

Barriers and bridges to risk assessment and management of contaminated sites in urban areas



Upper Silesia case study

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1. Overview of Upper Silesia contamination problem



Upper Silesia region



Upper Silesia

- main features

Impact factors	Risk factors
<ul style="list-style-type: none">- Heavy industry: mining sector, steel production, coal processing, chemical industry, transportation- Long history of industrial development- Extensive deposition of contamination: wastes, wastewater and emissions to air- Extensively changed environment- SME robust development (variety of activities)	<ul style="list-style-type: none">- Population 4 mln- Densely urbanized area: 1500 persons/km²- Important groundwater receptors- Ecological values- Economical and social constraints- Spatial complex structures

2. Inventory, assessment and understanding of the problem



Basic assessment criteria

● Impact

- Economical activity profiles
- Environmental management profiles

● Risk

- Pathways characteristics
- Vulnerability of receptors

● Uncertainty

- Information availability and reliability
methodological constraints

Identification of contamination sources

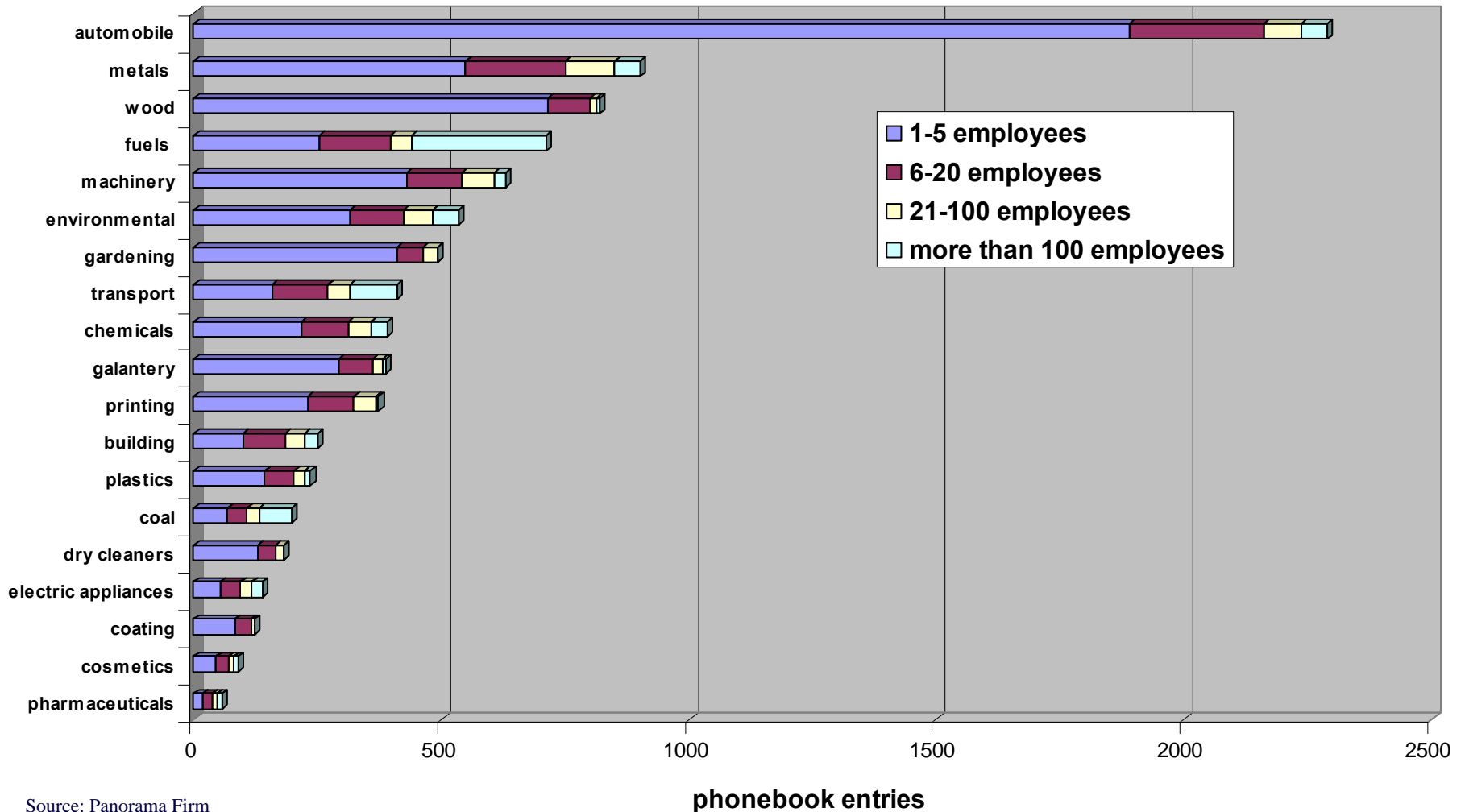
Source category	Confirmed	Potential
Postindustrial sites	e.g Tarnowskie Góry, Orzeł Biały non-ferrous plants	450 objects under investigation – Silesian Voivodship Marshal office
Main industry and communal utilities (operating, liquidated)	e.g Czechowice Dziedzice refinery plant	More than 150 main industry facilities (operating) and around 50 closed
Small and medium industry facilities (operating, liquidated)	Lack of organized information	More than 7000 potentially hazardous firms - phonebook entries, State Statistical Office
Environmental sector - communal facilities	Selected high impact facilities	Around 2500 facilities and firms
Contaminated land (soils, quaternary layers)	Not delimited, maps of contamination	A Few dozen square km of contaminated soil
Military sites	lack of organized information	A few dozen facilities
Individual activities (commercial, consumers)	Lack of assessment	Widely spread

