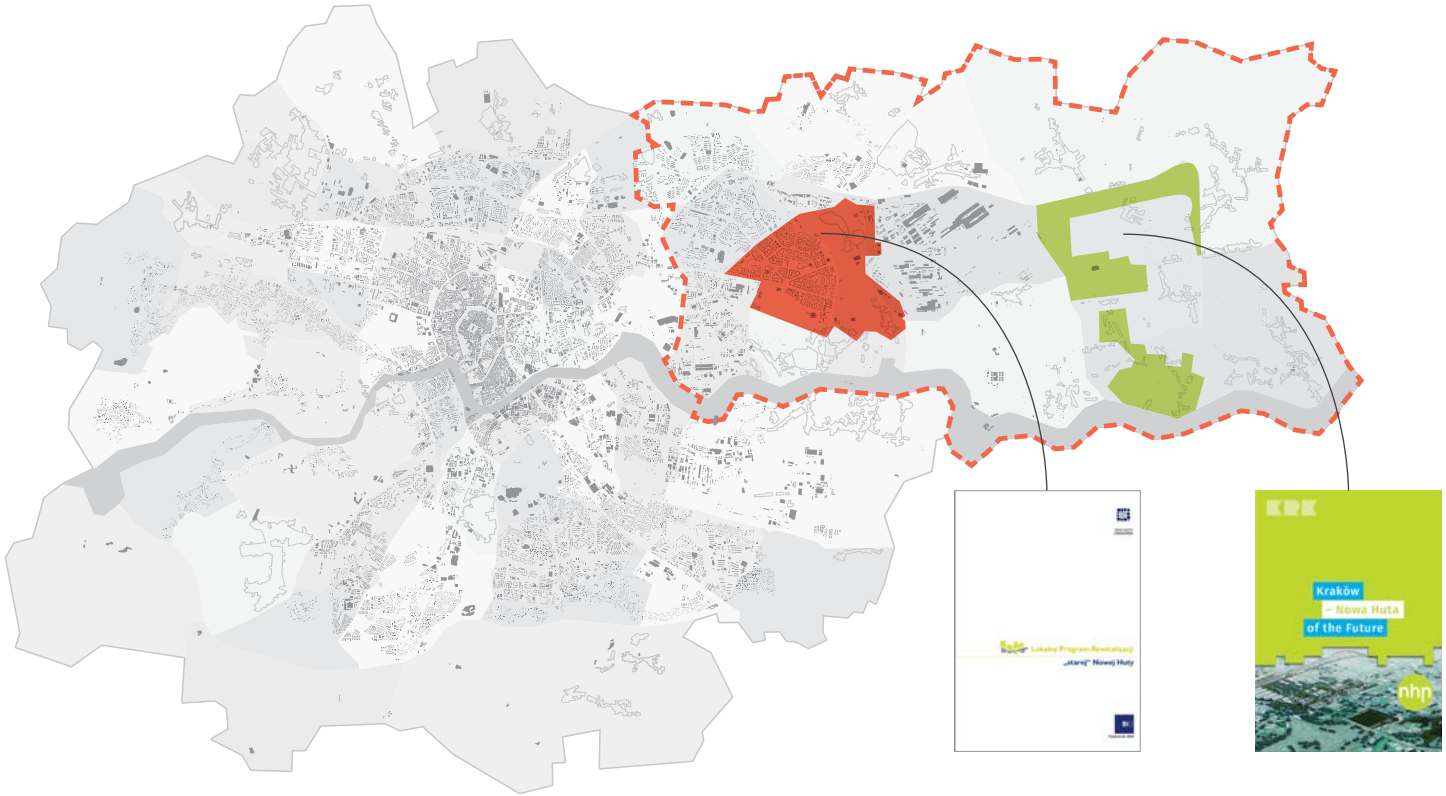



Fig. 45. Two, not interlinked plans for Nowa Huta that are dependant mostly on the external resources (European Funds) and external capital that could invest in the area. (own work)

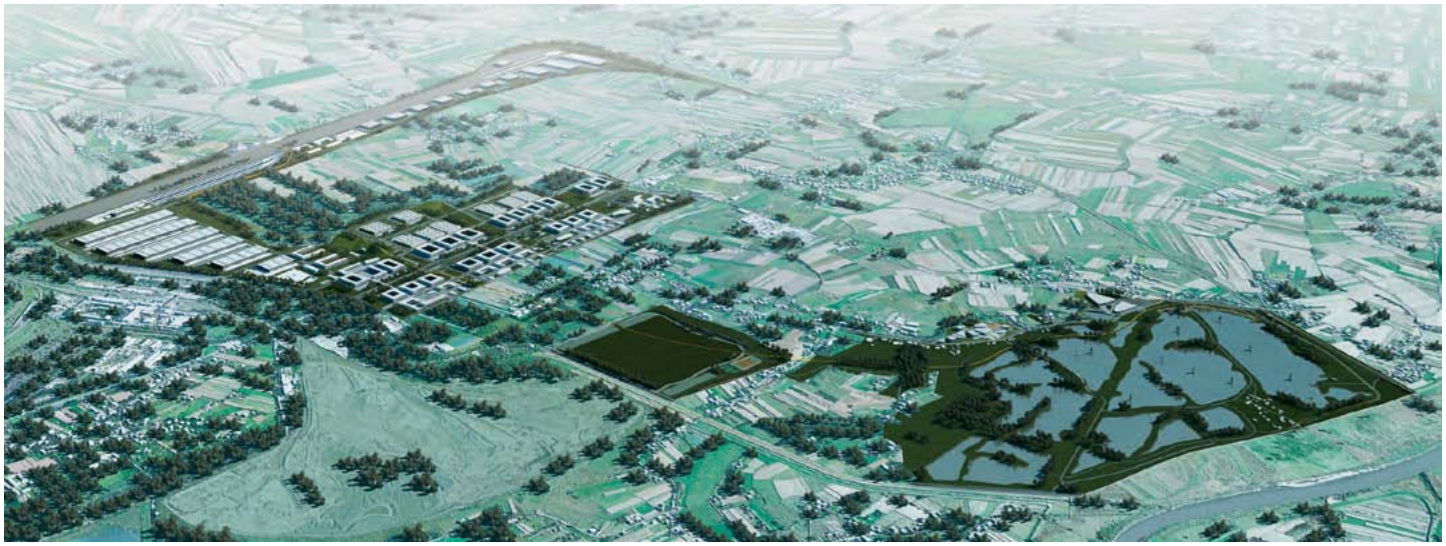


Fig. 46. Nowa Huta of the Future. “Smart City from a box?” source: City Development Department of the Municipality of Kraków


**Projects in Nowa Huta by user needs**
source: LRP of "Old" New Huta"; public debate 4 IX 2014


**Projects in Nowa Huta by destination (personal elaboration)**

Fig.47. Local Revitalization Plan: Does the plan correspond to the needs of citizens? Are the society needs far-sighted?

On the other hand the Kraków Council announced in 2012 an international competition called "Nowa Huta Przyszłości (Nowa Huta of the Future)" (Fig.46) requesting various urban planning studios to propose a huge investment project over the area located eastwards from the former Nowa Huta. **The lack of consequence in planning (submitting sprawling development before consolidating the city into more effective compact shape), rampant intentions such as a plan to expand the city by more than twenty percent, while demographic decline is predicted and leaving Nowa Huta inhabitants aside to the plans have to be considered critically (Fig.47). Mismanagement and strong antypathy towards municipal authorities became a reason to declare willingness for autonomy in the form of activist group "Magistrat Nowohucki" (Fig.48).**


Fig. 48. on the 12th of December 2012 in the cameras of nationwide television, Magistrat Nowohucki declared wish of Nowa Huta to become an independent city, source: Fakty TVN

Fig. 49. Design Motif: the vision of Nowa Huta as a compact city that responsibly uses the available resources around it.

# 6. GRADUATION AIMS

Studio Design as Politics challenges the graduation project "to think both in utopian as well as in an extremely realistic way: imagining a whole new society, but building it with what can be seen around" (Studio Guide, p.8). With this approach addressing the problems of Nowa Huta has to proceed in an extraordinary manner. The starting point of the research is to envision an utopian concept of the Nowa Huta as self-sustaining urban system which evolves from existing conditions.

The utopian image (Fig. 49) that has been prepared in the beginning of the course refer to the concept of Lewis Mumford, an American writer, who states that the structure of modern planning is in a great extend responsible for vast social problems. The writer imagines the perfect habitat in the shape of medieval town, whereas people have had more organic relationship with the nature (Mumford, The City in History, 1962). The subjective image was a „design motif, that drives the design process and leads to the creation of a design from internal perspective" (Nagai, 2009, p.16). " It also leads the research into the context of the transition from linear to circular economy and the recent movement of European regions towards autonomy. Why Nowa Huta cannot be autonomous? (Fig. 50)

Therefore, **the overall goal for the graduation project is to invent an urban utopia that tries to look ahead towards the better world on the ruins of the welfare system that we are a part of. The world less dependant on the global market, with diverse regional identities, more responsbile for natural environment and self-governing locally.**

The aim of the graduation is not only proposing a quality improvement of the buildings and space around them, also creating a new urban living system. In that sense, graduation tries to extended the urbanist role towards being more active in the fields of economy and politics and extend designing the urban tissues to design processes within them.

**Goals for the research part (see fig.66):**

A) to research on the application of the circular economy to the urban development and the role of urbanist in that activity
B) to analyze the local context and circumstances in order to propose exceptional scenario for the transition from linear to circular economy
~~C) to get involved in the actual processess of getting independence in Nowa Huta~~

**Goals for the design part (see fig.66):**

A) to design a coherent and complex strategy for Nowa Huta 2050 that answers coming socio-economical problems and fits in the theory of circular economy
B) to test the strategy in smaller scale (mezoscale) and show the process of changes of the area

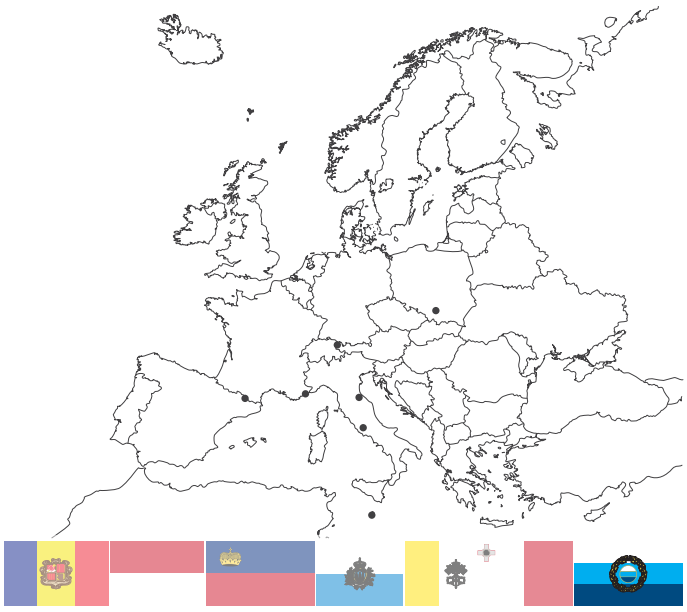


Fig. 50. Nowa Huta, a new independent microstate on the map of Europe (own work)

# 7. RESEARCH QUESTION

How circular economy utopia would look like?

How developed is the civil society in Nowa Huta?

**How the circular economy utopia could support the emergence of the civil society in Nowa Huta underpining its identity, independence and improving the economical situation in the area?**

What is the identity of Nowa Huta?

What are advantages of independent Nowa Huta?

Why improving economy in Nowa Huta is important?

# 7.1. SUB-RESEARCH QUESTIONS

Sub-research questions in the graduation project will support the themes raised in the main research question by referring them to the spatial dimensions. That method shall help to focus on urban planning and design.

1) What are **spatial concepts** that facilitates circular economy? — **circular economy utopia**

2) What can be the role of the civil society in the **urban tissue**? — **civil society**

3) Can the identity of Nowa Huta be co-developed by **urban fabric**, architectural forms, chosen materials etc.? — **identity**

4) What **spatial concepts** can help to detach Nowa Huta from Kraków? — **independence**

5) What **strategies, typology of buildings, functions or public spaces** can improve the local economy? — **economical situation**

# 8. RELEVANCE

**Design as Politics studio:**

"the government as the great insurance company with an army is being deconstructed (...) and seems intent on making itself smaller rather than bigger" (Studio Guide, p.7)

**Manifesto for a Resource-Efficient Europe:**

"In a world with growing pressures on resources and the environment, the EU has no choice but to go for the transition to a resource-efficient and ultimately regenerative circular economy."

**Magistrat Nowohucki:**

"What is good in the concept of Free Nowa Huta is the authentic alternative against what you can see in "the lounges". This is about our backyard, our tomorrow, our city."

The utopian project shall contribute to the overall research of Design as Politics Chair that explores commonalities and tensions between politics and design. Researching on possibilities of Nowa Huta to become independent not only on the administrative, but also on the self-sufficiency level with special attention to the aspect of reindustrializng area shall contribute to the concept of transition from linear to circular economy promoted by European Commission. Finally, the design shall be a spatial vision for the purposes of Magistrat Nowohucki, which is an active group promoting the independency of the city of Nowa Huta.

## 8.1. SOCIAL RELEVANCE:

The societal challenge that is fulfilling the gap after weak central governments (Studio Guide, p.7) is of high importance for the whole Europe. In the Eastern Europe context it is even more significant, since the civil society have never been decently established there. Moreover, in Poland, changing government since 25 years cannot solve or even do not see the problems of growing public debt, ageing population, mass emigration, decent health care system, pensions funds, earnings way behind western european level etc.

Observing powerless and shortsighted government leads to exploration of new kind of systems, especially within young and active generation. In the European Parliament Elections in 2014 people within age 18-25, in the opposition to the rest of the society, decided to support a political party that is EU-sceptic and stipulates serious limitation of the government role in the country. (Dziennik Wschodni, 25 May 2014). The graduation project that tries to imagine self-governing society seems to be very relevant.

## 8.2. SCIENTIFIC RELEVANCE:

On the other hand, European Commission on the 17th December, 2012 has released a Manifesto for a resource efficient Europe that calls for transition towards "resource-efficient and ultimately regenerative circular economy". **The EU encourages innovation and private investment, smart regulation, accelerate transition, using taxes to stimulate innovation, promoting products and services that are less impactful on the environment** and finally establishing the targets and indicators to measure progress.

Graduation project tries to reflect on the manifesto. Firstly, defining the urbanist role in the transition towards circular economy in the theoretical part. Secondly by examining the complex local conditions and possibilities within the resarch part. Finally, exploring possible design solutions for circular economy on many scales in Nowa Huta.

The master thesis will contribute to the existing state of knowledge on the circular economy per se, but also will try to answer the question: is there a way that growing need for market freedom and individualism of young polish society is binded to the "ultimate"and top-down planned transition towards circular economy run down by the European Commission?

# 8.3. PERSONAL RELEVANCE (MOTIVATION)

Observing tensions between politics and planning has determined my choose of the graduation studio to Design as Politics. Also, personal belief, that globalization is harming diversity in biological, cultural, identity and economic areas.

**Moreover, the location for research and design was chosen due to being familiar with Nowa Huta and the polish habitat in general. The product of research and design shall contribute to the development of urban visions that are almost non-existing in polish cities and become more involved personally in the process of change of status quo.**

Finally, selecting circular economy based on local cycling of products as the basis for utopian vision, I determined by personal believe that globalized economy creates imbalances in the world. Fortunately, the by-products or waste in the linear economy, become goods in the circular economy which results in the explosion of the people's creativity.

Fig. 51, Fig. 52, Plant and herbs hangers:

on the left: "ikea socker"

on the right: recycled from plastic bottles.

Which one is cheaper and lasts longer?

sources: bp.blogspot.com, recyclart.org

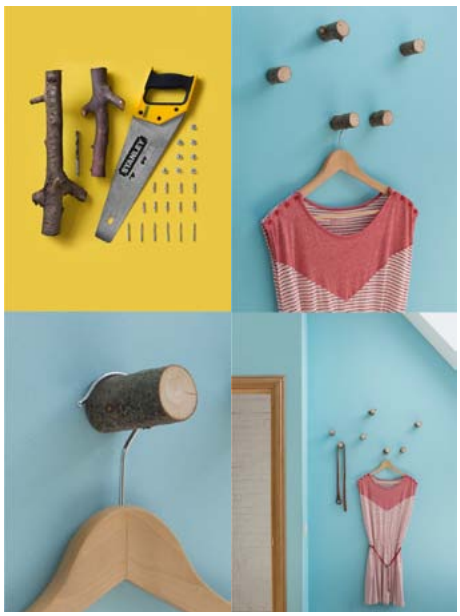


Fig. 53, Fig. 54, Cloth hangers:

on the left: "ikea bästis"

on the right: a branch found under the tree.

Which one is more sustainable?

sources: sumally.com, recyclart.org

# 9. THEORETICAL FRAMEWORK

To build a strong theoretical framework I treated literally the definition of (Swanson, 2013):

"The theoretical framework is **the structure** that can hold or support a theory of a research study. The theoretical framework introduces and describes the **theory that explains why the research problem under study exists**."

The structure (theoretical framework) (Fig. 55) is constructued around three topics that have supported the development of the utopian conditions required to work within Design as Politics studio guidelines. The threefold literature review treats:

1) Literature on utopia. Thomas More in his "Utopia" imagines an island that evolved from very basic conditions to a local political power with complex identity and system of values that perceive commitment to the society higher than gold and other natural resources. Studying of Colin Ward utopias, helped to understand that utopian city does not need to be a high-tech product satisfying all possible necessities, but can be a system based on common identity and a place for free development of society.

2) Nowa Huta is the Ruin of the Welfare State with its problematics described already. It is a place that needs more than "comfortable realities of the past decades where 'public and 'government' were always associated." (Studio Guide,p.8). The literature assists in finding an identity of the place, its history and socio-economic potential. Nowa Huta is also a place that have its own autonomy movement "Magistrat Nowohucki" that the graduation project is a part of their manifesto to separate as an individual city.

3) Circular economy that supports the scientific background of the project and answers the request of the studio guidelines that is creating self-sufficient communities. The concept and its application in urban design and strategy are further described in Appendix A (Review Paper).

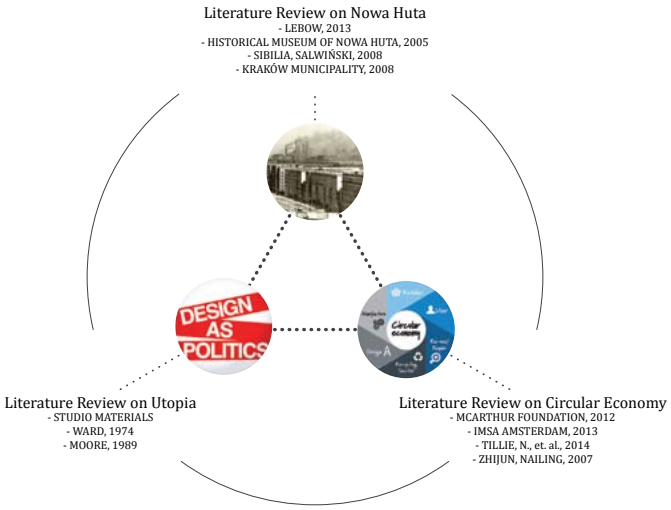



Fig. 55. Theoretical Framework of the Graduation Project

# 9.1. ANALYSIS FROM THEORETICAL FRAMEWORK

Confronting theories and literature, first concepts and analysis emerge (Fig. 56.):

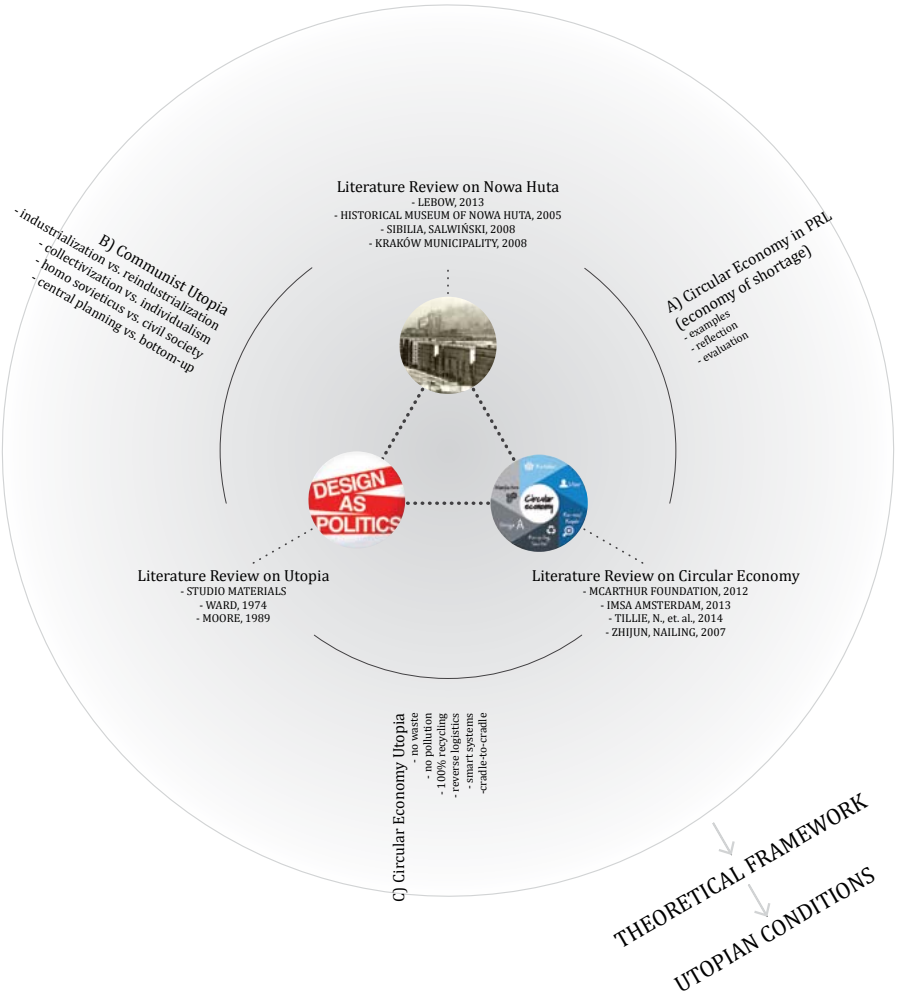
A) The circular economy concept that indicate resource scarcity was already present in Nowa Huta in the communist time as the economy of shortage. Further analysis demonstrates many examples from daily life in PRL that today are explained as circular economy i.e. reusing mustard glass as a drinking glass or institutions to exchange waste between industries. Nevertheless, the system was insufficient, forced and was a result from bad planning. Moreover, Polish citizens have no good memories with so called "circular economy".

B) Nowa Huta itself was an utopian project arranged by communist government. Industrialization of the country was necessary to build the socialist society.

But how on the ashes of existing centrally controled Steelwork, create a society that works more from the bottom-up? The same dillemmas comes when reflecting on homo sovieticus - a person that life is organized by the communist government and that still exist in the non-communist country. The question of the emergence of civil society is inevitable.

C) Circular economy in general is the utopian concept. Absolute waste reduction, saving energy from multiple upcycling goods rather than instinctive recycling, reverse logistics that creates bond between producer and customer or finally, industrial system that keeps resources cycling are utopian concepts itself. How to implement them in Poland that landfill 75% of waste?

Fig. 56. Additional analysis arising from theoretical framework structure



# 10. CRUCIAL INTERVIEWS

Interviewing people commited to Nowa Huta was an important method in assessing hitherto research findings, concluding analysis and making design decisions afterwards called “utopian conditions”.

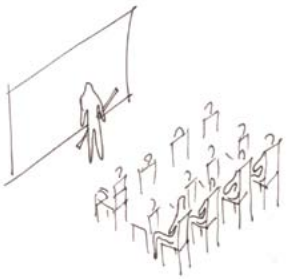
Conversation with Michał Stangel, a polish urbanist who won “Nowa Huta of the Future” competition, on the role of urbanist has revealed that the **participation tools in polish urbanism exists only in theory**. The urbanist mentioned the fact that **the profession is not a decisive factor while commissioned by private developers** and in general **society needs to be educated to understand better their role in creating cities**.

***Where is the urban planning in Poland heading? 18 XII 2014***

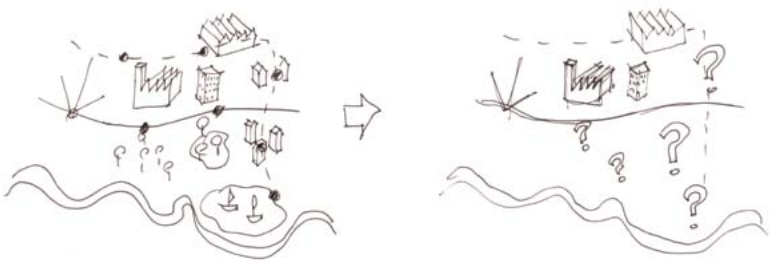
**MICHAŁ STANGEL**, architect, urbanist, Ph.D. of Technical Sciences. Graduated in Silesian University of Technology in Poland. Familiar with the city revitalization problematics. Set up ARCA urban design studio which won the Ist prize for “Nowa Huta of the Future”.

“ Participation tools are weak and at the end of process ”

“ Urbanist has more to say while commissioned by the municipality ”



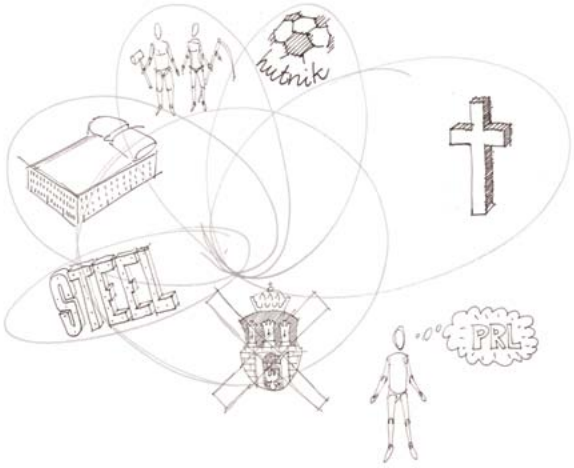
“ Entire society needs a proper education ”



“ Most of the urban plans, such as Nowa Huta of the Future is revised and restricted by the economy”

Fig. 57. Sketches from interview (own work)

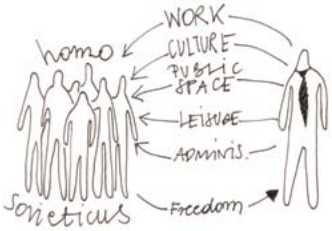
Another interview, with Paweł Jagło, historician from Historical Museum of Kraków, who knows the history of Nowa Huta by heart, demonstrated that **Nowa Huta identity is created on the opposition to Kraków**. The cult of steelworking did not develop and **people are strongly rooted to the catholic faith**. The future of Nowa Huta according to him is not optimistic. **More and more people leave the place**, the civil society does exist, but in a form that **people are not able to decide for themselves and are still waiting for the municipality initiative**.



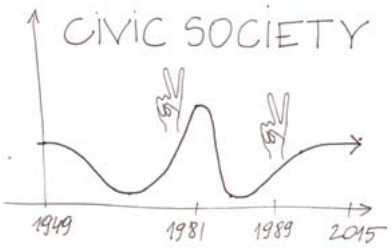

" Identity of Nowa Huta is mainly being constructed on the opposition to Kraków. The other significancies are the catholic faith, farm and manual labor roots. The other like sentiment to the PRL, or 'steel culture' are inconsiderable"

***Is there an identity of Nowa Huta? 18 XII 2014***

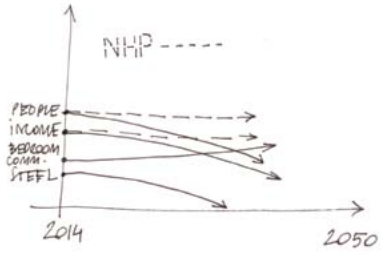
**PAWEŁ JAGŁO**, historician, writer, publicist, Kraków Historical Museum, Department of Nowa Huta History



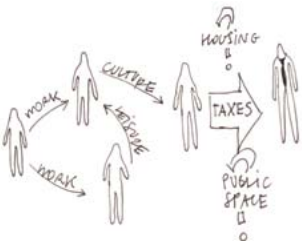

" Authority in PRL shaped a human that is not able to decide for his own "



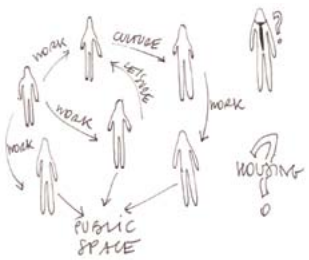

" The civic society does not exist in Nowa Huta. It was succesfully erased in communism and it will eventually occur together with new generations. "



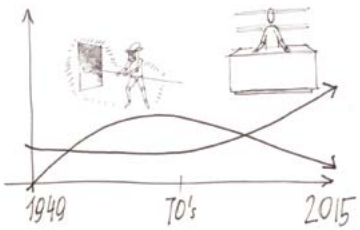

" We shall be not too optimistic about the future of Nowa Huta. If there was no a plan for change, the place will meet a huge crisis."




" Authorities in the free country couldn't organize public space and housing for its citizens "



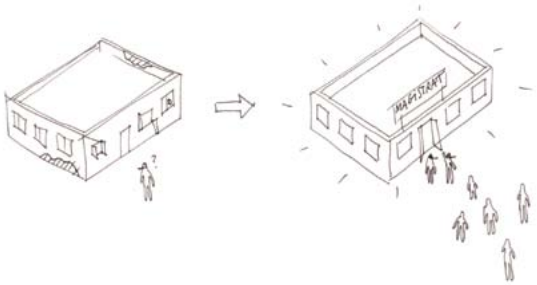

" Young generation couldn't afford a flat, but hopefully is more active than the old generation "




" Over the years, less and less people from Nowa Huta are involved in steelworks, small businessess are more common. "

Fig. 58. Sketches from interview (own work)

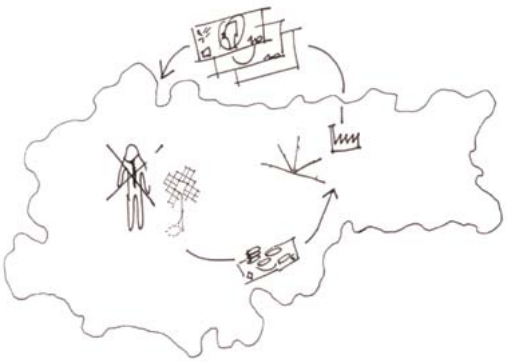
The last interview with an activist from Magistrat Nowohucki, Maciej Twaróg, revealed that **Nowa Huta is a place of lot of plans but no action**. The activist has proposed the demarcation line between Kraków and Nowa Huta and proposed a strategy in which Magistrat Nowohucki is the driving force of changes. The group of people involved in Nowa Huta should occupy abandoned kindergartens and teach young generations of useful crafts and arts and be taught to love their district since it will be their own city.



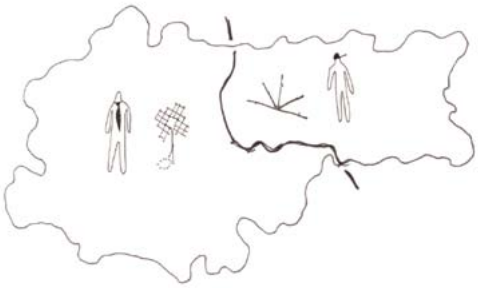
" We want to take control over vacant buildings and return them to the society, but the bureaucracy is too complex"

***Why is the independent Nowa Huta better?***
***20 XII 2014***

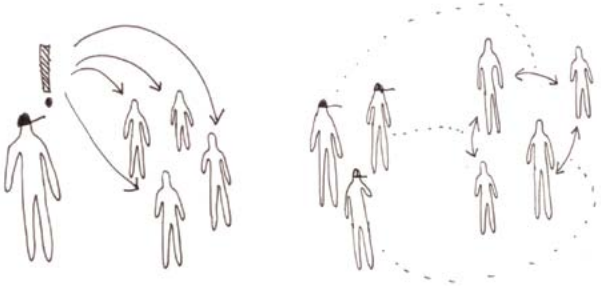
**MACIEJ TWARÓG**, local figure, politician, activist, writer; former alderman in Kraków Municipality; co-creator of "Magistrat Nowohucki", which wants to separate Nowa Huta from Kraków



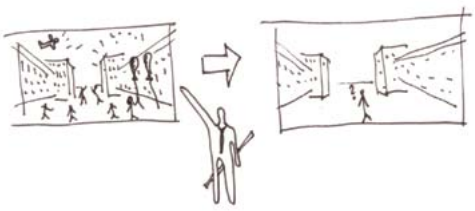
" Nowa Huta is drained by Kraków Municipality "



" We need our own president, the border is clear for us.
It will be the 12th city in Poland with 250,000 inhabitants "



" We want to educate future generations and prevent them from running away abroad. This is the place where they could find their happiness. Restoring misssing bonds within the society is also our goal."



" Plans for Nowa Huta
are on the paper for too long. "

Fig. 59. Sketches from interview (own work)

# 11. UTOPIAN CONDITIONS

Series of determinants (Fig.60) have been created while investigating characteristic features of Nowa Huta. They are already crucial **design decisions** and organize imaginary society into separate entity on the map of Europe.

Project will aim to design on the assumptions that:

1) **Steelworks** as the main industry in the area will dissolve into small enterpreneurial workshops **producing locally**

2) Nowa Huta will be an **independent economical zone** not only on the scale of Kraków, but also the whole country

3) **Social Security will not exist.** Every citizen will have its own bank account that he/she saves money on and dispose freely and wisely. The strong catholic community gathered around churches in Nowa Huta will assist voluntary

4) The index of GDP that focuses on the production expressed in money, will be prelaced by **HDI, that measures human development**

5) The **post-communist society** that is in the majority, will succesfully **rearrange itself into civil society** that is responsible on the public space.

6) To facilitate the return Poles from exile, make entrepreneurship easier and facilitate circular economy, the **income tax will be abolished**.

7) **EU funds** that can be issued on the beautification of public spaces and elevations, **will give rise to the circular economy transition**

8) Due to lack of resources and initial capital, **focus on the recycling of waste** seems to be an adequate starting point for improving the economy in the area

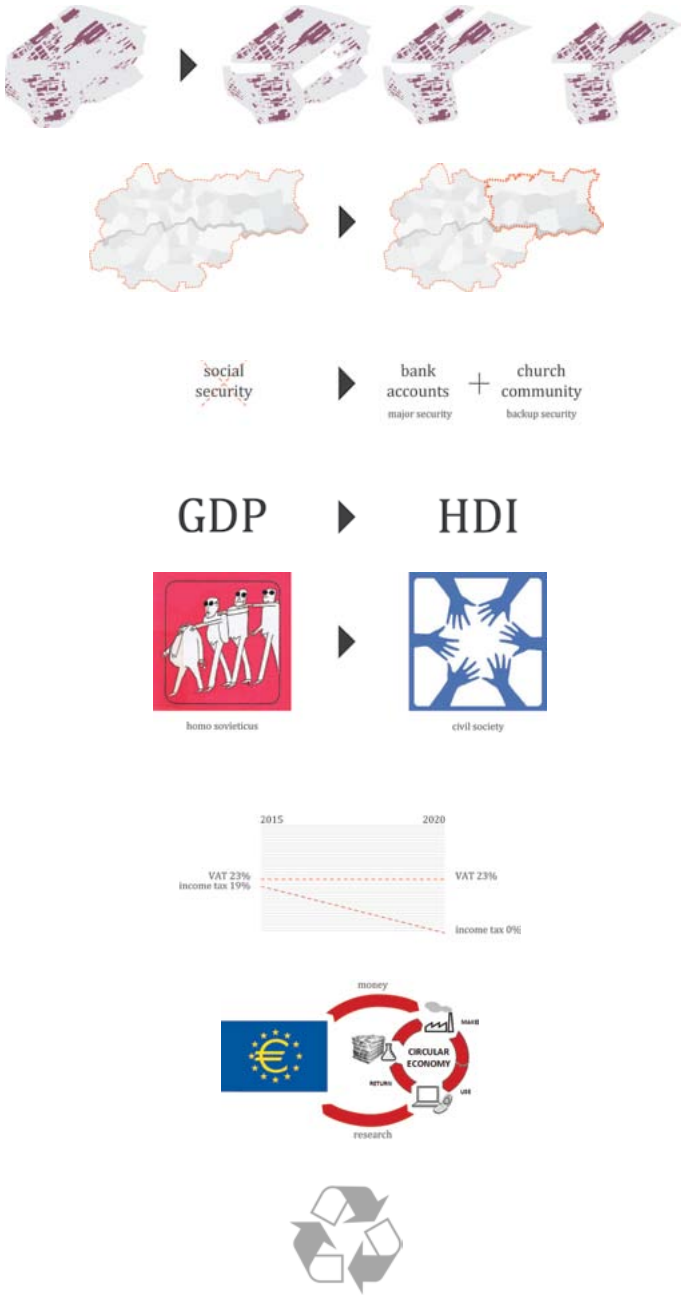



Fig. 60. Graphical presentation of utopian conditions (own work)

# 12. SCOPE OF THE PROJECT

The specifity of the research and design raises questions on many scales. What is the political status of Nowa Huta? What is the relation between Nowa Huta and the rest of the country or Kraków? To place the utopia in a broader context, research on various scales is necessary.

In the country scale (Fig. 61), Nowa Huta becomes an urban laboratory for testing circular economy in practice and tries to deal with approaching problems. Because of the high national waste landfill ratio and low innovative level, the city becomes an innovative waste filter for the rest of the country. Problems related to the entire country are tried to be solved in Nowa Huta.

Nowa Huta as the place constructed in the opposition to Kraków still derives its identity from that fact. The utopia assumes that the city is perceived as a separate entity that needs to take care of its own resources and be planned independently from Kraków (Fig.62).


Fig.61. Nowa Huta on the national level (Kraków boundary in correct 1:1 scale). On the largest scale, the area becomes an urban laboratory for experiencing circular economy in practice. source: (own work)

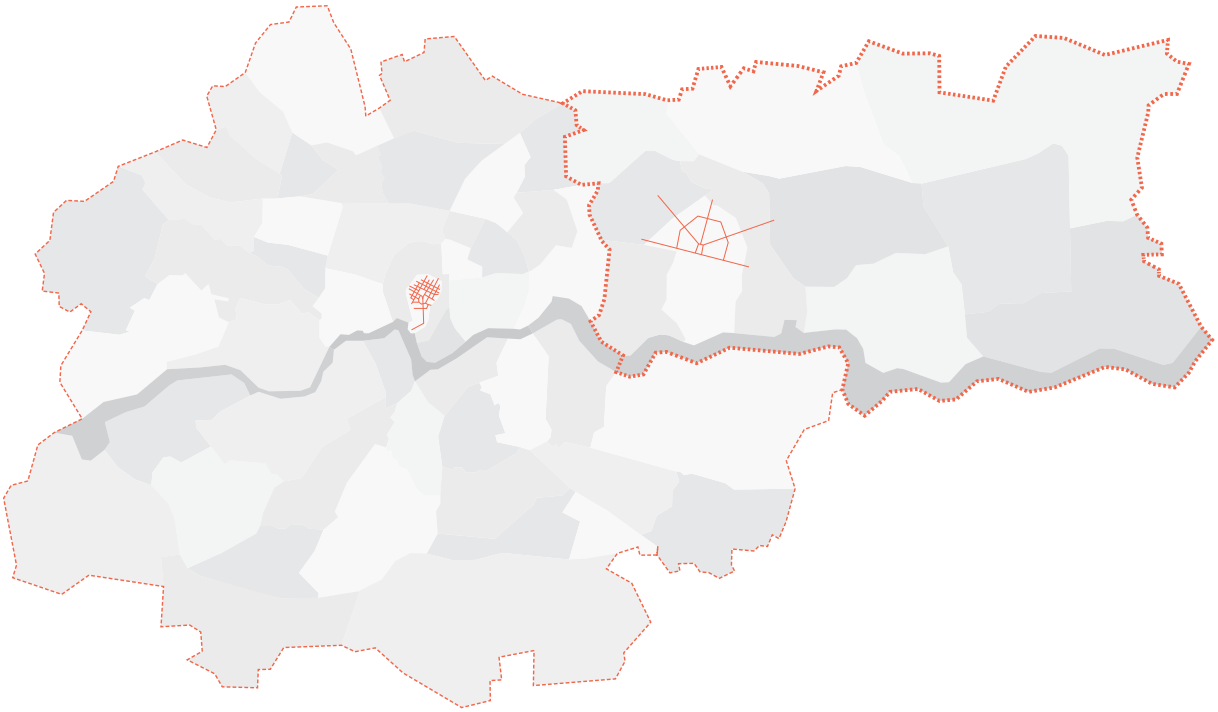


Fig. 62. Nowa Huta as an independent city that has its own strategy of development; (own work)

Nowa Huta as the independent circular system is examined in the city scale. At this level an existing level of resource cycling is investigated and the new system proposal is created. It is needed to develop complementary strategies for entire area (Fig. 63).

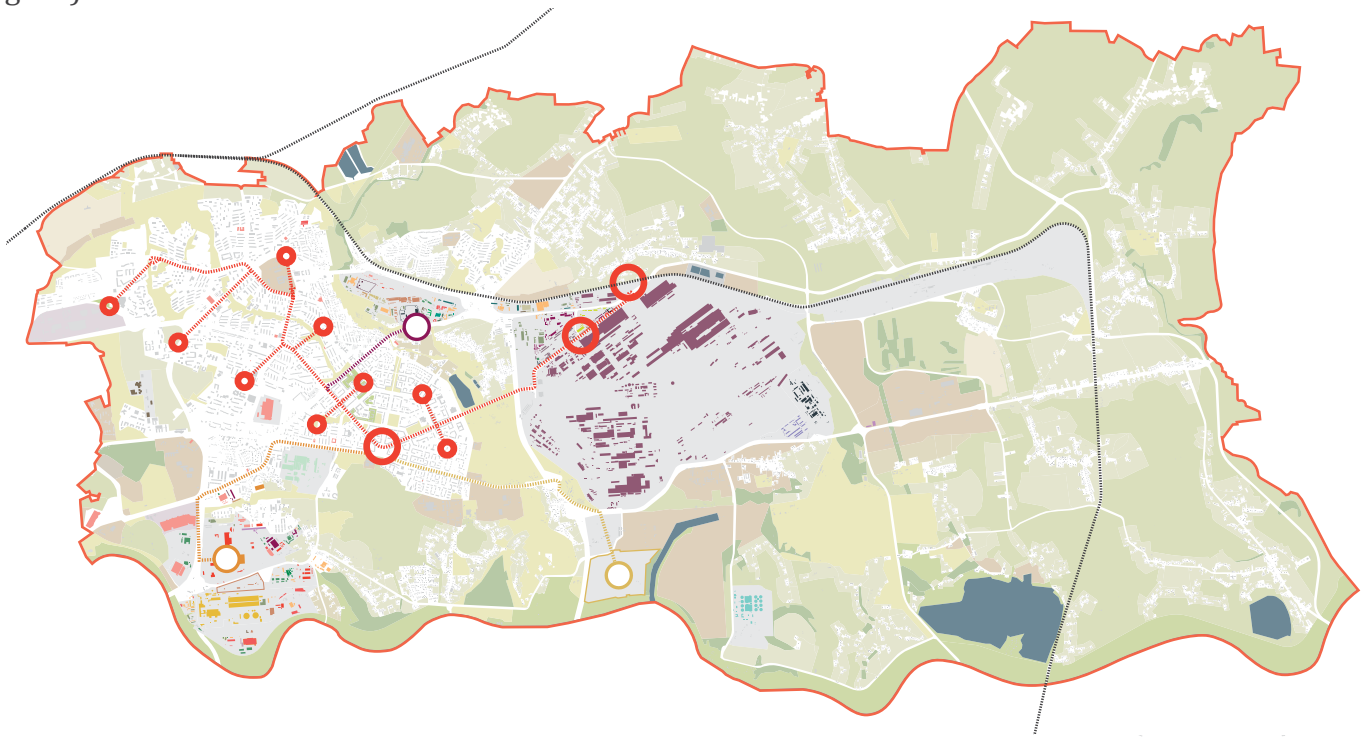


Fig. 63. Nowa Huta in regional scale is considered as a circular urban system (own work: a preliminary vision of the system)

Former scope of the project assumed to test the large scale strategies in the scale of habitat and major industry, steelworks. The concept grew up to test the strategy for the city on several smaller areas (mezoscales) that are linked by process of transformation to more self-sufficient city. (Fig. 64)

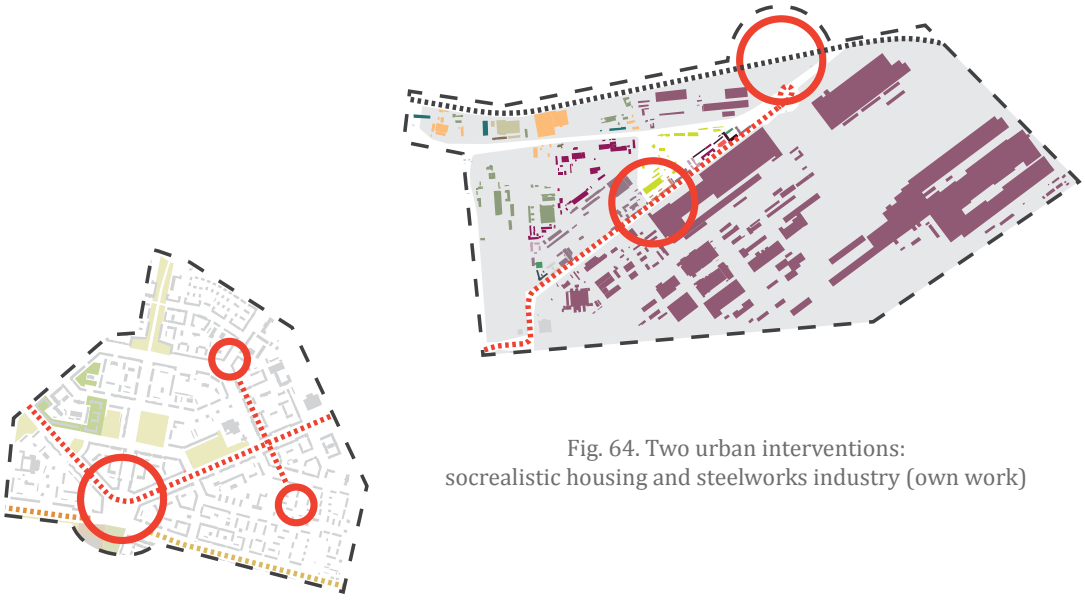


Fig. 64. Two urban interventions:
socrealistic housing and steelworks industry (own work)

# 13. METHODOLOGY

The graph presented below describes the structure of the thesis. It starts with grasping the utopian vision of Nowa Huta in order to follow gradually to probabilistic solution. (Fig. 65)

The prior version needed to be revised while moving to the design phase. The succeeding version tries to find an answer for issue underlined in research questions with methodology arising while creating 5 strategies for Nowa Huta 2050 (Fig. 66). Also, the research goal consisting of political involvment was unsuccesful.

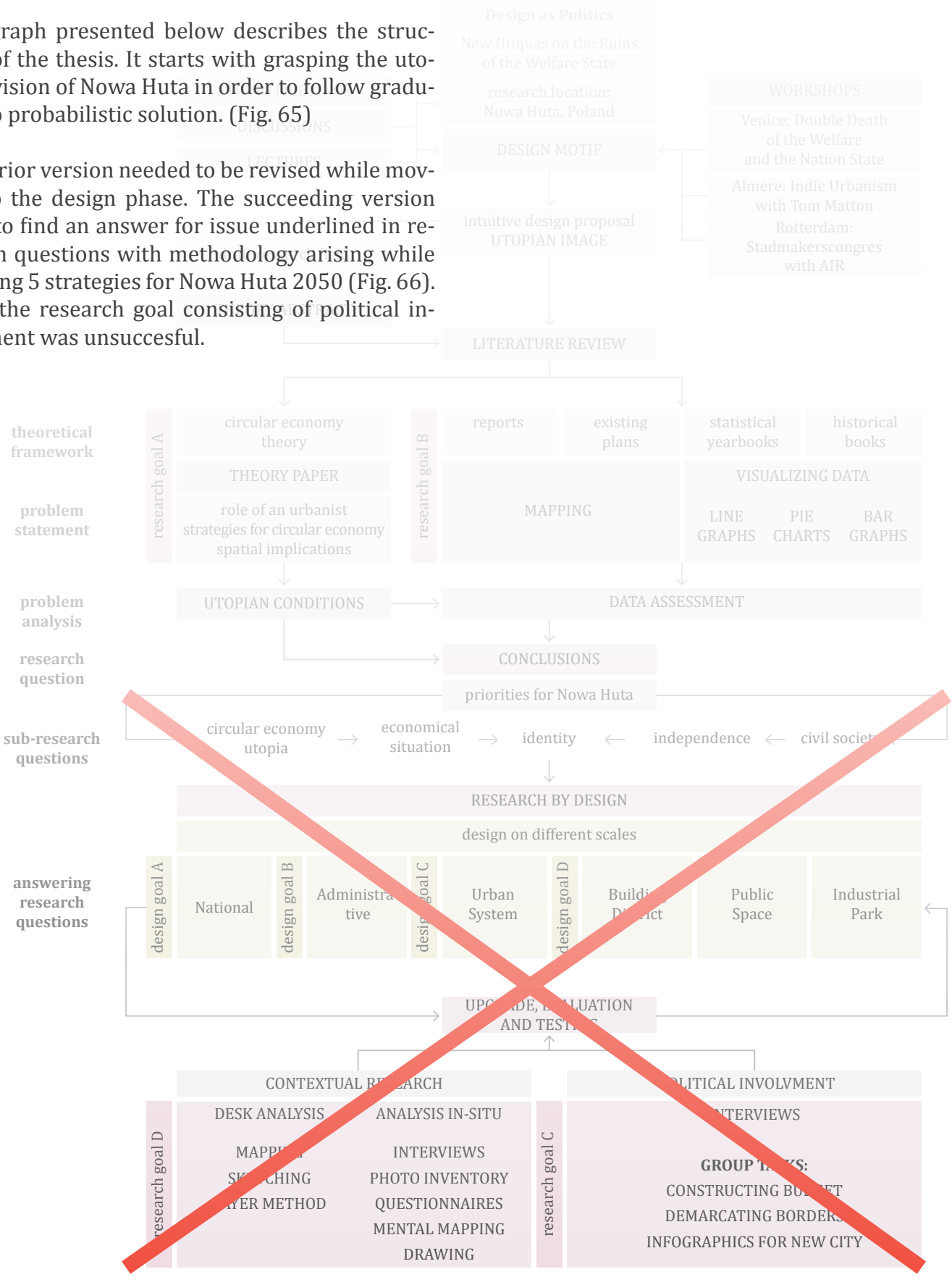



Fig. 65. Methodology Graph (own work)

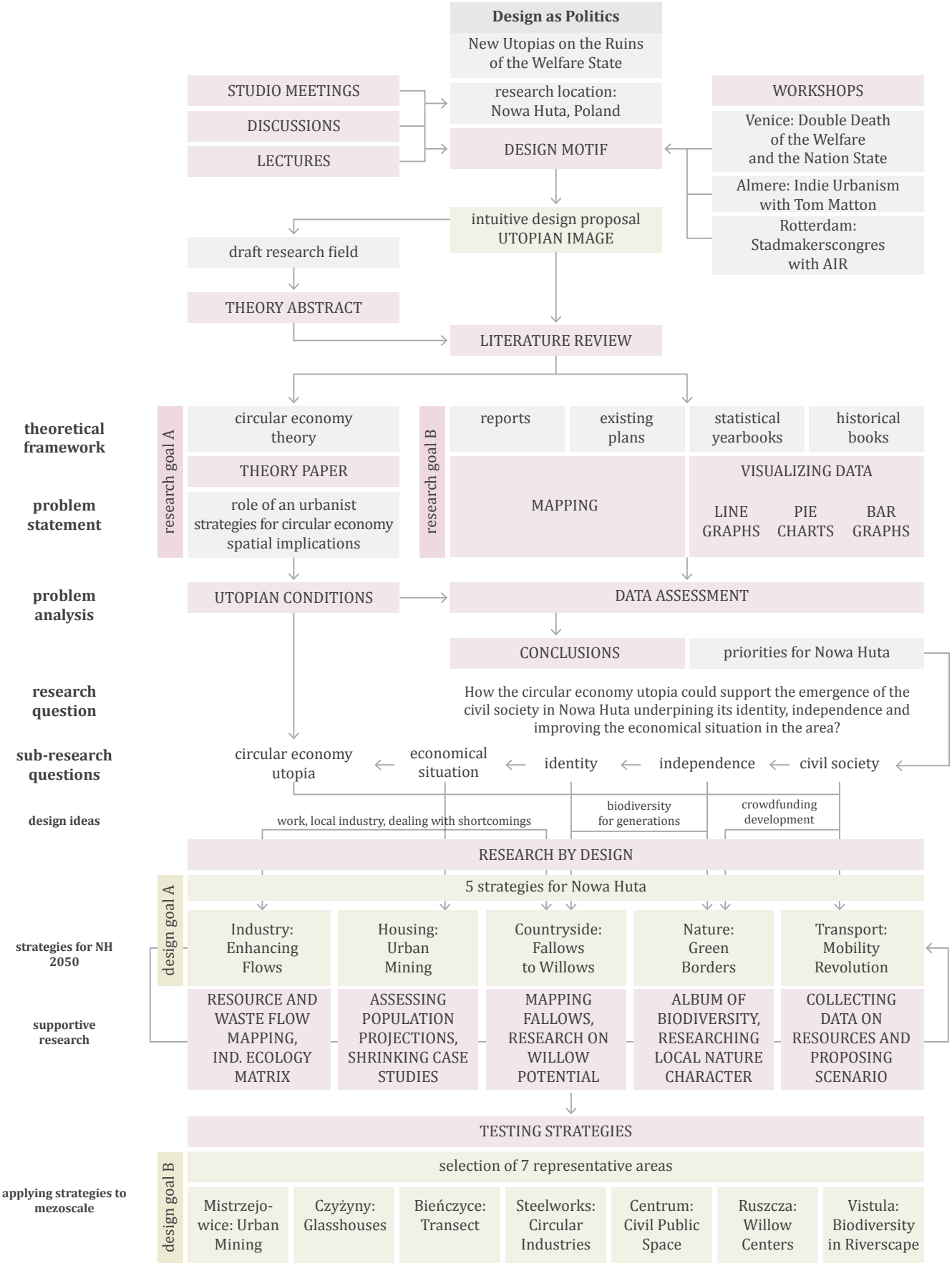



Fig. 66. Methodology Graph: Final version (own work)

# 14. FIVE STRATEGIES

The master project tries to see the urban planning as a process of changes rather than implementation of the masterplan decisions. The scope of the project is rather large, it covers the plan for a small country, thus it needs to be structured.

Five complementary strategies are proposed that at the end are translated into a guideplan for the Nowa Huta transformation. Following strategies are explained in further chapters:

1) Industry: Enhancing Flows
2) Housing: Urban Mining
3) Countryside: Fallows to Willows
4) Nature: Green Borders
5) Transport: Revolution

# 14.1. INDUSTRY

Global capitalistic economy have transferred many industries from the Old Continent to Asia between XVIII to XXth century, whereas labor and resources costs were diametrically lower. Nowadays, Asia became the world development leader, creating better working conditions for its citizens. Question of reindustrialization of the Western World is raised (Nawratek; Euler Hermes).

Due to the Soviet regime, Eastern Europe dissents from the global transformation. Poland in the day before the fall of the communism, was a highly industrialized country. Reforming the system after 1989 caused closure of many uncompetitive factories and reprivatization process. Despite of many documented frauds and gradual destruction of polish industry (Kieżun, 2013), Poland GDP is composed in 1/3 by industrial output (International Monetary Fund). Nevertheless, the process of deindustrialization still proceeds. An inveitable example is Steelworks in Nowa Huta, that continually reduces steel output and stays on the edge of closure.

Industry such as steelworks is highly important for Nowa Huta, not only because it gives work for its citizens and taxes for municipality, but also since it produces byproducts and waste for local companies. Moreover it is a knowledge and research exhibit for Kraków technical universities and other local companies.

**How the circular economy can contribute to the reversal of deindustrialization trend?**

A crucial part in achieveing circular economy is an industrial symbiosis. The state of symbiosis occurs in the nature whereas one organism is feeding another, creating closed loop of material flow. The notion of waste does not exist in the animated world.

The natural self-balancing system can be imitated in anthropogenic actions. The concept of industrial ecology can be described as a system whereas waste from one industry is used by another as a resource.

The state of industrial symbiosis has been achieved in Kalundborg, Denmark, becoming the model example. Cooperation between many actors, not only industries, led to develop the specific network. The outcome of industrial ecology in Kalundborg is a clean, localized industry cooperation that tracks resources and energy flows, with ambition to develop its functioning. Nowadays, the city wants to become a research institution, raising the profile of the city.

# 14.1.1. INDUSTRIAL ECOLOGY

The numerous linkages between power plant, oil rafinery, pharmaceutical plant, plasterboard factory, waste company, enzyme manufacturer and city of Kalundborg itself created notable example of applied theory of industrial ecology into real situation (Yuan, 2013). (Fig. 67) describes linkages between companies, underlining the time-span needed to achieve the complexity.

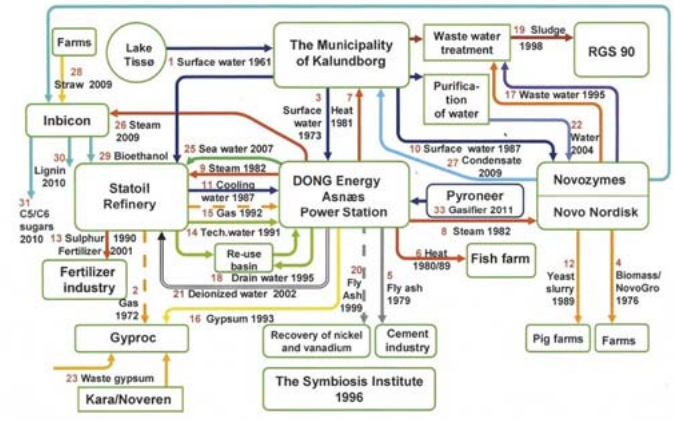



Fig. 67. Evolution of Industrial Ecology Network in Kalundborg, Denmark, source: Kalunborg Symbiosis

Industrial Ecology evolution can occur spontaneously through exchange of material, waste, energy and information between cooperating industries,. External actors such as municipality can facilitate the creation of linkages with suitable administrative or design tools. Industrial economy saves land, energy and resources. It also creates jobs, fosters flow of information and develop innovation. The economy becomes stable and local (Domenech, Davies, 2011).

Other studies have shown that **success of Eco-Industrial Parks Development** is associated with several factors (Lowitt, Peter, 2008):

1) some form of initial resource exchange is present
2) industries are in close proximity
3) cooperation between industries is happening
4) there is existing infrastructure
5) existance of a large corporation

Preliminary mapping of Nowa Huta industries and flows between them proves, that industrial ecology concept can be enhanced. Thus, the circular economy itself (Fig.68).

