

1. Climate Change: Mitigation

Refer to Section 2.1 of the Guidance Note

1A. Present Situation

Please complete the following table with most recent data available:

Table 1: Benchmarking Data - Climate Change: Mitigation

City's emissions reduction targets (add rows if needed for further commitments) Where possible please use 2005 as the base year for listing city reduction targets	Base Year	Target Year	% Reduction
	1995	2020	20
	1995	2030	25
	n/a	n/a	n/a
CO ₂ (and possibly other greenhouse gases) emissions		Units	Year of Data
Total CO ₂ emissions/capita	6,90	t CO ₂ /capita	2016
Total transport CO ₂ emissions/capita	1,66	t CO ₂ /capita	2016
Total (less transport) CO ₂ emissions/capita	5,25	t CO ₂ /capita	2016
Total CO ₂ emissions per year	5 319 347	t CO ₂	2016
Total CO ₂ emissions per MWh electricity consumed	1,59	t CO ₂	2016

Describe the present situation in relation to CO₂ (and possibly other greenhouse gases) emissions, including any relevant disadvantages or constraints resulting from historical, geographical and/or socio-economic factors which may have influenced this indicator.

Give details of any Baseline Emission Inventory prepared by the city, mentioning the baseline year and the applied methodology (direct/indirect emissions, data collection process, monitoring system), as well as the competent department. Provide a breakdown of the main sources of emissions.

Where available, information/data on the inventory and on the following indicators should be provided from previous (5-10) years to show trends, together with an explanation of the evolution.

Scientific grounds should be provided for any claimed reduction in CO₂ (and other greenhouse gases) emissions. Describe how the inventory system and information is integrated in the design of policies and measures.

Provide figures (in the table above), and comment on, the following specific indicators for the city:

1. Total CO₂ emissions (tonnes) per year;
2. CO₂ emissions per capita (tonnes) per year;
3. CO₂ emissions per capita (tonnes) resulting from fuel use in transport;
4. CO₂ emissions (tonnes) per MWh electricity consumed;

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5. CO₂ emissions reduction target(s) (e.g. 20% by 2020 compared to 1990).

Please also state clearly what year the data provided relates to.

Mention any target(s) adopted specifically for the municipal administration (e.g. carbon neutral municipality by 2020, adaptation measures set on municipal level).

(max. 600 words and five graphics, images or tables)

Development influences emission volumes

Greenhouse gases (GHG) emissions in Krakow have fallen despite the city's rapid development. In 2000–16 the number of dwellings increased by 43% and living area by 55%; the number of vehicles by 79%, and the GDP by 149%. Moreover CO₂ emissions were reduced by 12% in 1995–2016.

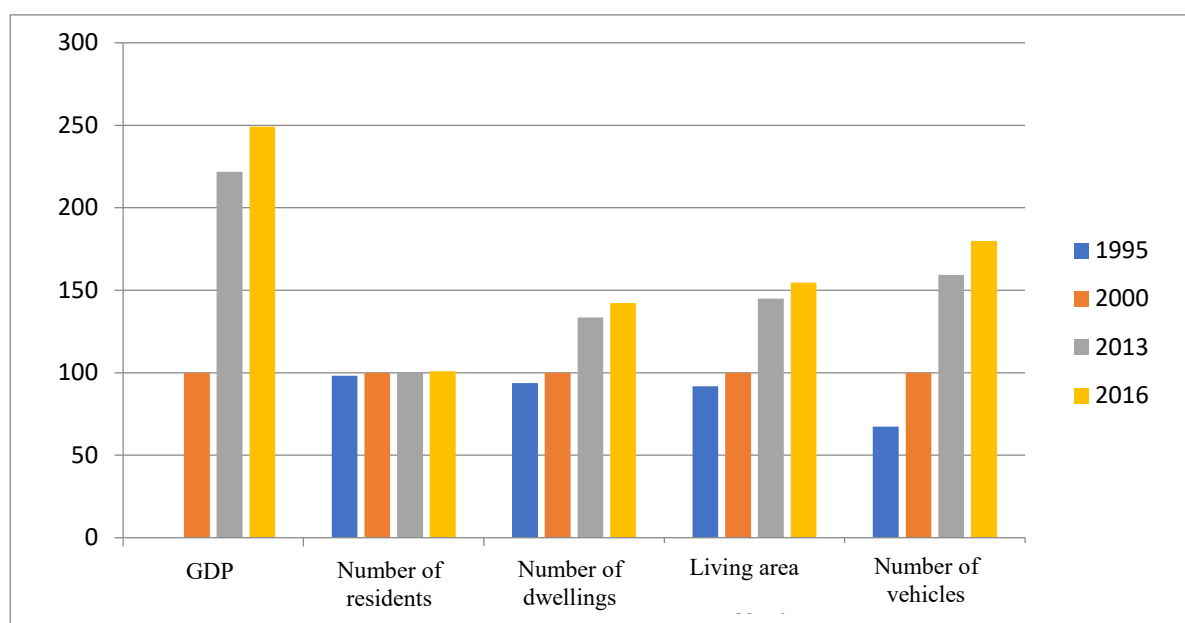


Figure 1. Economic data shows the dynamic development of the city. Source: Statistics Poland (1D2)

GHG emissions per capita are relatively high in Krakow due to a significant difference between the number of registered and actual residents. The city boasts nearly 170,000 students, many commuters travel to Krakow to work, and over 13 million tourists visit the city annually. The actual number of city users exceeds 1.1 million, i.e. over 40% more than the recorded number of residents (771,069 in 2018).

Changes in emissions structure

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Largest GHG producers are residential and service buildings, and the transport sector. A significant drop (24%) in emissions from construction is a result of thermal modernisation, despite a large increase in total

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heated space. Similarly, a major drop in emissions from industry is (41%) thanks to economic transformation and improved energy efficiency. There is a large increase in emissions in private and

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commercial transport (79%) due to the significant growth in the number of cars and car trips. Notable are

Waste management

Private and commercial
transport

Public transport

Municipal vehicles

Industry

Municipal public
lightning

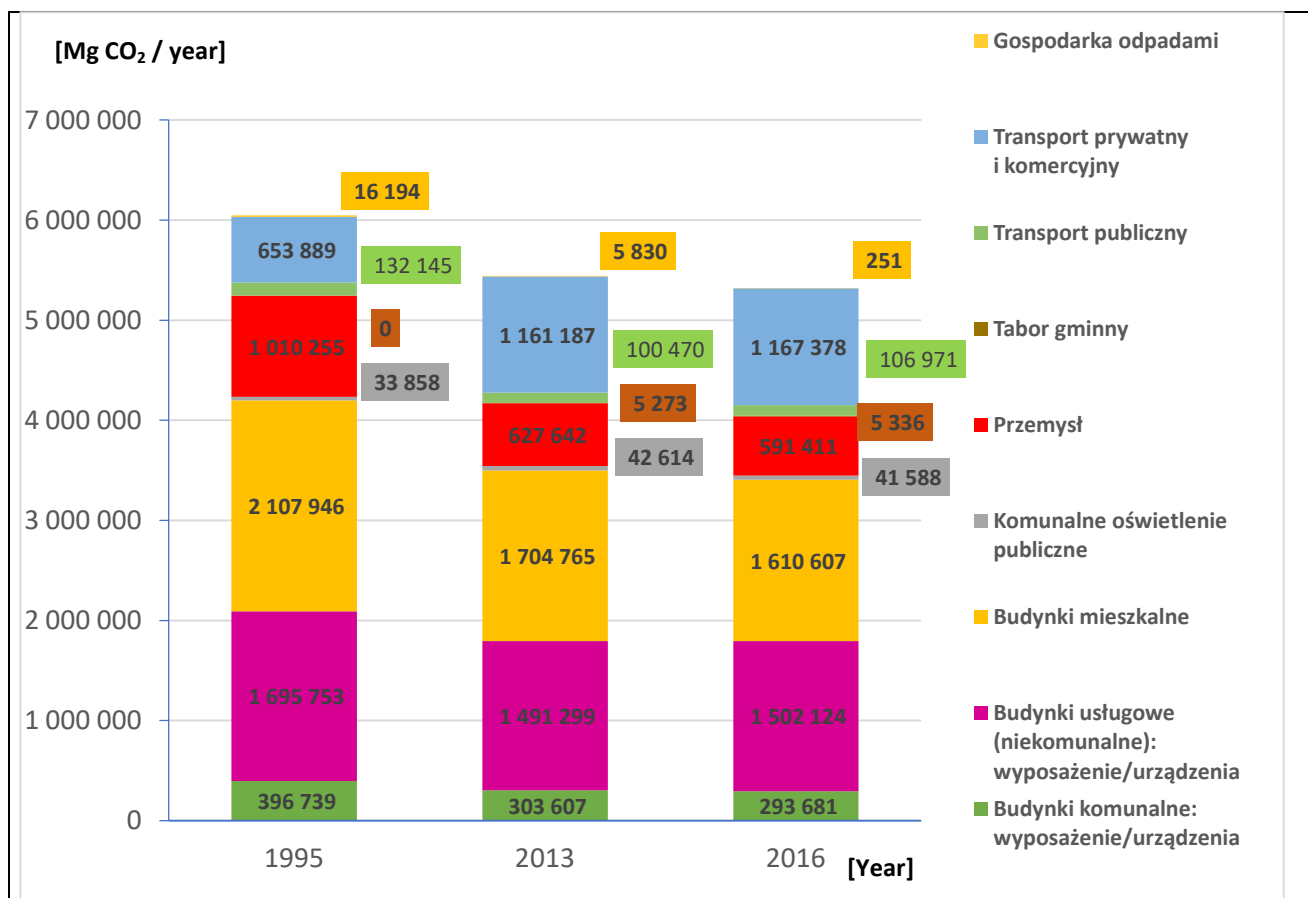
Residential buildings

Non-municipal service
buildings (equipment,
devices)

Municipal buildings
(equipment, devices)

Figure 2. Emissions by sector (tons of CO₂/year, 1D1)
reduced emissions in public transport resulting from bus and tram modernisation (See: Chapter 3).

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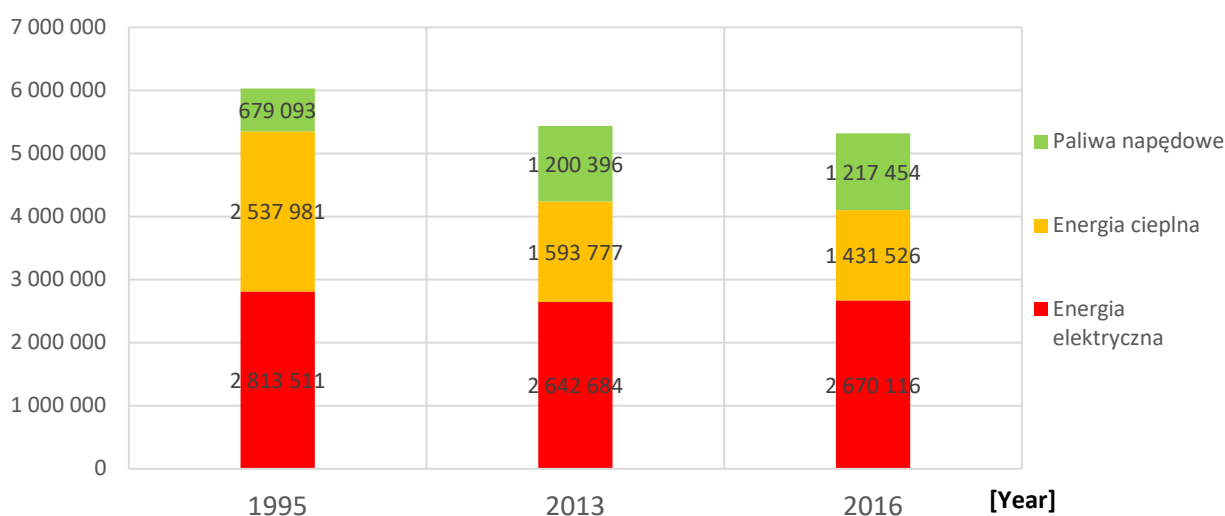
These trends are reflected in the changing mix of energy sources. In 2016, 50% of emissions resulted from consumption of electricity, 27% of heat, and 23% of propellant fuels.

Propellant fuels

Heat

Electricity

Figure 3. Emissions by mix of energy sources (tons of CO₂/year, 1D1)



Emissions inventory methodology

In 2015 direct emissions were appraised, with 1995 chosen as the base year and 2013 being monitored. The inventory followed the Sustainable Energy Action Plan (SEAP) guidelines and best practices in conducting inventories for cities. Emission volume was calculated as product of energy use and CO₂e.

Energy consumption was assessed from statistical data, data from energy providers, and data on traffic structure and vehicle types. The Municipality monitors CO₂ emissions and reductions.

Constraints

High GHG emissions in Krakow result from reasons based on history (centrally controlled economy between 1945–89), fuel sources (plentiful coal), and economic (coal-based power generation) and social factors. The

Polish energy market is highly specific:

- Poland maintains high economic growth, and thanks to increased energy efficiency the GDP-related energy demand decreases.
- Poland's energy balance is based on hard coal; extensive coal deposits and existing coal-fired power plants allow constant and stable provision of energy. Hard coal and lignite account for approximately 77% of electric energy.
- Coalmining and energy production are significant for the Polish economy and society, providing jobs, state revenue. The energy sector accounts for approximately 8% of the gross added value in Polish GDP (4.1% in energy production, 4.2% in related sectors) and employees around 600,000 people.
- The state plans to rely on coal as a significant source of energy, however, due to forecast increased energy demand, its share in the production of electric energy will fall to approximately 60% in 2030, a trend that will continue into the following decade.
- Poland will move towards diversification of energy sources, gradually increasing the share of RES (mostly wind and photovoltaics) and introducing nuclear energy (from 2033).

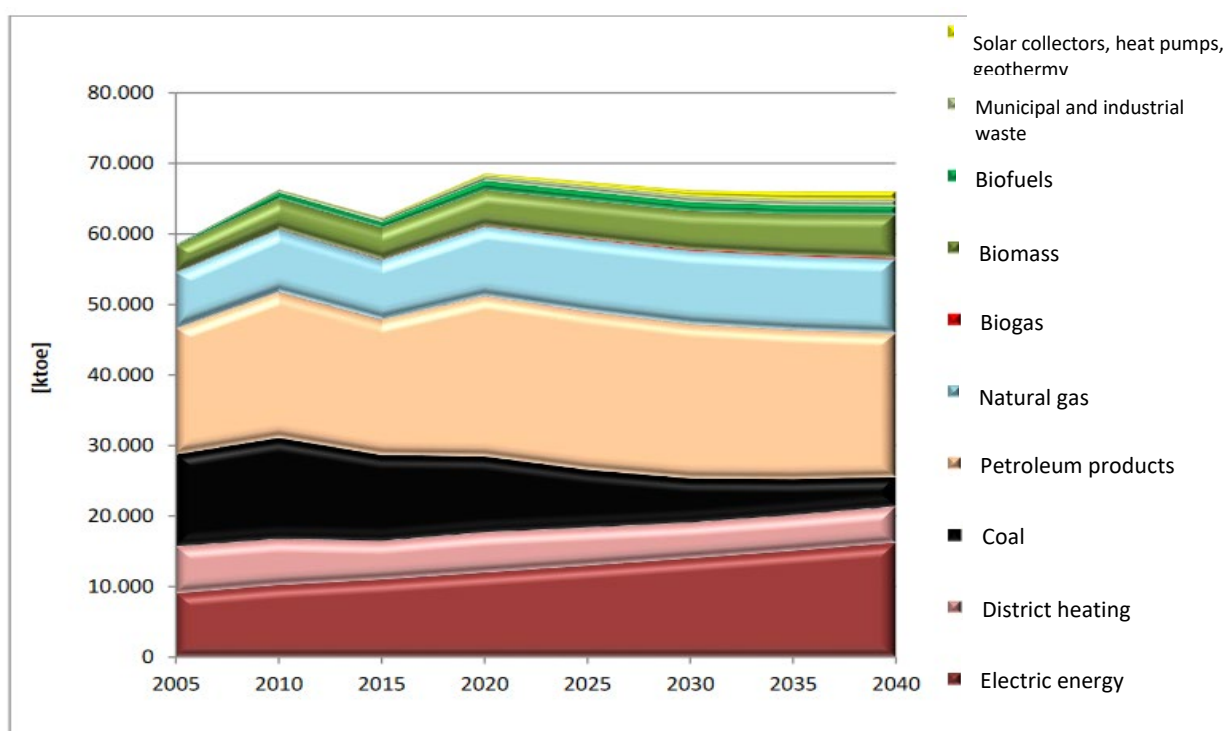


Figure 4. Final energy consumption forecast for Poland, by fuel (1D6)

Reduction Goals

Reduction Goals for Krakow are defined as 20% by 2020 and 25% by 2030 in Low Carbon Economy Plan (PGN, 1D1).

1B. Past Performance

Describe the measures implemented over the last five to ten years to reduce greenhouse gas emissions, including resources allocated to implement these measures. Comment on which measures have been most effective and how the implementation and impacts have been monitored.

Make reference to:

1. An overall strategy for climate change or any other strategy or action plan to reduce emissions;
2. Mainstreaming of climate protection measures across municipal services and in key areas of action such as energy efficiency in residential and commercial buildings, public transport and waste management. Highlight any innovative schemes for the built environment such as low carbon zones;
3. Mechanisms used (e.g. local regulations, financing schemes, partnerships). Explain how the city works on emissions reduction with other governmental bodies, private sector service providers, enterprises and citizens. Mention relevant national legislation or programmes and participation in EU funded projects or networks.

Provide details on the monitoring system (frequency, responsibility, outcomes) and how lessons learned have been used.

(max. 1,200 words and five graphics, images or tables)

Low Carbon Economy Plan (PGN)

Three potential scenarios (by 2020, 2030, 2040) are envisaged (1D1):

- continuation of current trends: CO₂ increases by 7%/17%/27%
- realistic scenario: CO₂ reduction by 11%/19%/26%
- optimistic scenario: CO₂ reduction by 20%/33%/51%.

The Municipality (commune) is only directly responsible for 8.4% of CO₂ emissions. The reduction of emissions in the sectors beyond the its direct influence depends mostly on national policies.

Activity of the Municipality in areas under its direct influence:

Liquidation of coal-fired sources: PONE (1D7) allowed subventions of PLN343,313,520 (€79,840,353) to be granted for the liquidation of 45,000 coal-fired sources and the installation of environmentally-friendly heating systems, including use of RES (e.g. heat pumps). A protection programme for poorer families subsidises their heating bills. (See: Chapter 6).

Thermal modernisation: 96 public utility buildings were submitted for thermal modernisation (Integrated Territorial Investments formula, PLN192,000,000/€44,600,000, of which PLN72,000,000/€16,700,000 was co-financed by the EU). Thermal modernisation included educational, healthcare, culture and sports facilities, and Municipality-administered buildings. The 96 buildings modernised, together with 51 completed projects, account for 40% of municipal building resources.

Use of renewable energy

The Waste Incineration Plant (ZTPO), was built to cater for waste management needs and produces heat and electricity. It processes 218,000 tons of municipal waste annually, generating 57,000MWh of electricity

and 227,000MWh of heat, of which 35,000MWh is renewable and 38,000MWh high-efficiency coal generation. (See: Chapter 11).

Modernisation of street lighting

The SOWA programme (2014–15) replaced 4375 streetlights, 116 control units, and 150 km of power cables, and introduced a remote control system. The annual savings were: 2755.86MWh electric energy (63.13%), a reduction in CO₂ emissions by 1912,4 tons.

In 2016, the ISE ledification project added traffic, motion and light sensors. The radio-based system is connected via the Internet and the data generated is used to dynamically adjust light levels along selected traffic routes in real time in response to changes in traffic intensity and daylight. Photovoltaic panels installed as part of the project account for annual electricity savings of 1377.9MWh (71.1%). Annual CO₂ reduction is estimated at 1234.32 tons.

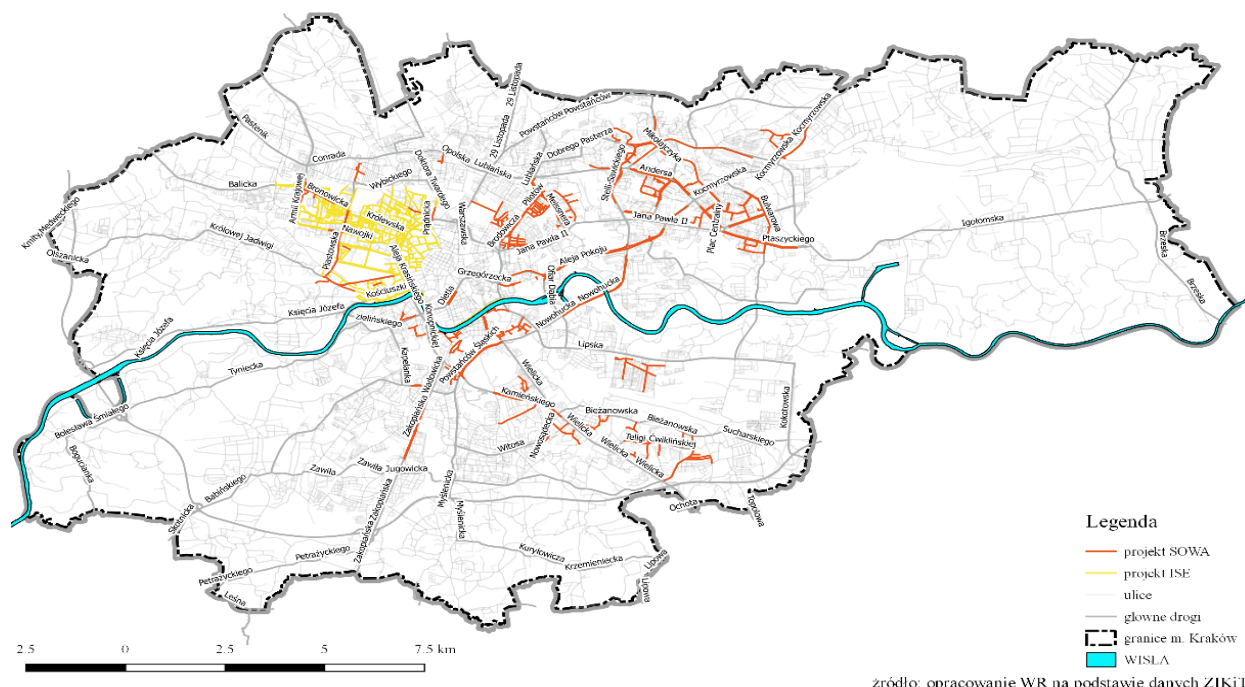


Figure 1. Smart lighting in Krakow. Modernisation: ISP program (yellow), SOWA program (red).

Modernisation of public buses and trams

Krakow has 646 buses and 391 trams. Between 2007–18, all public buses were exchanged for environmentally-friendly versions: now all meet the EURO5 or EURO6 standards, and the number of electric (26) and hybrid (64) buses is increasing. The tram rolling stock is also being modernised and exchanged. Modern trams use 45% less energy, and energy recuperation systems are being installed in the remaining 118 cars which saves over 10,000MWh of energy a year. Other projects in 2018 are:

- purchase and installation of energy recuperation systems in 77 buses
- purchase and installation of roof-mounted photovoltaic panels for 6 city buses to supply on-board installations and reduce fuel consumption
- purchase of five overhead charging stations for electric buses
- modernisation of the Tram Service Depot in Nowa Huta, installation of roof-mounted photovoltaic and

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solar hot water panels.

Total expenditure on purchase and modernisation of public rolling stock in 2018: nearly €50,000,000 (See:

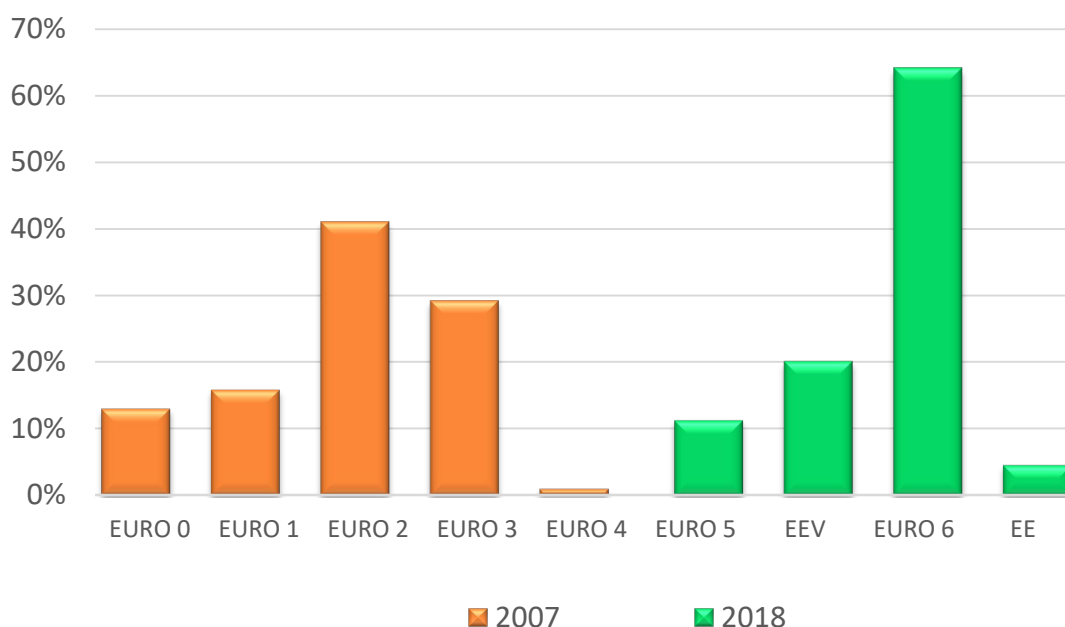


Figure 2. Transition to environmentally-friendly buses in public transport in 2007–18
Chapter 3).

Transport system modernisation: completion of ring road to limit city centre traffic, and transit between cities and districts.

Activities increasing participation of public transport in traffic:

- development of tramlines
- employing rail for transport within the city
- easier access to public transport for residents
- restrictions on private car traffic (e.g. limited emissions zone)
- restrictions on private car parking.

(See: chapter 3).

Electromobility

The Municipality and its utilities pledge that 10% of their fleet will be electric vehicles in 2020, and 30% in 2025. The share of zero-emission buses in public transport: 5% in 2021, 10% in 2023, 20% in 2025, 30% in 2028. (See: Chapter 3).

Waste management system

A new system was introduced in 2013; main outcomes:

- streamlining organisation and development of selective waste collection
- increasing paper, metal, glass, plastic recycling (42% in 2018)

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- reduction of biodegradable waste (0% in 2018)
- reduction of landfilling (3.74% in 2018)
- informational and educational activities.

(See: chapter 8)

Water and wastewater systems

An extensive campaign promoting drinking tap water helps reduce the number of PET bottles. Water recovered from treated waste is used for washing streets, specialist vehicles, rinsing the canals, and internal processes of the incineration plant (cooling, washing, deodorisation). Water recuperation also helps reduce energy consumption. (See: Chapter 9).

Municipal heat system

Modernisation and development of the heating system helps reduce inefficient coal heating and connect new consumers (158 new connections with total power of 59.64MW, and 9470m of heating network constructed in 2018). The municipal heat system uses heat from highly efficient cogeneration and significant effort is undertaken to increase heat sales in winter, mostly by replacing gas heaters with central hot water installations (107 buildings with total power of 14.72 MW connected in 2018). (See: Chapter 11).

Involving citizens

Energy Consulting Centre

The Municipality created a hub staffed by trained experts to offer citizens advice on exchanging sources of central heating and hot water, thermal modernisation of buildings, use of RES, and connection to the heat, gas, and electric networks.

Information about municipal and national support programs is complemented by assistance in completing grant applications; consultancy is often provided for new investments and includes infrared imaging, energy assessment, and consultancy.

Climathon

The goal (1D8) of the Climathon was to involve citizens in climate protection. Krakow has participated in three Climathons, integrating local activist communities. The winning projects included the sustainable organisation of public space in the Kazimierz district using urban prototyping (2016), an app listing the benefits of an active lifestyle: car/public transport, car/bike, lift/stairs (2018), and development of rain



Figure 3. Climathon



gardens (2018).

Social dialogue

Civic participation in the form of social dialogue supports the development of the city and participatory democracy. Krakow has multiple consulting and advisory bodies, including some for seniors. The dialogue structure involves sectoral bodies, NGOs, and specialised units of the Municipality. The sectoral Commissions for Civil Dialogue (KDO) consult draft acts of the Krakow City Council and other documents, define citizens' needs, and cooperate with similar bodies. Currently, Krakow runs 8 commissions: for the revival of Nowa Huta, culture, environment, health, people with disabilities, security, youth, and countering addictions.

Komunikat archiwalny

Młodzież i miasto razem dla klimatu

czwartek, 11 lipca 2019 r.

A A A 🔊

11 lipca magistrat odwiedzili krakowscy przedstawiciele Młodzieżowego Strajku Klimatycznego. Spotkali się z zastępcą prezydenta miasta ds. edukacji, sportu i turystyki Anną Korfel-Jasińską oraz z urzędnikami odpowiedzialnymi za ochronę środowiska, jakość powietrza, gospodarkę odpadami, partycypację społeczną i edukację. Podczas wielowątkowej dyskusji wspólnie z urzędnikami zastanawiali się, jak we współpracy z miastem mogą realizować swoje postulaty.



Figure 4. Social dialogue: meeting with citizens

1C. Future Plans

Describe the future short and long term objectives and proposed approach for further emissions reduction. Describe planned measures, including timescales and emphasise to what extent plans are supported by commitments, budget and staff allocations and monitoring and performance evaluation schemes.

Make reference to any long-term strategy employed and how it is integrated with other environmental

areas.

Briefly explain the rationale for choosing these future measures and highlight any innovative financing arrangements.

(max. 800 words and five graphics, images or tables)

New energy and climate plan

Emission monitoring results clearly show that the current CO₂ reduction strategy is unsatisfactory. The cautiously conservative national policy does not favour rapid energy and climate transformation, and Krakow is aware of the global challenges and the need to change its current policies. After the 2018 IPCC Report, the UN biodiversity report, and the latest IPCC report, citizens increasingly expect quick action, causing Krakow's ambitions to reach far beyond national goals.

The emissions strategy will be developed in international cooperation, and follow best European practices. Krakow's transformation towards climate neutrality will be supported in the Deep Demonstrations project (1D8) conducted by Climate-KIC (1D8) and financed by the European Institute for Innovation and Technology. A measure of the city's ambitions is the goal to become climate neutral by 2030. With the low starting point and the constraints described in 1A, the goal is difficult to achieve as time is short.

However, activities are underway: a series of workshops for diagnosing the starting point and identifying bottlenecks is planned for 2019, and all stakeholders will be invited to start work on the suggested solutions. Six action packages are planned for 2020:

- climate transformation strategy
- involvement and activation of residents and entrepreneurs
- development of business models for transformation to climate neutrality
- finance planning
- experimental introduction of transformation solutions.
- project management.

The project will be conducted with Urban Workshop, Global Covenant of Mayors, Democratic Society, Dark Matter Labs, Material Economics and Bankers Without Boundaries, and continued in subsequent years.

Involving citizens

Krakow also cooperates with InnoEnergy, a knowledge and innovation community, and has signed a memorandum of understanding with the Better Energy for Cities project to remove a key barrier to climate transformation, namely involvement of citizens and entrepreneurs who are jointly responsible for 93% of CO₂ emissions. Planned action packages include:

- multichannel marketing campaigns using the city's advertising potential to optimise the message for targeted groups of the region's residents
- educational programme developing energy-related behaviours of schools, using innovative solutions based on gamification
- development of a comprehensive and easy-to-understand commercial offer allowing citizens to compare standardised energy transformation offers
- examination of current regulatory and administrative duties from a resident's point of view
- involvement of commercial partners in the project.

Activities planned in the heating and cooling sector

In the first subsector, activities are focused on switching to low emission heat cogeneration sources,

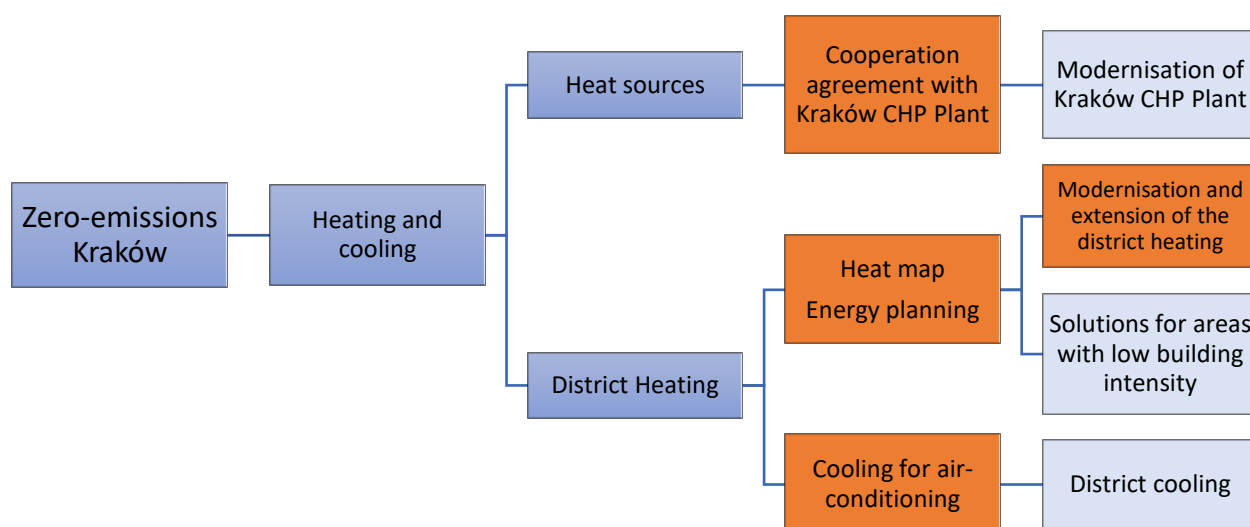
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modernisation and extension of the municipal heating network, energy planning, and expanding the services of the district heating network management company (MPEC) to include provision of cooling, and heating of dispersed settlements.

Another subsector focuses on individual sources and buildings. Planned activities include development of shallow geothermal sources based on the GeoPLASMA-CE project (1D10), development of districts with positive energy balance based on the ATELIER project (1D11), involvement of residents in the development of consumer attitudes to energy and thermal modernisation of buildings, and promotion of zero-energy developments.

A special package of actions is planned for the municipal building subsector: introduction of advanced energy consumption management, and fundamental thermal modernisation of buildings. EFFECT4buildings (1D12) will provide innovative solutions for financing the latter.

Figure 1. Outline of (current and planned) activities in heating and cooling: district heating sector



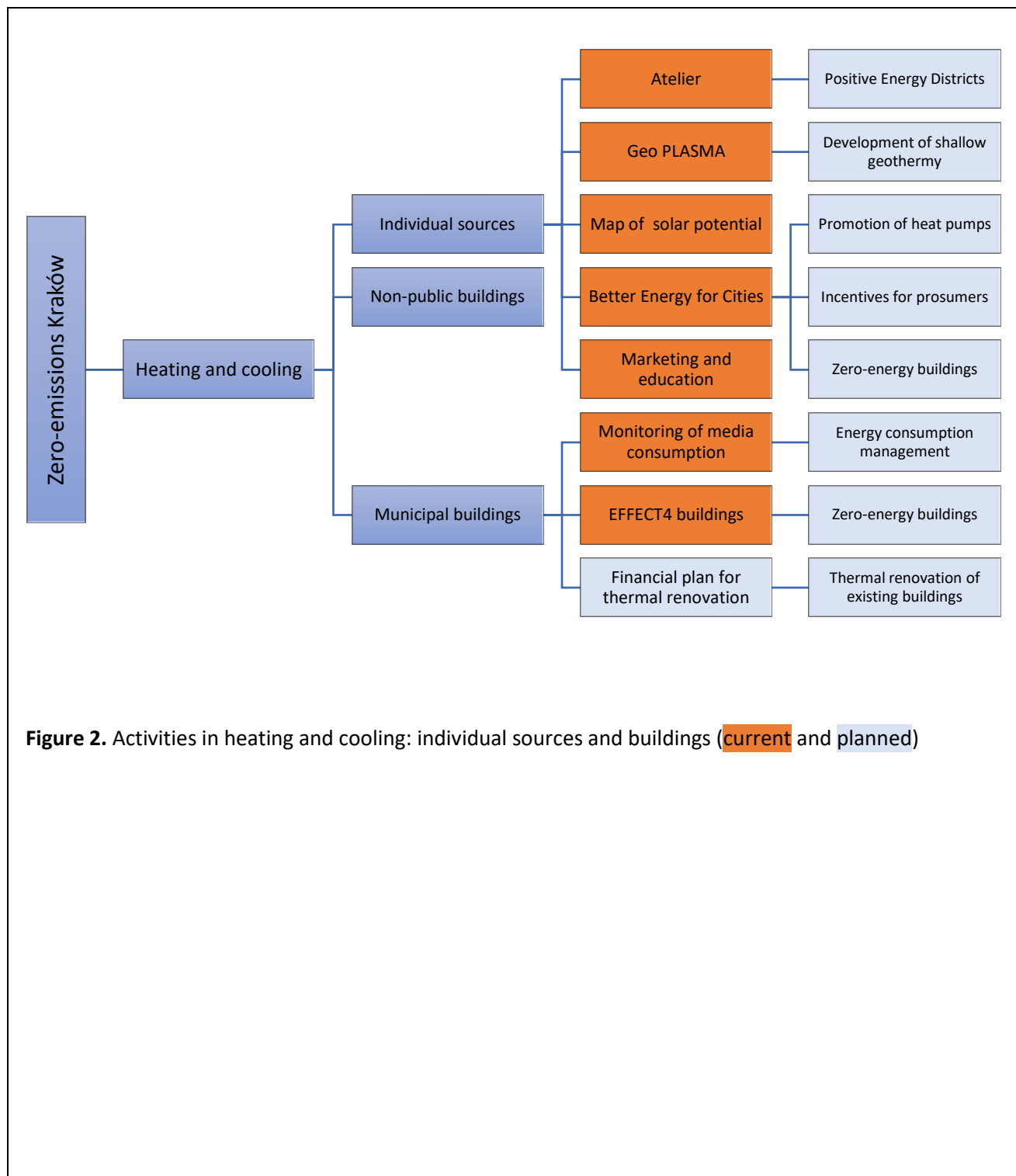


Figure 2. Activities in heating and cooling: individual sources and buildings (current and planned)

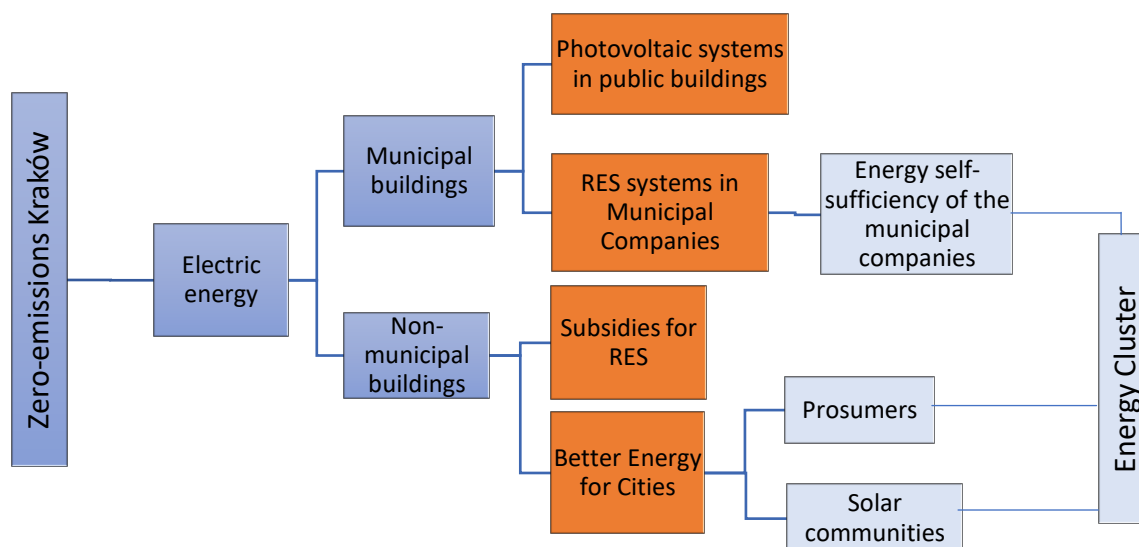


Figure 3. Activities in electricity production sector (current and planned)

Planned activities in circular economy sector

The Circular Cities project includes drafting the analysis of resource and product flow for Krakow, long-term zero waste strategy, and activity plans for selected economic sectors.