Characterisation of contamination sources

Information	Data available	Data source
Localization and size of the facility	- Sozological, hydrogeological maps, regional statistics	National Statistical Office, phonebooks, Environmental Protection Inspectorate
Activity characteristics	- Regional statistics	State Statistical Office, Voivodship and Marshal Offices
Technology used	- EIA, environmental audit, IPPC	Firms, County offices, Environmental Protection Inspectorate
History of operation (time, scale, profile)	- EIA archives	County offices, Voivodship and Marshal Offices
Scale and type of environmental impact (wastes, emissions, contaminants),	- EIA, - Sozological map - IPPC /EPER information	Firms, County offices, Environmental Protection Inspectorate, facility management office, State Statistical Office
Environmental management and risk containment	- EIA, EMAS, obligatory information	Environmental Protection Inspectorate, Certifying bodies, Facility management office

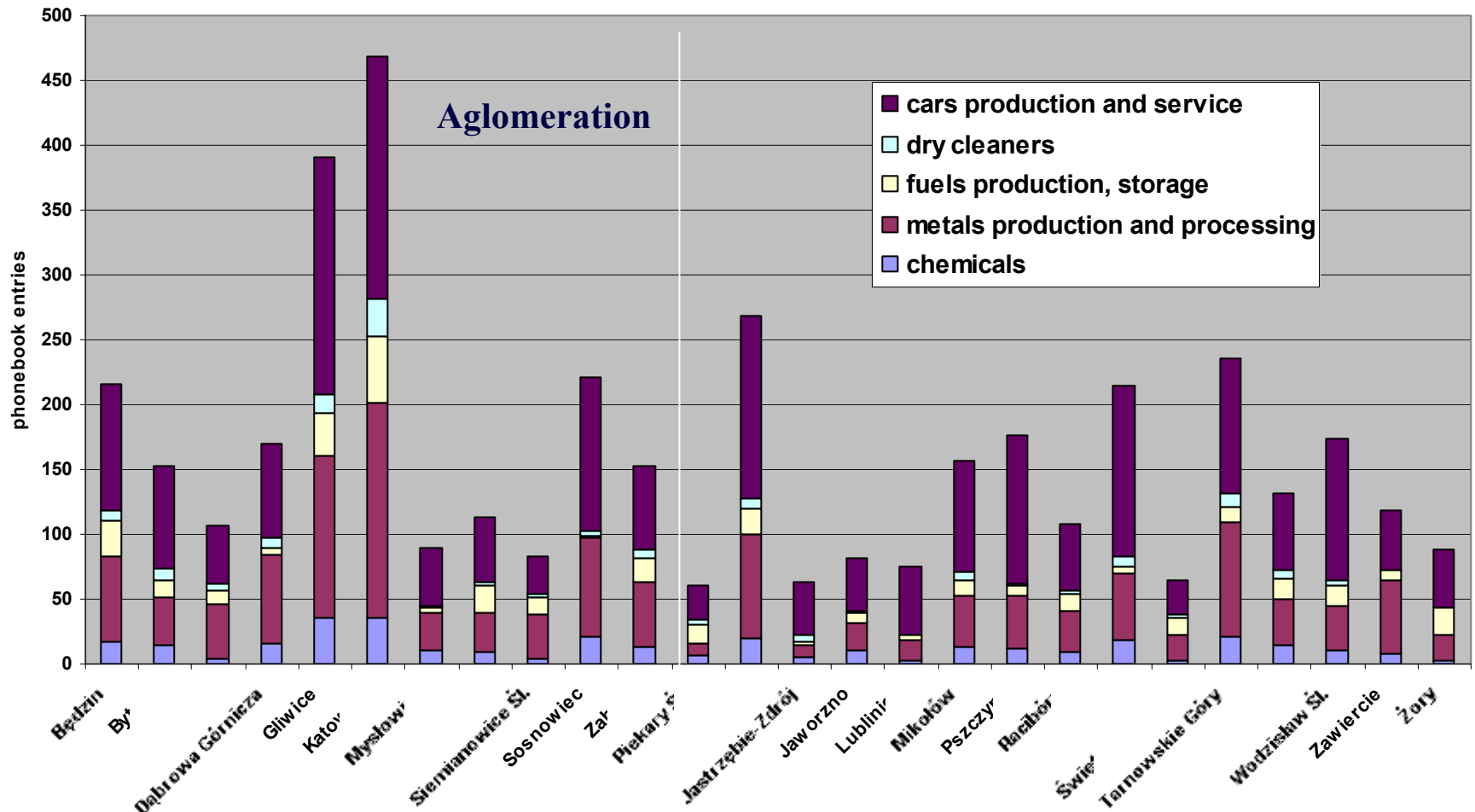
Economical activities

Economical sectors: production, processing, service, wholesales



Spatial distribution of economical activities

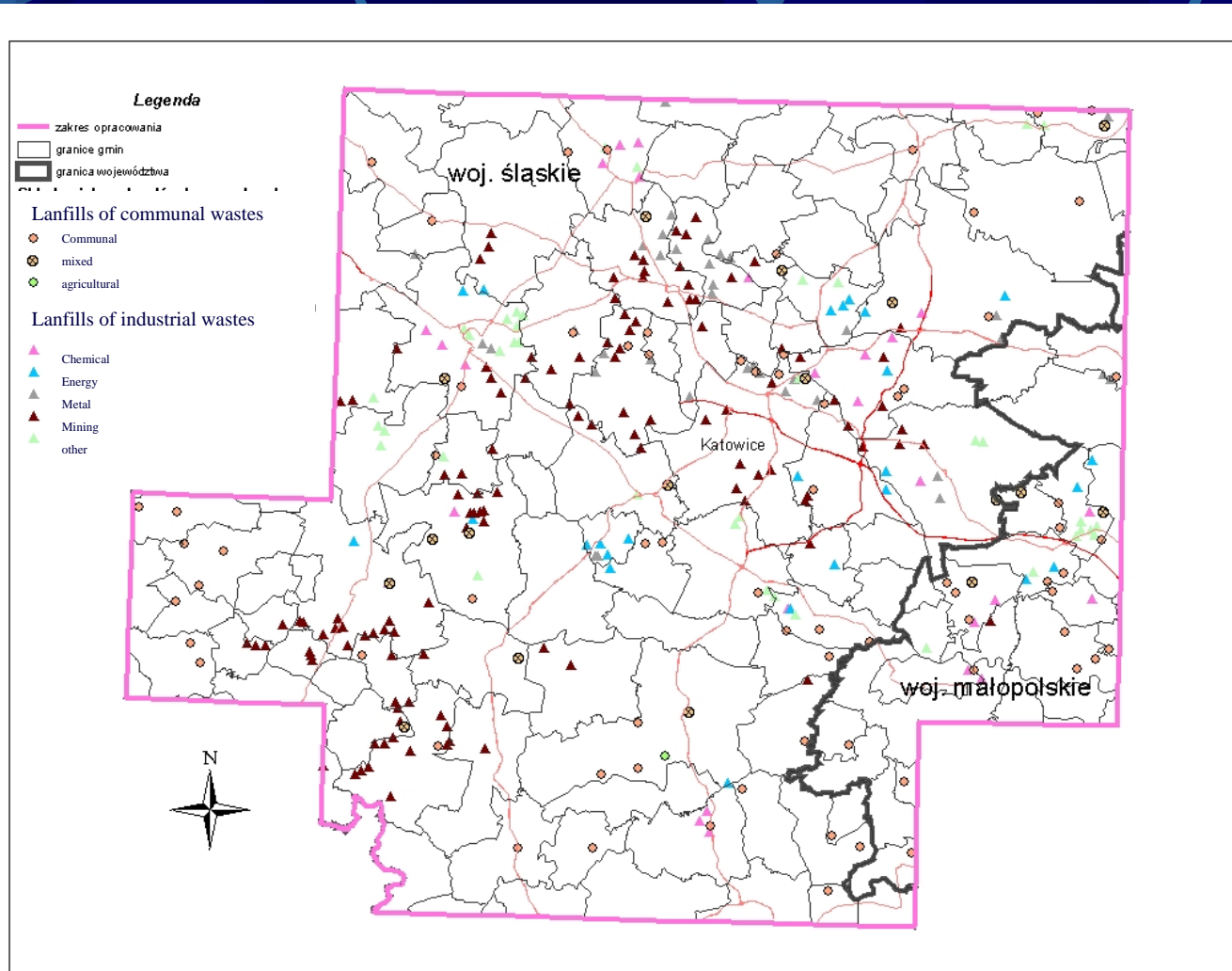
Selected branches activity characteristics