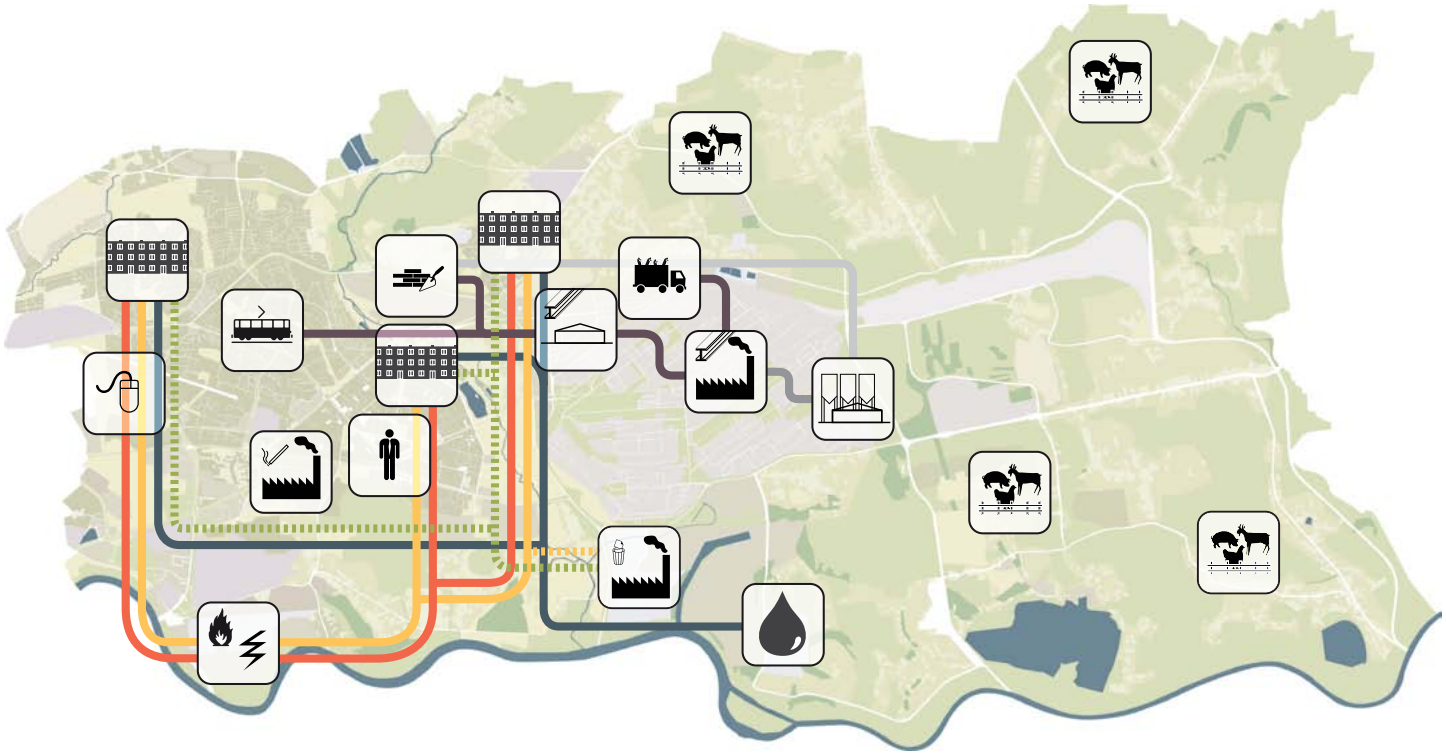


Fig. 68. Mapping of relations between industries in Nowa Huta; own work

# 14.1.2. IMPROVING FLOWS

Some of the largest industries in Nowa Huta were chosen in order to analyze their input and output and possibilities to enhance their coopeartion in the thesis design scenarios (see Appendix D: Mapping Flows", for more profound data and information on resource flow).

Further analysis demonstrates, that:

1) Steelworks uses local companies that collect metal scrap for its functioning; sludge and dust from steelmaking process is used either by local cement factory or landfilled in neighboring brownfield. Products of steelwork - rough steel elements are used by local manufacturing companies or construction industry (see chapter 5.2.).

Acording to World Steel Association there are several ways to enhance productivity of steel industry and reduce waste output:

- more responsible use of steel (life cycle assesment, cascade flows of steel components)
- production of steel in electric arc furnace process that needs less supplementary resources
- using waste from steelmaking process by another companies i.e. construction companies

2) CHP - combined heat and power plant that runs on coal input, produces electricity and heat for households and industries located in Nowa Huta and Kraków. Together with steelworks, CHP is the largest CO2 and other toxic particles producer.

The improvement for the industry lays in several areas:

- enhancing current efficiency from 36 to 45 %
- utilizing excess heat
- replacing some of the coal input with biomass
- investing in geothermal energy as the far-sight strategy
- using gypsum waste and fly ashes for cement production

3) Households in Nowa Huta occupied by some 200,000 inhabitants also generate waste. Calculations revealed that inhabitants of Nowa Huta consume around 120 510 Mg of food and 28 440 Mg drinks yearly and utilize other products that in total ends with 51 606 Mg of waste.

Current recycling rates in Poland are on a quite low level (see chapter 5.9), thus a significant improvement can be achieved.

Rough calculations revealed that by recycling 100% of waste, inhabitants can generate around 15% of heat and electricity for themselves. That can bring large savings to home budgets. On the other hand some of the waste can be reused or transformed into another objects of utility.

4) Constructed in 2015 incinerator will become an endpoint for about 220 00 Mg of Kraków municipal waste producing electricity that fulfills Nowa Huta energy demand in over 75%.

Byproducts of incinerator that is metal scrap, fly ashes or bottom ashes can be utilized by steelworks and construction companies.

**success of Eco-Industrial Parks Development in Nowa Huta:**

- ☑ some form of resource exchange
- ☑ close proximity of industries
- ☑ cooperation between different corporations
- ☑ existing infrastructure
- ☑ large corporations to support early implementation

# 14.1.3. INDUSTRIAL ECOLOGY MATRIX

Industrial Ecology Matrix (Fig.69) is a tool that helps to identify flows between industries and organize the data in a systematic way. The matrix in the master thesis is facilitated with another function: rethinking possibilities of potential exchange of resources between industries and propose scenarios for cooperation.

Some of the strategies and design concepts developed while using the tool:

- using excess heat and CO2 from CHP plant for horticulture or aquaponic farming

- municipal projects use construction materials manufactured locally, from the companies that takes responsbility for its life cycle

- 100% household waste recycling that is burned in local incinerator. Saved money goes to urban units budgets that facilitates public space projects and building renewals

- cars recycled by citizens goes to steelworks to be manufactured by local industries into new type of transport - shweeb, that is serviced locally

- releasing fallow lands from steelworks, infrastructural leftovers, predevelopment areas, for energetic willow production by local farmers that is an input for CHP and to initiate sustainable furniture production

- part of revenue from releasing land for willow production goes to “nature fund” that repurchase land along Vistula River and creates dynamic riverscape which serves for tourists and local citizens

- large-size waste and daily used objects that supposed to be thrown away can be reused by other citizens with the use of internet-of-things platform

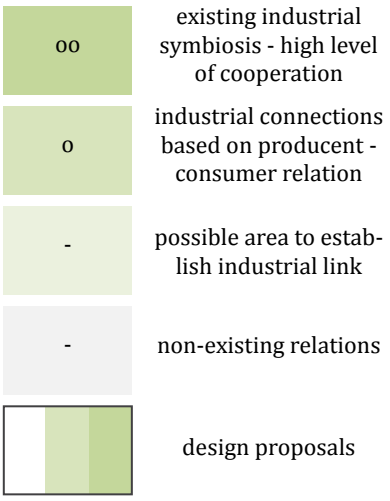
- prefabricated concrete elements and windows from shrinking housing areas can be reused as building component for glasshouses, small villas, bicycle paths

- due to decreasing number of cars in the area, parking garages in urban units can be reorganized to workshop areas for creating furniture or daily-use objects from waste.

- waste that is perceived now as useless, can be presorted in a new sorting station and transported to central square, whereas it is treated as resource for production of daily-use objects

- trams that cannot serve anymore for transporting passengers, can be reused into cargo trams that become main way of transporting goods in the area etc.

To visualize this process of change, linkage between actors in Nowa Huta is mapped (Fig. 70) and based on that scheme, more complex industrial system is proposed (Fig. 71).




Legend for the Industrial Ecology Matrix (see next page)

| | steelworks | cement plant | chp | local farmers | municipality | households | comarch | sewage treatment plant | metal recycling companies | steel processing industries | construction companies | public infrastructure | incinerator | Philip Morris cigarettes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| steelworks | | fly ashes and slag provider | electricity for industrial processes | releasing fallow lands for energy crops | more investment with use of steel | | | water management | facilitating cascade flows of materials | facilitating cascade flows of materials | facilitating cascade flows of materials | leasing steel train and tram tracks | energy exchange, recycled metals | |
| cement plant | oo | | gypsum waste to diversificate production | | preferential position in NH development | managing prefab concrete buildings | | | | | lifetime responsibility for resources | form of leasing public space surfaces | | |
| chp | o | o | | heat for fish farming, horticulture | providing electricity and heat | providing electricity and heat | providing electricity and heat | providing electricity and heat | providing electricity and heat | providing electricity and heat | providing electricity and heat | providing electricity | | providing electricity and heat |
| local farmers | - | - | o | | local food promotion (lower taxation), "willow found" program | local food support, nutrients exchange | | nutrients back to farmers | | leasing components for horticulture | | biofuels production | bioenergy production (willow) | biogas production |
| municipality | o | o | oo | - | | planning, management, organization | planning, guidance, tax management | | facilitating cascade flows of materials | facilitating cascade flows of materials | facilitating cascade flows of materials, "transect found" | public transport investment | | |
| households | - | o | oo | - | o | | fab-labs program support, open-databases, monitoring recycling | water management | better recycling rates | reverse logistics, lease of products | "transect found" | crowdfunding: "shweeb found" | better recycling rates | |
| comarch | o | - | o | - | o | - | | it support for recycling promotion and open databases | it support for recycling promotion and open databases | it support for introducing circular systems | it support for introducing circular systems | it support for crowdfunding programs | it support for recycling promotion and open databases | |
| sewage treatment plant | o | - | o | - | - | oo | - | | | | | investment in separate infrastructure for rainwater | | |
| metal recycling companies | o | - | o | - | - | o | - | - | | reverse logistics, cascade flows of materials | reverse logistics, cascade flows of materials | reverse logistics, cascade flows of materials | | |
| steel processing industries | oo | - | o | - | - | - | - | - | - | | reverse logistics, cascade flows of materials | reverse logistics, cascade flows of materials | | |
| construction companies | o | o | o | - | - | - | - | - | - | o | | reverse logistics, cascade flows of materials | | |
| public infrastructure | - | o | o | - | o | - | - | - | - | o | - | | free waste from public spaces and dustbins | |
| incinerator | - | - | - | - | - | o | - | - | - | - | - | - | | waste collection |
| Philip Morris cigarettes | - | - | o | - | - | - | - | - | - | - | - | - | - | |

Fig. 69. Industrial Ecology Matrix

# 14.1.4. FIRST STRATEGY: ENHANCING FLOWS

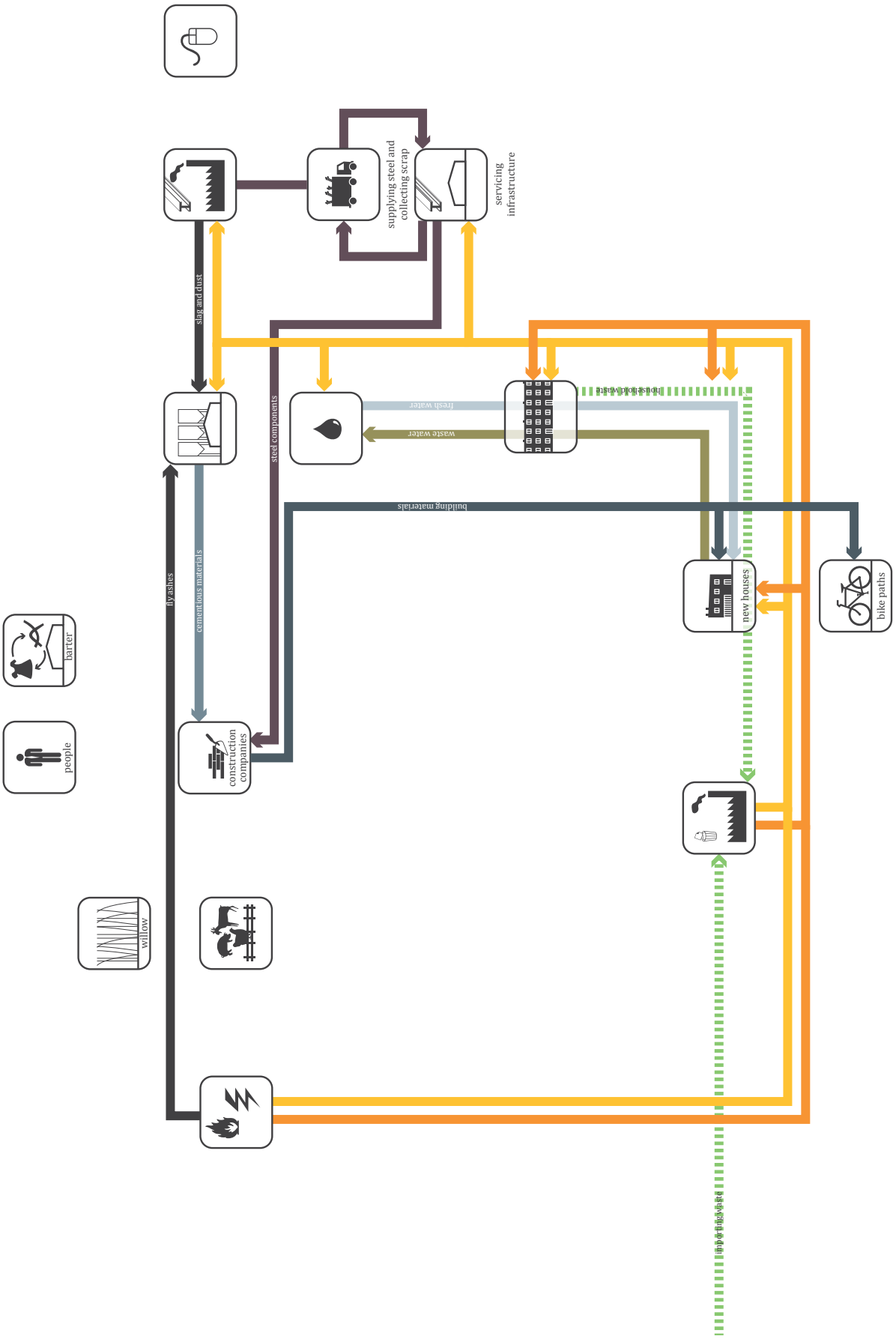



Fig. 70. Existing flows and relations between industries n Nowa Huta

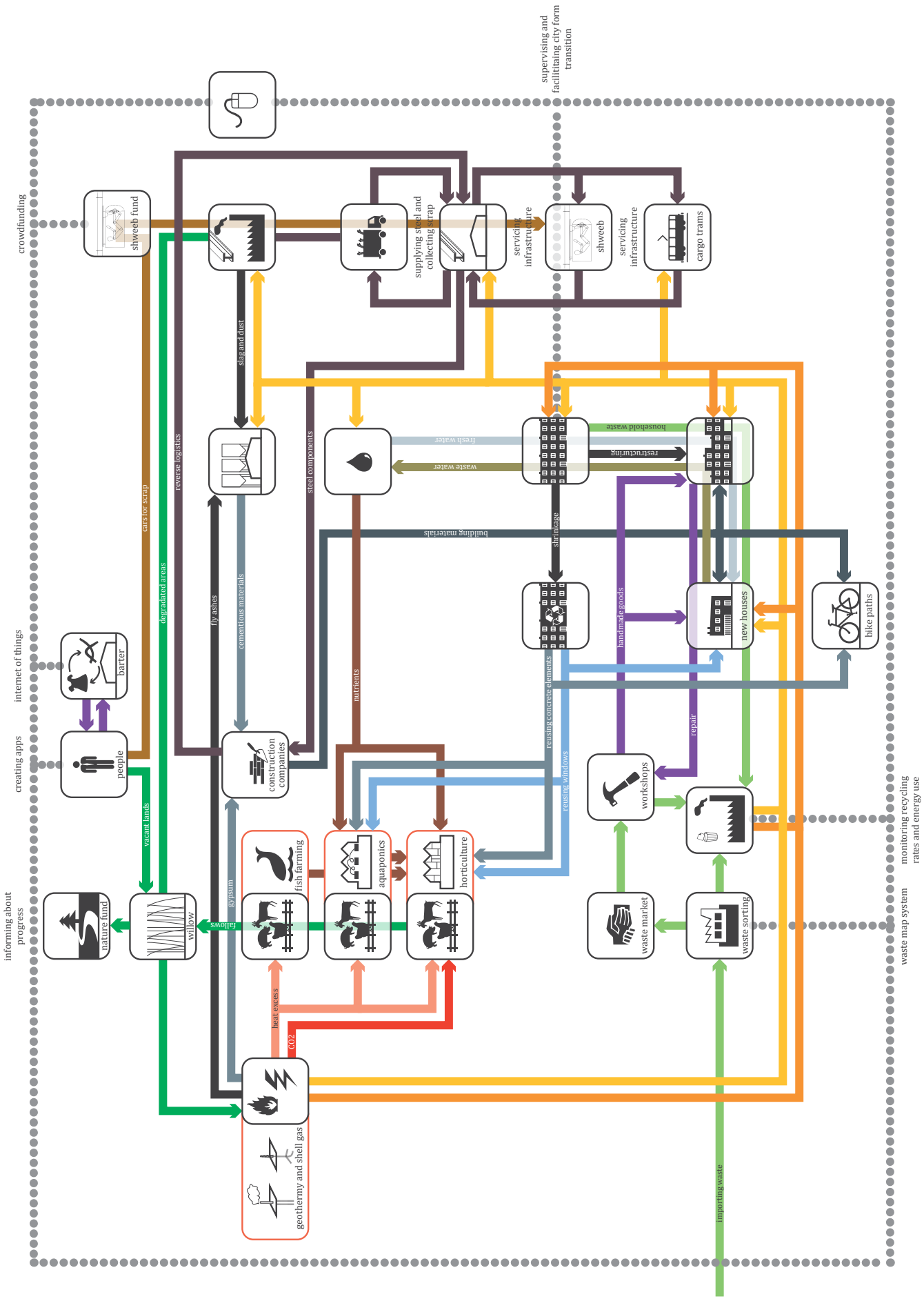



Fig. 71. 1st Strategy for NH : enhancing current relations and linkages with new industries, funds and transport means

# 14.2. HOUSING

Housing in Nowa Huta reveals socio-economic changes in the country from 1945 until today (see Appendix E: "typologies study").

The first multifamily building blocks in Nowa Huta were constructed for the purpose of settling thousands of forthcoming steelworkers. The urban plan was drawn from scratch by Taduesz Ptaszycki. The urban form and architectural details supposed to fulfill the idea of "palace for workers". Geometrical, renessaince form, has its core based on five urban axis that depart from Central Square located next to the old Vistula river valley. Axis created space for the concept of urban units widespread by American planner Clerence Arthur Perry (Fig. 72). Communities of 5000-6000 inhabitants within urban neighbourhood created districts of 30000. All necessary services for its citizens were included in units. The buildings around Central Square were the most monumental and densely composed. Further the density dissolves in greenery (Fig. 73).

In the beginning of construction, the technology was poor. Redbrick, the main building material was recycled from the city of Wrocław bombed after WWII. Transportation of material was done by wooden wheelbarrows and other low-tech solutions, such as horse waggon. Walls of buildings were erected by bricklayers that were motivated by authorities to compete during work. Beating up the record of most bricks layered within one shift was a common event organized by the authorities. First buildings were erected between 1949-1950.

Around 1953 technology of construction went one step further. Building sites were equipped with movable cranes, hence transportation was easier using different containers, boxes or racks. Together with cranes, some of the elements such as staircases or floor slabs were premanufactured and installed on brick walls. Those were slowly being replaced by block elements and further by prefabricated plates. Cell concrete or ceramic blocks for partition walls were commonly used.

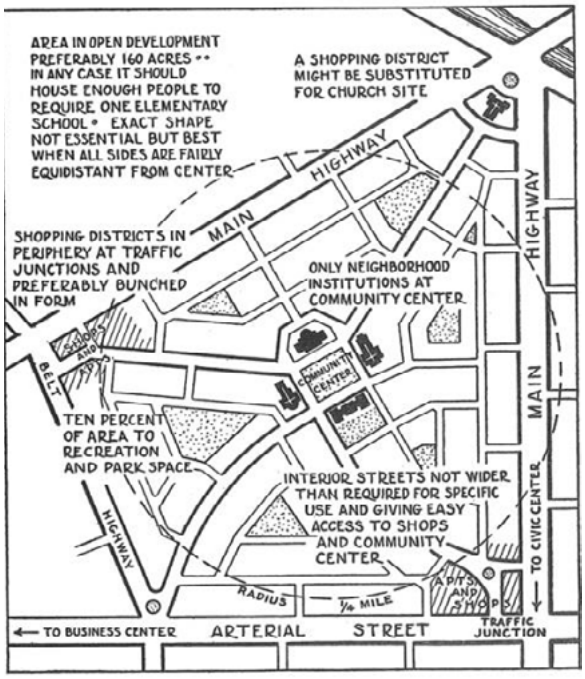



Fig. 72. Urban unit concept by C.A. Perry; wikimedia.org

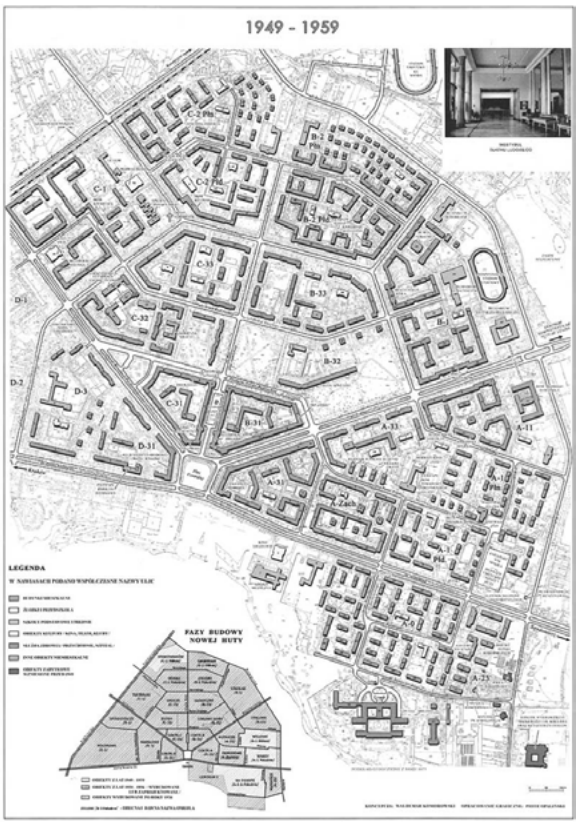



Fig. 73. Nowa Huta Masterplan composed of urban units http://www.newtowninstitute.org/

In 1956, after standarization of prefabricated elements, former social-realistic, geometrical urban form started to grow in western direction more freely. Neomodernistic box-like development was entirely different from former plans of Tadeusz Ptaszycki. Shops and services in clear streets frontages were replaced by free-standing malls. Compact urban form became the negative space without defined squares and streets. (Binek, 2014)

New construction materials, erection and transport technologies together with open urban plan and simple box-architecture facilitated easy and fast construction. Population of Nowa Huta was growing rapidly until 80's, when decay of communism in Poland, negative demographic changes and new type development financing occured.

From 1989 until today the construction market is growing very slowly. Housing constructed nowadays is characterized by refilling of gaps between current urban tissue, expanding on unoccupied arable land, high density of new housing and isolation (usually with high fence) from surroundings. New housing is scattered and does not contribute to order urban form.

# 14.2.1. UNCERTAIN FUTURE

Due to mass exile of Poles since 2004, mainly to the western European countries (see Chapter 5.5.), shortage of vacant houses become less unpleasant and housing market is more balanced than it was expected (Stopka, 2014).

Polish emmigrants are mostly young people who want to save enough money to have a home and a family. A research revealed that Polish emmigrants have statistically more kids abroad (2,1) than in Poland (1,3) (Wyborcza.pl, 2014). Another studies reveals that in 2015 number of emmigrants will exceed 3 mln of people. 78% of people willing to go abroad want to have better salary, 44% want to have higher standard of life, 37% see better working perspectives or lack of work in Poland, 35% want to travel, and 29% are affraid of polish health system. Mostly (63%) are people less than 35 years old, not only physical workers, but nurses, doctors, merchants or engineers (forbes.pl, 2015).

Situation is not conducive to develop housing market, moreover, recent forecast (Fig. 74) of population reveals that until 2050, polish cities will lose 20% of population (GUS, 2014).

Disapproval for status quo and willingness to create a "PLAN B" in case of real demographic crisis lead the master thesis to work within scenario that deals with shrinkage rather than growth (Fig. 75).

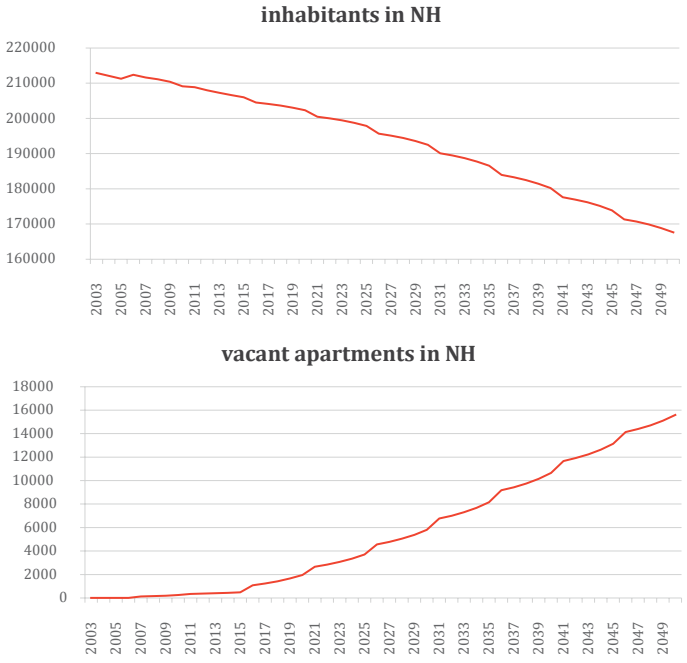



Fig. 75. Declining population affecting housing market in Nowa Huta; own assumption

**Tabl. 17. Stany ludności, przyrosty/ubytki i zmiany stanów w latach 2013-2050[a]**

*Table 17. Population size, increases/decreases and changes in 2013-2050[a]*

| Wyszczególnienie | 2013 | 2014 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Ludność na 31 XII (w tys.) | | | | | | | | | |
| Ogółem | 38495,7 | 38461,8 | 38419 | 38137,8 | 37741,5 | 37185,1 | 36476,8 | 35668,2 | 34817,4 | 33950,6 |
| Miasta | 23271,8 | 23202,5 | 23129,5 | 22716,6 | 22216,3 | 21618,4 | 20945,4 | 20234,5 | 19522,2 | 18825,8 |
| Wieś | 15223,9 | 15259,2 | 15289,5 | 15421,2 | 15525,1 | 15566,7 | 15531,4 | 15433,7 | 15295,2 | 15124,8 |
| | Zmiana w stosunku do okresu poprzedniego w % | | | | | | | | | |
| Ogółem | x | -0,1 | -0,1 | -0,7 | -1,0 | -1,5 | -1,9 | -2,2 | -2,4 | -2,5 |
| Miasta | x | -0,3 | -0,3 | -1,8 | -2,2 | -2,7 | -3,1 | -3,4 | -3,5 | -3,6 |
| Wieś | x | 0,2 | 0,2 | 0,9 | 0,7 | 0,3 | -0,2 | -0,6 | -0,9 | -1,1 |
| | Przyrost/ubytek ludności w stosunku do okresu poprzedniego (w tys.) | | | | | | | | | |
| Ogółem | x | -33,9 | -42,7 | -281,2 | -396,3 | -556,4 | -708,3 | -808,6 | -850,9 | -866,8 |
| Miasta | x | -69,3 | -73 | -412,9 | -500,3 | -598 | -673 | -710,9 | -712,3 | -696,4 |
| Wieś | x | 35,3 | 30,3 | 131,7 | 103,9 | 41,6 | -35,3 | -97,7 | -138,5 | -170,4 |
| | Zmiany w stosunku do 2013 r. (2013=100) | | | | | | | | | |
| Ogółem | 100 | 99,9 | 99,8 | 99,1 | 98 | 96,6 | 94,8 | 92,7 | 90,4 | 88,2 |
| Miasta | 100 | 99,7 | 99,4 | 97,6 | 95,5 | 92,9 | 90 | 86,9 | 83,9 | 80,9 |
| Wieś | 100 | 100,2 | 100,4 | 101,3 | 102 | 102,3 | 102 | 101,4 | 100,5 | 99,3 |

depopulation up to 20 %!

[a] Dane rzeczywiste; *actual data*

Fig. 74. Population changes between 2013-2050. Prognosis.
source: GUS, Population Projection 2014-2050, Warsaw, 2014

# 14.2.2. CASE STUDY: MARZAHN HELLERSDORF

Depopulation of post-communist housing is not a new topic. After reunification of Germany in 1990, population living in the eastern part of country, started to migrate to the western lands. Problem of vacant apartments lead to the research for solutions about working with negative demographic trends.

One of the examples of that phenomenon was Marzahn-Hellersdorf (Fig. 76) situated in the north-west border of Berlin built between 1976 and 1989. It fitted with 60.000 apartments in 6 or 10-11 storey high buildings. Between 1992 and 1998, population of Marzahn-Hellersdorf declined from 165.000 to 142.000 inhabitants.

First attempt to regenerate the housing was to modernize its energy-efficiency and invest in public spaces. Shortcomings were fixed, nevertheless more people started to leave behind apartments. Second attempt was more complex renewal (Fig.77), with mass demolition of unoccupied buildings, transformation into smaller scale buildings (Fig.78) or constructing new, together with investment for new green areas and public spaces, proposing varieties of typologies and houses size. Over 2 billions of euros were spent on that process. Nowadays, after 25 years of changes, district seems finally to have stable demographic trends.

Can this scenario be applied in Nowa Huta (Fig.79, 80)?

Fig. 78. New housing typologies from half-dismantled housing blocks. source: degewo.de

Fig. 75. Marzahn Hellersdorf, Berlin, Germany.
source: www.fotos-aus-der-luft.de

Fig. 79. Bieńczyce i Mistrzejowice, Nowa Huta, Poland
source: skyscrapercity.com


Fig. 77. Zoning plan of Marzahn-Hellersdorf. source: berlin.de

| MARZAHN-HELLERSDORF, BERLIN | | NOWA HUTA, KRAKÓW |
|---|---|---|
| area: | 3100 ha | 2400 ha |
| construction: | 1976 - 1989 | 1949 - 1989 |
| initial population: | 142 000 (1992) | 207 500 (2015) |
| decline in population: | 22 907 (1992-1998) | 39 620 (2015-2050) |
| decline in percentage: | 16,13% | 19,09% |

Fig. 80. Comparison of Marzahn-Hellerdorf depopulation size and Nowa Huta projections; own work

# 14.2.3. CASE STUDIES: CONCLUS, RECYCLED GLASSHOUSES

Due to change in requirements of living standard, the whole eastern Germany went through a mass pre-fab concrete housing demolition in the last decade. Over 350.000 thousands of vacant apartments were demolished between 2005 and 2009. Most of the waste - concrete elements was used as highways building material, even though, the concrete substance was in a very good condition.

Architectural company “Conclus” started to take advantage of the material that commonly was treated as waste. The firm was designing single-family houses (Fig.81,82) out of the recovered prefab-concrete elements, dealing with transport of 6 tonnes slabs from dismantling site, to the new destination (Fig.83) (Spiegel.de, 2005)

Fig. 81. 3d model of house from reused concrete element.
source: conclus architektburo

Fig. 83. recycled house in progress.
source: conclus architektburo

Hervé Biele, the founder of the office has done several projects using revocered concrete elements. It cost on average 30% less than conventional houses and were erected in around one week. Reusing concrete elements bring substantial number of other advantages: lower cost of raw material and energy savings, without need to mention that concrete gets stronger as it gets older. (Guardian, 2005)

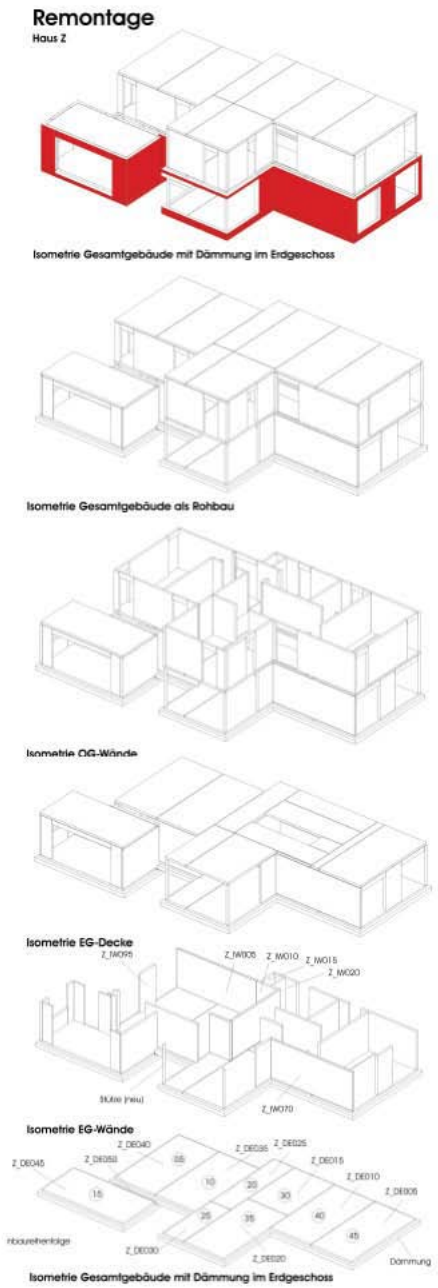



Fig. 82. schematic construction process.
source: conclus architektburo

Another way to recycle post-communist housing could be reusing windows from dismantled apartments. There are plenty of example of upcycling windows, such as a 500$ house made by makers Nick Olson and Lilah Horowitz in Vriginia, the U.S (Fig.84), erected with recycled windows (inhabitat.com). Other example: August Schmidt designed a showroom (Fig.85) from the same material in Trondheim, Norway (archdaily.com). Dutch Superuse Studio succesfully constructed a cafe bar at Architectural Faculty in TU Delft, and also creating a platform (Fig.86) that gathers designers who are interested in designing out of waste or Oogstkaart.nl (Fig.87) that helps to find recyclable materials (Superuse Studio).

Fig. 85. August Schmidt Showroom, source: archdaily.com

Fig. 84. Nick Olson and Nina Horowitz home, source: archdaily.com

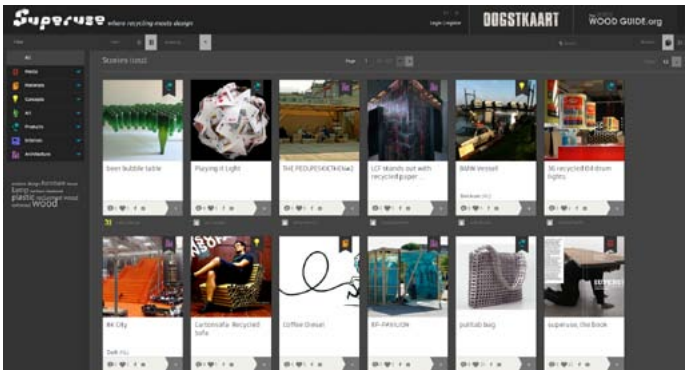



Fig. 86. Superuse.org: design out of waste platform

Fig. 88. glasshouses from recycled windows, source: pinterest.com


Fig. 87. Oogstkaart.org: marketplace for recyclers

## 14.2.4. SECOND STRATEGY: URBAN MINING

Assuming that population in Poland will decline significantly until 2050, there is need to consider the future of housing estates in polish cities, thus in Nowa Huta. According to previous calculations, around 16,000 apartments can be emptied withing next 35 years, which approximately covers the area of Mistrzejowice (Fig. 89, 89) one of the Nowa Huta districts. In this scenario, around 200 blocks of flats will be abandoned. The area become an urban mine whereas prefabricated concrete elements and windows are treated as a resource for reuse.

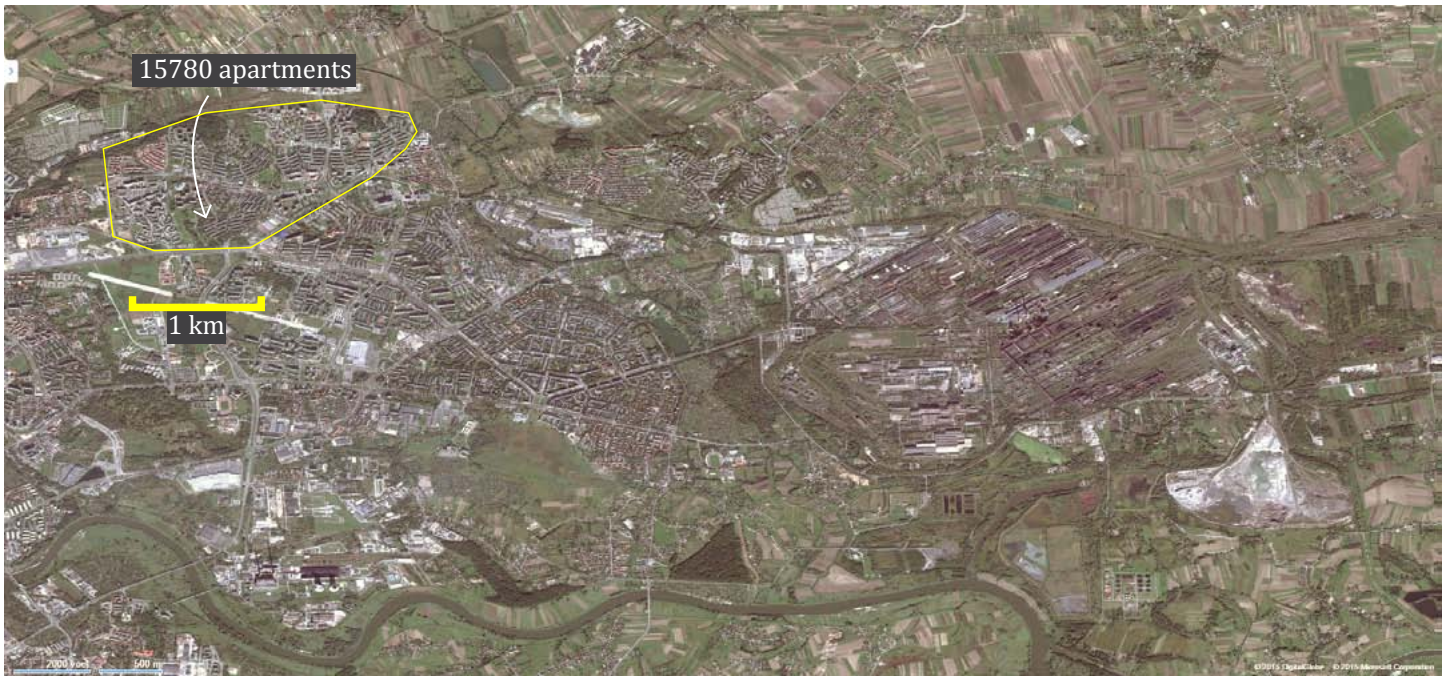



Fig. 89. Nowa Huta - aerial photo with outlined area to be dismantled, source: bingmaps.com


Fig. 90. close-up on “urban mine”, source: bingmaps.com

Proposed strategy for housing assumes that buildings in Mistrzejowice can be dissasembled on site, transported to another area for recovery of elements and once again reused in different spots (Fig. 91, 92) such as Czyżyny where recovered windows become glasshouses; Bieńczyce to create street frontages with services, office space and new housing; villages to construct villas or farm buildings; Vistula river valley for bicycle paths or come back to Mistrzejowice for the same reason. Rough calculations reveal that capital stored in housing is worth millions of euros. (Fig.93)

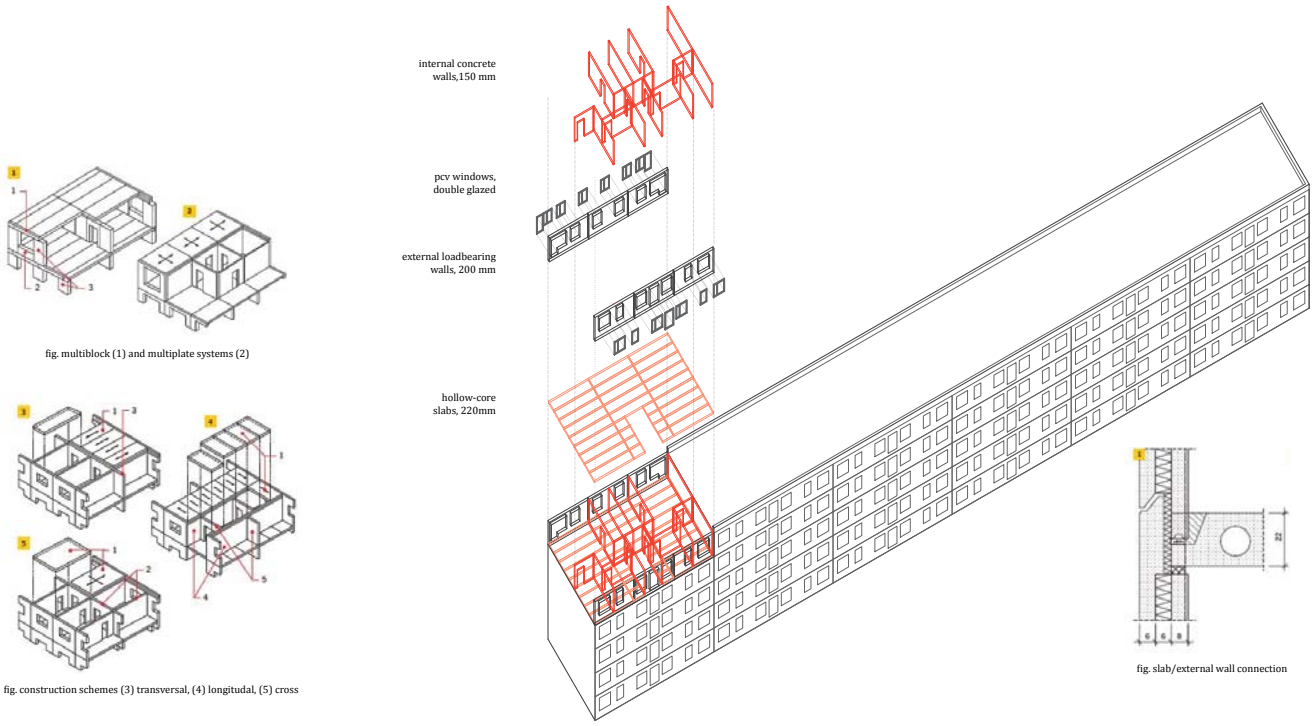



Fig. 91. Standard prefab concrete multifamily house and its construction elements; own work

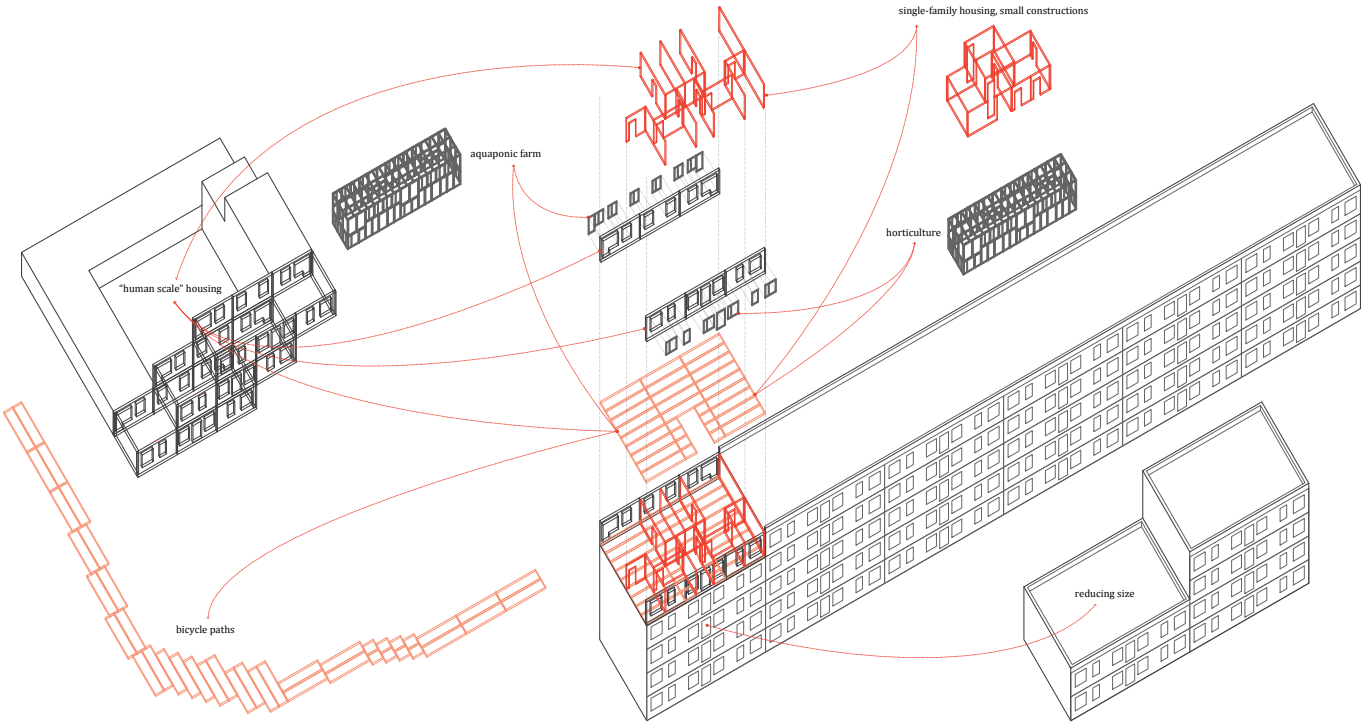
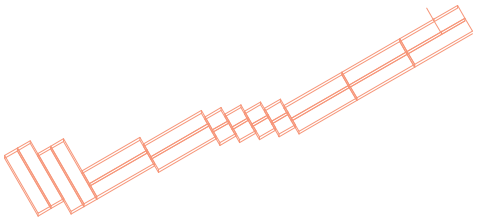
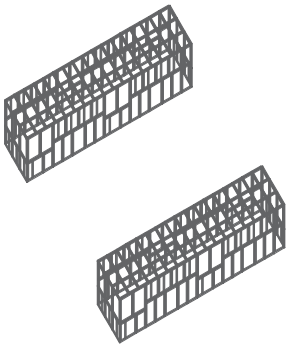
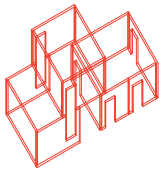
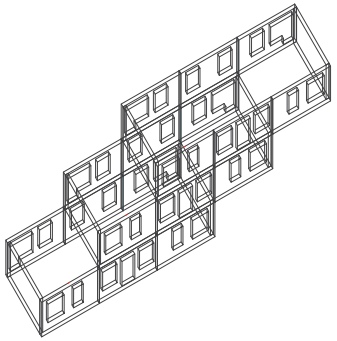



Fig. 92. Transforming elements into new functions; own work









| | bicycle paths from upcycled slabs (2,4m width) | aquaponic farms and horticulture | concrete partition walls (2,8 m height) (for small constructions) | reshaped urban tissue |
|---|---|---|---|---|
| 2015 | 8 345 m | 2 254 sqm. | 48 924 sqm | 17 970 sqm. |
| 2016 | | | | |
| 2017 | | | | |
| 2018 | | | | |
| 2019 | | | | |
| 2020 | 66 387 m | 17 931 sqm. | 195 000 sqm. | 142 959 sqm. |
| 2021 | | | | |
| 2022 | | | | |
| 2023 | | | | |
| 2024 | | | | |
| 2025 | 120 065 m | 34 049 sqm. | 370 297 sqm. | 271 467 sqm. |
| 2026 | | | | |
| 2027 | | | | |
| 2028 | | | | |
| 2029 | | | | |
| 2030 | 197 699 m | 53 397 sqm. | 580 709 sqm. | 425 724 sqm. |
| 2031 | | | | |
| 2032 | | | | |
| 2033 | | | | |
| 2034 | | | | |
| 2035 | 277 745 m | 75 016 sqm. | 815 836 sqm. | 598 095 sqm. |
| 2036 | | | | |
| 2037 | | | | |
| 2038 | | | | |
| 2039 | | | | |
| 2040 | 362 800 m | 97 989 sqm. | 1 065 666 sqm. | 781 251 sqm. |
| 2041 | | | | |
| 2042 | | | | |
| 2043 | | | | |
| 2044 | | | | |
| 2045 | 447 376 m | 120 832 sqm. | 1 314 102 sqm. | 963 378 sqm. |
| 2046 | | | | |
| 2047 | | | | |
| 2048 | | | | |
| 2049 | | | | |
| 2050 | 531 306 m | 143 502 sqm. | 1 560 630 sqm. | 1 144 113 sqm. |
| | 40€ /m (21 240 000 € of market price) | 14,3 ha (49 000 000 € of market price) (10 994 568 €/year revenue) | 10 € /sqm. (15 606 300€ of material price) | 15 € /sqm. (17 161 695€ of material price) |

Fig. 93. Rough calculations of profit from reusing housing elements to another functions; own work

Together with reusing materials on a large scale, the scenario considers two other types of "mining". Taking care of the recycling rates nowadays (see Chapter 5.9: Circular Economy today), there is a space for a substantial improvement. Waste flow analysis (see App. D: Mapping flows) reveals that Nowa Huta produces around 140 tonnes of waste per day from what 75% can be incinerated - 107 tonnes per day. That number gives 257 GJ of electricity and 770 GJ of heat produced every day from Nowa Huta waste.

The market price of electricity produced from waste in the local incinerator sums up to 10 280 € per day + 9 625 € for heating. The money could be achieved if citizens were recycling the waste in 100%. If the money was distributed back to the people, everyone would only have 0,1/€ day. If intended for civil budget, it makes a large difference.

What can be done with 20 000€?

- 200 m of new bicycle path
- 3200 m of demarcated bicycle path on existing road
- replacement of 400 sqm of concrete pavement
- replacement of 250 sqm of asphalt road
- 80 demarcated pedestrian crossings
- 160 new trees
- 228 sqm of a footbal pitch with artificial surface
- 260 m of park alley
- 11 new lanterns
- 80 m of hedge
- 1 outdoor fitness
- 100 x 100 m lawn
- 20 x 20 m of flower bed
- 50 new dustbins
- 40 new benches
- a new playground in 4 days

(source: civil budget in Wrocław, 2015)

The other type of mining is upcycling old trams that cannot serve for transporting passengers, but would run in the night shifts, collecting waste, or carrying goods from place to place.

This strategy would help both: reduce costs of waste management (price of energy used by trams is 40 % less than wheel lorries), create a coherent strategy for waste management inside Nowa Huta, help to establish a grid of public transport in Nowa Huta and finally, giving possibilities for servicing the infrastructure for local steel manufacturing companies.

# 14.3. COUNTRYSIDE STRUCTURE

The countryside landscape in researched area covers more than 50% of the land (Fig. 94). Due to river activities in the past, the soil is very fertile, with I-III bonitation class and scattered IV class islets (Fig. 95).

There are numerous types of agricultural activities in Nowa Huta. The least one are backyard gardens accompanying single-family houses, farm buildings as well as allotments. usually in close relation to the river landscape. Cultivation on small surface mostly around 100 sqm, cannot provide high nutrition value for inhabitants, nevertheless it functions as a mean of recreation or hobby and is an expression of the attachment to the land.

Further from the center of urbanization, old villages dissolve into singly-family housing areas. Some of the households still cultivate vegetables for own use (up to 250 sqm.), the larger up to 1 ha constitute an addition to home budget.

More than 20 post-village centers are still earth-bounded. In their proximity two types of arable fields can be distinguished. Fields up to 2 ha that serves as vegetable reservoir for village inhabitants and larger than 2 ha set to profit. Most of the farm buildings are equipped with farm tools and simple machinery and outbuildings to store crops.

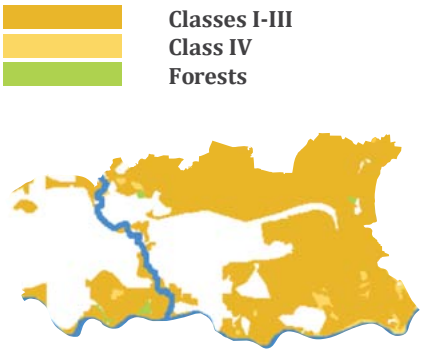



Fig. 95. Bonitation class of soil in Nowa Huta, source: msip.krakow.pl

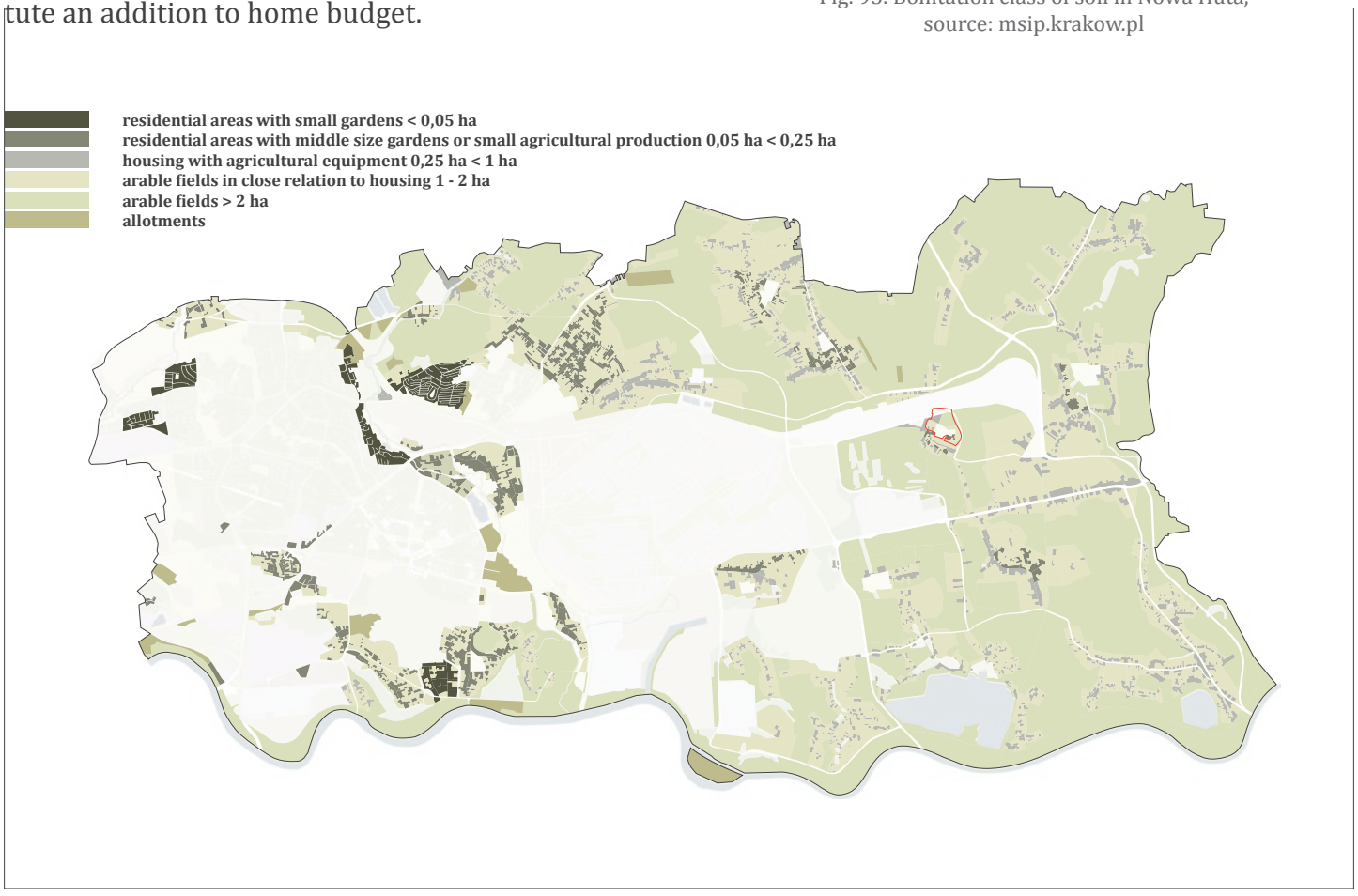



Fig. 94. Agriculture in Nowa Huta. Mapping analysis, own work

# 14.3.1. AGRICULTURAL GOODS

Between 1995 and 2009, structure of cropping patterns changed significantly. Polish farmers cultivate less potatoes (4,2% from 11,8%), rye (12,0% from 19,0%) and barley (8,1% from 10,0%) for favor of wheat (20,2% from 18,7%), triticale (12,6% from 4,8%), rape and turnip rape (7,0% from 4,7%) and corn (6,0% from 1,4%). Crops that production did not change are oat (4,5%), sugar betroots (1,7%), vegetables (1,5%) and other (20,3%).

In Kraków area most popular crops are wheat (5-15%) and potatoes (10-15%), barley (2-5%), oat (2-5%), sugar betroots (<2%) and rye (<2%). Kraków area has a low number of cattle (<15/100ha), swine (50-100/ha), sheeps (2-5/100ha) and poultry (<150/100ha) (wiking.edu.pl).

Nonetheless food crop, another important type of cultivation is related to energy use. According to (Ginalski, 2010), Kraków area is very suitable for energetic plants: willow and mallow. Both have energetic and recultivation function. (Fig.96,97,98)

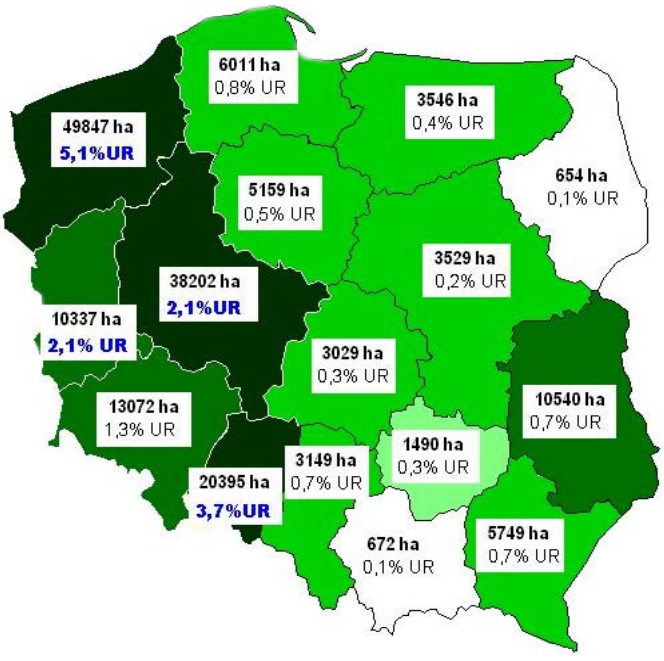



Fig. 96. Share of energetic plants in overall arable area by voivodship. (Dr Mazulewski, ARiMR)

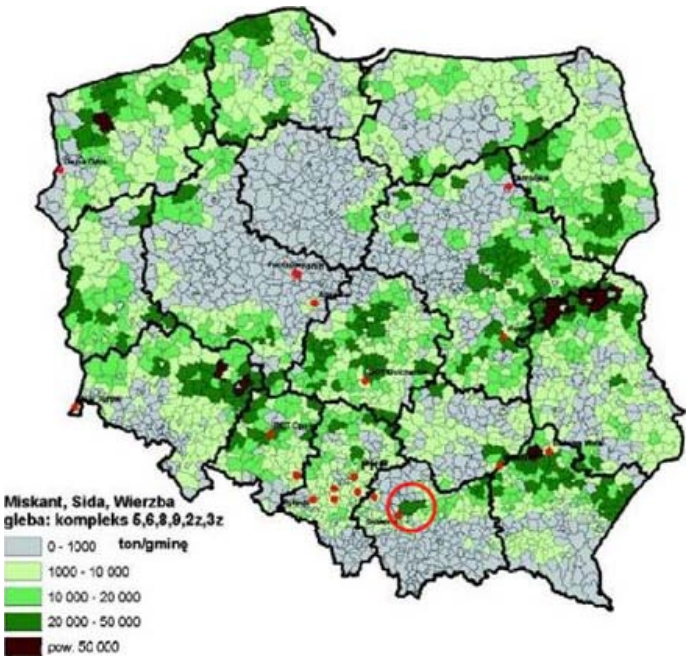



Fig. 97. Areas with good contitions for cultivating energetic plants: willow and mallow. (Jadczyszyn J., Faber A., Zaliwski A., 2008)

| | | |
|---|---|---|
| oleaginous | 114794 ha | 63,60% |
| cereals | 36853 ha | 20,40% |
| corn | 19885 ha | 11,00% |
| **willow** | **6816 ha** | **3,80%** |
| grasses | 1947 ha | 1,10% |
| root | 207 ha | 0,10% |
| other | 4 ha | 0,00% |
| total | 180506 ha | 100,00% |

Fig. 98. Most popular energetic plants in Poland. (Dr Mazulewski, ARiMR)

# 14.3.2. SMALL PLOTS

Scattered landownership causes low productivity of farms. An average size of arable field in the location is 3,95 ha (ec.europa.eu, armir.gov.pl). Comparing to Polish average (10,48 ha), the Netherlands (25,9 ha) or Czech Republic (152,4 ha), Lesser Poland agricutlture cannot be competitive (Fig. 99). Current pace of change is not satisfying. Projection made on the purpose of this master thesis, reveals that until 2050 land average will raise only up to 5,15 ha with current tempo (Fig.100).