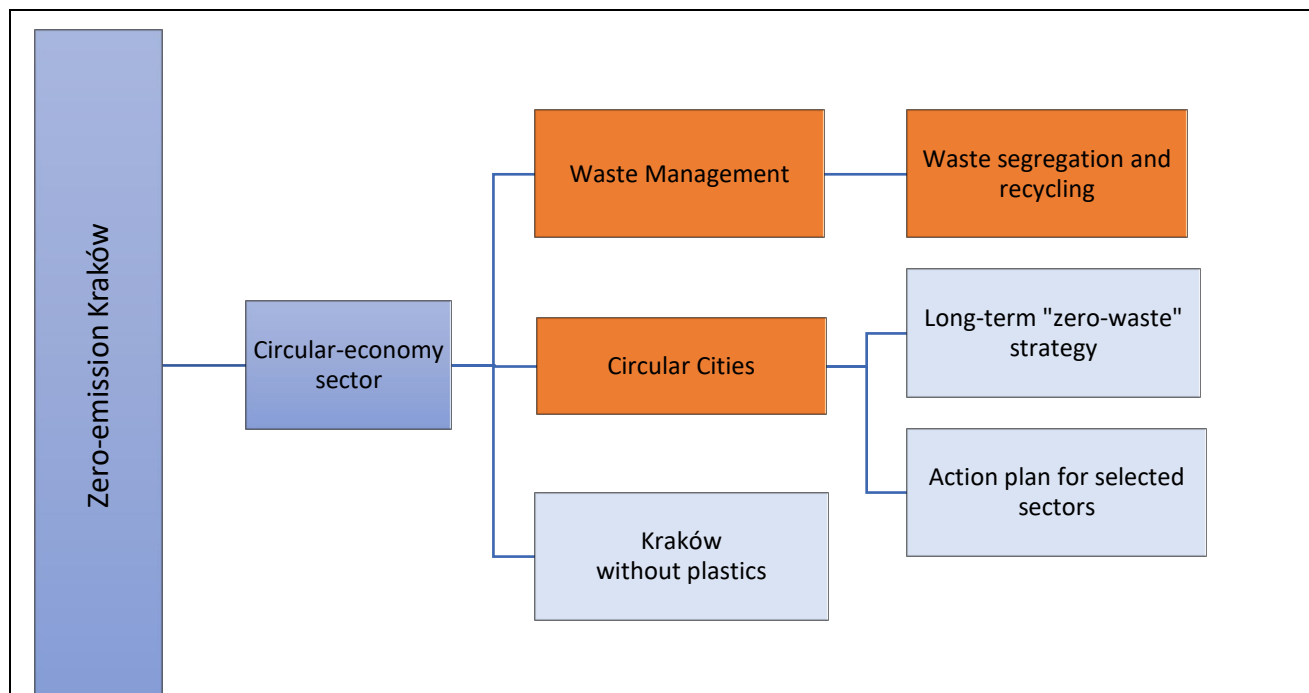


Figure 4. Activities in circular economy sector (current and planned)

1D. References

List supporting documentation, adding links where possible. Further detail may be requested during the pre-selection stage. Documentation should not be forwarded at this stage.

(max. 400 words)

1. Low Carbon Economy Plan (PGN) for Krakow, (2018 update; in Polish)
https://www.bip.krakow.pl/?dok_id=167&sub_dok_id=167&sub=uchwala&query=id%3D23736%26typ%3Du
2. Statistics Poland (in Polish)
3. Polish Energy Policy to 2040 (PEP2040, in Polish)
https://www.gov.pl/documents/33372/436746/PEP2040_projekt_v12_2018-11-23.pdf/ee3374f4-10c3-5ad8-1843-f58dae119936
4. National Energy And Climate Plan for 2021–30 (draft, in English)
<https://www.gov.pl/web/energia/draft-of-national-energy-and-climate-plan-for-the-years-2021-2030>
5. Current situation and forecasts for existing policies and measures (as of end of 2017) Attachment 1 to National Energy And Climate Plan for 2021–30 (in Polish)
<https://www.gov.pl/attachment/1e68d07b-94a4-4a0f-9629-d798131db92a>
6. Assessment of impact of planned policies and measures. Attachment 2 to National Energy And Climate Plan for 2021–30 (in Polish)
7. Reducing Low Emissions in Krakow Programme

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- https://www.bip.krakow.pl/?dok_id=105326
8. Climathon
<https://aerisfuturo.pl/climathon-2017-agenda/>
 9. Deep Demonstrations
<https://www.climate-kic.org/>
 10. Interreg Central Europe GeoPLASMA-CE project
<https://www.interreg-central.eu/Content.Node/GeoPLASMA-CE.html>
 11. Horizon 2020 ATELIER project
<https://projects.interreg-baltic.eu/projects/effect4buildings-114.html>
 12. Interred Baltic Sea EFFECT4buildings project
 13. Circular Cities project

Word Count Check

Please complete the below word count check for Indicator 1: Climate Change: Mitigation, Sections 1A, 1B and 1C.

As per the Guidance Note (Annex 2 of the Rules of Contest), the word count includes text in graphics/tables and the body of text. The word count excludes text in the original application form, captions and text in Table 1: Benchmarking Data - Climate Change: Mitigation.

Section	Number of words in graphics/tables	Number of words in body of text	Total number of words in graphics/tables <u>and</u> body of text	Max. words
1A	0	548	562	600
1B	165	1027	1192	1,200
1C	0	547	547	800

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2. Climate Change: Adaptation

Refer to Section 2.2 of the Guidance Note

2A. Present Situation

Please, complete the following table with most recent data available:

Table 1: Benchmarking Data - Climate Change: Adaptation

**double left click the check box and select 'Default Value - Checked' where appropriate*

Systematic climate risks and vulnerabilities assessment					
<input checked="" type="checkbox"/> Existing	If yes, year it was or will be finished:	[2018]	Considers:	<input checked="" type="checkbox"/> Heat	<input checked="" type="checkbox"/> Current climate risk
<input type="checkbox"/> In preparation		[.....]		<input checked="" type="checkbox"/> Droughts	<input checked="" type="checkbox"/> Future climate risks
<input type="checkbox"/> None				<input checked="" type="checkbox"/> Floods	<input type="checkbox"/> Sea level rise

Climate change adaptation strategy					
<input checked="" type="checkbox"/> Existing	If yes, year it was approved or will be finished:	[2019]	It is:	<input checked="" type="checkbox"/> A stand-alone strategy	
<input type="checkbox"/> In preparation		[.....]		<input type="checkbox"/> Integral part of another strategy	
<input type="checkbox"/> None					
Considers:					
<input checked="" type="checkbox"/> Heat	<input checked="" type="checkbox"/> Floods	<input checked="" type="checkbox"/> Current climate risks			
<input checked="" type="checkbox"/> Droughts	<input type="checkbox"/> Sea level rise	<input checked="" type="checkbox"/> Future climate risks			

Action plan for climate change adaptation					
<input type="checkbox"/> Existing	If yes, year it was approved or will be finished:	[.....]	It is:	<input checked="" type="checkbox"/> A stand-alone plan	
<input checked="" type="checkbox"/> In preparation		[2020]		<input type="checkbox"/> Integral part of another plan	
<input type="checkbox"/> None					
Considers:					
<input checked="" type="checkbox"/> Heat	<input checked="" type="checkbox"/> Floods	<input checked="" type="checkbox"/> Current climate risks			
<input checked="" type="checkbox"/> Droughts	<input type="checkbox"/> Sea level rise	<input checked="" type="checkbox"/> Future climate risks			

Showing self-commitment in Europe, nationally or internationally	
<input type="checkbox"/> Signed Covenant of Mayors for Climate and Energy	[...Year]
<input type="checkbox"/> Others	[...list here]

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None

In relation to the above, describe the present state of climate change adaptation in the city. Thereby, include an answer to each of the following questions:

Awareness and Commitment

- How does the city assess the level of awareness on the need to adapt to climate change with different stakeholder groups - administration, politicians, citizens, business etc.?
- How has the city organised the responsibility for adaptation in the administration and established collaboration between different departments?
- Does the political level show commitment and in which way?

Vulnerability and Risk Assessment

- Does the city have a systematic vulnerability and risk assessment to identify and prioritise the future climate change impacts in your city? In addition to the basic information in the table, please provide more detail on the:
 - Identified climate impacts (temperature, different types of flooding, droughts, vulnerability of certain population groups, etc.);
 - Sectors it considered (e.g. transport, water management, health etc.);
 - Identified specific climate challenges for the city.

Climate Change Adaptation Strategy/Action Plan

- Does the city have a climate change adaptation strategy and/or an action plan? In addition to the basic information in Table 1, please provide more detail on the:
 - Status of development/approval/implementation;
 - Relation to overall city planning and other plans and strategies ;
 - The impacts and sectors considered;
 - Targets and milestones set.

Adaptation Measures

- Does the city implement or plan adaptation measures?
- Does the city have a comprehensive adaptation action plan or systematic list of measures?
- Which types of measures does the city consider (technical measures, green and blue infrastructure, soft measures like regulation and behavior)?
- Describe key measures. Reference relevant adaptation measures in other indicator areas and explain how these are designed to support adaptation;
- Do you mainstream measures into other sectors like water management, climate mitigation, green spaces or other to use win-win-options? Please, describe and cross reference to other relevant indicators where appropriate;
- What share of the budget or €/inhabitant is invested in climate change adaptation?

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Participation

- How does the city involve stakeholders, like citizens, other sectors, public and private owners etc. in awareness raising, planning and implementation?

Monitoring

- How does the city monitor progress in terms of the implementation of measures and of actual reduced vulnerability/risks?

(max. 1,000 words and five graphics, images or tables)

Awareness and Commitment

Krakow's residents are aware of the need to adapt to climate changes. The subject is alive and discussed frequently, with a visible increase in interest following the IPCC special report and COP24 summit in Katowice in autumn 2018. Numerous NGOs and associations lobby for quick and effective action. The need to intensify adaptation is also recognised by the city and national authorities.

Krakow City Council has passed relevant resolutions, especially on flood prevention and water drainage (2D4), air protection (2D8), expansion of green space (2D5) and is preparing documentation for increasing forest cover (2D6).

Vulnerability and Risk Assessment

The vulnerability and risk assessment conducted for Krakow in 2018 as part of the 44 MPA (2D3) national programme was based on a uniform methodology approved for Poland's 44 largest cities. The research included a number of detailed analyses discussed below.

Analysis of climate phenomena and their effects: The assessment of climate changes was based on meteorological and hydrological data from 1981–2015. It also took account of climate change trends to 2030 and 2050 under two GHG emissions scenarios (RCP4.5 and RCP8.5). It identifies the threats facing the city (Figure 1) and defines its degree of exposure.

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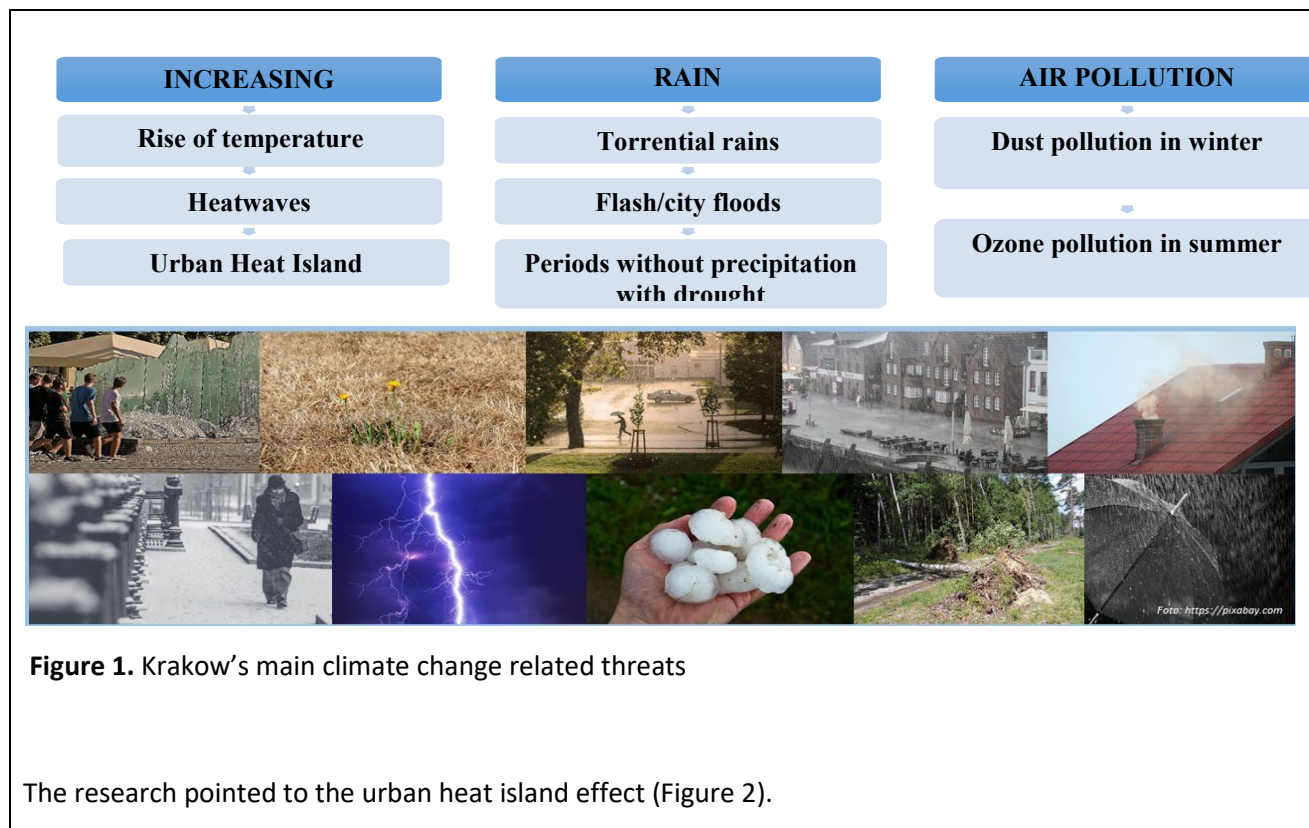
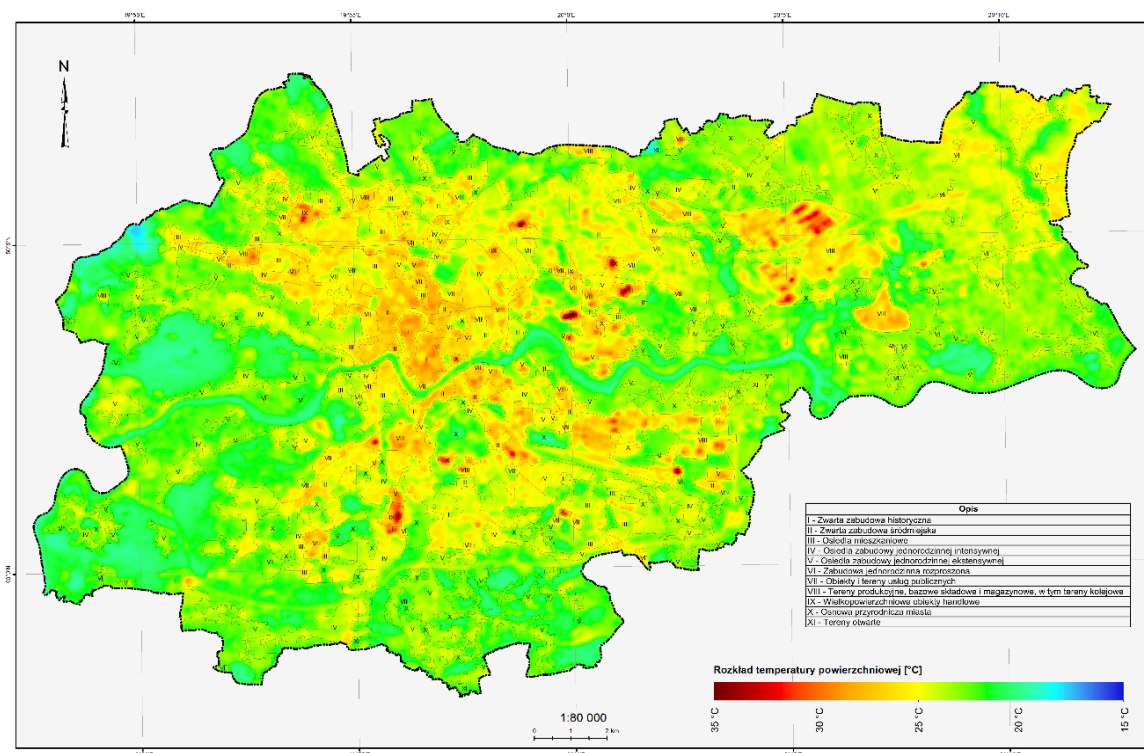


Figure 2. Urban heat island effect in Krakow



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Assessment of city vulnerability to climate change: 17 spatial and economic sectors were analysed, and the four most vulnerable to climate changes (Figure 3) were selected.

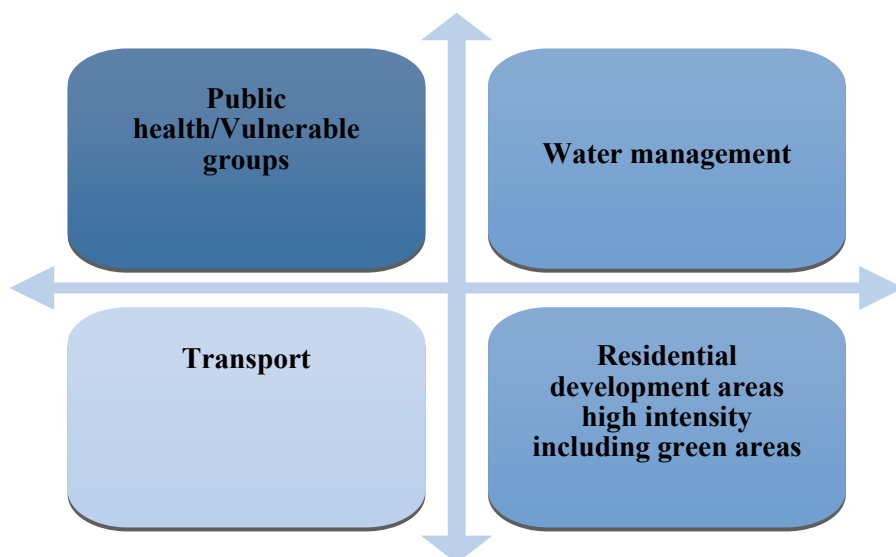


Figure 3. Sectors most vulnerable to climate change.

Assessment of vulnerability to climate change: the assessment, was based on analyses of climate change impact, and assessment of vulnerability and adaptive potential. The assessment allowed components especially susceptible to climate-related factors to be identified.

Assessment of city adaptation potential: the potential was considered high for 5 categories and medium for 3 categories (Figure 4).

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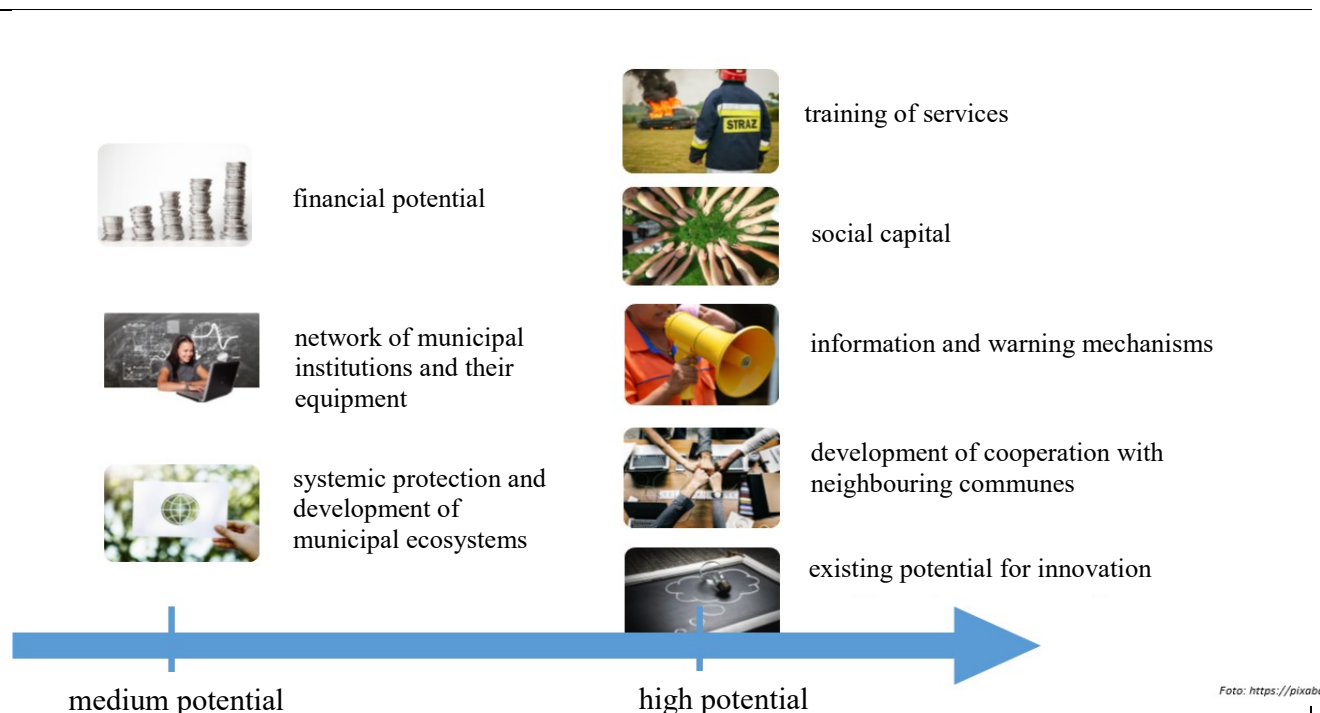


Figure 4. Krakow's adaptive potential

Risk analysis was based on the probability of those climate events posing greatest risk to the city occurring, and their potential impact. It points to those components in vulnerable sectors for which adaptive activities will have the highest priority (Figure 5).

Sector	Component	Climate-related phenomena and their derivatives										
		temperature						precipitation			air	
		maximum temperature	heatwaves	cold snaps	transition temperature	No. of days with -5°C < mean temp. or < 2.5°C with precipitation	urban heat island	torrential rains	river flooding	flash/city floods	concentration of air pollution	winter smog
health/vulnerable	city population			2			2					2
	65+			2								
	children under 5			2			2					

individuals with chronic illnesses (cardiovascular, respiratory)	individuals with chronic illnesses (cardiovascular, respiratory)			2							
	people with disabilities			2			2				2
	homeless						2				2
	healthcare infrastructure			2							2
	social care infrastructure										
transport	rail subsystem					2					
	road subsystem			2							
	air subsystem										
	water subsystem: inland waters							2			
	municipal public transport subsystem				2						
water management	water supply subsystem							2			
	wastewater management subsystem										
	flood prevention infrastructure							2			
developed areas	dense historical developments			2							
	dense city centre developments			2							
	residential settlements: contemporary block developments						2				

Risk black, low medium high very high

Figure 5. Risk assessment in individual sectors

Climate Change Adaptation Strategy

The vulnerability and risk assessment provided the basis for the Climate Change Adaptation Strategy 2030 (CCAS, 2D2). The document is part of the municipal strategy, which will be approved by Krakow City Council in autumn 2019. Its main goal is to increase and use the adaptive potential of the city to protect quality of life, and allow further sustainable development in the face of climate change.

The CCAS results from a key document, the Krakow Development Strategy to 2030 (2D1). It defines courses of action intended to increase the city's resilience to climate change.

CCAS is implemented through sectoral programmes, including:

- Environmental Protection Programme (2D7)

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- Low Emissions Reduction Programme (2D8)
- Municipal Healthcare Protection Programme (2D10)
- Directions for Development and Management of Green Spaces in Krakow (2B5)
- County Programme for Increasing Forestation (2D6).

Adaptation Measures

CCAS distinguishes 86 specific adaptive measures, including:

- organisational measures to update strategic and planning documents, and implement and adapt processes
- technical actions: investments in infrastructure and environment
- informational and educational activities.

The estimated adaptation costs by 2030 are PLN8 billion (€1.8 billion), some 7% of the city's annual budget. The parallel social, environmental, and economic gains are estimated at PLN25.8 billion (€6 billion). Most measures are already included in the Long-Term Financial Forecast for Krakow (2D11) and the investment plans of stakeholders such as Państwowe Gospodarstwo Wodne Wody Polskie (2D12).

Participation

Stakeholders are involved in adapting the city to climate change at multiple levels, whether via informational, educational or promotional activities, public consultation, subsidies, or administrative decisions.

The planning process involves public consultation and participation in the development of zoning/master plans, definition of constraints (e.g. protection of biodiverse areas), and preservation of green space. The Municipality conducts informational and educational campaigns, and uses grants encouraging rainwater retention.

Stakeholders are also involved through administrative decisions, e.g. mandatory inclusion of rainwater storage in construction permits.

Monitoring

Implementation of CCAS activities is monitored in real-time by the municipal reporting and supervision system. The assessment of the degree of adaptation is ongoing and based on the monitoring of sectoral indicators of progress. Regular evaluation allows reaction to inconsistencies between the actual state and the intended results.

2B. Past Performance

Describe the city's situation of climate change adaptation five to ten years ago and how the action evolved over time to reach the present situation. Which climate and adaptation challenges was the city facing, how did the city overcome these and what actions were taken? Use the questions under Section 2A as a guide to formulate the response.

(max. 800 words and five graphics, images or tables)

The Municipality's previous actions to adapt to climate change are described below for individual sectors.

Water and wastewater management: Water and Wastewater Management project.

The project started in 2005 and its main goal is the organisation of water and wastewater management in Krakow and the surrounding area, improving the condition of technical infrastructure, and increasing service accessibility. Its implementation helped protect the natural environment, and improved both the standard and comfort of life. Currently, 99.5% of Krakow residents have access to municipal mains water and 98.8% can connect to the wastewater network. Opinions on drinkable water improved significantly, with 81% of residents satisfied with its quality in 2018 compared to only 56.5% in 2014.

Kraków tap water came second (only to Singapore) in a ranking conducted in multiple countries by European Benchmarking Co-operation.

For information on water and wastewater network development, see Chapter 9.

Development of blue infrastructure

Construction and modernisation increased access to bathing sites, swimming pools, and water fountains, while water curtains are installed when needed. There are 18 water fountains and over 100 drinking water bowsters in Krakow, as well as 330+ wells used in emergencies. During heat waves, additional drinking water points are installed at spots popular with locals and tourists (both fountains and bowsters).



Figure 6 Blue infrastructure in Krakow.

Flood prevention and water drainage in the city

Flood Risk Management Plan (2016): its main goal is to limit the potential negative impact of flooding on human life and health, the environment, cultural heritage, and businesses, by minimising the identified threats. It provided the basis for drafting and approval of City Council Resolution 3043/18 (2D4) on the Plan for Limiting Flood Impact and Drainage of Krakow.

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Maps of Flood Risk (2015): show areas with a defined probability of flooding or vulnerable to flooding in the event of damage to or destruction of flood embankments (Figure 7). They calculate the cost of such damage, and identify buildings and infrastructure vulnerable to flooding with a specific probability.

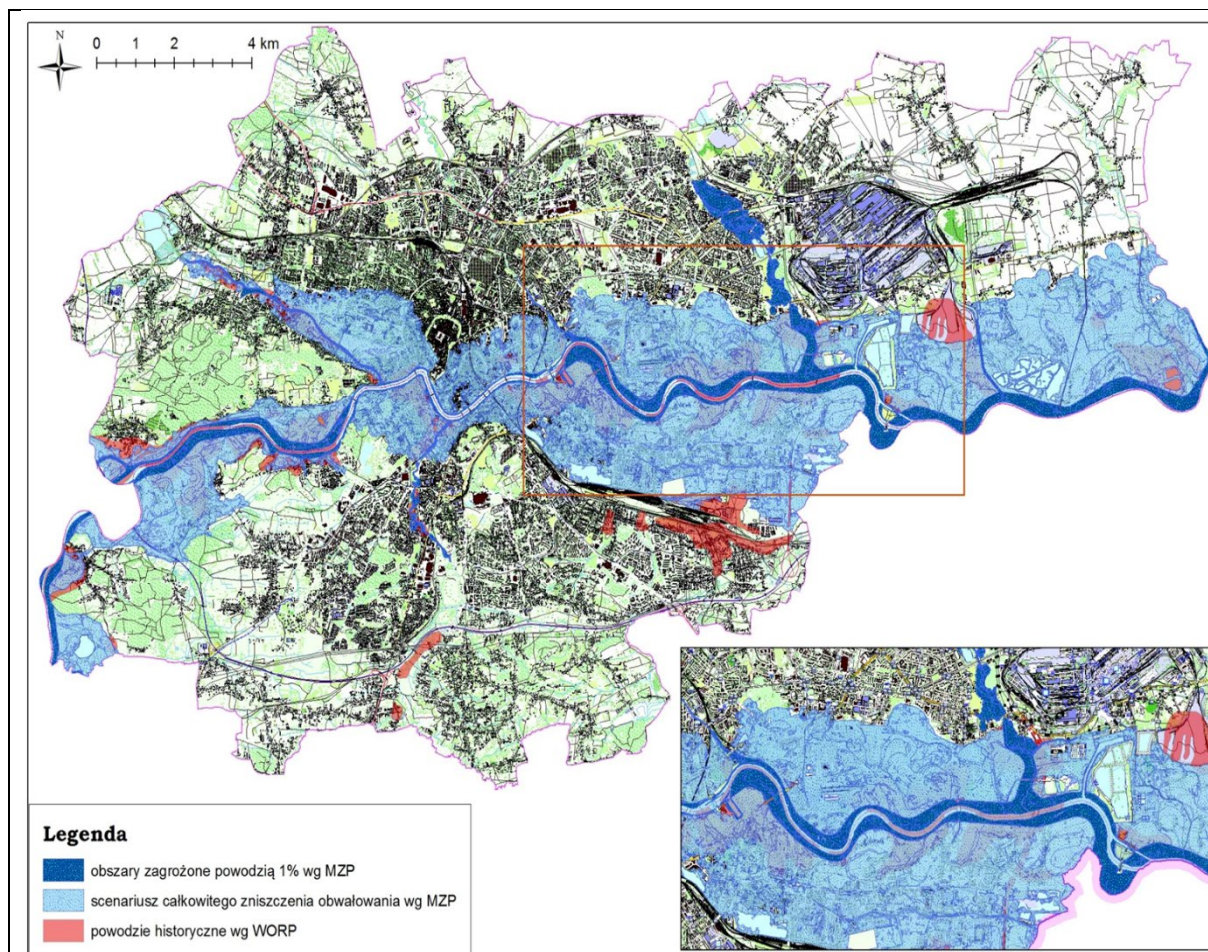


Figure 7 Flooding risks in Krakow.



Figure 8 Biezanów retention pond

2C. Future Plans

Following on from the present situation described under Section 2A, describe the future short and long term objectives and proposed approach for further 'climate-proofing' and adaptation to the impacts of climate change. Describe planned measures, including timescales, and emphasise to what extent plans are supported by commitments, budget and staff allocations, participatory approaches and monitoring and performance evaluationschemes.

Make reference to any long-term strategy employed and how it is integrated with other environmental areas.

Briefly explain the rationale for choosing these future measures and highlight any innovative financing arrangements.

(max. 800 words and five graphics, images or tables)

Implementing CCAS

Team

Implementation of adaptation measures will be coordinated by the Steering Committee chaired by the Deputy Mayor, with the participation of representatives of municipal departments and city utilities.

Financing

The adaptation costs to 2030 mentioned in 2A (PLN8 billion/€1.8 billion) will be partially covered by the city's budget and partially from external funds.

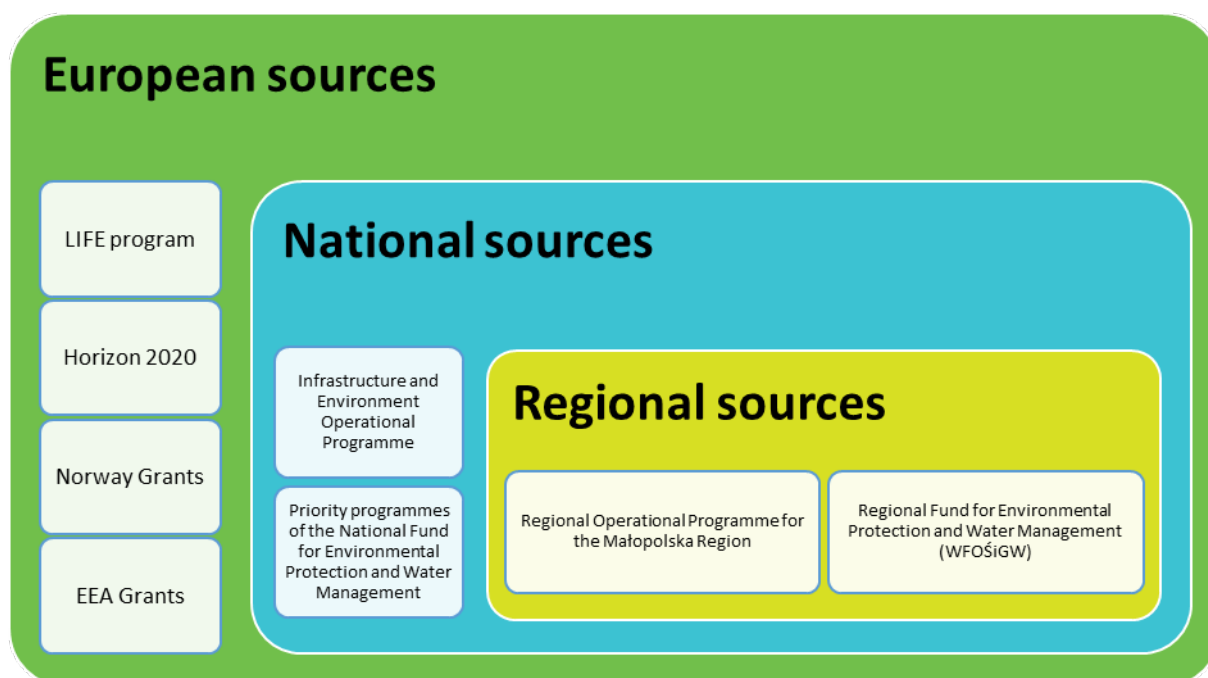


Figure 11. Planned external sources of financing of the adaptation tasks

Monitoring and assessment of results

Ongoing evaluation of CCAS is planned with the help of product and result indicators available in the city's reporting and supervisory system, and ex-post at the mid and end points (at six-year intervals).

2D. References

List supporting documentation, adding links where possible. Further detail may be requested during the pre-selection phase. Documentation should not be forwarded at this stage.