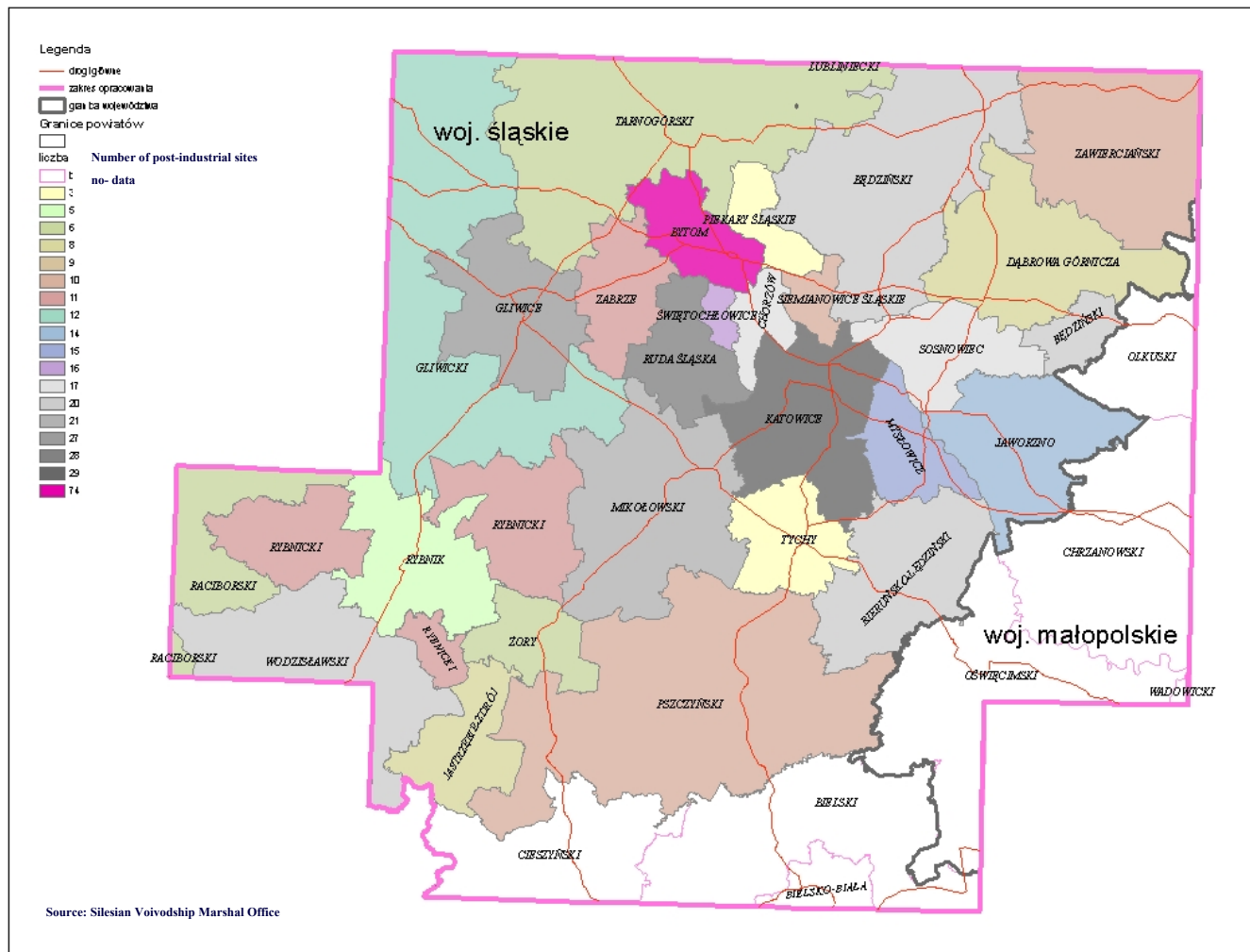
Main industries

Sector	Potential Health Hazard	Number of facilities	Causes
Mining industry	PCBs, heavy metals	65	handling of processes, wastes
Metal processing industry	Heavy metals, PAHs, organics	19	emissions, handling of processes, wastes
Energy sector	Heavy metals, PAHs, PCBs	60	emissions, handling of processes, wastes
Chemical production	Organics and inorganics	13	handling of processes, accidents, wastes
Environmental sector	Organics, heavy metals, biological	30	handling of processes, wastes