The reason of this situation may be found in the historical partition of land to smaller entities. Also due to socialistic transformation in the last centuries, large grange villages were renationalised and distributed to small farmers.

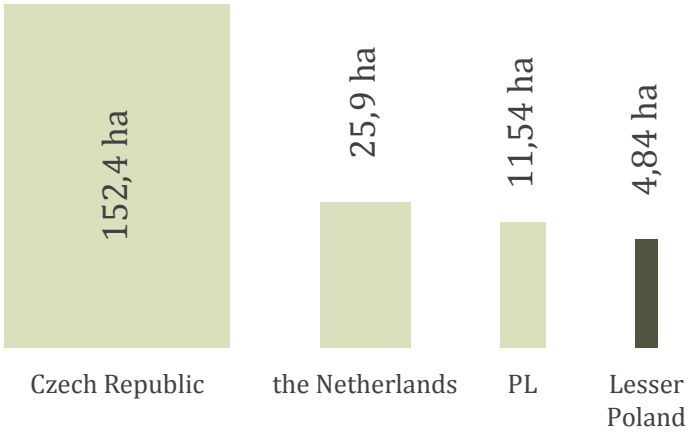



Fig. 99. Comparison of farm parcel size (source: ec.europa)

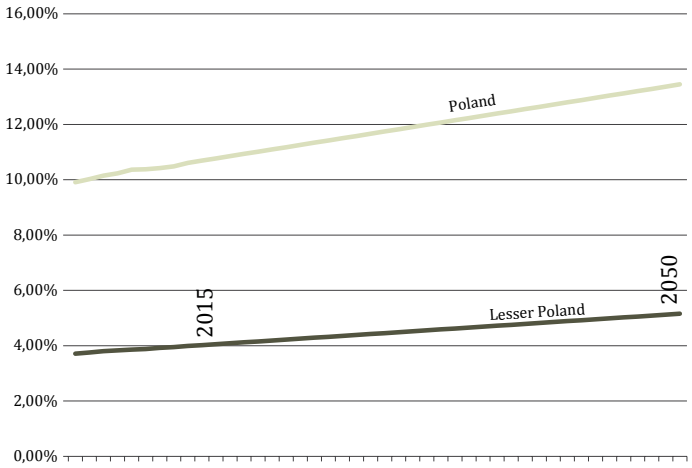



Fig. 100. Projection of land consolidation in Poland and Lesser Poland. (own work, based on: armir.gov.pl)

# 14.3.3. WASTELANDS

Further analysis of wastelands, reveals many post-industrial sites, infrastructural leftovers, neglected public spaces, post-railways, river floodplains and similar, that have no function (fig.101). Rough calculations reveal that more than 2000 ha are unused (fig.102). EU policy towards subsidizing fallows give substantial amount of money for farmers, but slows down the process of farming modernization.


Fig. 101. Samples of wastelands in Nowa Huta; own work

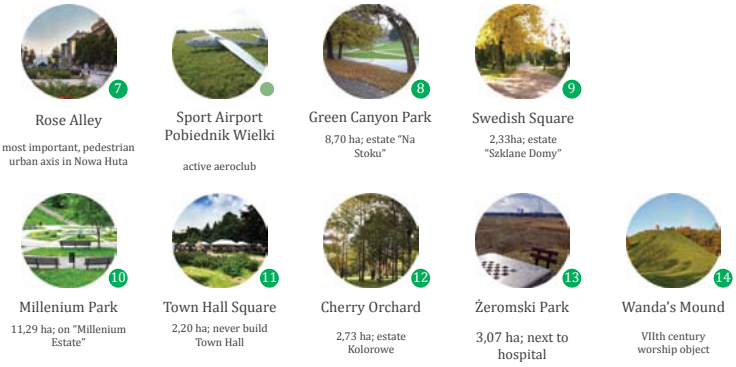
| | | |
|---|---|---|
| **total area:** | **11 079 ha** | |
| **fallows approximate:** | **12%:** | **1 300 ha** |
| **postindustrial areas:** | **8%:** | **900 ha** |
| | | **2 200 ha** |


Fig. 102. Agriculture in Nowa Huta. Mapping analysis; own work

# 14.3.4. CULTURAL CENTERS

Historically, villages around Kraków were properties of noble class people that invested money in agricultural and cultural development. They were living in in mansions - architectural masterpieces, that used to be centers of political, cultural and philosophical life (fig.103). Surrounded by recreational parks with close proximity to churches, most of them are national heritage today.

Nonetheless, many mansions are abandoned and parks around them are neglected. Villages lost their cultural function and become single-family housing estates. The identity of villages in Nowa Huta area can still be found in traditions related to following the calendar of religious events.





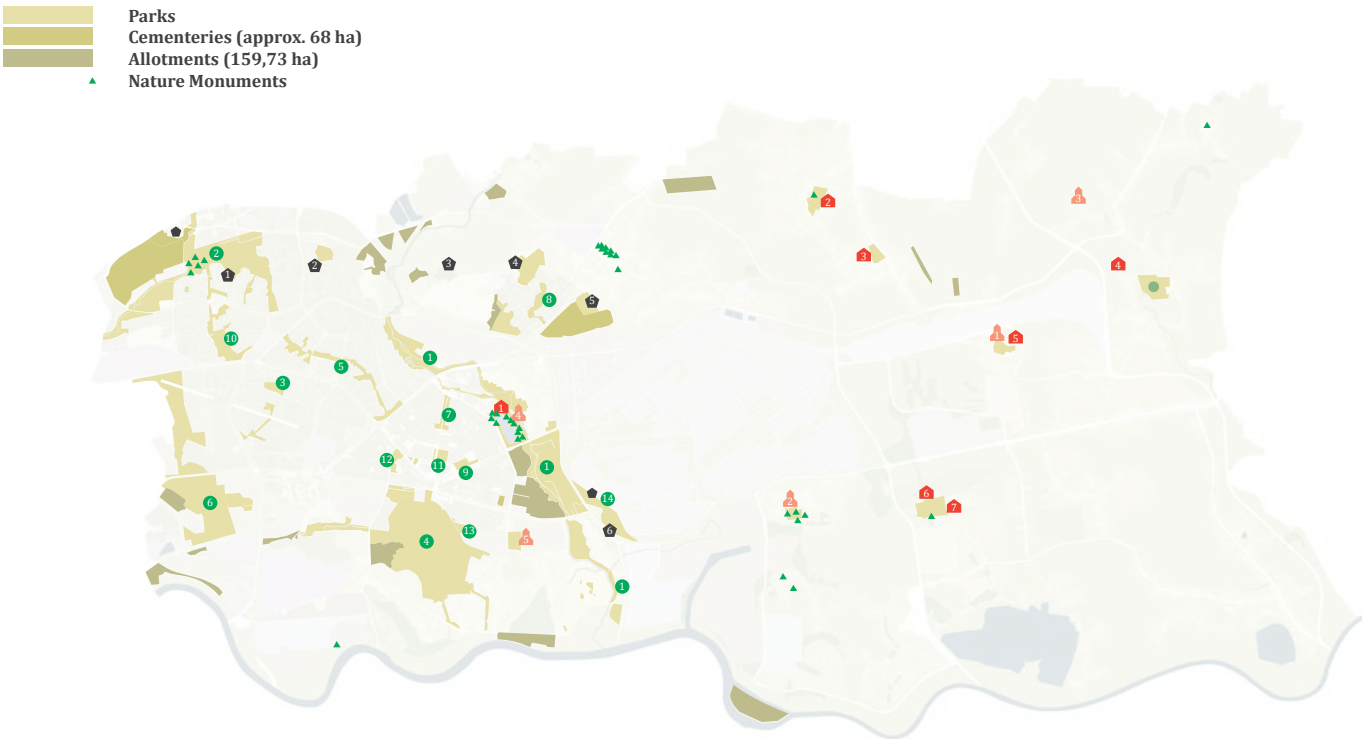



Fig. 103. Mapping history traces in Nowa Huta area - important point that builds identity of the area; own work

# 14.3.5. VILLAGE TRANSFORMATION

An analysis of historical maps (MHMK, 2008) and written sources about Ruszcza - one of the former grange village, reveals the story of this area at the turn of the last 250 years, whereas Kraków area was changing its political affilation very often.

During the time of no Polish statehood (1795-1918), Ruszcza was owned by Popiel family, a noble man who was organizing cultural life in his mansion, organizing so-called "thursday dinners" that were unformal political and philosophical debates for intelligentsia class. Popiel was a funder of "Czas" a conservative journal, became an alderman of Kraków Municipality and a member of many associations. (Fig.104)

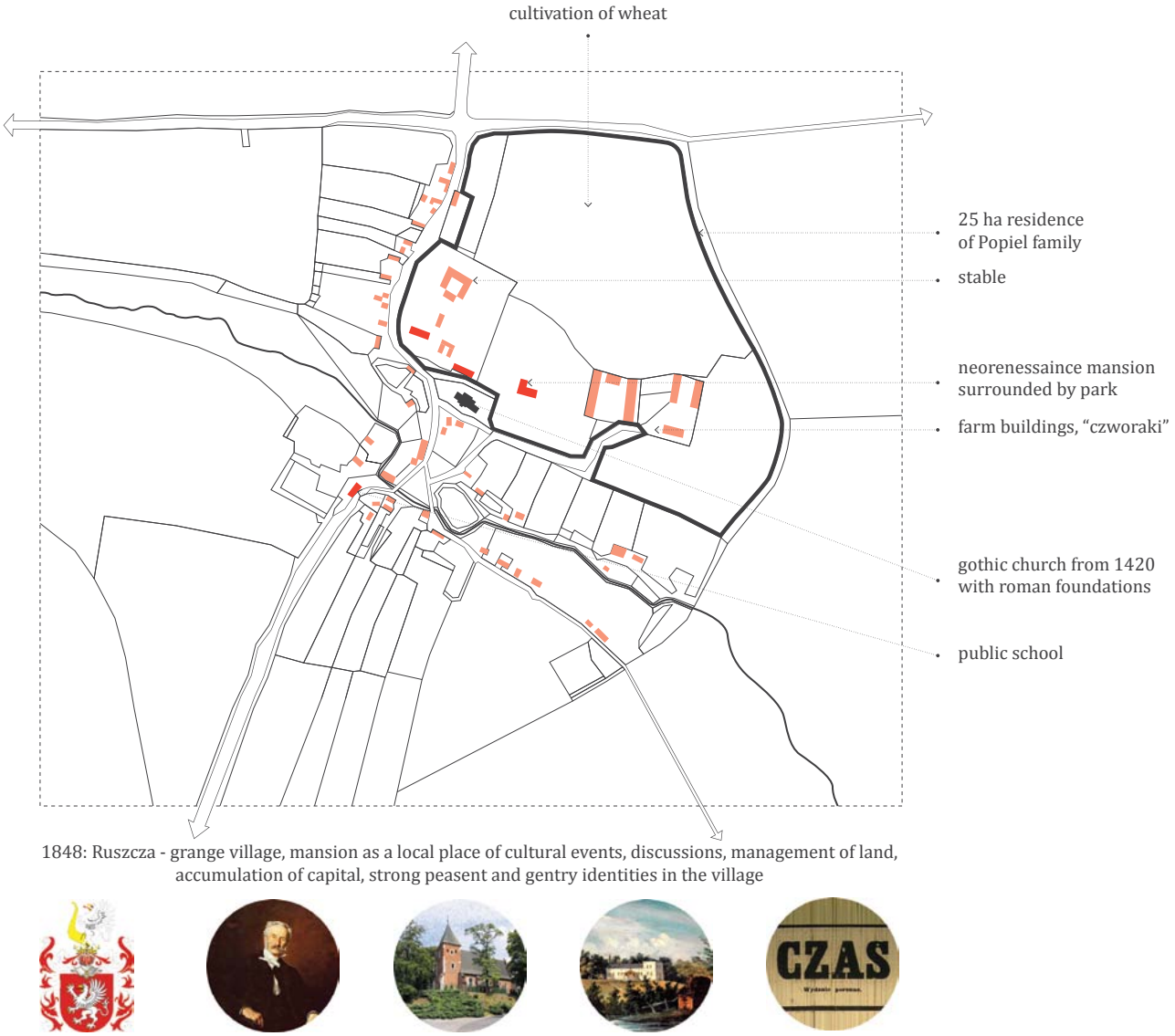



Fig. 104. Analysis of XIX Ruszcza village and its structure; own work

Recently, the village mansion became appropriated by the communist state that released outbuildings for communal reasons and build military barracks on a part of the residence. The northern portion was cut by railway tracks going to steelworks and the rest distributed to local farmers.

Nowadays, neoclasical palace is abandoned, military barracks renewed into social housing that steelworks have chosen for its PR program of creating flower gardens for the neighbours (Fig. 105).

Small plots that are scattered around village are slowly repurchased by larger farmers. Nevertheless landownership maps and recent aerial photos indicates that many of the plots are unused (fallows) or too little to constitute a market value.


2015: Large fragmentation of land, thus non-effective land management, identity monuments mostly abandoned and ruined, mixed suburbian and city identity

Fig. 105. Analysis of XXI Ruszcza village and its structure; own work

# 14.3.6. THIRD STRATEGY: LIVELY AND PRODUCTIVE COUNTRYSIDE

The prior analysis reveals a couple of goals that should be achieved in order to give a higher range for village areas, initiate identity development, and create more productive landscape.

The third strategy for Nowa Huta consist of several interdependent elements:

I) facilitating landownership transformation
II) utilizing fallow areas to crop energetic willow and mallow
III) restoring cultural centers in villages

The strategy is explained for Ruszcza village.

# I) LANDOWNERSHIP TRANSFORMATION

I) Landownership transformation is needed in order to create opportunities for local farmers to be more competitive on a larger scale. Land productivity in Poland is on a very low level and in average is around 961 €/ha compared to 7224€/ha in the Netherlands (Gębka, Filipiak, 2006). To achieve better productivity, it is needed to increase the size of farms, improve knowledge of farmers, create good loan and fiscal facilities, use techniques of farming that improve productivity without use of pesticides, invest in energy savings and newest farming technologies etc. Dutch experiences can be crucial for landownership transformation scenario. Nevertheless, polish farming can be competitive in different area such as bio-food production (AERI Hague, 2003).

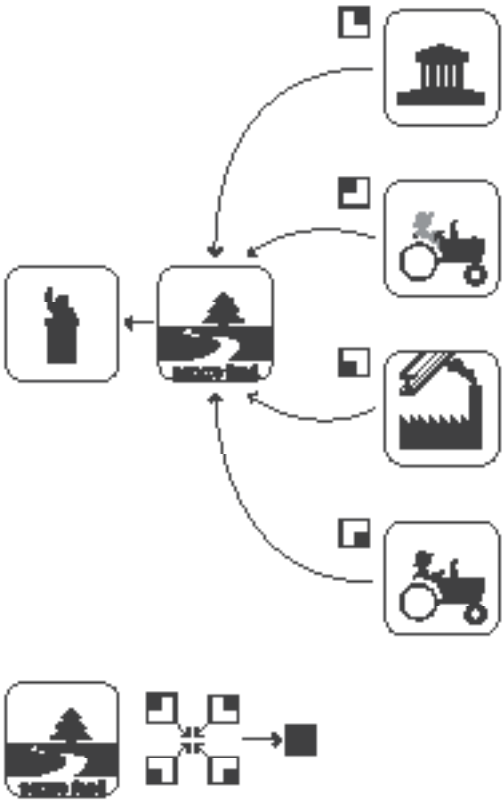
The property map of the area reveals that nowadays, parcels around Ruszcza belongs to three main actors. Firstly, steelworks plots, mostly afforested. Secondly, national plots slowly being freed from railway infrastructure. Thirdly, private landownership that is partly used for larger farmers planting i.e. oil rape, or smaller farmers for own use. Finally, some of the plots belong are municipal and mostly are intended for single-family housing purpose (Fig. 106).

Arcelor Mittal
National Treasure
Private Ownership
Municipality

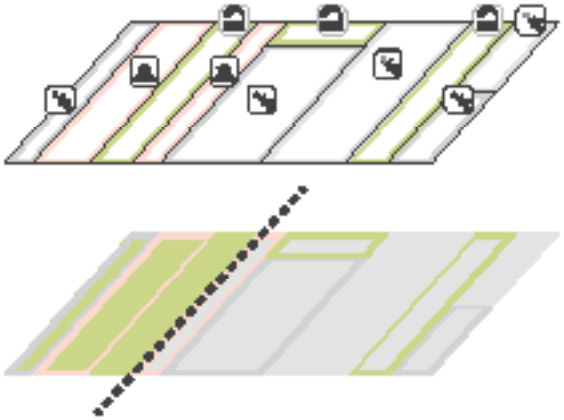
Fig. 106. Land ownership map of Ruszcza village and an exemplary scenario of rearrangement, source: http://miip.geomalopolska.pl

Strategy should provide all the actor with following tools:

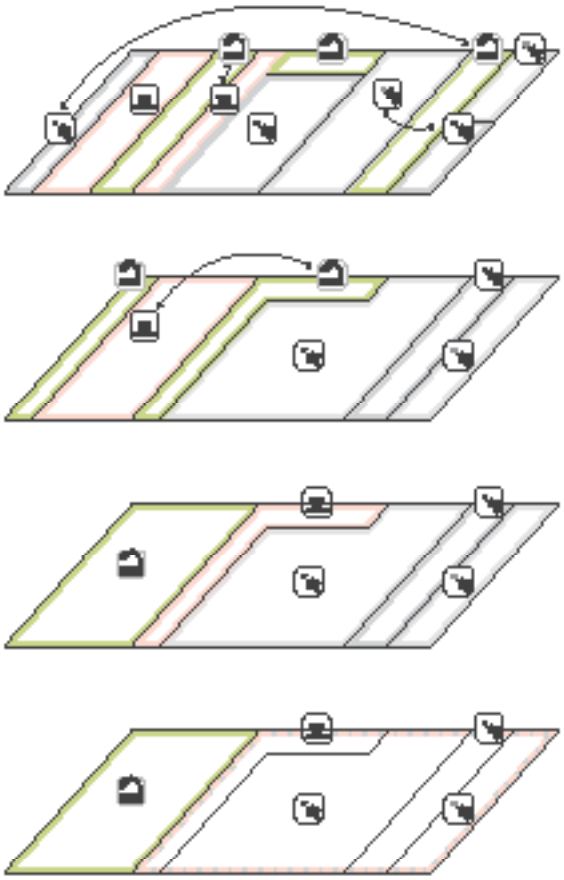
1) negotiation platform that help to swap plots between each actor



2) repurchasing fund that find small plots (preferably unused), purchase them and sells back as larger chunk



3) zoning plan that favors steelworks plot to be combined together creating belt surrounding industry and farmer plots together to facilitate collective farming



4) collective farming program, that encourages small farmers to lend their plots for larger cultivation

5) preferential conditions to establish light industry such as furniture manufacturing or daily-use objects production in village centers, preferably for farmers with smaller plots

Prior points shall accelerate enlarging plots into bigger entities and bring job opportunities to village centers.

# II) FALLOW TO WILLOW

II) In analyzed area that is designed to be a village entity there are some 434,94 ha of arable land. Mapping fallows and unused land reveals that 91,95 ha nowadays stays unused. which is around 21% of total arable land in Ruszcza. It may be assumed that around half of fallows today are subsidized by EU funds that gives a number of 11 500 € per year for not using the land for any reason. In the scenario, whereas fallows are transformed into energetic plant production, it can be calculated that some 41 400 € of revenue is generated, which is 4 times more than subsidizing fallows scenario run by EU.

Fallow strategy implies that the money from willow production partly will enhance budget of farmers that used to use "cultivating payment from EU" and partly power "the NH nature fund" which will establish special ecological zones in Nowa Huta (more elaborated in the fourth strategy in NH) - see chapter 14.4). Preliminary calculations reveal, that willow market in Nowa Huta oscillates around 1 000 000 €. Willow is a plant that has not only an energetic value, but also fulfill other important roles (Fig.107).


Fig. 107. Willow: natural plant species that can help to build new identity of Nowa Huta at many levels; own work

# III) SCATTERED CENTERS

III) The third strategy assumes restoring old village centers to become once more a lively area. Alongside landownership transformation and willow production, another beneficial scenario occurs. Willlow is not only used for energy or recultivation reason, it is also a raw material for producing willow ecological furniture. Taking care that the Kraków area has decent soil to cultivate willow, it is possible to establish furniture centers that can bring new cultural and industrial aspect for villages and not only. Public spaces made out from living willow, can bring back life to countryside, give a reason to renovate mansions and other monuments that deteriorates (Fig. 108).

Fig. 108. Willow industry as the connecting element for Nowa Huta; own work

# 14.4. NATURE: HUMAN ACTIVITY

Biodiversity is a variety of organisms that growth is restricted by human activity. Nature is an important part creating identity of any given area. Development restricted zones are not only a great way of spending time and escape from city life, but play the role of ecological deposits of biosystems.

There are several ecological deposits in Nowa Huta, that are inhabited by plenty of unique species, that within 7000 years of human existence, have changed dramatically.

The landscape before anthropogenic changes was very different that it is nowadays. It ressembled a large river pool that vegetation was changing along with the range of river floods.

Closest to the river in the area flooded every year, there used to grow many varietes of willow (Salicetum triandro-viminalis). Further were water level was still high, there used to grow riparian forests - willows and poplars (Salici Populetum). They were accompanied by high willows. Riparian forests were cut by Vistula river basin, that was a natural inhabitant for swamp vegetation with water leelas.

On higher terraces that were flooded only ocassionally, there used to grow ash and elm forests, also hails and oaks. Some of them grew very high and extensive. Even higher, where floods did not reach the ground level, grew hornbearm forests with trees like hornbeam, linden, maple and oak. (fig.109)

First settlements were believed to occur in the area around 7400 years ago in the place where smaller Dłubnia River flows into Vistula. Until early Medieval, settlement has faded away and reborn many times. Before plan of building steelworks in 1949, the area was entirely transformed into arable field on higher terraces and meadows in lower terraces. The natural landscape was almost completely changed.

Fig. 109. map representing presumed areas of vegetation before anthropogenic transformation (see types of vegetation on the left) compared to situation nowadays (images on the top); own work based on Salwiński, J.)

# 14.4.1. ECOLOGICAL DEPOSITS

Hopefully, some of the ecological deposits can be spotted in the area nowadays (Fig.110, see Appendix F: Biodiversity Album):

- Lasek Mogilski, whereas many 100-years old elms are restrained into ground with imposing buttresses. Unfortunately, since lack of sufficient wet in the ground, many of them withered. In the forest many stately oak trees, ashes, black poplars and aspens one can observe. A high embankment with a road that  keeps water out of the forest, asphalt paths and dry environment is changing the character of the riverine character of the wood. The forest is a natural home of many other species such as rooks or jackdaws

- Lasek Łęgowski, consist of tree types of trees, in the western part oak tree, in the middle ash, and in the eastern part black alder. The forest is also a home for many other species: bushes, mosses and avifauna

- Łąki Nowohuckie, in close proximity to central square, protected by law ecological meadow. The place is covered by hundreds of different species of grass, perennials and bushes. There are many marshy spots that enrich the biodiversity of the area.

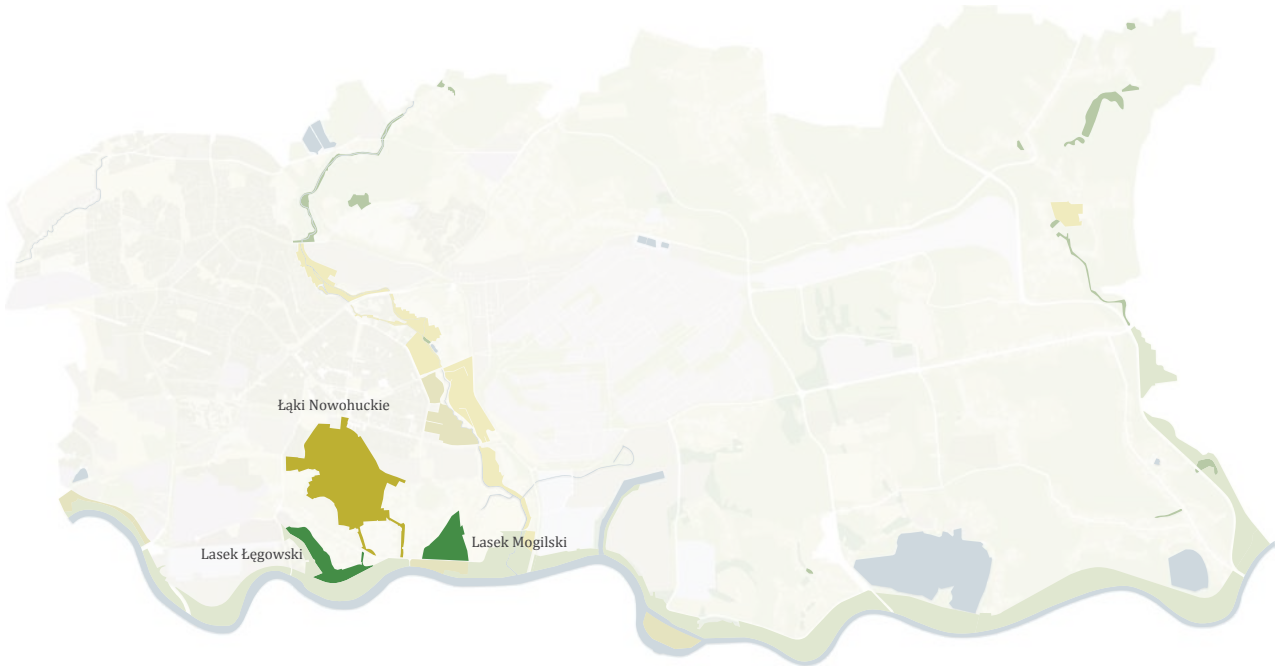



Fig. 110. Map representing ecolocigal deposit areas with very high biological value; own work

Also, some of the areas, that are transformed by anthropogenic activity, but eventually can become a wildlife zone (Fig.111):

- Przylasek Rusiecki, former gravel pit. Nowadays is a half-natural ponds reservoir that is a home for countless avifauna and fishes.

- Vistula River Valley, that on larger scale is an ecological corridor connecting mountainous southern rim of Poland with Baltic Sea on the north. Unfortunately, river banks are used as hay meadows, that used to be water ponds area in the past.

- Dłubnia River Valley, that runs between residential area and steelworks, creating steep slopes in the northern part, flows to Vistula river in southern part of the area. Landscape qualities of the valley was partly preserved by introducing mostly recreational and sport facilities along its location.

- Potok Kościelnicki Valley, it is an area that naturally creates eastern border of Nowa Huta, is also an important ecological corridor that domesticates many species of birds, grasses and perennials.

Proecological organizations in Nowa Huta, actively works for leaving natural character of the ecological deposits and became initiators of many action that suppose to protect the areas from intensive development. Prior areas are underused in the meaning of recreation and education. (Salwiński, J., 2008)


Fig. 111. Map representing areas with moderate ecological values that could be preserved and enhanced

## 14.4.2. FOURTH STRATEGY: GREEN BORDERS

The fourth strategy for Nowa Huta proposes creation of continous ecological zone, combining all of the investigated areas. The green continuous park is foreseen to fulfill many roles (fig. 112):

1) recreational, focusing sport facilities, health centers, touristical paths, wellness and spa, eco-labs, educational buildings, retirement homes, shooting ranges, allotments scattered in greenery in many individual spots

2) biological, becoming green corridor for undisturbed evolution and movement of species, both flora and fauna

3) environmental, absorbing the waste coming from steelworks and car traffic, helping to clean the air in Nowa Huta, that nowadays surpasses all standards

4) forming natural intensive development restricted area, that helps to keep the city compact

5) political, underlining borders of the city of Nowa Huta

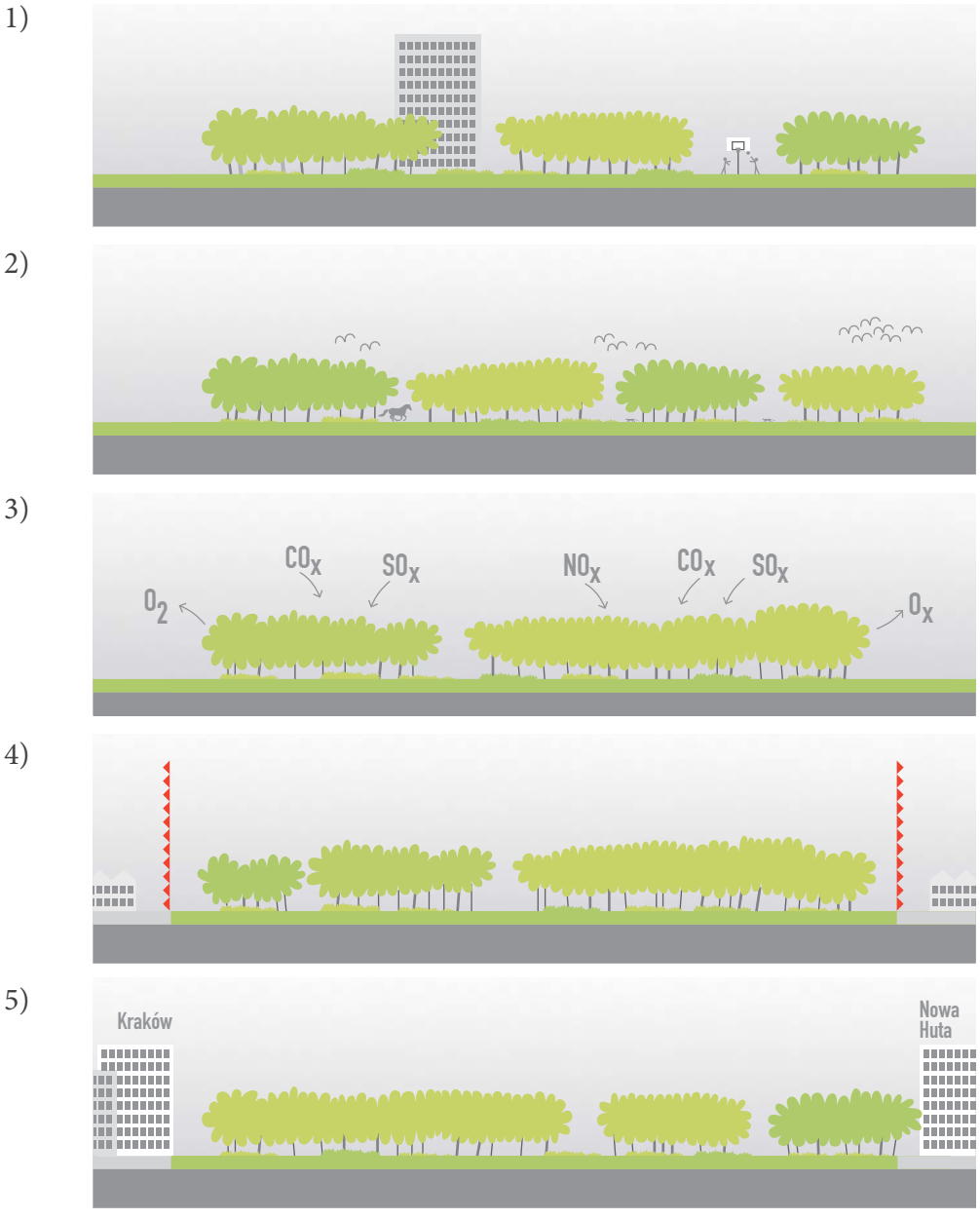



Fig. 112. Green border and its functionality; own work

The green continous park on the south assumes Vistula River Valley, that run latitudinally will be gradually be repurchased from farmers. The money will come from prior established “nature fund”. The hard river banks in spots where water current is strongest, will be removed and let the erosion occurs. Gradually, where the river starts to wash out material deposit, more hard obstacles will be introduced to change current intensivity (Fig.113). Lasek Łęgowski and Lasek Mogilski will naturally expand towards the river valley. Bicycle paths and shweeb station will be provided for tourists and inhabitants together with light service points. Three meridional ecological corridors will be connected with Vistula River Valley.

On the westernmost part, two large parks will be connected - Park of Polish Aviators and Millenium Park through still undeveloped areas. West green corridor will be a natural border between Kraków and Nowa Huta. Left bank of the park will be provided for developing bypass, that nowadays is planned between Nowa Huta and steelworks.

In the middle-part between steelworks and residential areas lays Dłubnia River Valley, that is foreseen to serve as the central green corridor. Nowadays it serves as isolation from steelworks.

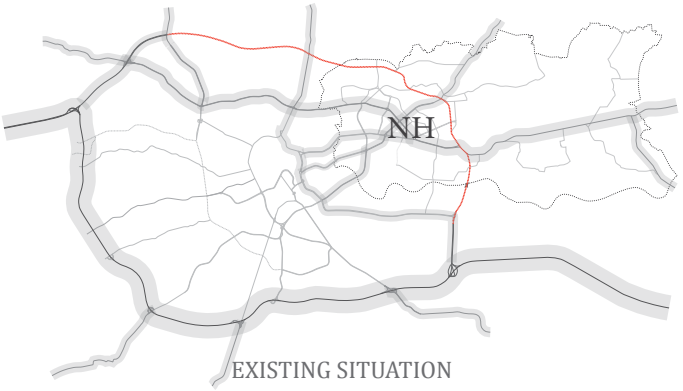
On the easternmost part lays Potok Kościelnicki Valley which will be the eastern border of Nowa Huta. Together with central corridor and Vistula River Valley shall create clear boundaries for countryside landscape with village centers.

The northernmost part nowadays is a hilly area with Mistrzejowice - highrise building estate. In the previous strategy (see Chapter 14.2.4: Urban Mining), the housing estate is predicted to be depopulated. Some of the buildings there will change its function to more recreational, most of the area will create northern, hilly forest that closes residential area from the top, closing residential area inside a green loop.

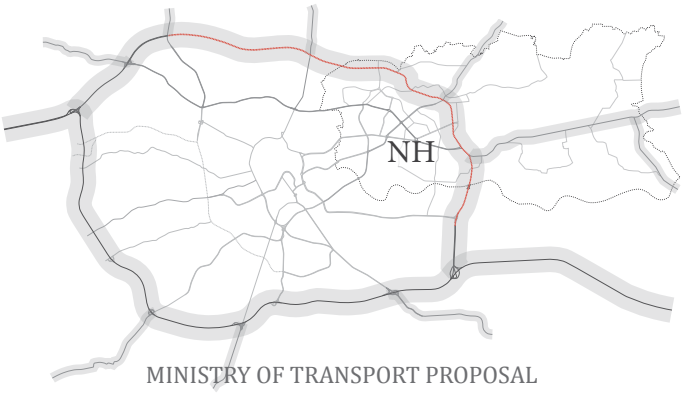

Fig. 113. Green border strategy: greenery as multifunctional ecological corridors; own work

# 14.5.TRANSPORT

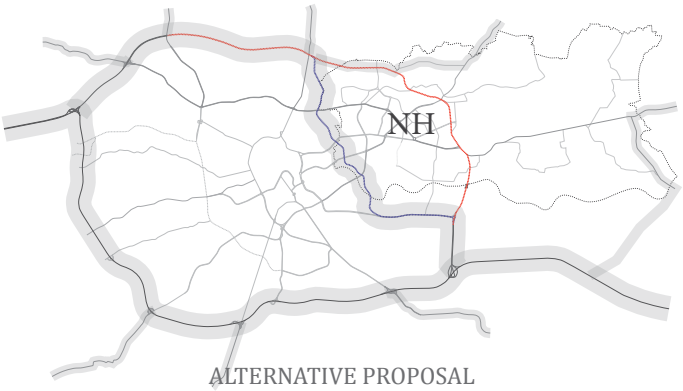
The macroscale analysis (see. Appendix G: Transport and Transit) demonstrates that Nowa Huta is located on a very important spot in the center of Eastern Europe. Many transregional plans that have been already launched, convince that the new priority here, will be maximizing mobility. Motorways and expressways construction are already being started. Network of wheel roads shall be densified within the next decades to facilitate fast transit.




EXISTING SITUATION




MINISTRY OF TRANSPORT PROPOSAL




ALTERNATIVE PROPOSAL

Fig. 114. Transit through Kraków. From up: current transit routes, middle: proposition by Ministry of Transport, down: change of proposal (separating NH from Kraków); own work

The macroscale planning affects the urban form of Nowa Huta. According to the plans of Ministry of Transport, Kraków will be provided with a new bypass that will dismiss heavy transit from Nowa Huta (Fig.114). The decision could be crucial to perceive Nowa Huta as part of Kraków, thus an intervention is necessary, to create the bypass between cities. That procedure shall successfully detach Nowa Huta from Kraków (Fig.115, 117).

Transport in Nowa Huta itselft is mostly designed for car owners. Wide roads crossing highrise housing estates nominate car as the main mean of traffic. Public transport is limited to rarely coursing tramways and buses, which connect Steelworks, Nowa Huta and Kraków center (Fig.116).

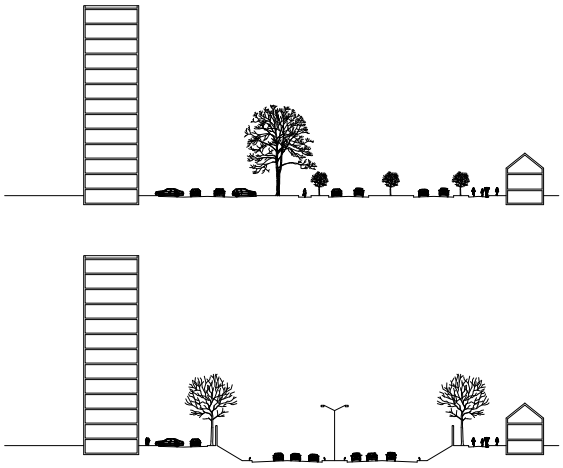
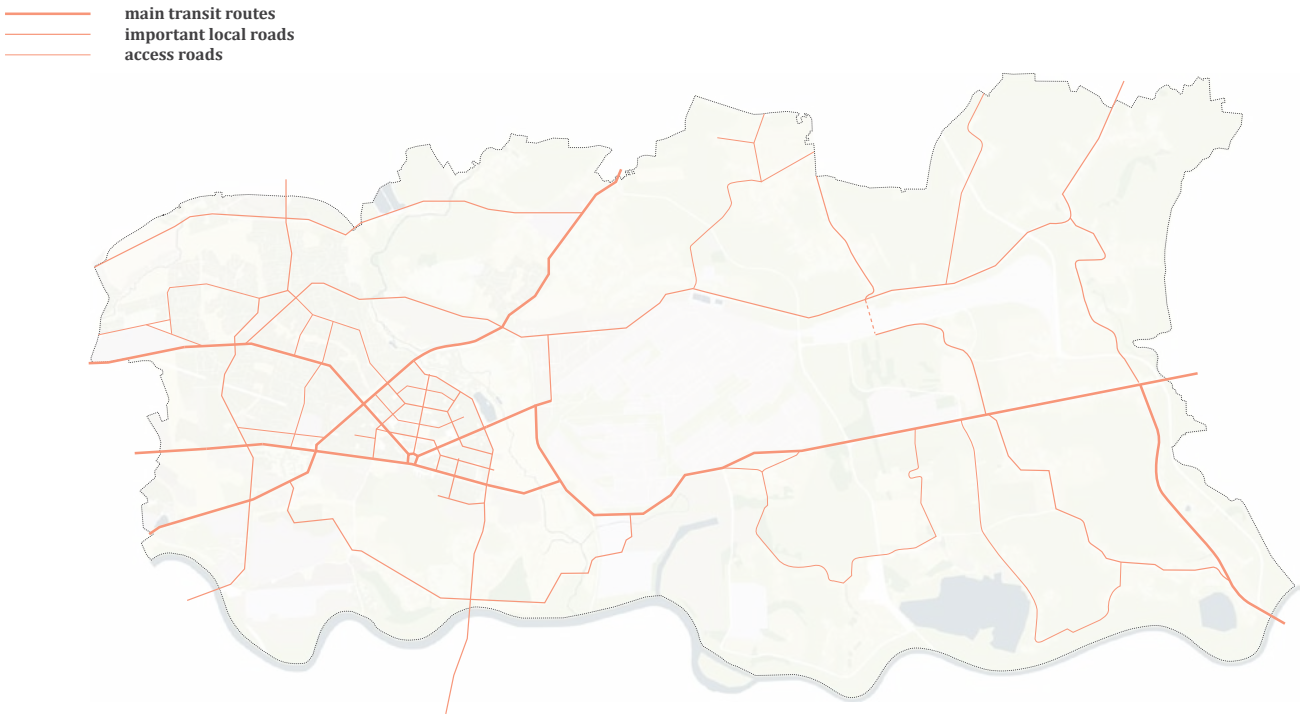


Fig.115. Macroscale planning affecting microscale: creating infrastructural border separating NH from Kraków; own work

Fig. 116. Existing tram network is not sufficient for 200 000 people and became just an optional way of travelling; own work

## Current road network




## Proposed road network

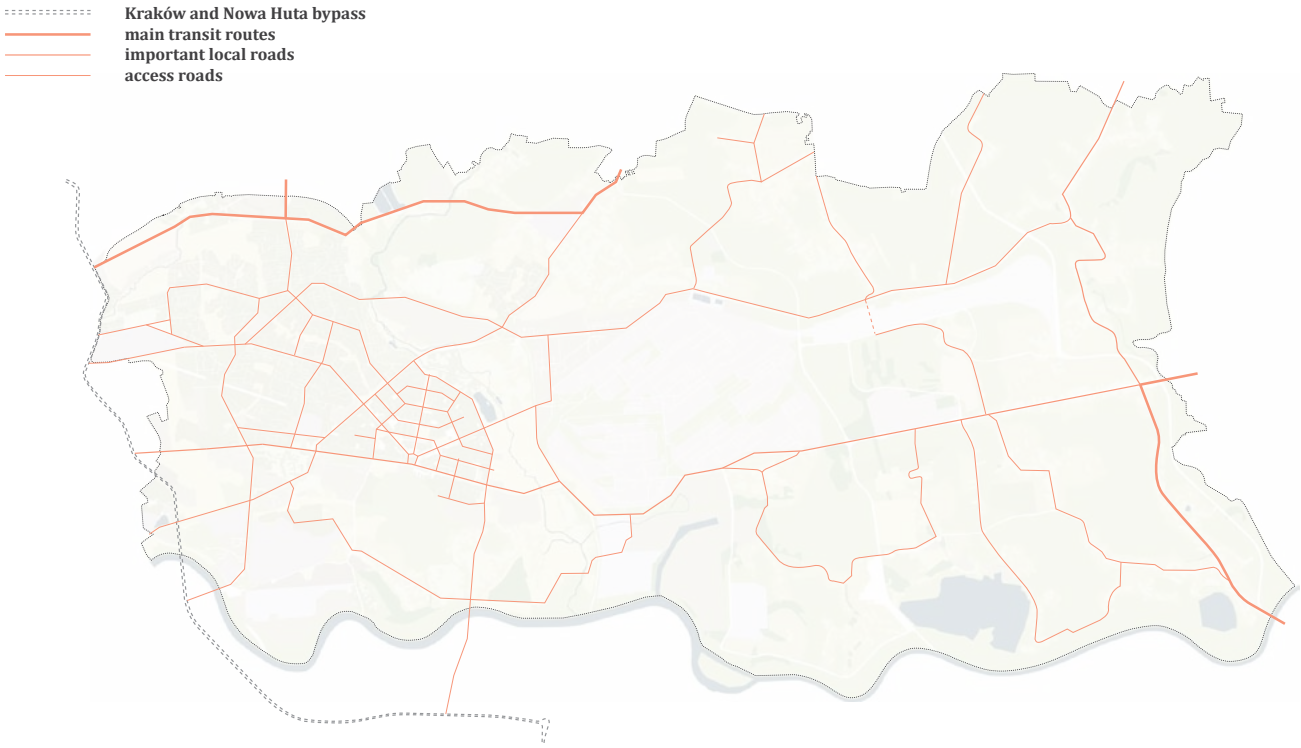



Fig. 117. Design decision: avoiding high traffic throughout the researched area in favor of bypass and motorway

# 14.5.1. IMAGE OF THE CITY

The social realistic part of Nowa Huta is based on clear marked urban axis (Fig.119). Urban blocks are compact and sucessfully articulate transition from private to public realm. Nonetheless, the subsequent development have disregarded those rules, proposing open, neomodernistic extension of the urban form. Vast public areas that are approachable mostly by wheel transport, with large shopping malls and no clear transition semi-private or semi-public spaces (Fig.120).

Thorought years of living in the built environment, citizens started to look positively on their home, admiring lots of green spaces around the blocks. People got used to complain to the authority when the greenery is not maintained, pavement has a bad quality or public transport runs less frequently. Municipality with limited resources patches holes and bounces waves of criticism, when trying to densify the city (dziennik polski, 2015).

Research on relationship between petroleum use and desity of a city reveals that the form of the city and use of energy goes hand in hand (Fig.121). Respecting growing costs of energy and prior mentioned scenario, what shall be the future of Nowa Huta?

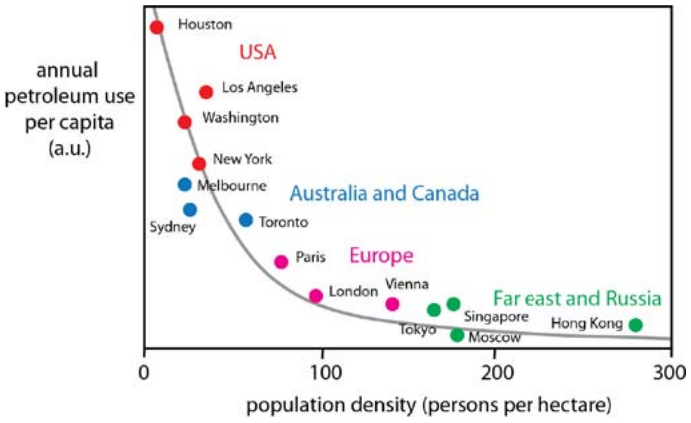



Fig. 121. The relation between use of petroleum and density; wikipedia.org

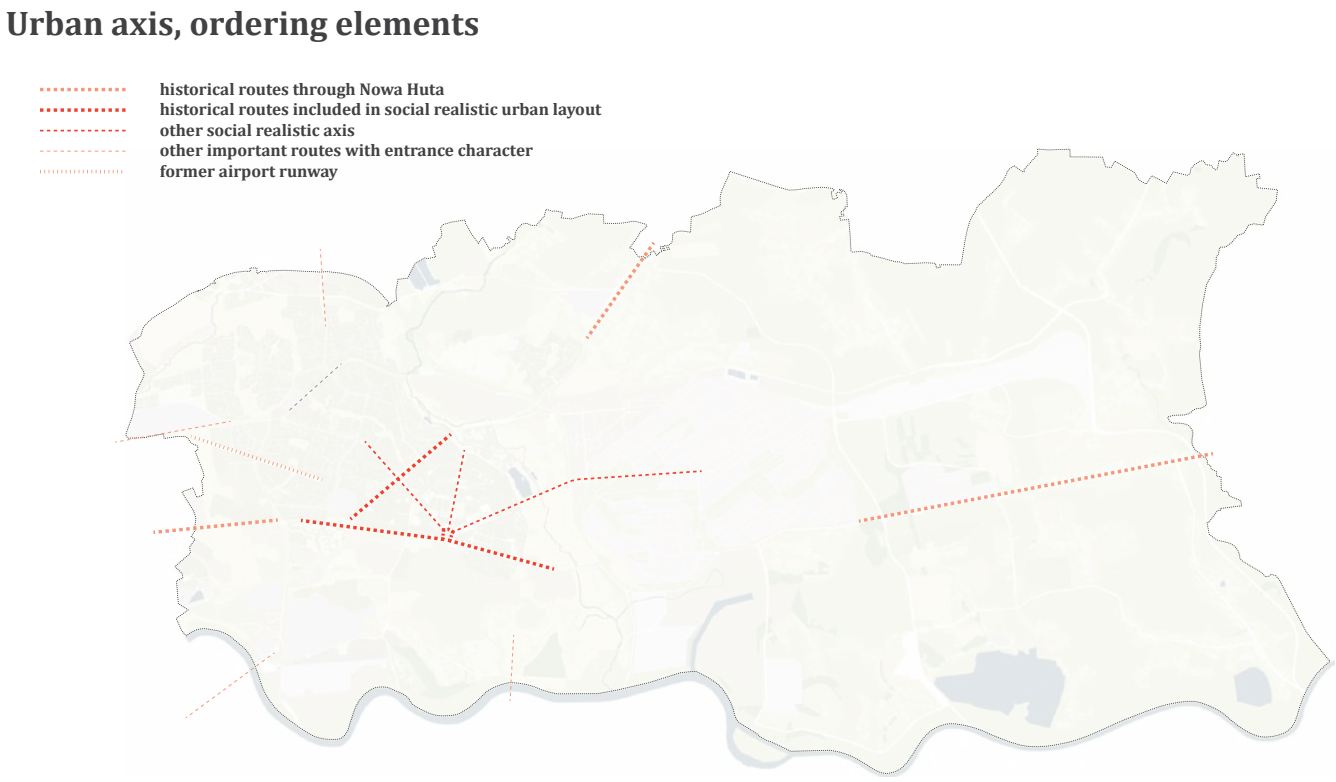
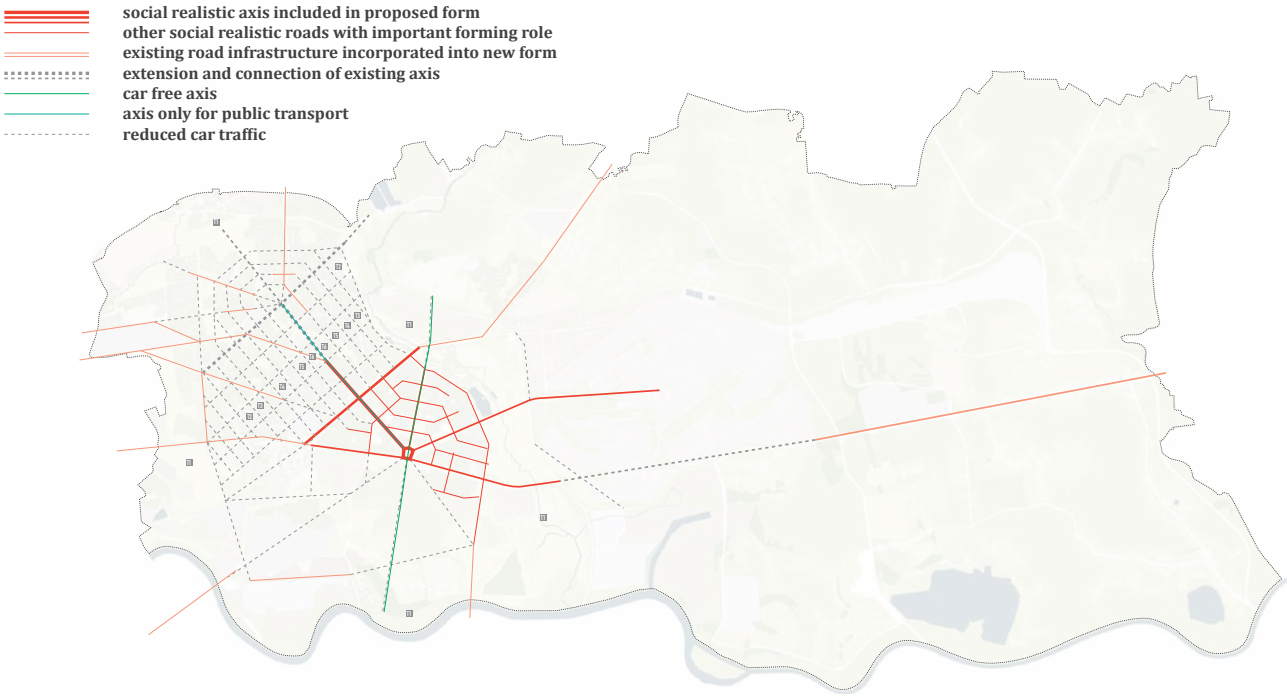



Fig. 119. There are some clear ordering elements in Nowa Huta, mostly being a residue of historical routes or Nowa Huta city planner; own work

## Spatial form analysis


Fig. 120. Spatial form analysis reveals, that the north-west extensions of Nowa Huta has very poor liveability level and does not favor good way-finding and well organized public transport; own work

## Proposed ordering form of the city




transect urban model defining densities of the areas along the main axis; development responding to the demographic trends

Fig. 122. An attempt to order the neomodernistic city form through transect model. The city can adjust its density to further demographic trends;  own work

## 14.5.2. FIFTH SCENARIO: TRANSPORT REVOLUTION

As written in the beginning of this Master thesis, the future of the polish cities is unknown and very interrelated with political and economical decisions on the upmost administrative level. Taking the advantage of postponing the proposal of PLAN-A by the national authorities, the master thesis tries to create a PLAN-B, assuming that nothing is done to "save the polish cities". PLAN-B takes into account raising costs of road maintanance and public transport while low economic growth keeps salaries at the same level.

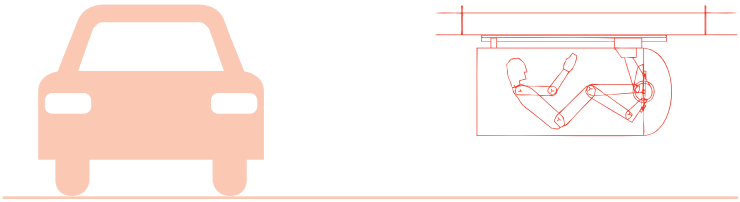
Transport within this scenario has to be gradually more energy efficient, cheaper, inclusive and low-tech. The best solution is believed to be SHWEEB - a low-tech, mechanical, build up mostly from steel mean of transport (Fig.123). SHWEEB produces no CO2, is cheaper than owning a car, ready for common use and the most important - can be entirely build up and serviced inside the city.

The scenario of creating the network is simple and involves all the inhabitants. Every year in Nowa Huta, more than 1800 cars is delivered for recycling. If citizens agree on a scenario whereas they leave their wreck for common good, it is possible to build 5,7m of shweeb infrastructure from a single car that weigh around 1 Mg (tonne).
More actors can be involved in the scenario, such as Arcelor Mittal steelworks for resmelting the cars and municipality by publicizing action. It is believed, that more than 10km of infrastructure can be build yearly (fig.124,125), succesfully replacing half of the roads in the area. Moreover, the manifacturing and service of shweeb can be localized entirely in Nowa Huta giving work for dozens of inhabitants.

The shweeb network can start a revolution both in transport and also in urban forming. Shweeb plays the major role of transport in the area, creating a grid that the new development is subordinated to (fig.126). Calculations reveal that number of cars in the area will be reduced by 50% to 2050, due to new shweeb network (see Appendix H: Data Projection). To create more inclusive way of transport (shweeb is not likely to be used by the oldest generation), tram extensions densifing the shweeb grid is proposed.

The last point of the transport revolution are cargo trams that are created from trams that cannot serve for transporting people. They are upcycled mostly to collect waste from citizens.