(max. 400 words)

- 1) Krakow Development Strategy to 2030 (KDS2030)
https://www.bip.krakow.pl/?dok_id=94892
- 2) Climate Change Adaptation Strategy 2030 (CCAS)
https://www.bip.krakow.pl/?dok_id=114317
- 3) 44 MPA Programme: development of climate change adaptation plans in cities of over 100,000 inhabitants
<http://www.44mpa.pl/>
- 4) Krakow City Council Resolution No. 3043/2018 of 7 November 2018 on the implementation of Reducing Flood Impact and Drainage in Krakow
https://www.bip.krakow.pl/?dok_id=167&sub_dok_id=167&sub=uchwala&query=id%3D23777%26typ%3Du
- 5) Directions for Development and Management of Green Spaces in Krakow for 2017–30
http://www.bip.krakow.pl/?dok_id=115159
<http://www.bip.krakow.pl/zalaczniki/dokumenty/n/251065/karta>
- 6) County Programme for Increasing Forestation in Krakow in 2018–40 (draft)
https://zsm.krakow.pl/images/pliki/nowe_lasy/koniec/Program_PPZL.pdf
- 7) Krakow City Council Resolution No. LXI/863/12 of 21 November 2012 on the approval of the Environmental Protection Programme for Krakow for 2012–15 including tasks completed in 2011 and the perspective for 2016–19
https://www.bip.krakow.pl/?dok_id=53605
- 8) Low Emissions Reduction Programme for Krakow
https://www.bip.krakow.pl/?dok_id=105326
- 9) Sustainable Public Transport Development Plan for Krakow and the neighbouring communes that signed public transport agreements with the Municipality of Krakow
https://www.bip.krakow.pl/?sub_dok_id=57922
- 10) “Zdrowy Kraków” Municipal Healthcare Protection Programme 2019–21
https://www.bip.krakow.pl/?dok_id=110906
- 11) Long-Term Financial Forecast for Krakow and Long-Term Krakow Investment Plan
https://www.bip.krakow.pl/?dok_id=104881
- 12) Państwowe Gospodarstwo Wodne Wody Polskie state utility – Flood Risk Management Plan
<https://www.kzgw.gov.pl/index.php/pl/materialy-informacyjne/plany-zarzadzania-ryzykiem-powodziowym>
- 13) Krakow programme for small-scale rainwater retention
https://www.bip.krakow.pl/?dok_id=106464
- 14) Medical Daycare Centre in Krakow
<https://mco.krakow.pl/dzienny-dom-opieki-medycznej-w-krakowie-1/>
- 15) Krakow City Council Resolution No. CVIII/2837/18 of 29 August 2018 on changing Resolution

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LXXIII/1763/17 of 31 May 2017 on the introduction and implementation of Krakow for “D” Families programme

https://www.bip.krakow.pl/?dok_id=167&sub_dok_id=167&sub=uchwala&query=id%3D23563%26typ%3Du

16) Krakow Centre for Information and Support for Carers of the Disabled

<https://wsparciekrakow.pl/>

17) GRAD – green roofs as a tool for climate change adaptation for urban areas

<http://www.strategiezielonychdachow.eu/pl/o-projekcie>

Word Count Check

Please complete the below word count check for Indicator 2: Climate Change: Adaptation, Sections 2A, 2B and 2C.

As per the Guidance Note (Annex 2 of the Rules of Contest), the word count includes text in graphics/tables and the body of text. The word count excludes text in the original application form and captions.

Section	Number of words in graphics/tables	Number of words in body of text	Total number of words in graphics/tables and body of text	Max. words
2A	194	694	888	1,000
2B	0	752	752	800
2C	80	573	653	800

3. Sustainable Urban Mobility

Refer to Section 2.3 of the Guidance Note

3A. Present Situation

Please complete the following table providing the most recent data that is available:

Table 1: Benchmarking Data - Sustainable Urban Mobility

Indicator	Data		Units	Year of Data Provided
Proportion of population living within 300 metres of an hourly (or more frequent) public transport service	85		%	2019
For all journeys under 5 km, proportion of these journeys undertaken by:	Car	33,7	%	2013
i) Car;	Public Transport	36,3		
ii) Public transport;	Cycling	0,3		
iii) Bicycle;	Foot	28,4		
iv) Foot;	Multimodal	1,2		
v) Multimodal (active/shared mobility + public transport);	Other	0,1		
vi) Other.				
Proportion of buses operating in the city that are:	Low emission	63,3	%	2019
<ul style="list-style-type: none"> Low emission (at least Euro VI); and Alternatively fuelled (electric, hydrogen, LNG etc.) 	Alternatively fuelled	9,3		

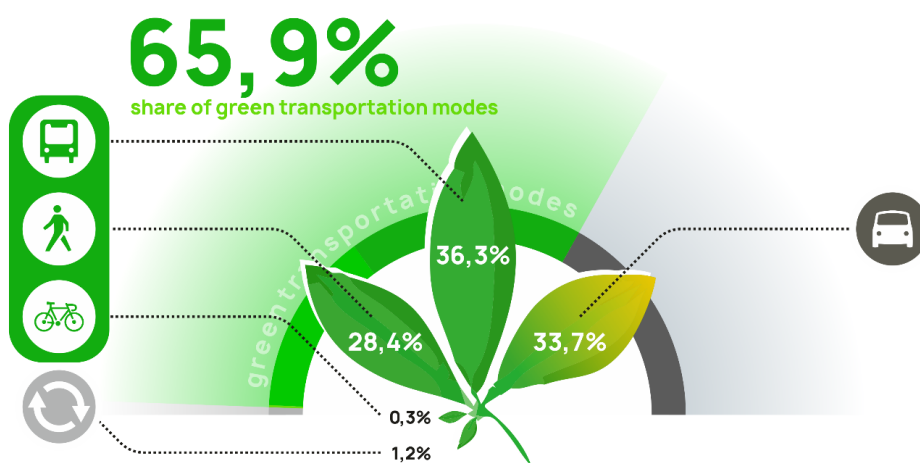


Figure 1 Modal split in Krakow 2013

Welcome

Many of Krakow's citizens want to shape the city into a precursor of global trends and innovations while respecting its 1000-year tradition and cultural heritage.

Krakovians' mobility follows global trends, and migration to the suburbs in search of calmness and "their own garden" generating additional car trips (some 200,000 non-transit vehicles enter Krakow daily). On the other hand, the raising awareness of people moving into the new estates and memories of a car-free city legitimises the Municipality's ambitious actions to reduce the negative impact of road traffic. Growing motorisation confirms Poles' infatuation with cars, a fetish from communist times when cars represented economic success. Despite this, the proactive efforts of many residents and the city authorities means the breakdown of travel by means of transport remains balanced, with a majority, nearly 66%, being on foot, bike, or public transport (PT).

Current strategic programmes

Krakow is enacting ambitious strategic plans, primarily the Transport Policy (2016–25), frequently incorporating the new SUMP concept. Moreover, as a partner in the CH4LLENGE (2013–16) EU project, Krakow is actively developing the SUMP methodology and, as part of the process, has assessed its transport system, listed the strengths and opportunities of planning processes, analysed the main development threats and opportunities, identified potential stakeholders, development scenarios, and different visions, objectives and priorities.

Public transport

PT in Krakow uses only zero-emission trams (light railway) or buses complying with at least the EURO 5 norm, which is absolutely unique in the world. Our 391 trams and 646 buses (73% are low- (Euro6) or zero-emission) operate daily on 173 lines [2,3].

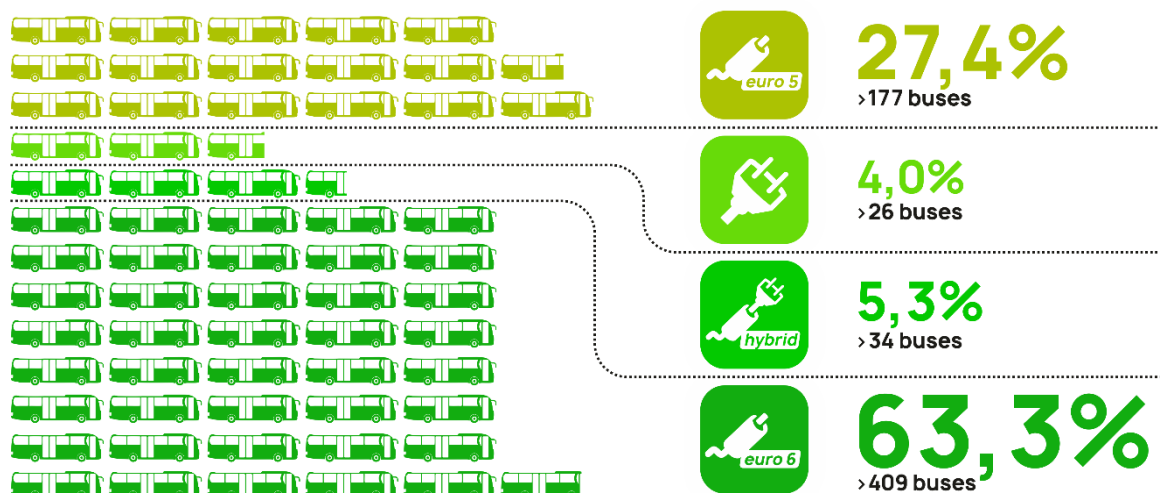


Figure 2 Share of EURO 5, EURO 6 and alternatives fuels bus fleet in Krakow PT buses

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Krakow trams are synonymous with environmental friendliness, recuperating enough energy to satisfy the annual electricity demand of 8300 households. Krakow launched Poland's first fully electric bus route. Over 85% of residents have access to PT operating at least once every 30min, which is minimum service standard in Krakow.

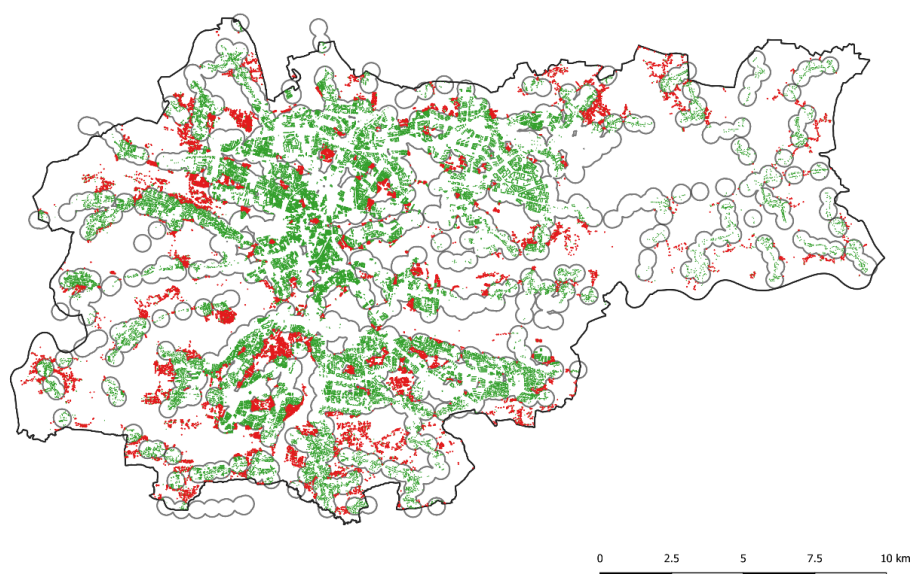


Figure 3 City areas with full access to PT services (green colour)

PT is a priority in the city centre. The first ring-road was redeveloped from four lanes of traffic to tram and bus lanes, one general lane, and a bicycle contraflow, making it the symbol of change in Kraków and winning the city the Civitas Transformation prize 2016. Traffic reduction has exceedingly high support with over 80% citizens expecting restrictions in the centre.

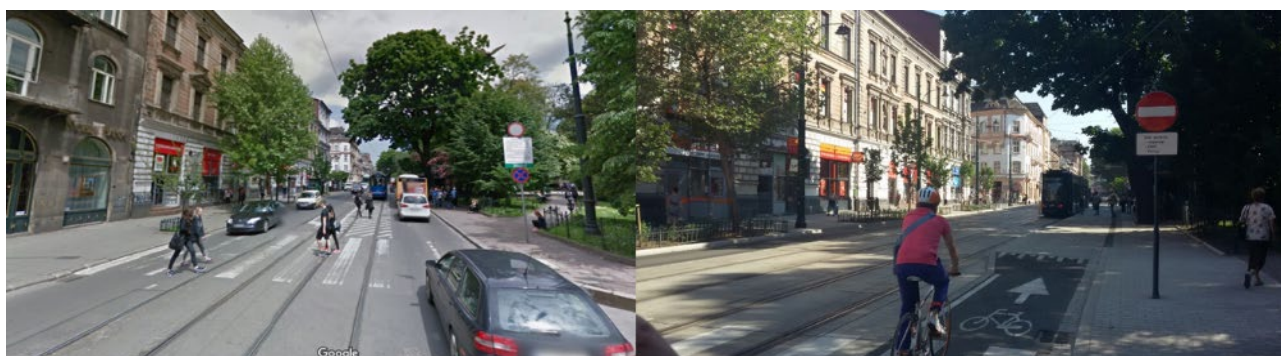


Figure 4 First ring-road before and after redevelopment

Walkability and cycling

Residents love to walk (28% of trips in the city) and, having access to 230 km of cycle paths, increasingly often choose biking [7]. This boosted bike traffic in key corridors by 30%, as attested by several counters assembled on cycle paths. This switch is confirmed by data from the city's Wawelo cycle hire scheme, whose users covered almost 4million km over 1million trips on the blue bikes in 2018. This represents nearly 10 trips to the Moon or 91 trips around the Earth [4].

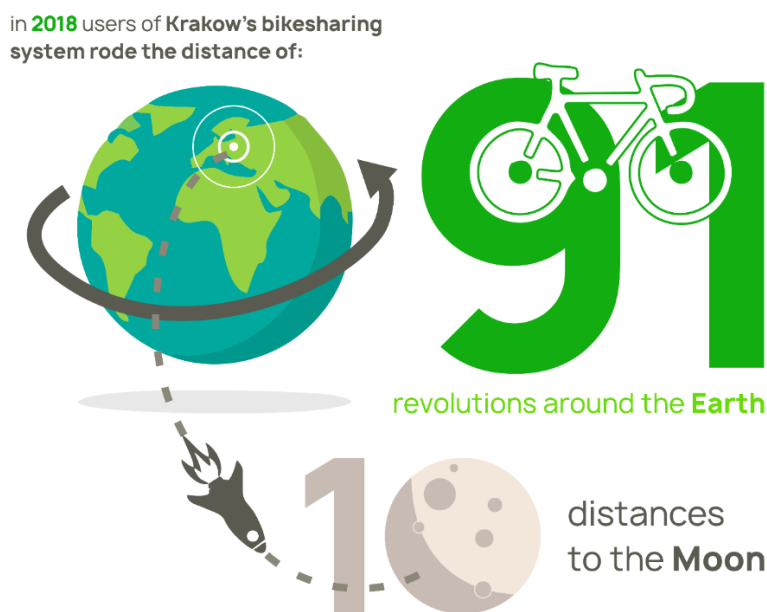


Figure 5 Number and length of bikesharing rides

Bikes are not the only shared vehicles that can be hired in Krakow: commercial car sharing is growing with around 450 vehicles currently available, including hybrid and electric cars(temporary unavailable) that could enter Poland's first Clean Transport Zone [5] created in the Kazimierz district in January 2019.

Krakow, and certainly in its world-heritage centre within the secret Planty Garden, is a pleasant city to live in: a modern one with navy blue trams, buses and bikes and, judging by the smiles and conversations in public squares, also a happy one.

3B. Past Performance

History

Krakow's unique atmosphere was built over the ages by residents and provides the conditions to catalyse change in many areas, including mobility. The objectives for everyday travel always gave rise to a need for better air quality by reducing traffic fumes. The medieval design of the city centre, with narrow streets, restricts space for transport, especially parking. For a city inconveniently situated in a valley that concentrates air pollution, elimination of low-level emissions is essential, even though the whole energy system runs on

coal. This is the reason why the city decided to support zero-emission transport, currently mainly electro-mobility.

Access restriction model

Krakow applies methods to reduce demand for car travel while increasing the range of alternatives, consistently supporting pedestrian and bike traffic.

In 1988, still under communism, Krakow was the first city in Poland and one of the first in Central Europe, to introduce sustainable mobility by creating zones closed to cars or with restrictions.

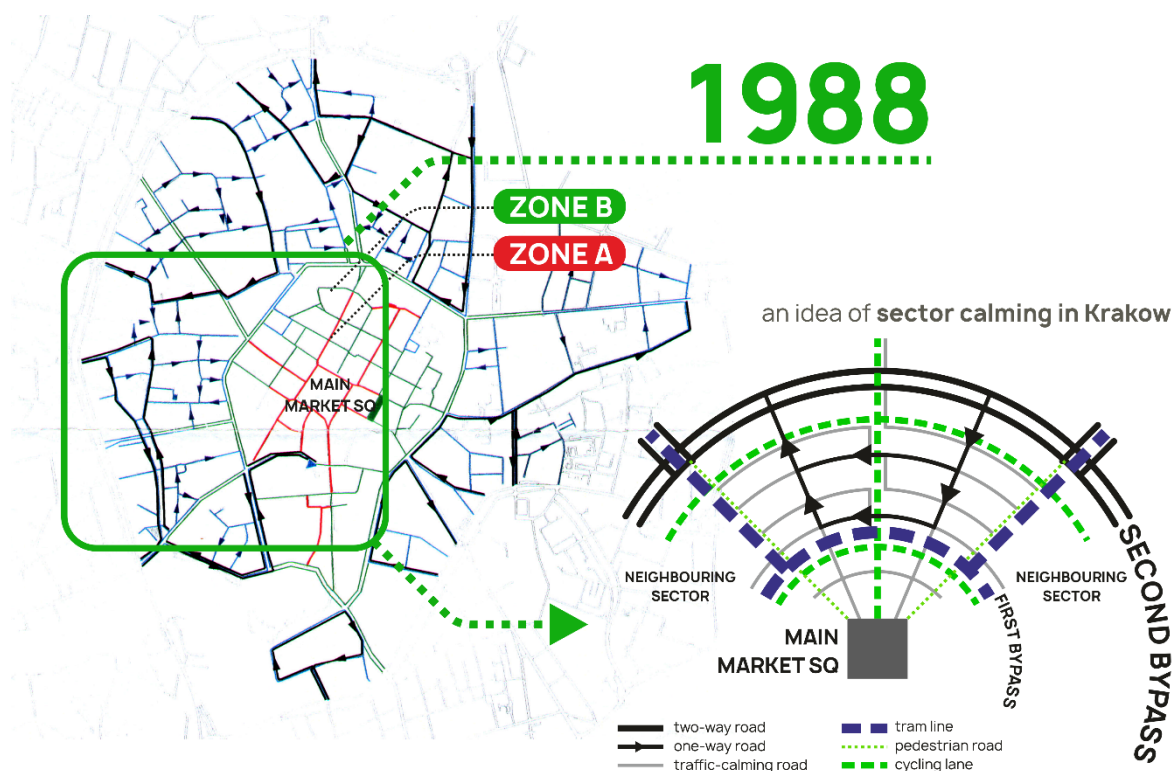


Figure 6 Sectoral traffic organisation in Krakow

Two central zones have been operating in Krakow for 30 years, with Zone A entirely closed to traffic, and Zone B allowing resident and delivery access at specific times. More streets were added to the zones and by 2016, the system of streets closed to general traffic (ca. 3.5km) was the longest in the world, beating even Copenhagen's famous Stroget.

Streets reclaimed from cars and delivered to pedestrians and cyclists, regain their vitality. Opening city centre spaces to pedestrians also facilitates the movement of numerous tourists who visit Krakow every year to admire the heritage of this UNESCO-listed city.

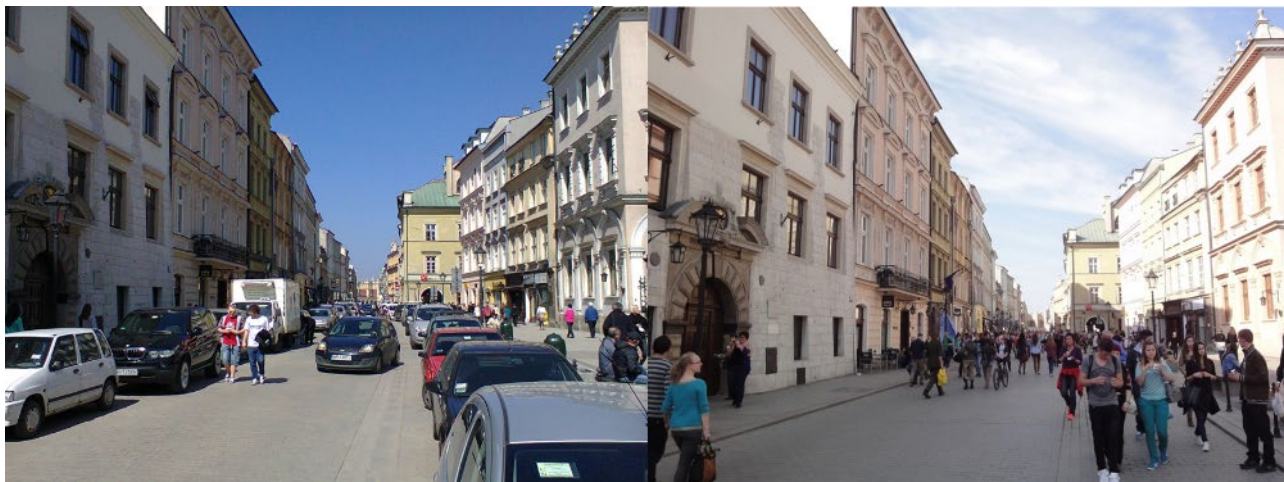


Figure 7 Krakow's high street before and after traffic calming

Krakow is probably the world's only city to have reduced parking spaces in the centre by 20% in just one year (ca. 4000 in 2017) . Public protest against car parking taking over the pavements required a revolutionary change and the complete removal of car parking in 90 streets, and preserving walkways at least 2m wide for pedestrians. That would have been impossible without the city's officials visiting local inhabitants on the streets, conducting dozens of informational meetings and consultations , and devoting hundreds of hours to explaining the reasons for change. Resistance means the successive elimination of car parking spaces progresses in small steps, reinforced by education to change transport behaviour, i.e. selection of alternative and preferred means of transport that are faster and healthier than cars.

A revolutionary paid parking zone was introduced together with a restricted traffic zone, and the latest decision (from July 2019) means it now covers the entire functional city centre.

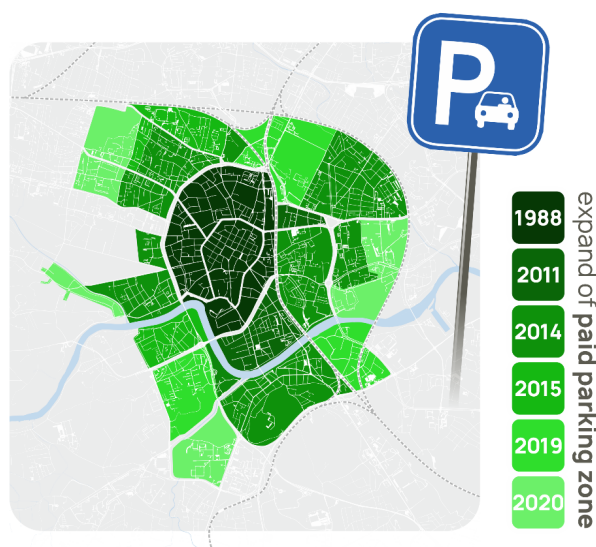


Figure 8 Paid parking zone since 1989

Smart and low-cost traffic management

Krakow has long tried to implement measures favouring pedestrians. The three most important are: switching off all traffic lights inside the second ring-road to reduce pedestrian waiting time at crossings, replacing underground passages with ground level crossings, and improving safety by limiting lanes at zebra crossings.

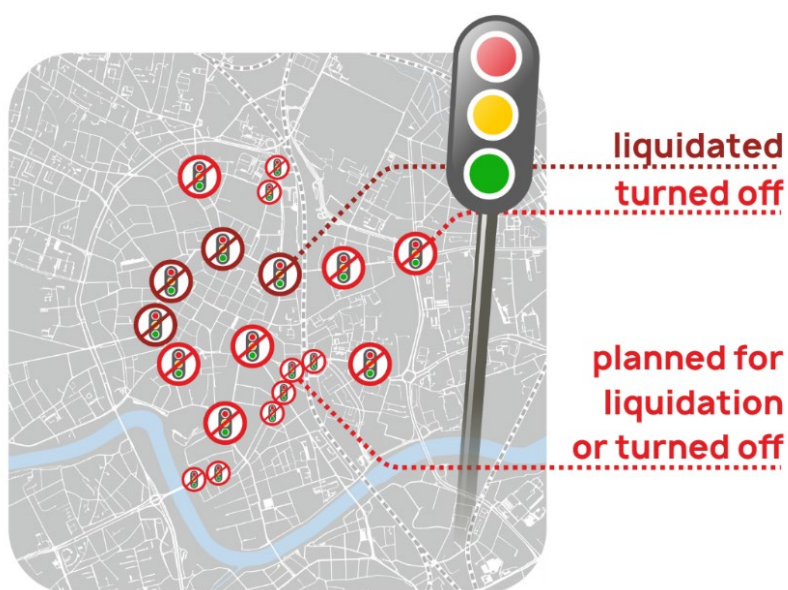


Figure 9 Traffic lights liquidation and turning off

The first time traffic lights were disabled at a central junction was treated with scepticism and fears of accidents and chaos. The fears proved groundless provided certain conditions are met (primarily tram traffic, realistic speed restrictions, and appropriate levels of pedestrian traffic). Moreover, despite appearing slightly chaotic, the flows in all modes (pedestrian, public transport, and passenger cars) are smooth and generate no additional pollution. This solution practically allowed Krakow to eliminate congestion from the first ring-road and other streets in the centre.

The most walkable city in the world

Creating ground level crossings instead of underground passages was symbolic and, quoting Bogota's mayor Penalosa, "showed due respect to pedestrians". Now two most troublesome underground passages in central Krakow have been replaced with level crossings, with only one that is less burdensome thanks to ramps. The fear of congestion generated by such solutions was strong, yet the low-cost paint-based pilot convinced residents, and today no one dreams of returning underground.



Figure 10 Zebra crossing replacing an underground passage

Safety first

Polish roads are infamous in Europe for the danger they pose to unprotected road users. Krakow, eager to leave this ignoble club, attempts to improve pedestrian safety at crossings by introducing measures at dozens of locations. These low-cost solutions most often mean switching from two lanes to one at a crossing, and are the most effective tool for dealing with the sadly numerous drivers who pay insufficient attention at crossings, overtaking others who have stopped to allow pedestrians to pass and causing serious accidents. Removing the second lane at pedestrian crossings is the most effective physical barrier to preventing bad driver behaviour.

The first zero-emission traffic zone in CE Europe

Krakow moves forward, introducing the Transport Policy step-by-step. After a tumultuous session, the City Council approved a Zero-Emissions Zone in the historical but traffic choked district of Kazimierz in December 2018, the first in this part of Europe. It was open only to electric cars and a few cars, e.g. municipal services and, at certain times, deliveries. A vast social (and not only) experiment, it is carefully monitored not only by Krakow's residents but also other cities looking for effective solutions to limit the negative impact of cars on city life.

Despite the problematic conditions caused by the rise in motorisation in Poland over the last 30 years, Krakow has truly transformed towards sustainable mobility, with the process accelerating over the last five years. In setting ambitious strategic goals (transport policy, SUMP) the authorities have successfully and boldly introduced numerous measures, including one of the world's largest restricted traffic zones, the first zero-emission zone in this part of Europe, removing cars from pavements, Poland's first large paid parking zone with appropriate charges. All these put the city among real leaders. As everywhere, some residents support and others oppose the changes, but the sceptics are more and more often convinced by the results that are evident on the city's streets.

3C. Future Plans

The future is now

This is how Krakow plans for the near future. Having reduced the negative impact of road traffic on the life of residents, the Municipality improved air quality further by introducing Poland's first total ban on burning coal and wood for domestic heating on 01/09/2019. With the residents' engagement this bold decision created a recipe for practical success.

With the support of residents, the city has already changed course and knows which path to follow to set even more ambitious goals. World climate crisis enforces rethinking objectives and intensification of activity in local and global environment. We cannot wait any longer or indulge long transitions. Raising awareness of the climate crisis requires convincing residents to change their everyday behaviours and lifestyles, which currently consume too much energy and space.

In mobility, the key is adopting the transport behaviour pyramid, where trips under 1km are always on foot or bike, up to 4km are by bike or possibly public transport, and over 4km are primarily via public transport. Trips, including deliveries, which require cars or public transport should be carried out with zero-emission vehicles. A vast challenge from sociological perspective, there is no alternative if we want to survive.

Having focused its transport policy primarily on improvement of the quality of air and public space, Krakow will continue implementing a policy of reducing cars in the expanding City Centre Paid Parking Zone. Moreover, experiences from the Clean Transport Zone will help to expand the areas open to environmentally-friendly cars. Infrastructure transformation, development of public transport, and opening of new sectors favouring pedestrians and bikes will gradually eliminate cars.

Poland's first remote emission measurements for future low/zero-emissions zone

Analysis of the results of the first extensive investigation of remotely sensed exhaust emissions in this part of Europe and Poland is currently underway. Over 100,000 cars and buses were scanned with an innovative device as they moved through the streets of Krakow to see what they actually emit. The results will clearly indicate the next steps in developing zero/low- emission zones. On this basis, over the next five years the Municipality will introduce the most effective steps as well as zones where use of the most polluting cars is restricted.



Figure 11 Remote emissions measurement in Krakow

City of places

The future lies in developing the city not according to transport but spatial objectives, i.e. a so-called City of Places. Krakow started, and will continue, to transform street infrastructure and public squares in line with the expectations of residents, who want more green spaces, revitalisation, and traffic calming to reduce noise and pollution. Boulevards and spaces for pedestrians and cyclists of all ages will replace multi-lane streets in the centre. To gain societal acceptance, pilot projects will be used to illustrate the goal of changes, as experience shows that allowing locals to experience trials generates much less emotional reactions.



Figure 12 Half the space of a street surrendered to pedestrians and greenery in a pilot change

Transforming streets

A few years ago, transformation of the first ring-road proved the benefits to residents and legitimised future changes. Model streets are already being built, and more are to come.

Figure 13 Model redevelopment of street with pedestrians, cyclists and PT in mind

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City squares will also be transformed to regain their original function as places to meet and trade.

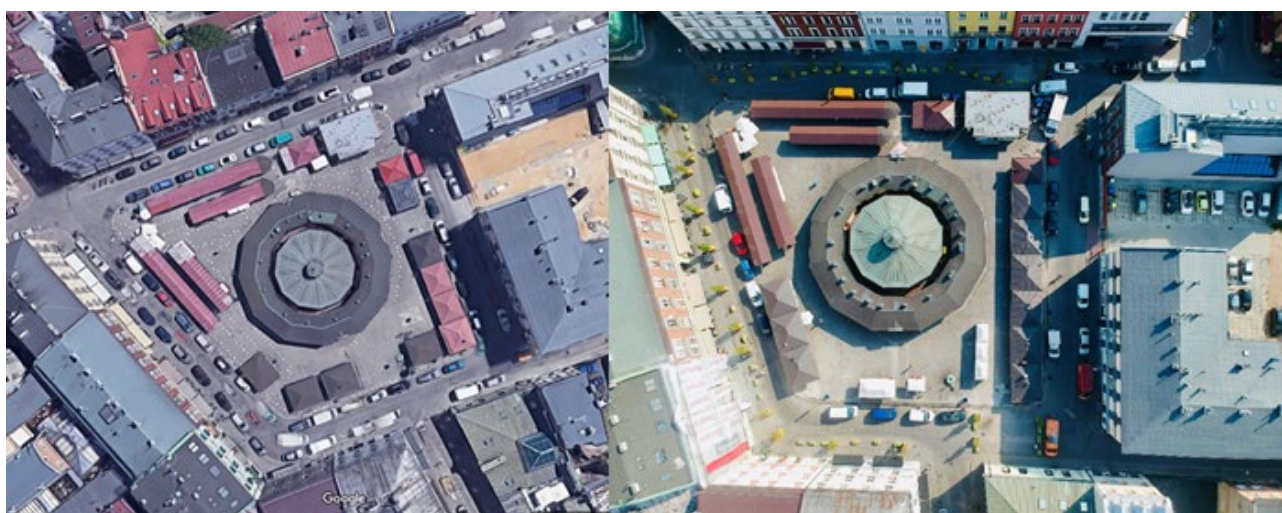


Figure 14 Public square (Nowy) before and after replacing parking spaces with greenery: model for future transformations

PT: work in progress

In terms of investments, the city primarily focuses on public transport and cycling infrastructure. A 4.2km tramline is being built to the north of Krakow to improve accessibility and six others are planned to improve the throughput and robustness of the existing system. By 2020 a feasibility study for tunnels under the city centre will have been completed and will determine whether these will cater for trams or a new metro system. The network of comfortable, high quality cycle paths should be complete by 2025 to encourage cycling and provide access to the city centre from Krakow's main residential areas. Poland's longest cycle bridge is underway.

Krakow has declared it will join a government programme encouraging switching the public bus fleet to electric vehicles: once financed, it will gain at least 100 electric buses. Besides this, new electric and hybrid buses will be purchased to develop zero-emission corridors (the plan is to start from the first ring-road), leading to zero-emission areas. First orders for 60 electric buses are underway.

Cargo on the bike

Participation in EU projects allows testing of innovative solutions in shared mobility and goods deliveries. Under the continuing Interreg Low Carb project, in 2020 Krakow will develop a pilot of electric public bikes and Poland's first cargo bike rental: seen as the future for serving areas with traffic restrictions and zero/low-emission zones. If the tests of the first cargo bike station, where a delivery vehicle is parked in a dedicated space at any time of day or night, and its contents are loaded onto a bike to continue the journey, prove successful, more will be built as a systemic solution.



Figure 15 Cargo bike offered by the Municipality to shopkeepers in city centre (to become cargo bicycle sharing system in 2020)

Work in progress needs support

Krakow faces a massive challenge over the coming years in continuing its transformation towards fully zero-emission and green public spaces, where happy residents fulfil their dreams and build their futures. As residents have managed to create critical mass to reduce particulate matter originating from coal and wood combustion, it is certainly possible to join the premier league of global cities that will be leading practical change and being role models for others. Obviously, there is a risk that populists will try to convince people that sacrifices are unnecessary, and you can still live on climate loans, so this is why joining the prestigious ranks of European Green Capitals would demonstrate powerfully that the direction chosen by active citizens is the best.

3D. References

List supporting documentation (e.g. survey about user satisfaction with the urban transport system), and add links where possible. Further detail may be requested during the pre-selection phase. Documentation should not be forwarded at this stage.

(max. 400 words)

Application Form for the European Green Capital Award 2022

- [1] Szarata A., *Kompleksowe Badania Ruchu w Krakowie – Raport końcowy z badań ankietowych wraz z syntezą wyników i szczegółowymi wnioskami*, <https://www.bip.krakow.pl/zalaczniki/dokumenty/n/207255/karta> – accessed 27/08/2019
- [2] Krakow public transport: <http://www.mobilis.pl/komunikacja-miejska/krakow.html> – accessed 27/08/2019
- [3] <http://www.mpk.krakow.pl/pl/tabor/> – accessed 27/08/2019
- [4] <https://www.transport-publiczny.pl/wiadomosci/krakow-niemal-milion-wypozycczen-wavelo-w-2018-r-60604.html> – accessed 27/08/2019
- [5] http://krakow.pl/aktualnosci/226585,29,komunikat,abc_strefy_czystego_transportu_na_kazimierzu.html – accessed 27/08/2019
- [6] http://krakow.pl/aktualnosci/230879,29,komunikat,innowacyjne_badania_spalin_w_krakowie.html – accessed 27/08/2019
- [7] http://infobike.pl/230-km-rowerowych-drog-krakowa-film-more_111501.html – accessed 28/08/2019

Word Count Check

Please complete the below word count check for Indicator 3: Sustainable Urban Mobility, Sections 3A, 3B and 3C.

As per the Guidance Note (Annex 2 of the Rules of Contest), the word count includes text in graphics/tables and the body of text. The word count excludes text in the original application form, captions and text in Table 1: Benchmarking Data - Sustainable Urban Mobility.

Section	Number of words in graphics/tables	Number of words in body of text	Total number of words in graphics/tables and body of text	Max. words
3A	36	551	587	600
3B	30	945	975	1,000
3C	0	840	840	1,000

4. Sustainable Land Use

Refer to Section 2.4 of the Guidance Note

4A. Present Situation

Please complete the following table providing the most recent data that is available:

Table 1: Benchmarking Data - Sustainable Land Use

Land use within the city (this will provide important background information on the character of the city and is not an evaluation criterion itself)

Land Use Data	Inner City ^[4]	Overall City ^[4]	Unit	Year of Data Provided
Public Green Area	17	11,5	%	2018
Private Green Area	4	13		
(Urban) Agricultural Land	4	26		
Blue	2,5	2,1		
Residential	44	27		
Industrial/Economic	3,5	2,5		
Mixed ^[1]	6	9,3		
Brownfield ^[2]	13	2,2		
Communication ^[3]	6	6,4		
Total	100	100		
Population Data	Inner City ^[4]	Overall City ^[4]	Unit	Year of Data Provided
Population density in built-up areas (city area minus green and blue)	70	49	Inhabitants per ha	2018
Population density (inhabitants per hectare) for new developments	72	71	Inhabitants per ha	2018
Percentage of people living within 300 m of green urban areas of any size	97	96	%	2019
Percentage of people living within 300 m of green urban areas of >5,000 m ²	87	86	%	2019

^[1] Please specify the land use types within the 'mixed land'

^[2] See guidance note for clarification

^[3] Please specify 'other' within Table1: Benchmarking Data – Sustainable Land Use. Add additional rows as required.

^[4] Please refer to Guidance Note section 2.4 on how to delineate 'Inner City' and 'Overall City'.

Land Use Plan has mixed-use areas, because city's structure is mosaic due to historical context; that's category including orchards and plantations with old agricultural lands and garden allotment.