Waste management facilities

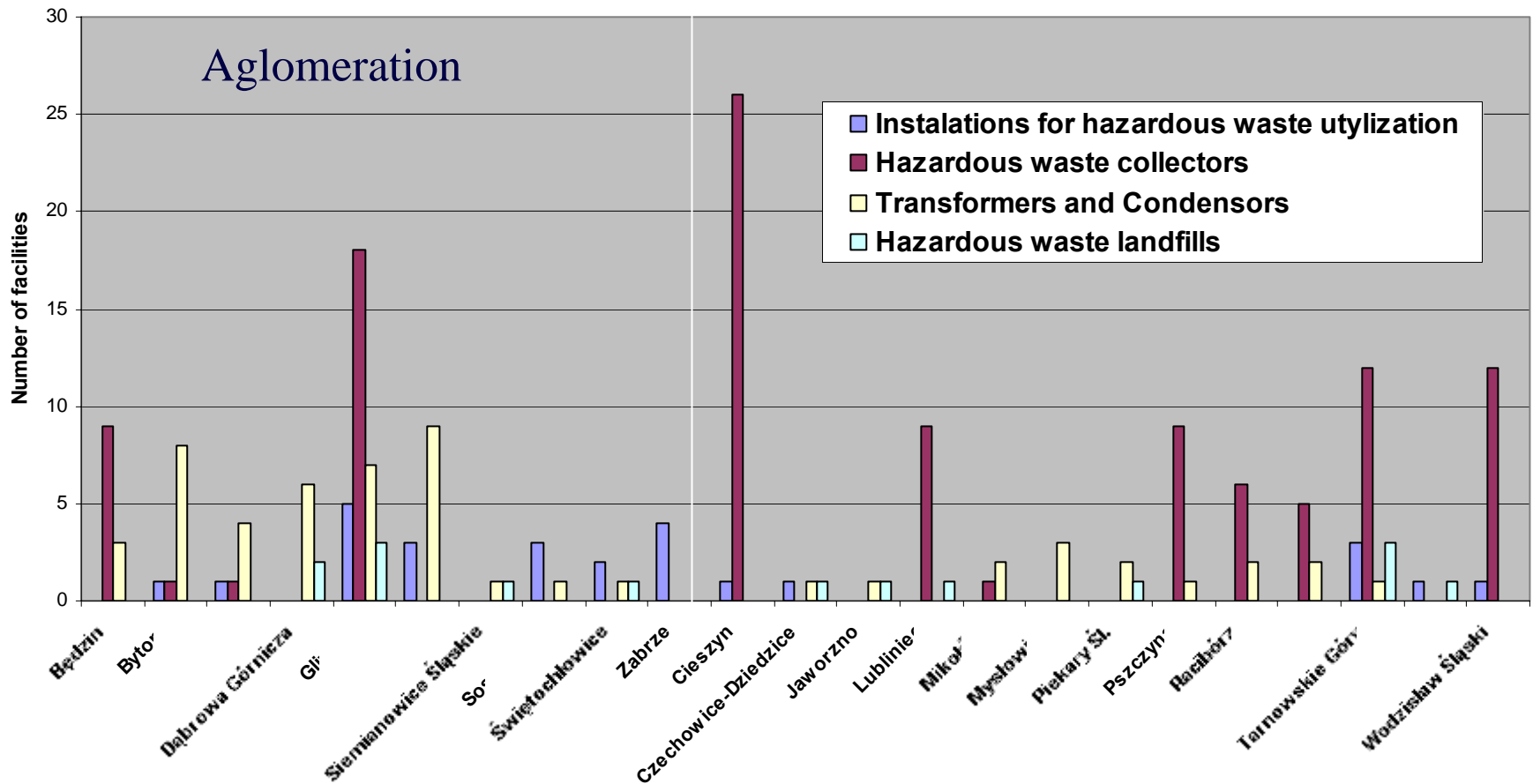


Post-industrial sites



Hazardous waste management

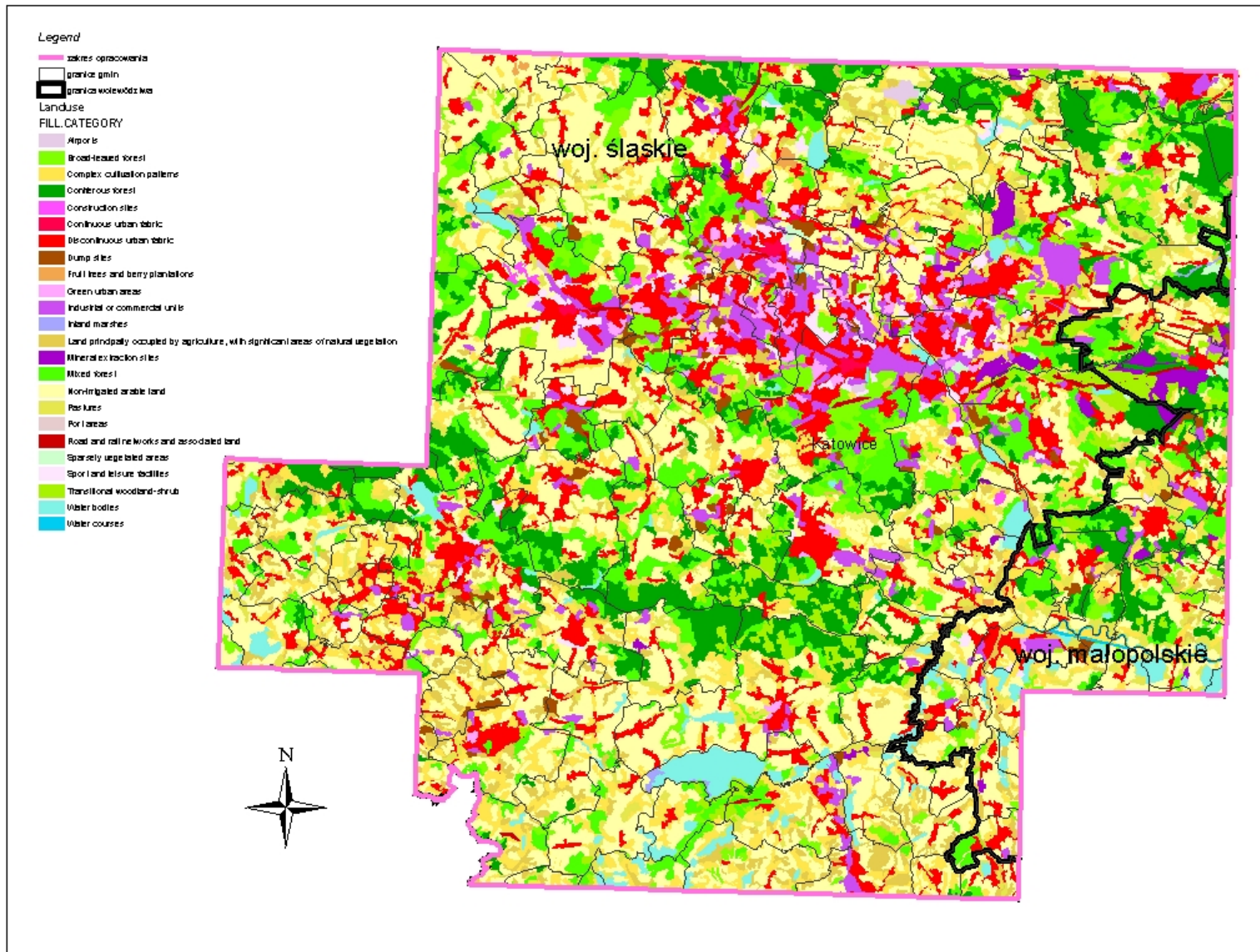
Hazardous waste management facilities



Pathways and receptors - assessment parameters

Receptor	Basic parameters	Data source
Inhabitants	<ul style="list-style-type: none"> - impact characteristics - distance and accessibility to the contaminated site - land use at the site and off the site 	<ul style="list-style-type: none"> - land use map - statistical information
Groundwater	<ul style="list-style-type: none"> - impact characteristics - groundwater depth and flow - hydrogeological layers (soil, lithology of the unsaturated zone, impermeable layers), distance of the nearest well - groundwater use 	<ul style="list-style-type: none"> - zoological map, hydrogeological maps, studies and reports - Environmental Protection Inspectorate
Surface water	<ul style="list-style-type: none"> - impact characteristics - surface body type, rate and use - distance from the contaminated site - flood return 	<ul style="list-style-type: none"> - zoological, hydrogeological map - Environmental Protection Inspectorate
Ecosystems/ Soils	<ul style="list-style-type: none"> - impact characteristics - distance from the site 	<ul style="list-style-type: none"> - zoological map - state administration