SHWEEB: human powered monorail



**electric car**
speed: up to 220 km/h
speed in cities: 50 km/h...
C02 emission: 250g/km + 18g/km
energy needed to move 1 km (35km/h):
836 357 J

**shweeb**
speed: up to 70km/h
speed in cities: 50 km/h
CO2 emission: 18g/km (driver only)
energy needed to move 1 km (35km/h):
10 285 J

**15 times less CO2 in transport**
**81 times less energy consumed**

average: 1 Mg of steel
+ costful road infrastructure
1856 Mg (yearly recycled cars in NH)

1 Mg of steel = 5,71 m of shweeb
1856 Mg of steel = 10 597 m of shweeb per year

Fig. 123. 2050: environmental impact of shweeb, compared to electrical car; own work

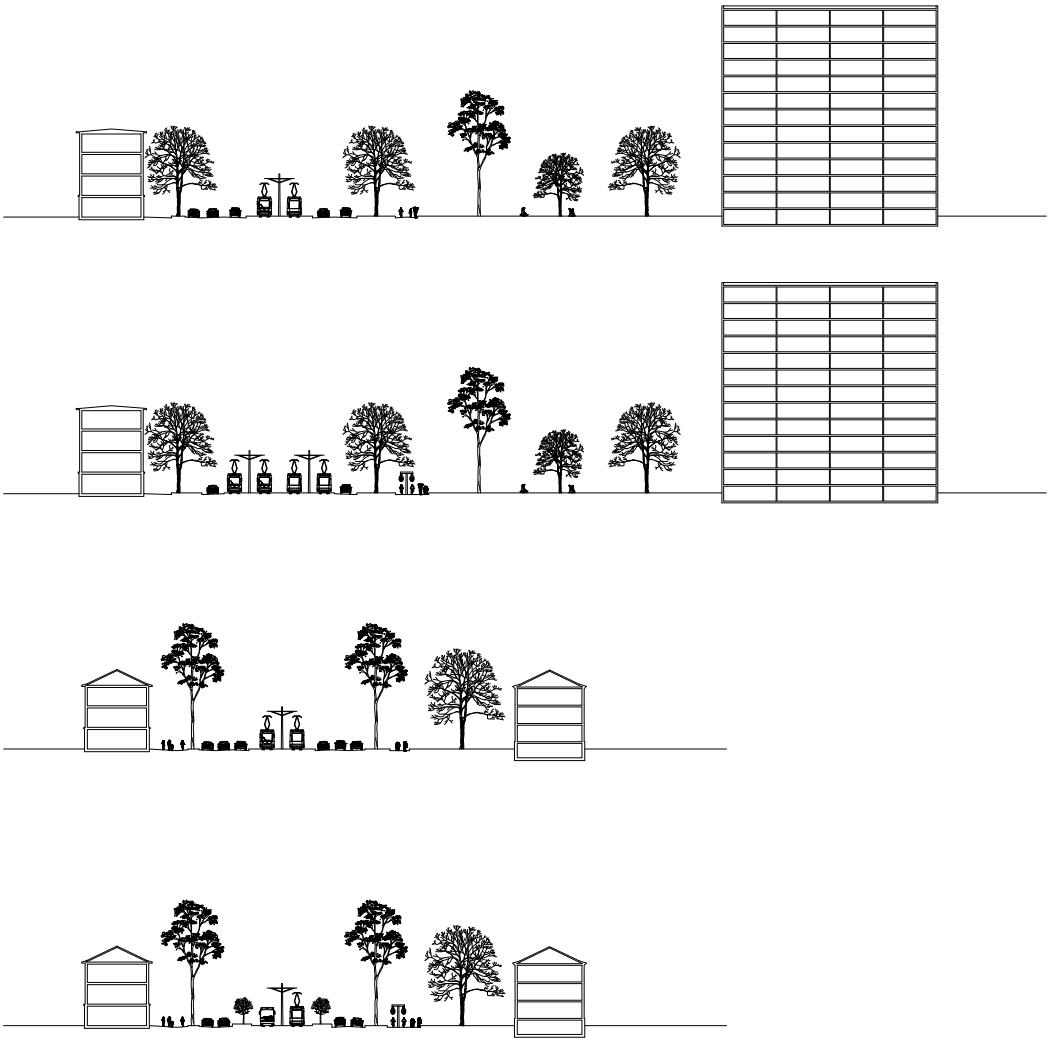


Fig. 126. 2050: less cars, more trams and shweeb; own work


Fig. 124. three complementary means of transport that organizes the structure of the city;  own work

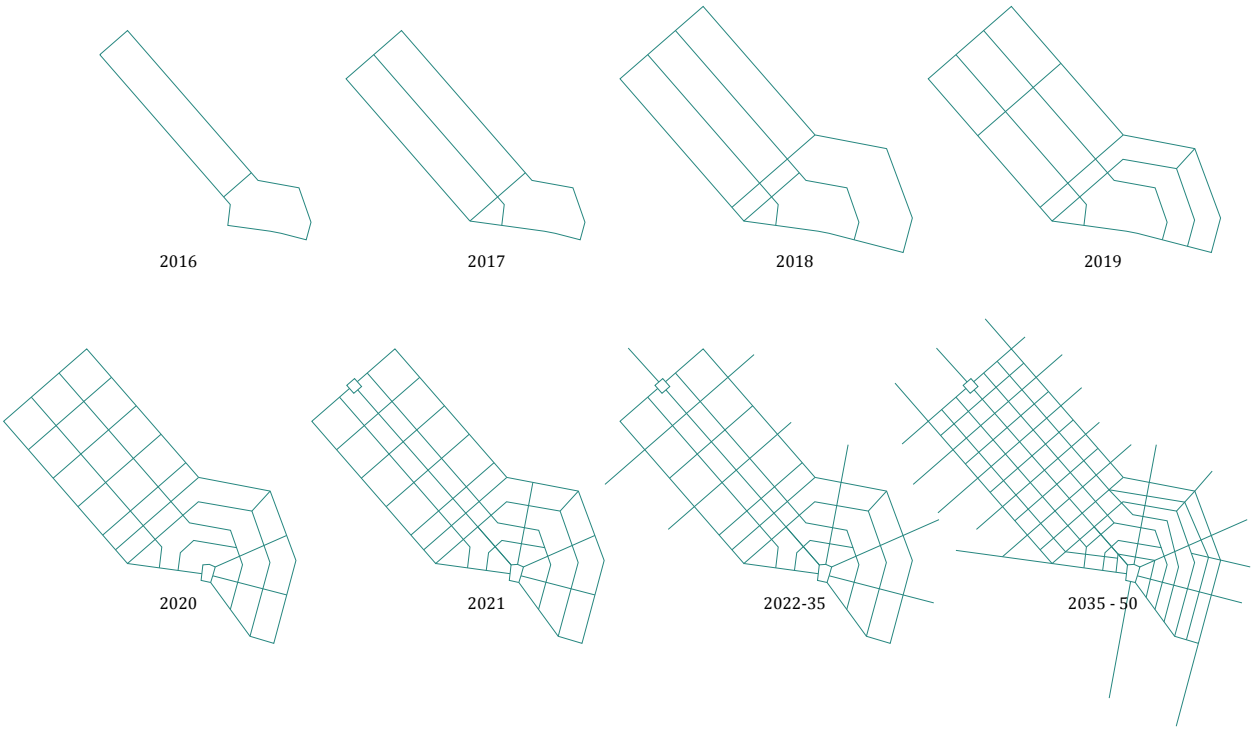



Fig. 125. Shweeb development scenario - entire network in could be achieved in 5 years for further extensions and densification until 2050;  own work

# 14.6. FROM STRATEGY TO GUIDEPLAN

Combined strategies create a guideplan for changes in Nowa Huta until 2050. Together they create a coherent scenario for dealing with coming adverse changes. The guideplan consist of twelve overlapping elements:

1) axis
2) transect grid

} **city form**

3) urban units
4) village centers

} **organization**

5) transit-free city
6) transport revolution

} **mobility**

} **spatial planning**

7) urban mining
8) industrial ecology network

} **work**

} **production planning**

9) willow production
10) dynamic riverscape

} **nature**

11) green borders
12) tourism

} **recreation**

} **landscape design**

} **urban design**

# CITY FORM

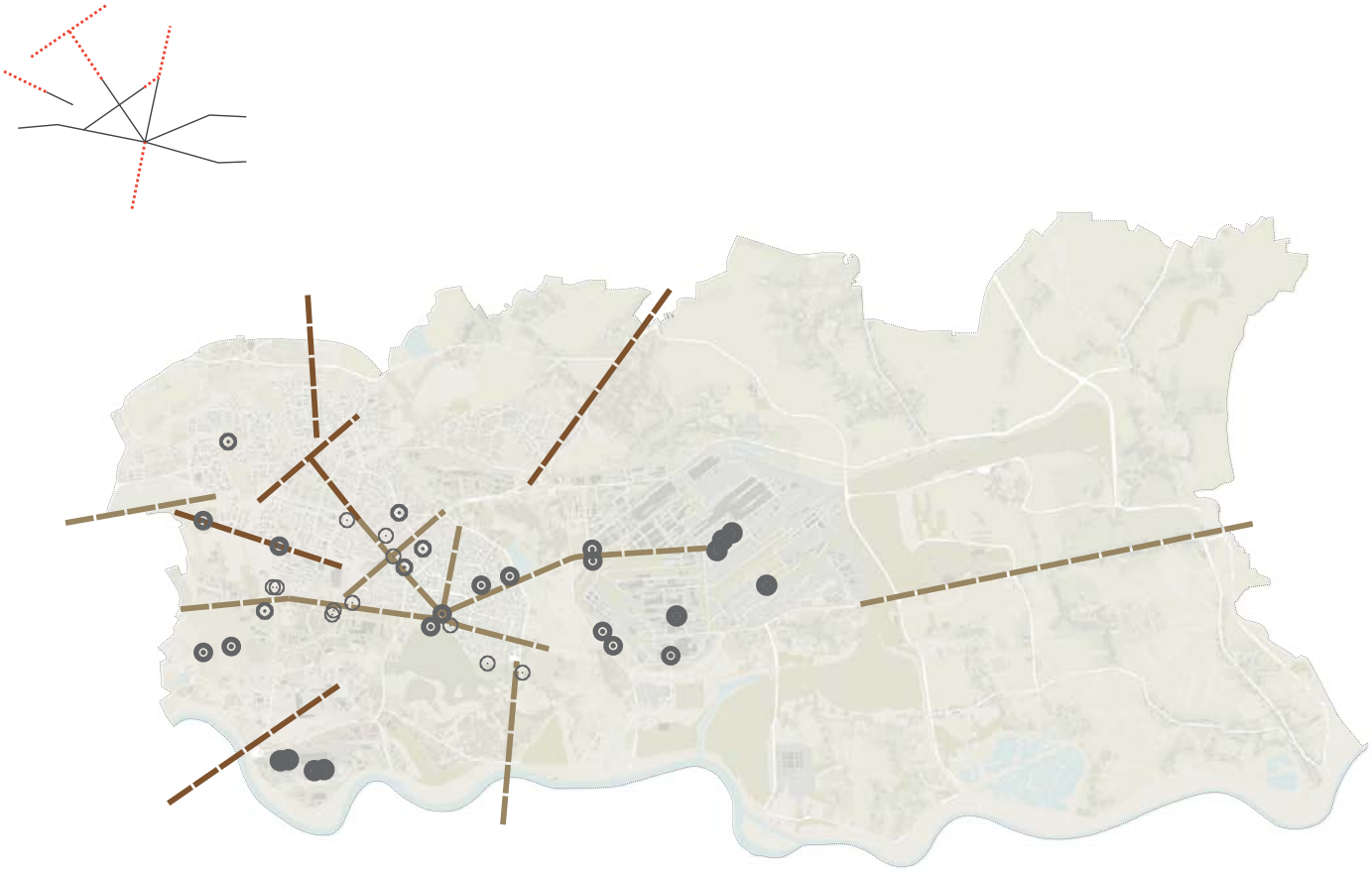


Fig. 127. Landmarks and urban axis - spatial forms creating the spine of NH 2050; own work

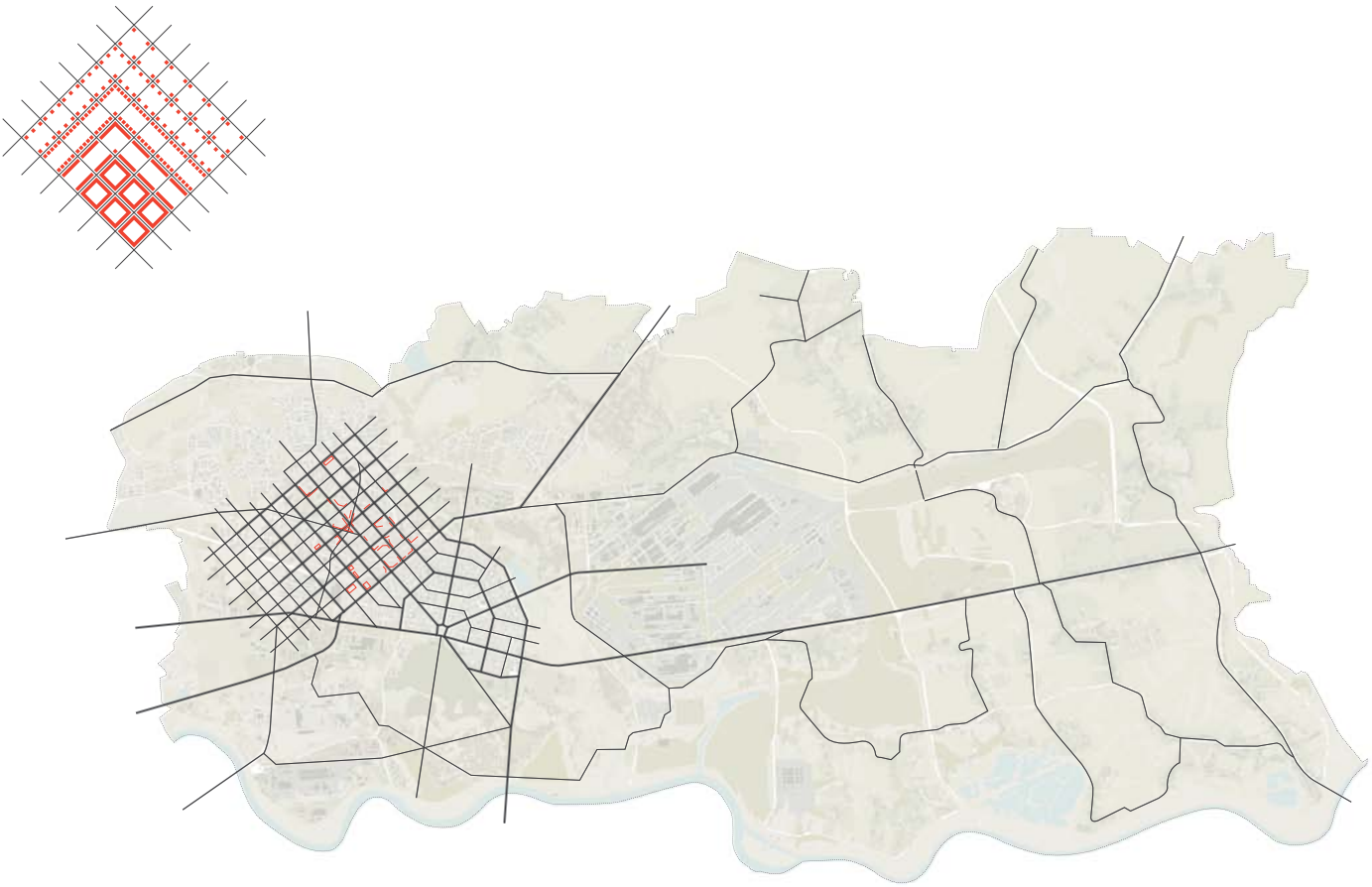


Fig. 128. Transect grid - a matrix for tiding up the form of city and transport network pattern; own work

# ORGANIZATION

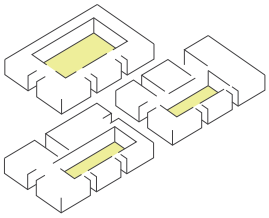
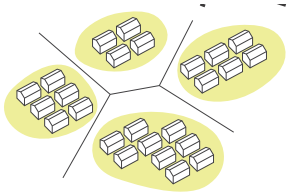


Fig. 129. Urban units (one for approx. 2500 people)
- organized around civil budgets;  own work



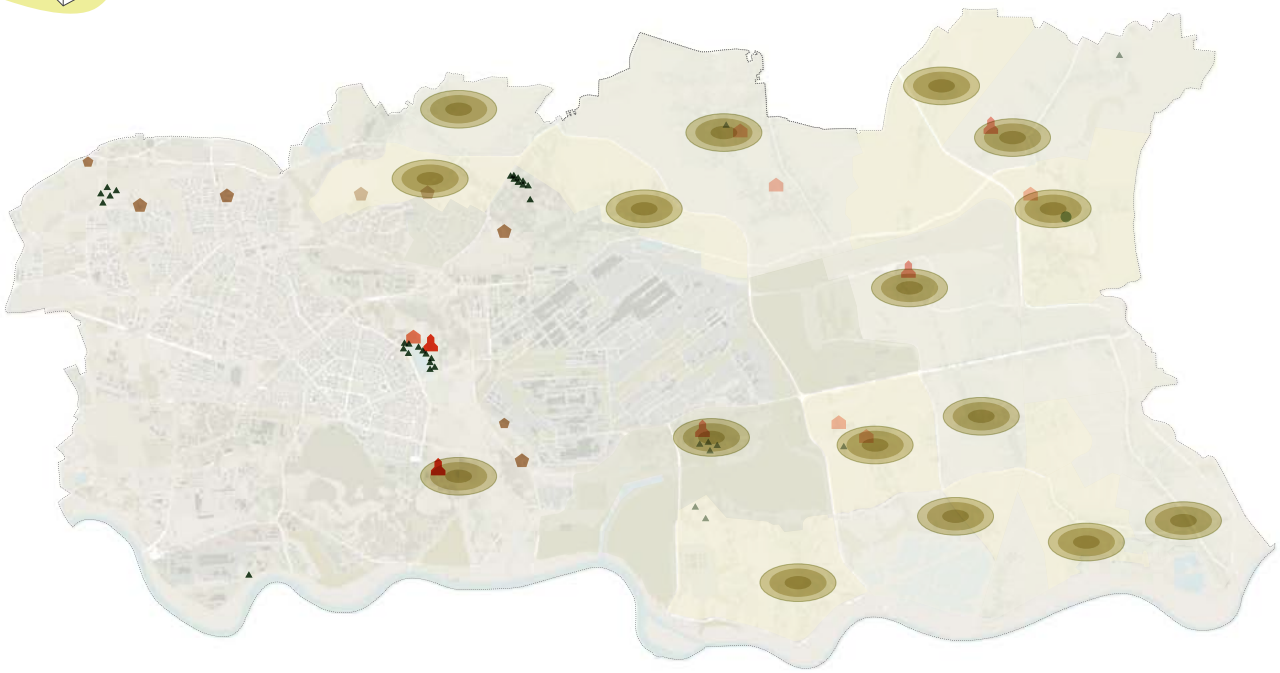


Fig. 130. Village centers - organized around common production of wilow;
own work

# MOBILITY

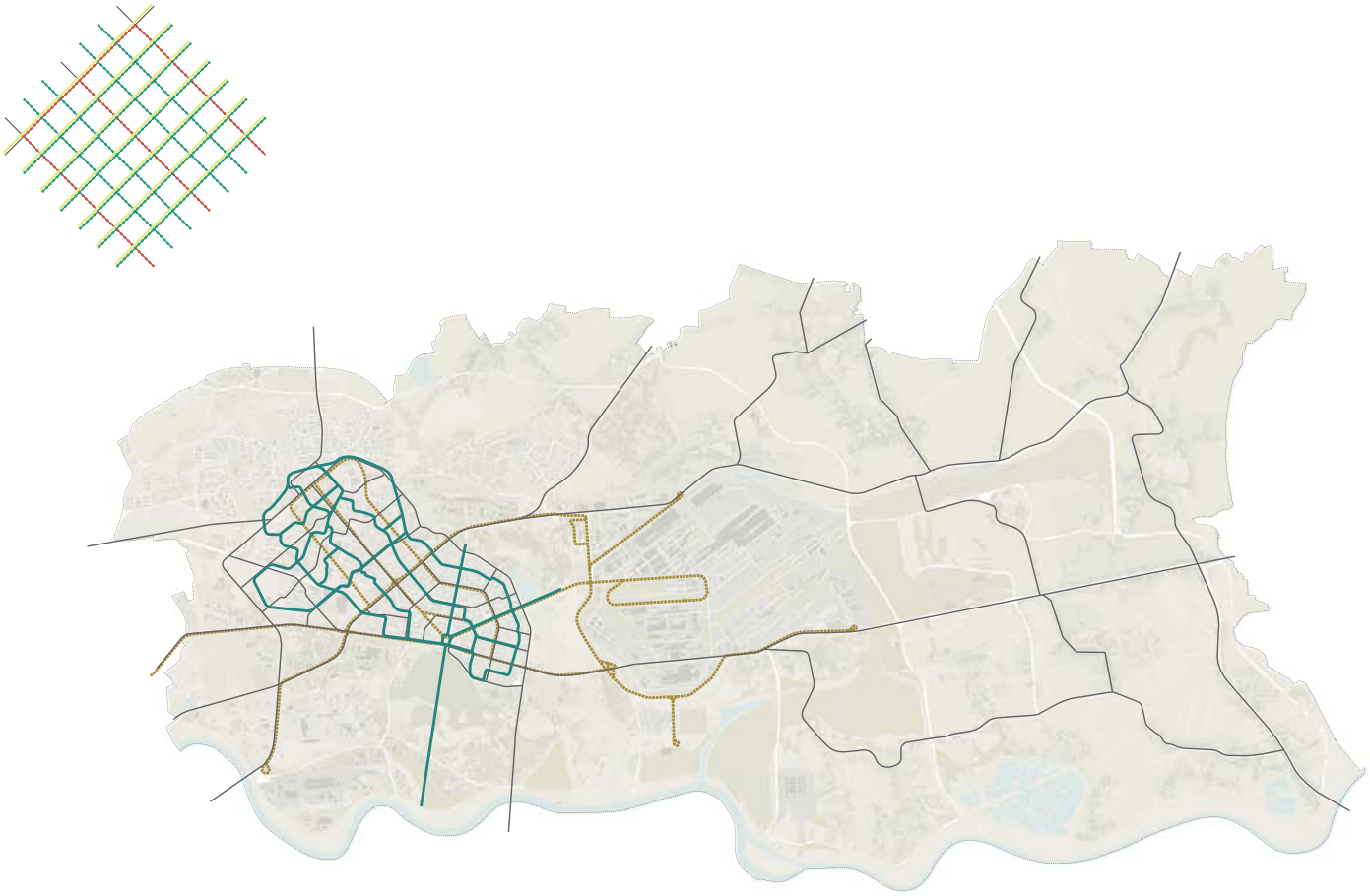


Fig. 131. Transport network: complementary trams, cars and shweeb ; own work

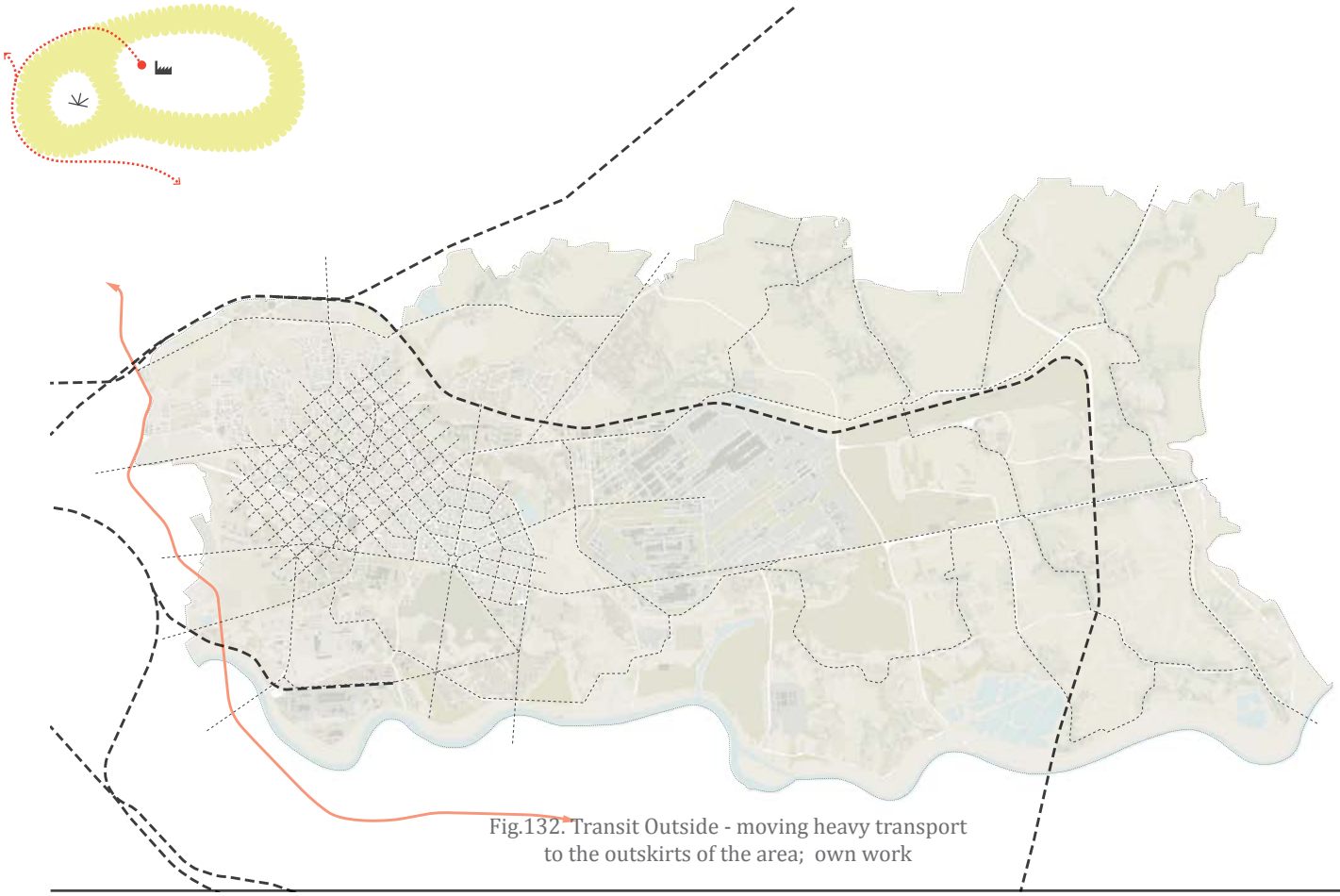


Fig.132. Transit Outside - moving heavy transport to the outskirts of the area; own work

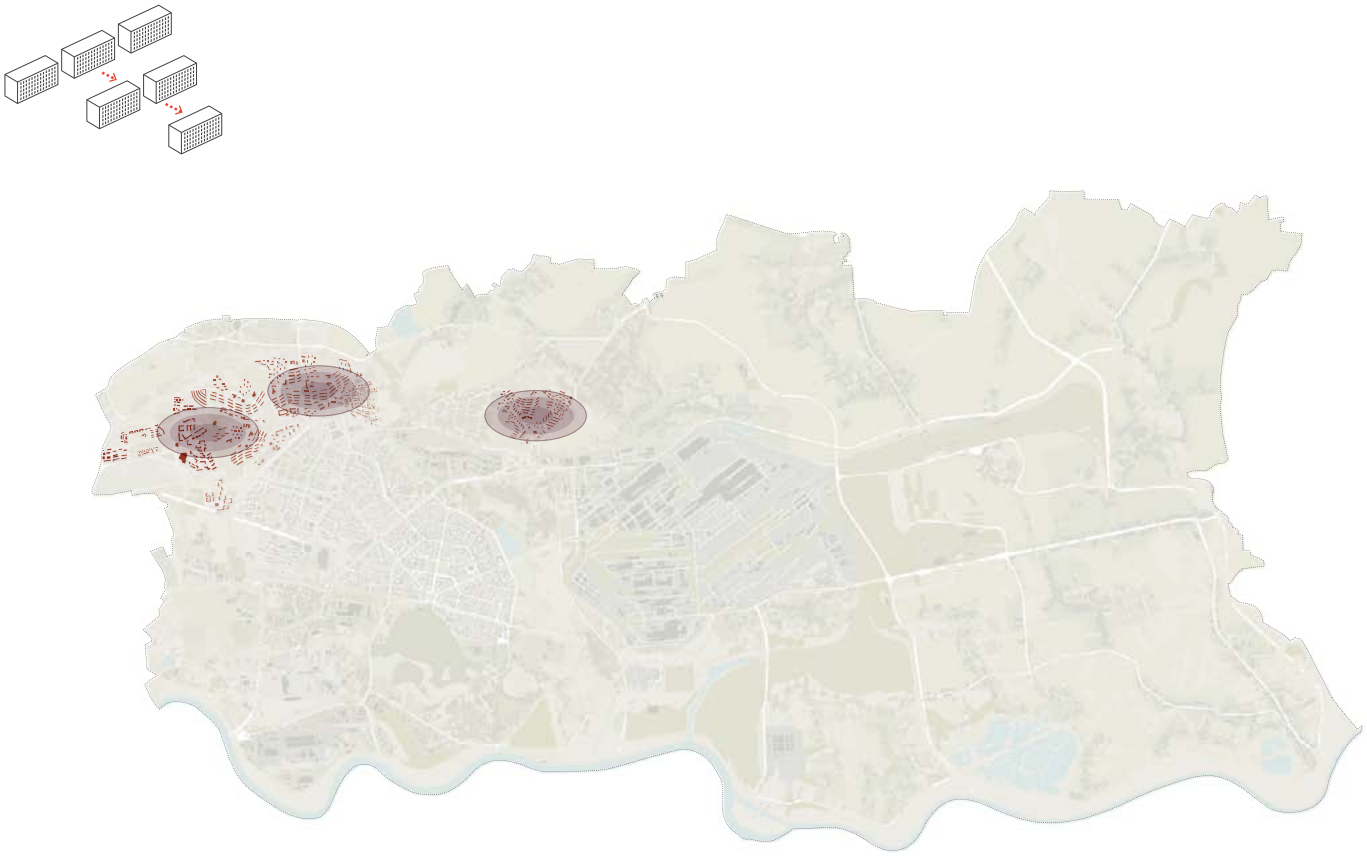


Fig. 133. urban mining - assignation of the new housing to be dismantled and reused in other parts of the city; own work

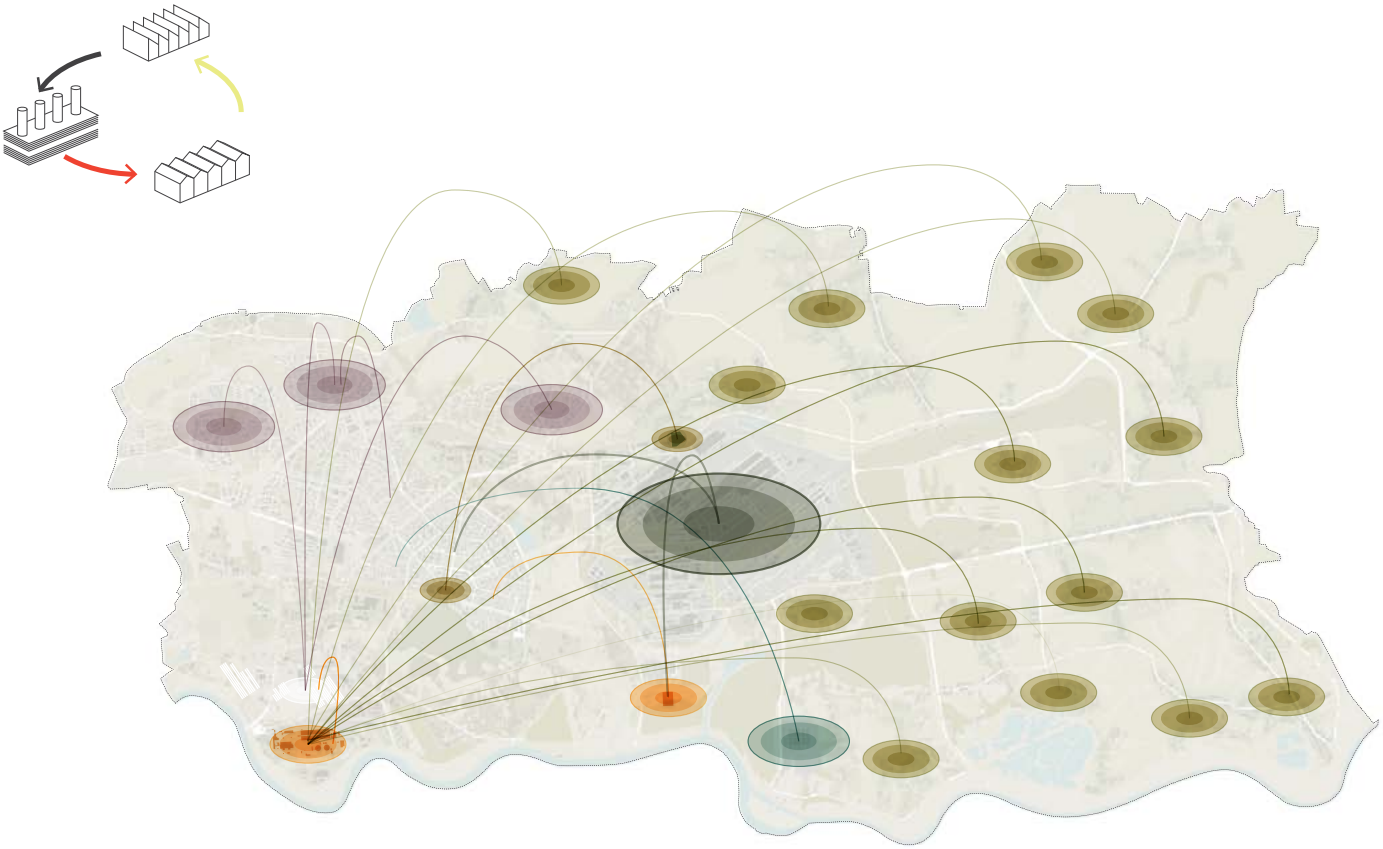
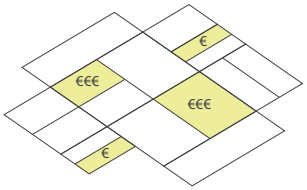


Fig. 134. industrial ecology - creating links between industries in Nowa Huta; own work

# NATURE

Fig. 135. Dynamic riverscape - repurchasing plots and creating landscape park along Vistula River, allowing biodiversity development;  own work



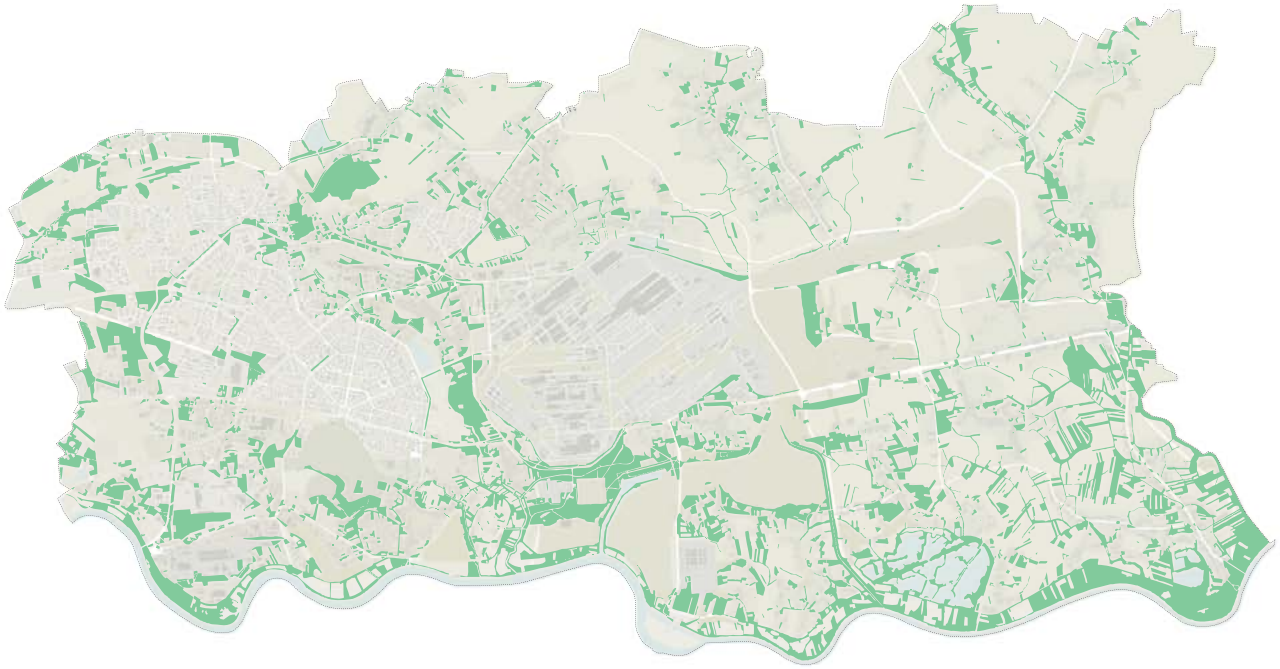



Fig. 136. occupying fallows - taking advantage of good location and unproductive fallows to plant energetic willow;  own work

# RECREATION

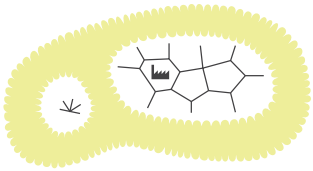
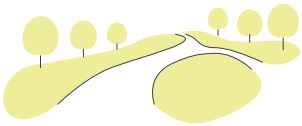


Fig.137. green borders - enhancing form of the city and creating recreational space inside natural areas;  own work



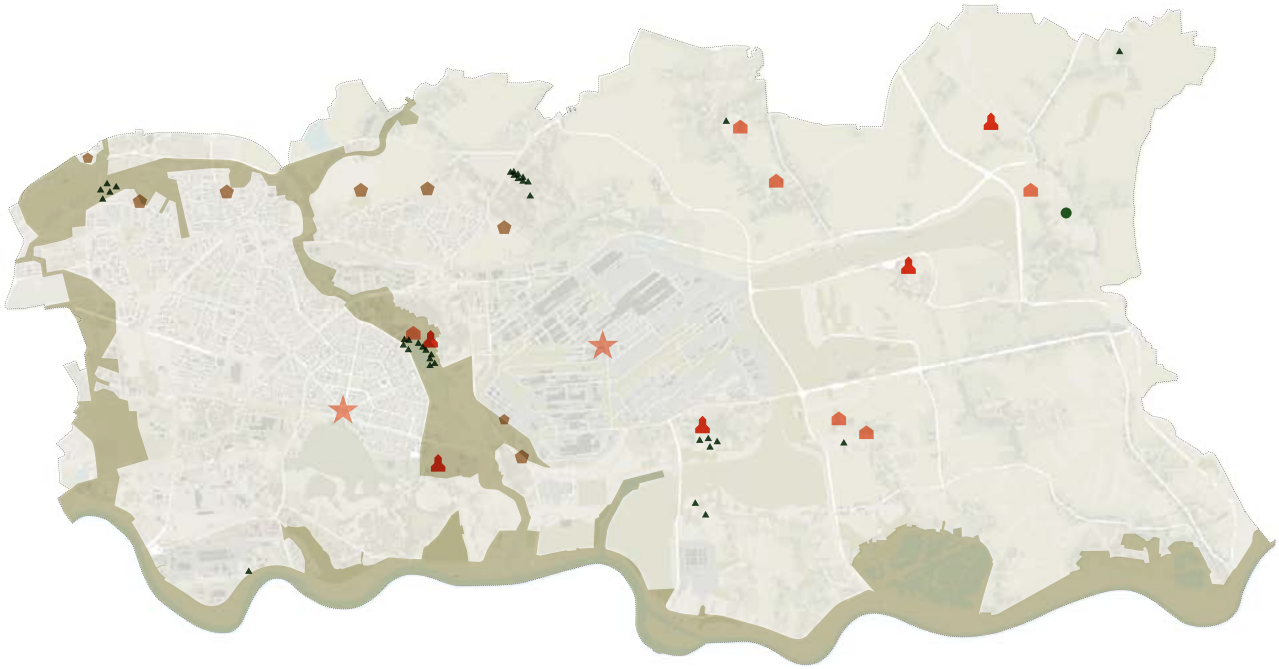


Fig. 138. Tourism - creating opportunities of additional income in redeveloped areas of NH;  own work

# NOWA HUTA 2050
# ~~MASTERPLAN~~ GUIDEPLAN

# 15. TESTING GUIDEPLAN: MEZOSCALES SELECTION

Several smaller scale (1:2000. 1:5000) areas have been chosen to test the guideplan and present how the transition is going to happen on the scale of urban neighbourhood.

The method of selecting several areas with different character, allows to have a deeper insight into prior presented strategies (fig.140,141).

Mezoscale design will consider development of following areas:

1) Mistrzejowice: urban mining scenario
2) Czyżyny: glasshouses in the heating plant area
3) Steelworks: internal circular companies
4) Centrum: civil budgets and recycling
5) Bieńczyce: transect and transport revolution
6) Ruszcza: village centers and willow production
7) Vistula: nature fund and dynamic riverscape

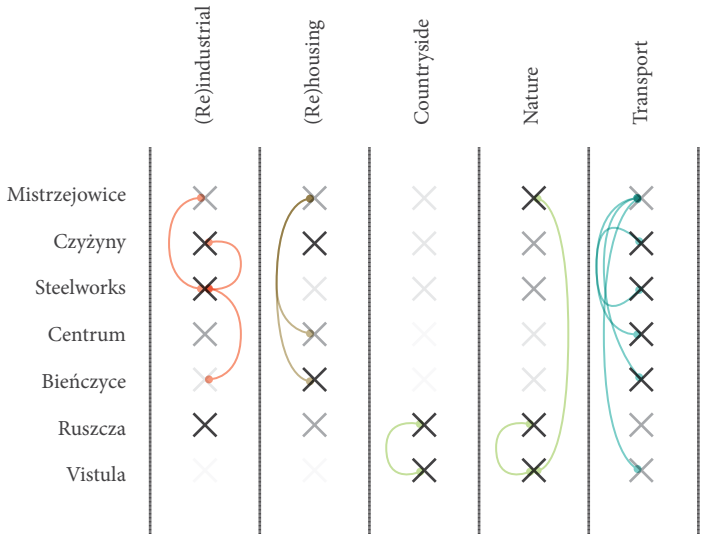



Fig. 140. Themes actuated in the mezoscale design + links between projects


Fig. 141. Selected test sites

# 15.1. TEST SITE #1: MISTRZEJOWICE URBAN MINING AND GREEN BORDER

Mistrzejowice is an area that concentrates the negative demographic trends in the coming years. Detailed calculations reveal that starting from 2016, 400 apartments will be abandoned yearly, which is approximately 6 blocks of flats that can be dismantled and reused (see Appendix H: Data Projection).

Every year, around 4 000 sqm of windows, 10 000 m of prefabricated concrete slabs, 20 000 sqm of external walls and 30 000 sqm internal (mostly prefab-concrete walls) will be transported to appointed place in the circular industry area (see test site #3: steelworks). After recovery, the material shall be distributed in different parts of Nowa Huta.

It is needed for further research to investigate other "resources" that can be also considered for reuse such as installation pipes, furniture, wall and floor coverings. Moreover, urban infrastructure such as asphalt roads that can be crushed and used again, pavement and other "treasures".

The situation in 1:2000 scale (fig.148) of a part of Mistrzejowice focuses on the process of transformation from housing estate to green border with scattered recreational functions.

Starting from 2015, an online database is storing information about vacant apartments in Nowa Huta. Citizens can change their home, having an option to choose the most convenient location, closer to the centre of urbanity facilitated with better public transport and more services.


Fig.142. section through Mistrzejowice: 2015 and 2050

After the first buildings are dismantled, the vacant area is recultivated and let for nature to grow. Some of the buildings (5%) in appropriate location are preserved and given new features. New functions are proposed:

- museum of prefabricated housing
- rehab center
- student dormitory
- biology faculty and labs
- nursing home
- hostel
- office space and conference
- spa & wellness
- shooting range and scouting camp
- asg, paintball and bungee jumping

etc.

The process of tranfsormation proceed slowly and imperceptibly. Less occupied streets gives a place for cyclists around 2025 and shweeb around 2035. Existing unused urban infrastructure is partly dismantled and partly preserved creating Park alleys (Fig. 142).

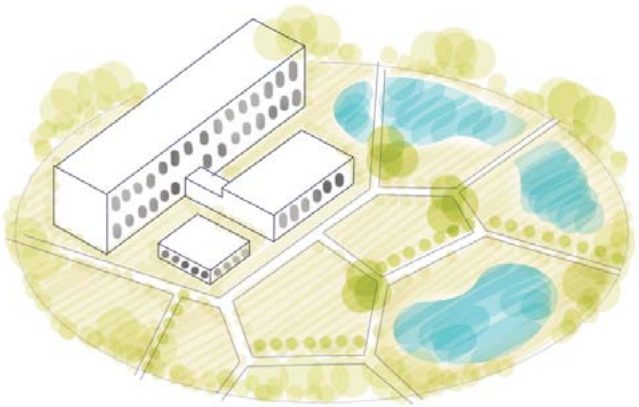


Fig. 145. spa & wellness

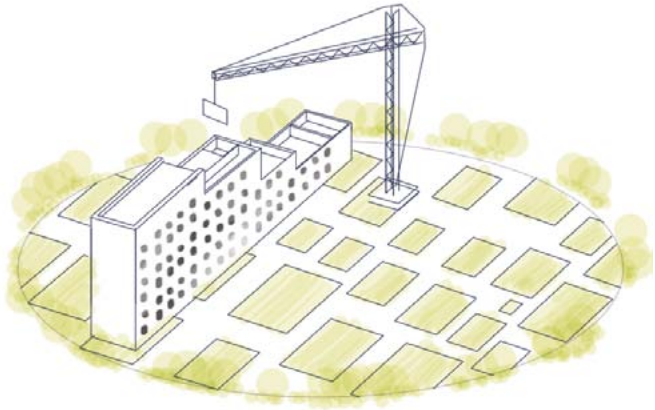


Fig. 143. museum of prefab concrete housing

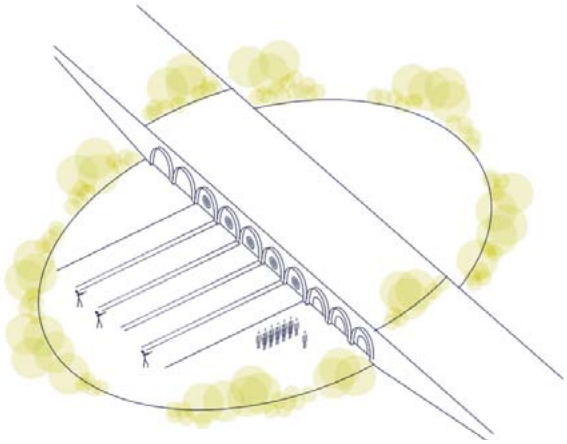


Fig. 146. shooting range and scouting camp

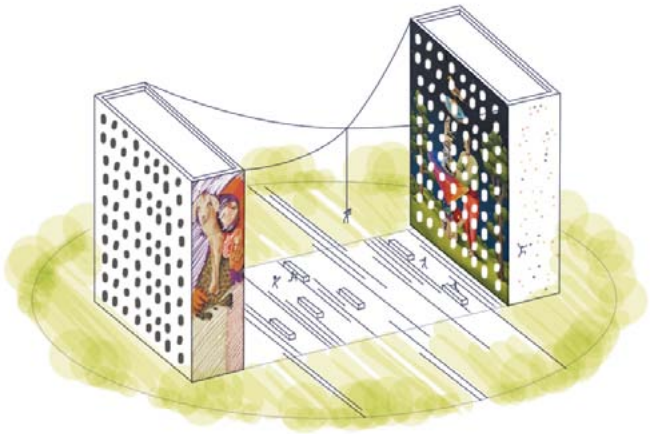


Fig. 144. entertainment park

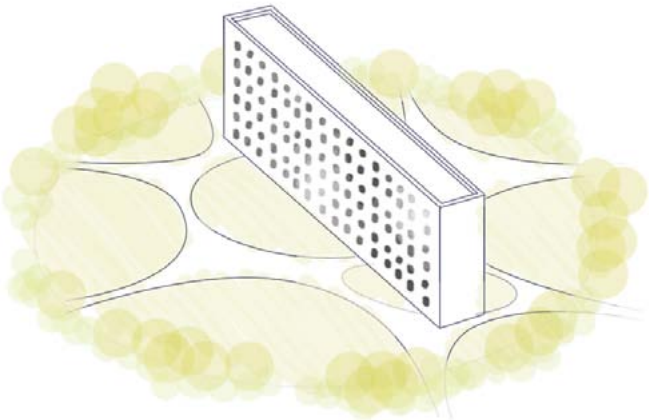


Fig. 147. rehab center

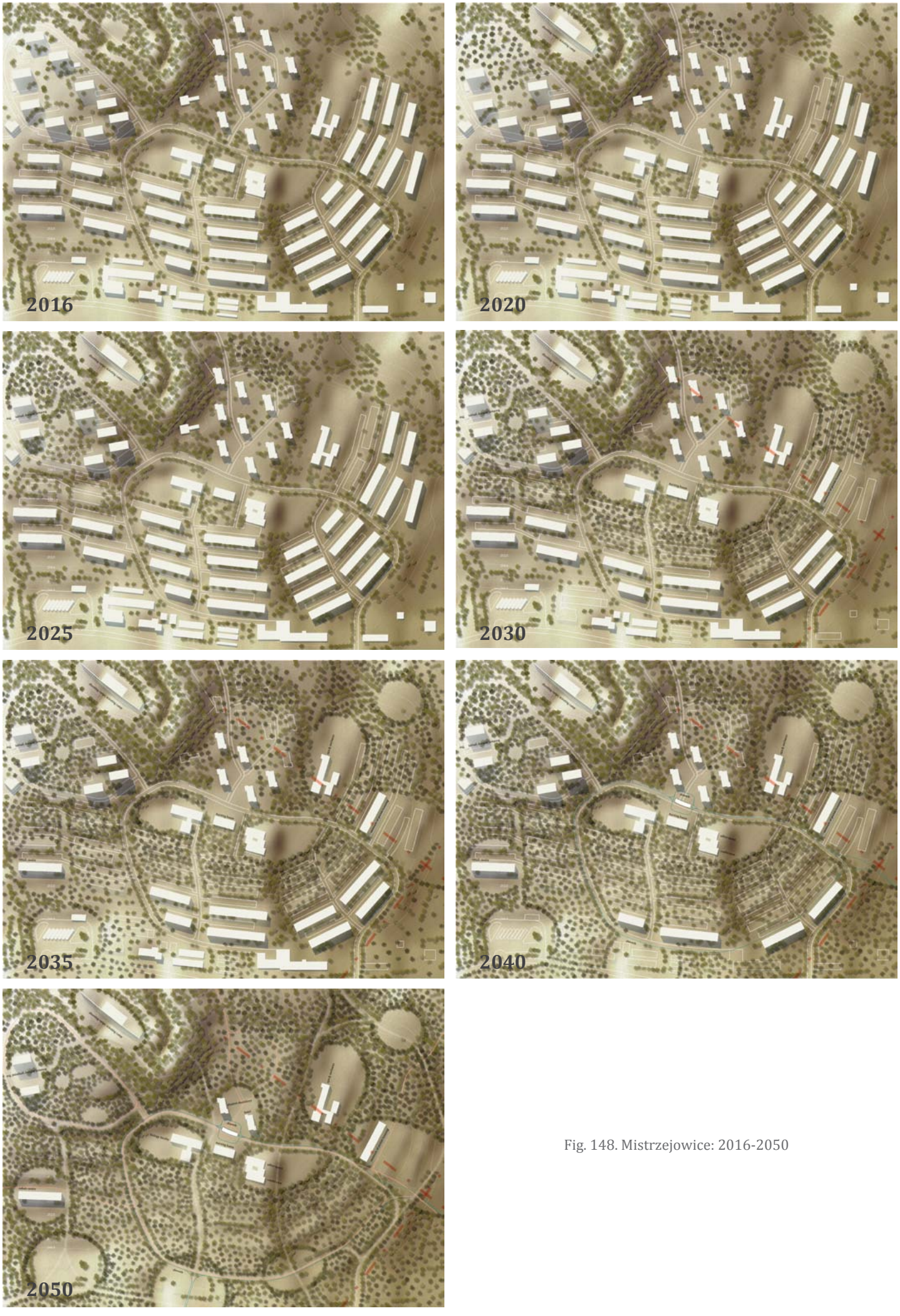



Fig. 148. Mistrzejowice: 2016-2050


Fig.149. Transforming abandoned hosuing into paintball park

# 15.2. TEST SITE #2: STEELWORKS CIRCULAR INDUSTRY AND TRANSFORMATION HEART

The history of steelworks is intertwined with the history of Nowa Huta. Since the beginning, the steelworks was a major force pointing out directions of development in the area. Starting from 80's, the production of steel was declining. After political transformation in 1989, steelworks changed its owner several times, gradually decreasing production rates. In 2015 the future of steelworks is questioned. There is a significant chance that current owner - Arcelor Mittal, will fall back and withdraw from Nowa Huta in favor of another steelwork in Dąbrowa Górnicza, located around 100 km from Nowa Huta. Together with steelworks, plenty of side-industries will be threatened, such as steel scrap companies, local manufacturers, cement factory that uses slag and sludge (waste from steelmaking process) and other related to steelwork services.

It is a high time to propose a PLAN-B for that problem. The design of test site #2 demonstrates that an alternative in local production and creation of new types of industries that produce, manufacture and service components for local needs.

The plan of transformation as usual starts with creating plots, firstly used for biomass production and slowly being replaced by appearing development. Transformation of Nowa Huta in the circular economy realm will need several types of industrial spaces to allow the operation that can be categorized in following order:

**urban mining** - space for storing reclaimed components and industrial process of recovery, room for local companies that disassembles old housing and construct new buildings with old materials

**shweeb transportation** - space for donated car wrecks, shweeb wagons production and testing, shweeb infrastructure components production and service

**cargo trams** - area for recovering old passenger trams into cargo trams, manufacture and service of tram infrastructure, production and service of cargo tram wagons

**food processing** - space for storing and distributing food from local farmers, food processing industrial line

**light furniture industry** - factory halls and exhibition spaces for local companies invloved in production of furniture from willow and waste

**public space elements production** - industry that produces urban furniture, public space elements for urban units

**administration** - office space for Magistrat Nowohucki (local activists), shweeb management, cargo trams management, urban mining process management, willow furniture production, biomass production and nature fund, resources and waste flow supervision and improvment

**design** - room for transport planners, designers, engineers and scientists involved in process of changes in Nowa Huta

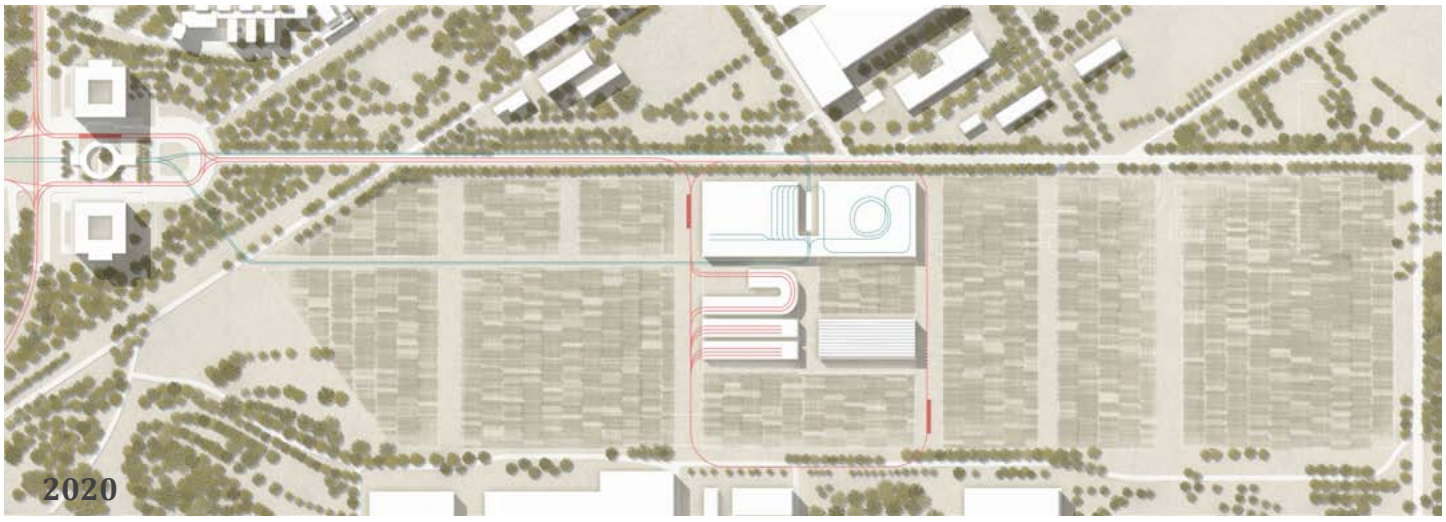
**laboratories** - room for Kraków Universities and local companies that want to be involved in the innovative process (Mining and Steelworking University, Technical University of Kraków, Agricultural Academy, Economic University, Comarch).

**backup space** for local small and medium size entrepreneurs and companies who want to be involved in the process

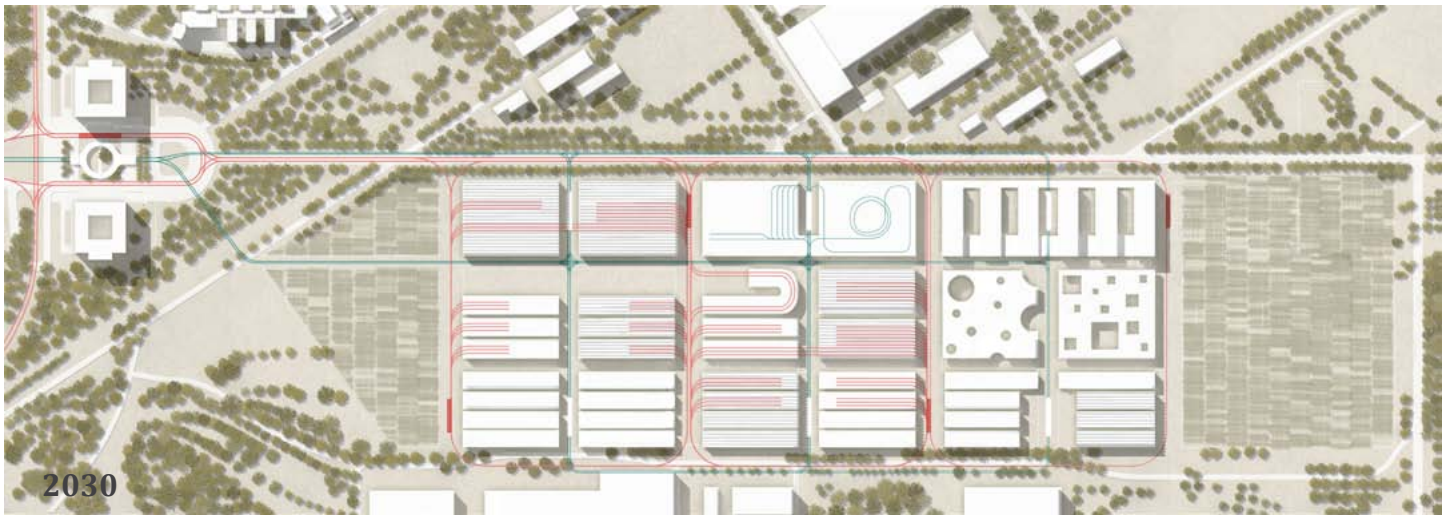
**museum of Nowa Huta and steelworking** - representative building that organizes events for guests, educating NH citizens about the city, having permanent and temporary exhibitions.

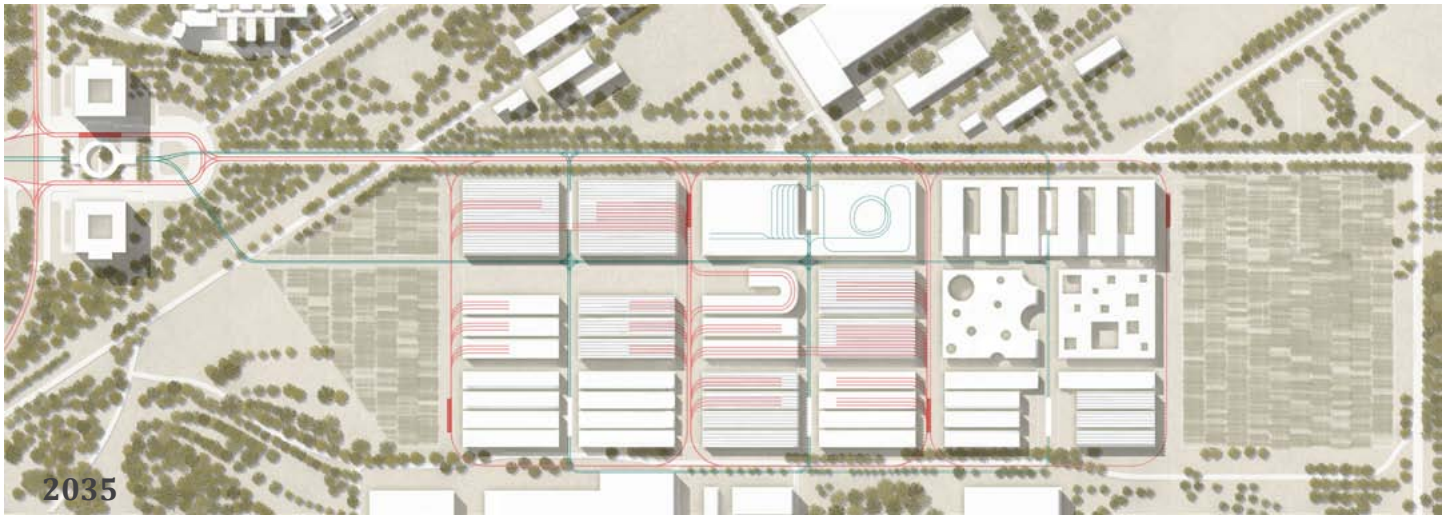
The area that is reclaimed from former steelworks will be provided with shweeb and cargo trams transport and is designed to facilitate using those two ways of mobility.