Green Urban Areas/Green Infrastructure

1. Is there a main policy implemented on green areas/green infrastructure within the urban tissue (or on the

connection of urban green scapes to rural or natural 'hinterland')? What are the effects of this policy on public and private places?

2. In what way do green areas (green infrastructure) affect the living environment (in the environmental, social, and economic contexts)?
3. What is the quality of urban green (and blue) areas, and what indicators are used to assess the quality of the green areas? Is there a budget to ensure this quality?
4. How is accessibility to green urban areas ensured for all citizens?

Sustainable Land Use

5. Is there a medium term strategy for sustainable land use (including urban sprawl, soil sealing and/or redeveloping underused areas) which has been implemented in urban and regional planning during the 10 last years?
6. How does the city anticipate dealing with current and future changes (such as economic growth, demographic or climate change) in sustainable land use planning?
7. How much land within the city consists of brownfields (or derelict or underused zones) and how many of those areas have been regenerated during the last 5 years (please refer to the map)?
8. To what extent is the (percentage of) sealed surface (with buildings, pavement or otherwise) causing challenges within the urban tissue?

Urban Farming

9. Are there any areas allocated for urban agriculture/allotment gardening? If so, how many?
10. To what extent do the urban farming areas contribute to the urban food supply?

Maps

- Provide a land use map that indicates:
 - a) the municipality boundaries delineating the overall city area;
 - b) the inner city area;
- Provide additional map(s) showing green and blue areas in the city, and their connectivity and coherence;
- Provide map(s) of the location of brownfield sites (derelict zones) that:
 - a) Have been regenerated in the past ten years;
 - b) Have not been redeveloped (yet).

(max. 1,100 words and five graphics, images or tables plus the three requested maps detailed above)

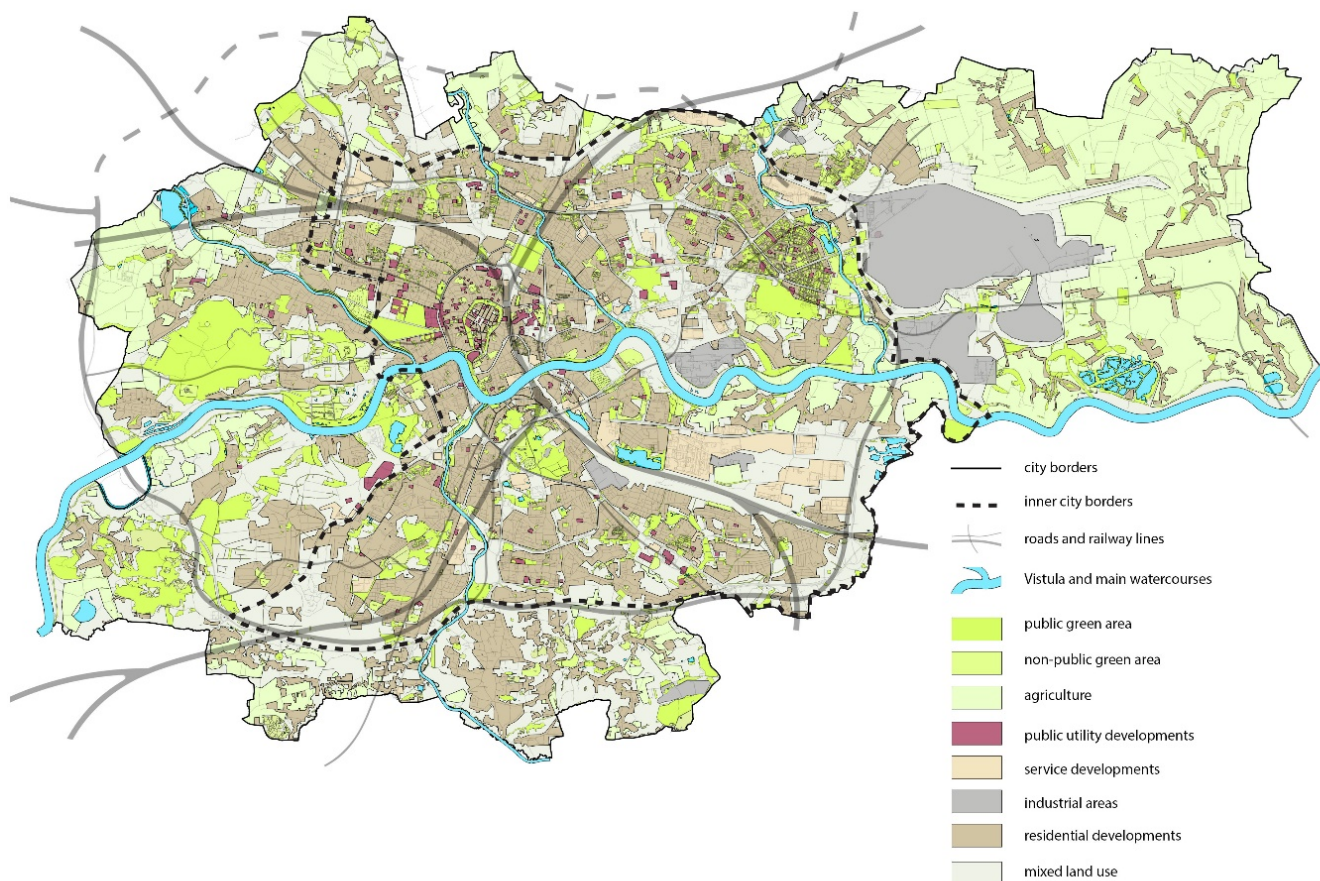


Figure 1 Land use map

[1]

Directions[4D5] presents guidelines on planning and management of greenspaces, defines a coherent system of urban greenspaces based on a network of river parks, and ensures access for residents. Implementation of this GIS-based document (aligned with city planning policy: Study[4D2] and MPZP[4D3]) began while still at the drafting stage (2015–19).

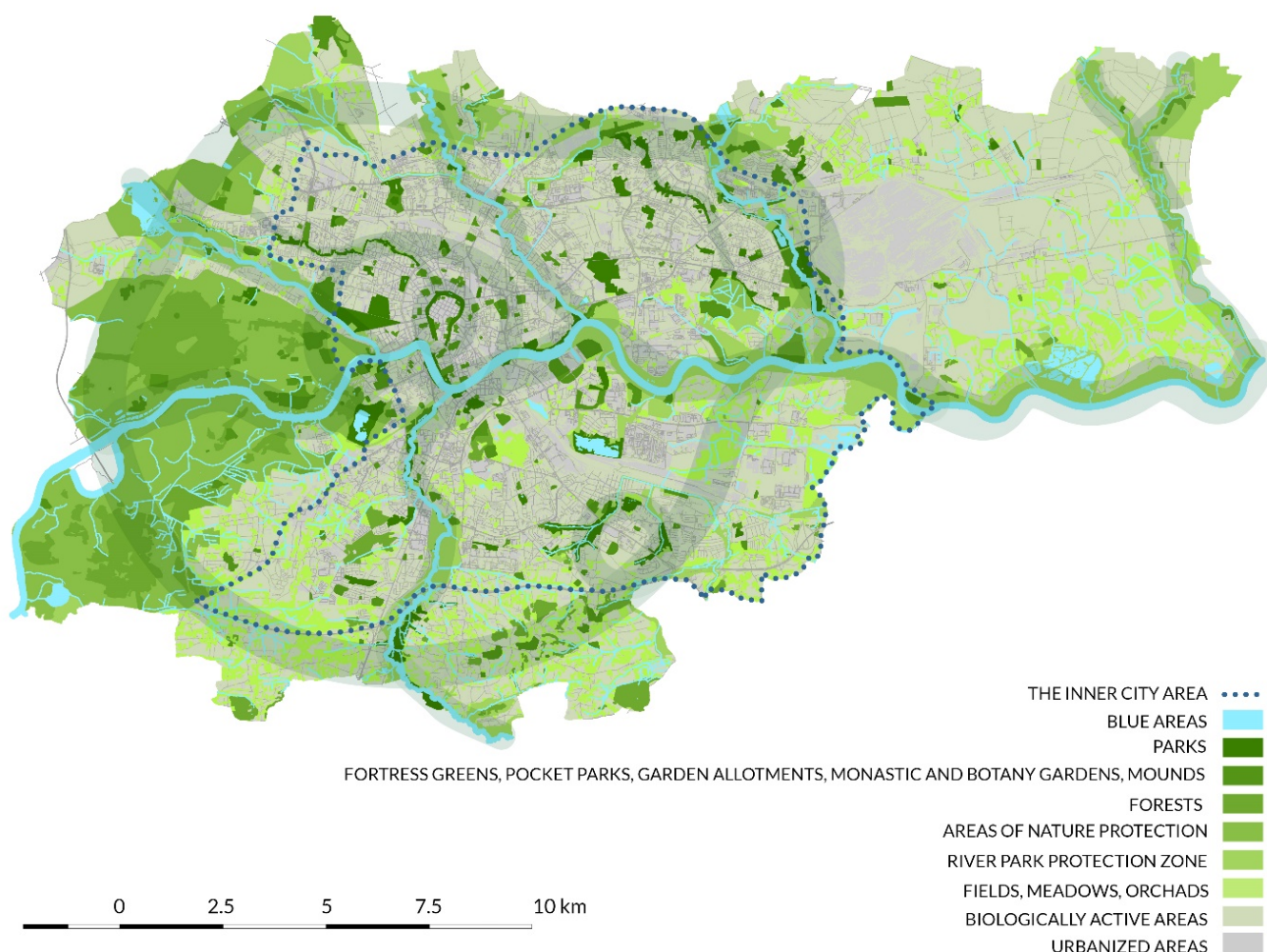


Figure 2 Green and blue areas in Krakow and their connectivity and coherence.

Krakow has always been aware of the need to protect its unique natural heritage. The concept of river parks began in the 1990s, and implementation continues. Blue-green infrastructure received protection in MPZP[4D3] that covers the natural character of the Vistula (EECONET eco-corridor) and its tributaries, making it green even in the city centre.



Figure 3 Unique natural character of original courses of rivers and their environment: used by citizens for recreation.

The growing network of greenways includes linear parks, green streets, and pedestrian/cycling routes. Greenspaces are maintained to high standards[4D5B], and the quality of new and refurbished greenery has increased significantly. Significant efforts are put into access to greenspaces close to citizens' homes and connecting them into a coherent system.

MPZP[4D3] also protects certain private land from development and enforces green and/or agricultural use.

Development of semi-natural green areas that represent the city's potential for adaptation to climate change, includes forested areas that will double by area by 2040 (PPZL[4D8]). The largest forest complex is Las Wolski (419ha). Alluvial forests covers nearly 100ha. Meadows (1476ha) include areas protected under Natura 2000.

Krakow's Błonia Common, Europe's largest urban meadow, covers 41ha. Harking back to its 12th-century agricultural origins, the mowed grass is distributed to local farmers for animal use, while some sections remain unmowed, improving biodiversity and air filtering. Flower meadows (21ha) were planted in the city's densely-populated areas and by roadsides.



Figure 4 Historical green areas in the city centre: 1-Błonia Common, 2-Vistula Embankments green, 3-Krakow Planty Garden Ring (replaced the demolished fortifications)

In 2016 the city purchased 15 times more green land than in 2014, and in 2018 budgeted approximately €4.2 million for this purpose.

[2]

Up to 75% of public greenspaces, including 5000ha covered by protection, are semi-natural.

Krakow's parks buzz with life as the ZZM team[4D21] organises outdoor cultural and sports events (fitness, picnics, and open-air cinemas) for residents, with the seasonal ParkBus providing free shuttling between parks.

Park pavilions providing social, cultural, and service functions are managed by operators chosen for their best ideas for activities.

Greenspaces attract investors eager to develop service buildings nearby, thus creating jobs.

[3]

The quality of the blue-green infrastructure is high, with the percentage of residents satisfied with the quality of greenspaces rising rapidly since 2015 (35% in 2014 and 68% in 2018[4D12]).

Indicators for the assessment of quality of the system of blue-green infrastructure are described in 4C.



Figure 5 Quality of Krakow green areas is appreciated by locals and wins numerous prizes.

Greenspaces are financed primarily from the city (see: City Introduction) and participatory budgets[4D14] which invites residents to submit and vote on projects. In 2018 the “greenery and environmental protection” category was most popular, so 70% of all Participatory Budget funds were allocated to greenspaces.

Additional sources of financing:

- WFOŚiGW[4D32]
- co-financing from EU funds at €12 million since 2015, 2/3 of which was used for reclaiming brownfields.

[4]

Greenspace amounts to 49m² per inhabitant (indicator 1) and 96% of the population lives within 300m from an accessible site (indicator 2). Areas with a deficit of greenspace are identified by low values of indicators 1 and 2, and high population density. Future areas of deficit are forecast[4D5] on the basis of ongoing development processes and provisions of MPZP[4D3] so creation of new greenspace is prioritised there.

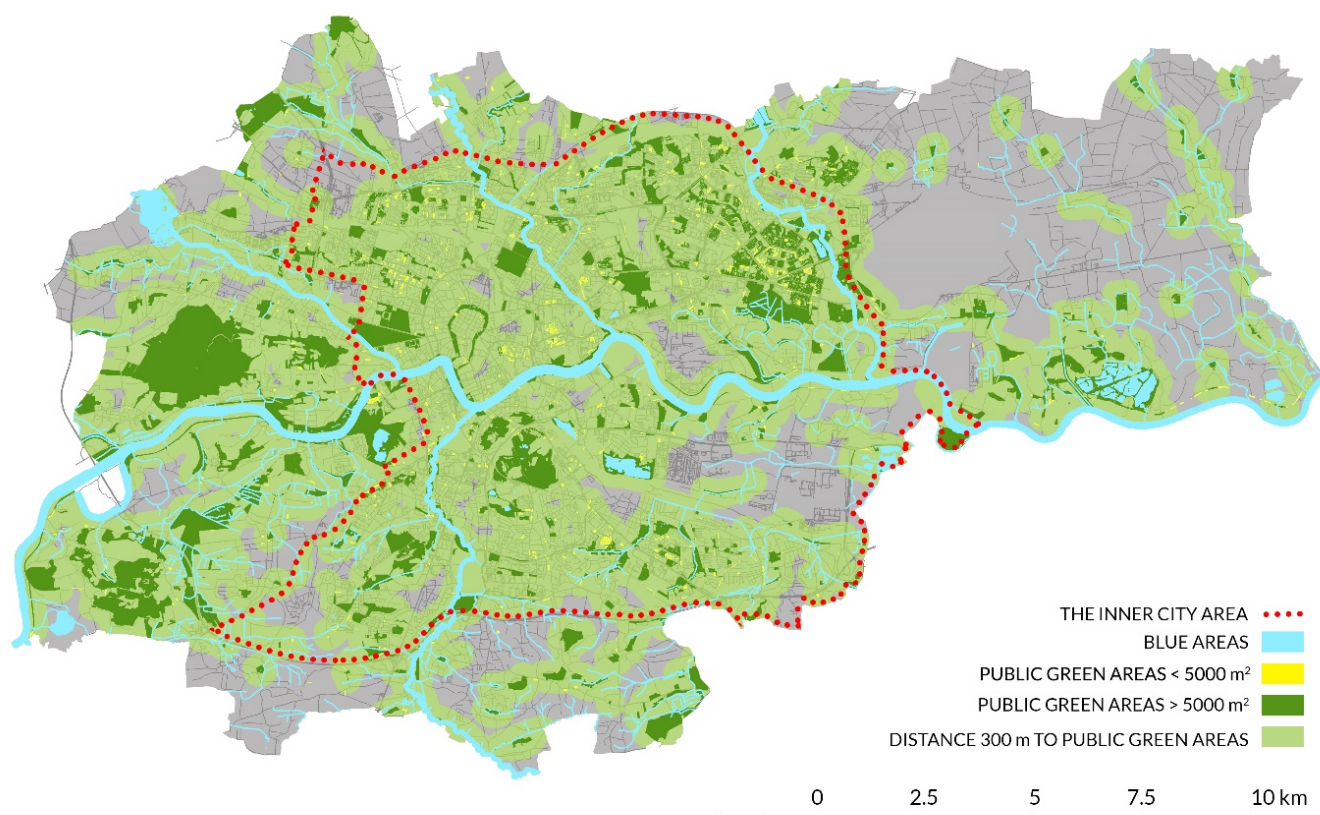


Figure 6 Access to public green areas within 300-metre-radius

[5]

Polish law has sustainable land use defined by Zoning Plans(MPZP) regulations[4D3]. They stem from Study[4D2] which provides direction for the whole city.

With 64.1% coverage by MPZP[4D3], Krakow has one of the best results in Poland, and is Poland's only city with a Green Masterplan[4D4] for all greenspaces defined in Study[4D2A]. Of 191 MPZP[4D3] in force, 47 protect greenspaces and landscape (5510.1ha).

The Study[4D2A] defines 35.6% of the city as green, i.e.

- Greenspaces in Study[4D2A] unconditionally protected under MPZP[4D3]
- Investment areas in Study[4D2A] and MPZP[4D3] define unconditionally protected greenspaces, and investment land with a defined ratio of soft landscape area.

Study[4D2A] defines 4 strategic city projects concerning:

- **Brownfield development:** Krakow – Nowa Huta Przyszłości (NHP[4D29]) and New City
- **Revitalisation of Vistula embankments:** Vistula River Park
- **Metropolitan:** Balice.

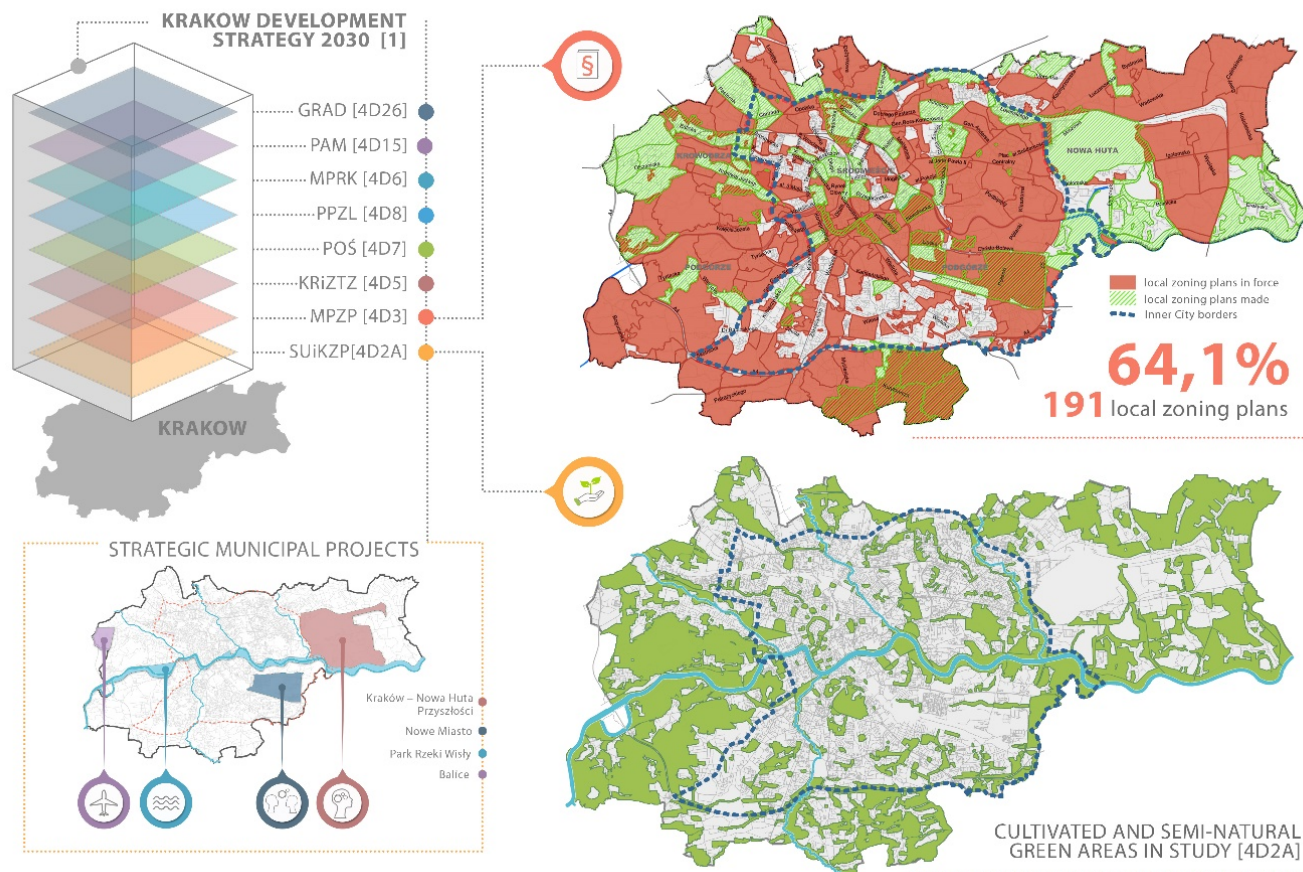


Figure 7 Protection of green areas in strategic documents.

[6]

Krakow is implementing Strategy[4D1], with the goal of becoming a Resident-Friendly City and a Smart City, through:

- **Strategic documents**
 - Study[4D2A] and MPZP[4D3] “growth not extension”: transformation towards a densely-knit city with polycentric functional and spatial structures, taking into account natural environment values.
 - Others: PPZL[4D8], KRiZTZ[4D5], GRAD[4D26], POŚ[4D7]
- **Revitalisation:** of problem areas, including brownfields
- **Greenspaces:** purchase of land for greenspace, creation of new parks, increasing access
- **Access to water:**
 - Vistula Connects project
 - seasonal beach
 - water playgrounds
 - open bathing sides (on brownfields)
- **Human capital:** cooperation with innovative academic institutions; Krakow: the academic city.
- **Administration:** setting up units responsible for climate change adaptation, green area development, implementation of European Directives

- **Eco-education:** building environmental awareness.

[7]

Under communism, industrial areas of Nowa Huta were connected to the city's ring structure, appropriating 2000ha of land for this purpose.

The estimated area of brownfields is 4115ha.

After the change in Study[4D2A] and redefinition of priorities, work began on Zoning Plan[4D3] for post-industrial areas, which allows further steps to be implemented today.

Distribution of industrial areas in the city:

- **Factories and warehouses** (sustainable development for services and residential purposes, including greenspaces, sports and recreation areas).
- **Stone quarries and gravel pits** (development for public greenery)
 - Zakrzówek: Poland's largest green development (64ha)
 - Design began on the Liban Stone Quarry (11.5ha)
 - Bagry Wielkie Urban Park: green element of New City strategy
 - Przylasek Rusiecki: element of NHP[4D29] strategy.

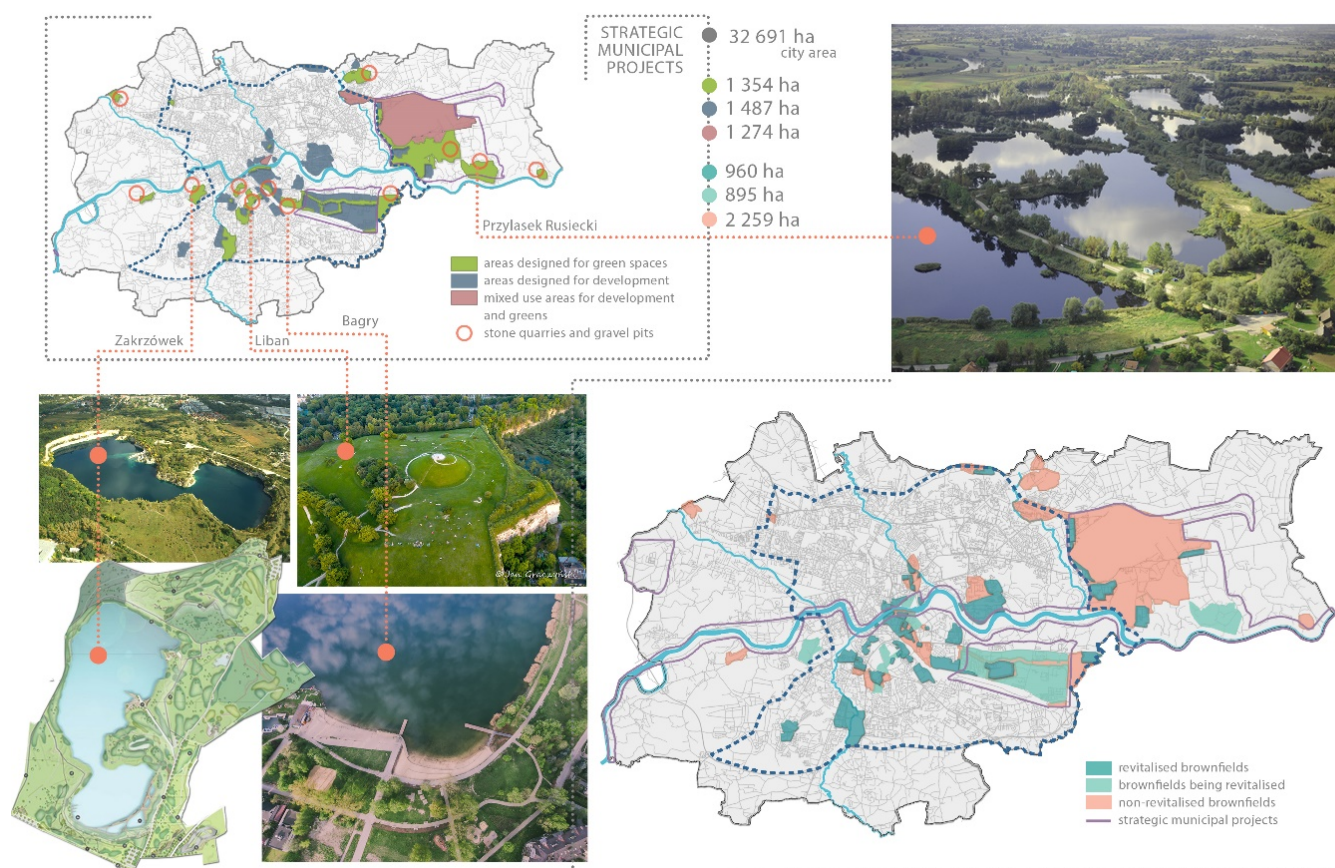


Figure 8 Situation of post-industrial and derelict areas (brownfields).

[8]

The ratio of soft landscaped areas to development areas is protected by Study[4D2] and MPZP[4D3]. Study[4D2A] also defines a Nature Formation Zone (62.4% of city area), including investment areas where according to MPZP[4D3] developments must include a high proportion of soft landscape area (minimum 40% for services, and 50-70% for other areas). Outside Nature Formation Zone, the minimum values of the indicators are 20% (services) and 40% (residential).

[9]

Almost 30% of Krakow's surface area is agricultural. Arable crops and orchards cover 22%, and meadows and pastures – 4.6%. The 86 allotment gardens occupy 488ha, mostly in the centre, MPZP[4D3] covering 97% of them. They receive public financing for infrastructure in return for opening to citizens.

Seven civic gardens were created with residents and municipal co-funding, and further are being developed via the Participatory Budget[4D14]. Vegetable/herbal beds in parks were also developed as a citizen-led initiative.

[10]

Around 4000 farmers in Krakow receive direct payments (ARiMR[4D34]). With around 50,000 users, allotment gardens are also a significant source of food, and Krakow's open markets bring together residents with local producers.

4B. Past Performance

Green Urban Areas/Green Infrastructure

1. Regarding the green heritage and potential of the city, has there been a trend in increasing or decreasing accessibility of green areas? If so, please explain the trend.
2. What measures have been undertaken to increase green infrastructure and what was the effect of the measures taken? (for example see Guidance Note);
3. What investments or policies have been used for promoting the use of green infrastructure and what was the effect of the measures taken? (e.g. tax reductions for green roofs, building permits, funding schemes for green roofs or biodiversity-rich communal gardens);
4. To what extent have citizens been involved in planning, designing or creating green urban areas?

Sustainable Land Use

5. What other measures or plans were important for the city in regard to sustainable land use of green urban areas? What were the main policies on housing and settlements to preserve the environment in the last 25-30 years?
6. What measures have been taken to minimise the total area of fallow, derelict and contaminated land (brownfields)? Please include some concrete examples;
7. What stakeholders, partners, local, regional or national governments have been involved in the renovation or regeneration of derelict zones?
8. What measures have been taken to minimise the environmental effects of soil sealing? How effective are those measures? Please include some concrete examples;

Urban Farming

9. Does the city have a history or culture of urban farming, or is it a recently emerging development? If urban

farming is not happening please indicate this;

10. What stakeholders have been involved in urban farming or urban gardening to date?

(max. 1,200 words and five graphics, images or tables)

[1]

Green infrastructure developed more quickly after 2015, when ZZM[4D11] was introduced:

- 31 new parks, including 26 pocket parks – Ogrody Krakowian[4D17] – which won awards at the European Urban Green Infrastructure Conference 2019 in London, a TUP[35] national competition for the best-designed green public space and Euro-China Green&Smart City Forum and Awards
- 14 revitalised parks
- documentation for the modernisation and creation of another 11 city parks and 5 pocket parks

In 2014, 57% of residents agreed that they could access greenspace within 15 minutes from home, which rose to 85% of residents in 2018. The opening up of semi-natural green areas to recreation, and the development of greenways also improved access.

Figure 9 Ogrody Krakowian: Thematic pocket parks developed in green areas between residential settlements, in every district, helping local communities to integrate



4C. Future Plans

Green Urban Areas/Green Infrastructure

1. What will the future of the city look like with respect to green infrastructure?
2. What are the long term objectives to the establishment and management (maintenance) of green urban areas (publicly and privately owned)?
3. Are green urban areas/green infrastructure perceived as beneficial or costly? How will they be paid for? Is there a budget or plan?
4. Are there any monitoring and performance evaluation schemes? If so, what criteria will be used to measure progress and impacts?

Sustainable Land Use

5. What will the future city look like with respect to sustainable urban land use planning?
6. Are the long term objectives, which address the rehabilitation of brown field sites (derelict and/or contaminated land) for both new development and/or decontamination measures designed specifically for environmental purposes?
7. To what extent are plans supported by commitments and budget allocations?
8. Are there any monitoring and performance evaluation schemes? If so, what criteria are used to measure progress and impacts?

Urban Farming

9. What are the city's future plans on urban farming? And detail the linkages between the city and its surrounding region?
10. What stakeholders will be involved and how will they impact on the plans and projects?

(max. 800 words and five graphics, images or tables)

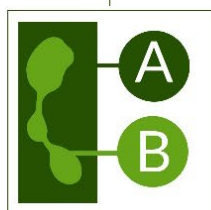
[1]

Directions[4D5] defined guidelines for greenspaces, and implementation began at the time of its drafting (2016). Blue-green infrastructure forms a single continuous system, impacting biodiversity and resilience to climate change, while the Vistula Connects project will extend the network of green transport.

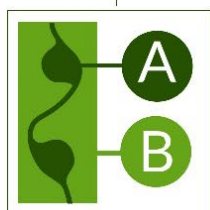
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PUBLIC GREEN AREAS



public green areas:
cultivated
(with eco-zones)



public green areas:
semi-natural
(with path, benches etc.)

DATABASE 30 records

basic information
(about green)

- 14 participation and opinions
(about green)
- 7
- 9 guidelines and timelines
for main directions
- planning
- administration
- investment
- protection

VISTULA CONNECTS PROJECT

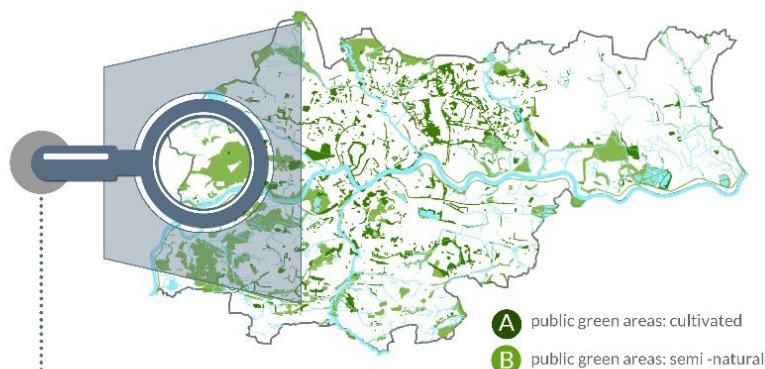


Figure 14 Directions of development and management of greenspaces in Krakow 2019-2030 [4D5].

Directions[4D5] defined guidelines for greenspaces, and implementation began at the time of its drafting (2016). Blue-green infrastructure forms a single continuous system, impacting biodiversity and resilience to climate change, while the Vistula Connects project will extend the network of green transport. Green infrastructure will be even better used in adapting to climate change (Climate NBS Poland[25]). Measures to improve water retention will be implemented in all greenspaces (Directions-Annex[5A]), expanding green infrastructure will reduce the urban heat island effect, and green roofs will grow in numbers after implementation of GRAD[4D26] strategy.

Area of recreational greenspace will increase by 30%, accessibility will reach 90% (Directions[4D5]), and the area covered by forest will double (PPZL[4D8]). 100% residents will be living within 300m of public greenspaces.

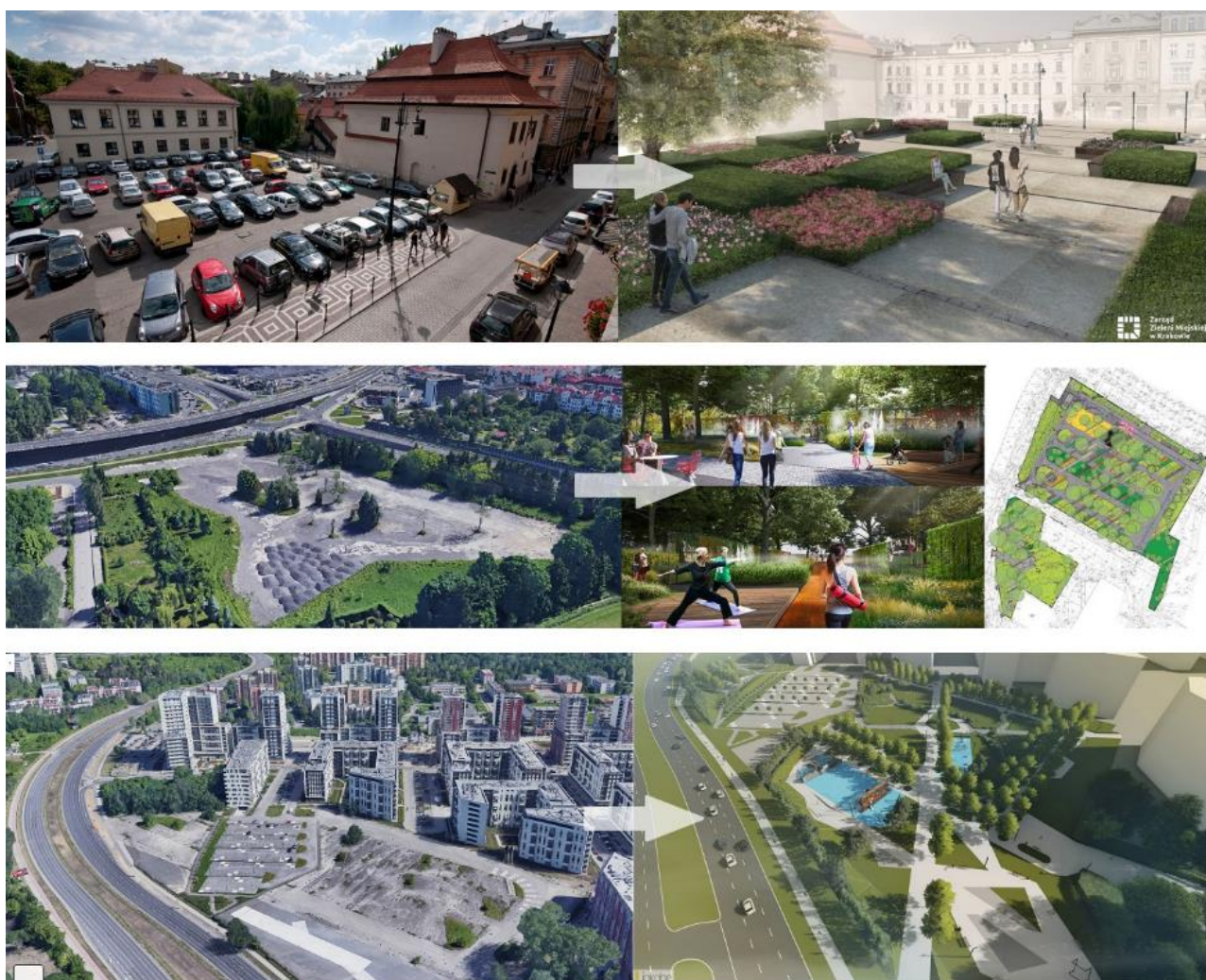


Figure 15 Increasing the share of green infrastructure: turning car parks into public green areas

[2]

Long-term objectives (SUiKZP[4D2], POŚ[4D7], and Directions[4D5]) include:

- connecting greenspaces into a continuous system with greenways, streets, and pedestrian/cycle paths
- supporting biodiversity, including remediation of brownfields
- forestation, particularly on fallow land, and rehabilitated areas
- protection of the system of open spaces, also along waterways
- protection of ecological and ventilation corridors
- protection of underground and surface waters, including prevention of disappearance of reservoirs, wetlands, and lowering of the water table
- retention and development of public greenspace that meets social needs.

[3]

Greenspaces are designed to reduce maintenance outlays and increase the utility of ecosystems:

- flower meadows instead of lawns: limits mowing costs, increases biodiversity, supports pollinators, and filters pollution.
- eco-zones (see Chapter 5): reduces expenditure on mowing, watering and management of tree canopies, increases biodiversity and water retention
- rain gardens: reduces watering, increases water retention.

Sources of financing:

- City budget.
- EU funds, WFOŚiGW[4D32]
- public-private partnerships, including
 - Sponsorship Packages: we are first in Poland to develop a solution allowing private companies to support municipal greenery
 - Superścieżka (Superpath): cooperation between the municipality, private investors, and residents.