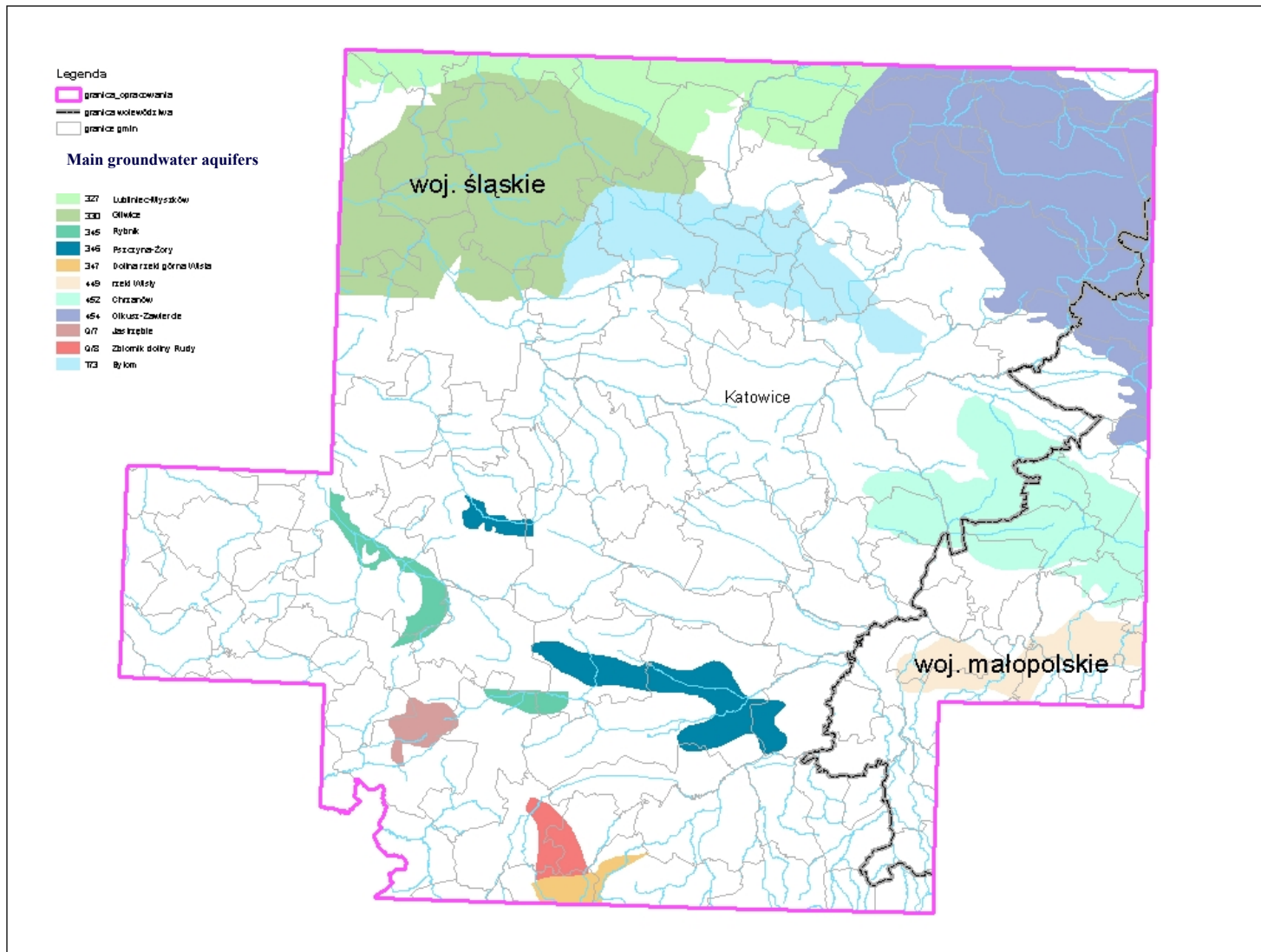
Land use pattern



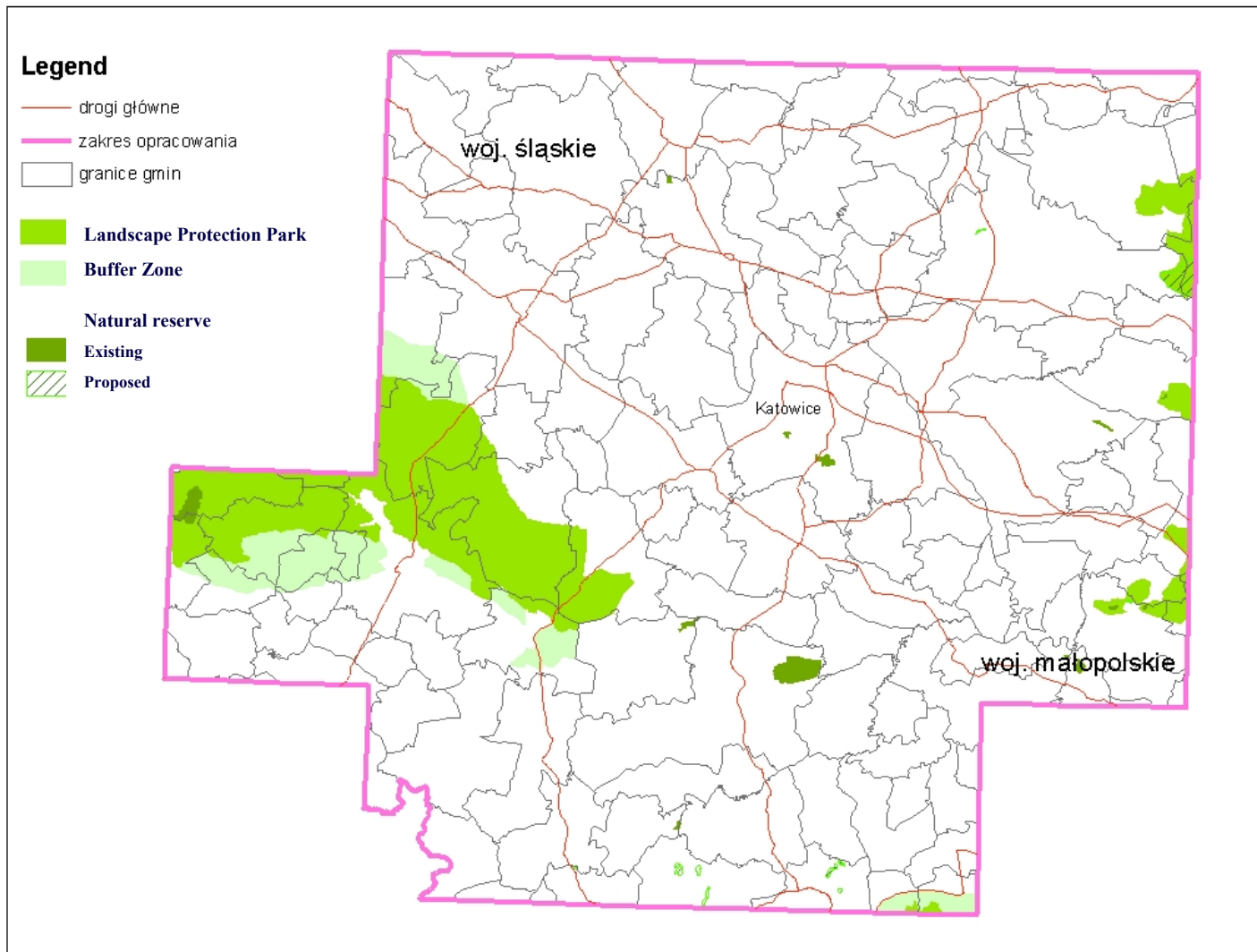
Human receptors



Groundwater resources



Protected ecosystems



Risk estimations and priorities

Receptor	Areas of concern	Importance
Inhabitants	Mixed functional patches within agglomeration (settlements, industry, economical activity, recreation)	High
Groundwater	Deeper aquifers in areas on the border of agglomeration, shallow aquifers mostly degraded (medium and low quality)	High
Surface water	Relatively small rivers, mostly degraded (non-class category)	Medium
Ecosystems/ soils	Valuable, located in the outskirts of agglomeration	Low

3. Legal, institutional,
 environmental, social
and economical aspects

Environmental and infrastructural aspects

- Environmental buffer consisting of soil/ground (quaternary layer) and surface waters
- Anthropogenic buffer composed of infrastructure – built up cover, sewerage and storm systems, relatively high level of water treatment
- Changes in the environment: including land degradation, groundwater contamination, changes in the groundwater regime, geological structures, land deformations, river system changes and pollution

Socio-economical factors

Negative	Positive
<ul style="list-style-type: none">- Poor waste recycling practices in small firms and industrial facilities- Low income housing and social problems in most endangered areas- Local communities budget constraints- Weak environmental responsibility in small firms/grey economy	<ul style="list-style-type: none">- Rising awareness among firms management-Funding opportunities for small and medium size firms- European Union and national financial support- Economical changes – new investments

Legal-institutional aspects

Negative	Positive
<ul style="list-style-type: none">- Weak integration of policies- Insufficient system of monitoring and control- Weak coordination of information systems- institutional constraints	<ul style="list-style-type: none">- New legal requirements- Environmental strategies developed and implemented- New concepts and schemes of environmental management- New obligations on environmental information- New organization of environmental information national and regional level (REMAS)