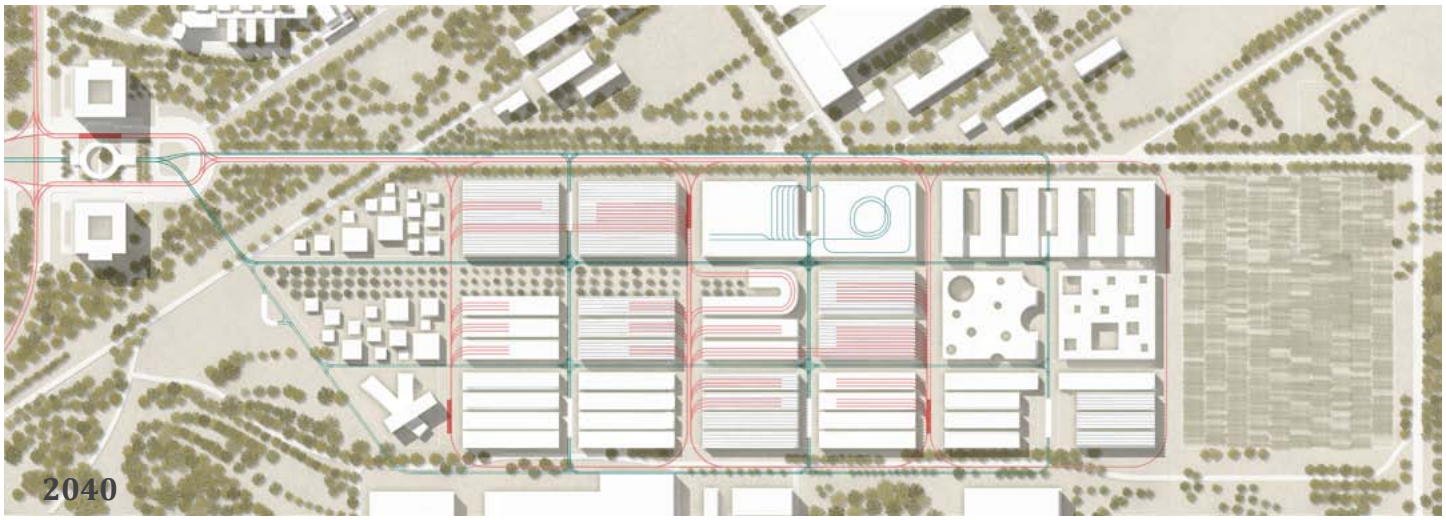

2016

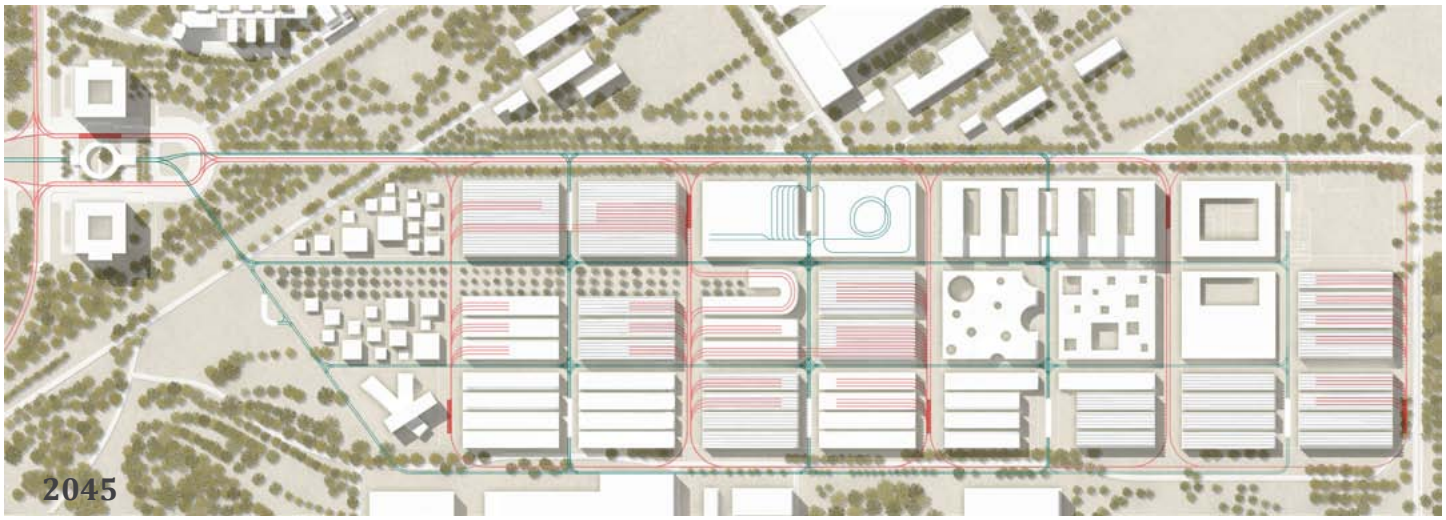

2020

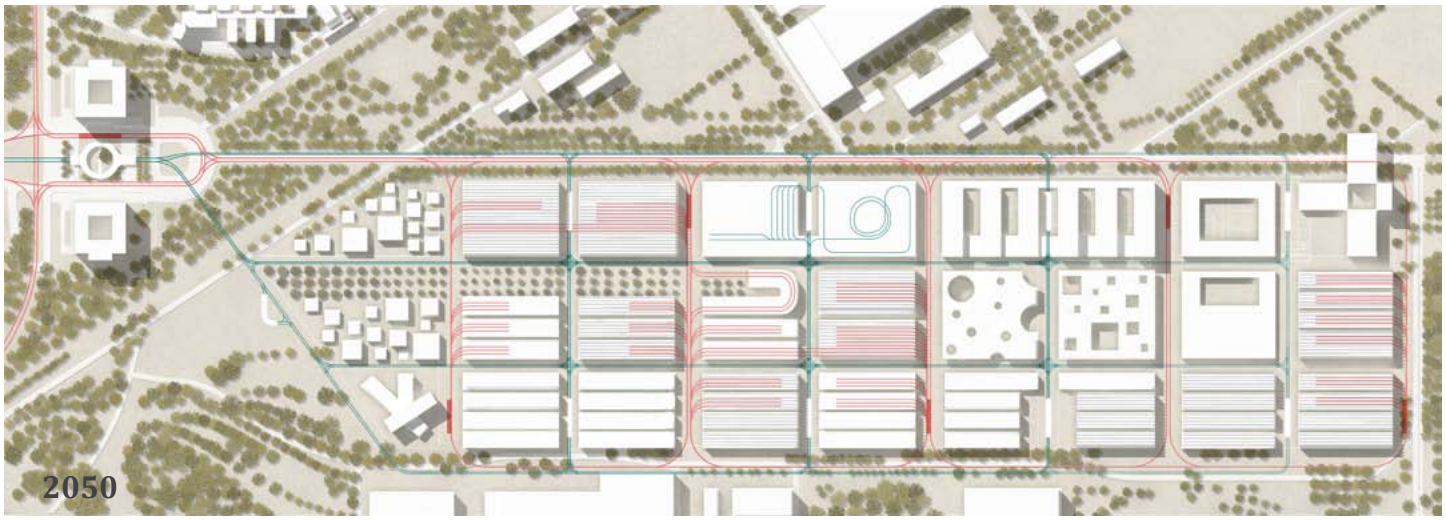

2025


2030


2035


2040


2045


2050

# 15.3. TEST SITE #3: CZYŻYNY
# INDUSTRIAL ECOLOGY AND LOCAL INDUSTRY

Czyżyny is a post-industrial area in a close proximity to CHP. In the test site, some abandoned post-factory buildings and a new exposition building (EXPO Kraków) that was opened in 2014 can be found. The location is selected to become an origin of a new kind of industry in Nowa Huta: horticulture.

The decision is made due to several factors:
- close proximity to CHP, that reveals to produce a lot of excess heat and CO2 that are desirable resources to cultivate greenhouse plants
- foreseen accessibility to free windows reclaimed from Mistrzejowice
- available post-industrial ground that after recultivation can get a new function

Glasshouses in Czyżyny is a project of transition from post-industrial neglected area through reclamation of land with energetic willow, to creation of new light industry - horticulture and accompanying settlement of farmers. The process is steered by initial quality of ground (fig.150).

The transformation starts with delimitation of plots that will be planted with biomass, incinerated in CHP. Money from electricity and heating will be used for nature fund. Succesfully, rereclaimed land, will be built-up with new glasshouses that will be a working place for farmers coming to settle in Czyżyny.

The settlement process is foreseen to take place gradually. Whenever, there are available recovered resources at test site #2: steelworks, a group of people (4-8) that wants to start their horticultural bussiness, will be provided with necessary materials to build their own houses from recovered prefab-concrete elements and glasshouses from recovered windows. The products from local farmers in Nowa Huta, shall be less liable for the VAT tax, thus promoting locally produced food. Another convenience is letting the union of farmers to use abandoned buildings for the reasons of storing machinery and crops.

The settlers are believed to organize the construction and production process themselves and are provided only with one plot for housing and one plot for glasshouses to avoid monopoly situation. New settlement is believed to reach its peak point around 2050, when recovered resources will not be available on the mass scale. Nevertheless, 35 years of experience in horticultural farming and savings shall let the industry to expand in other places in Nowa Huta. The localism of production shall be achieved.

Together with growing settlement, other facilities shall grow organically, such as shops, services in ground floor, shweeb network, cargo tram.


Fig. 150. Czyżyny: Delimitation of plots in the area; own work


Fig. 151. Czyżyny: ground quality


2016


2020


2025


2030


2035


2040


2045


2050

# 15.4. TEST SITE #4: CENTRUM A-D URBAN UNITS AND CIVIL BUDGETS

The housing in the heart of Nowa Huta consist of architectural pearls constructed in social realistic style. The architectural and urban qualities in this particular area is forgotten due to the process of material degradation.

The most representative part creating estates A,B,C,D, together with Rose Alley, nowadays is commonly visited by tourists wanting to have a recall of communism time. Nonetheless, the lack of driving force, made this space a bedroom for Kraków, even though, having a lot of opportunities to become an important regional centrality.

The interviews with local actors revealed that the society living in the area is passive and reluctant to change the status quo. So called, civil society, has not developed in the area since last 25 years.

The design assumes that through giving opportunities to change can bring extraordinary results. The transformation starts with recycling. Prior calculations revealed that by recycling 100% of material that can be burned in local incinerator will give enough money to facilitate development of public space (fig.151).

According to the figures from the estate Centrum A, 1800 inhabitants can save up to 43 000 € yearly just from recycling all the waste they produce. The amount of money goes to a local budget, that is foreseen to facilitate urban projects, beforehand democratically selected by inhabitants. For the reason of master thesis, 22 proposals of urban furniture, recycling systems, technological solutions and gathering places were made (fig.153).

Some of those need service and maintenance, thus it gives an opportunity for local unemployees, but also for people who have no official status of being unemploye.

To recycle 100% of waste, a special system is needed. To facilitate collection, several cargo tram stops are proposed on the edges of urban units. Cargo trams will collect waste at night by simple solution placing collective waste containers on rails that does not need too much of effort and produces less sound than ordinary waste trucks. If system is succesful, it can be replicated into another urban blocks, facilitating circular economy in Nowa Huta.

Another design solutions in this area is facilitating every urban unit with a shweeb station serving local citizens to travel from one urban unit to another or to the work or recreation places.

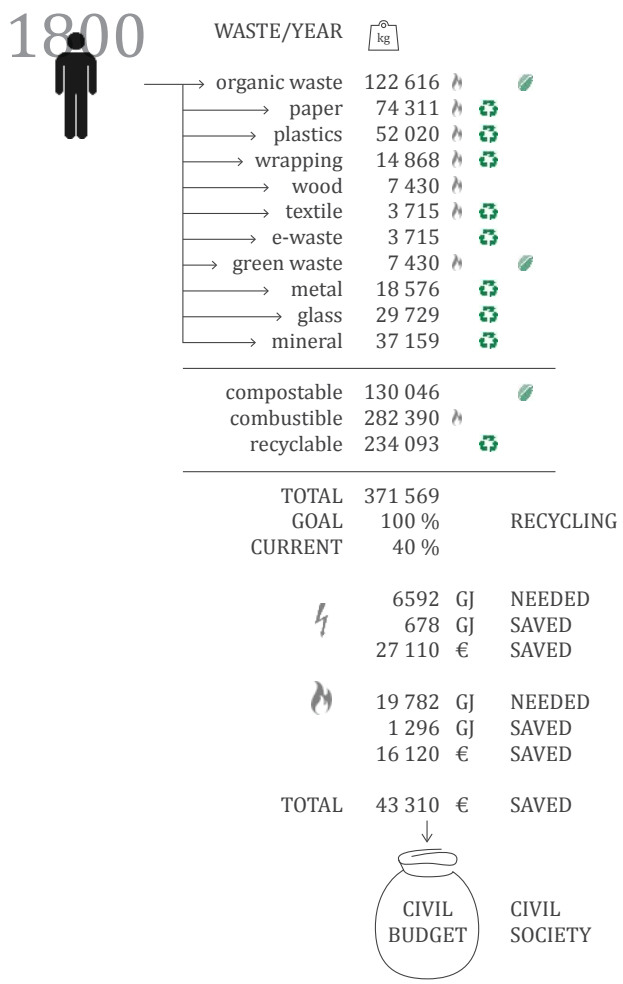
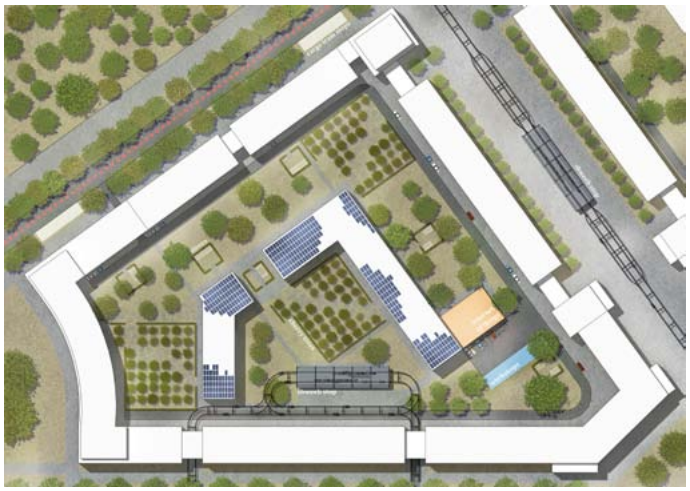



Fig. 152. From recycling to civil society

In the area there is also a place designated for waste market. It is an area used by the most active citizens who wants to try implementing circular economy in their lifes. The waste that is preselected in local waste sorting plant, goes to waste market and is treated as any other resource to build daily-use objects such as furniture or home appliances. The space for waste workshops will be obtained by reusing car garages. If the process of self-production is succesful, the workshops could be facilitated with more complex tools, 3d printers, lasercutters and electronics.

Citizens will also be able to exchange their goods in local markets that will be provided with space for "internet-of-things". The inhabitants will inform each other about their home goods that are no longer necessary and can give/sell it to another people living in the urban unit.

Due to less heavy car traffic, urban groundfloors along main axis can be open to the public. As mentioned before, communism tourism in this area can bring an opportunity to introduce more service such as restaurants, cafes, bars, pubs that will bring back city-life character to the place.



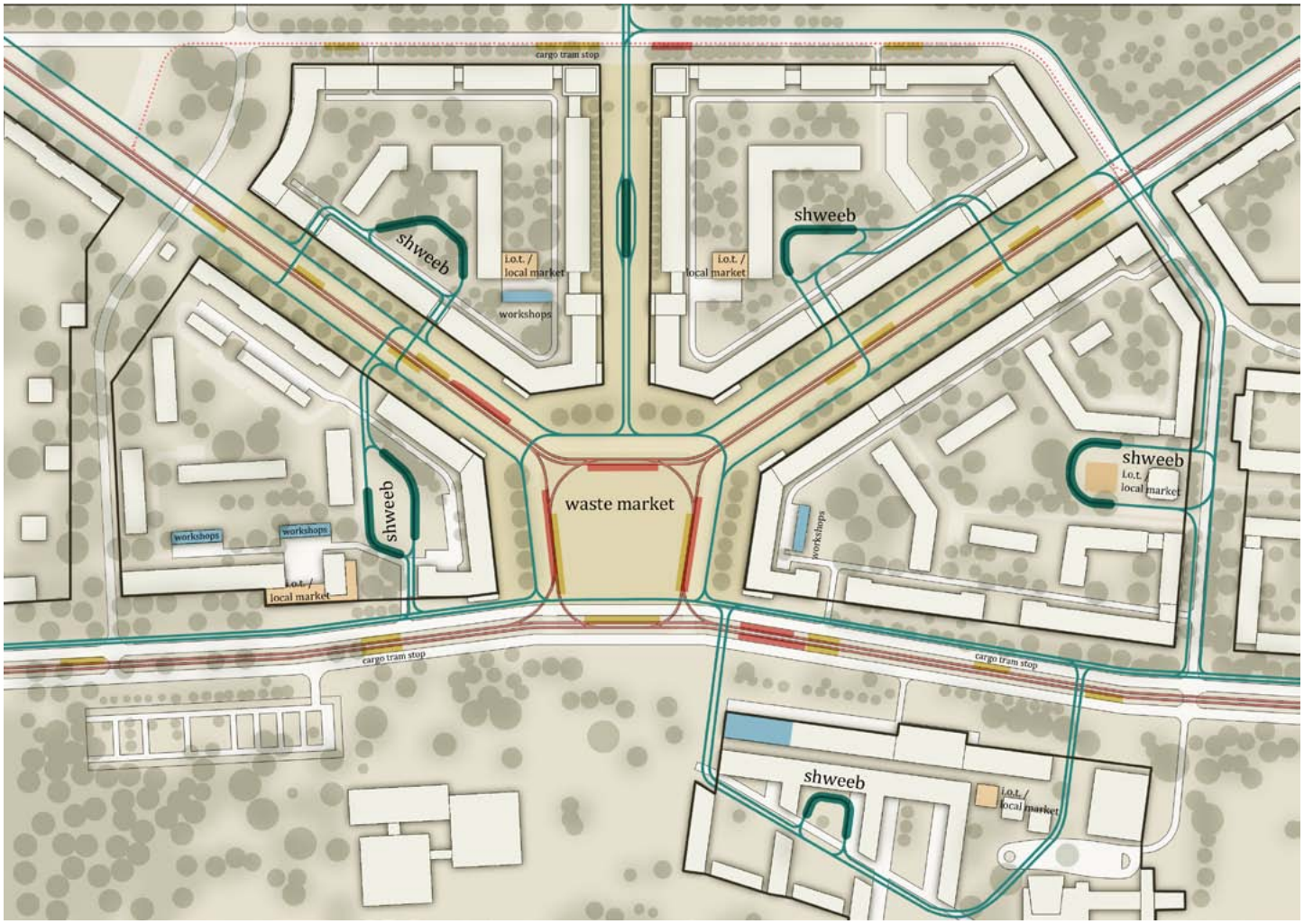
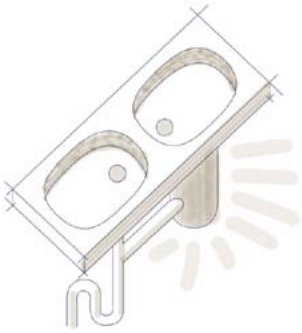
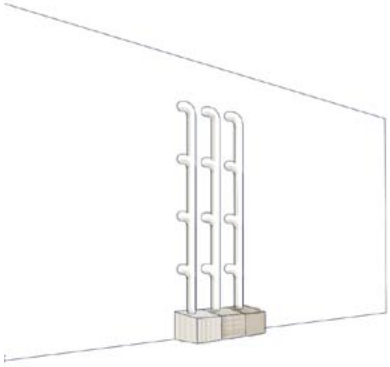


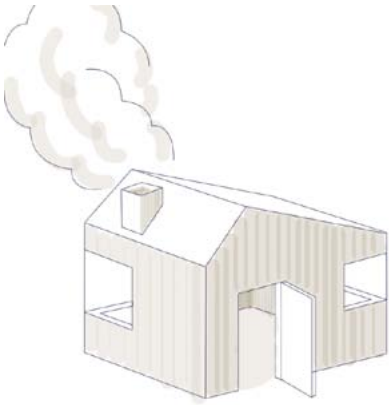

Fig. 153,154. Test site #4: Schematic plan that demonstrates new functions in the center of Nowa Huta



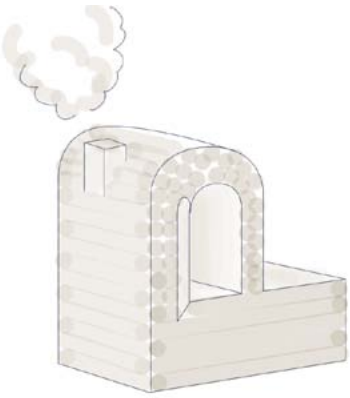
Garbutrators



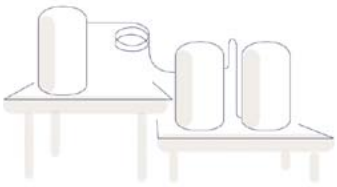
Garbage shafts



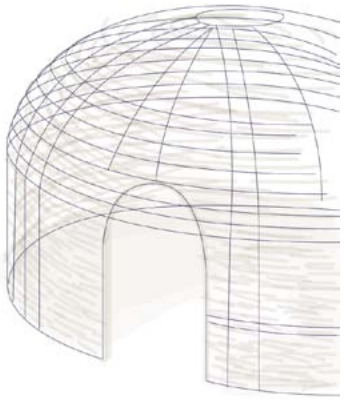
Bread ovens



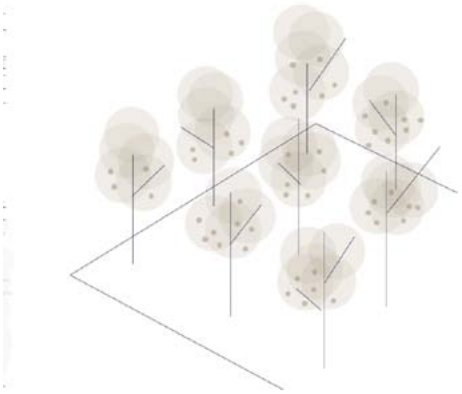
Smokehouse



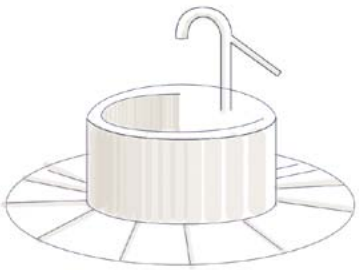
Local beer production



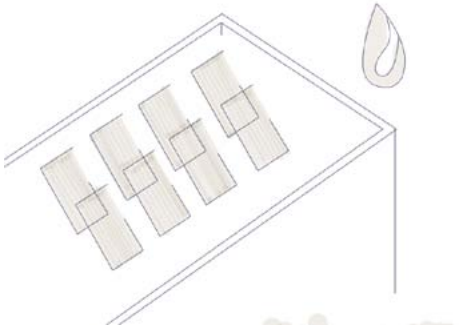
Grill arbor



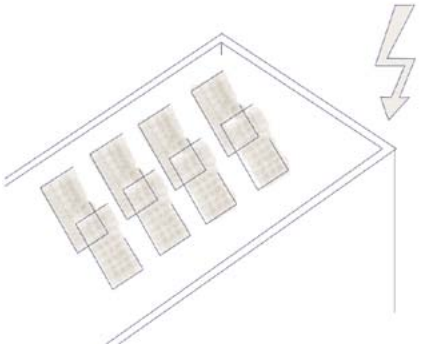
Fruit trees



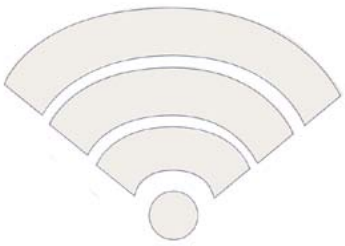
Abisynian well



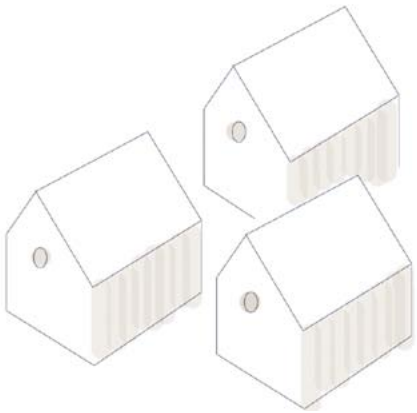
Solar panels



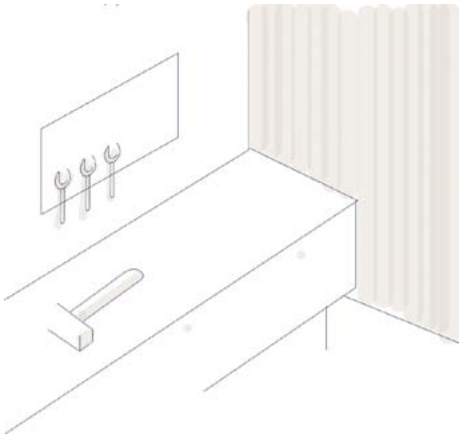
Photovoltaic panels



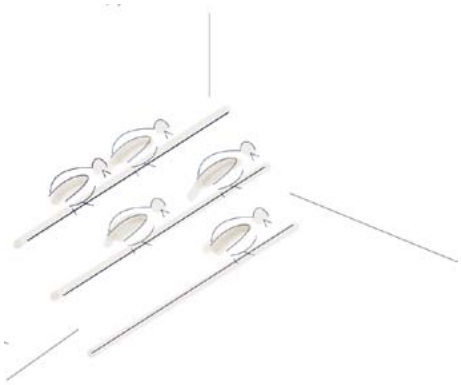
wi-fi



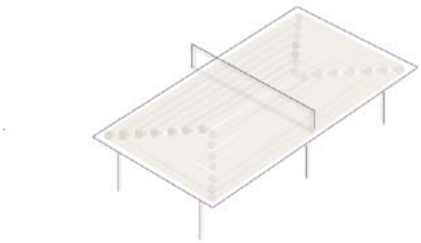
bee - hives



Workshop tools



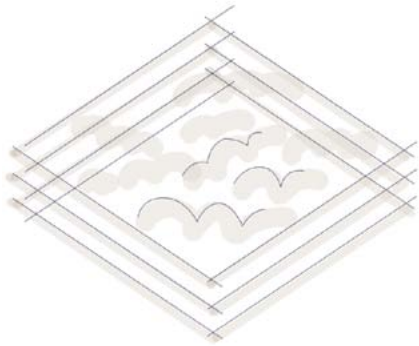
Chicken coops



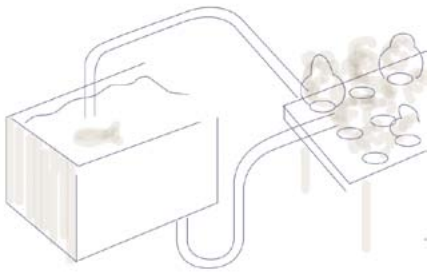
Sport facilities

Heating pump

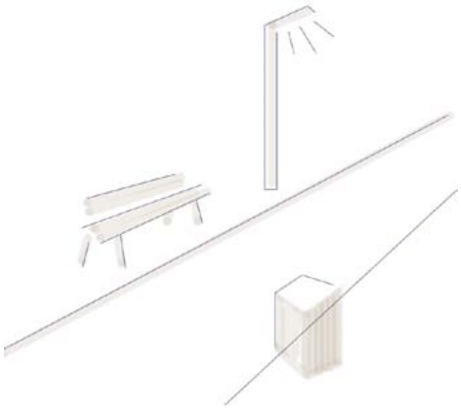
Pottery equipment



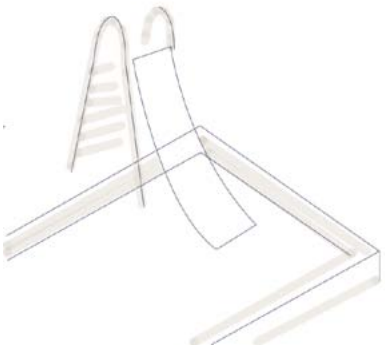
Composter



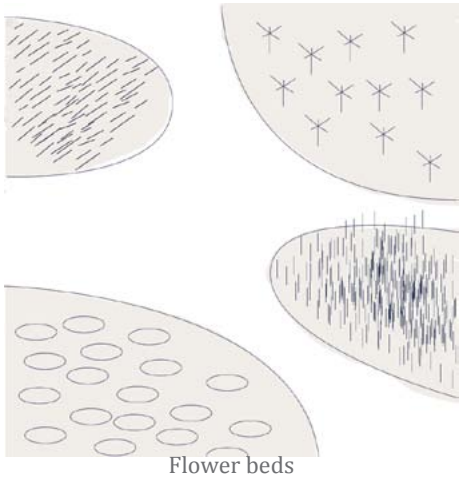
Aquaponic farm



Street furniture



Playground



Flower beds

Fig. 155. Album of public projects financed from civil budget

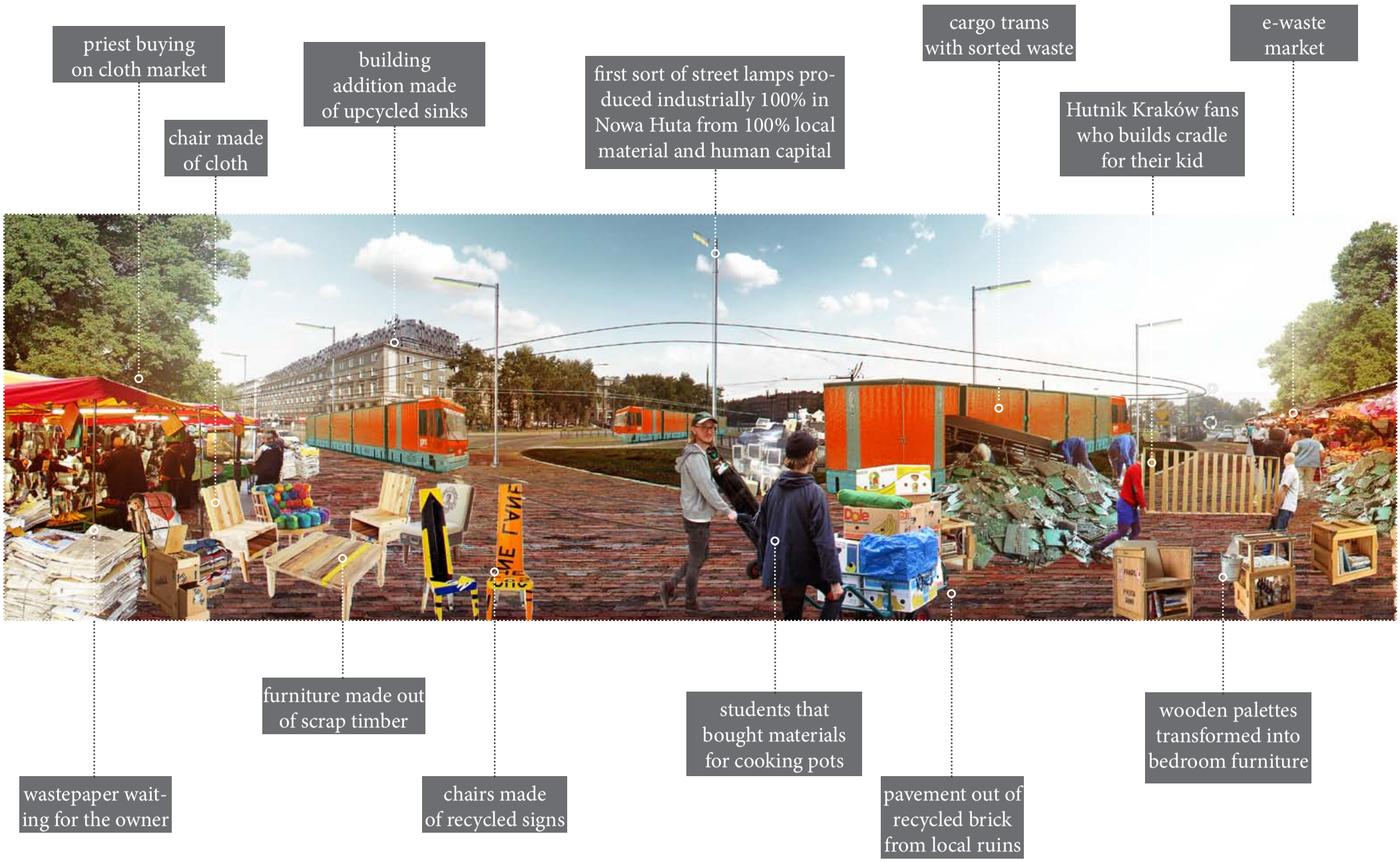



Fig.156. Visualization of Waste Market on the Central Square

# 15.5. TEST SITE #5: BIEŃCZYCE: TRANSECT AND TRANSPORT REVOLUTION

Polish Ministry of Infrastructure and Development has recently started to address problems of Polish cities. The coming years are intended to establish a law for urbanized areas that will overcome burning issues. Chaotic and scattered development that increase cost of maintenance and transportation; extensive areas designated for housing development, without consideration of population projection; no influence of local communities on design and strategies. Appreciated by the Ministry - concept of compact city has many obstacles to overcome.

New law will restrict extensive development and push investment into existing urban tissue, whereas infrastructure already exists. Also, new local plans will need to be preceded by profound analysis of market demand and need to include green areas as part of development. Cities shall be more friendly for pedestrians and cyclists, new development consulted with many actors. New plans shall be always provided with visualizations for local inhabitants to understand the impact of new development (prawo.pl).

The above mentioned topics are difficult to implement, but cannot be avoided. Compact city concept shall be a priority for vast post-communist housing estates that were built rapidly and cheap. The model shall decrease the maintenance and environmental costs.

Bieńczyce is a housing estate designed after 1958, in the time when production power of steelworks doubled and need for the city extension was significant. The competition for the development of housing for 50 000 people was written out and a plan with "box-like buildings" of J. Guzicka was chosen. The plan predicted high-rise buildings of around 8-11 floors with 1-2 floors functional pavilions located along the most busy streets.

The project was in danger due to existence of a close airport and unforseen problems with landing and orbiting planes. The obstacle was erased with moving airport to the opposite end of the city, leaving a gap that is still an empty place between Nowa Huta and Kraków (Binek).

The mezoscale design considers a slow transition from "neomodernistic" plan to more condense and clear structure, that will facilitate costs reduction, environmental impact and enrich the place with more services and well-organized public transport.

Bieńczyce will be redesigned on the basis of liveability theory that respects gradual transition from private to public realm. The concept provides the area with a rectangular grid, with zones 266m x 266m that shall be designed as an urban unit for some 2500 people with local civil budget for development of public spaces, workshops, features on the groundfloor and green areas. The zone that is a semi-public realm will consist of four blocks with semi-private common areas with shweeb station. Between zones, street sections will be widest in order to condense the highest traffic.

Nowadays, on average the area defined by grid consist of 1500 citizens. Urban indicators such as FAR (Floor ratio area) is around 0,596; DU (Dwelling units/ha) = 75,28, POP (Population/ha) is around 188 (fig.156). Comparing the indicators to the list published on a website "densityatlas.org" it clearly show that Bieńczyce is a housing project with very low intensity, thus besides of vast green areas, it misses other urban qualities.

The plan for Bieńczyce as a compact city includes possibility to control density over time. The transect city model specifies gradual reduction of intensity towards green borders. That intervention would help to organically adjust intensivity of housing typology to demographic trend.

Application of the grid is a long-term process that needs more than couple of decades of consistent urban planning and strict limitations of investment in the areas designated to become urban

blocks in the future. Bieńczyce design underlines the necessity to think about urban development decades ahead.

The transition presented on the mezoscale design drawings, slowly introduces new housing facilitated with high first floor with services and office space. Over the years, old pre-fab concrete housing is dismantled and releases place for new development that is oriented to the new grid (Fig.155).

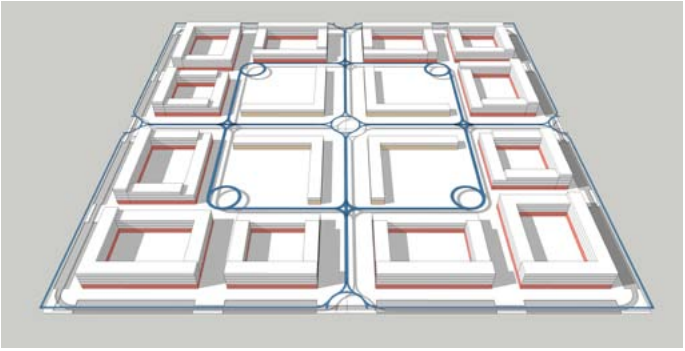
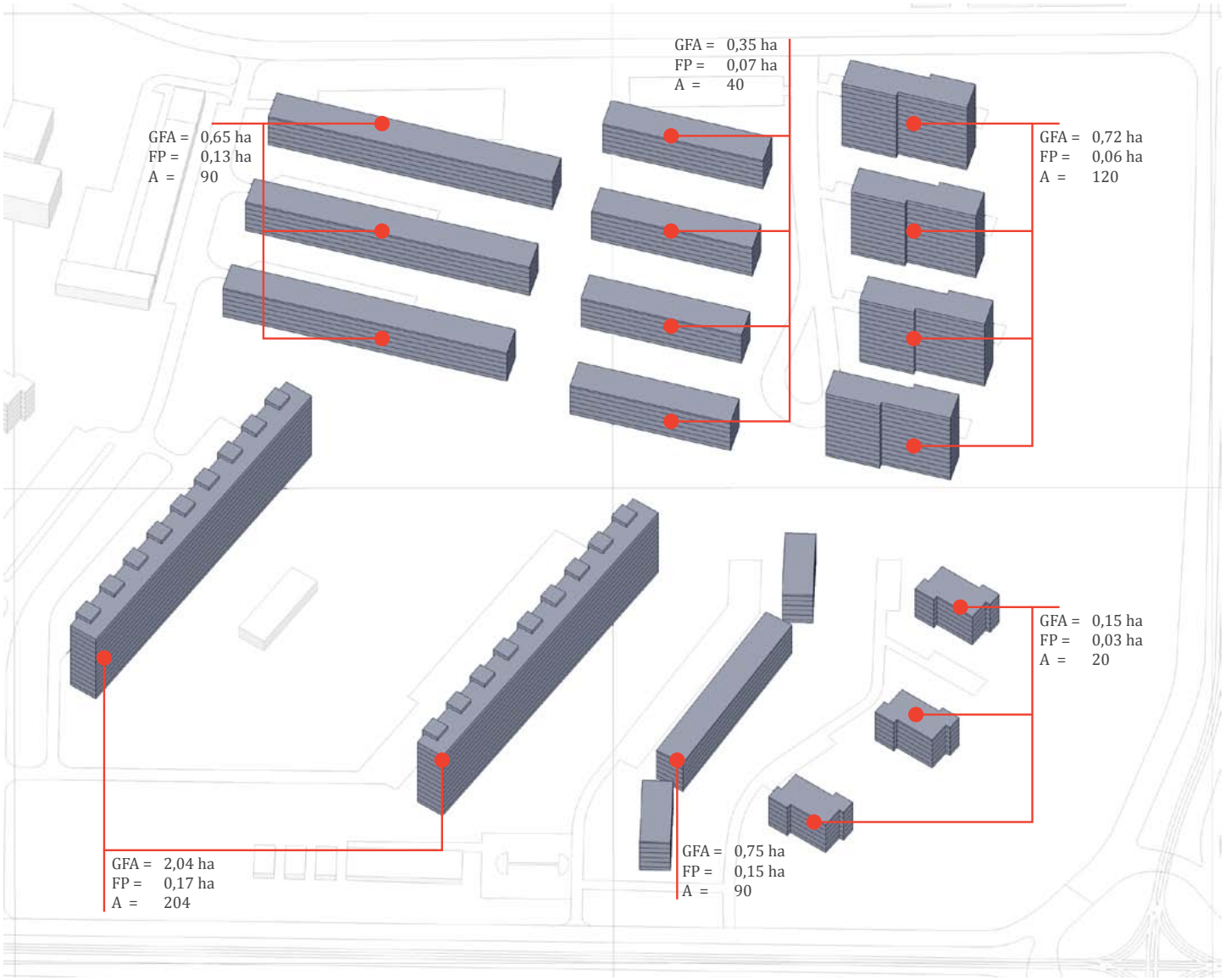


Fig. 157. The scheme of a new urban layout that shall be transformed onto the existing fabric




FAR = 0,596
DU = 75,28
POP = 188,2

high cost of transport
high cost of maintenance
high cost of infrastructure
low amount of services
low liveability
great ampunt of greenery

GFA = GROSS FLOOR AREA
FP = FOOTPRINT
A = APARTMENTS
FAR = FLOOR AREA RATIO
DU = DWELLING UNITS /ha
POP = POPULATION / ha

Fig. 158. Compared to the other case studies of housing typologies worldwide, Bieńczyce has very low density, source: densityatlas.org

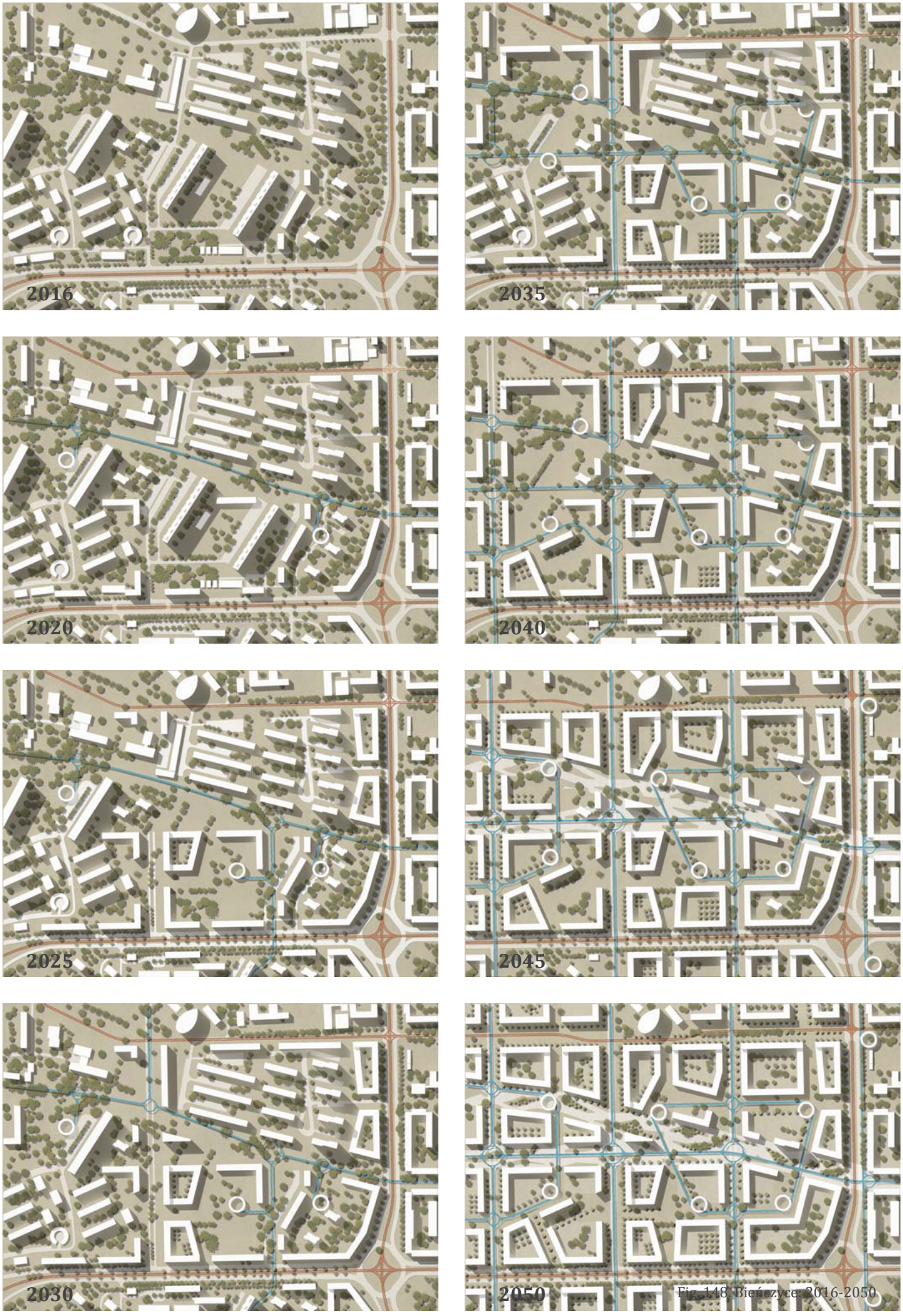



Fig. 148 Bieńczyce, 2016-2050


Fig.159. Architectural form of the shweeb station in the housing context

# 15.6. TEST SITE #6: RUSZCZA COUNTRYSIDE CENTER AND WILLOW PRODUCTION

Ruszcza is an exemplary village that is selected to visualize the transformation of the countryside in Nowa Huta. The prior analysis demonstrates the loss of identity and cultural importance that was build around mansion in the past.

Due to the necessity of landownership transformation described in the fourth strategy: countryside, the area around Ruszcza will be considered to become more productive, vivid and attractive for tourism.

To achieve that character, several matters need to be redesigned. Firstly, with guidance of NH municipality and clear information system, a phase of land exchange between steelworks and farmers shall be introduced. Afterwards, a programma guided by authorities shall give an opportunity for farmers to give their fallows for the nature fund purpose. Substantial renumeration shall be commissioned in return for that favor. Gradually, farmers will be proposed to sell back their small plots and when combined, offered back to the market.

In the village center, the abandoned mansion shall be dedicated for public use and development of willow industry. The new village center shall bring back a meeting place for inhabitants and restore attachment to the village through cultural events, workshops such as traditional production of willow furniture etc. More actors shall be involved, such as local warehouses for the purpose of seedlings preparation, storing machinery, wetting the willow intended for furniture production, room for furniture production itself and other industrial aims.

Another area shall be designated for testing various kinds of willow and other biomass plants, such as mallow, sunflower, baby rose, sakhalin knotweed, perennial grasses etc. The original park layout shall be restored and enhanced with the use of different kinds of willow that will be used for urban furniture.


Fig. 160. Ruszcza before landownership transformation

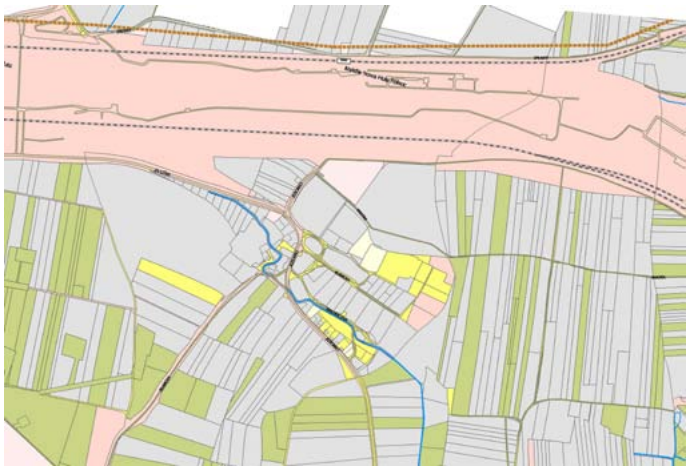


Fig. 161. Landownership

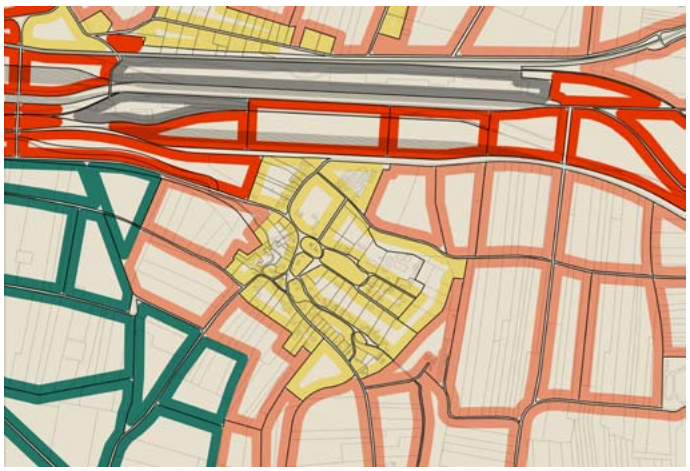


Fig. 162. Change in landownerhip, green - steelworks, orange - farmers, red - national treasure for new farmers, gray - industrial


Fig. 163,164. Transformation of Ruszcza village center

# 15.7. TEST SITE #7: VISTULA RIVER NATURE FUND AND DYNAMIC RIVERSCAPE

The money collected due to the strategy of claiming fallows for willow production goes to the nature fund. The system is designed for restoring and enhancing natural biodiversity in the area. According to prior research, around 1 mln € per year could be collected to repurchase land along the Vistula River and bring back the natural processes of sedimentations and erosion that creates marshy landscape that used to be transformed anthropogenically.

The part of NH land that shall be transformed lays between floodbanks and the riverbank. The area is approximately 350 ha of land and its market price oscillates between 20 - 30 mln €. The land can be succesfully repurchased within 30 years, creating a natural dynamic riverscape before 2050. The repurchase of the valley starts next to the ecological deposits (Lasek Łęgowski and Lasek Mogilski), to enhance the natural acquisition of land by riverine forests as a home for swampy ecosystems.

To facilitate the process of transformation, some interventions are proposed. Firstly, the current of river was analyzed in order to make it more dynamic by creating hard obstructions whereas the current is changing its angle hitting river banks on the other side. To let the erosion occur faster, the hard riverbank is dismantled, where the current is approaching. Another modification is a slipping protection - a channel filled with concrete rubble that prevents the river to go further to the dike. (fig. 163,164). The modifications are foreseen to be constructed from recycled material from test site #1: Mistrzejowice.

The process of transformation to natural habitat taking place in the area shall bring a huge possibilities for recreation and tourism. Shweeb line and bicycle paths constructed along the river will bring more reasons to vist the area and bring opportunity to cooperate with Kraków municipality in this aspect. More visitors shall convince individuals to invest their money in light recreational pavillions, cafes, restaurants, canoeing, surfing, yachting etc. Fig.165).

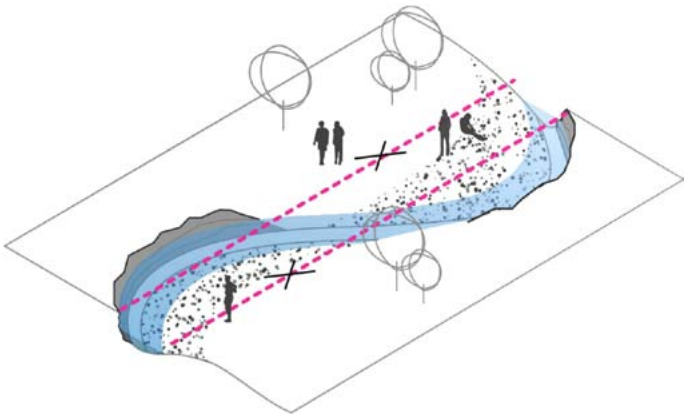


Fig. 165. Allowing channel migration; source: River, Space, Design

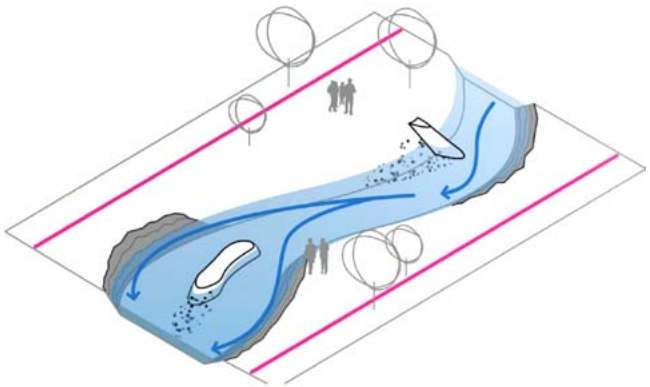


Fig. 166. Initiating channgel dynamics; source: River, Space, Design

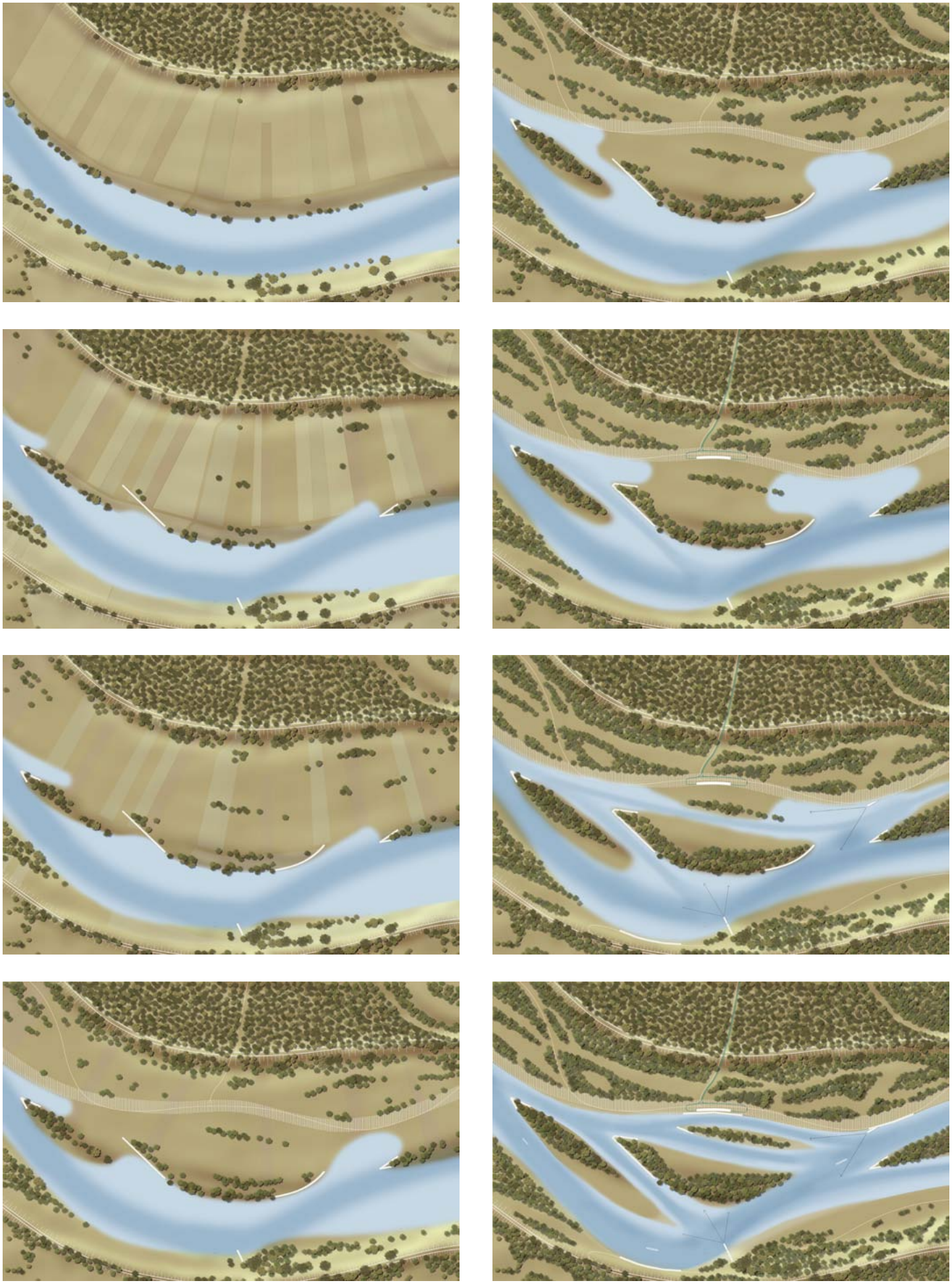
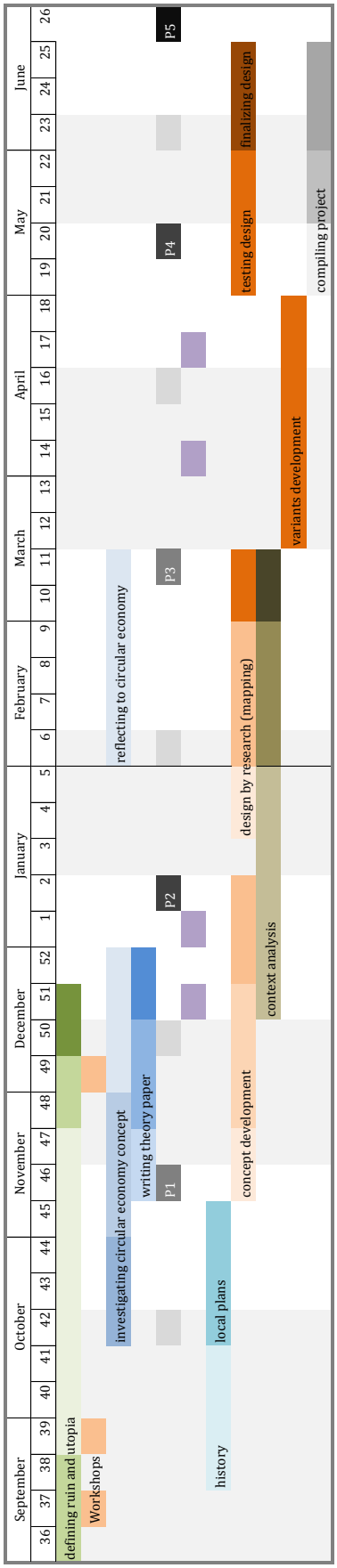


Fig. 167. Transformation of Vistula River Valley

Fig.168. Vistula River after transformation

# 16. TIME PLANNING




Activity log:

1) weeks 36-38: definition and preliminary analysis of the Ruin of the Welfare State - Nowa Huta
2) week 39: Workshops in Swiss Pavilion at Venice Biennale 2014 “Double Death of the Nation and the Welfare States”; Veneto Autonomy case study
3) weeks 40: utopian image + Venice workshops deliverables
4) week 41-42: Research on the Ruin of the Welfare State, defining scale and the topic (circular economy), defining details of utopia.

// PINUP PRESENTATION

5) weeks 43-46: investigating circular economy concept, reading theory, writing preliminary theory paper, research on solutions in urban planning and design within circular economy, preliminary design for Nowa Huta on the large (city) scale and small scale

// P1 PRESENTATION

6) weeks 47-48: investigating circular economy in the history of Nowa Huta, mapping existing industries, research on the local production, its flow and recycling, evaluating local plans for Nowa Huta and investigating on the identity of the place, grasping broader context
7) week 49: workshops with AIR in Rotterdam
8) week 50: defining conditions for utopian Nowa Huta, designing system of recycling, reuse and upcycling of resources

// PIN-UP PRESENTATION

9) week 51: interviews with Paweł Jagło (history of Nowa Huta), Michał Stangel (Nowa Huta of the Future winning proposal), Maciej Twaróg (Magistrat Nowohucki)
10) week 52: finishing theory paper
11) week 01-02: compiling and analyzing collected data, preparing P2 presentation

// P2 PRESENTATION

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# APPENDIX A: REVIEW PAPER

# Circularity in urbanism

## How urbanist can facilitate transition towards circular economy

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Delft University of Technology, Department of Urbanism
Theory Paper

November 30th 2014

**Abstract** - On the 17th of December 2012 European Commission has released "Manifesto for a Resource-Efficient Europe", pointing out the opportunities that comes from adapting "ultimately regenerative circular economy". Until now, many efforts have been done to move towards absolute waste reduction, but still "the action has to be taken in the next ten years to put Europe on the right track and to speed up the transition." (European Commission, 2012) . Circular economy is a concept of industrial system that attempts to create a flow of resources, both organic and technological, that supposedly works in closed loops of reuse. The system is restorative and regenerative by design and promotes the multi-cycle flow of resources. Though, the complex redesign of the current infrastructure is needed. (McArthur Foundation, 2014).

The aim of this review paper is to get insight into circular economy concept from the urbanist point of view through identifying planning strategies and design approaches that facilitate the transition. Industrial ecology studies proposes two approaches for an urbanist. A paradigm shift to design for ecological communities rather than for generic society and a toolbox, that can help to rethink urban proposals to work with circularity. (Ferrao and Fernandez, 2013). On the other hand, the transition towards circular economy can be carried by multi-step activity that brings the circularity thinking from niche to mainstream. (IMSA Amsterdam, 2013). Both approaches are tested already while creating strategies for regions (Zhijun, 2007) and cities (Tilie, N., 2014). Even though, transition towards circular economy will create many job and environmental opportunities, it is heavy to achieve in urban proposals since many obstacles that need to be leapfrogged. (European Commission 2014. Ellen McArthur Foundation, 2014. IMSA Amsterdam, 2013).

Taking the challenge provided by the EU, this review paper attempts to answer the question: how the circular economy concept will be evident in urban planning and design and what will be the agenda of an urbanist in the next few years regarding the emergence of circular economy. How urbanists can speed up the transition? What design solutions and strategy proposals will facilitate the process?