[4]

Indicators monitored annually (Directions[4D5]):

1. Greenspace per resident (m²/person).
 2. Residents living within 300m of public greenspaces (%)
 3. Trees surveyed in R3Trees[4D24] (%)
 4. Area of river parks covered by MPZP[4D3] (%)
 5. Outlay on maintenance of greenspaces (PLN/m²)
 6. Outlay on maintenance of forests (PLN/m²)
 7. Completion of plan from Directions[4D5] (real estate management, management and administration, %)
 8. Completion of plan from Directions[4D5] (development and modernisation of greenspaces; %)
 9. Acquisition of land for greenery (ha)
 10. Completion of protection plans from Directions[4D5] (%)
 11. Number of forms of natural protection developed (PCs)
 12. Completion of plans from Directions[4D5] (educational and promotional tasks; %).
- Target values of indicators were set for the end of 2020, 2025, and 2030.

[5]

Krakow's green revolution is the change in thinking about the city and its development for people.

Covering the whole city with MPZP[4D3] will protect its green potential and allow sustainable adaptation to climate change.

Strategic projects will be implemented to stimulate development, provide great opportunities, and validate planning assumptions.

Continuous transformation employ's Krakow's growing adaptive potential: human, institutional, infrastructural, and knowledge resources.

[6]

Krakow will rehabilitate the following areas:

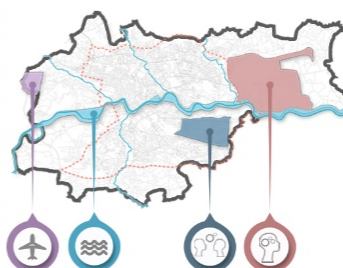
- **Nowa Huta Steelworks** (MPZP for 1162.6ha being drafted), including a huge spoil tip (to be forested).
- **Krakow – New City:** multifunctional urban centre, including Bagry bathing site and greenspace along the Drwina (441ha)
- **Nowa Huta of the Future** strategic project[4D29]: Includes four investment projects (Figure 17)



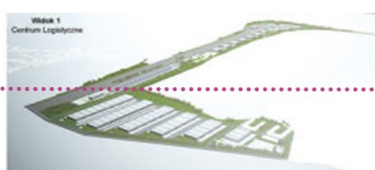
Krakow - Nowa Huta of the Future

550 ha

STRATEGIC MUNICIPAL PROJECTS



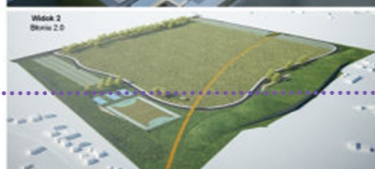
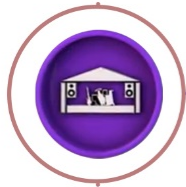
Kraków – Nowa Huta Przyszłości
 Nowe Miasto
 Park Rzeki Wisły
 Balice



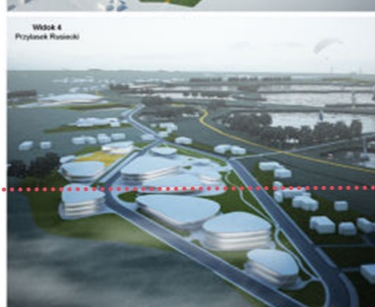
Logistics Center
 Economic Activity Zone
 228,56 ha



Science and Technology Park
 Branice
 127,75ha



Błonia 2.0
 Centre for Large-Scale Cultural Events
 36,87 ha



Przylasek Rusiecki
 Recreation and Leisure Area with Accompanying Services
 191,65 ha

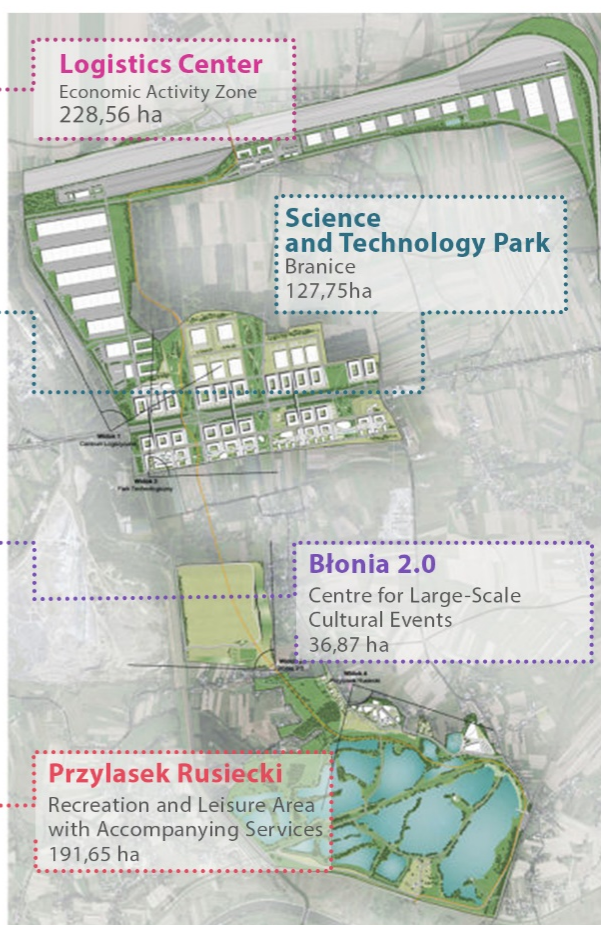


Figure 17 Nowa Huta of the Future: functional project.

[7]

Investments will continue to be financed by the city, regional and structural programmes, universities, and private investors. Public-private partnerships will be used beside municipal investments into infrastructure and public buildings.

In 2018, the Municipality obtained funding from the European Fund[4D12] for rehabilitation of:

- post-industrial areas (€11m, including the Liban Stone Quarry €7.3m)
- strategic areas (39.8ha), co-financing of €13.7m for Nowa Huta of the Future.

[8]

The integrated management system covers 16 fields, and uses the STRADOM Business Intelligence software integrating strategic and operational management, combining Strategy[4D1] with strategic programmes, budgets, the Long-Term Financial Forecast, and sectoral indicators (see: Good Practice 1). Project portfolio and individual projects rely on management methods (e.g. PRINCE2).

[9]

Krakow's RU:RBAN[4D27] project inspires and educates residents in creating and managing civic gardens, and developing urban policy. The planned urban farm will provide healthy local food to schools.

Krakow is significantly supplied by farmers from neighbouring communes who sell their produce in the numerous open markets.

[10]

The Local Support Group was developed during the RU:RBAN[4D27] project to promote agriculture and urban resilience. It involves:

- municipal departments
- academia
- Ambasada Krakowian Association
- Children into Nature Foundation
- ADaSie informal group
- creators of the first Polish website on urban gardening
- members of Krakow Civic Gardens (residents).



Figure 18 Civic gardens in Krakow.

4D. References

List supporting documentation, adding links where possible. Further detail may be requested during the pre-selection phase. Documentation should not be forwarded at this stage.

(max. 400 words)

Link	Document	Short name	Access
[1]	Krakow Development Strategy	Strategy	https://www.bip.krakow.pl/index.php?dok_id=94892
[2]	Krakow Land Use/Zoning Plan 2003	SUiKZP 2003	https://www.bip.krakow.pl/?bip_id=1&dok_id=466&sub_dok_id=466
[2A]	Krakow Land Use/Zoning Plan 2014	SUiKZP 2014	https://www.bip.krakow.pl/?bip_id=1&mmi=48
[3]	Local Zoning/Master Plan	MPZP	http://planowanie.um.krakow.pl/bpp/plany_obow.htm

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			http://www.bip.krakow.pl/?bip_id=1&mmi=412
[4]	Local Zoning/Master Plan for Selected Natural Areas of Krakow	MPZZ	Stage 1: https://www.bip.krakow.pl/?dok_id=102579 Stage 2: https://www.bip.krakow.pl/?dok_id=80571
[5]	Directions of Development and Management of Greenspaces in Krakow 2019-2030	Directions	http://www.bip.krakow.pl/?dok_id=115159 http://www.bip.krakow.pl/zalaczniki/dokumenty/n/251065/karta
[5A]	Directions of Development and Management of Greenspaces in Krakow: Ecohydrological Aspects	Directions: Appendix	http://www.bip.krakow.pl/zalaczniki/dokumenty/n/251072/karta
[5B]	Directions of Development and Management of Greenspaces in Krakow: Standards for the Creation and Maintenance of Basic Types of Greenspaces in Krakow	Directions: Standards	http://www.bip.krakow.pl/zalaczniki/dokumenty/n/251069/karta Appendix 1: http://www.bip.krakow.pl/zalaczniki/dokumenty/n/251070/karta Appendix 1: http://www.bip.krakow.pl/zalaczniki/dokumenty/n/251071/karta
[6]	Municipal Programme for the Revitalisation of Krakow	MPRK	https://www.bip.krakow.pl/?sub_dok_id=944
[7]	Environmental Protection Programme for Krakow 2012–15 including tasks completed in 2011 and prospects for 2016–19	POŚ	https://www.bip.krakow.pl/?dok_id=53605
[8]	County Programme for Increasing Forestation of Krakow 2018–40	PPZL	https://zsm.krakow.pl/nowe-lasy.html
[9]	General Zoning Plan for Kraków 1994	MPOZP	
[10]	Planning Permission for Public Purpose Investment	ULICP	
[11]	Krakow Municipal Greenspace Authority	ZZM	https://zsm.krakow.pl/
[12]	European Funds in Regional		https://www.rpo.malopolska.pl/

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	Operational Programme of the Małopolska Region 2014–20		
[13]	STRADOM		https://www.bip.krakow.pl/?dok_id=67584
[14]	Participatory Budget		
[15]	Krakow Climate Change Adaptation Plan to 2030		
[16]	State of the City Report 2009	RoSM	https://www.bip.krakow.pl/?dok_id=29325
[17]	Ogrody Krakowian – pocket parks		https://www.facebook.com/ogrodykrakowian/ https://zsm.krakow.pl/dla-krakowian/ogrody/ogrody-krakowian.html
[18]	Act of 27 March 2003 on spatial planning and land development		
[19]	Małopolska Regional Development Agency		https://www.marr.pl/
[20]	Krakow Municipal Greenspace Authority in social media		https://www.facebook.com/zsm.krakow/
[21]	Kraków w zieleni: ZSM Department in social media		https://www.facebook.com/krakowwzieleni/
[22]	Magic Kraków municipal website		http://www.krakow.pl/
[23]	Open Kraków municipal website		http://otwarty.krakow.pl/
[24]	R3Trees	R3Trees	https://www.r3-trees.com/
[25]	Sendzimir Foundation		https://sendzimir.org.pl/en/
[26]	GRAD Green Roofs for Climate Adaption in Urban Areas		https://www.euki.de/en/euki-projects/grad-green-roofs/
[27]	RU:RBAN – Resilient Urban Agriculture project	RU:RBAN	https://urbact.eu/rurban
[28]	Public-Private Partnership for Krakow	PPP4Kraków	http://ppp4krakow.pl/
[29]	Nowa Huta Przyszłości: Nowa Huta of the Future	NHP	https://knhp.com.pl/index.php/index
[30]	Video presentations of Kraków parks		https://www.youtube.com/playlist?list=PLONALu7QVlwLwoHV_2SHxDopzdneBq5C9

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[31]	Planning permission	WZ	
[32]	Regional Fund for Environmental Protection and Water Management	WFOŚiGW	https://www.wfos.krakow.pl/
[33]	Education in ecology		http://www.ekocentrum.krakow.pl/251,a,edukacja-ekologiczna.htm http://symbioza-krakow.pl/
[34]	Agency for Restructuring and Modernisation of Agriculture	ARiMR	https://www.arimr.gov.pl/o-arimr/information-about-the-agency.html
[35]	Society of Polish Town Planners	TUP	https://www.tup.org.pl/

Word Count Check

Please complete the below word count check for Indicator 4: Sustainable Land Use, Sections 4A, 4B and 4C.

As per the Guidance Note (Annex 2 of the Rules of Contest), the word count includes text in graphics/tables and the body of text. The word count excludes text in the original application form and captions and text in Table 1: Benchmarking Data - Sustainable Land Use.

Section	Number of words in graphics/tables	Number of words in body of text	Total number of words in graphics/tables and body of text	Max. words
4A	10	1088	1098	1,100
4B	79	1102	1181	1,200
4C	26	771	797	800

5. Nature and Biodiversity

Refer to Section 2.5 of the Guidance Note

5A. Present Situation

Please complete the following table providing the most recent data that is available:

Indicator	Number	Total Area (ha)	Year of Data Provided
Number and total area of Natura 2000 sites that are located in the city or nearby (i.e. within 10 km)	10	15440	2019
Number and total area of designated sites of national biodiversity importance within the city (habitat/species management areas)	8	40606 (total) 4795 (in the city)	2019
Number and total area of designated sites of local (city) biodiversity importance within the city (habitat/species management areas)	15	185	2019
Date and time horizon of your city's Biodiversity Action Plan	2030	2030	2030

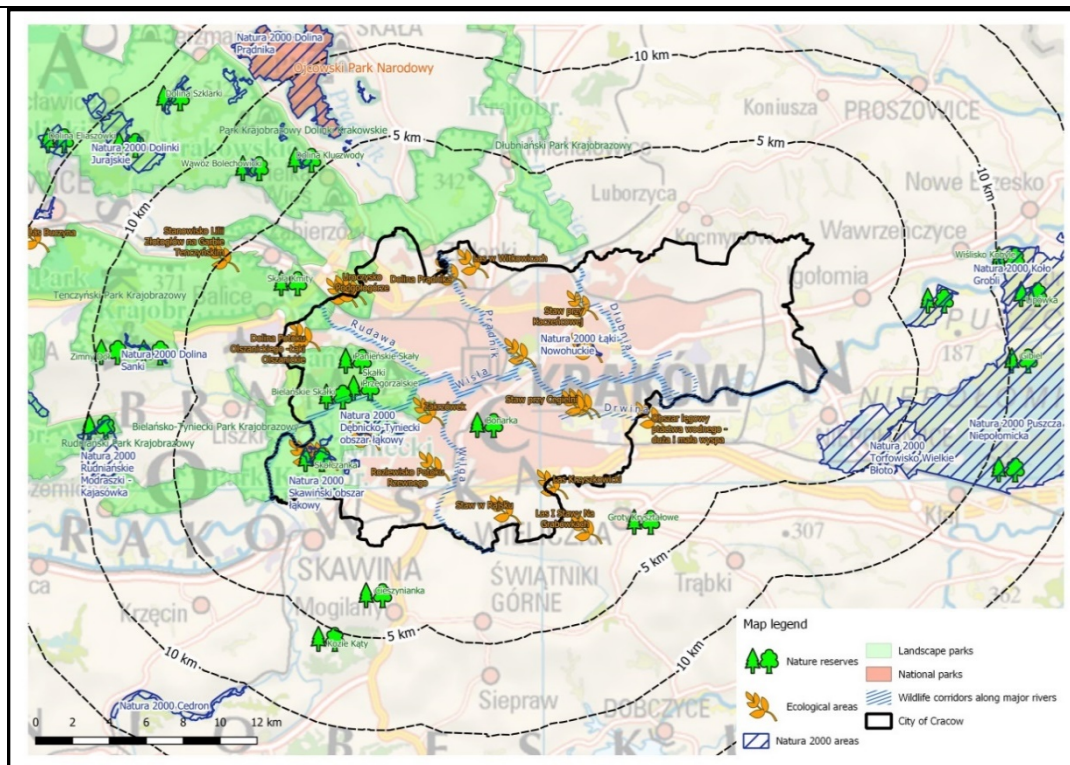
Table 5.1: Benchmarking Data - Nature and Biodiversity

Describe how nature and biodiversity is monitored, protected and managed in your city, and how local people are engaged in nature conservation and biodiversity action.

Please provide details of the following:

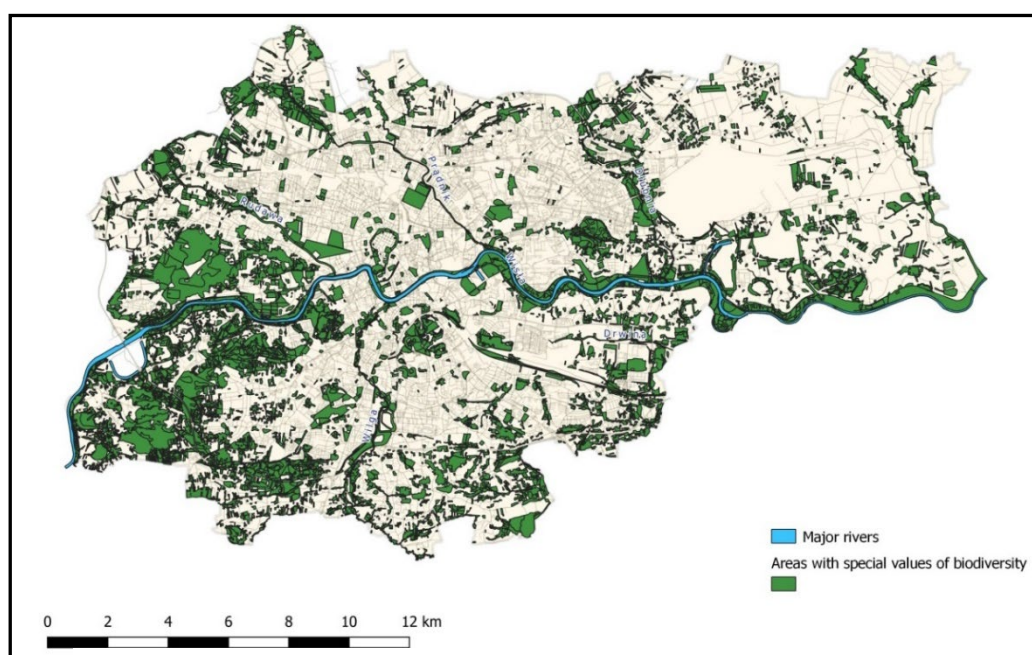
1. Maps showing protected sites, habitats, ecosystems or biotopes;
2. Examples of species and habitat monitoring programmes;
3. Current strategies, plans and projects for the management of ecological networks, key sites, and priority species;
4. The city's approach to involving and engaging residents, visitors, business and institutions in planning and action for nature.

(max. 600 words and five graphics, images or tables)



Map 5.1. Protected areas: Krakow and vicinity

Thanks to its extensive hydrographic network (Vistula with tributaries) and varied geology, Krakow has a highly diverse network of habitats which make up the city's natural system. The presence of natural and seminatural clusters, and maintained city greenery supports high biodiversity, and almost 17% of the city is covered by environmentally valuable areas.



Map 5.2. Areas of highest biodiversity in Krakow

In Krakow were observed:

- ca. 50 complexes of vascular plants, from molinia meadows (*Molinion*), to xerothermic grasses (*Festuco-Brometea*), and (*Tilio-Carpinetum*), (*Fraxino-Alnetum*) forest stands
- around 46 protected plant species, including many species listed in the EU Habitat Directive, e.g. Siberian Iris.



Figure 5.1. Protected plant species and their habitats

The notable richness of the flora is reflected in high animal biodiversity. The hermit beetle (*Osmoderma eremita*) and Lycaenidae and Nymphalidae butterflies can be found in Krakow, and three Natura 2000 areas were set up to protect their habitats: PLH 120065[1], PLH 120069[2], and PLH 120079[3] meadows. Various protected animals, including 12 amphibian species, can also be found in Krakow.

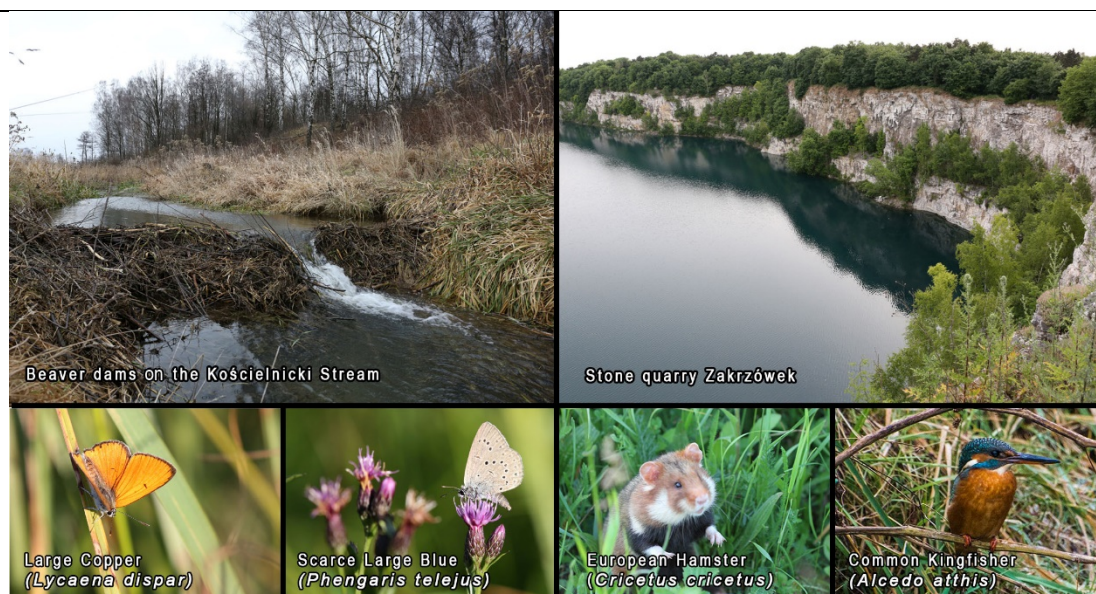


Figure 5.2. Protected animal species and their habitats

The high biodiversity of the flora and fauna populations ensures stable ecosystems and translates into a high potential for adaptation to climate change.

To protect the biological richness of Krakow effectively, the Municipality carries out survey and monitoring activities:

- Map[4] as two interactive layers: actual vegetation and valorisation of the nature
- Inventory of Krakow's Forest Fauna (2016)
- Inventory of amphibians (2009)[5]
- Map of ecological connections (2019) to protect wildlife migration corridors.

Efficient environmental management is carried out on the basis of the following documents:

No.	Document	Purpose	Scope	Timescale
1	Strategy[6]	Krakow policies, goals, and strategies	E.g. quality of life (incl. Chapter 4.3: Sustainable Environment)	2016–30
2	SUiKZP[7]	Vision and direction of spatial policy in Krakow	Spatial management, zoning, defining borders of developed and undeveloped areas; definition of nature in the city, foundation for drafting MPZPs[22]	2014–30 being updated. 2030.

3	POŚ[8]	General principles of environmental management in Krakow	Protection of nature, landscape, water, soil, and air; protection against flooding, noise, electromagnetic and ionising radiation; waste management	2012–19, being updated. 2030
4	Directions[9]	Principles for developing a system of public greenery, including biodiversity protection	Development of greenery: protection and shaping of landscape, nature protection, education	2019–30
5	PPZL[10]	Principles for increasing forested areas in Krakow	Increasing forest acreage, forestation plans, environmental management, protection	2018–40

Table 5.2. Strategic documents

To protect biodiversity, municipality cooperate with social partners:

1. Civil Dialogue Commission: consists of urban activists and representatives of environmental professions
2. Programme Council for Greenery – a consulting and advisory body for the Mayor, includes academics from Krakow.
3. MSIP-Permits[11] – citizens have access to municipal map portal with information on issued tree removal permits.
4. Task Force for Greenspace Protection – civil servants, scientists, and representatives of NGOs.

The city also cooperates with NGOs and funds their operations:

1. Projects related to the education of police, municipal police and fire guard, and also children, teens, seniors: Dzika Klinika Foundation (5 editions)[12]
2. Projects connected to nature lessons for schoolchildren conducted in the field: Dzieci w Naturę Fundation (2 projects)[13]

5B. Past Performance

Describe how your city created and developed its measures to protect and improve nature and biodiversity over the last five to ten years. Comment on how effective these have been.

1. Indicate changes in the extent of sites and ecological network protected for nature and biodiversity (e.g. Natura 2000 network of sites);
2. Illustrate habitat and species trends using collected monitoring data;
3. Give examples of conservation actions to manage and restore sites and habitats, and redress species, including any measures introduced to control invasive non-native species;
4. Explain how the city encourages nature in other open spaces. Has naturalisation been encouraged outside of formal nature reserves?
5. What communication and educational activities have been introduced to promote awareness of nature and biodiversity among the public, including young people?

(max. 1,200 words and five graphics, images or tables)

Krakow is a city of change, both geopolitical (transitioning from communism to democracy in the 1990s) and social. This is reflected in the changing attitudes of citizens particularly regarding increased environmental awareness, covering protection of nature, landscape, and biodiversity. The evolution of management of the natural environment can be traced through policies and strategies dedicated to environmental protection in Krakow (POŚ[8,14] and Directions[9]), which are now norm, unlike a decade ago. The first POŚ[14] were drafted in Krakow in 2005. The document for 2012–19[8] is still valid, and a new one is being prepared. Reports from POŚ[8,14] implementations are prepared every two years, and selected indicators suggesting the increases in Krakow's biodiversity are presented below:

No.	Indicator	Unit	2006	2015
1	Areas of special natural value, legally protected	% share compared to city area/number/area	14.93%	16.24%
			4868ha	5310.68ha
2	Ecological areas		0.2%	0.32%
			66.6ha	106.53ha
3	Natura 2000 areas		0.0%	1.17%
			0.0ha	384.39ha
4	Forests		4.23%	4.38
			1383ha	1431ha
5	Natural monuments		197 PCs	325 PCs

Table 5.3. Biodiversity indicators (Source: POŚ reports 2005–06 and 2014–15).

POŚ[8] was used to draft two further strategic documents: Directions[9] and PPZL[10], which will result in Krakow's biodiversity increasing.

Three Natura 2000 areas were created in Krakow in 2011 to protect meadow habitats and the rare butterfly species described in section A. The City Council[25] also approved creation of five new ecological areas (Dąbrowa, Dolina Potoku Olszanickiego – łąki Olszanickie, and Zakrzówek) in 2018.

Since 2009, 35 trees have been designated natural monuments, one of which, Henryk Oak, boasts its own civil protection committee and was runner-up in the annual national Tree of the Year competition (2018, organised by Klub Gaja). In 2013, Krakow was awarded the title of European City of Trees by the EAC[15], who recognise that Krakow has plenty of greenspaces accessible to residents.



Figure 5.3. A natural monument: Henryk Oak today and in the past

One of the best researched and most valuable animal species in Krakow is the smooth snake (*Coronella austriaca*) which is strictly protected. Its natural habitats are in the south-west of the city (e.g., abandoned stone quarries of Zakrzówek and areas in Tyniec and Bodzów) and are monitored by Małopolska Landscape Parks (2011, 2014, 2016). Its population in Zakrzówek ranges from 12 to 17 specimens, making it one of the largest in Poland.

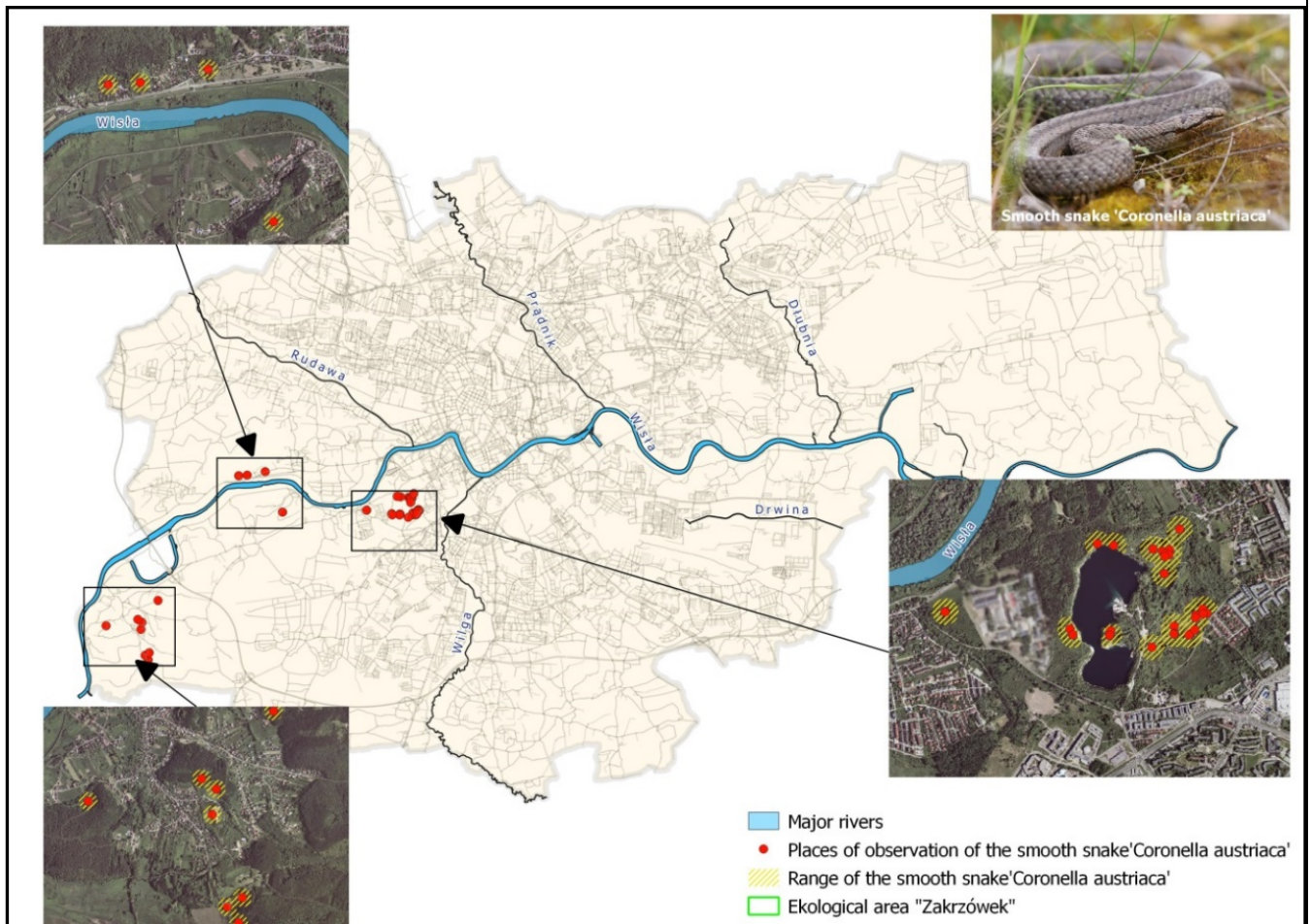


Figure 5.4. Sightings of smooth snake in Krakow

To protect natural habitats, including those of the smooth snake, the 17.5ha Zakrzówek Ecological Area was created in 2018. It is a perfect example of the combination of grassroots activism and the increasing environmental awareness of Krakovians, as it was local activists who pushed for urgent protection of the area.

The city also runs active protection activities. Following the PZO[17] plan for Łąki Nowohuckie meadows (2017), they are mowed twice a year to prevent secondary succession and overgrowth, and the biomass removed. In 2010–13 and 2018–19 to protect xerothermic grasses in the Skałki Przegorzalskie Nature Reserve, the RDOŚ[18] removed shrubs growing on the limestone rocks. Grass is also mowed in the Skołczanka Nature Reserve.

Animal protection is supported by the Service[19] which deals with victims of traffic accidents, or incidents involving wild animals. The Service[19] catches animals posing a danger to people, e.g. catching foxes in humane traps, or tranquilising elks and releasing them elsewhere. The Service[19] makes almost 2000 interventions annually.



Figure 5.5. Biodiversity of Krakow: protective measures

The fight back against Sosnowsky's Hogweed began in 2014 with support from the Krakow's University of Agriculture and was relatively successful. It continues, with the amount of hogweed in the city falling. In 2017, 2.79ha of land covered by the plant was cleared, and in 2018 only 1.39ha needed clearing.

The 24 eco-zones set up in 12 municipal parks cover a total of 16ha. These areas are left for nature to claim, and interventions are limited or not performed at all. Deadwood, fallen leaves and branches are left, and trees and shrubs are trimmed only to ensure human safety. In ecospheres are installed "insect hotels" is that are furthermore equipped with appropriate noticeboards.

Krakow has quite an extensive campaign for installing bird nesting boxes for birds in its parks and green spaces, as well as on residential buildings. Thanks to financing from the Participatory Budget, the city will add another 1500 boxes (budget: 60,500€) in 2019.

Flowers meadows with local species of grass and perennial are organised in Krakow parks and by the roads, what is a perfect way to show that, instead of lawns, they can support Krakow biodiversity (pollinators) by establishing flowering multi-species meadows.

The Get Lost in Greenery campaign encourages citizens to spend their free time in nature, out of formally protected areas. The project consists of:

- Exercise in Greenery[28]: free fitness activities in Krakow parks
- Parkbus in Greenery[29]: free bus rides from one side of the city to the other, passing parks and forests, so that residents can discover green spaces elsewhere in the city
- Cinema on the Grass – Green Film Marathon[30]: screening films about nature and ecology in open green areas –

parks, squares, and urban beaches

– Green Sundays[31]: the ZZM[27] website publishes suggestions of walking trails for residents for Sundays when the shops are closed

No.	Action/time	Purpose	Target group	Means of implementation
1	Annual open-air events: Earth Days, ecological picnics, World Environmental Protection Day	Informational, educational	Children, teens, adults	Workshops on educational standards, outdoor activities, games
2	Information boards on how to feed wild birds		Children, teens, adults	Boards set up wherever people feed wild birds
3	Greenery in Krakow, Information Campaign 2018		Residents of Krakow	City website, bus TV screens, bus stop posters, open air events
4	“Tree for Tree” Information Campaign 2017	Informational	Residents, investors, farmers	Municipality’s campaign website, bus TV screens, social media channels
5	Protection of Biological Diversity in Urban Ecosystems – educational platform; co-organised with Dzika Klinika Foundation, 2015–19	Educational	Police, municipal police and fire officers, housing cooperatives staff, children, school youth, seniors	Classroom training, nature lessons in kindergartens and schools, films on bus TV screens: <i>I Found a Wild Animal – What Do I Do?</i> , workbook for children, EcoSystem Power building blocks
6	Green Hour, Micro Explorations, co-organised by Dzieci w Naturę Foundation 2019	Educational	Children and school youth	Training in Krakow kindergartens and outdoor nature lessons, e.g. in Łąki Nowohuckie Natura 2000 Area
7	Educational Trail: Role of Dead Wood 2019	Educational	Residents of Krakow	Role of Dead Wood educational trail was developed along the route connecting the Reduta and Fort Batowice parks, in the Sudoł Dominikański Valley

8	Workshops I apiary “What buzzing in the hive” – take by ZKM and Akademia Pszczelarzy	Educational	Children and school youth	Lesson about bees, beekeeping, hive construction and bee habits
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Table 5.4. Educational and informational activities

5C. Future Plans

Describe the city's short and long term ambitions and objectives for nature and biodiversity and how these proposals will be achieved. Indicate strategic and policy commitments, budget allocations and monitoring and performance evaluation schemes. Include references to any plans, projects or activities supporting the conservation of wild bees and pollinators. Demonstrate how this work coincides with the EU 2020 Biodiversity Strategy, Nature Directives and other relevant Directives such as sustainable use of pesticides and complementary national strategies.



Figure 5.6. Flower meadows in Tyniec

(max. 800 words and five graphics, images or tables)

Improvement of environmental quality is one of the priorities of the Strategy[6] which was approved by the Municipal Council[25] in February 2018. The goals for protection of urban biodiversity are identified and described in detail in documents listed in section A above (Table 5.2, 2-5).

Although POŚ[8] is currently being updated, the priorities for protection of nature and biodiversity in Krakow will remain the same, i.e.:

- improve residents' comfort of life using the potential of nature and greenery, increase Krakow's attractiveness,

and advance sustainable development

- almost double the forested area
- increase accessibility and acreage of greenery
- apply Green Public Procurement when planning investments and procurement
- environmental education of society and promotion of environmentally friendly approaches.

The Strategy[6] presents indicators of achievement of Strategic Goal IV: An Inhabitant-Friendly City. Selected indicators with the greatest impact on biodiversity are:

No.	Indicator	Measured quality	Status in 2017	Status in 2030
1	Accessibility of public greenery for residents	Percentage of people living within 300m (approx. 15-minute-walk) of recreational greenery (without forests)	75%	86%
2	Forestation in the city	Forests as a percentage of total area of the city	4.4%	7.0%
3	Number of pocket parks	Number of small parks (below 0.5ha)	4	70

Table 5.5. Strategic indicators: biodiversity (Source: Strategy[6])

One of the most important and effective tools for protecting biodiversity included in Study[7] is the protection of selected green areas from development (categories: ZU[20], ZR[21]). These categories define the minimum ratio of biologically active surfaces that must be retained in both local zoning plans and all developments.

Classification	Minimum percentage of biologically active area (%)	Exceptions/examples (%)
ZU[20]	80 – 90	50 – zoo 60 – sports, recreational, tourist, and relaxation areas 70 – Cmentarz Rakowicki, Bielany Las Wolski, Przylasek Rusiecki – Wolica regions 85 – allotments
ZR[21]	90 – 95	none

Table 5.6. Minimum biologically active area

To protect areas of natural value, Kraków passed Local Zoning Plan for Selected Natural Areas in Kraków[26].



Figure 5.7. Precious aquatic habitats with species

Plans concerning natural protection can also be found in Directions[9], and they will be achieved by covering valuable areas with forms of nature protection or protected by a heritage conservator:

- creating new (28) and extending (3) existing ecological grounds
- creating 8 nature and landscape complexes
- creating new natural monuments, consistent with current surveys
- creating a landscape park
- adding one site to the Heritage Register.



Figure 5.8. Areas earmarked for protection

The activities mentioned above will be monitored and reported for every year covered by the document, and their implementation is described in Directions by:

- Indicator 10: Performing Protection Tasks (in % and hectares)
- Indicator 11: Number of Forms of Natural Protection (number of areas).