4. Management options and approaches

Policy instruments

Measures	Actual state
Remediation and redevelopment	Selected projects of of post-industrial sites remediation Post-industrial sites inventory and management system under developed
Legal	Environmental law, building code
Information	Reorganization of monitoring system
Assessment methods	Inventories and pilot studies
Environmental management systems	Establishing environmental management systems in public and private sectors
Public awareness	Public access to information
Spatial planning	Spatial plans, concepts and studies

Sectoral oriented tools

Activity	Managements standards	EIA, audit, monitoring	Regulations	Technical standards and innovation
Car production and service	ISO 140001 main industry	Required for production	Wastes	-
Metals production and processing	ISO 140001 main industry	Industrial facilities	Wastes, emissions	-
Environmental sector	ISO 140001 selected objects	Required in most cases	Technical aspects	-
Fules production, storage and retail	ISO 14001 Main firms	Required in most cases	Technical aspects	High quality infrastructure
Chemical manufacture and wholesale	ISO 140001 selected industry	Required	Substance handling	Machines and processes
Machinery production	ISO 140001 Main firms	Selected	Wastes	-
Coating	ISO 140001 Main firms	Required	Substance handling	-
Dry cleaners	ISO 140001 Selected firms	Selected	Substance handling	Machines and processes



Conclusions

Possibilities and actions

- Rising awareness of the problems and integration of the efforts on local and regional level
- Strengthening understanding of the problem with respect to economical activities and risks – regional and local model of assessment and management
- Improvement in the monitoring, information and control system
- Development of institutional capacity and support systems
- Implementation of procedures for cost-efficient risk assessment and management



Thank you for attention