**Key words** – circular economy, urban metabolism, resource scarcity, sustainable urbanism, resource management, transition towards sustainability

## 1. Introduction to the problem

The world of the XXIst century, with its finite resources pool, sooner or later will face the problem of energy and goods supply. Trend of growth and expansion started in the XXth century has not changed, only moved from developed to developing countries. The mainstream, linear economy shapes the urban development and the social behaviour. In this model the level of prosperity is measured by GDP index that focuses on the production aspect. It concerns no more "than whether market mechanism can distribute the last unit of resources in the most efficient way" (Pin, Hutao, 2007). Even though the supplies of petroleum

and natural gas have already peaked (Pimentel, D. 2008), and agricultural footprint extended the amount of land comparable to the area of Asia (Hamilton, et al., 2014), three billion people are expected to join middle-class consumers before 2030. It will rise the natural resources extraction more than a half comparing to 55 billion tonnes in 2002. (Dobbs, R., 2011) Following this course, the Earth is aiming for rapid resources depletion with unpredictable effects.

On the background of the global resource insufficiency a crucial question arises: "how the urbanism profession can deal with the resource scarcity?". In contrary to the linear "take-make-dispose" system where materials and energy are widely wasted, stands circular economy. The system is a restorative and regenerative mechanism which treats technological and organic resources separately, resulting in a lack of remaining waste. Keeping resources in constant cycles of production, reuse, refurbishment and recycling helps to protect the environment from being polluted and optimize the use of resources and energy (Ellen McArthur Foundation, 2014). The concept is believed to revolutionize our daily life, but is still not widely applied in urban proposals.

## 2. Circular economy principles

The basic assumption of circular economy is that products needed to be designed in a way to flow in optimised cycles of use and dissassembly. That process set them apart from being disposed or recycled in short term. Waste in that sense does not exist, since can be turned into resource. Materials are kept in flow, thus the residual waste is close to zero (European Comission, 2014). Circularity defines strict difference between non-toxic biological commodities that are consumable compared to the durable technological nutrients i.e. electronics or machinery (Fig.1). The energy required to maintain the cycles is from a renewable source. (Ellen McArthur Foundation, 2014). Circular economy replaces the idea of consumer by the notion of a user who can establish closer relation with industries, and through that improve (extend) the life cycle of a product. The major focus points of circular economy (minimazing the use of resources and energy) are achieved through four principles (Ellen McArthur Foundation, 2014):

1) Inner cycle: minimalisation of the material usage
2) Cycling longer: products are meant to be reused, remanufactured or recycled more times and longer
3) Cascade use: The components of products can be reused in a different way any time the initial product is worn out
4) Pure cycles: respecting uncontamination of material flow

The core point of circularity is design. Through standarisation and modularisation, products could avoid being damp in landfill, being moved between industries. The proper design of products accelerate chain of positive changes. Industries can gain profits from cross-chain collaboration. Eliminating waste and downsizing pollution will affect positively the environment., etc. (Ellen McArthur Foundation 2014)

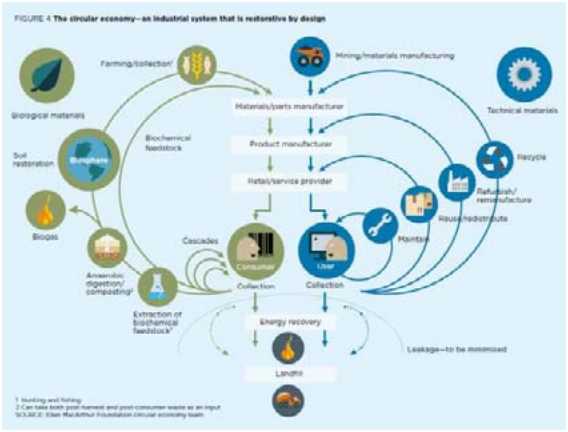


**Fig. 1 Circular Economy and its biocycles, technocycles and cascade use (Ellen MacArthur Foundation, 2014)**

## 3. Different paradigms to achieve circular economy in urbanism

<u>Industrial Ecology Agenda: facilitiating sustainable urban systems through circularity and introducing a toolbox for urbanists</u>

Urbanists willing to find the way to implement principles of the circular economy into reality and achieve urban sustainability shall find the feedback in the Industrial Ecology. The system creates an urban development that provides the values of justice and equity to the citizens through the healthy environment of living. In that sense, every action made by the human being concerning creation of an urban fabric has to be assessed in the relation to the environment with the use of available data. Industrial Ecology delivers two main contributions to the circular economy (Ferrao and Fernandez, 2013):

Firstly, the Paradigm Shift, that has to change point of urbanists view towards community, connectedness and cooperation. The realization of autonomous self has to go by the wayside in order to achieve "ecological communities". The eco-communities stands opposite to "the consumption society, that lacks a principle that is offered by the industrial ecology metaphor, which is the principle of sufficiency" (Ferrao and Fernandez, 2013). The circular economy may create new markets, and patterns that promote sharing, reusing and using instead of owning (European Comission, 2014). The Paradigm Shift brings some patterns that can be promoted in our environment (Ferrao and Fernandez, 2013):

- New customized services and products
- Culturally embeded local jobs
- Creating chain of industries that integrate the residues and end-of-life products between them

Basing on Industrial Ecology studies, European Union already prepared a programma – Resource Efficient Europe 2020, which will facilitate the transition. The agenda coordinates actions across many sectors and introduce policies which will generates jobs through better resource use (European Comission, 2014).

Secondly, Industrial Ecology brings an Ecology Toolbox which helps to redirect the urban development towards better sustainable systems. The toolbox tries to rethink the human developed systems by comparing them to natural systems. In example, the economy, that is driven by money nowadays, shall be driven by solar energy and be focused on resources availability and need to address solidarity or voluntarism. Further, focus on efficiency, consumption and production could be enhanced while focusing on sufficiency. That could be achieved by internalize the limits of growth, developing new business strategies which provides service rather than products. Linear economy should become, like in the nature, more circular and promote reusing, and recycling of products, while material flows shall develop recycling strategies using the cascade use of materials, whereas resources are recycled, reused, upcycled or refurbished (Ferrao and Fernandez, 2013).

Circle Economy Agenda: Transition in steps

On the other hand, the Circle Economy Foundation proposes a gradual process with two major phases. The first phase, non-competitive niche in the linear economy model is a phase of testing and research for circular economy. It precedes the second phase – mainstreaming, whereas circularity becomes a common phenomena. The organization distinguishes 14 steps to facilitate that emergence. (IMSA Amsterdam, 2013):

First of all, an index of performance (1), other than GDP is needed (European Comission, 2014., Zhijun, 2007., Schremeer, 2009). Industries, companies, investors and new development shall be granted or fined i.e. by the measure of environmental impact. After that, the experimentation, innovation and new approach toward design shall be introduced (2). Succesful products or enterpreneurs who adopt the circular economy idea will be promoted in order to spread the concept (3).

**Fig. 2 Step 2: Experimentation Phase. Villa Welpeloo by 2012 Architects made of recycled textile, wood, flooring and insulation**

Along experimenting and testing, the education and training (4) should be initiated to enlarge the awareness within academias and different businessess. The latter will develop a long-term vision (5) of identifying risks and opportunities streaming from assessing resources characteristics. (Zhijun et al., 2007) proposes similar pilot and demonstration programs, involving vertically – enterprises, industry parks, urban infrastrucrures, cities and regions, whereas and horizontally – industries, urban infrastructures, cultural environment and social consumption system. The implementation shall be started in the micro level in single enterprises going up to the macro – regions.

Further, exchanging waste (6) (material pooling) shows the opportunity to cooperate between industries rather than compete. Promotion of products made in circular cycles is the next step to achieve circular economy. (7) The companies which stays in linear economy could be introduced to a "roadmap" which helps them to go through transition. (8). Business can redesign wholly the chain of production and distribution. The transition shall be supported by ICT

development and social change (European Comission, 2014). The fora or platforms to exchange experiences are needed (9). Switching to circular economy need attention of different groups of actors and shall be a part of policy-making (European Comission, 2014).

The steps presented above deal with today's status quo. It seems to be adequate for urbanists to follow the experimentation, trainings and education steps, especially when thinking about roadmaps for economic sectors and designing infrastructural systems of material pooling and circular products.

After niche steps are achieved, the governments needs to oversee the companies performance according to the new standards (10), conduct a shift from labour to resources tax (11), change the current economic indicator (12), establish international independent systems for material flows (13) and adjust policies to the new realm (14).

In that phase an urbanist can find his role in being more involved political, especially while creating strategies and policies cities and regions.

## 4. Urban strategies based on circular economy concept

Circular Economy can be achieved through design of systems, chains and products. Greater cooperation between industries, users and policy-makers; advanced eco-innovation, move from selling products to selling services and developing business models based on leasing, sharing and repairng is also an important factor (European Commission, 2014).

In this realm, IABR-PROJECT ATELIER ROTTERDAM (Tilie, N., 2014) proposes Four strategies to optimize flows in Rotterdam. The atelier aim was to answer the question "how the urban metabolism idea can contribute to increased sustainability in the development of the city."

Regarding the fact that Rotterdam is the main Dutch port, urban planners, find the transportation of goods, raw materials and semi-finished products as one of the most important area of investigation. Therefore, a strategy which deals with that flows shall improve the quality of life and enhance the environment. Two approaches are highlighted to achieve it.

Firstly, using the geographical proximity of material flows an attempt is made to find the synergy between range of flows linked to each other through the spatial design. The second approach focuses on material flows of production and consumption. Planners use circular economy as a guidance to improve the sustainability of the material use in the chain of production and consumption.

Four urban design strategies are proposed (Channeling Energy, Creating Biotopoes, Collecting Resources and Catalyzing Re-Industrialization) based on above mentioned approaches. Two of them refers to the circular economy idea.

<u>Collecting Resources:</u>

In regional scale: harvesting phosphate in aquafarming; producing medicines, comsetics and plastic from bio-based nutrients.

In city scale: collecting waste in a way that flows do not mix through easy applications; sustainable renovation instead of building demolition; collecting phosphates from human feaces required for food production; collecting proteines at household scale and using them in urban farming; creating local points (extending funcitonality of supermarket) for e-waste collection and for servicing daily-use products (Fig.2) .

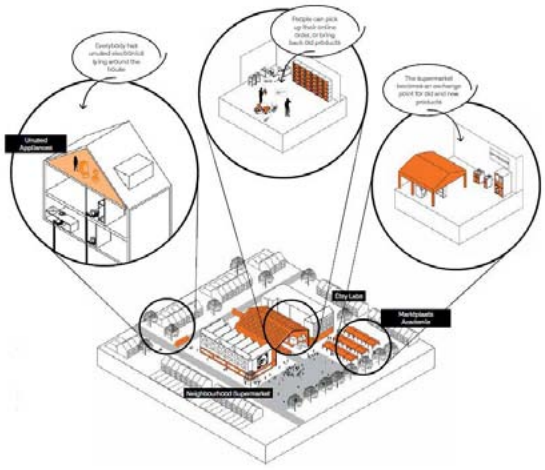


**Fig. 3 Design Application of Circular Economy: Supermarket as the resources exchange place**

<u>Catalyzing Re-industrialization:</u>

In regional scale: logical business location for small size manufactures and public transport facilitating mobility of people.

In city scale: creating missing links of transportation for "knowledge" through lightrail; designiting development zones for new innovative industries; creating experience centers, expertises offices, new experimental laboratories; filling gaps in the urban fabric with the new forms of manufacturing industry and craft activities; optimizing logistics; reducing motorized freight traffic; cargo-hubs; open-air markets; distribution centers; transfer hubs and pick-up points facilitating transport of people and cargo; Re-Industrializing Boulevards by facilitating appropriate place for small entrepreneurs; The strategy mentions the transition from mass goods production towards local manufacturing. The 3d printing (digital manufacturing), social networking, decreasing cost of transport is treated as a promise for the future; two developments for digital manufacturing shall play the crucial role in the future: digital production of simple consumer items for the local market; high-tech products through cooperation of makers and thinkers, such as RDM Campus.

(Zhijun et al.,2007) proposes a strategy model of implementing circular economy rules proposing different levels of application.

1) Enterprise level: setting up industrial chains that minimize product use and pollution, maximizng resource usage
2) Industry level: waste exchange, clean production, multi-level use of energy, minimize discharge and waste, regional integration, smooth information exchange
3) City level: pollution prevention, sustainable social, economic and environmental development

Also the aspects of good legislation process are considered (Zhijun et al.,2007):

Coordinating with environmental planning, at various levels with budgetary support; stipulating responsibilities of central and local government; forcing major polluting enterprises to adopt circular practices; encouraging use of less hazardous technologies and rewarding recycling and reuse; networking businessess; giving responsibility of recycling to households; public participation in creating resource-circulating society.

## 5. Obstacles

European Comission is underlining challenges and obstacles that has to be overcomed (European Comission, 2014): Companies lack awareness of the circular economy solutions; confidentiality and trust issues blocks share of knowledge. The status quo that we live in, can lock the economy in linear model (powerful stakeholders would rather stay in current economic business); Investment towards eco-efficiency is too risky and too complex. Demand for sustainable products and services is relatively low in european society, price of them does not reflect on environmental impact and finally the voice of politician is not sufficiently strong.

On the other hand Circle Economy sees following obstacles (IMSA Amsterdam, 2013): In financial point of view, major investment cost for companies; externalities (environmental change) is not taken into consideration of new industries, recycling is still more expensive than raw materials extraction, cost of management can be too high whereas quality of recycling materials is low. Considering infrastructure: application of new business models is limited, technologies which are linear are deeply rooted and there is a lack of information exchange system. From socio-political point of view, attention on the end-life of products is very low; separating bio and technical nutrients in households is a challenge, government are supporting linear economy model, circularity is not integrated efficiently and finally, policies on recycling are ineffective.

## 6. Conclusions: What urbanists could do?

EU recognizes opportunities that will bring values while transition is completed: 8% of annual turnover, and reducing greenhouse gas emission up to 4%, 2 million jobs could be created. Moreover, the society is vastly convinced that resource saving will create savings and better living conditions. But how the urbanist can help to achieve that goals?

As described in previous chapters, there are tools already available for urbanists, that can be used to facilitate transition towards circular economy.
Firstly, paradigm shift is to be underlined together with the use of industrial ecology toolbox. Secondly, participating in education, trainings, workshops and understanding urban flows in niche phase. Designers are responsible to understand the circular economy concept and

promote it through their design. Regardless the scale of project (from designing 100% recyclable mobile phone, to designing a self-sufficient urban system). Following Sustainable Urban Metabolism in Europe, it is needed to analyze the potential to transform existing urban built environments to minimize resource use by improving urban form (Schremeer, 2009).

Regarding the fact, that the circular economy concept is very hard to implement and propagate, the influence of urbanist and designers in overall in that field can be crucial. "Influencing urban structures and promoting more sustainable forms of behavior, will require more than single policy instruments." (Schremeer, 2009). Urbanists shall consciously participate in policy-making process while circular economy is in mainstream phase.

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# APPENDIX B: GRADUATION LAB: REPORT FROM WORKSHOP

# Report from the workshop „Get Inspired by Biennale"

By Tanya Chandra, Martina Gentili, Di Fang, Juste Stefanovic, Sarah Rach & Krzysztof Pydo

*The 14th Architectural Exhibition in Venice Biennale 2014* has become a fairly convenient location for a workshop organized by Msc3 Urbanism students from TU Delft. The major aim of the student workshop organized at the Biennale was to reflect on different forms of representation of various exhibitions located mainly in the Giardini and in the Arsenale. The major task was to analyze how the pavilions and exhibitions attract visitors, what emotions they evoke, what senses are involved in communicating the meaning of display and what is the interaction between installations and users.

The conclusions of the workshop was linked to the *Design as Politics* activities taking place at *Swiss Pavilion*, whereas students were asked to think through and to visualize the independency of Scotland, Veneto and Cataluña. The intention of the exercise was to exaggerate one of the crucial aspects of examined regions in order to create their utopian images. The utopian systems of *Scottish Lottocracy, Veneto: Country of Production, Polenta & Palladio* and School of life supposed to be finalized with a pavilion design of the newly formed country for the purpose of its first Biennale Exhibition in Venice in 2016.

As a group we defined different manners of involving visitors in an exhibition/pavilion. Involvement can be done in an active way where the visitor takes an active role in viewing the exhibition and needs to take effort to be provided of information or in a passive way where the viewer is more of an observer. Then there is another distinction where the viewer is either a visitor of the pavilion or is experiencing the pavilion. So summerizing there is a distinction between active and passive, and visitor and experience.

In the following the different pavilions as an end product of the Design as Politics workshop are presented which were inspired by the different pavilions we visited during the week.

**The Pavilion of Scotland:** *Martina Gentili*

The recent Scottish referendum was debated not only on the basis of national identity but on notions of justice and equality. These stem not from a regional identity but from disenchantment with dysfunctional democratic processes. Scotland is not unique in this respect but provides a convenient boundary and broad political consensus in which to base a project.

In the Scottish pavilion the future 'lottocratical' Scotland is presented: an independent country in which a series of lotteries have replaced normal systems within society.

The government is elected lottocratically (all citizens may be called upon). The lottery considers the hours of labour, leisure, GDP and housing required towards achieving the governments broad goals and distributes them unevenly, much in the way that resources are distributed unevenly in 2014. Money earned, house, salary and work hours are appointed at random and have no correlation to (eg. thanks to the lottery a butcher, working 3 hours a week, earn £400,000-a-year, living in a caravan in Peebles may find himself in Nairn the day after, a surgeon working 40 hours for £10,000-a-year whilst living in a high-rise). This is a form of fairness in which everything is not equal but in which all citizens will experience all ways of living - it is our contention that empathy arising from this situation would create a better society (would undermine spatial segregation, condemnation of certain housing types, accepted forms of government etc.).

In the course of a week spent in Venice working through the utopia to its absurd conclusion, with its implications for human instinct, self-determination, reproduction, education, law making, immigration etc, we feel that it provides a compelling alternative to the situation in 2014.

The visitors of the Scotland pavilion can experience it in an active way. They will find a lottery machine in the middle of the pavilion to guide them through a personal journey in the life of Lottocratic Scots. Personal paths, determined by the lottery machine, will lead the visitor through a series of images depicting the possible life he or she could have if living in the new independent People's Lottocracy of Scotland.

**The Pavilion of Veneto:** *Tanya Chandra, Sarah Rach & Krzysztof Pydo*

The pavilion of the Veneto region is showing the utopic country of production. The production state of Veneto is aiming an optimized production system in the sense that it should endure as long as possible. In order to create a utopic country of production it runs a cycle of optimal production which tries to reach consensus between using all available resources and exist as long as possible in this state.

The intention of this utopia is to generate a cycle that takes this character but removing the idea of ownership. Everything in it belongs to production. The four quadrants of this system is production, housing, resources and recreation. One is at its peak of production when they use the 24 hours of a day equally for working, sleeping and recreating. The pavilion consists of a conveyer belt which passes by the different quadrants of the production country. At certain times the visitor is forced to get of the belt to either rest or play a mandatory game.

The visitor of the Veneto pavilion experiences the pavilion in an active way. He is forced to participate in mandatory activities (which are a metaphor for the optimized activities in the utopic country of production) and a set time will lead the visitor through the pavilion just like the inhabitant of the Veneto region sleep, works and recreate for exactly 8 hours a day.

**The Pavilion of Cataluña:** *Di Fang & Juste Stefanovic*

For our group work we got inspiration from two pavilions – the Swiss and the French pavilions.

The inspiring part in a French pavilion was the movies, which they were showing. It was easy to understand, but at the same very informative and unique. And what was also important, that it interested a lot of people.

The Swiss pavilion mainly shows works from Cedric Price and Lucius Burckhardt, who were both much concerned with the idea of the present moment, of the need to relate to “now” and chart a future path for their contemporary society. Both Burckhardt and Price critiqued the traditional tertiary education system and were interested in rethinking the basic concept of a university. When we first arrived at Swiss pavilion, we looked at the models in the room and checked the archives, just as normal visitors. Later on, we had our workshop in Swiss pavilion and visitors came and stopped to watch our work. Then our activities became part of the exhibition and our roles changed from passive visitors to active actors.

We were working on a theme of independent Catalonia, where we basically proposed a strategy of a “School of Life”, where people are obliged to learn/produce Catalan culture and production during all their lives, and spread it all over the world. Therefore, the main idea of the pavilion of Catalonia was to create a space for workshops, where people could learn some Catalan culture. This way of exhibition is chosen in the same logics as the whole idea of the Utopia. It is based on learning to publicize Catalan culture. The pavilion is shaped as a circle, on the wall there will be screens showing movies of Catalan culture, which involves visitors in a passive way.

Inspired by our workshop in Swiss pavilion, our Pavilion will also provide workshop for people and make visitors play a more active role. The workshops in the room become performance, people sitting on the stage in the middle become the audience. As people keep coming in and going out, the “actors“ and “audience“ keep changing all the time, every moment becomes different.

# APPENDIX C: GRADUATION ORIENTATION

# GRADUATION ORIENTATION

Studio:
**Design as Politics**

Graduation Theme**:**
**New Utopias on the Ruins of the Welfare State**

Course Instructors
**Prof. Dr. Wouter Vanstiphout**
**Ir. Marta Relats**
**Ir. Mike Emmerik**

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Design as Politics: New Utopias on the Ruins of the Welfare State is a research theme of Design as Politics Studio that states: „Modern Architecture would be nothing without its connection to the welfare state" . To prevent societies from social unrest, set of social benefits covering most of the life aspects have been made with the use of enormous concentration of power and decision making. (Studio Guide, p.6).

**Response: chosen location, Nowa Huta, is a Ruin of the Welfare State that was build for the reason of creating communist society. The entire life was organized there by the People's Party: work in steel plant, housing in social realistic blocks of flats, healthcare, pension and other social benefits. The enormous industry could have not been functioning without gathering and indoctrinating masses of labour force in one place. (Jagło, 2013)**

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DaP: The organizational structure that was bureaucratic, central and technocratic was the only way to implement top-down gigantic urban plans.

**Re.: The project size of Nowa Huta was enormous for post-war Poland, meant to settle down 100,000 thousands inhabitants, producing 6,5 millions of tonnes of steel and employ 30,000 steelworkers. The government was central planned and impresonal towards local workers. No planning decisions came from bottom-up. Initiatives to build worship places or cultural centers were surpressed causing many social problems in early Nowa Huta such as overcrowding, rapes in worker hostels, infanticide etc. (Lebow, 2013)**

DaP: „we live in an age when all over the world the role of government is being (...) deconstructed" (Studio Guide, p.7). The control over society weakens and communities have to use the market to take care of themselves.

**Re.: The society of Nowa Huta for 40 years has unlearned how to take initiative. The further 20 years brought stagnation and pre-crisis situation. The community of Nowa Huta needs to learn how to organize their life fast, before it will start to be marginalized. (research conclusion)**

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DaP: The inefficient political system is collapsing and countries tend to federalize and disintegrate.

**Re.: The fact is also observed in Nowa Huta, whereas Magistrat Nowohucki – a group of local activitsts, make an effort to separate from Kraków that was linked in 1951. They believe that the difference from Kraków is too strong to be uniform city and that Municipality makes no effort to improve the existing situation. (Magistrat Nowohucki)**

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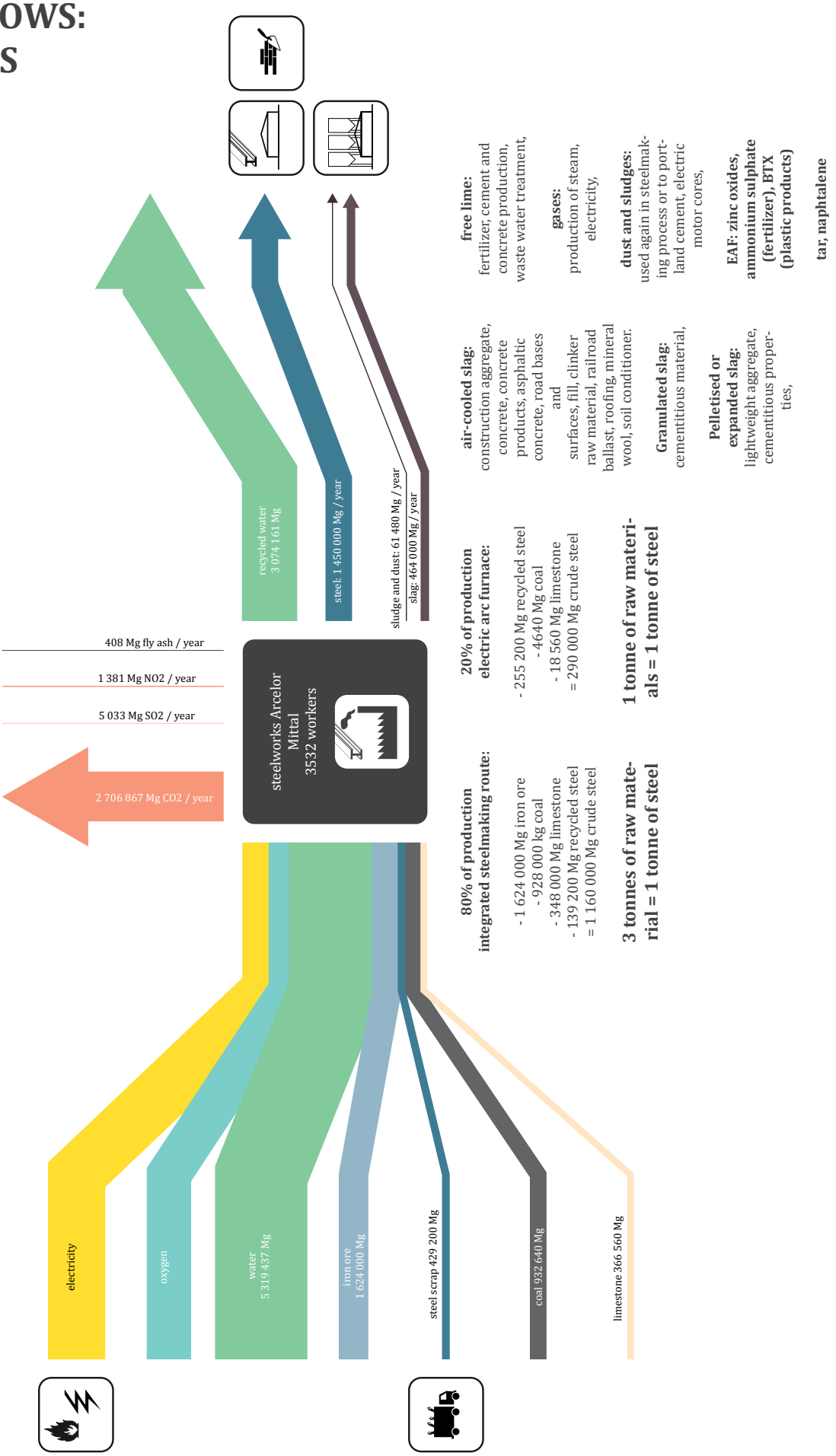
DaP: Studio calls to design in a reality whereas the state does not play that huge role in the communities, whereas planning and design has to happen without the state and developer, but with community. The design is an utopia that is builded with what can be seen around.

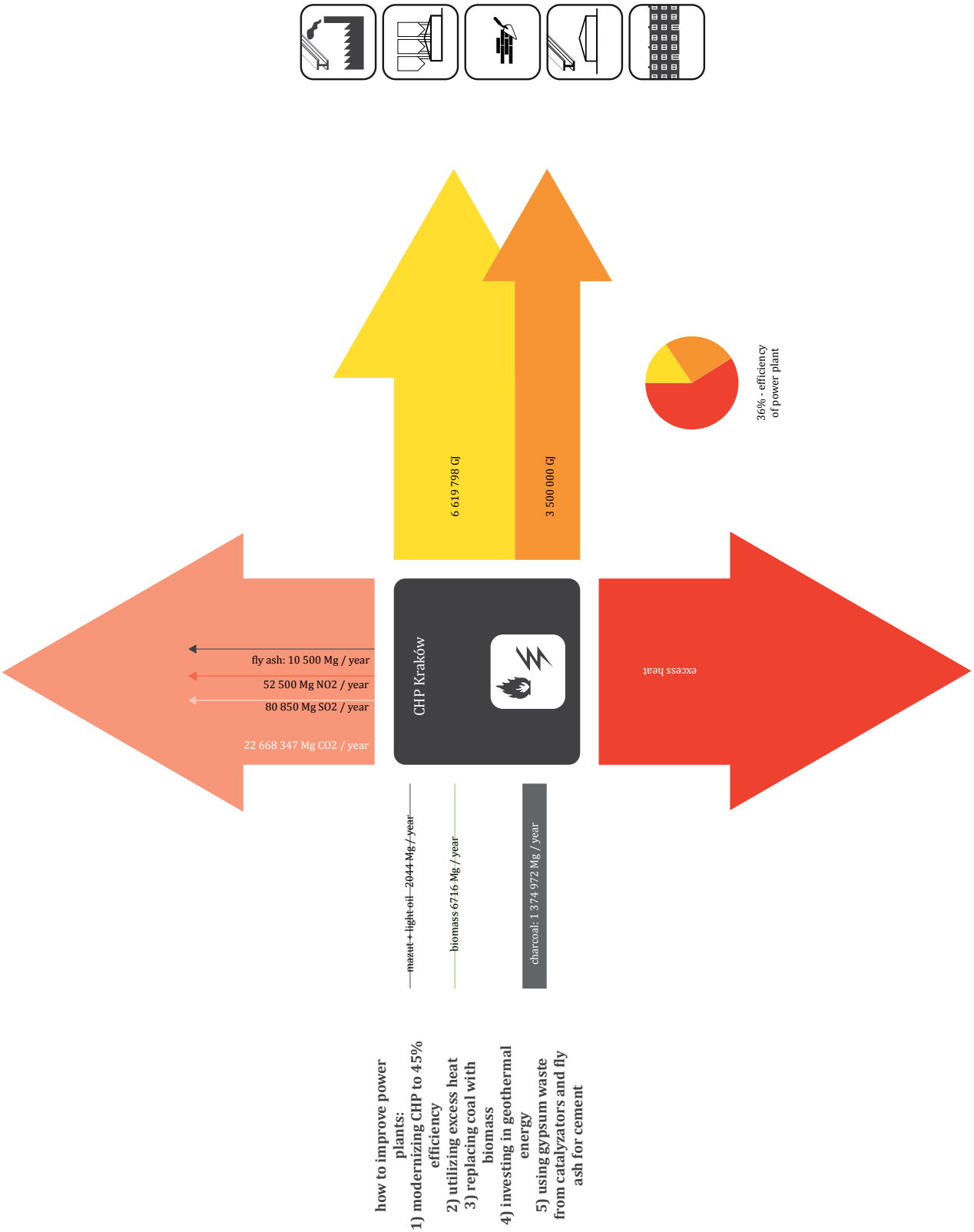
**Re.: The design proposal of graduation project for Nowa Huta literally proposes design solutions with what is laying around and perceived as worthless. Old trams that are too uncomfortable to carry passengers, are refurbished into cargo trams; steel plant that is constantly retreating is becoming a place for new entrepreneurs and enterntainment activities for citizens and tourists; unsorted waste that the whole country cannot sort, goes through Nowa Huta and is upcycled by local workshops that are occupying abandoned kindergartens; ordinary development of public transport such as bike paths, roads, are replaced by shweeb – one passenger mechanic vehicles made in 99% out of steel and trams on steel tracks; the new production and construction is made and serviced by local enterpreneurs with circular economy principles. One's social security is replaced by his own security bank account and social services organized by many of existing catholic churches etc. (design proposal)**

# APPENDIX D: MAPPING FLOWS

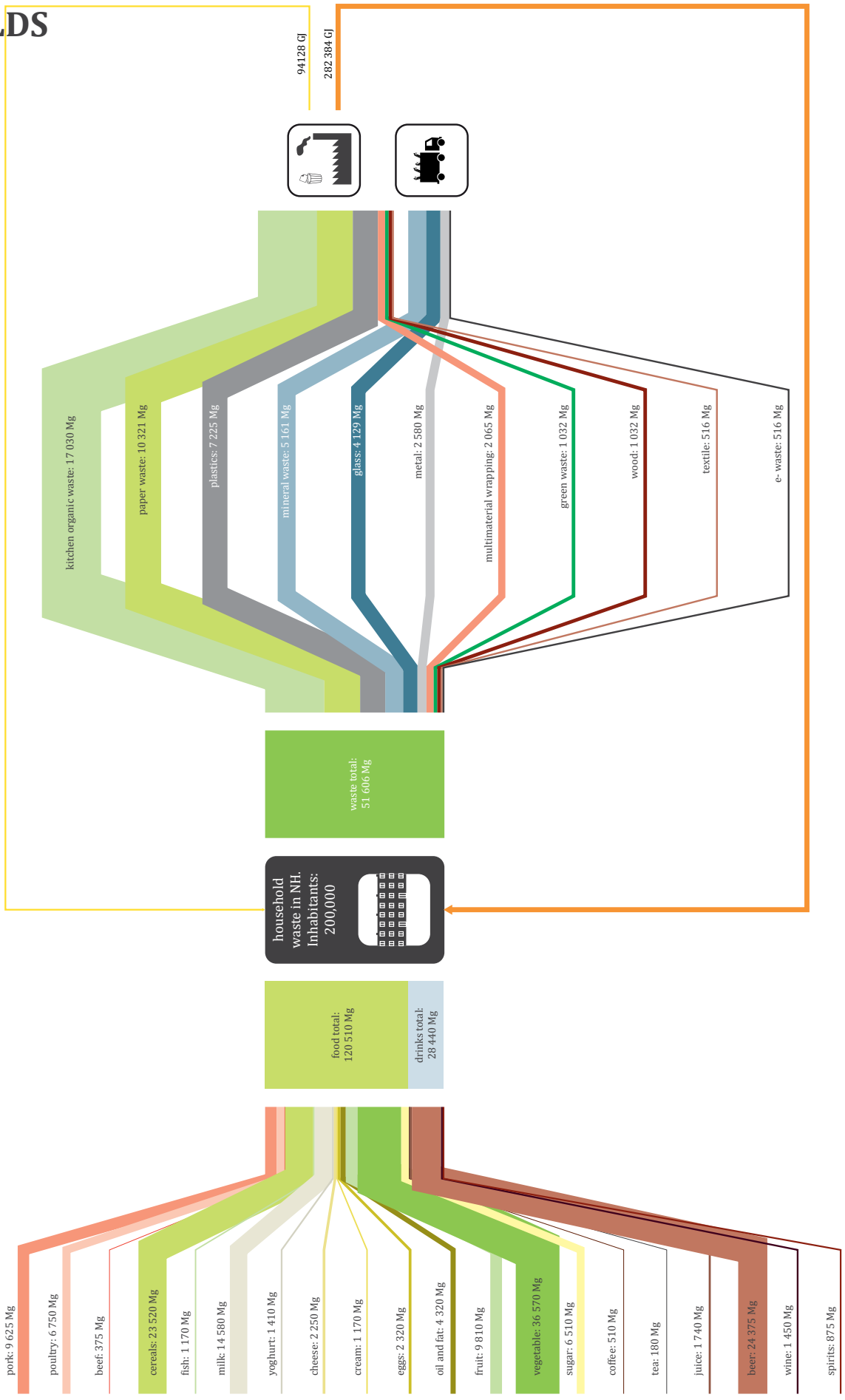
# MAPPING FLOWS: STEELWORKS



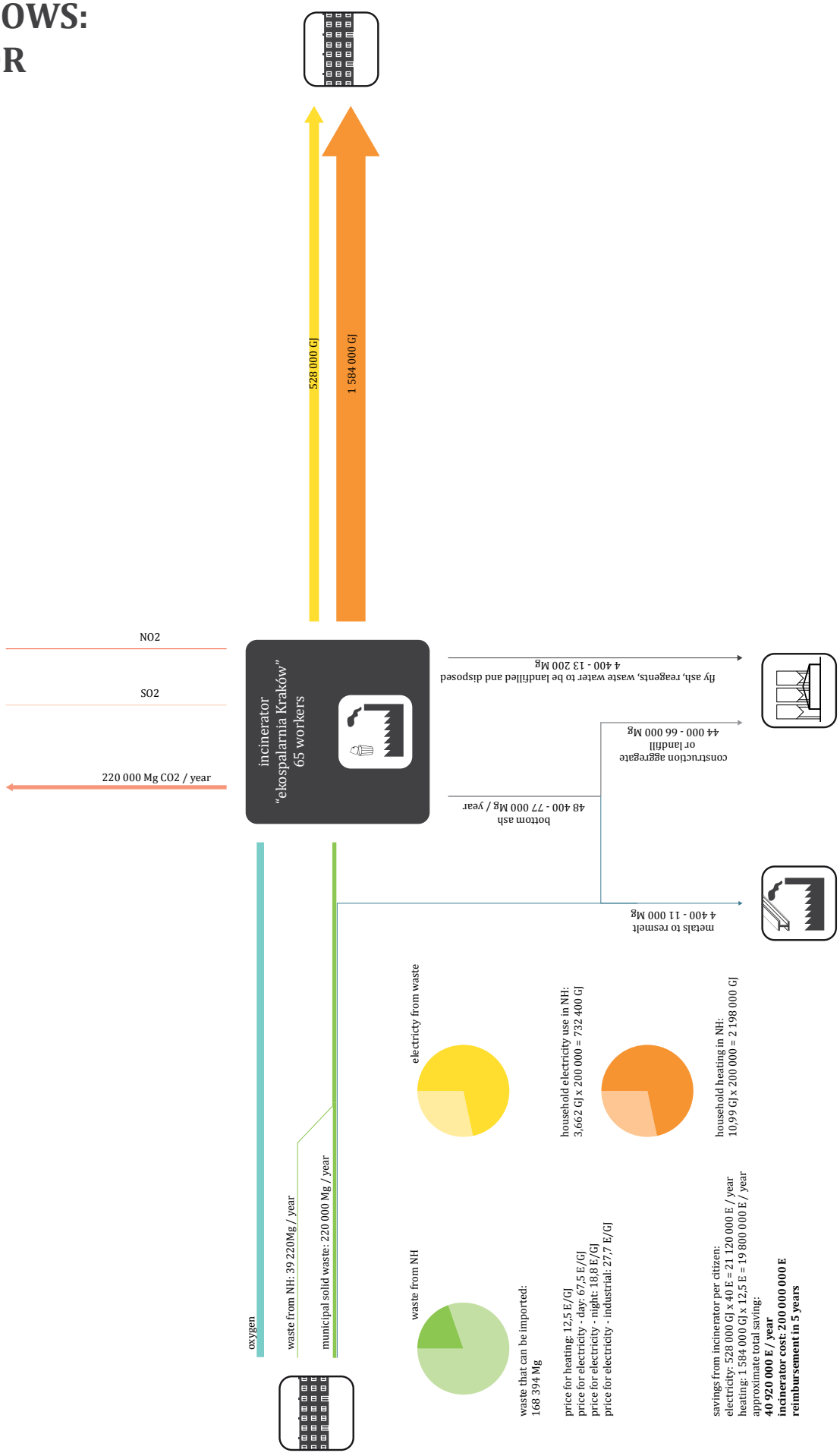
# MAPPING FLOWS:
# CHP



# MAPPING FLOWS: HOUSEHOLDS

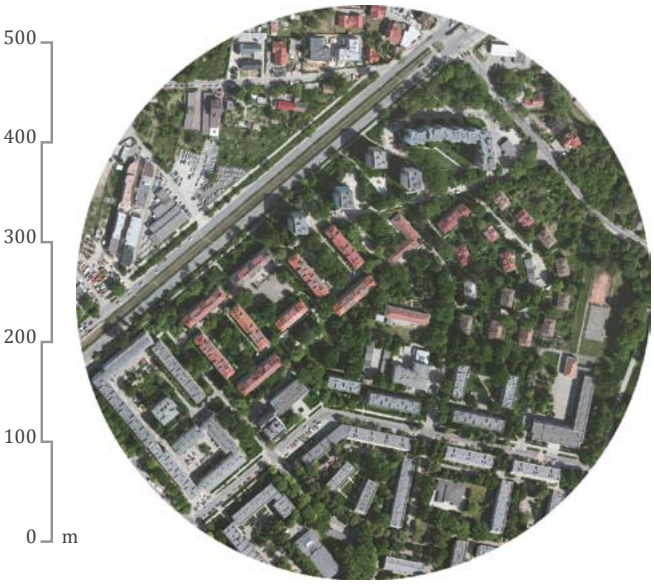


# MAPPING FLOWS: INCINERATOR

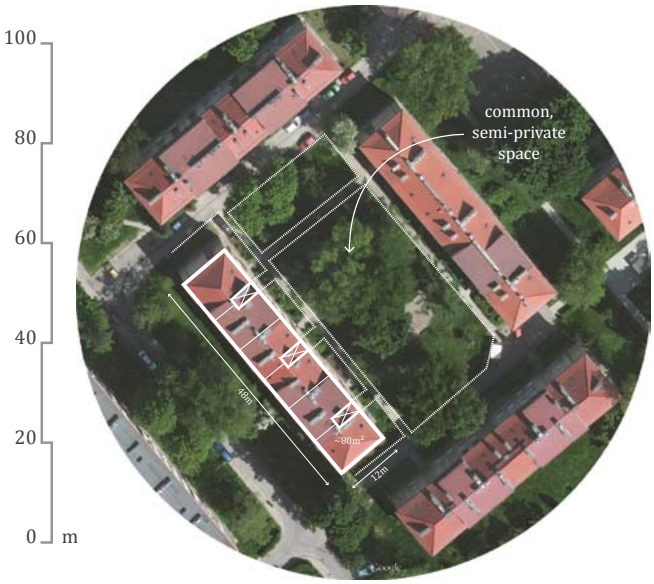


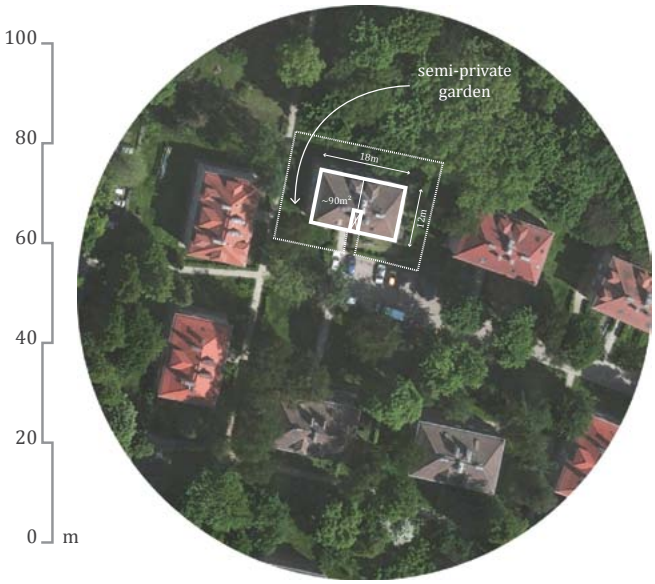
# APPENDIX E: TYPOLOGIES STUDY

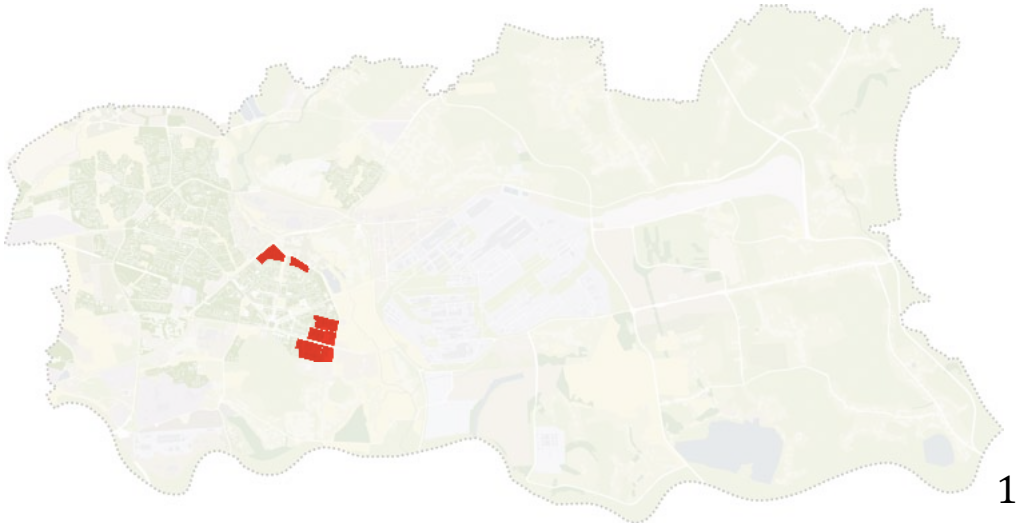
# WANDY, NA SKARPIE, MŁODOŚCI, WILLOWE, SPORTOWE, KRAKOWIAKÓW




multi-family housing; 4, 6, 7 apartments per staircase (entrance)
4, 14, 21, 28 apartments per building; 2-4 storey high; entrance from courtyard;
100-150 apartments per courtyard

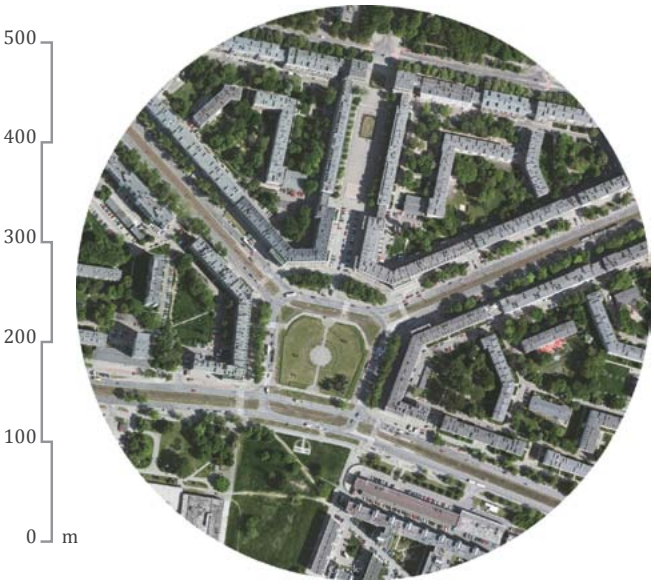


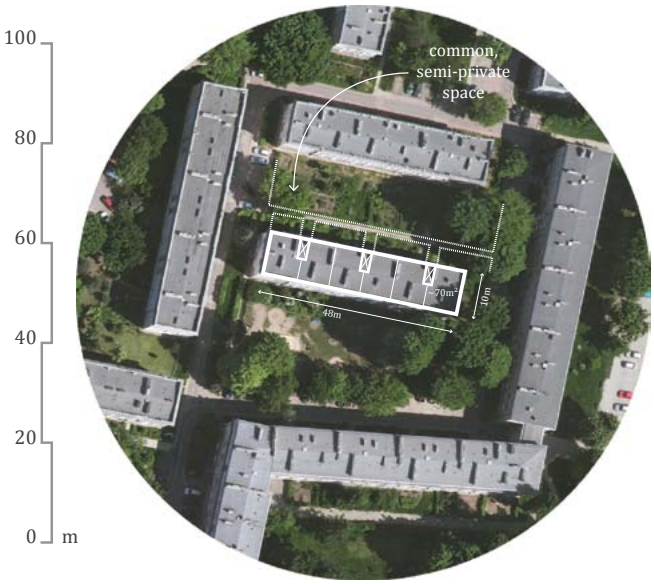



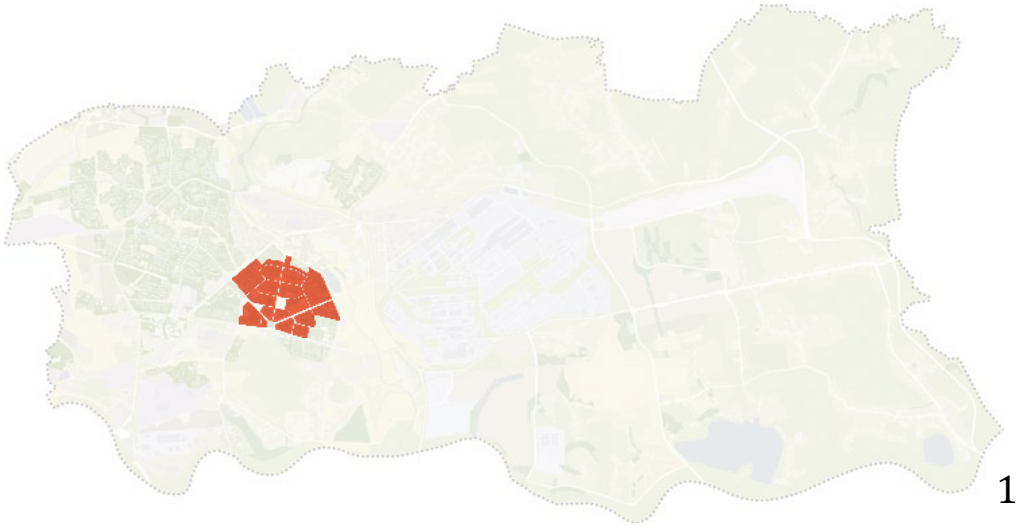
1949- 1950

# CENTRUM A-D, HUTNICZE, STALOWE, OGRODOWE, SZKLANE DOMY, SZKOLNE, SŁONECZNE, ZGODY, UROCZE, ZIELONE, GÓRALI, TEATRALNE



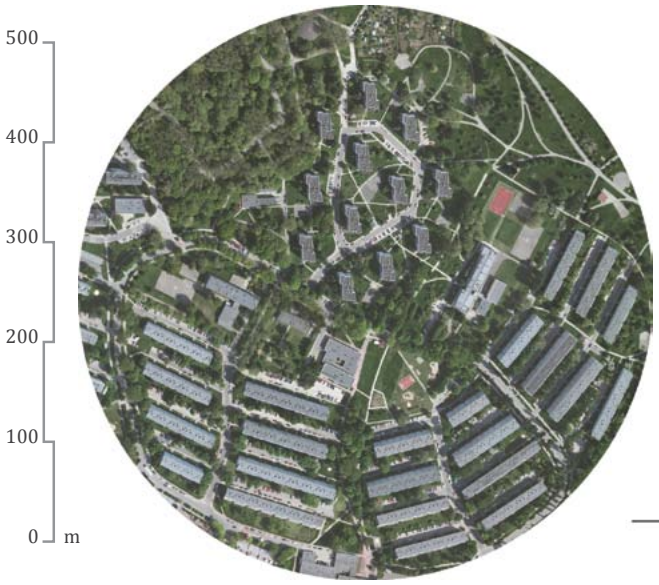



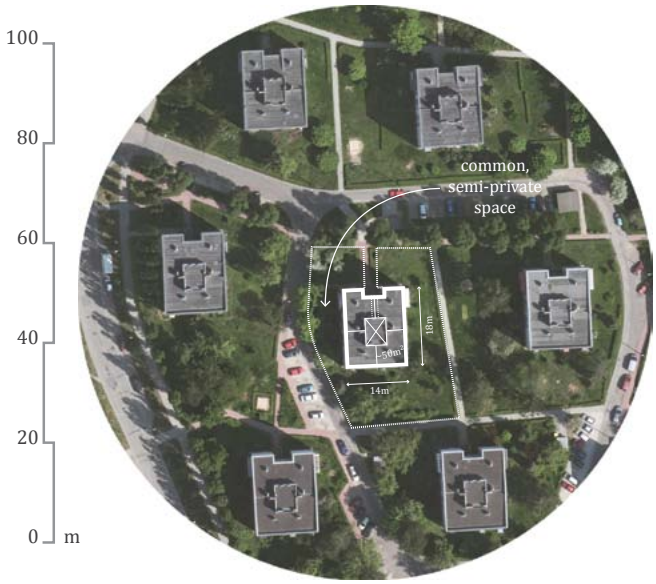

multi-family housing
6, 8, 10, 12, 14 apartments per staircase
3-7 storey high
entrances from courtyard or from street
300 - 600 apartments per unit



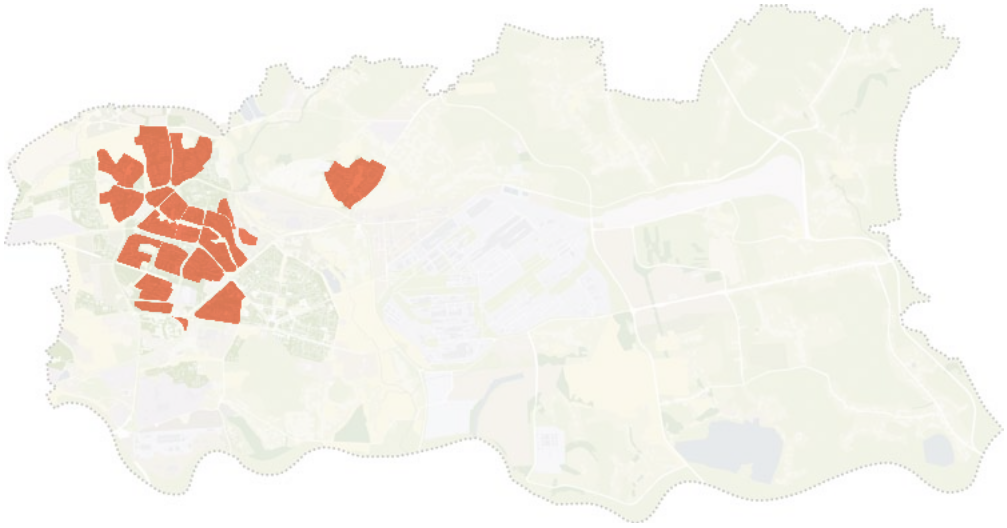
1950- 1956

HANDLOWE, SPÓŁDZIELCZE, KOLOROWE, ALBERTYŃSKIE, BIEŃCZYCE, WYSOKIE, KALINOWE, JÓZEFA STRUSIA, KOŚCIUSZKOWSKIE, AVIA, KOMBATANTÓW, MISTRZEJOWICE, PIASTÓW, TYSIĄCLECIA

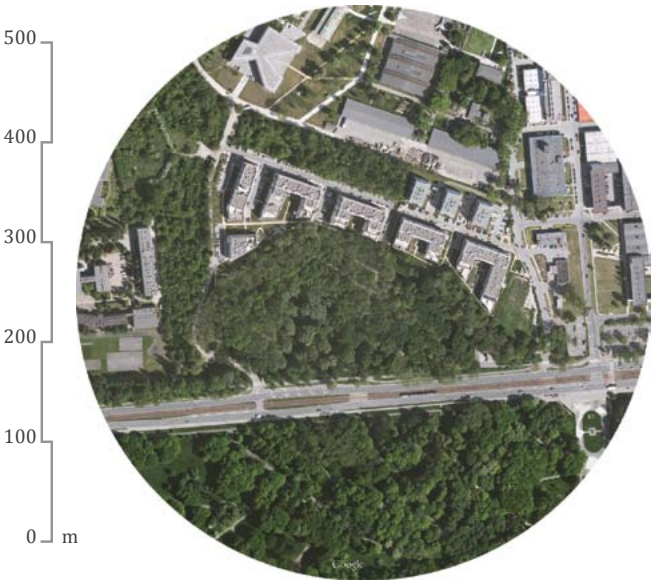


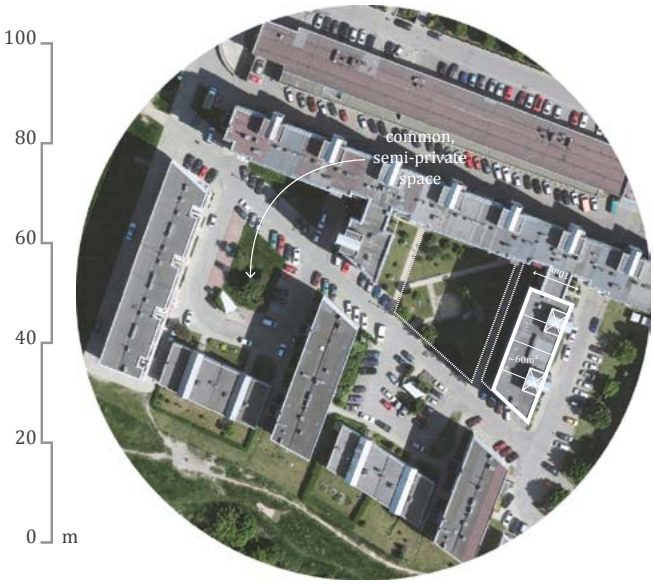



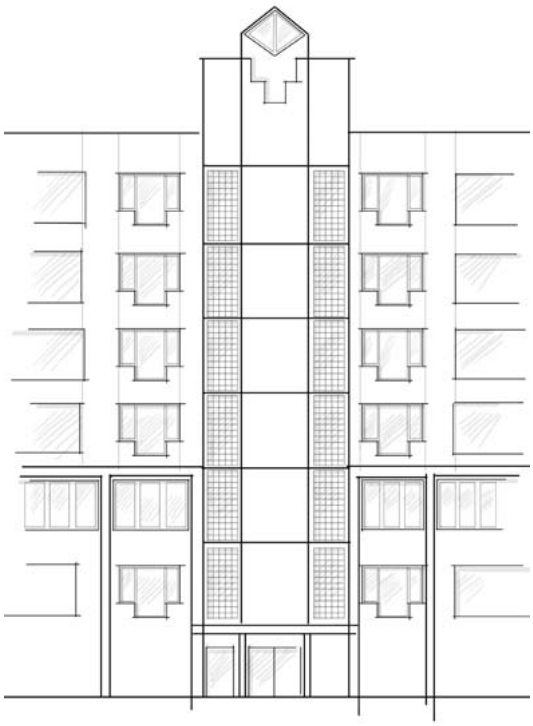

multi-family housing
8, 10, 12, 14, 16 and more apartments per staircase
3-12 storey high
entrance from street, no courtyards
300 - 1000 apartments per cluster