Increasing forestation, the main purpose of PPZL[10], is to be achieved by:

- reclassifying land as forests – around 574ha
- earmarking areas for forestation, and changing classification to LS[forest] – around 856ha.

Expected result: Krakow forestation doubled by 2040.

Monitoring: annual reporting of forested area and area reclassified into LS[forest].

These indicators are reported annually in the Report on the Condition of the City and Report on the Condition of the Municipality, documents that assess the work of the Mayor and municipal authorities and are used by the City Council to evaluate the work of the administration.

To support animal species protection, the concept for a Wildlife Rehabilitation Centre is being prepared. The Centre will be set up by the end of 2021 in Lasy Tynieckie in Krakow, to treat wild animals and return them to their natural environments.

To protect pollinating insects, and following EU guidelines on pesticide reduction, the city uses only low-risk biological pesticides, and no synthetic pesticides, to fight insect pests, predominantly the invasive box tree moth (*Cydalima perspectalis*). Krakow also aims to increase the honeybee population (*Apis mellifera*) through the Krakow Apiary project, by installing apiaries on roofs. The honey they produce is used to promote the city, and the project continues to develop.

The city's current activities and plans connected to the protection of natural resources and biodiversity form the vision of 21st-century Krakow: a city of modern Europe! A civic, environmentally-friendly city. Krakow of the future is a city of sustainable, knowledge-based economic development, using its resources effectively in line with EU 2020 Biodiversity Strategy. A city that is socially coherent, whose inhabitants residents and local government work together to improve living conditions – not only for people but also plants and animals.

5D. References

List supporting documentation, adding links where possible. Further detail may be requested during the pre-selection phase. Documentation should not be forwarded at this stage.

(max. 400 words)

No.	Document	Acronym	Link
[1]	Dębnicko-Tyniecki meadows	PLH 120065	http://crfop.gdos.gov.pl/CRFOP/
[2]	Łąki Nowohuckie meadows	PLH 120069	http://crfop.gdos.gov.pl/CRFOP/
[3]	Skawiński meadows	PLH 120079	http://crfop.gdos.gov.pl/CRFOP/
[4]	Map of Current Flora of Krakow	Map	https://msip.um.krakow.pl
[5]	Inventory of Amphibian Habitats and Breeding Grounds (2009)	-	https://msip.um.krakow.pl
[6]	Krakow Development Strategy	Strategy	https://www.bip.krakow.pl/index.php?dok_id=94892
[7]	Krakow Land Use/Zoning Plan	Study	https://www.bip.krakow.pl/?bip_id=1&mimi=48
[8]	Environmental Protection Programme for Krakow 2012÷15 accounting for tasks completed in 2011 and prospects for 2016÷19	POŚ	https://www.bip.krakow.pl/?dok_id=53605
[9]	Directions of Development and Management of Green Areas in Krakow	Directions	https://www.bip.krakow.pl/?dok_id=115410
[10]	County Programme for Increasing Forestation of Krakow 2018–40	PPZL	https://zsm.krakow.pl/nowe-lasy.html
[11]	MSIP-Permits		https://msip.um.krakow.pl

[12]	Dzika Klinika w Krakowie Foundation		http://dzikaklinika.com/projekty/
[13]	Dzieci w Naturę z Krakowa Foundation		https://www.facebook.com/events/
[14]	Environmental Protection Programme for Krakow incl. Waste Management Plan (2005÷07 accounting for tasks completed in 2004 and prospects for 2008÷11)	POŚ	https://www.bip.krakow.pl/?dok_id=15904
[15]	European Arboricultural Council	EAC	www.eac-arboriculture.com
[16]	Małopolska Landscape Parks	ZPKWM	https://zpkwm.pl/
[17]	Protection Plan	PZO	-
[18]	Regional Environmental Protection Directorate in Krakow	RDOŚ	http://krakow.rdos.gov.pl/
[19]	Protected Animal Rescue Service Game Animal Rescue Service	Service	https://www.bip.krakow.pl/?sub_dok_id=26137
[20]	Cultivated greenspace, listed in Study	ZU	-
[21]	Non-cultivated greenspace, listed in Study	ZR	-
[22]	Local Zoning/Master Plan	MPZP	http://planowanie.um.krakow.pl/bpp/plany_obow.htm http://www.bip.krakow.pl/?bip_id=1&mmi=412
[23]	Krakow Municipality	GMK	https://www.bip.krakow.pl/?mmi=97
[24]	Mayor of Krakow	PMK	https://www.bip.krakow.pl/?id=96
[25]	Krakow City Council	RMK	https://www.bip.krakow.pl/?bip_id=1&mmi=15431
[26]	Local Zoning/Master Plan for Selected Natural Areas of Krakow	MPZZ	https://www.bip.krakow.pl/?dok_id=102579 - Etap I https://www.bip.krakow.pl/?dok_id=80571 - Etap II
[27]	Krakow Municipal Greenspace Authority	ZZM	https://zsm.krakow.pl/
[28]	Exercise in Greenery		https://zsm.krakow.pl/aktualnosci/612-cwicz-w-zieleni-edycja-2019.html
[29]	Parkbus in Greenery		https://zsm.krakow.pl/aktualnosci/618-rozklad-jazdy-parkobusu.html

[30]	Cinema on the Grass – Green Film Marathon		https://zsm.krakow.pl/dla-krakowian/krakow-w-zieleni/kino-na-trawie-kino-wielu-kultur.html
[31]	Green Sundays		https://zsm.krakow.pl/dla-krakowian/zielona-niedziela.html

Word Count Check

Please complete the below word count check for Indicator 5: Nature and Biodiversity, Sections 5A, 5B and 5C.

As per the Guidance Note (Annex 2 of the Rules of Contest), the word count includes text in graphics/tables and the body of text. The word count excludes text in the original application form, captions and text in Table 1: Benchmarking Data - Nature and Biodiversity.

Section	Number of words in graphics/tables	Number of words in body of text	Total number of words in graphics/tables and body of text	Max. words
5A	202	367	569	600
5B	325	797	1122	1,200
5C	123	611	734	800

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6. Air Quality

Refer to Section 2.6 of the Guidance Note

6A. Present Situation

Please complete the following table providing the most recent data that is available:

Table 1: Benchmarking Data - Air Quality

Indicator		Unit	Year of Data
Number of PM ₁₀ monitoring stations	8 7	No. of monitoring stations	2019 2018
For each station provide the number of days per year PM ₁₀ exceeded 50 µg/m ³	166(161)*- transport (al. Krasińskiego) 97(92)*- background (ul. Bujaka) 71(68)*- industrial (ul. Bulwarowa) 109(103)*- transport (ul. Dietla) 71(69)*- background (os. Piastów) 60(58)*- industrial (os. Wadów) 101(96)*- background (ul. Złoty Róg)	Days	2018
For each station provide annual average PM ₁₀ concentration	57(56)*- transport (al. Krasińskiego) 43- background (ul. Bujaka) 38(37)*- industrial (ul. Bulwarowa) 47- transport (ul. Dietla) 36- background (os. Piastów) 33- industrial (os. Wadów) 42- background (ul. Złoty Róg)	µg/m ³	2018
Number of NO ₂ monitoring stations	4	No. of monitoring stations	2018
For each station provide the number of hours with NO ₂ concentrations higher than 200 µg/m ³	0,0,0,0	Hours	2018
For each station provide annual average NO ₂ concentration	61- transport (al. Krasińskiego) 32- background (ul. Bujaka) 27- industrial (ul. Bulwarowa) 41- transport (ul. Dietla)	µg/m ³	2018
Number of PM _{2.5} monitoring stations	3	No. of monitoring stations	2018
For each station provide the annual average PM _{2.5} concentration	39- transport (al. Krasińskiego) 31- background (ul. Bujaka) 27- industrial (ul. Bulwarowa)	µg/m ³	2018

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Describe the present situation in relation to ambient air quality, including any relevant disadvantages or constraints resulting from historical, geographical and/or socio-economic factors which may have influenced this indicator. Topographical constraints should also be mentioned where relevant.

Make reference, providing data in the table above, to:

1. Assess the contribution from local sources and from long-range transport to annual mean concentration of NO₂, PM₁₀ and PM_{2.5};
2. If available, provide information on the relative contribution of different local sources (e.g. road traffic, residential wood combustion etc.) to the annual mean of NO₂, PM₁₀ and PM_{2.5};
3. If exceedances occur, describe the extent of the exceedances in the city as a whole, not only at the monitoring sites. If available, provide maps of air pollutant concentrations.

Charts:

Air quality data (addressing NO₂, PM₁₀ and PM_{2.5} at a minimum) should be provided to show trends over time. Please use five charts to illustrate:

1. Trend (10 years at least) of annual average NO₂ for each monitoring site;
2. Trend (10 years at least) of annual average PM₁₀ for each monitoring site;
3. Trend (10 years at least) of annual average PM_{2.5} for each monitoring site;
4. Trend (10 years at least) of number of daily limit exceedances of PM₁₀;
5. Trend (10 years at least) of number of hourly limit exceedances of NO₂.

An example of the requested chart is provided in the Guidance Note, Figure 2.1.

Describe whether air quality objectives and measures taken go beyond what is required by the Ambient Air Quality Directives, and how this is achieved.

Describe whether and how air quality planning and measures are integrated with other plans and measures in the city, and whether and how synergies have been achieved between objectives and measures on air quality and those in other areas.

(max. 1,000 words and five graphics, images or tables plus the five requested charts detailed above)

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Air quality assessment is part of State environmental monitoring.

Air quality in Krakow is currently monitored at eight stations, of which 2 monitor transport, 2 industry, and the remaining 4 – the background. Continuous monitoring of quality is a task of the Chief Inspectorate of Environmental Protection[6D2]. Nonetheless, **Mayor of Krakow purchased (€275,256 from city budget) five measuring units to provide residents with access to precise information about air pollution levels.**

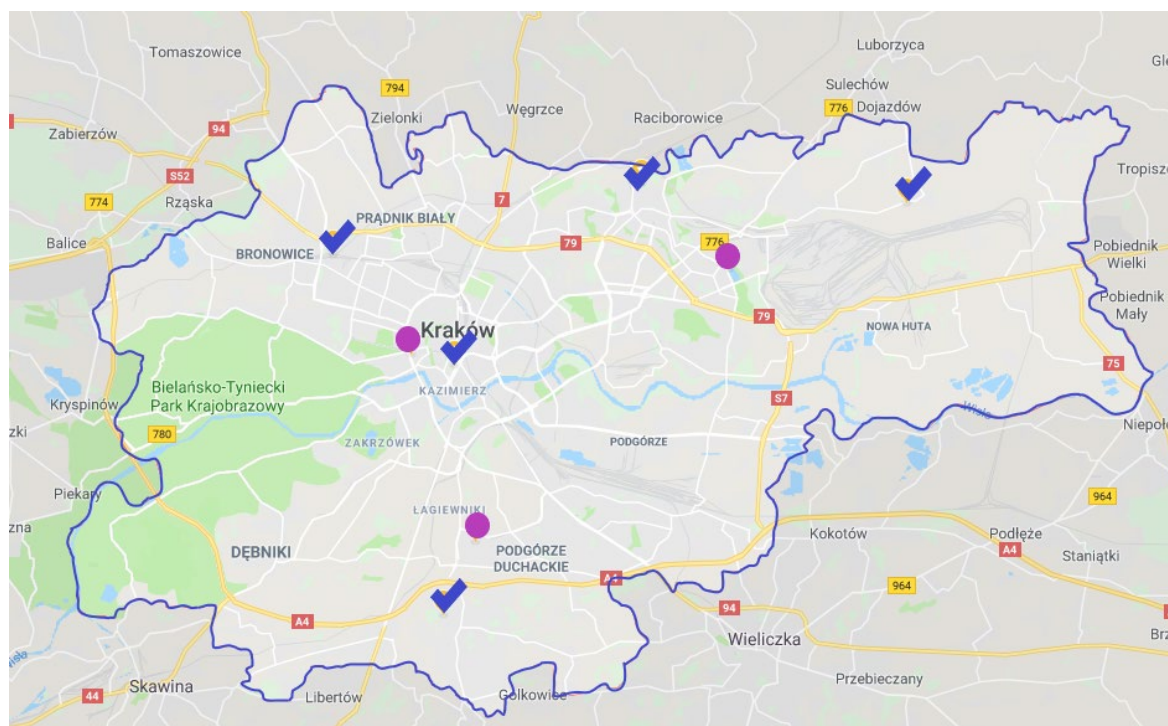


Figure 1 Deployment of monitoring stations in Krakow

- ✓ Municipal monitoring stations
- Chief Inspectorate of Environmental Protection

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Concentrations 2006–18

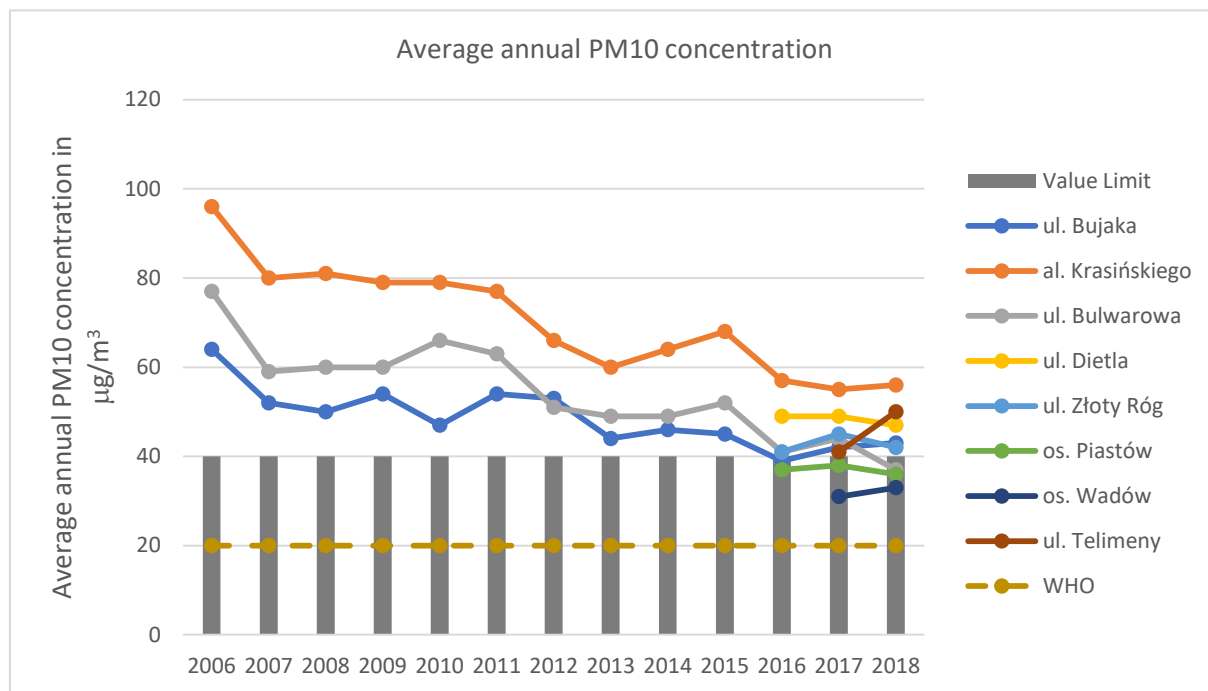


Figure 2 Average annual PM10 concentration

Average annual PM10 concentrations showed falling tendency in 2006–18. Since 2016 for certain stations

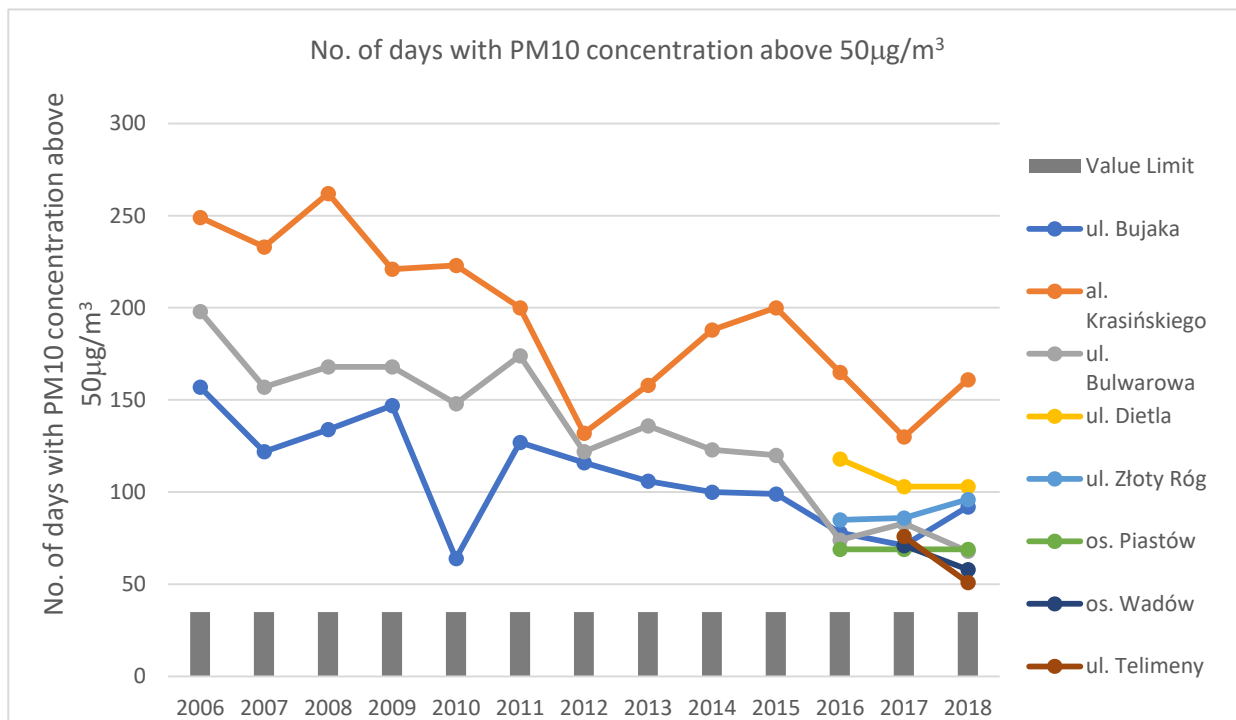


Figure 3 No. of days with PM10 concentration $>50\mu\text{g}/\text{m}^3$

they lie within the permitted range.

As much as the allowed number of days with average daily concentrations of PM₁₀ above the norm is still exceeded, it is being successively lowered.

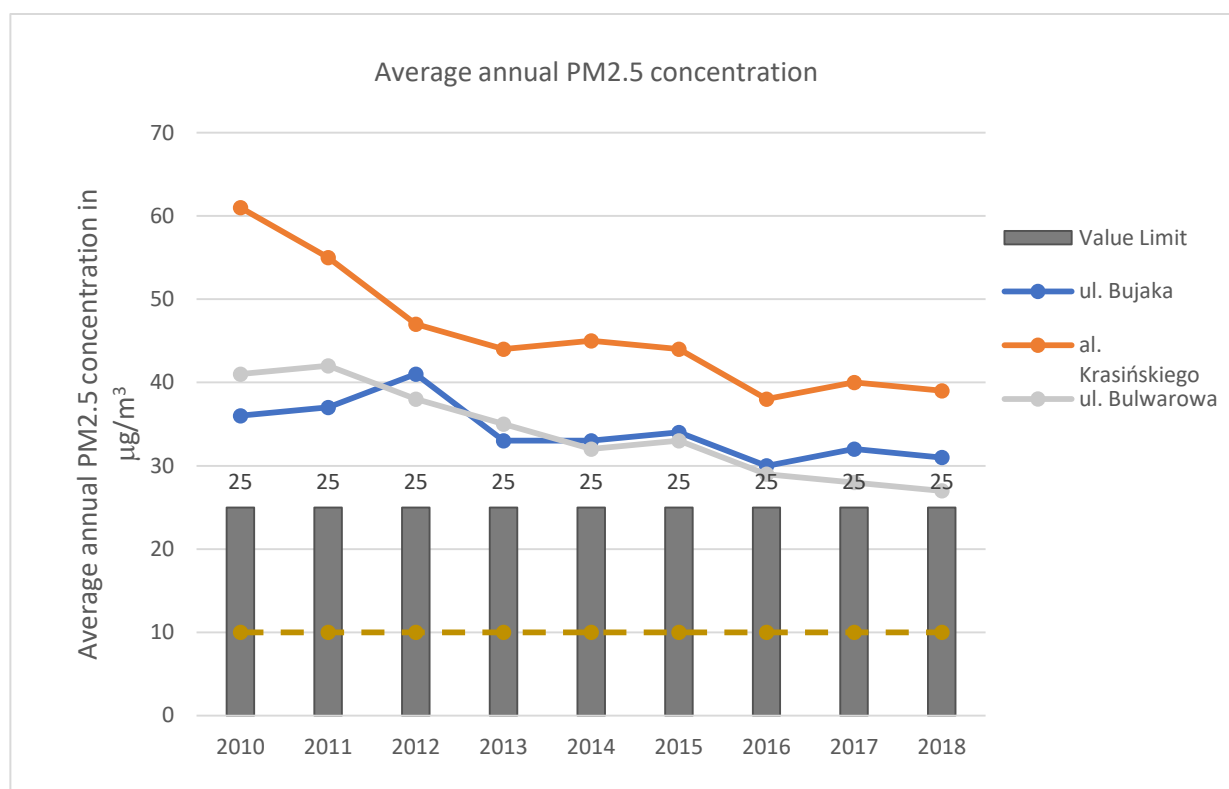


Figure 4. Average annual PM_{2.5} concentration

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Average annual concentrations of PM_{2.5} show a long-term falling tendency.

The level of average annual concentration of PM₁₀ dropped from 64 µg/m³ in 2006 (background, ul. Bujaka) to the level of the standard in 2016[6D3]. Similar reduction of concentrations was recorded at the industrial station in the same period. In 2018 annual average concentrations of particulate matter oscillated around the permitted level at most stations. Air quality is still unsatisfactory, though a great progress in attempts to improve it needs emphasising. The number of days with concentrations above norms dropped from 157 in 2006 to 97(92)* in 2018 at ul. Bujaka (background) and from 249 in 2006 to 166(161)* in 2018 (transport)[6D3].

*Without Sahara dust.

High PM₁₀ concentrations (100–200 µg/m³) were recorded on fewer days in 2018 than before: reduction from 29 in 2015 to 15 in 2018.

A broad scope of activities supporting air quality improvement aim at reaching average annual concentrations of PM₁₀ and PM_{2.5} at the level recommended by the WHO.

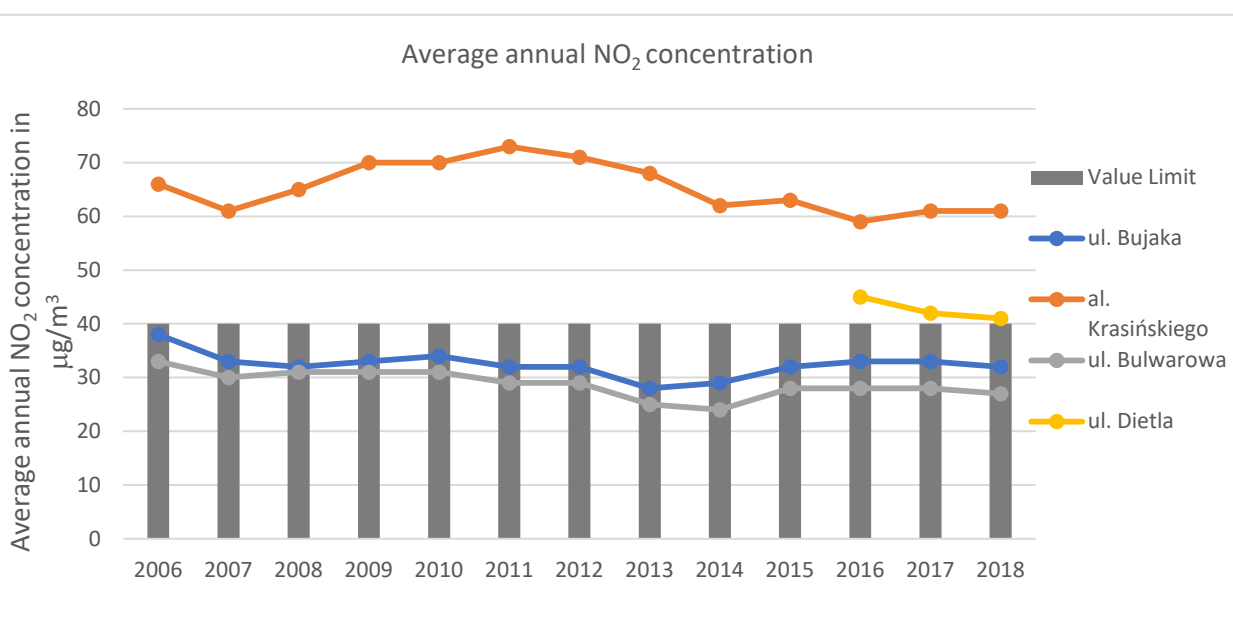


Figure 5. Average annual NO₂ concentration

NO₂ concentrations at transport stations show a falling tendency, however, the permitted levels are still exceeded. Average annual concentrations of NO₂ have not been exceeded at the remaining stations for many years.

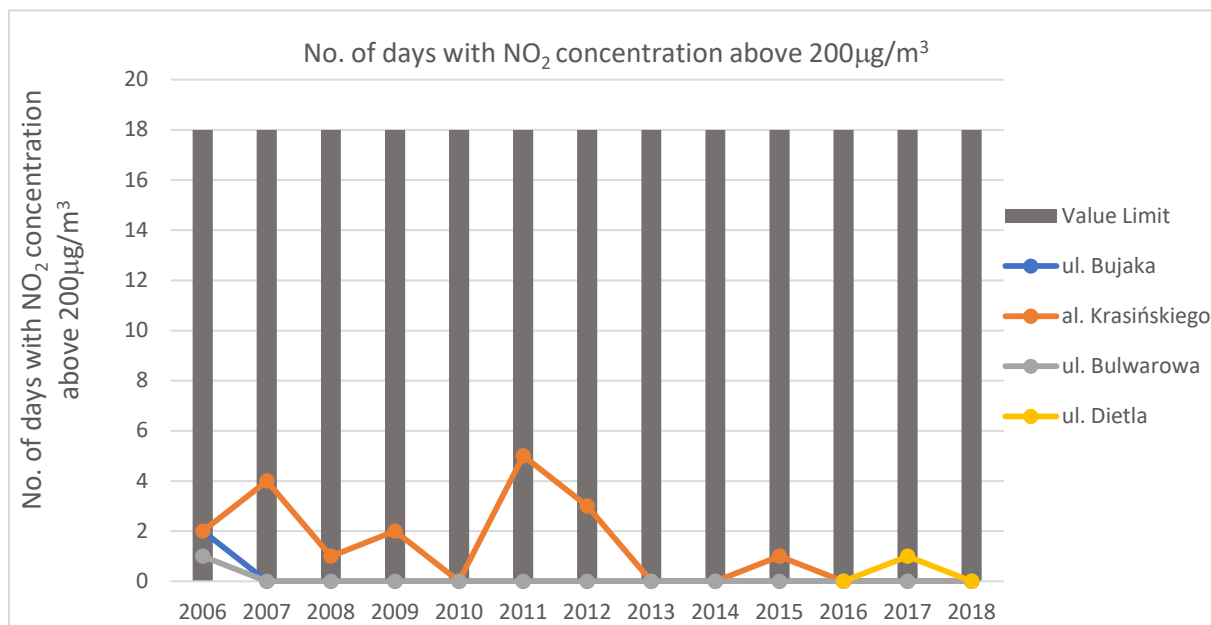


Figure 6. No. of days with NO₂ concentration >200µg/m³

Despite NO₂ concentration exceeding 200µg/m³ on individual days, the frequency of such exceedance is permissible and continuously reduced.

The highest values of average annual concentrations of PM and NO₂ are detected at transport stations. This results from the impact of low emissions, traffic, and topography, climate and dense residential development.

Krakow has approved lower average daily levels for information, information/warning, and warning than required in Polish law.

POLAND[4]	KRAKOW[5]	KRAKOW[6]
PM10 LEVELS (average daily values)		
PERMITTED	1st LEVEL: requiring notification	
50µg/m ³	50µg/m ³	50µg/m ³
REQUIRING NOTIFICATION	2nd LEVEL: requiring notification and warning	
200µg/m ³	150µg/m ³	80µg/m ³
WARNING	2nd LEVEL: requiring warning and action	
300µg/m ³	300µg/m ³	100µg/m ³

Figure 7. Krakow versus Poland

6B. Past Performance

Describe the plans and measures implemented over the last five to ten years for the improvement of ambient air quality. Comment on which measures have been most effective.

Particular reference should be given to:

1. Existence and implementation status of an air quality management plan (specify if it is a local, regional and/or national plan);
2. Local measures taken to improve air quality and quantify their effect on air quality in terms of pollutant emissions abatement;
3. Information for the public (both inhabitants and tourists) on air quality levels (e.g. web pages, information screens) in order to increase public awareness and behavioural change. Make reference to relevant stakeholder/citizen participation process.

(max. 800 words and five graphics, images or tables)

Air Protection Programme (APP)

Part of Małopolska Region air quality strategy coherent with EU environmental protection policy, AQP[6D5] defines:

- reasons for exceedances
- short/long-term actions
- bodies carrying out tasks
- ecological effects and costs.

TRANSFORMATION IN KRAKOW:

- **absolute ban on burning solid fuel in Krakow**[6D8]
- **regulations on fuel quality** before the ban[6D10]
- **limitations on fuel and boiler quality outside Krakow**[6D11] due to inflowing emissions.

Krakow is Poland's first city to introduce local regulations banning coal (enforced on 01/09/2019).

The current condition of the air was achieved through:

- changes in national law
- active eco-education and community buy-in
- investment outlay.

Review of sources

Liquidation of sources has continued since 1995. In 2013–15 stoves, boilers, and fireplaces were inventoried to define the significance of the problem and earmark funds.[Good Practices 3]

LIFE Project[6D12],[1B],[10B]

LIFE Integrated Project "Implementation of Air Quality Plan for Małopolska Region – Małopolska in a healthy atmosphere". The project aims at speeding up implementation of APP measures improving air quality[6D5]. LIFE finances innovative large-area projects of €17m, and employs 22 people (including

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energy consultants) to handle the grants process and support programmes.

Energy consulting points[1B]

Advice offered to residents on exchanging heat sources, thermal modernisation, and Renewable Energy Sources (RES); also thermal-imaging camera tests.

Current campaigns:

YES! to clean air: extending assistance to residents who have not liquidated coal sources

Let's fight together for clean air: bringing residents of Krakow and neighbouring communes together in campaigning for clean air

#EKO(r)EWOLUCJA: information campaign devoted to banning solid fuels.

Educational open air events:

Days of the Earth, Family Festivity, Family Eco-Picnics, European Week of Sustainable Transport [12A].



Figure 11. Open-air educational events.

Awareness changes make residents abandon coal-fired boilers on a mass scale. The public consulted the anti-smog resolution, submitting comments and ideas.



Figure 12. Exchange of heat sources.

YEAR	LIQUIDATING LOW EMISSIONS IN KRAKOW
------	-------------------------------------

Resident support programmes:

Low Emissions Reduction Programme (LERP)[6D13]: grants for switching from solid fuel heating system to:

- municipal heating network[1B]
- gas, electric or light oil heating installations
- hot running water installations
- RES.

Grant value: by 2016, grants covered 100% eligible costs, 80% in 2017, and 60% in 2018–19.

Controls: performed >26,000 controls of completed LERP investments.

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	Expenditure incurred (€)	Liquidated sources	Liquidated boiler rooms	Sources & boiler rooms	Installed RES
2012	535,571	375	16	391	130
2013	3,508,571	1591	255	1,846	1
2014	8,945,931	1320	878	2,198	313
2015	9,100,239	1156	1159	2,315	73
2016	16,596,844	2002	2240	4,242	149
2017	21,479,835	3368	2703	6,071	344
2018	12,662,336	2456	1477	3,933	467
2019*	10,045,900	3203	1594	4,797	232
TOTAL 2012–19	82,875,225	15,471	10,322	25,793	1,709
TOTAL 1995–19	85,828,380	35,002	10,647	45,649	2,001

Krakow is Poland's only city to have achieved such a spectacular result in exchanging sources.

Figure 13. Liquidation of low emissions in Krakow

**Actual number of liquidated sources will be known after grant process completion.*

Cooperation with residents was key for achieving success. Independent of support programmes residents also liquidated sources themselves.

Barrier diagnosis

By constant monitoring of sources exchange process, the Municipality diagnosed preventing barriers. New programmes were developed to help residents:

Local Protection Programme (2014–22)[6D14] co-financing higher costs of heating.

Welfare Protection Programme (since 2018)[6D15] offering up to 100% eligible costs to residents with lower incomes.

Programme of Thermal Modernisation for Family Houses (since 2018)[6D16] co-funding for thermal modernisation.

Krakow Metropolitan Area Association[6D17],[6D24]

Krakow and 14 neighbouring communes carry out the objectives of Integrated Territorial Investments.

OTHER ACTIVITIES RESULTING FROM APP[6D5]:

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Reducing emissions from municipal and housing sector[1B]:

- development and modernisation of municipal heating and gas networks
- RES use
- thermal modernisation of buildings, energy-efficient construction
- control of waste incineration, enforcement of the ban on solid fuels[8B]

Reducing transport emissions[1B,3A,3B]:

- extension of public transport, tram and bus networks
- park- and -the ride car park system,
- exchange of municipal rolling stock for vehicles meeting highest exhaust emission standards and electric buses
- expanding the limited traffic zone
- improving organisation of vehicular traffic
- maintenance of roads to cut down secondary emissions: regular washing, overhauls
- development of bicycle transport
- controls at diagnostic stations
- free public transport during high pollutant concentrations[6D18].

Reducing industrial emissions:

- special supervision over industry
- compensatory measures[6D2]
- permissions for issuing gases and particulate matter into the air[6D2]

Improving airing of the city[4A]

Designing development that respects airing of the city, with special consideration of densely developed areas, and designing the spatial layout of the city to retain and protect the largest possible number of greenspaces being the places of air exchange and regeneration.

Implementation of MONIT-AIR project co-financed from EEA [6D19],[6A]

Purpose: **to create an integrated system of monitoring spatial data for improving air quality in Krakow.**
One of its deliverables was The Atlas of Land Use and Airing of Krakow.

Communicating information on air quality:

- **multimedia boards** situated close to the centre and transport hubs
- **information on air quality:** presented in trams and buses, and on tram/bus stops
- **websites:** updated information and air-quality indexes[6D20],[6D3]
- **mobile app**[6D21].

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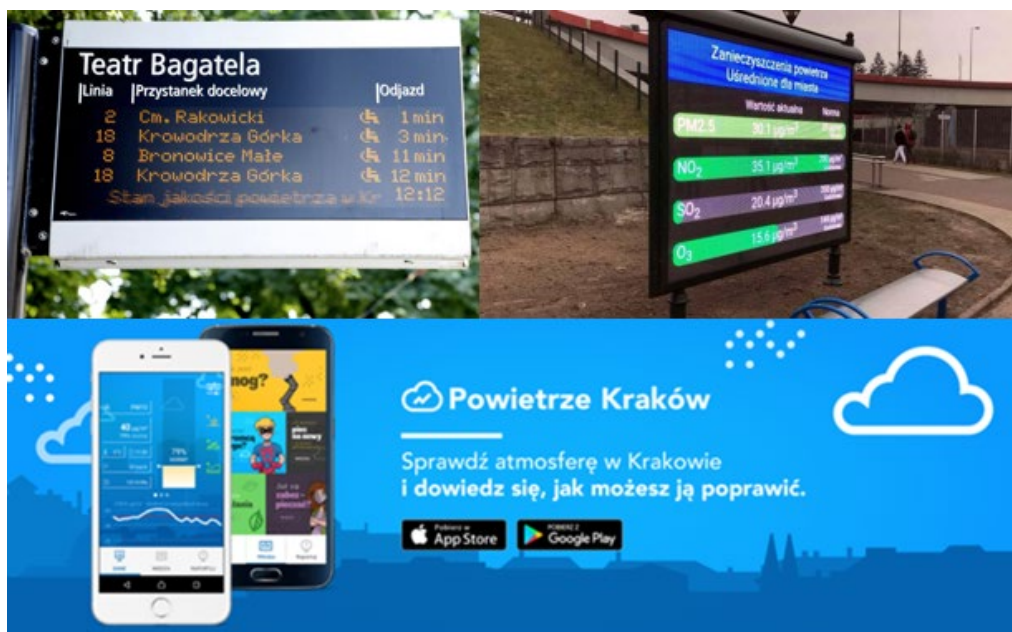
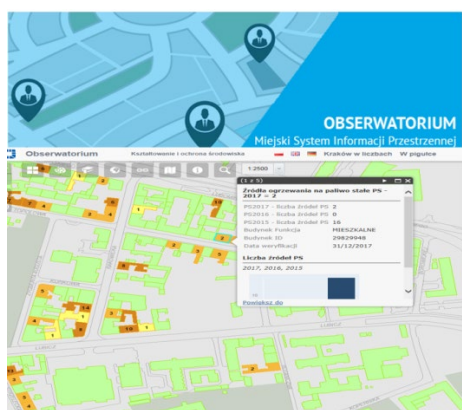


Figure 14. Ways of sharing information

Maps on liquidation of low emission sources are available on the website of the Municipal System of Spatial Information–Observatory[6D22].

Activities resorted to in case of risk and exceedance of warning, information, permitted, and target thresholds: three alarm levels are in operation[6A Figure 8,6D5].



6C. Future Plans

Describe the short and long term objectives for the future, proposed plans and the proposed approach and measures for their achievement. Quantify the expected effects of proposed measures on air quality in terms of immissions (if possible).

Emphasise to what extent plans are supported by commitments, budget allocations, and monitoring and performance evaluation schemes.