1956-1989

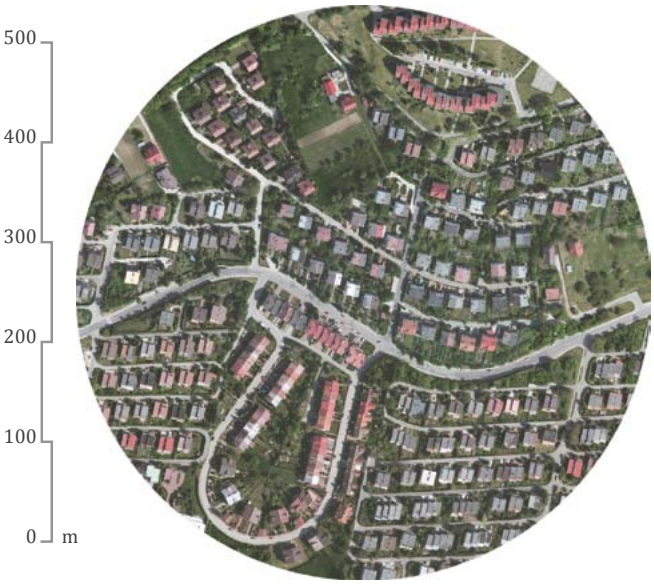


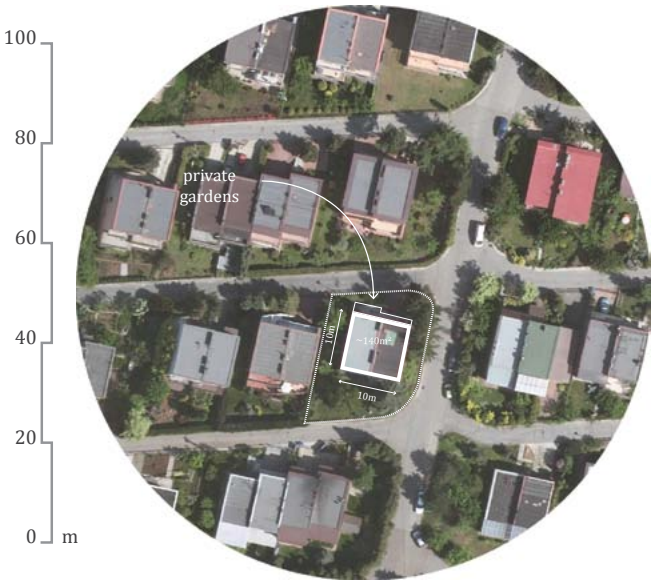



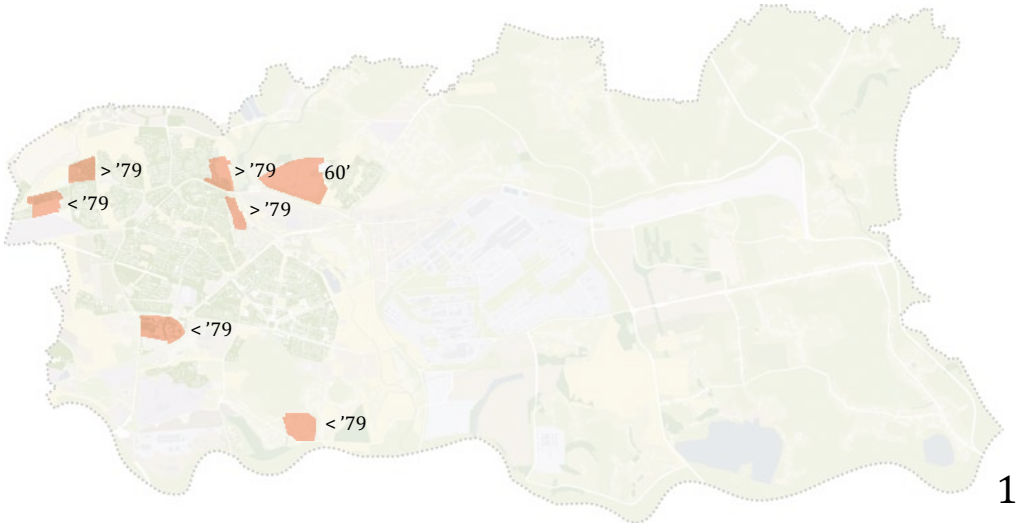
multi-family housing
6, 8, 10, 12 apartments per staircase
3-8 storey high
entrance from courtyards or streets
200 - 500 apartments per unit

1989-2015



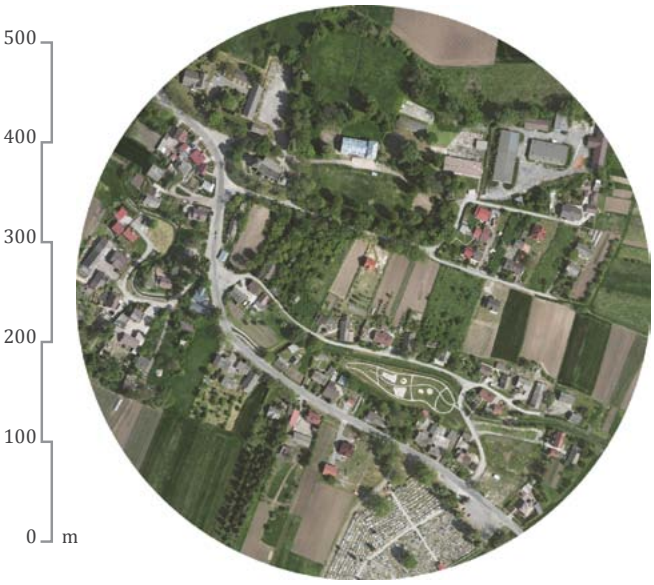

single-family housing
detached houses, semi-detached houses, row houses
1, (2, 4) families per house
1-3 storey high
entrance from street
200, 300, 600 houses per cluster



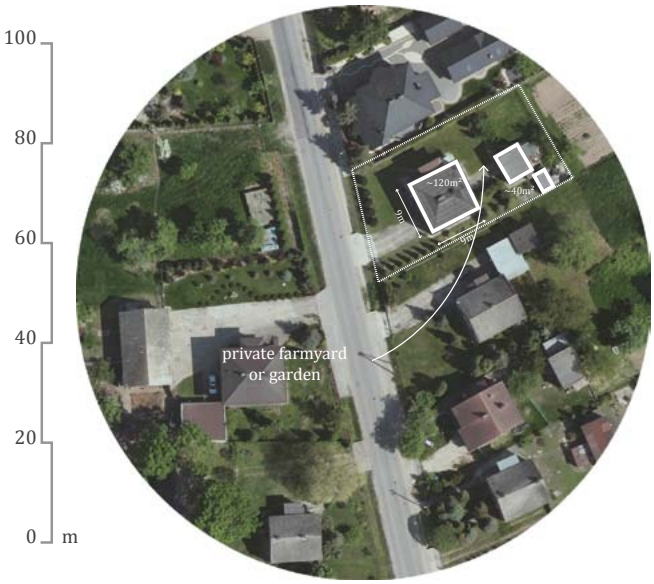



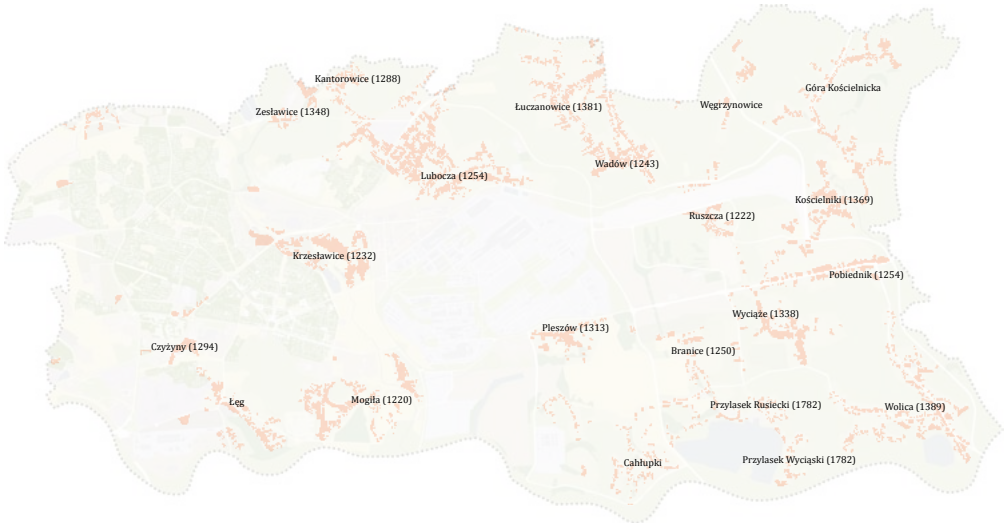

1945- 2015

KRZESŁAWICE, MOGIŁA, WĘGRZYNOWICE, KOŚCIELNIKI, RUSZCZA, WYCIĄŻE WSCHÓD, WYCIĄŻE ZACHÓD, WOLICA, PRZYLASEK RUSIECKI, BRANICE, PLESZÓW, KUJAWY, LUBOCZA, GRĘBAŁÓW, KANTOROWICE, ZESŁAWICE,




single family housing, farm houses
detached houses, semi-detached houses, refurbished cottage houses, new single-family houses
1, (2) families per house
entrance from street, often with own arable field,
50, 100, 200 houses per village district



# APPENDIX F: BIODIVERSITY ALBUM

# LASEK MOGILSKI

wiąz szypułkowy - limak (Ulmus laevis) / elm tree

dąb szypułkowy (Quercus robur) / oak tree

jesion (Fraxinus excelsior) / ash tree

topola czarna (Populus nigra) / black poplar

osika (Populus tremula) / aspen tree

bez czarny (Sambucus nigra) / eldberry

dereń świdwa (Cornus sanguinea) / dogwood

trzmielina pospolita (Euonymus europaeus) / common spindle

czeremcha zwyczajna (Padvus avium) / bird cherries

leszczyna pospolita (Corylus avellana) / filberts

ziarnopłon wiosenny (Ficaria verna) / lesser celandine

zawilec gajowy (Anemone nemorosa) / anemone

miodunka ćma (Pumonaria obscura) / unspotted lungwort

czyściec leśny (Stachys sylvatica) / hedge woundwort

czartwa pospolita (Circaea lutetiana) / enchanter's-nightshade

kłosownica leśna (Brachypodium sylvaticum) / false brome

kostrzewa olbrzymia (Festuca gigantea) / giant fescue

pokrzywa (Urtica dioica) / nettle

podagrycznik pospolity (Aegopodium podagraria) / ground elder

dzięcioł zielonosiwy (Picus canus) / grey-headed woodpecker

dzięcioł zielony (Picus viridis) / green woodpecker

grzyby / mushrooms

mchy / mosses

gawron (Corvus frugilegus) / rook

kawka (Corvus monedula) / jackdaw

# LASEK ŁĘGOWSKI:

dąb szypułkowy (Quercus robur) / oak tree

jesion (Fraxinus excelsior) / ash tree

olsza czarna (Alnus glutinosa) / black alder

bez czarny (Sambucus nigra) / eldberry

dereń świdwa (Cornus sanguinea) / dogwood

trzmielina pospolita (Euonymus europaeus) / common spindle

czeremcha zwyczajna (Padvus avium) / bird cherries

ziarnopłon wiosenny (Ficaria verna) / lesser celandine

płożymerzyk kędzierzawy (Plagiomnium undulatum)

krótkosz łyżkowaty (Brachythecium rutabulum)

miodunka ćma (Pumonaria obscura) / unspotted lungwort

kostrzewa olbrzymia (Festuca gigantea) / giant fescue

turzyca rzadkokłosa (Carex ramota) / sedge

pokrzywa (Urtica dioica) / nettle

kuklik pospolity (Geum urbanum) / wood avens

podagrycznik pospolity (Aegopodium podagraria) / ground elder

trznadel (Emberiza citrinella) / yellowhammer

kos (Turdus merula) / common blackbird

rudzik (Erithacus rubecula) / european robin

wilga (Oriolus oriolus) / black-naped oriole

dzięcioł duży (Dendrocopos major) / great spotted woodpecker

grzywacz (Columba palumbus) / wood pigeon

myszołów zwyczajny (Buteo buteo) / common buzzard

# ŁĄKI NOWOHUCKIE


rośliny ruderalne / ruderal species


rajgras wyniosły (Arrhenatherum elatius)
/ false oat-grass


kupkówka pospolita (Dactylis glomerata)
/ orchard grass


kostrzewa łąkowa (Festuca pratensis)
/ meadow fescue


wiechlina łąkowa (Poa pratensis)
/ smooth meadow-grass


trzcina (Phragmites australis) / reed


wyczyniec łąkowy (Alopecurus pratensis)
/ meadow foxtail


koniczyna łąkowa (Trifolium pratense)
/ red clover


wyka ptasia (Vicia cracca)
/ cow vetch


groszek łąkowy (Lathyrus pratensis)
/ meadow vetchling


mniszek lekarski (Taraxcum officinale)
/ common dandelion


złocieniec właściwy (Leucanthemum vulgare)
/ oxeye daisy


chaber łąkowy (Centaurea jacea)
/ brownray knapweed


ostrożeń łąkowy (Cirsium rivulare) / thistle


rdest wężownik (Polygonum bistorta)
/ bistort


krwiściąg lekarski (Sanguisorba officinalis)
/ great burnet


szuwar z kosaćcem żółtym
(Iridetum pseudoacori) / yellow flag


kozłek lekarski (Valeriana officinalis)
/ valerian


kułka krwista (Dactylhoriza incarnata)
/ early marsh-orchid


wiązówka błotna (Filipendula ulmaria)
/ meadowsweet


pałka szerokolistna (Typhetum latifoliae)
/ broad truncheons


trzciniak (Acrocephalus arundinaceus)
/ great reed warbler


trzcinniczek (Acrocephalus scirpaceus)
/ reed warbler


rokitniczka (Acrocephalus schoenobeanus)
/ sedge warbler


łozówka (Acrocephalus palustris)
/ marsh warbler


świerszczak (Locustella naevia)
/ common grasshopper warbler


brzęczka (Locustella luscinioides)
/ savi's warbler


strumieniówka (Locustella fluviatilis)
/ river warbler


pokrzewka cierniówka (Sylvia communis)
/ common whitethroat


potrzos (Emberiza schoeniclus)
/ common reed bunting


derkacz (Crex crex)
/ corn crake


gąsiorek (Lanius collourio)
/ red-backed shrike


bączek (Ixobrychus minutus)
/ little bittern


błotniak stawowy (Circus aeruginosus)
/ western marsh harrier


szpak (Sturnus vulgaris)
/ common starling


sroka (Pica pica)


jaskółka (Hirundinida) / swallow


kwiczół (Turdus pilaris) / fieldfare


czerwończyk fioletek (Lycaena helle)
/ violet copper


czerwończyk nieparek (Lycena dispar)
/ large copper


moderaszek telejus (Maculinea teleius)
/ scarce large blue

# DOLINA WISŁY


wierzba biała (Salix alba) / white willow


wierzba krucha (Salix fragilis) / fragile willow


olsza czarna (Alnus glutinosa) / black alder


topola czarna (Populus nigra) / black poplar


wrotycz (Tanacetum vulgare) / tansy


bylica (Artemisia vulgaris) / wormwood


kaczka krzyżówka (Anas platyrhynchos) / mallard

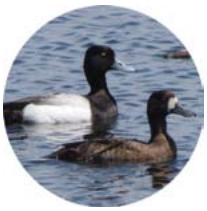

czernica (Aytha fuligula) / tufted duck


głowienka (Aythya ferina) / common pochard


kormoran (Phalacrocorax carbo) / cormorant


tracz nurogęś (Mergus merganser) / common merganser


tracz bielaczek (Mergus albellus) / smew


ogorzałka (Aytha marila) / greater scaup


bielik (Haliaetus albicilla) / white-tailed eagle

# DOLINA DŁUBNI

traszka grzebieniasta (Triturus cristatus) / northern crested newt

rzekotka drzewna (Hyla arborea) / tree frog

wierzba biała (Salix alba) / white willow

olsza czarna (Alnus glutinosa) / black alder

bóbr (Castor fiber) / beaver

rudbekia naga (Rudbeckia laciniata) / cutleaf

nawłoć późna (Solidago gigantea) / tall goldenrod

kolczurka klapowana (Echinocystis lobata) / wild cucumber

niecierpka gruczołowata (Impatiens glandulifera) / bobby tops

zimorodek (Alcedo atthis) / kingfisher

remiz (Remiz pendulinus) / remiz

kwiczoł (Turdus pilaris) / fieldfare

pokrzewka cierniówka (Sylvia communis) / common whitethroat

pokrzewka czarnołbista (Sylvia atricapilla) / blackcap

łozówka (Acrocephalus palustris) / marsh warbler

słowik rdzawy (Luscinai megarhynchos) / nightingale

łabędź niemy (Cygnus olor) / mute swan

kaczka krzyżówka (Anas platyrhynchos) / mallard

łyska (Fulica atra) / coot

kokoszka wodna (Gallinula chloropus) / water moorhen

kureczka kasztanowata (Zapornia fusca) / ruddy-breasted crake

brodziec krwawodzioby (Tringa totanus) / redshank

# DOLINA POTOKU KOŚCIELNICKIEGO


brzoza (Betula) / birch tree


ostrożeń łąkowy (Cirsium rivulare) / thistle


ostrożeń siwy (Cirsium canum) / thistle


firletka poszarpana (Lychnis flos-cuculi) / ragged robin


jaskier ostry (Ranunculus acris) / buttercup


łęg olszowy (Fraxino-Alnetum) / alder riverine forest


wierzba biała (Salix alba) / white willow


wierzba krucha (Salix fragilis) / fragile willow


olsza czarna (Alnus glutinosa) / black alder


trzcina (Phragmites australis) / reed


zimorodek (Alcedo atthis) / kingfisher


remiz (Remiz pendulinus) / remiz


kwiczoł (Turdus pilaris) / fieldfare


łozówka (Acrocephalus palustris) / marsh warbler


słowik rdzawy (Luscinai megarhynchos) / nightingale


kaczka krzyżówka (Anas platyrhynchos) / mallard


łyska (Fulica atra) / coot


łabędź niemy (Cygnus olor) / mute swan


kokoszka wodna (Gallinula chloropus) / water moorhen


kureczka kasztanowata (Zapornia fusca) / ruddy-breasted crake


brodziec krwawodzioby (Tringa totanus) / redshank


grzywacz (Columba palumbus) / wood pigeon


strumieniówka (Locustella fluviatilis) / river warbler


pokrzewka cierniówka (Sylvia communis) / common whitethroat


pokląskwa (Saxicola ruberta) / whinchart


dzwoniec (Chloris chloris) / greenfinch


zięba zwyczajna (Fringilla coelebs) / common chaffinch


grubodziób zwyczajny (Coccothraustes coccothraustes) / hawfinch


wróbel mazurek (Passer montanus) / tree sparrow


kulczyk (Serinus serinus) / serin


makolągwa (Linaria cannabina) / common linnet

# PRZYLASEK RUSIECKI

wierzba biała (Salix alba) / white willow

wierzba krucha (Salix fragilis) / fragile willow

olsza czarna (Alnus glutinosa) / black alder

trzcina (Phragmites australis) / reed

pałka szerokolistna (Typhetum latifoliae) / broad truncheons

łabędź niemy (Cygnus olor) / mute swan

kaczka krzyżówka (Anas platyrhynchos) / mallard

czernica (Aytha fuligula) / tufted duck

głowienka (Aythya ferina) / common pochard

perkoz dwuczuby (Podiceps cirstatus) / great crested grebe

perkozek (Podiceps ruficollis) / little grebe

łyska (Fulica atra) / coot

kokoszka wodna (Gallinula chloropus) / water moorhen

rybitwa rzeczna (Sterna hirundo) / common tern

mewa śmieszka (Larus ridibundus) / black-headed gull

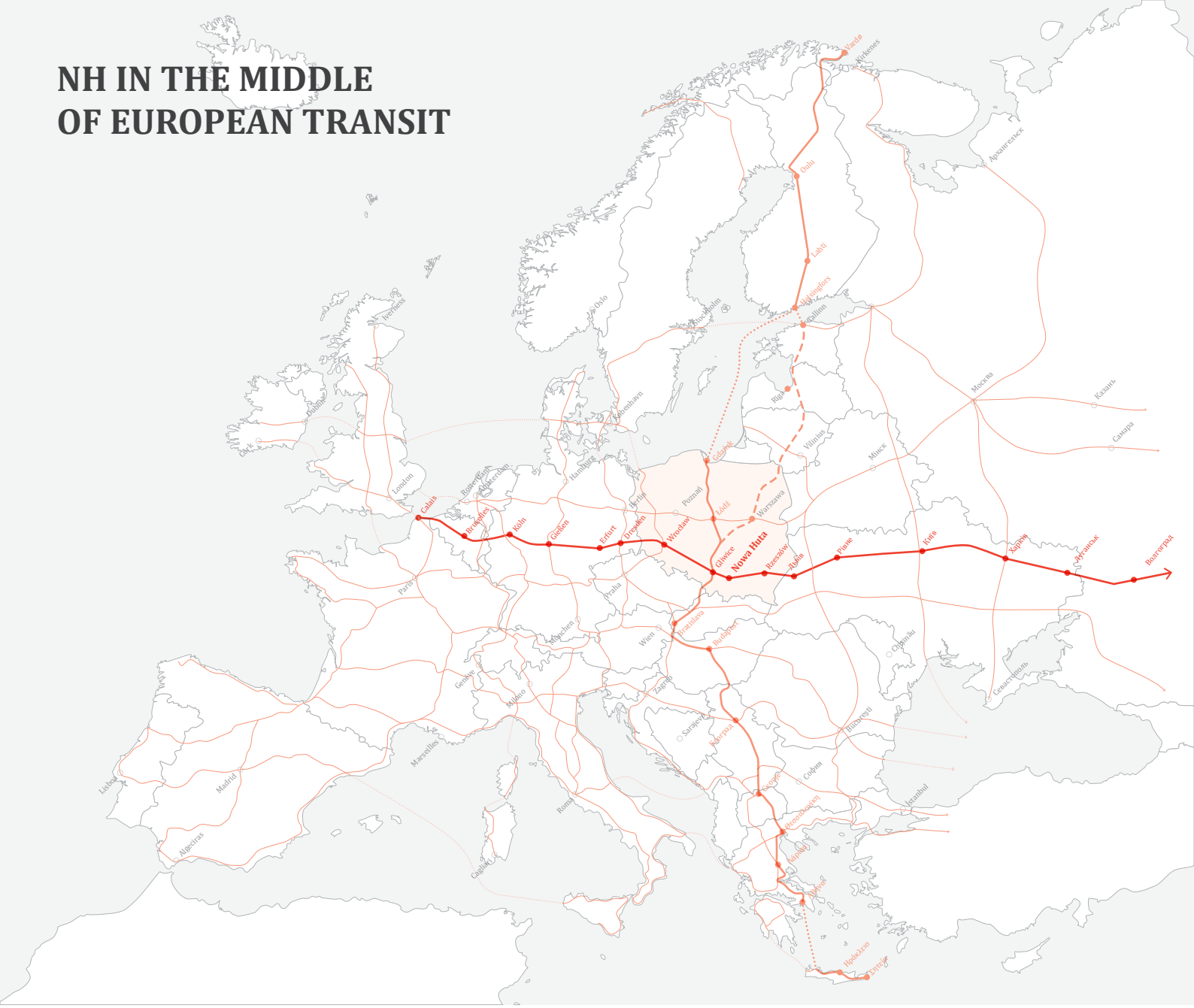
mewa pospolita (Larus canus) / common gull

remiz (Remiz pendulinus) / remiz

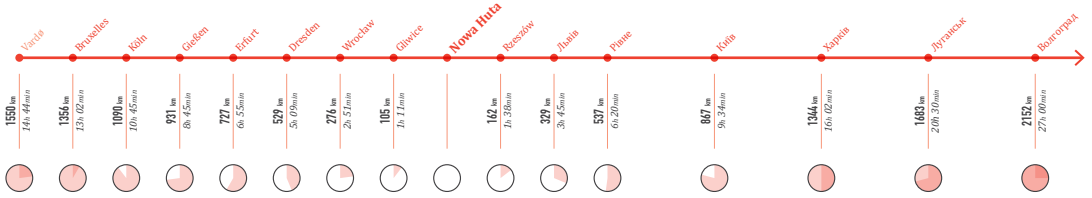
kormoran (Phalacrocorax carbo) / cormorant

# APPENDIX G: TRANSPORT AND TRANSIT

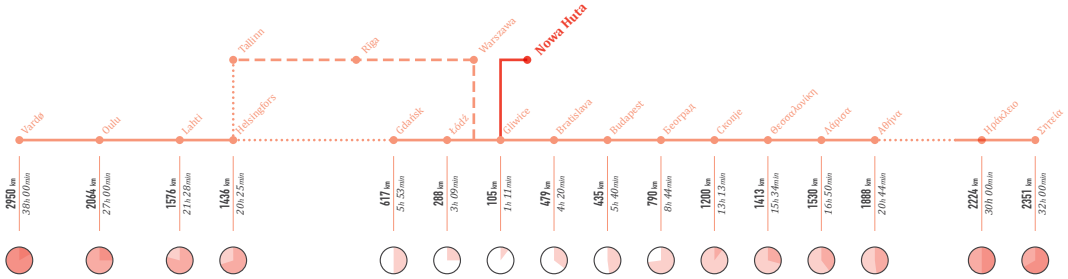
# NH IN THE MIDDLE OF EUROPEAN TRANSIT




European route E 40: the longest European Route (over 8,400 km) and E 75 (4,340 km) on the map of the European Route Map



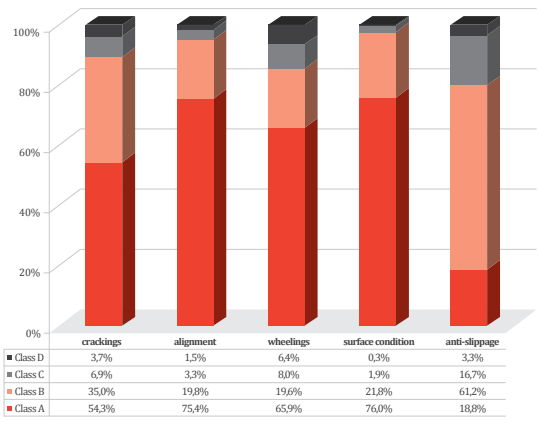

East-West European Route E 40




North- South European Route E 75

http://europe.aaroads.com/eroads/index.ht; mhttp://maps.google.com; retrieved on 31 january 2015

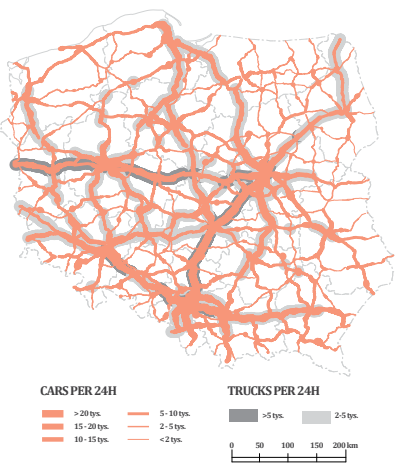
# POTENTIAL LOGISTICS HUB


| | crackings | alignment | wheelings | surface condition | anti-slippage |
|---|---|---|---|---|---|
| Class D | 3,7% | 1,5% | 6,4% | 0,3% | 3,3% |
| Class C | 6,9% | 3,3% | 8,0% | 1,9% | 16,7% |
| Class B | 35,0% | 19,8% | 19,6% | 21,8% | 61,2% |
| Class A | 54,3% | 75,4% | 65,9% | 76,0% | 18,8% |

Technical condition of national roads in Poland

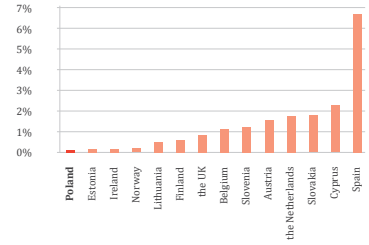

Technical condition of national roadsper voivodship



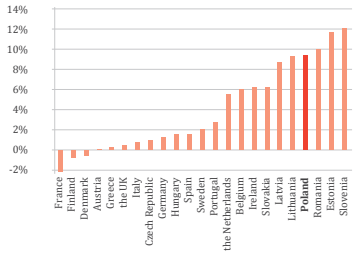

Traffic flow on the national roads

http://stat.gov.pl; http://eurostat.org; http://eurometer.eu; http://maps.google.com; http://gddkia.gov.pl; retrieved on 1 february 2015; P.Rosik (IGiPZ PAN)

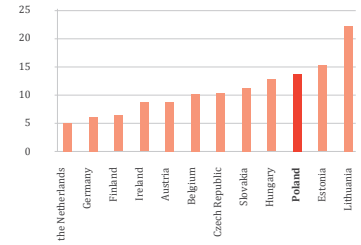
# ROAD TRANSPORT IN PL: A LOT TO CHANGE



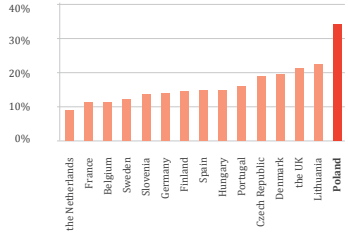

Share of highways in national road network



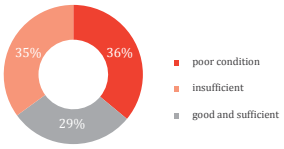

Dynamic of road transport y/y between 2002-2007



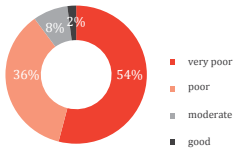

Road accidents victims on 100,000 inhabitants



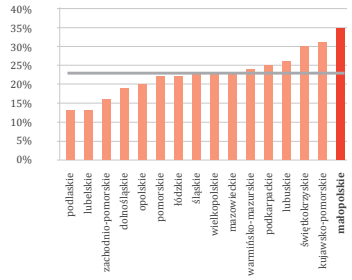

Road accidents death
in the share of overall road accidents



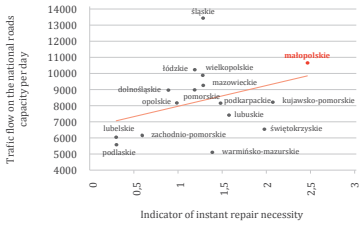

Technical condition of county public roads



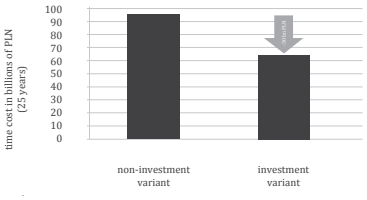

Road infrastructure in the assessment
of foreign investors



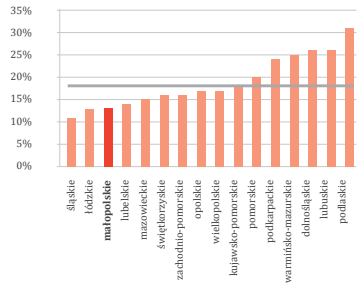

Percentage of national roads that need instant repairs
per voivodship



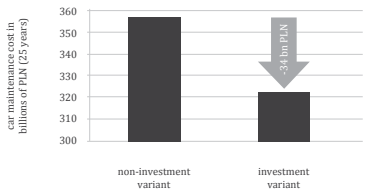

Relation: national roads that need instant repairs
to the trafic flow



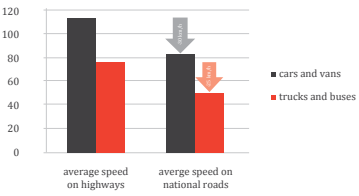

Cost of time of the national road users



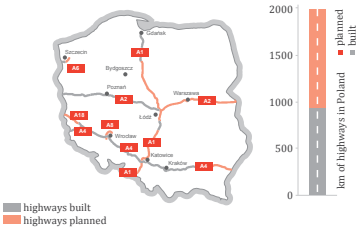

Trafic flow per voivodship between 2000-2005



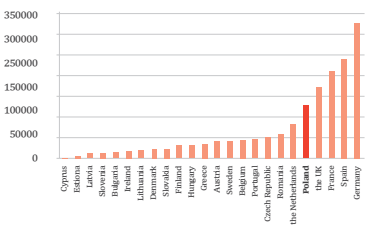

Car maintenance cost in billions of PLN



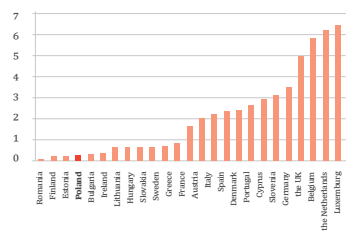

Average speed on the national roads and highways




Highways built and planned



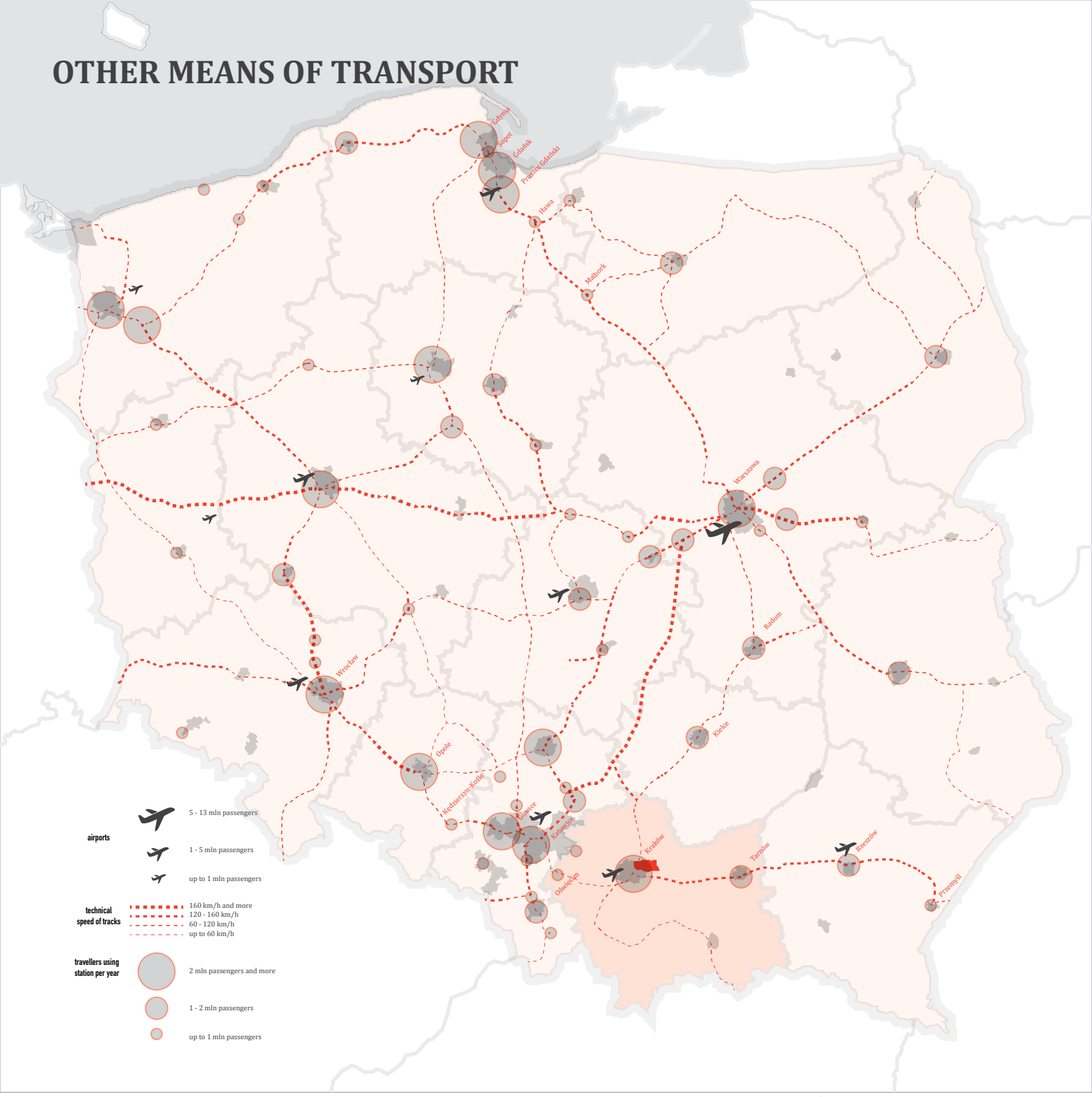

Transported goods. Million tonnes per km of road

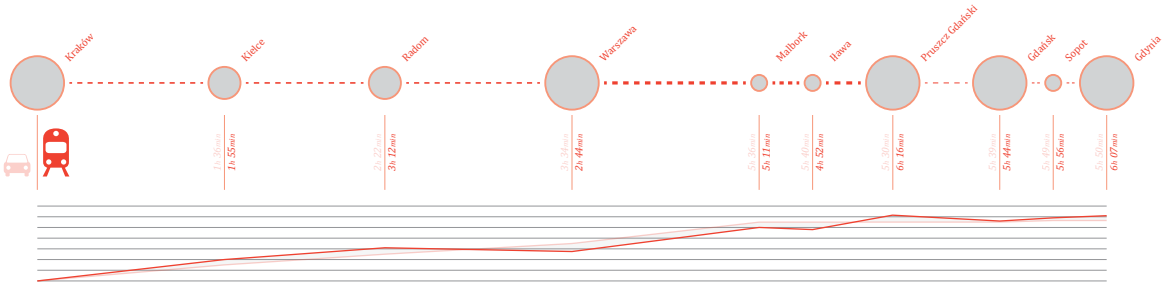


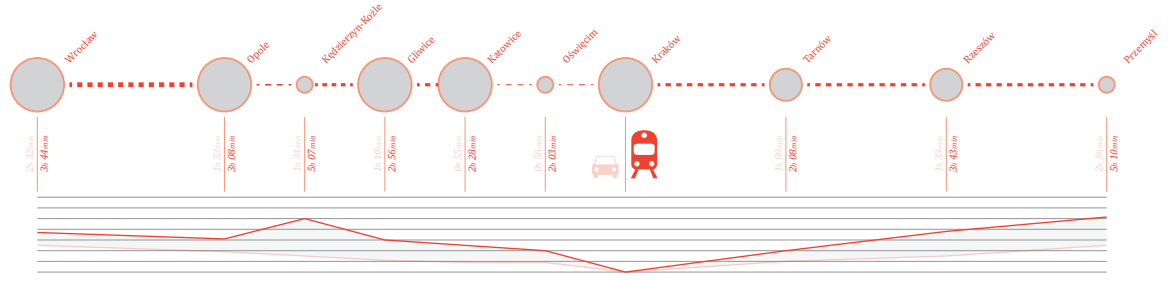

Density of motorways in EU countries (km / 100 km$^2$)

http://stat.gov.pl; http://eurostat.org; http://eurometer.eu; http://maps.google.com; http://gddkia.gov.pl; retrieved on 1 february 2015

# OTHER MEANS OF TRANSPORT



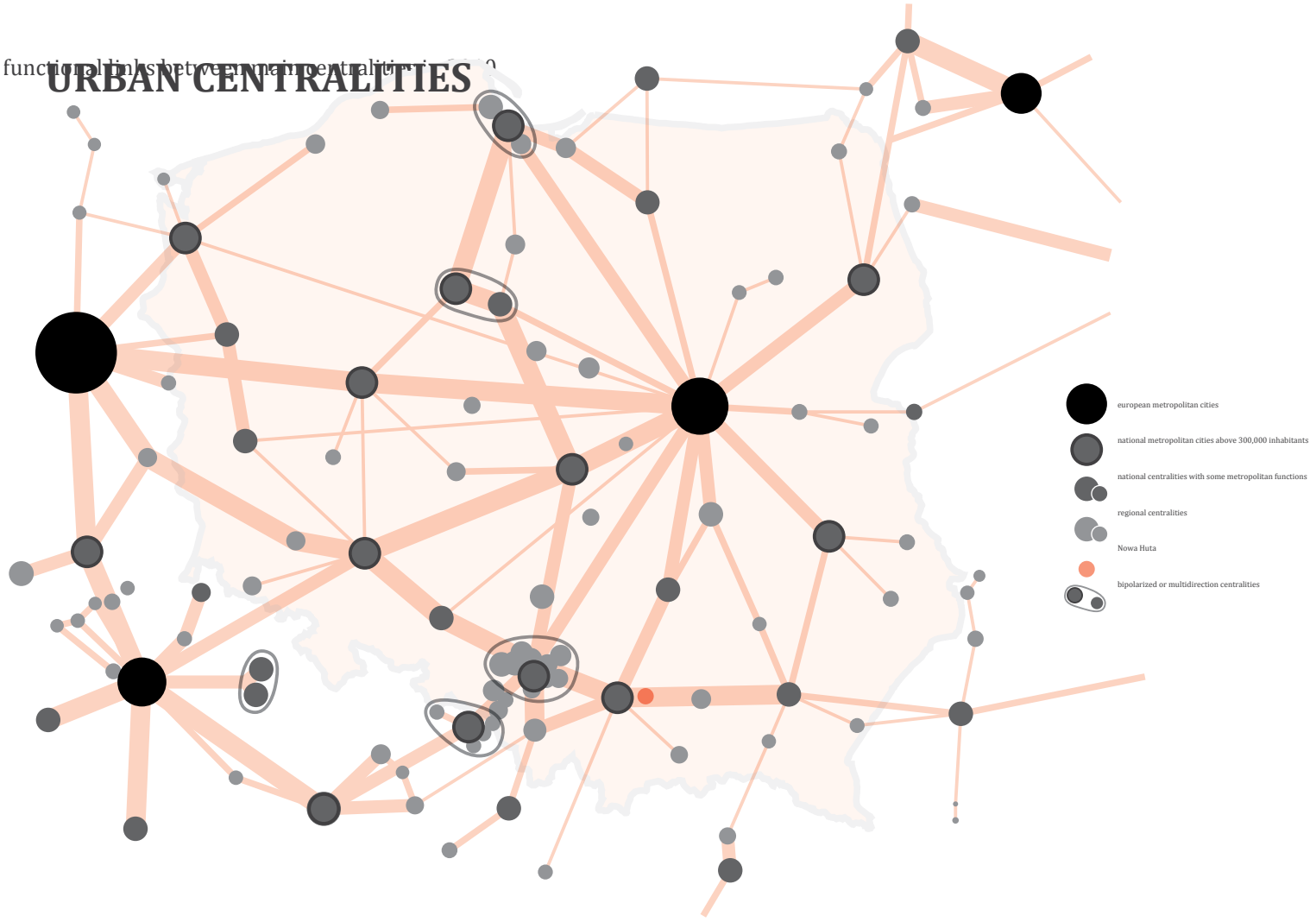



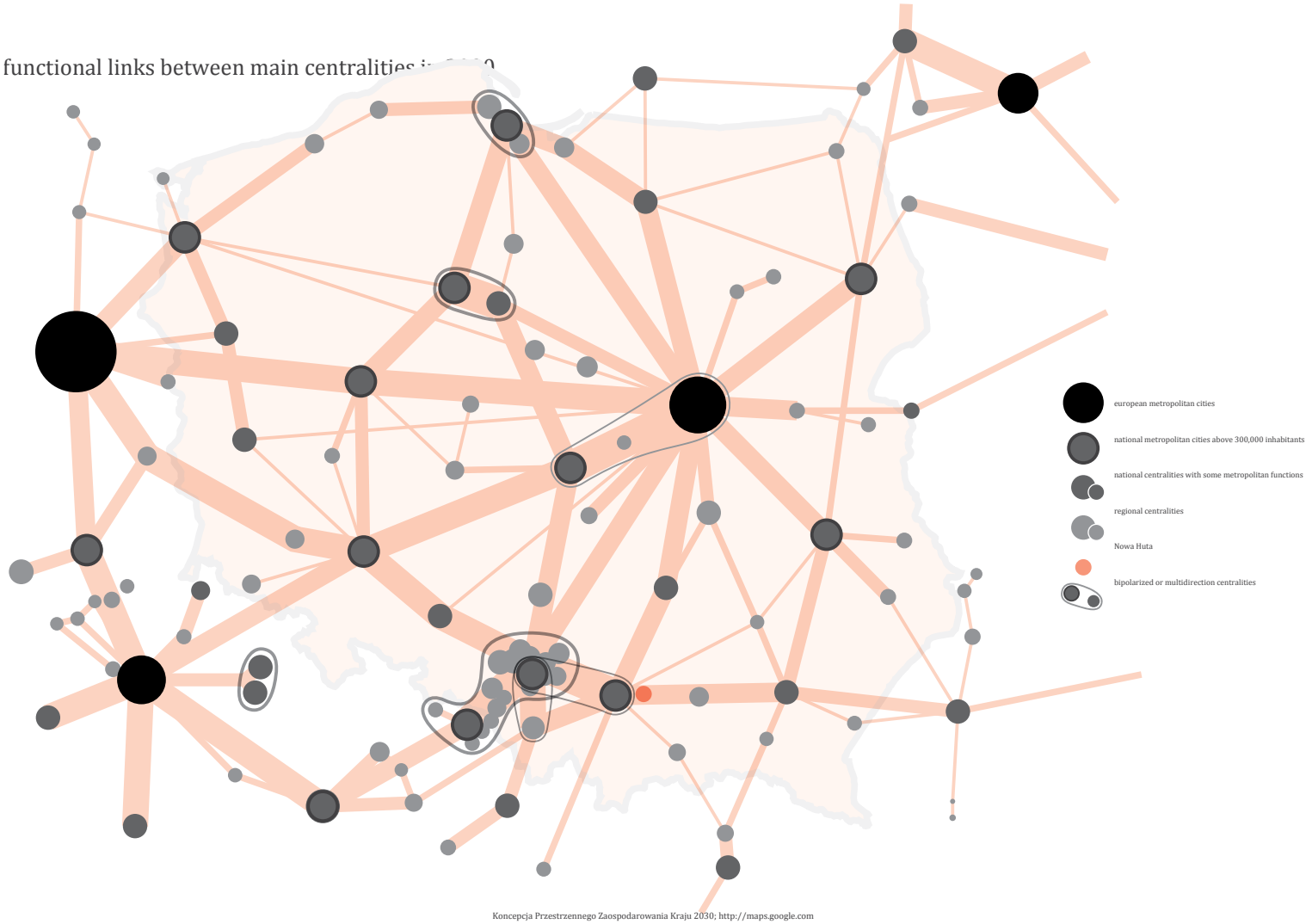

Koncepcja Przestrzennego Zaospodarowania Kraju 2030; http://maps.google.com

# URBAN CENTRALITIES

functional links between main centralities in 2030

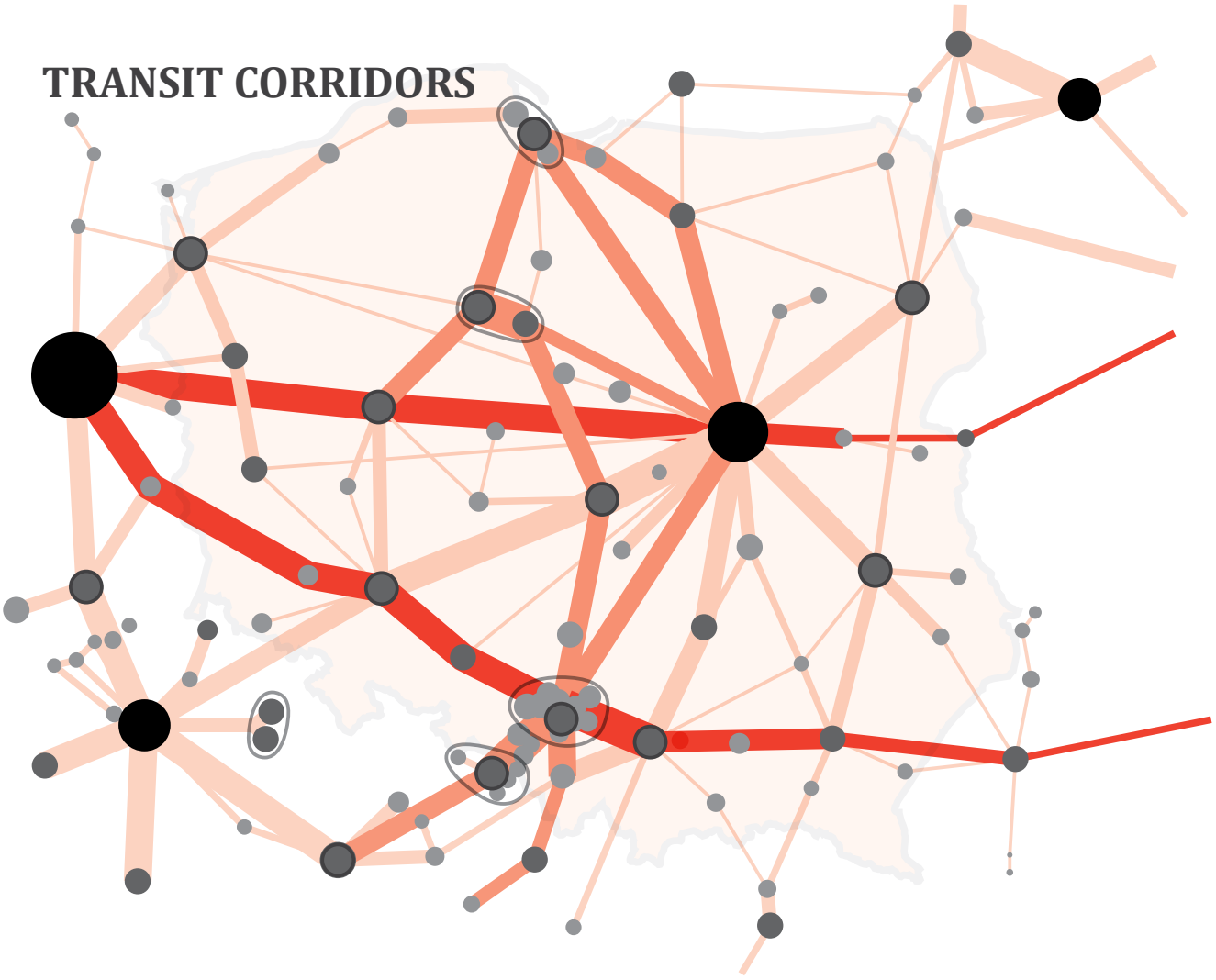



functional links between main centralities in 2030




Koncepcja Przestrzennego Zaospodarowania Kraju 2030; http://maps.google.com

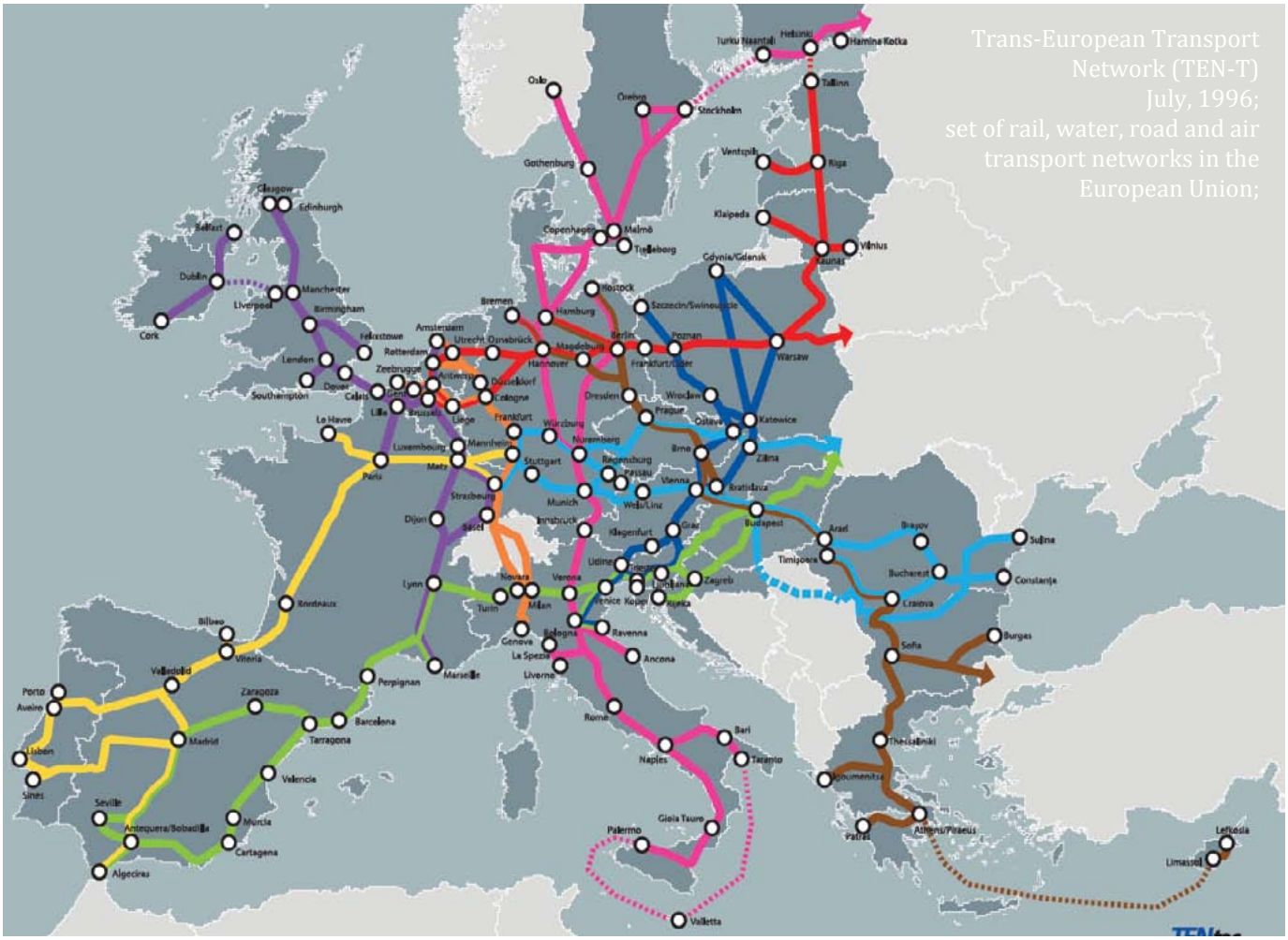
# TRANSIT CORRIDORS



Pan-European Transport Corridors,
March, 1994;
Map for major infrastructural investment
between 1995-2010 to connect former eastern Europe
Soviet block to the western Europe network


http://en.wikipedia.org/wiki/Pan-European_corridors

# TRANS-EUROPEAN TRANSPORT

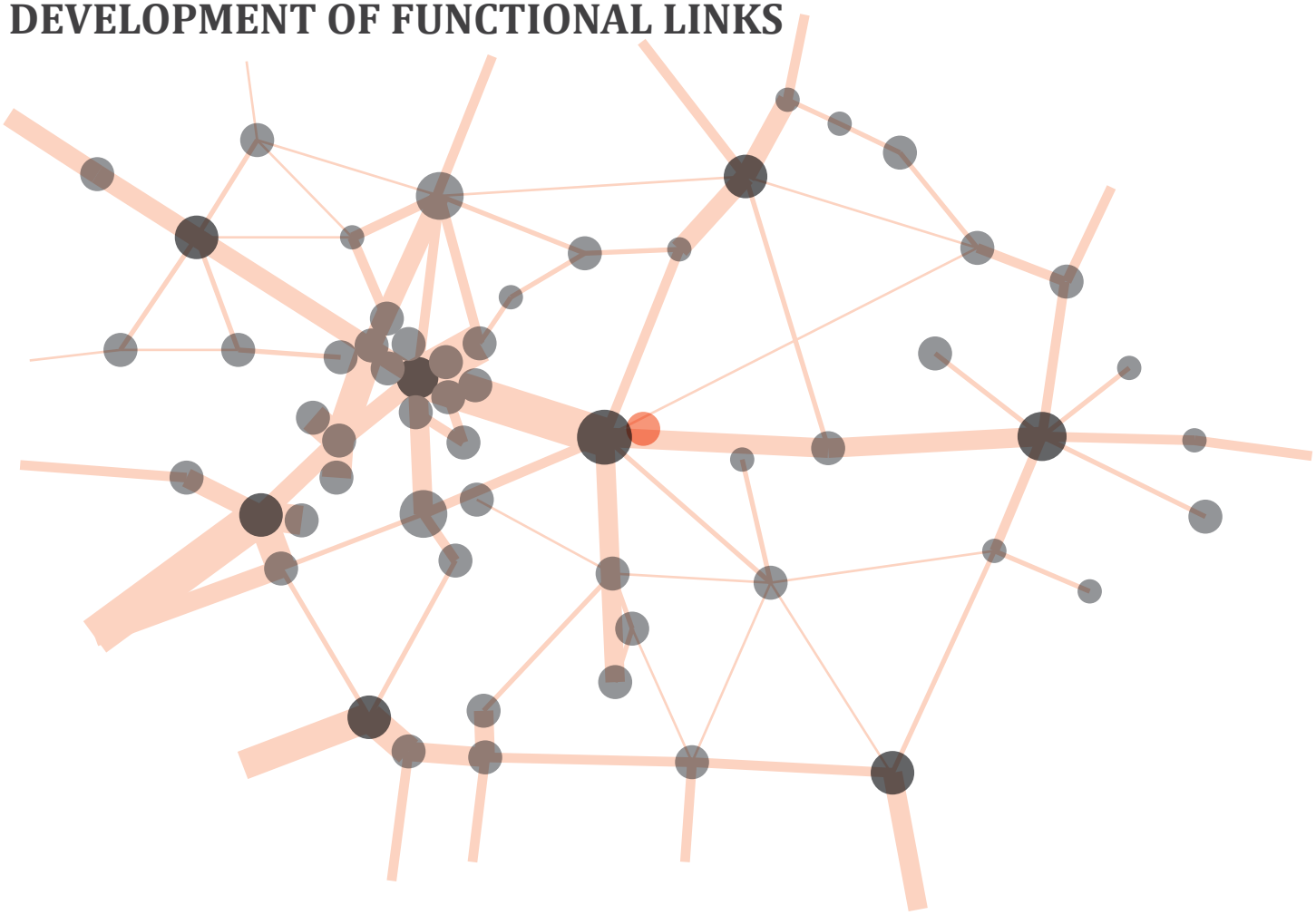


# VIA CARPATHIA (NOT REALIZED)

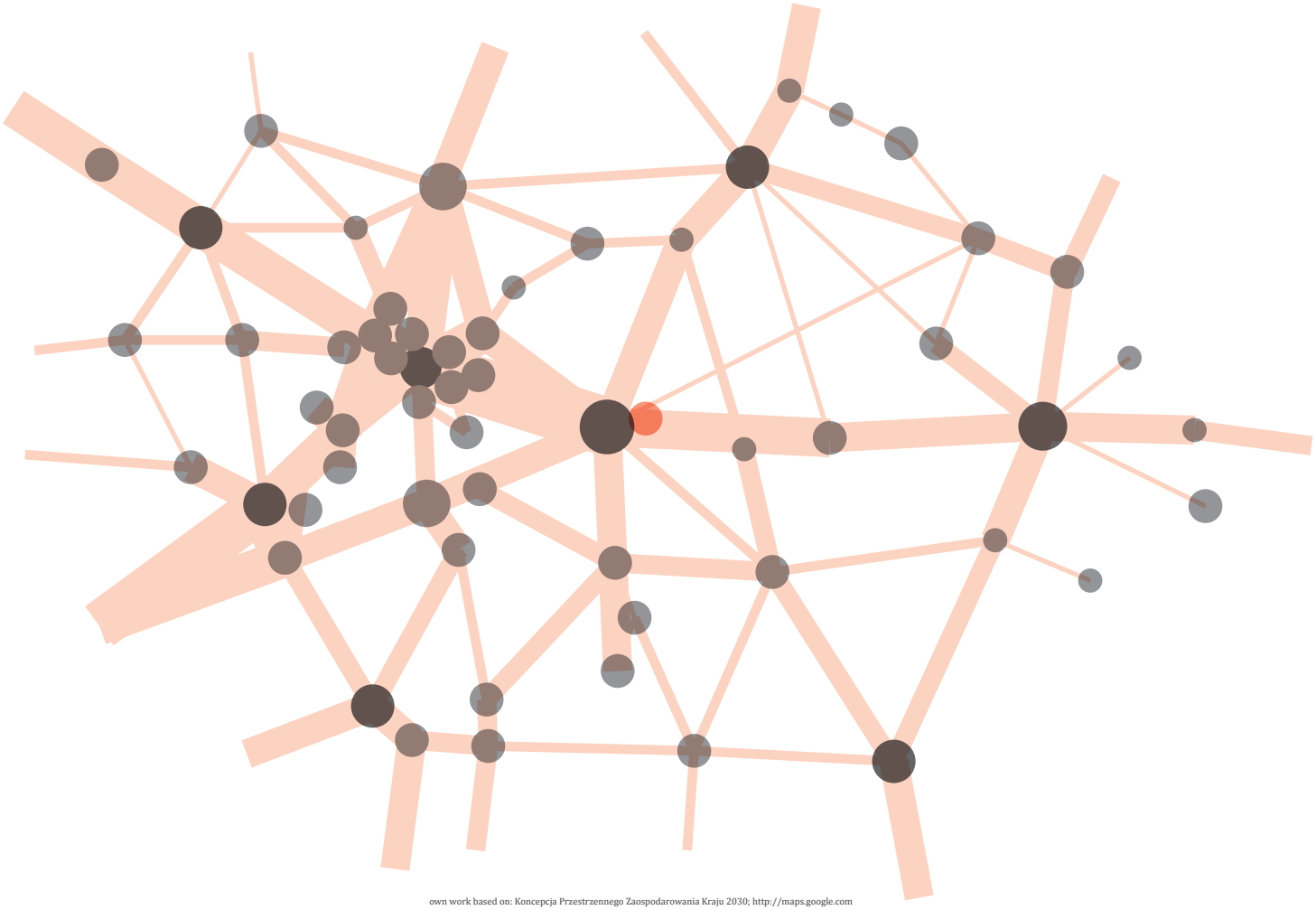
VIA Carpatia;
October, 2006;
Project of high speed road connection linking the easternmost part of the European Union

functional links between main centralities in 2010: zoom in

# DEVELOPMENT OF FUNCTIONAL LINKS

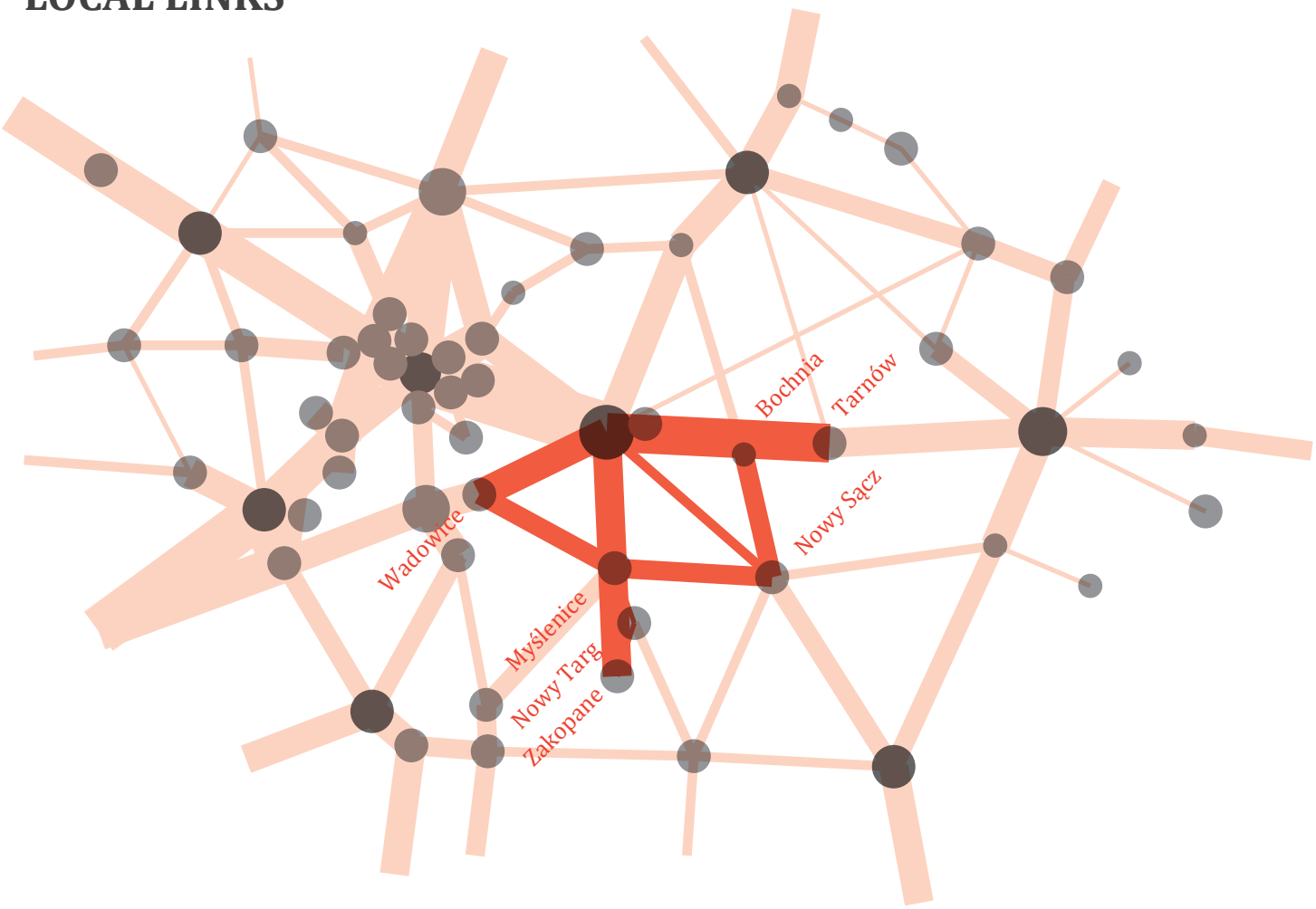


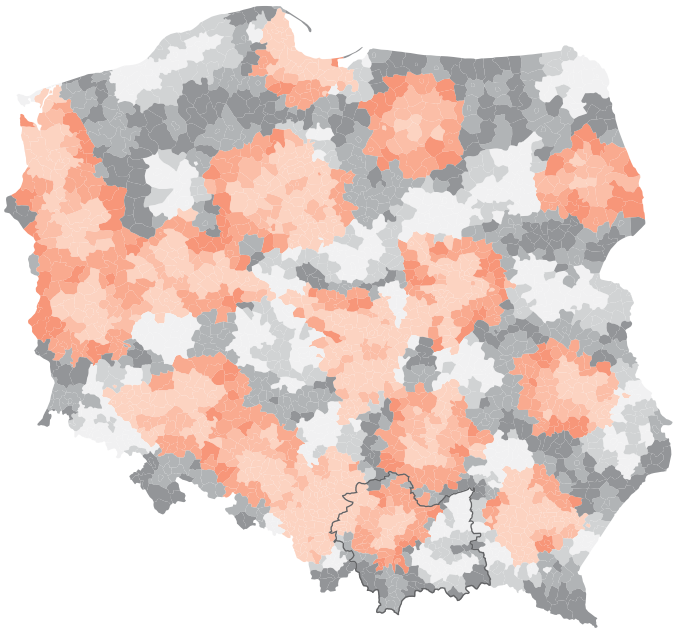
functional links between main centralities in 2030: zoom in



own work based on: Koncepcja Przestrzennego Zaospodarowania Kraju 2030; http://maps.google.com