(max. 800 words and five graphics, images or tables)

To allow living in healthy environment Krakow will continue activities under Air Protection Programme [6D5],[6B]. Its update aims at assessing efficiency of actions taken.

Air quality improvement strategy is integrated in climate supporting measures. **2019 is the breakthrough year for the city and its residents as ban on solid fuels came into force on 1 September, ending the era of coal in Krakow.**



Figure 17. End of coal era in Krakow

KRAKOW'S PLANS FOR THE FUTURE:

Implementation of programmes:

Local Protection Programme (2014–22)[6D14]

Programme of Thermal Modernisation for Family Houses (since 2018)[6D16] co-funding for thermal modernisation.

Programme for Development of Renewable Energy Sources

Financial support for the purchase and assembly of heat pumps, solar panel installations, and photovoltaics.

LIFE Project[6B],[6D12]

Consulting on air protection and energy management, primarily thermal modernisation of buildings and installation of RES.

ELENA Programme[6D25]

An initiative of European Investment Bank and European Commission, the programme provides grants for technical assistance focused on residential buildings energy efficiency projects, mostly by covering costs of employment. Project worth €45 million is planned for January 2020–December 2022.

Climate-KIC[11C,1C,2C]

The project urges development of RES, municipal heating, and improvement of energy efficiency. New municipal unit Climate-Energy-Water Management was incorporated.

Better Energy for Cities[1C]

The project engages residents and entrepreneurs into climate transformation.

Implementation of pilot projects in electricity and heat cogeneration from RES installations[1C]

Scientific and R&D projects, whose key element is technical consulting and implementation of educational projects in broadly construed environmental protection with special focus on RES and passive construction.

Promotion of energy-efficient construction in residential sector, infrared camera tests.

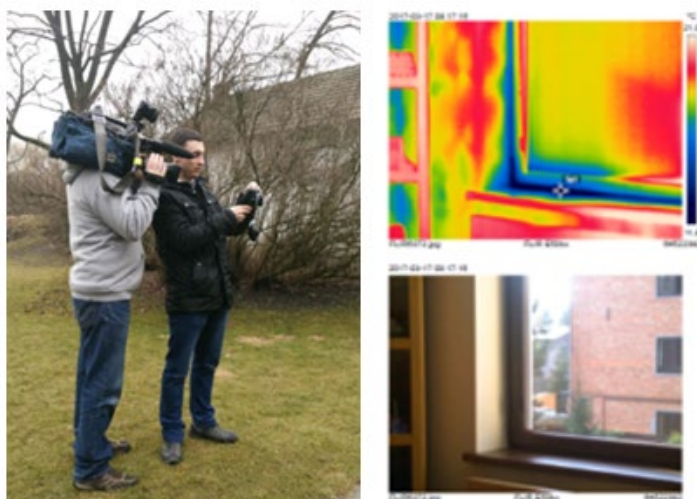


Figure 17. Infrared camera testing

MAŁOPOLSKA PLANS FOR FUTURE:

Clean Air Programme: governmental complex programme for improving air quality aimed to reduce or avoid emissions from family houses by co-financing thermal modernisation and exchange of inefficient heat sources. Cooperation between Krakow and [6D23] on shared implementation of the programme will reach larger number of Krakow residents.

Integrated Territorial Investments ITI [6D24]

A new form of cooperation of territorial authorities co-financed from European Funds. Local governments started a partnership – Krakow Metropolitan Area Association – and developed shared ITI Strategy. The key objectives and projects for the coming years: improvement of energy efficiency, reduction of pollutant emissions, and low-emissions transport. Krakow and surrounding communes and regional authorities jointly agree goals and name necessary investments. Financing for ITI envisaged in Infrastructure and Environment Operational Programme is €229,721,001.

Intensification of activity of Krakow Metropolitan Area Association[6B]

With respect to the impact of inflowing emissions on the quality of air in Krakow, actions reducing low emissions in neighbouring communes are a priority. For that reason, municipal authorities intend to create low-emissions policy in the metropolitan area. Krakow, championing the fight for clean air, offers its experience to other cities and communes, aiming at the implementation of the following **throughout Małopolska:**

– introduction of ban on solid fuels in new built, and absolute ban on solid fuels in buildings that can be connected to heating and/or gas networks, and eventually absolute elimination of solid fuels, as happened

in Krakow

- appointing controls, supervising the ban on burning waste in all Małopolska, also enforcing regulations of anti-smog acts, and insistence on increasing controls adequately to the significance of the problem in neighbouring communes
- drafting a plan of heating installations control both for forbidden burning of waste and for enforcement of anti-smog laws
- increasing number of eco-consultants and educational campaigns in neighbouring communes to improve local awareness, promote eco-friendly attitudes, and engagement in the fight for clean air.

Task implementation in line with APP[6D5]:

Development and modernisation of heating and gas networks to connect new users.

Improvement of city airing and protection of green spaces[6B],[6D5].

Activities connected with reducing transport emissions by development of public transport, tram and bus networks, park-and-ride car park system, exchange of municipal rolling stock for vehicles meeting the highest norms of exhaust emissions and electric buses, development of bicycle transport, etc.[3C].

Enforcing anti-smog regulations: the ban on burning solid fuels introduced by local law will be enforced by authorised units, with both preventive and interventional controls.

Continuing systemic support and supervision of homes with barriers to liquidation of coal-fired sources: staff of Municipal Welfare Centre will deal with cases of financial, social, and health problems.

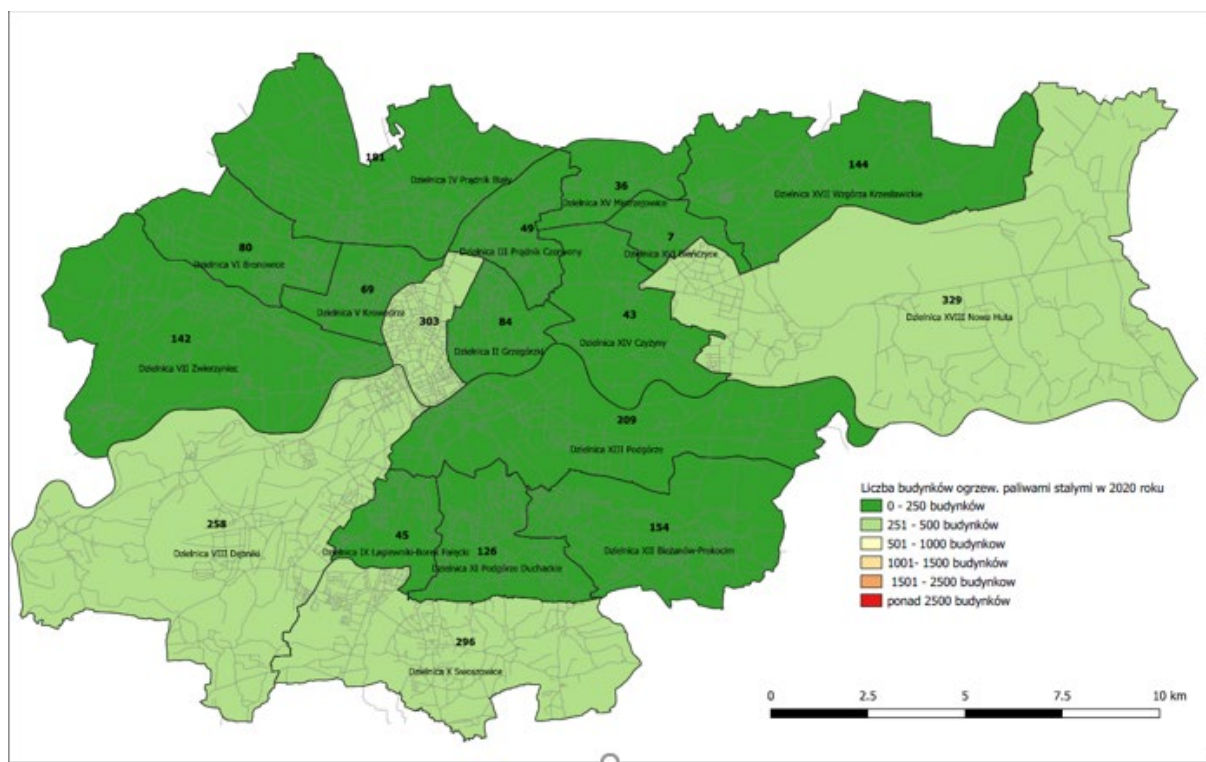


Figure 18. Number of buildings heated with solid fuels in 2020 (forecast).

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Krakov intends to focus on activities aimed at lowering line emissions. Results of measurements conducted prove that focus on such steps is necessary. The current scale of activity makes it possible to attain assumed results (ecological effects) in the final year of implementation of the main remedial programme for Małopolska Region.

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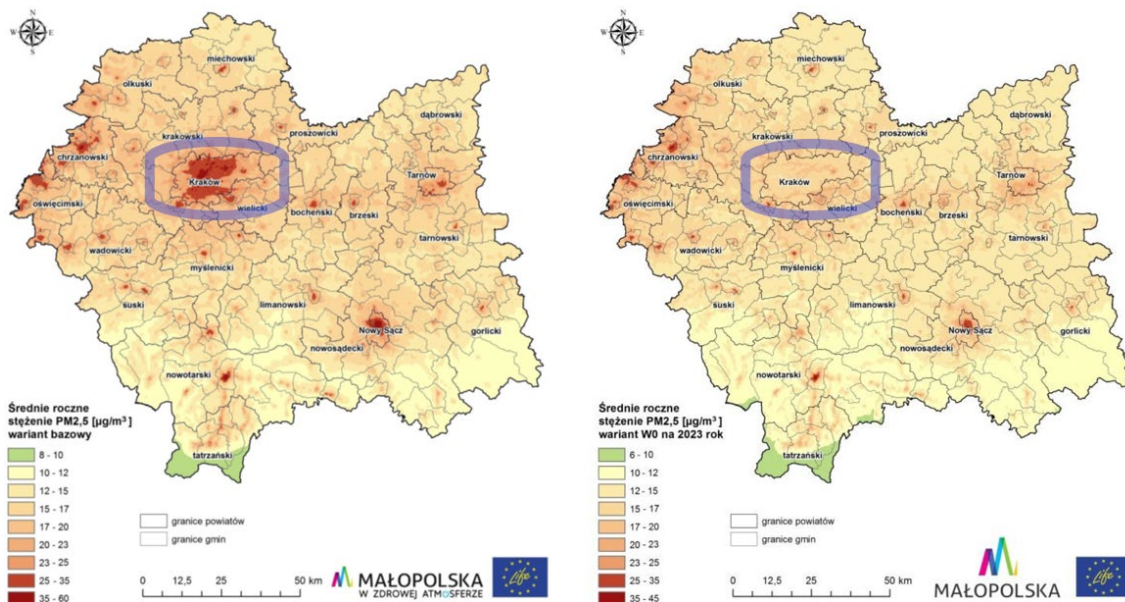


Figure 19. Comparison of average annual concentrations of PM_{2.5} in 2016 and forecast for 2023[6D5]

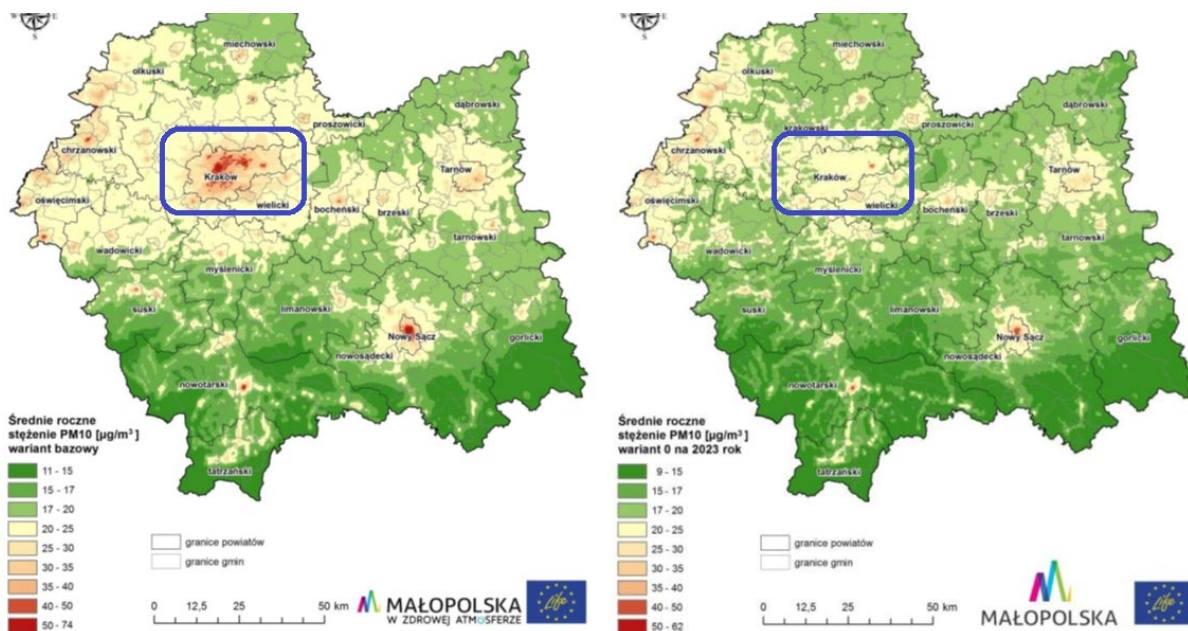


Figure 20. Comparison of average annual concentrations of PM₁₀ in 2016 and forecast for 2023[6D5]

6D. References

List supporting documentation, adding links where possible. Further detail may be requested during the pre-selection phase. Documentation should not be forwarded at this stage.

(max. 400 words)

1. Annual air quality assessment in Małopolska Region. Regional report for 2018:
<http://powietrze.gios.gov.pl/pjp/publications/card/14060>
2. Environment Protection Law of 27 April 2001: tasks of Chief Inspector of Environmental Protection
 - running constant monitoring
 - compensatory measures
 - permits for issuing gases and PM into air<http://prawo.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20010620627>
3. Data from measurements: pollutant concentration
<http://powietrze.gios.gov.pl/pjp/home>, <http://krakow.pios.gov.pl/>
4. Resolution of the Minister of Environment of 24 August 2012 on levels of selected substances in the air
<http://prawo.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20120001031>
5. Air Protection Programme for Małopolska Region, Appendix to the Resolution No. XXXII/451/17 of Małopolska Regional Parliament of 23 January 2017
<https://bip.malopolska.pl/umwm,a,1283890,uchwala-nr-xxxii45117-sejmiku-wojewodztwa-malopolskiego-z-dnia-23-stycznia-2017-r-w-sprawie-zmiany-u.html>
 1. Draft amendment of the Air Protection Programme for Małopolska Region
7. Air Quality Indexes: Regional Inspectorate of Environmental Protection:
<http://powietrze.gios.gov.pl/pjp/current>, <https://powietrze.gios.gov.pl/pjp/content/show/1001197>
8. Resolution No. XVIII/243/16 of Małopolska Regional Parliament of 15 January 2016 on restricting fuel-burning installations in the area of Municipality of Kraków (Anti-Smog Law)
<https://bip.malopolska.pl/umwm/Article/get/id,1159347.html>
9. Supreme Audit Office
<https://www.nik.gov.pl/o-nik/>
10. Resolution No. XXXV/527/17 of Małopolska Regional Parliament of 24 April 2017 on banning fuel-burning installations in the area of Municipality of Kraków from 1 July 2017 to 31 August 2019:
<https://bip.malopolska.pl/umwm,a,1316501,uchwala-nr-xxxv52717-sejmiku-wojewodztwa-malopolskiego-z-dnia-24-kwietnia-2017-r-w-sprawie-wprowadze.html>
11. Resolution No. XXXII/452/17 of Małopolska Regional Parliament of 23 January 2017 on banning and restricting fuel-burning installations in the area of in Małopolska Region:
<https://bip.malopolska.pl/umwm,a,1283900,uchwala-nr-xxxii45217-sejmiku-wojewodztwa-malopolskiego-z-dnia-23-stycznia-2017-r-w-sprawie-wprowadze.html>
12. LIFE Project:
<https://powietrze.malopolska.pl/life/>
13. Programme for Reducing Low Emissions (PONE):
https://www.bip.krakow.pl/?dok_id=105326
14. Local Protection Programme:
https://www.bip.krakow.pl/?dok_id=97105
15. Welfare Protection Programme:

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http://www.bip.krakow.pl/?dok_id=97190
https://mops.krakow.pl/mops/219927,artykul,doplaty_dla_zmieniajacych_system_grzewczy.html
 16. Programme of Thermal Modernisation for Family Houses
https://www.bip.krakow.pl/?dok_id=101664
 17. Krakow Metropolitan Area Association
<http://metropoliakrakowska.pl/>
 18. Resolution No. IV/82/19 of Krakow City Council of 9 January 2019 on proclaiming free use of municipal transport in Krakow when concentration levels of certain substances in the air have been exceeded:
https://www.bip.krakow.pl/?dok_id=167&sub_dok_id=167&sub=uchwala&query=id%3D23885%26typ%3DU
 19. Implementation of MONIT-AIR:
<http://umk-gd.maps.arcgis.com/apps/MapSeries/index.html?appid=81480b0233ab4163a376936410be9064>
http://krakow.pl/aktualnosci/209121,29,komunikat_atlas_pokrycia_terenu_i_przewietrzania_krakowa_n_agrodzony.html
 20. Magic Krakow, information about air quality:
<http://krakow.pl/>
 21. App presenting current levels of air pollution:
<https://powietrze.malopolska.pl/aplikacje/>
 22. Municipal System of Spatial Information–Observatory:
<https://msip.krakow.pl/>
 23. Regional Fund for Environmental Protection and Water Management :
<https://www.wfos.krakow.pl/>
 24. Integrated Territorial Investments (ITI)
<https://www.rpo.malopolska.pl/o-programie/poznaj-zasady-dzialania-programu/zintegrowane-inwestycje-terytorialne-wsparcie-dla-osrodkow-terytorialnych>
 25. Elena:
<https://www.eib.org/en/products/advising/elena/index.htm>

Word Count Check

Please complete the below word count check for Indicator 6: Air Quality, Sections 6A, 6B and 6C.

As per the Guidance Note (Annex 2 of the Rules of Contest), the word count includes text in graphics/tables and the body of text. The word count excludes text in the original application form, captions and text in Table 1: Benchmarking Data - Air Quality.

Section	Number of words in graphics/tables	Number of words in body of text	Total number of words in graphics/tables and body of text	Max. words
6A	39	909	948	1,000
6B	0	764	764	800
6C	0	742	742	800

7. Noise

7A. Present Situation

Please complete the following table providing the most recent data that is available:

Table 7.1: Benchmarking Data – Noise

Indicator		Unit	Year of Data
Share of population exposed to total noise values of L _{den} above 55 dB(A)	road noise	40.83%	2017
	tram noise	5.66%	
	railway noise	1.9%	
	industrial noise	0.14%	
Share of population exposed to total noise values of L _{den} above 65 dB(A)	road noise	14.52%	2017
	tram noise	0.95%	
	railway noise	0.1%	
	industrial noise	0%	
Share of population exposed to total noise values of L _n (night noise indicator) above 50 dB(A)**	road noise	29.66%	2017
	tram noise	1.94%	
	railway noise	1.35%	
	industrial noise	0.04%	
Share of population exposed to total noise values of L _n (night noise indicator) above 55 dB(A)	road noise	16.04%	2017
	tram noise	1.15%	
	railway noise	0.31%	
	industrial noise	0.02%	
The percentage of citizens living within 300 m of quiet areas	no data: no quiet areas defined (described 7B)		
Percentage of implementation of the last noise action plan		77.3%*	2017
Which limits or reference value does the city apply to residential areas? (Ld/Le/Ln)	City centre: <ul style="list-style-type: none">road and rail noise: L_{DEN} 70 dB, L_N 65 dB;industrial noise: L_{DEN} 55 dB, L_N 45 dB; Residential multi-family and residential/service developments: <ul style="list-style-type: none">road and rail noise: L_{DEN} 68 dB, L_N 59 dB;industrial noise: L_{DEN} 55 dB, L_N 45 dB; Single-family residential developments: <ul style="list-style-type: none">road and rail noise: L_{DEN} 64 dB, L_N 59 dB;industrial noise: L_{DEN} 50 dB, L_N 40 dB;		

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In the last year how many noise complaints did the city receive related to leisure or recreational activities?	0
How many noise experts does the city have?	2

** including:*

- remedial steps for areas with the highest M indicator values (described in 7B): completion rate 58.3%
- investment activities for 2014–18 envisaged in the Long-Term Financial Forecast influencing the improvement of the Krakow acoustic environment; completion rate: 100%.

*** lack of information on Ln in 45÷50dB range (Polish law requires determining % of population exposed to >50dB noise levels)*

Describe the present situation in relation to the quality of the acoustic environment, including any disadvantages or constraints resulting from historical, geographical and/or socio-economic factors which may have influenced this indicator. Where available, information/data should be provided from previous years (5-10) to show trends. Present situation may also include information describing the city's commitment to the aims of the Environmental Noise Directive.

Additional figures for noise exposure to individual noise sources (road, rail, air, industry, and leisure/entertainment) can also be included.

Information on formally defined and delimited quiet areas, or sound improved areas, should also be included.

(max. 800 words and five graphics, images or tables)

The situation of the city and impact of the many centuries of its development have made Krakow one of Poland's key road and rail hubs. The high intensity of (primarily road) traffic and the situation of main transport routes in the vicinity of residential areas are decisive for the Krakow acoustic environment.

Typical methods of protection against transport noise (in the imission zone) bar the path of the soundwave from the source to recipient (e.g. noise barriers, embankments, and non-residential developments protecting residential ones) cannot be applied in city centre due to dense residential developments directly by the roads. Reduction of noise to values permitted in legislation is hard to achieve in such circumstances and high traffic intensity.

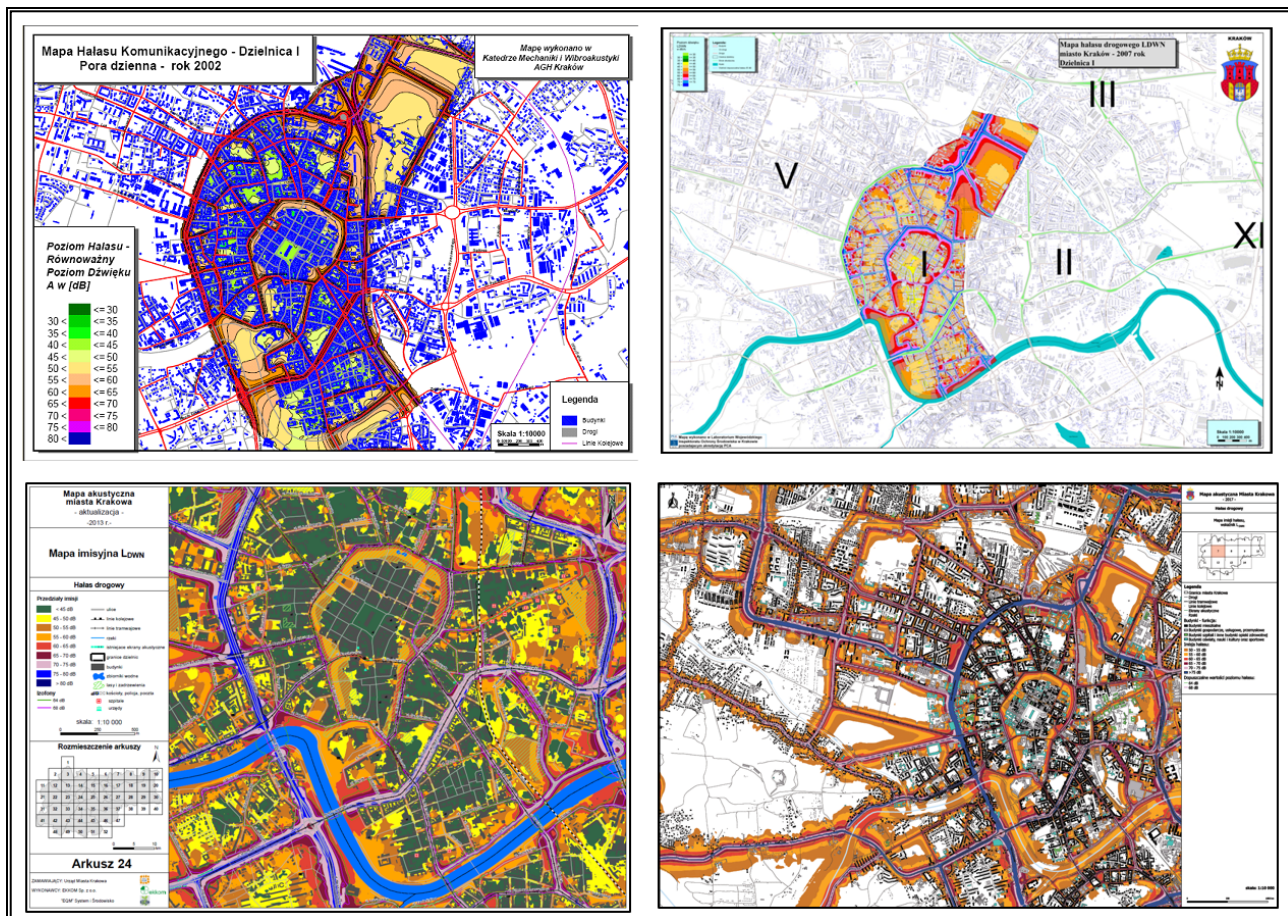


Figure 7.1. Noise maps, 2002, 2007, 2012, 2017: road noise LDWN (den) (District I)

Aware of the need to develop tools for proper management of Krakow acoustic environment and prepare an action plan to limit environmental noise emissions Poland's first noise map (Krakow Noise map) was drafted in 2002 to assess precisely the acoustic conditions in Krakow. Fulfilling the objectives of Directive 2002/49/CE of European Parliament and Council, Krakow passed in the following years:

- successive updates of Krakow Noise map (2007, 2012, 2017),
- 3 Noise Action Plans for Krakow, approved by the City Council in 2009, 2013, and 2018.

The first and later updates of the Krakow Noise map proved that citizens of Krakow find road noise the worst nuisance, and that it impacts nearly the whole city (by all main transport routes). The remaining noise types (rail, tram, aircraft, industrial, and municipal) are local and inconvenience far fewer residents, as demonstrated by Table 7.1.

Comparison of the city's noise maps from 2012 and 2017 shows the following changing tendencies in Krakow acoustic environment.

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	Data from Noise Map 2012		Data from Noise Map 2017	
values w dB	No. of people exposed	% of people exposed	No. of people exposed	% of people exposed
55-60	123836	16.37	97916	12.77
60-65	87664	11.59	103834	13.54
65-70	51434	6.8	72780	9.49
70-75	18291	2.42	31343	4.09
>75	3643	0.48	7227	0.94
	284868	37.66	313100	40.83

Table 7.2. Number of people exposed to road noise (L_{DEN})

A comparison of results of road noise analyses shows that the number of residents subjected to noise has risen by 3.17 percentage points in the last five years. This results from the increase in the number of vehicles and new residential developments situated very close to transport routes, including areas exposed to noise.

Noise Action Plan (a.k.a. Programme of Protection Against Environmental Noise) 2019–23 was drafted and approved in 2018. Its tasks, courses of action, and strategic investments will improve the acoustic environment and reduce the number of residents exposed to noise.

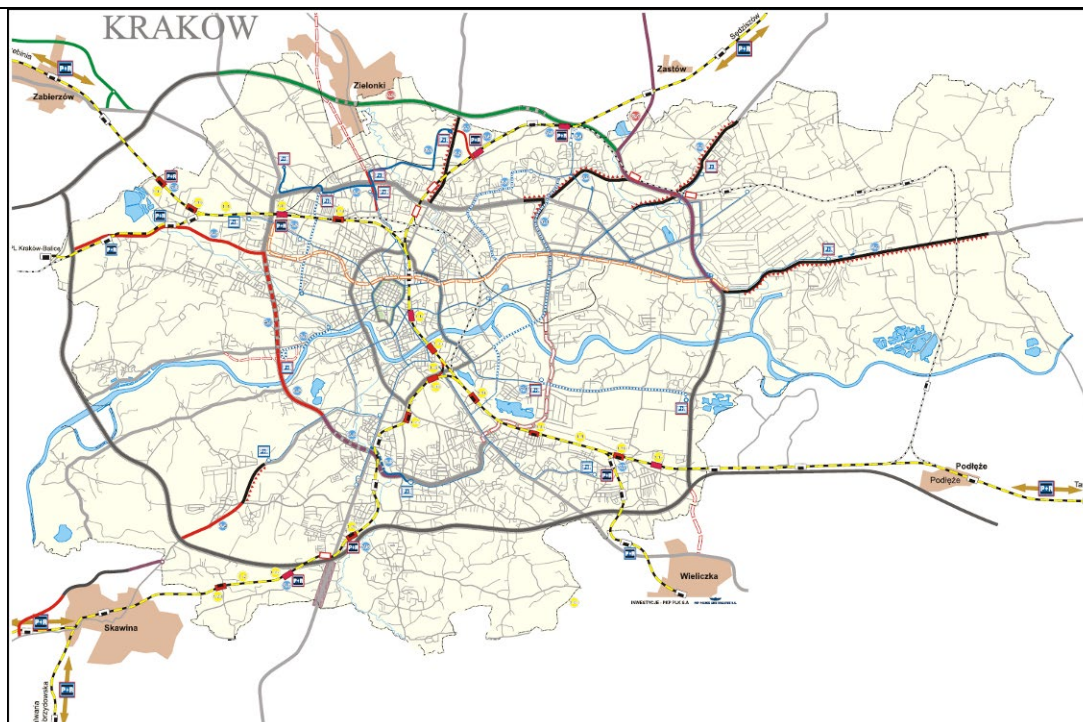


Figure 7.2. Major strategic investments

Aircraft noise: the number of operations at Kraków-Balice Airport (under 50,000 aircraft take-offs and landings annually) releases it from the obligation to draft acoustic maps and submit such data to the Mayor. For that reason, and because the airport is situated outside Krakow, aircraft noise is not accounted for in the Krakow Noise map 2017 and the latest Noise Action Plan.

7B. Past Performance

Describe the measures implemented in recent years for improving the urban sound quality and increasing awareness to noise. Comment on which measures have been most effective.

Make reference to:

1. Classification of territory (if applicable) into appropriate noise classes and with appropriate noise limits (e.g. specially protected, hospitals/schools, residential, commercial, industrial) including details on enforcement mechanisms if in place
2. Stakeholder involvement
3. Communication with citizens (participation/involvement/engagement)
4. Preservation and improvement of good acoustic urban environments such as quiet areas
5. Noise reduction measures that influenced the current situation
6. Municipal regulations concerning noise management and reduction
7. With respect to action plans that are already adopted, what is the percentage of the plan effectively implemented (e.g. overall amounts already paid for actions versus overall amounts

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initially committed). A clear description of the following issues will be valuable: noise action plan integration with city strategy, time plan, budget, and tools for monitoring its implementation.

(max. 1,000 words and five graphics, images or tables)

Timing of remedial actions in Kraków noise action plans, as stipulated in regulations of the Minister of Environment on protection against environmental noise, based on exceedances of noise levels in:

- areas designed for hospitals, care centres, and spa protection A-zones
- residential areas
- other areas, for which permitted noise levels are set.

The order of implementing tasks in residential areas was based on the values of M^* indicator defining the exceedance of maximum noise limit and the number of residents in the given area (defined in the above-mentioned ordinance). Possibility of financing individual measures from Long-Term Financial Forecast, and provisions of Krakow Development Strategy and other strategic developments were taken into account. Monitoring and reporting is conducted on STRADOM IT platform.

** M indicator is calculated as: $M = 0,1 m(10^{0,1\Delta L} - 1)$*

where: ΔL – is exceedance of permitted noise level in dB dB, m – is number of residents in the area of exceedance.

Implementation of the majority of planned tasks made a positive impact on Krakow acoustic environment. The degree of execution of the last two programmes:

- 2009-2013 - 73,6 % completed,
- 2014-2018 - 77,3 % completed.

The means of noise reduction that have improved Krakow acoustic environment:

- construction of noise barriers
- road reconstruction and exchange of road surfaces
- deployment of low-noise surfaces (sections of roads)
- modernisation and sanding of tram tracks
- machining of the wheels of track rolling stock
- introduction of traffic management system.

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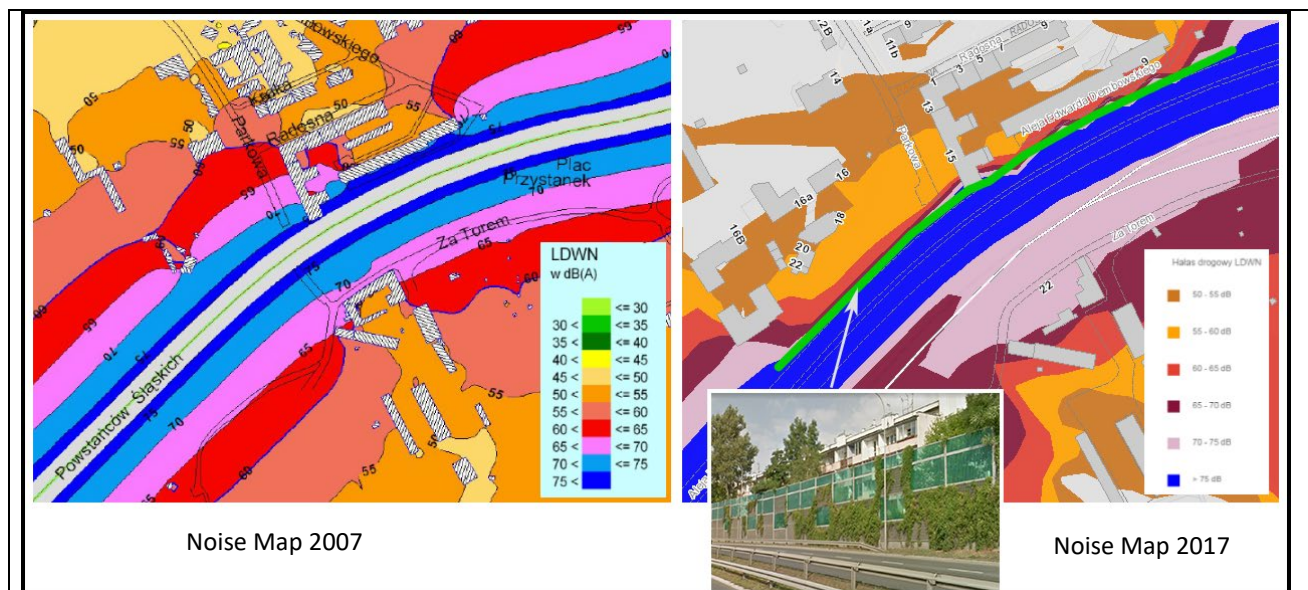


Figure 7.3. Example of noise barriers applied to reduce noise (in al. Powstańców Śląskich street)

In 2009–18, Krakow Road Authority installed 6360m of noise barriers covering 23,386.76m² at the cost of 4,415,909€. In 2013–17, 215km of roads and 29km of tram tracks were modernised and renovated at the estimated cost of 32,730,022€. As it is impossible to elicit unit costs from the total costs of specific investments, it was impossible to assign amounts to the implementation of other steps taken to limit the excess noise in Krakow.

The development of Krakow ring-roads is material for shaping the city's acoustic environment, especially the 4th ring-road as it has taken over most of transit traffic. In 2011, the newly built northern section between Radzikowskiego and Modlniczka exits was opened, and 7.2km of the eastern ring-road was built in 2008–17.

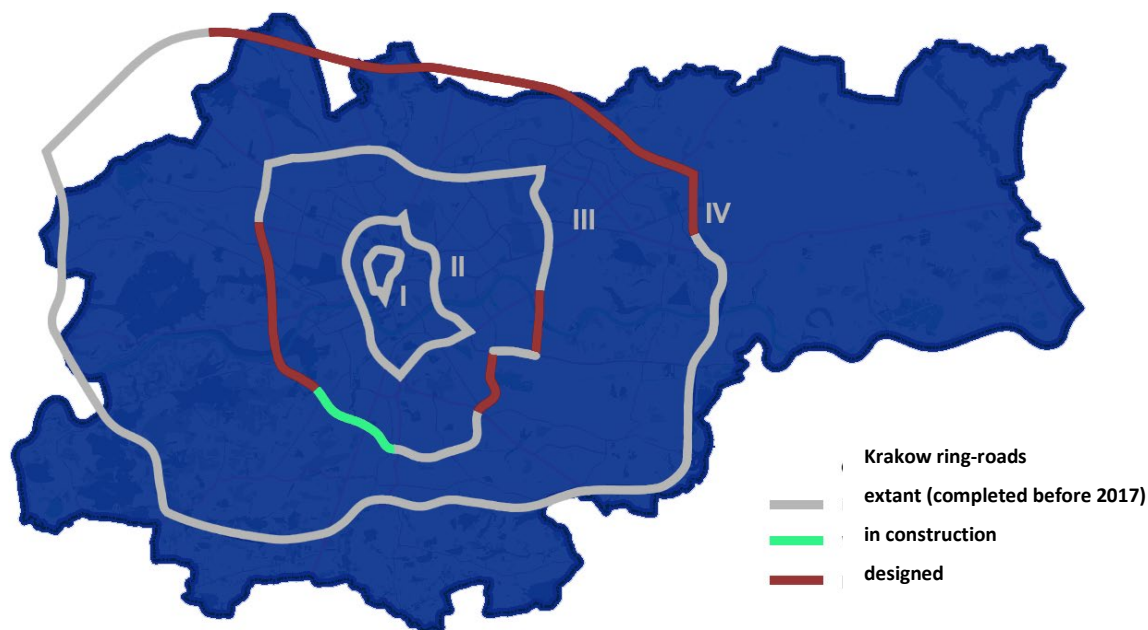


Figure 7.4. Degree of completion of Krakow ring-roads

Continuous activities have also been carried out. A good example is switching public transport vehicles to more environmentally-friendly ones, producing lower emissions of pollutants and noise. Simultaneously, the network of bus and tram interconnections was extended.