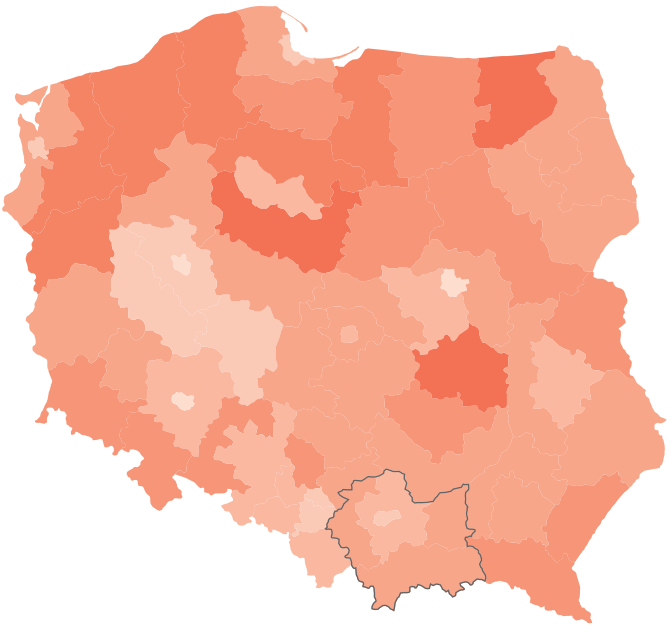
# LOCAL LINKS



Accessibility to the closest centralities (Voivodship capitals, Magistrates and Counties)

| | | | |
|---|---|---|---|
| V < 60 min<br>G < 40 min<br>P < 20 min | V < 60 min<br>G < 40 min<br>P > 20 min | V > 60 min<br>G < 40 min<br>P < 20 min | V > 60 min<br>G < 40 min<br>P > 20 min |
| V < 60 min<br>G > 40 min<br>P < 20 min | V < 60 min<br>G > 40 min<br>P > 20 min | V > 60 min<br>G > 40 min<br>P < 20 min | V > 60 min<br>G > 40 min<br>P > 20 min |

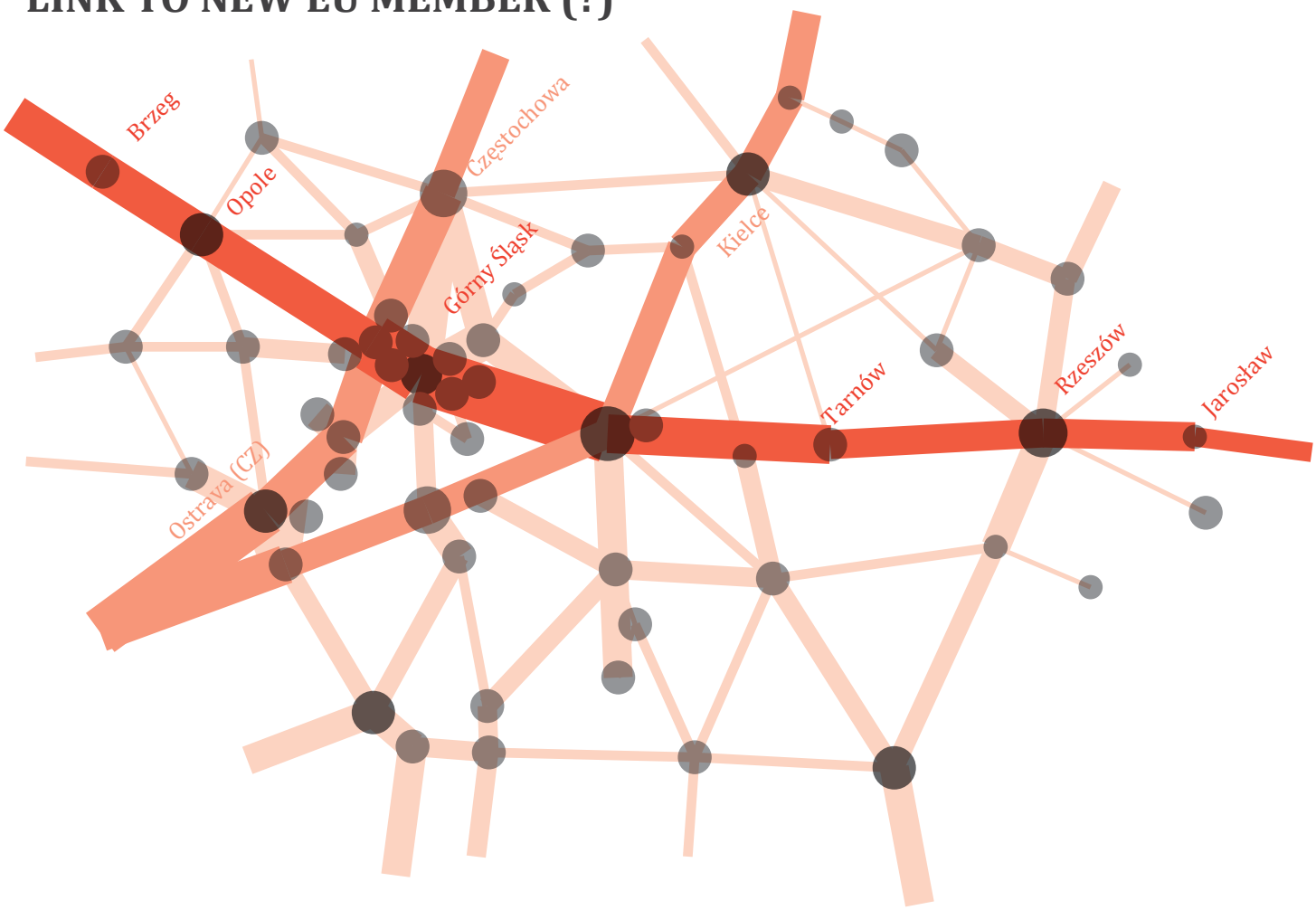


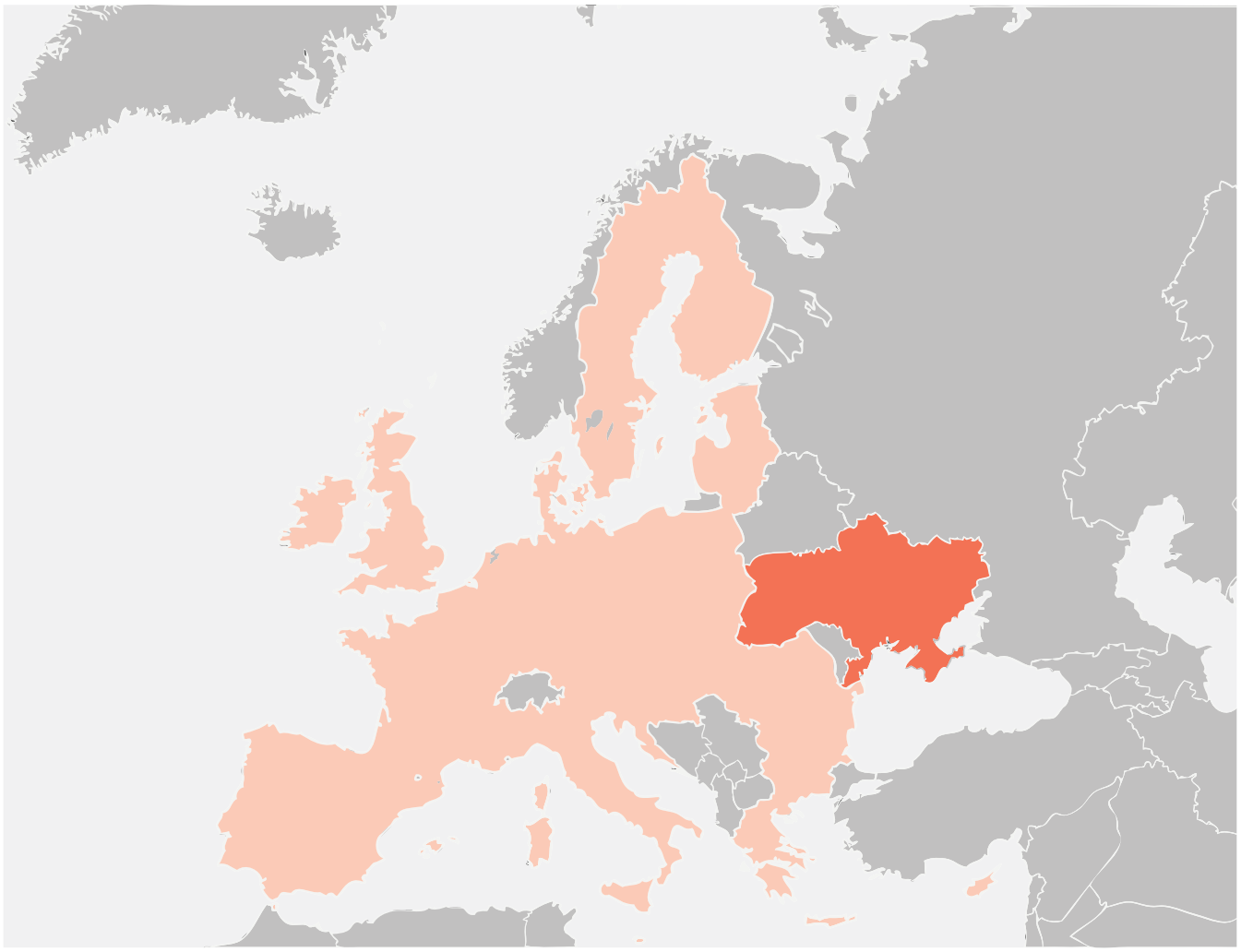
Registered Unemployment in % (october 2014)

0 5 8 11 14 17 20 23 26 29 32

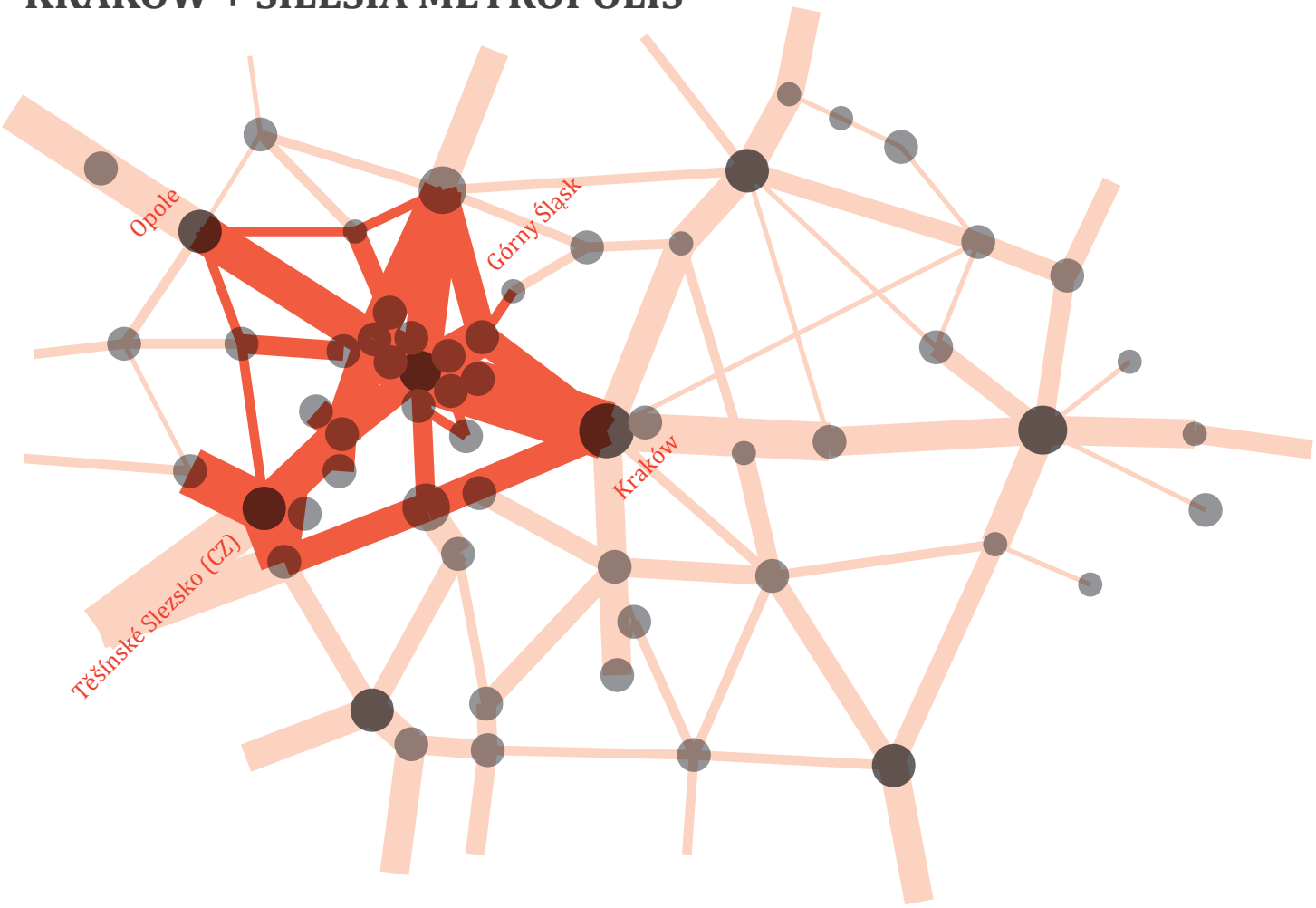
own work based on: stat.gov.pl; Koncepcja Przestrzennego Zaospodarowania Kraju 2030; Instytut Geografii i Przestrzennego Zagospodarowania PAN pod kierunkiem P. Śleszyńskiego dla Ministerstwa Rozwoju Regionalnego;

# LINK TO NEW EU MEMBER (?)



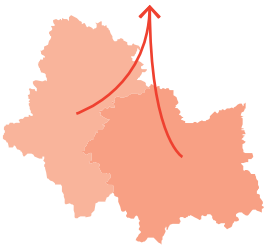



# KRAKÓW + SILESIA METROPOLIS



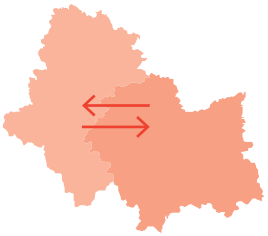

Strategy for the Development of South Poland in the are of Lesser Poland and Silesia until 2020

SPATIAL INTEGRATION OF THE VOIVODSHIPS
METROPOLITAN COOPERATION
ENHANCING COMPETITIVNESS
HUMAN CAPITAL INVESTMENT
PROMOTION OF THE SOUTHERN POLAND



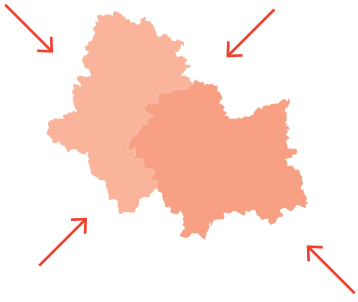
**Europol**

concentration of innovation and creativity, trendsetting development paths, becoming one of the most dynamic european regions



**Partnership Cooperation**

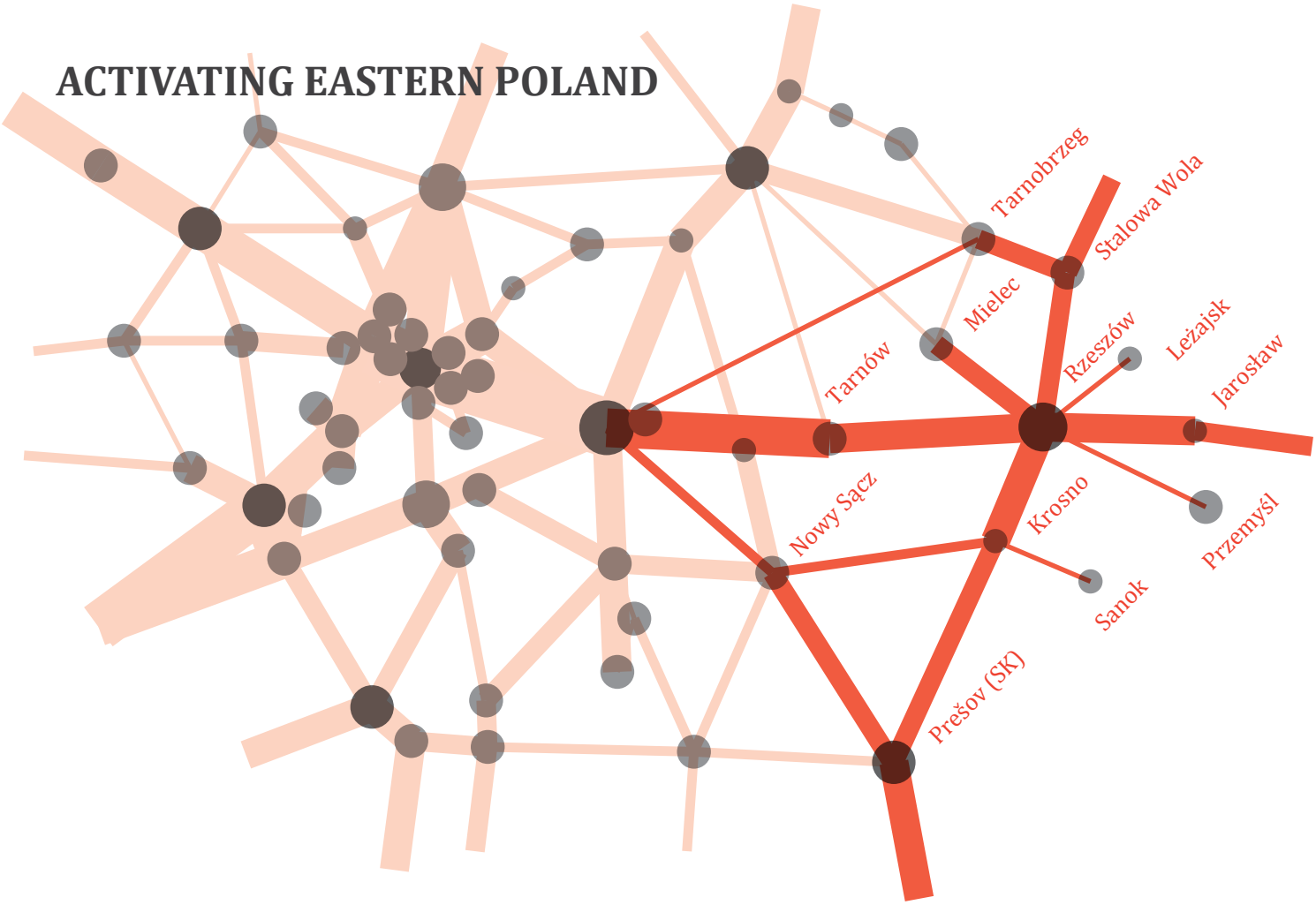
combining development programs and realization of common projects

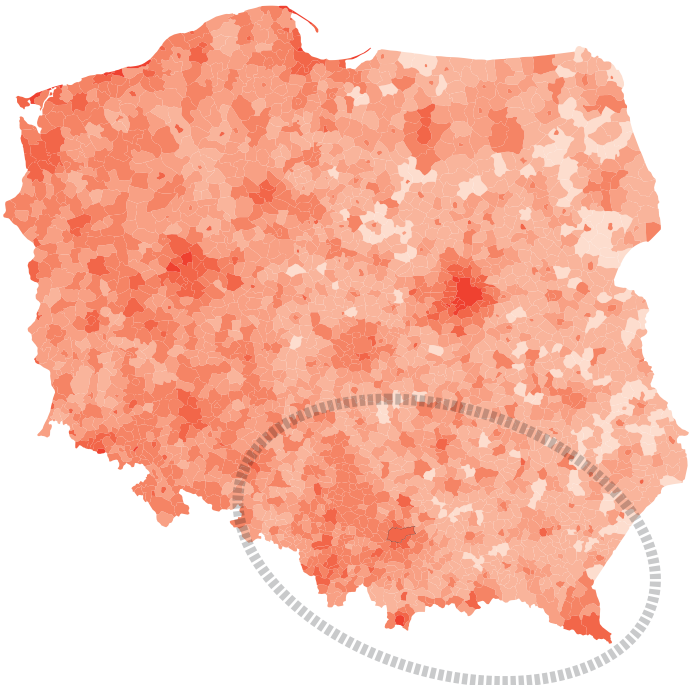


**Leader Position**

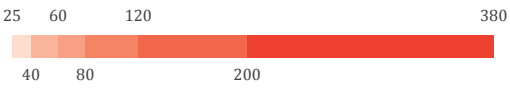
leadership that is a magnet for people and development

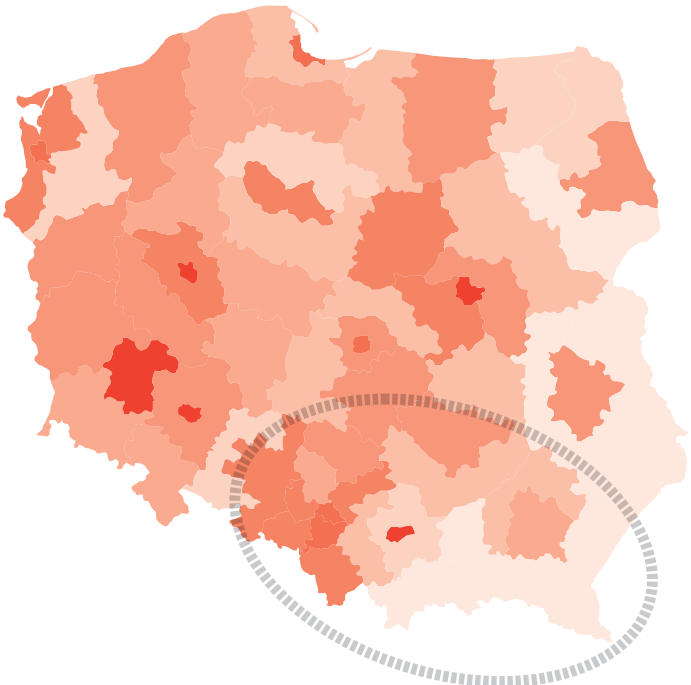
# ACTIVATING EASTERN POLAND



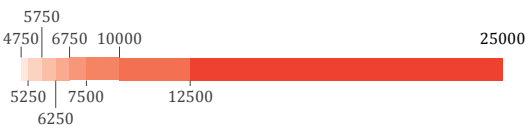



Economic Entities per 1000 inhabitants



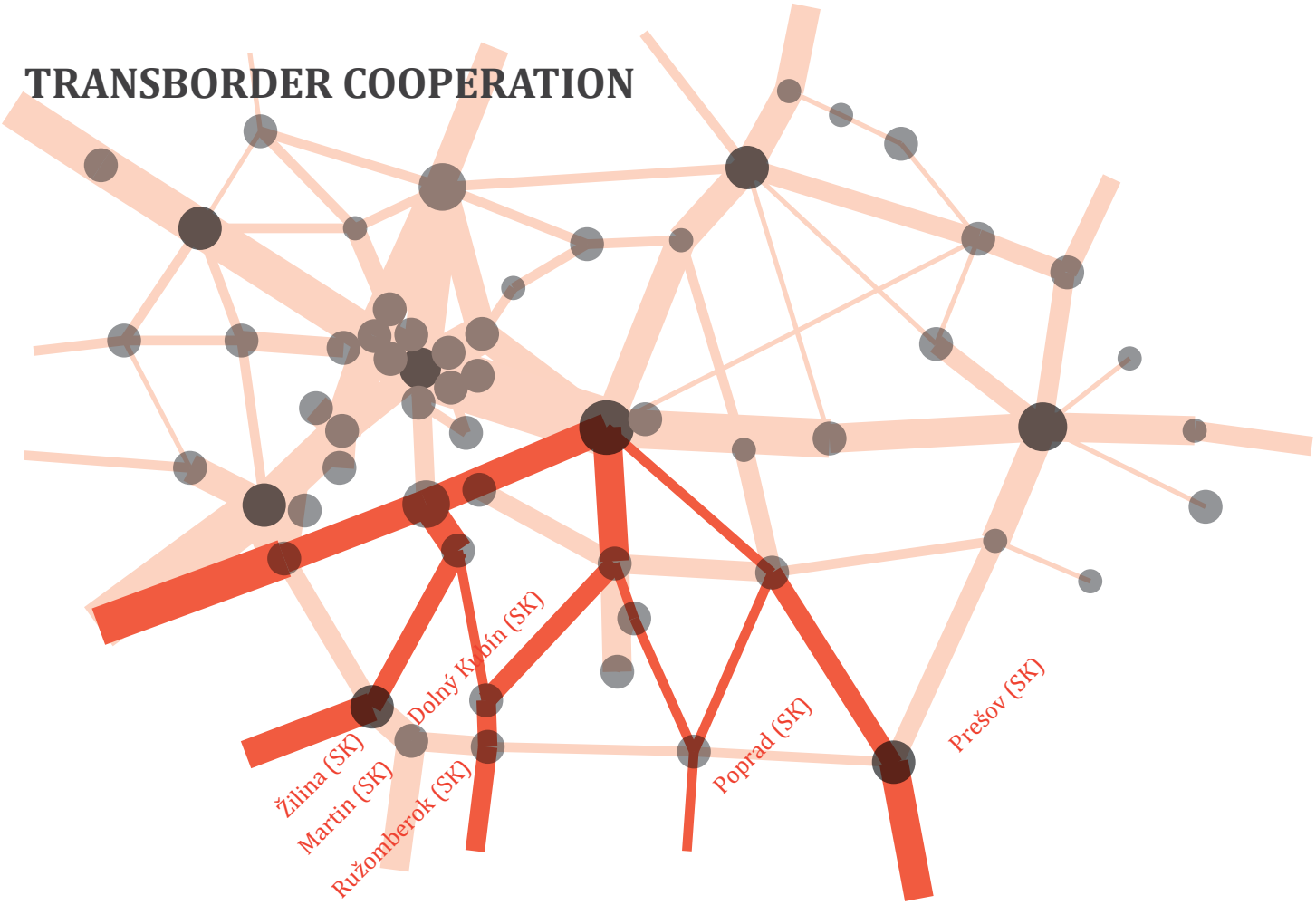



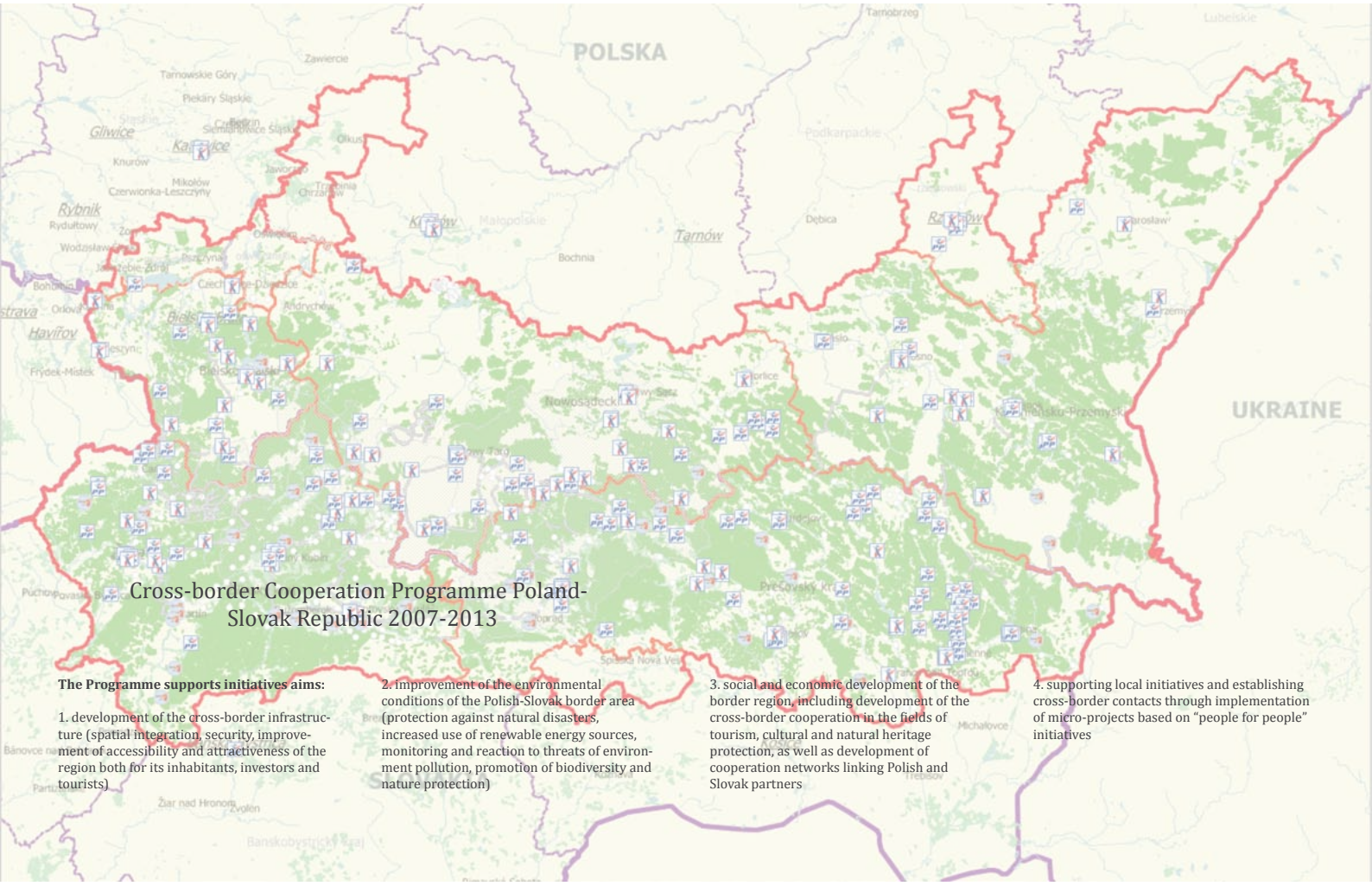
National Gross Product per inhabitant (EUR) (2008)




Koncepcja Przestrzennego Zaospodarowania Kraju 2030; Instytut Geografii i Przestrzennego Zagospodarowania PAN pod kierunkiem P. Śleszyńskiego dla Ministerstwa Rozwoju Regionalnego

# TRANSBORDER COOPERATION




## Cross-border Cooperation Programme Poland-Slovak Republic 2007-2013

**The Programme supports initiatives aims:**

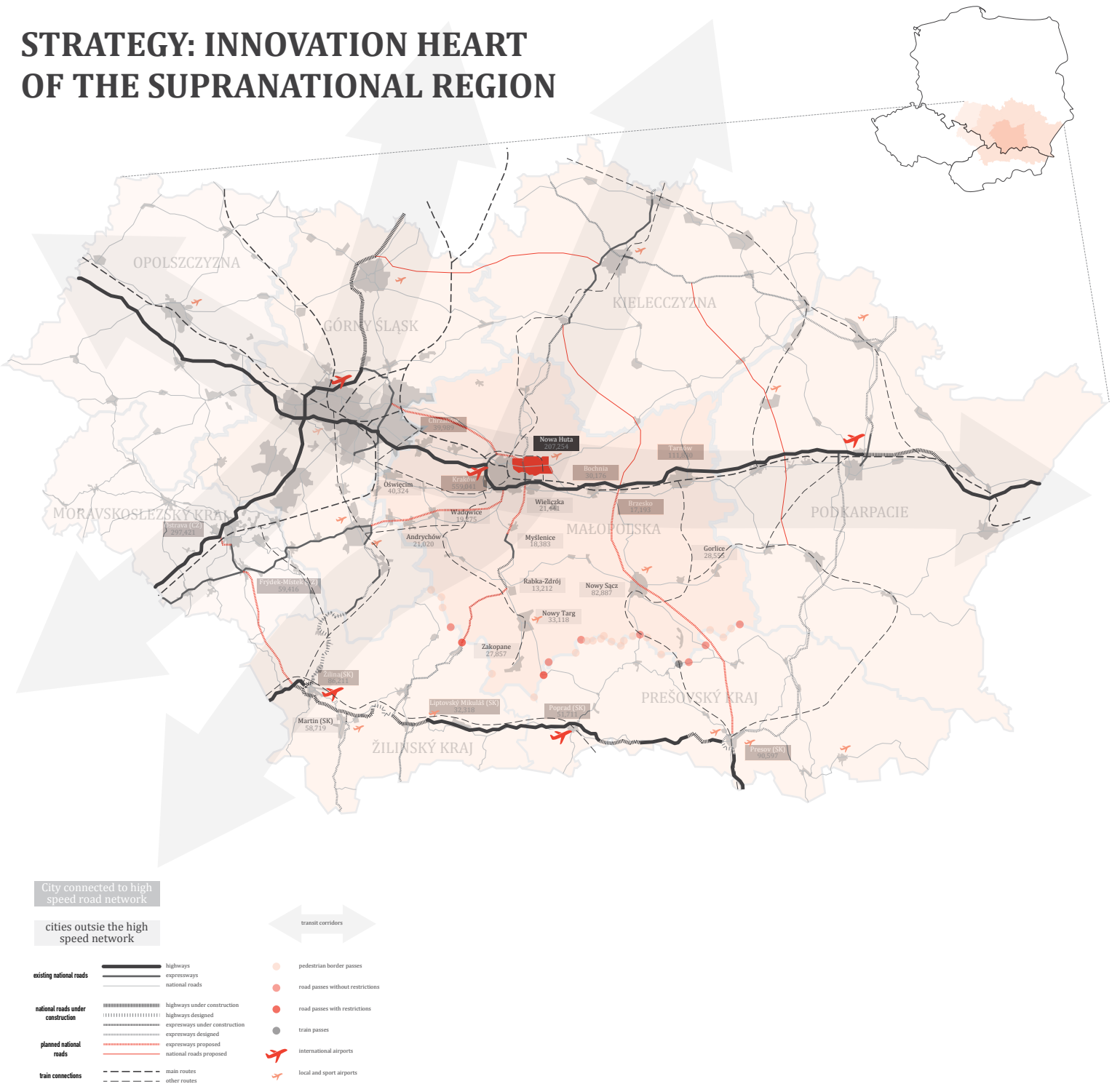
1. development of the cross-border infrastructure (spatial integration, security, improvement of accessibility and attractiveness of the region both for its inhabitants, investors and tourists)

2. improvement of the environmental conditions of the Polish-Slovak border area (protection against natural disasters, increased use of renewable energy sources, monitoring and reaction to threats of environment pollution, promotion of biodiversity and nature protection)

3. social and economic development of the border region, including development of the cross-border cooperation in the fields of tourism, cultural and natural heritage protection, as well as development of cooperation networks linking Polish and Slovak partners

4. supporting local initiatives and establishing cross-border contacts through implementation of micro-projects based on "people for people" initiatives

# STRATEGY: INNOVATION HEART OF THE SUPRANATIONAL REGION




CONCLUSIONS FROM MACROSCALE PLANNING:

- large investment in transport infrastructure needed (bypass around Kraków will lower transit through the city and especially through Nowa Huta, links to Lesser Poland underemployed cities will create new opportunities for migrating people, investment in links to Silesia and Slovakia will pay off in cultural, academic, touristic and economical way)
- road infrastructure needs instant repair - but focus should be on strategical connections
- money invested in better infrastructure will eventually comes back to local entrepreneurs who will save their time of travelling - various funds are needed
- if railroad infrastructure is not developed, it will lose competition with road transport
- east-west connections are almost ready, time for activating south-north development between former eastern block countries
- opportunity for Lesser Poland and Silesia to become a center of a cross-border european region that will become polycentric region such as Rhine Industrial Region or Randstad

# APPENDIX H: DATA PROJECTION

# SHWEEB

## NOWA HUTA

| | Population | Cars in NH (1 per 2 citizens in 2015) | Cars recycled ( 0,00896 of car recycled per citizen in PL) | shweeb from cars | shweeb network length (m) |
|---|---|---|---|---|---|
| **2015** | 206012 | 103006 | 1846 | 10540 | 10540 |
| **2016** | 235878 | 101160 | 1813 | 10351 | 20891 |
| **2017** | 265743 | 99347 | 1780 | 10166 | 31056 |
| **2018** | 295609 | 97567 | 1748 | 9983 | 41040 |
| **2019** | 325475 | 95819 | 1717 | 9804 | 50844 |
| **2020** | 202304 | 94102 | 1686 | 9629 | 60473 |
| **2021** | 236091 | 92415 | 1656 | 9456 | 69929 |
| **2022** | 269878 | 90759 | 1626 | 9287 | 79216 |
| **2023** | 303665 | 89133 | 1597 | 9120 | 88336 |
| **2024** | 337451 | 87536 | 1569 | 8957 | 97293 |
| **2025** | 197853 | 85967 | 1541 | 8796 | 106090 |
| **2026** | 234104 | 84426 | 1513 | 8639 | 114729 |
| **2027** | 270354 | 82913 | 1486 | 8484 | 123212 |
| **2028** | 306605 | 81428 | 1459 | 8332 | 131544 |
| **2029** | 342855 | 79968 | 1433 | 8183 | 139727 |
| **2030** | 192511 | 78535 | 1407 | 8036 | 147763 |
| **2031** | 229028 | 77128 | 1382 | 7892 | 155655 |
| **2032** | 265544 | 75746 | 1357 | 7751 | 163406 |
| **2033** | 302061 | 74389 | 1333 | 7612 | 171017 |
| **2034** | 338578 | 73056 | 1309 | 7475 | 178493 |
| **2035** | 186543 | 71746 | 1286 | 7341 | 185834 |
| **2036** | 222799 | 70461 | 1263 | 7210 | 193044 |
| **2037** | 259056 | 69198 | 1240 | 7081 | 200124 |
| **2038** | 295312 | 67958 | 1218 | 6954 | 207078 |
| **2039** | 331569 | 66740 | 1196 | 6829 | 213907 |
| **2040** | 180201 | 65544 | 1175 | 6707 | 220614 |
| **2041** | -41366 | 64370 | 1154 | 6587 | 227200 |
| **2042** | -262933 | 63216 | 1133 | 6468 | 233669 |
| **2043** | -484500 | 62083 | 1113 | 6353 | 240021 |
| **2044** | -706067 | 60971 | 1093 | 6239 | 246260 |
| **2045** | 173894 | 59878 | 1073 | 6127 | 252387 |
| **2046** | 173879 | 58805 | 1054 | 6017 | 258404 |
| **2047** | 173865 | 57751 | 1035 | 5909 | 264313 |
| **2048** | 173850 | 56716 | 1016 | 5803 | 270117 |
| **2049** | 173835 | 55700 | 998 | 5699 | 275816 |
| **2050** | 167634 | 54702 | 980 | 5597 | 281413 |
| | | 1 car per 3 citizens<br>twice less cars<br>twice less infrastructure | | | total length of asphalt roads in NH |

## CENTRUM A

| | Population | Cars overall | Cars recycled | shweeb from cars | shweeb network length (m) |
|---|---|---|---|---|---|
| **2015** | 1800 | 900 | 16 | 92 | 92 |
| **2016** | 1800 | 884 | 16 | 90 | 182 |
| **2017** | 1800 | 868 | 16 | 89 | 271 |
| **2018** | 1800 | 852 | 15 | 87 | 358 |
| **2019** | 1800 | 837 | 15 | 86 | 444 |
| **2020** | 1800 | 822 | 15 | 84 | 528 |
| **2021** | 1800 | 807 | 14 | 83 | 611 |
| **2022** | 1800 | 793 | 14 | 81 | 692 |
| **2023** | 1800 | 779 | 14 | 80 | 772 |
| **2024** | 1800 | 765 | 14 | 78 | 850 |
| **2025** | 1800 | 751 | 13 | 77 | 927 |
| **2026** | 1800 | 738 | 13 | 75 | 1002 |
| **2027** | 1800 | 724 | 13 | 74 | 1076 |
| **2028** | 1800 | 711 | 13 | 73 | 1149 |
| **2029** | 1800 | 699 | 13 | 71 | 1221 |
| **2030** | 1800 | 686 | 12 | 70 | 1291 |
| **2031** | 1800 | 674 | 12 | 69 | 1360 |
| **2032** | 1800 | 662 | 12 | 68 | 1428 |
| **2033** | 1800 | 650 | 12 | 67 | 1494 |
| **2034** | 1800 | 638 | 11 | 65 | 1559 |
| **2035** | 1800 | 627 | 11 | 64 | 1624 |
| **2036** | 1800 | 616 | 11 | 63 | 1687 |
| **2037** | 1800 | 605 | 11 | 62 | 1748 |
| **2038** | 1800 | 594 | 11 | 61 | 1809 |
| **2039** | 1800 | 583 | 10 | 60 | 1869 |
| **2040** | 1800 | 573 | 10 | 59 | 1927 |
| **2041** | 1800 | 562 | 10 | 58 | 1985 |
| **2042** | 1800 | 552 | 10 | 57 | 2042 |
| **2043** | 1800 | 542 | 10 | 56 | 2097 |
| **2044** | 1800 | 533 | 10 | 55 | 2152 |
| **2045** | 1800 | 523 | 9 | 54 | 2205 |
| **2046** | 1800 | 514 | 9 | 53 | 2258 |
| **2047** | 1800 | 505 | 9 | 52 | 2309 |
| **2048** | 1800 | 496 | 9 | 51 | 2360 |
| **2049** | 1800 | 487 | 9 | 50 | 2410 |
| **2050** | 1800 | 478 | 9 | 49 | 2459 |
| | | | | | double circuit of urban unit in NH |

## WILLOW PRODUCTION

| | NOWA HUTA | | | | |
|---|---|---|---|---|---|
| | **Fallowlands and vacant area (ha)** | **Energetic Willow** | **Craft Willow** | **Energy from Willow** | **Revenue** |
| **2015** | 500 | 500 | 0 | 56500 | 225 000 € |
| **2016** | 600 | 600 | 0 | 67800 | 270 000 € |
| **2017** | 700 | 700 | 0 | 79100 | 315 000 € |
| **2018** | 800 | 800 | 0 | 90400 | 360 000 € |
| **2019** | 900 | 900 | 0 | 101700 | 405 000 € |
| **2020** | 1000 | 900 | 50 | 113000 | 465 750 € |
| **2021** | 1100 | 990 | 55 | 124300 | 512 325 € |
| **2022** | 1200 | 1080 | 60 | 135600 | 558 900 € |
| **2023** | 1300 | 1170 | 65 | 146900 | 605 475 € |
| **2024** | 1400 | 1260 | 70 | 158200 | 652 050 € |
| **2025** | 1500 | 1350 | 75 | 169500 | 789 750 € |
| **2026** | 1600 | 1440 | 80 | 180800 | 842 400 € |
| **2027** | 1700 | 1530 | 85 | 192100 | 895 050 € |
| **2028** | 1800 | 1620 | 90 | 203400 | 947 700 € |
| **2029** | 1900 | 1710 | 95 | 214700 | 1 000 350 € |
| **2030** | 2000 | 1800 | 100 | 226000 | 1 174 500 € |
| **2031** | 1950 | 1560 | 117 | 220350 | 1 017 900 € |
| **2032** | 1900 | 1520 | 114 | 214700 | 991 800 € |
| **2033** | 1850 | 1480 | 111 | 209050 | 965 700 € |
| **2034** | 1800 | 1440 | 126 | 203400 | 939 600 € |
| **2035** | 1750 | 1400 | 122,5 | 197750 | 1 008 000 € |
| **2036** | 1700 | 1360 | 119 | 192100 | 979 200 € |
| **2037** | 1650 | 1320 | 115,5 | 186450 | 950 400 € |
| **2038** | 1600 | 1280 | 128 | 180800 | 921 600 € |
| **2039** | 1550 | 1240 | 124 | 175150 | 892 800 € |
| **2040** | 1500 | 1200 | 120 | 169500 | 945 000 € |
| **2041** | 1450 | 1087,5 | 130,5 | 163850 | 856 406 € |
| **2042** | 1400 | 1050 | 140 | 158200 | 826 875 € |
| **2043** | 1350 | 1012,5 | 148,5 | 152550 | 797 344 € |
| **2044** | 1300 | 975 | 169 | 146900 | 767 813 € |
| **2045** | 1250 | 937,5 | 187,5 | 141250 | 801 563 € |
| **2046** | 1200 | 900 | 204 | 135600 | 769 500 € |
| **2047** | 1150 | 862,5 | 218,5 | 129950 | 737 438 € |
| **2048** | 1100 | 825 | 231 | 124300 | 705 375 € |
| **2049** | 1050 | 787,5 | 241,5 | 118650 | 673 313 € |
| **2050** | 1000 | 750 | 250 | 113000 | 675 000 € |
| | postindustrial: 900 ha fallowlands: 1100 ha leftovers: 200 ha | 100-75% of willow production | 0-25% of willow production | 113 GJ from ha | 2015 450 € / ha 2050: as twice expensive |

## URBAN MINING

| | MISTRZEJOWICE | | | | | |
|---|---|---|---|---|---|---|
| | **Population** | **Vacant Apartments** | **Urban Mining: windows (sqm)** | **Urban Mining: slabs (m)** | **Urban Mining: ext. walls (sqm)** | **Urban Mining:int. walls (sqm)** |
| **2015** | 206012 | 468 | 6669 | 15912 | 34329 | 46826 |
| **2016** | 205270 | 761 | 10837 | 25858 | 55785 | 76094 |
| **2017** | 204529 | 1053 | 15000 | 35790 | 77213 | 105322 |
| **2018** | 203787 | 1345 | 19168 | 45735 | 98669 | 134590 |
| **2019** | 203046 | 1637 | 23331 | 55667 | 120097 | 163819 |
| **2020** | 202304 | 1930 | 27500 | 65613 | 141554 | 193086 |
| **2021** | 201414 | 2281 | 32499 | 77542 | 167290 | 228192 |
| **2022** | 200524 | 2632 | 37499 | 89472 | 193026 | 263298 |
| **2023** | 199633 | 2983 | 42505 | 101414 | 218791 | 298443 |
| **2024** | 198743 | 3334 | 47504 | 113344 | 244528 | 333549 |
| **2025** | 197853 | 3685 | 52504 | 125273 | 270264 | 368654 |
| **2026** | 196785 | 4106 | 58504 | 139588 | 301148 | 410781 |
| **2027** | 195716 | 4527 | 64509 | 153917 | 332060 | 452947 |
| **2028** | 194648 | 4948 | 70509 | 168232 | 362944 | 495074 |
| **2029** | 193579 | 5369 | 76514 | 182561 | 393856 | 537240 |
| **2030** | 192511 | 5790 | 82514 | 196876 | 424740 | 579367 |
| **2031** | 191317 | 6261 | 89222 | 212880 | 459267 | 626464 |
| **2032** | 190124 | 6731 | 95924 | 228870 | 493765 | 673521 |
| **2033** | 188930 | 7202 | 102631 | 244875 | 528292 | 720618 |
| **2034** | 187737 | 7673 | 109333 | 260865 | 562790 | 767676 |
| **2035** | 186543 | 8143 | 116041 | 276869 | 597318 | 814772 |
| **2036** | 185275 | 8643 | 123164 | 293865 | 633985 | 864788 |
| **2037** | 184006 | 9143 | 130293 | 310874 | 670681 | 914843 |
| **2038** | 182738 | 9643 | 137416 | 327870 | 707348 | 964859 |
| **2039** | 181469 | 10144 | 144545 | 344880 | 744043 | 1014914 |
| **2040** | 180201 | 10643 | 151668 | 361876 | 780710 | 1064930 |
| **2041** | 178940 | 11141 | 158752 | 378778 | 817175 | 1114670 |
| **2042** | 177678 | 11638 | 165842 | 395693 | 853669 | 1164449 |
| **2043** | 176417 | 12135 | 172926 | 412595 | 890133 | 1214188 |
| **2044** | 175155 | 12633 | 180016 | 429511 | 926627 | 1263967 |
| **2045** | 173894 | 13130 | 187100 | 446413 | 963091 | 1313707 |
| **2046** | 172642 | 13623 | 194133 | 463194 | 999296 | 1363092 |
| **2047** | 171390 | 14117 | 201166 | 479976 | 1035500 | 1412476 |
| **2048** | 170138 | 14611 | 208200 | 496757 | 1071704 | 1461861 |
| **2049** | 168886 | 15104 | 215233 | 513539 | 1107909 | 1511245 |
| **2050** | 167634 | 15598 | 222267 | 530320 | 1144113 | 1 560 630 |
| | | 2,56 people /apartment | 14,25 sqm /apartment | 34 m /apartment | 73,35 sqm /apartment | 100,05 sqm /apartment |

# GLASSHOUSES

## CZYŻYNY

| glasshouse area edge (m) (calc.) | glasshouse surface (sqm) (calc.) | "standard" glasshouses | glasshouse area total (sqm) | potential product value | glasshouse revenue | income per farmer (€/year) | number of farmers | farmers apartments area (sqm) | willow area (sqm) | willow revenue in € | occupied area (sqm) | inflation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 77 | 6288 | 1,12 | 5595 | 295853 | 111896 | 14400 | **8** | 777 | 25963 | 1168 | 6372 | 100% |
| 118 | 14450 | 1,82 | 9092 | 495195 | 187290 | 14832 | **13** | 1263 | 51129 | 2301 | 10354 | 103% |
| 126 | 16507 | 2,52 | 12584 | 705368 | 266780 | 15129 | **18** | 1763 | 75496 | 3397 | 14347 | 106% |
| 136 | 19085 | 3,22 | 16081 | 926892 | 350564 | 15431 | **23** | 2272 | 99059 | 4458 | 18353 | 109% |
| 147 | 22315 | 3,91 | 19573 | 1159233 | 438439 | 15740 | **28** | 2786 | 121821 | 5482 | 22359 | 112% |
| 160 | 26362 | 4,61 | 23070 | 1402940 | 530613 | 16055 | **33** | 3305 | 143775 | 6470 | 26375 | 115% |
| 189 | 36339 | 5,45 | 27265 | 1701266 | 643444 | 16376 | **39** | 3929 | 164364 | 7396 | 31194 | 118% |
| 195 | 38839 | 6,29 | 31459 | 2012899 | 761308 | 16703 | **46** | 4558 | 183987 | 8279 | 36017 | 121% |
| 203 | 41966 | 7,13 | 35658 | 2338150 | 884323 | 17037 | **52** | 5191 | 202636 | 9119 | 40849 | 124% |
| 212 | 45879 | 7,97 | 39853 | 2676408 | 1012257 | 17378 | **58** | 5825 | 220322 | 9915 | 45678 | 127% |
| 223 | 50774 | 8,81 | 44047 | 3027974 | 1145225 | 17726 | **65** | 6461 | 215492 | 9697 | 50508 | 130% |
| 249 | 62826 | 9,82 | 49080 | 3451847 | 1305540 | 18080 | **72** | 7221 | 209699 | 9436 | 56301 | 133% |
| 255 | 65842 | 10,82 | 54118 | 3892029 | 1472023 | 18442 | **80** | 7982 | 203899 | 9175 | 62101 | 136% |
| 262 | 69614 | 11,83 | 59152 | 4347850 | 1644421 | 18811 | **87** | 8742 | 198106 | 8915 | 67894 | 139% |
| 271 | 74332 | 12,84 | 64190 | 4819994 | 1822993 | 19187 | **95** | 9501 | 192309 | 8654 | 73691 | 142% |
| 281 | 80232 | 13,84 | 69223 | 5307761 | 2007474 | 19571 | **103** | 10258 | 186519 | 8393 | 79481 | 145% |
| 304 | 93747 | 14,97 | 74850 | 5857973 | 2215572 | 19962 | **111** | 11099 | 180051 | 8102 | 85949 | 148% |
| 310 | 97128 | 16,09 | 80473 | 6425662 | 2430280 | 20361 | **119** | 11936 | 173591 | 7812 | 92409 | 151% |
| 316 | 101355 | 17,22 | 86100 | 7011573 | 2651881 | 20768 | **128** | 12769 | 167131 | 7521 | 98869 | 154% |
| 325 | 106641 | 18,34 | 91722 | 7614947 | 2880086 | 21184 | **136** | 13596 | 160682 | 7231 | 105318 | 157% |
| 335 | 113251 | 19,47 | 97350 | 8236559 | 3115189 | 21607 | **144** | 14417 | 154233 | 6940 | 111767 | 160% |
| 355 | 127643 | 20,67 | 103326 | 8906085 | 3368413 | 22040 | **153** | 15283 | 147391 | 6633 | 118609 | 163% |
| 360 | 131242 | 21,86 | 109306 | 9594985 | 3628966 | 22480 | **161** | 16143 | 140551 | 6325 | 125449 | 166% |
| 366 | 135742 | 23,06 | 115282 | 10302440 | 3896535 | 22930 | **170** | 16993 | 133725 | 6018 | 132275 | 169% |
| 374 | 141369 | 24,25 | 121263 | 11029283 | 4171438 | 23389 | **178** | 17835 | 126902 | 5711 | 139098 | 172% |
| 383 | 148404 | 25,45 | 127239 | 11774666 | 4453353 | 23856 | **187** | 18667 | 120094 | 5404 | 145906 | 175% |
| 401 | 162737 | 26,64 | 133182 | 12535904 | 4741265 | 24333 | **195** | 19485 | 113334 | 5100 | 152666 | 178% |
| 406 | 166321 | 27,83 | 139129 | 13316448 | 5036478 | 24820 | **203** | 20292 | 106579 | 4796 | 159421 | 181% |
| 411 | 170802 | 29,01 | 145072 | 14115405 | 5338655 | 25317 | **211** | 21088 | 99840 | 4493 | 166160 | 184% |
| 418 | 176404 | 30,20 | 151020 | 14933684 | 5648141 | 25823 | **219** | 21873 | 93108 | 4190 | 172892 | 187% |
| 426 | 183408 | 31,39 | 156963 | 15770359 | 5964584 | 26339 | **226** | 22645 | 86392 | 3888 | 179608 | 190% |
| 443 | 197647 | 32,57 | 162863 | 16621562 | 6286521 | 26866 | **234** | 23399 | 79737 | 3588 | 186263 | 193% |
| 447 | 201207 | 33,75 | 168764 | 17491485 | 6615539 | 27403 | **241** | 24141 | 73095 | 3289 | 192905 | 196% |
| 451 | 205658 | 34,93 | 174664 | 18380130 | 6951638 | 27952 | **249** | 24870 | 66465 | 2991 | 199535 | 199% |
| 458 | 211222 | 36,11 | 180565 | 19287496 | 7294817 | 28511 | **256** | 25586 | 59849 | 2693 | 206151 | 202% |
| 465 | 218179 | 37,29 | 186465 | 20213583 | 7645077 | 29081 | **263** | 26289 | 53246 | 2396 | 212754 | 205% |
| | | standard glasshouse | | 52,88 | 20 | average salary in PL: | | | start: 266 000 | 0,045 €/sqm | non- | |
| 3,2 m height | | 5000 sqm | | € / sqm | €/sqm | 12000 €/year | | | | | occupied = | |