Figure 7.5. Electric buses

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The length of cycle paths network is constantly extended: in 2009–18 it grew by 70%. Municipal bike-rental system was introduced for fast and service-free renting of bikes, designed especially for comfortable urban mobility. All these steps, described in greater detail under Indicator 3, and the growing accessibility of public transport encourage residents to give up private cars for the sake of public transport.

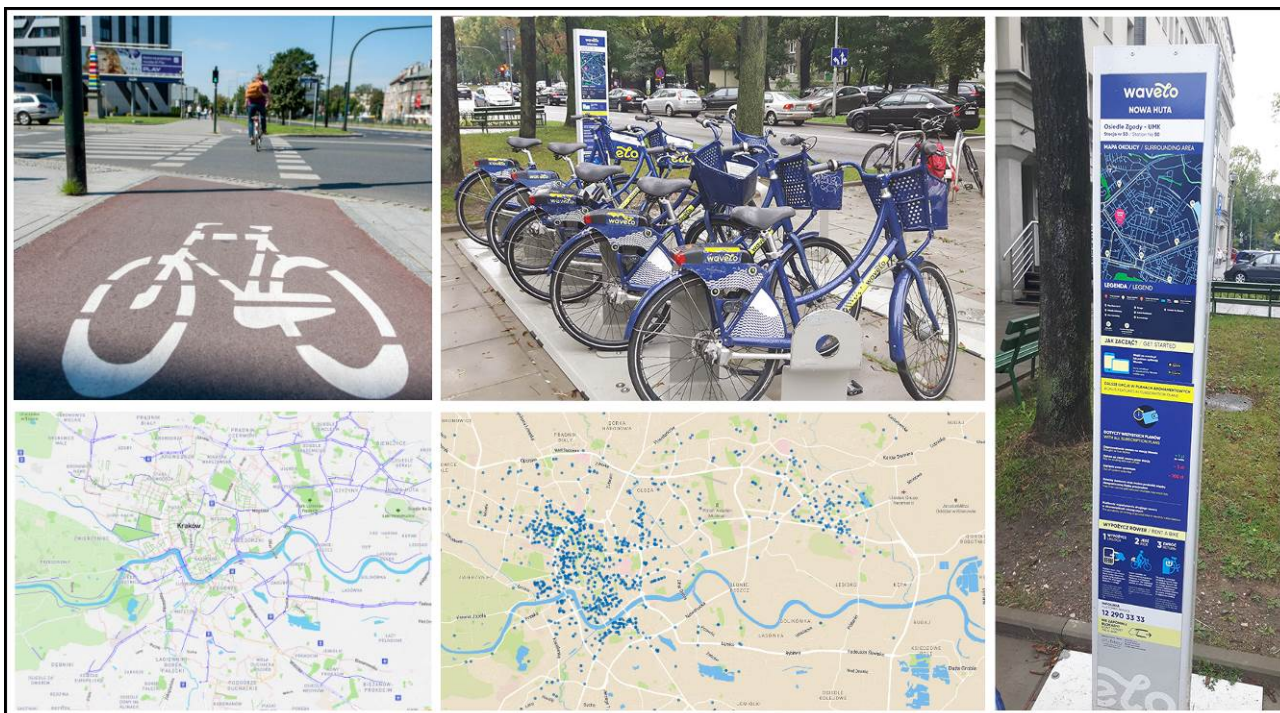


Figure 7.6. Cycle paths and city bike-sharing system

With resident contribution to the development of acoustic environment of the city in mind, it must be mentioned that resident interventions concerning noise nuisance were accounted at the stage of drafting the noise map. Moreover, all noise action plans were consulted with residents, local self-government, and eco-NGOs as well as other bodies and units.

As data on the acoustic environment, acoustic maps, and noise action plans educate and inform about noise-related dangers, they are made available to residents on the Municipality's portals: Magic Krakow and MSIP Obserwatorium.



Figure 7.7. MSIP Obserwatorium: Noise map 2017 (2D and 3D)

Krakow has a fair experience and success in certain areas for promoting eco-behaviours as it participates in a number of projects:

- Civitas-Caravel – on sustainable transport development (completed 2009)
- STARS – aimed at increasing children’s and young people’s bike trips on the way to school (reduction of car trips to take children to school: 2013–16)
- VeloCitta – promoting bike sharing: renting public bikes and increasing numbers of their users (2014–17)
- PUSH & PULL – to improve the conditions of city mobility by managing parking space (2014–17).

Moreover, Krakow has participated in campaigns promoting environmentally-friendly forms of mobility: European Mobility Week (19 times) and European Car-Free Day (16 times).

Quiet areas have not been defined in Krakow, however, to protect areas that require special acoustic protection and those with good acoustic environment, Krakow Noise Action Plans introduce additional guidelines for new road and residential developments, for example:

- designing new roads so as to ensure least intervention into areas covered by acoustic protection,
- deployment of new residential developments outside the scope of transport noise nuisance,
- zoning of development, deployment of non-residential structures (e.g. garages) closer to the sound

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sources to provide natural sound barrier for acoustically protected developments situated further away.

Moreover special protection has been extended to the following areas::

- Osiedle Uzdrowisko Swoszowice residential estate/spa: legal regulations approved by the City Council Resolution forbid activity resulting in excess environmental noise levels, organisation of events disturbing the process of spa treatment, entertainment upsetting the curfew, and deployment of investments that could significantly impact the environment.
- City Centre: legal regulations approved by the City Council Resolution and the mayor's decision include detailed clauses on the use of sound amplification during events and musical performances, and bans on amplifiers in café gardens, and on air conditioning and amplifying devices in public space to protect the acoustic environment.
- Bagry Wielkie Municipal Park: bans on petrol and diesel engines in floating equipment, noisemaking, and sound amplification without the permit from the Operator
- other areas including nature reserves are protected acoustically under Act of 16 April 2004 on nature conservation.

7C. Future Plans

Describe the short and long term objectives for quality of the acoustic environment and the proposed approach for their achievement. Emphasise to what extent plans are supported by commitments, budget allocations, and monitoring and performance evaluation schemes.

Make reference to:

1. Stakeholder involvement
2. Consultation with the population including noise perception surveys; citizen participation, involvement and engagement initiatives; and awareness initiatives
3. Actions planned to reduce the impact of noise from transportation or other sources (probably those integrated in the Noise Action Plan)
4. Foreseen reduction in the share of population exposed to noise values of L_{den} (day-evening-night indicator) above 55 dB(A) and above 65 dB(A) and in the share of population exposed to noise values of L_n (night indicator) above 45 dB(A) and 55 dB(A), mention targets
5. Actions to preserve, extend, or improve urban quiet areas, and raising awareness and promoting quiet areas
6. Holistic/qualitative approaches to the acoustic environment (e.g. by soundscape design approaches, using green infrastructure solutions etc.).

(max. 800 words and five graphics, images or tables)

In 2018 Krakow Noise Action Plan 2019–23 (hereafter: Plan), was drafted and approved.

The main objective of the Plan is to improve the standard of life of Krakow residents by implementing specific steps to:

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- decrease the percentage of spaces subjected to noise
- decrease the percentage of people subjected to noise.

The Plan was carried out with expert staff of the Municipality and municipal utilities. Moreover, its draft was consulted with Krakow residents, District Councils, and eco-NGOs. Consultations also included city councillors, environmental protection services, police, sanitary inspection, academia, local press, and road, tramline and railway line authorities. Comments, conclusions and all the complaints addressed to the Municipality in 2013–18 were analysed for inclusion in the short-term strategy of the Plan.

The ground for Plan update was the acoustic map drafted in 2017, and the order of task implementation for residential areas was based on indicator M (described in 6B). Possibility of financing individual measures from Long-Term Financial Forecast, and provisions of Krakow Development Strategy and other strategic developments were taken into account. Monitoring and reporting is conducted on STRADOM IT platform.

Value of indicator M	Activities	Period
Above 100	short-term	2019–23
75–100	medium-term	2024–28
0–75	long-term	after 2028

Table 7.3. Priorities of action dependent on the value of M indicator

The Plan did not analyse the forecasted reduction of population exposed to Lden and Ln noise levels. In turn, a forecast of change in noise impact before and after implementation of short- and medium-term tasks was performed (example: Figure 7.8). The actions of the Plan will be precisely evaluated while working on the Acoustic Map 2022.

The Plan proposes measures that should improve the acoustic environment in Krakow and allow achievement of the above-mentioned main objective. They have been divided into the following groups.

Short-term measures

17 areas for remedial measures to be taken in 2019–23 at the estimated cost of 2,079,069 € have been defined. Moreover, the Long-Term Financial Forecast assumes six major investments during the validity period of the Plan that will have a positive impact on the city's acoustic environment (estimated cost 485,569,302€).

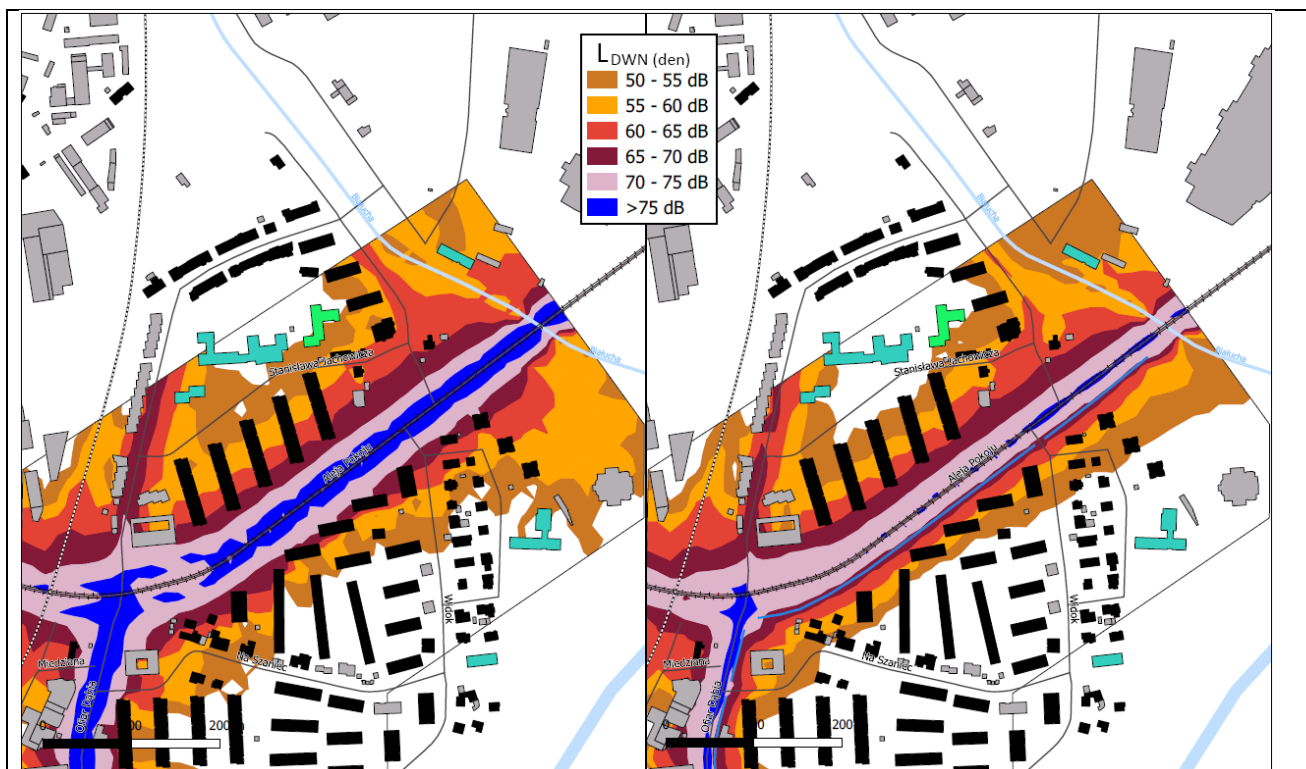


Figure 7.8. Sample short-term measure along Al. Pokoju (before and after remedial steps)

Medium-term measures

15 areas for remedial measures to be taken in 2024–28 have been defined. A “waiting list” for short-term actions, they should be carried out earlier if sufficient funds are found in the municipal budget.

Long-term measures

Long-term strategy defines projects whose implementation is envisaged for the validity periods of successive (post-2028) Noise Action Plans. Over 200 such areas have been defined.

Activities in public education

Special attention must be paid here to the promotion of public and bike transport, development of the cycle path network, “quiet” vehicles, alternative forms of car use, proper spatial planning, etc.

The Plan intends to introduce the following means of protection against noise:

- noise barriers
- durable means of Road Traffic Safety
- exchange of road surfaces to quiet asphalt
- sanding tracks and machining wheels
- coordination of traffic lights
- speed limit enforcement.

Other measures to reduce transport noise emissions are planned in the coming years. By increasing the share of public transport and other environmentally friendly forms of mobility including:

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- further restriction of traffic in city centre
- development of cycle infrastructure, also bike parking facilities
- introduction of speed limits within the 2nd ring-road, including “30kph” zone
- promotion of car and bike sharing model
- bus passes
- introduction of extensive privileges for public transport
- purchase of modern tram and bus rolling stock (also electric).

Moreover strategic projects with positive impact on the city’s acoustic environment are intended:

- construction of the missing sections of the 3rd ring-road, and missing links between the 3rd and 4 ring-roads
- construction of park-and-ride car parks

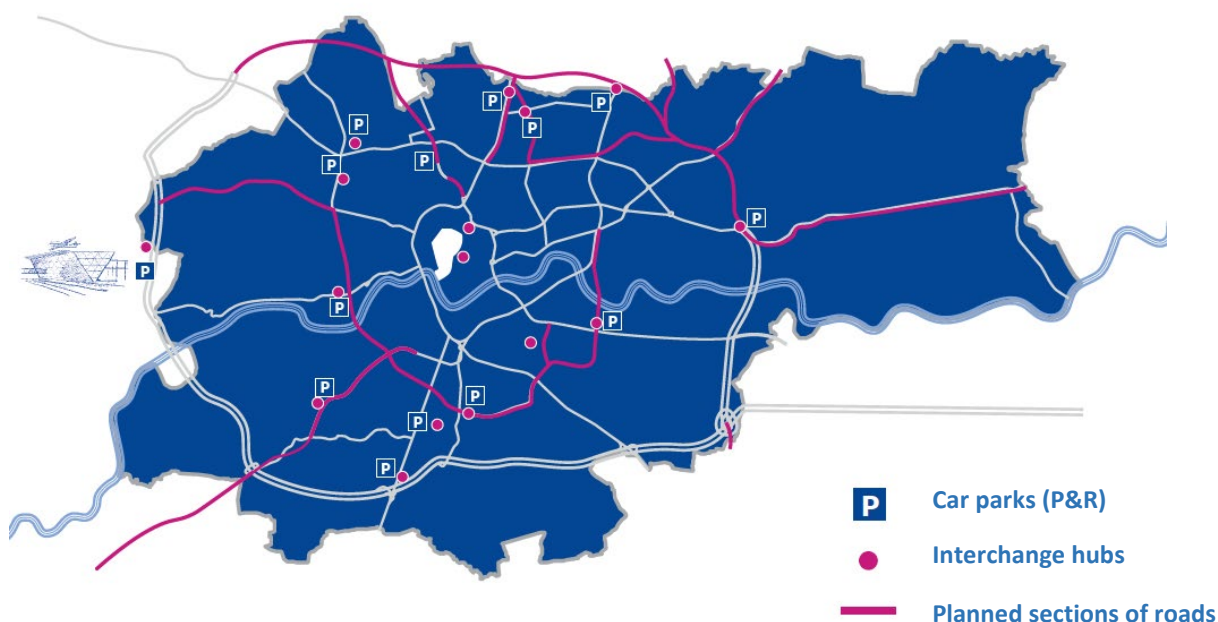


Figure 7.9. Planned road sections

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- completion of Fast Metropolitan Railway
- construction and extension of key interchange hubs
- construction of railway stops
- support for preparation of quick, collision-free metro-type railway transport
- construction of new tramlines, including successive stages of Krakow Fast Tram.

The following are taken into account in designing measures of noise protection and shaping the Krakow acoustic environment:

- visual qualities and impact of noise barriers on cityscape
- negative impact of barriers of avian fauna (mortality of birds crashing against transparent barriers)
- preference of “green wall” barriers as they are pleasant to look at, and properly chosen plants both improve acoustic environment and reduce air pollution
- design of soundscapes: an example is the new fountain changing sound volume in the Park of Polish Aviators, where the sound of water, visual properties, and the shape of the fountain mask the noise and view of the nearby street.

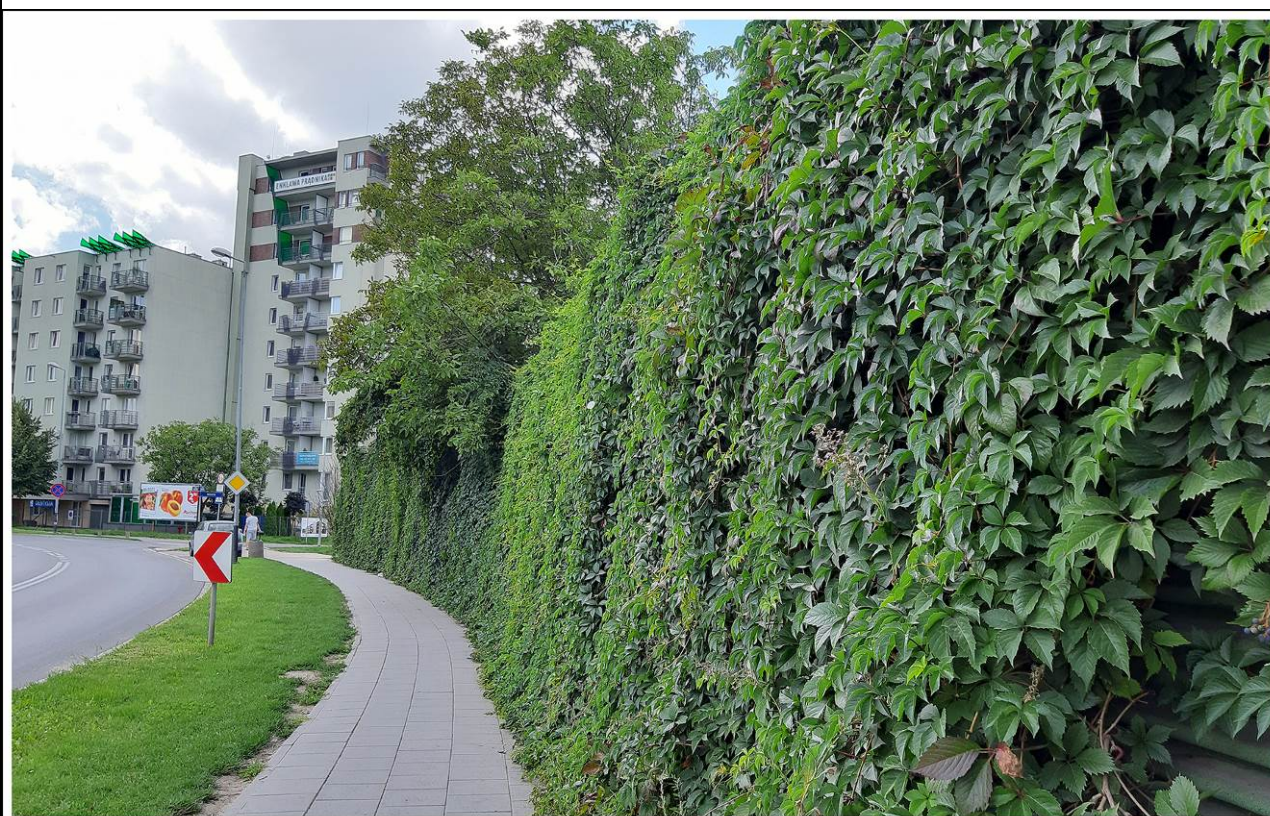


Figure 7.10. “Green wall” barrier in Bohomolca Street



Figure 7.11 Sample soundscape design: fountain in Polish Aviators Park

7D. References

1. Krakow Noise Map 2017
http://krakow.pl/encyklopedia_krakowa/13140,artykul,mapa_akustyczna_miasta_krakowa.html
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- [typ%3Du](#)
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 11. Plan of Sustainable Development of Public Transport for the Municipality of Krakow and Neighbouring Municipalities: Krakow City Council Resolution No. LXXX/1220/13 of 28 August 2013
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 12. Programme of Parking Services for Krakow: Krakow City Council Resolution No. LIII/723/12 of 29 August 2012
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 13. Projects Civitas-Caravel, STARS, VeloCitta, and PUSH & PULL
https://www.bip.krakow.pl/?bip_id=1&mmi=9784
 14. STRADOM
https://www.bip.krakow.pl/?dok_id=67584
 15. Map of Krakow with major strategic investments
https://www.bip.krakow.pl/?dok_id=44164

Word Count Check

Please complete the below word count check for Indicator 7: Noise, Sections 7A, 7B and 7C.

As per the Guidance Note (Annex 2 of the Rules of Contest), the word count includes text in graphics/tables and the body of text. The word count excludes text in the original application form, captions and text in Table 1: Benchmarking Data - Noise.

Section	Number of words in graphics/tables	Number of words in body of text	Total number of words in graphics/tables and body of text	Max. words
7A	58	631	689	800
7B	15	891	906	1,000
7C	26	716	742	800

8. Waste

Refer to Section 2.8 of the Guidance Note

8A. Present Situation

Please complete the following table providing the most recent data that is available for your city. If city data is not available, please provide a brief explanation and use regional or national data where available. If no data is available, please state this and indicate the reason why.

To ensure a correct interpretation of the concepts used in sections 8A to 8C ('municipal' waste, 'biowaste', 'packaging waste' etc.) it is important to refer to the explanation in the Guidance Note.

Table 1: Benchmarking Data – Waste

Indicator	Type of Data (City/Regional/National)	Unit	Year of Data
Amount of municipal waste generated per capita	475 (entire area of the Municipality)	kg/capita/year	2018
Percentage of municipal waste that is recycled (including through composting and digestion of biowaste)	42 % recycling and preparation for reuse of paper, metal, plastic, and glass, calculated according to Polish law (Method 2)	%	2018
	56,77% collected and selectively collected recyclables and biowaste as % of the estimated volume of recyclable waste in the total municipal waste stream; waste: paper, metal, plastic, multi-material packaging, glass (40.91%, according to analysis carried out by the Municipal Cleaning Company), kitchen waste, green waste (11.82% as above)		
Percentage of municipal biowaste that is recycled (through composting and digestion)	45,49% recycled, biodegradable waste as % of the estimated volume of biodegradable waste in the total municipal waste stream; biodegradable waste: kitchen waste, green waste (11.82% as above)	%	2018
Percentage of municipal waste sent for energy recovery (R1 code)	33,87% unsorted (mixed) municipal waste delivered for thermal management as % of the total volume of collected municipal waste	%	2018

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Percentage of municipal waste sent to landfill (or other forms of disposal (D codes))	3,65% landfilled waste (13,181.78 tons) as % of the total volume of collected municipal waste (361,246.32 tons)		%	2018
Percentage of municipal waste that is collected separately	38,49% selectively collected municipal waste as % of the total volume of collected municipal waste		%	2018
Percentage of recycled packaging waste	45,68% ilość odpadów opakowaniowych poddanych recyklingowi / ilość odpadów opakowaniowych zebranych w Krakowie		%	2018
Percentage of packaging waste that is collected separately	43,33% recycled packaging waste as % of the total volume of collected packaging waste		%	2018
Established collection systems for hazardous waste:	Type of Data (City/Regional/National)	Yes/No	Unit	Year of Data
i) WEEE	5,61 (database of the Marshal's Office)	Yes	kg/capita/year	2018
ii) Batteries	1,69 (as above)	Yes	kg/capita/year	2018
iii) Waste oils	3,43 (as above)	Yes	kg/capita/year	2018
iv) Household chemicals	0,05 (as above)	Yes	kg/capita/year	2018
v) Asbestos	0,10 (as above)	Yes	kg/capita/year	2018
vi) Construction & demolition waste	298,59 (as above)	Yes	kg/capita/year	2018
vii) Unused pharmaceuticals	0,09 (as above)	Yes	kg/capita/year	2018

Describe the present situation in relation to waste production and management by providing details about each of the following areas:

1. Waste management strategies or plans in place;
2. Waste prevention strategies or plans in place including possible specific measures to reduce food waste, plastic waste and other waste materials;
3. Reuse and/or repair initiatives or partnerships currently in the city (include examples describing the types and quantities of materials reused);
4. Current waste collection system including the types of waste collected separately (both covering dry recyclables such as paper, plastics, glass metals and biowaste, as well as hazardous waste) and the extent of roll-out (% coverage) of the systems as well as clean-up initiatives;
5. Sorting, recycling and other treatment of separately collected and residual waste as well as any

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home/community composting practices;

6. Application of the 'polluter pays' principle and economic instruments, including through differentiated tariffs ('Pay as You Throw' (PAYT) initiatives) and landfill and incineration charges.

(max. 800 words and five graphics, images or tables)

Currently adopted waste management strategies and plans

Krakow is the leading Polish metropolis in terms of waste management and has operated the Integrated System for the Management of Municipal Waste (ISMMW) since 2013. The system is managed by the Municipal Cleaning Company (MPO), a utility fully owned by the Municipality.

Table 8.1. Legal basis for the ISMMW in Krakow.

Legislation	Document	Goals
National	Act on waste of 14/12/2012	Definition of resources for protection of the environment, human life and health, and limiting the negative impact of waste production and management. Based on EU Directives.
	Act on maintenance of order/cleanliness in municipalities of 13/09/1996	Defines the Municipality's tasks, and property owners' duties regarding the maintenance of cleanliness and commercial terms for municipal waste collection and management.
	National waste management plan 2022, of 01/07/2016	Key goals: transforming waste into resources, limiting energy recuperation to non-recyclable materials, reducing landfilling of recyclable waste, ensuring highest recycling quality.
Regional	Małopolska Waste Management Plan 2016–22 of 27/03/2017	Main document requiring that Municipality defines municipal and other waste management.
Municipal	Krakow City Council resolutions	Regulations for maintenance of order/cleanliness in Krakow. Setting fees for municipal waste management.

Current strategies and plans for waste prevention

Key assumptions in the National Plan for Prevention of Waste Generation (2014) are::

- protection of valuable mineral deposits
- increasing recycling
- rational resource management
- supporting the transition to a low-carbon economy
- environmental protection
- rational waste management.

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Krakov organises numerous educational campaigns on waste management that emphasise the need to reduce waste by choosing reusable items and better planning of purchases. In April 2019, the City Council passed a resolution on a “Plastic-free Krakow” packaging reduction campaign.

MPO and other municipal utilities teach waste prevention. Waterworks distribute (mostly to children) thousands of reusable water bottles made of 95% sugar, which reduces plastic waste.

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Figure 8.1 Educational activities by MPO

Reuse and repair

Krakow is constantly introducing circular waste management principles, e.g. over 10,000 wood-waste nesting boxes are delivered annually, for free, to citizens, and furniture at the MPO children's educational centre is made from wood waste.



Figure 8. 2. Examples of wood reuse

A programme conducted with the Polish Red Cross redirects clothing unwanted by citizens to people in need.

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Biogas is collected from the recultivated area of the Barycz Municipal Landfill to produce enough electricity and heat for waste processing installations, making them energy self-sufficient, and feeding excess electricity back into the grid.

In cooperation with the Pogromcy Bazgrołów NGO, leftover paint is used to cover graffiti defacing the city.

Current waste collection system

The ISMMW introduced in Krakow in July 2013 follows the hierarchy of waste management enshrined in EU law. The system covers all property in the city and favours selective collection of municipal waste at the source by the bid-winning companies, which then deliver it for processing. Over 99% of Krakow's recyclables are processed at sites owned by the Municipality.

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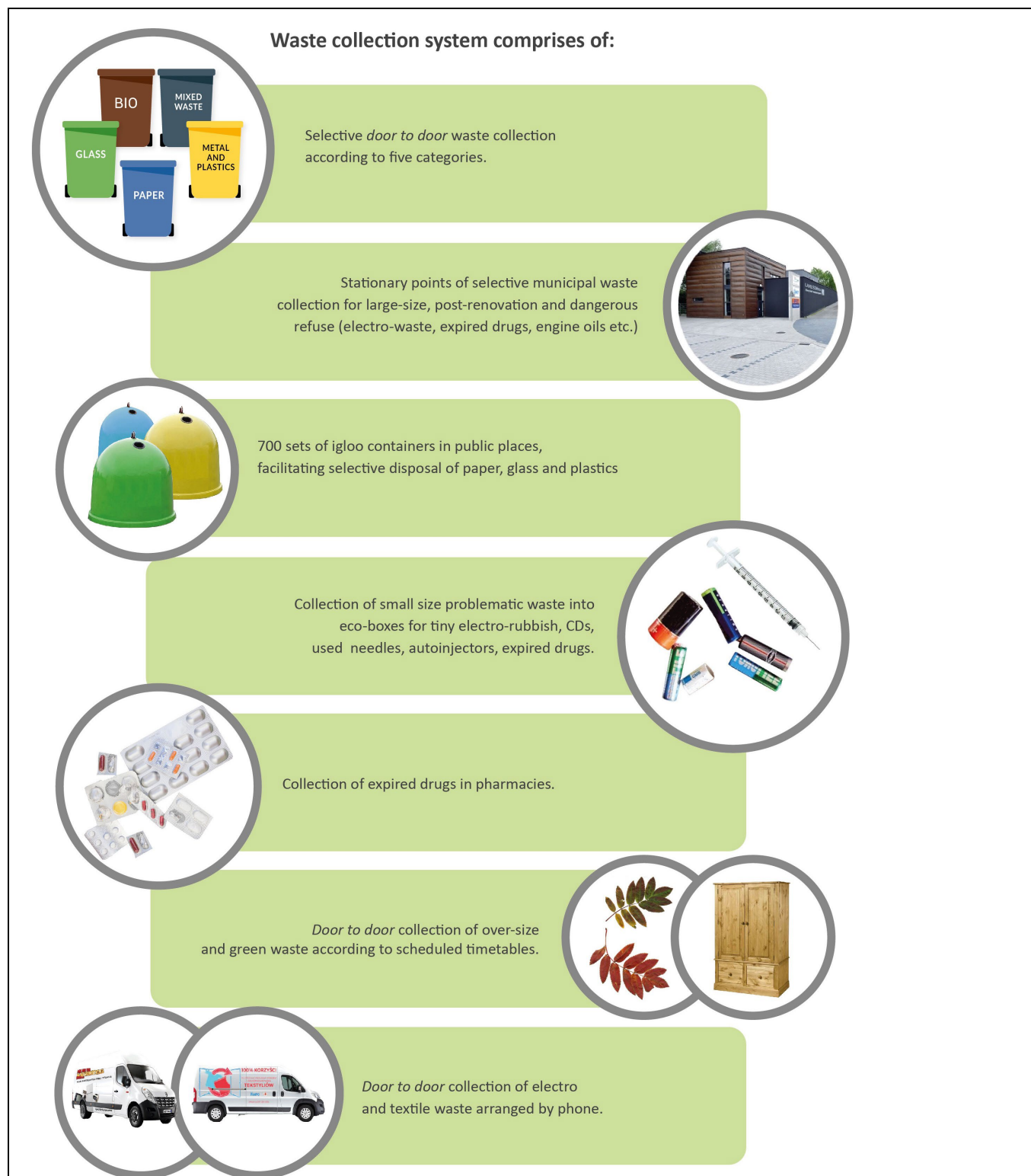


Figure 8.3. Krakow waste collection system.

Sorting, recycling, and other ways of managing waste

7

Municipal waste collected in Krakow undergoes processing in the following installations:

- plant for mechanical-and-biological processing of waste; capacity: 100,000t unsorted and 50,000t selectively collected waste

8B. Past Performance

Describe the measures implemented over the last five to ten years for improving waste management and include details on the following:

1. Past trends in the amount of municipal and packaging waste produced per capita in the city;
2. Past measures which have promoted waste prevention and recycling;
3. Trends in municipal and packaging waste treatment in the city including changes in recycling (including composting and digestion), recovery and disposal rates over the previous 5-10 years;
4. Evolution of separate collection systems in the city;
5. The collection market in terms of how it has developed and the role of municipal (public) authorities and/or private waste companies;
6. Type and scale of infrastructure put in place to treat municipal and packaging waste distinguishing between dry recyclables, biowaste and residual waste, and progress to date;
7. Use of instruments (economic or regulatory) applied in the city to manage municipal and packaging wastes.

(max. 1,000 words and five graphics, images or tables)

Earlier trends in the volume of waste produced in the city

The continuous development of the city leads to an increasing volume of waste produced every year. Krakow is the second largest city in Poland with some 770,000 residents in 2018, and over 100,000 students and 10+ million tourists visiting the city annually. Together with the increasing number of residential, office and service buildings, this increases waste production. However, recycling levels are also rising, so overall Krakow meets all the legally required targets, often comfortably exceeding them.

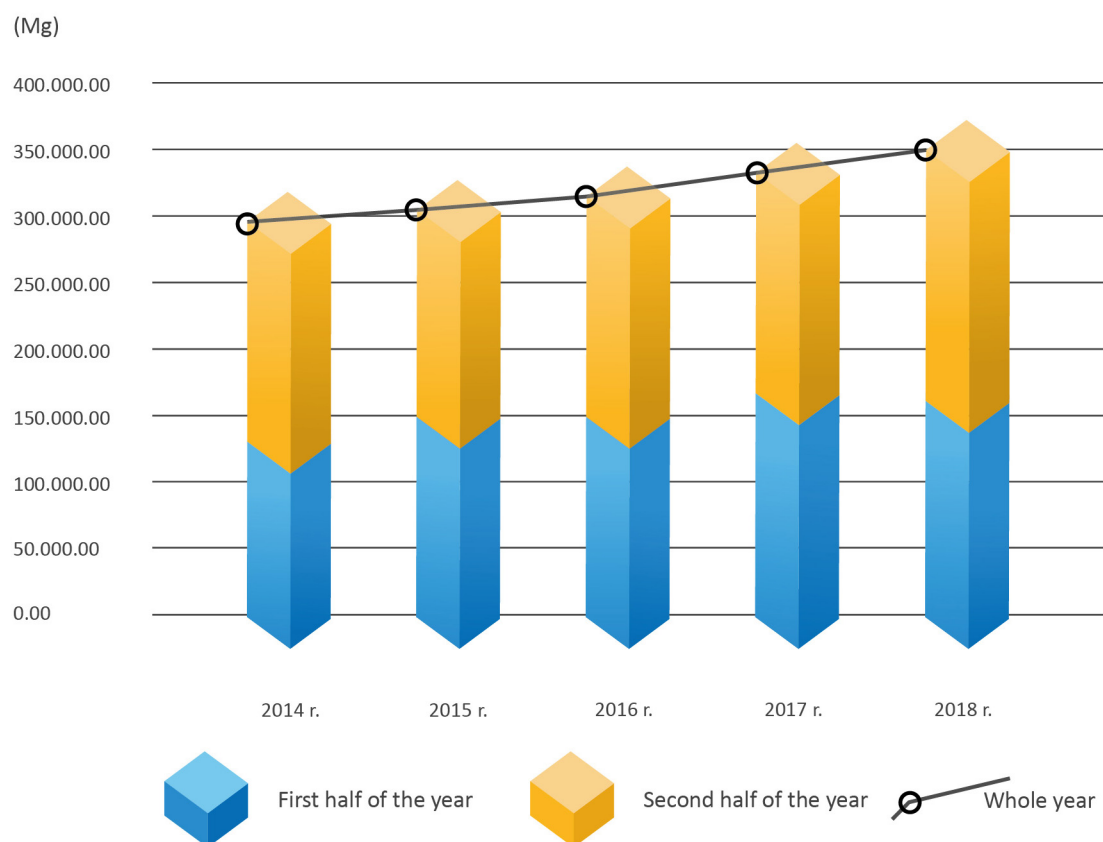


Figure 8.5. Volume of waste collected in Krakow in 2014–18

Earlier measures promoting waste prevention and recycling

With the introduction of the ISMMW (2013), Krakow launched an intensive information and education campaign. MPO workers went door-to-door, visiting all households in the system to inform them about waste segregation principles, deliver leaflets and posters, and answer questions.

Regular meetings with commercial property managers and administrators were organised to explain waste segregation principles and introduce new solutions.

The Municipality also runs regular information and media campaigns promoting the benefits of sorting waste, including:

- organisation of environmental events (Earth Day, open days, Krakow Picnics, neighbourhood harvest festivals, environmental competitions for schools)
- information and advertising activities in traditional, electronic, and social media
- delivery of brochures, posters and leaflets, to households.

Since the introduction of the ISMMW, MPO has run educational programmes for both children and adults,

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including workshops at their premises as well as schools, clubs etc, reaching over 10,000 people annually. The “Krakow Schools Segregate Waste Best” programme helps schools introduce a sorting system by providing them with bins, training for teachers, and engaging teaching aids. The “Battery Operated Cinema” programme launched in 2014 educates Krakow’s pupils and students what to do with spent batteries.

Trends in waste processing

Krakow has completely changed its waste management policy over the last decade. In the 1990s, most waste was landfilled but Krakow then adopted a strategy of investing in its own processing facilities. The introduction and continuous improvement of the ISMMW (2013) brought visible effects: recycling levels of paper, metal, plastic, and glass (calculated according to national requirements – Method 2) increased from 15.6% (2013) to 42% (2018). Current Polish legislation does not allow biowaste to be included, but this would increase the level of recycling in 2018 to 56.77%. Recycling of demolition waste and rubble reached 100% in 2015, and no biodegradable waste was sent to landfill in 2016. The total volume of landfilled waste dropped from 45% (2012) to 3.7% (2018).

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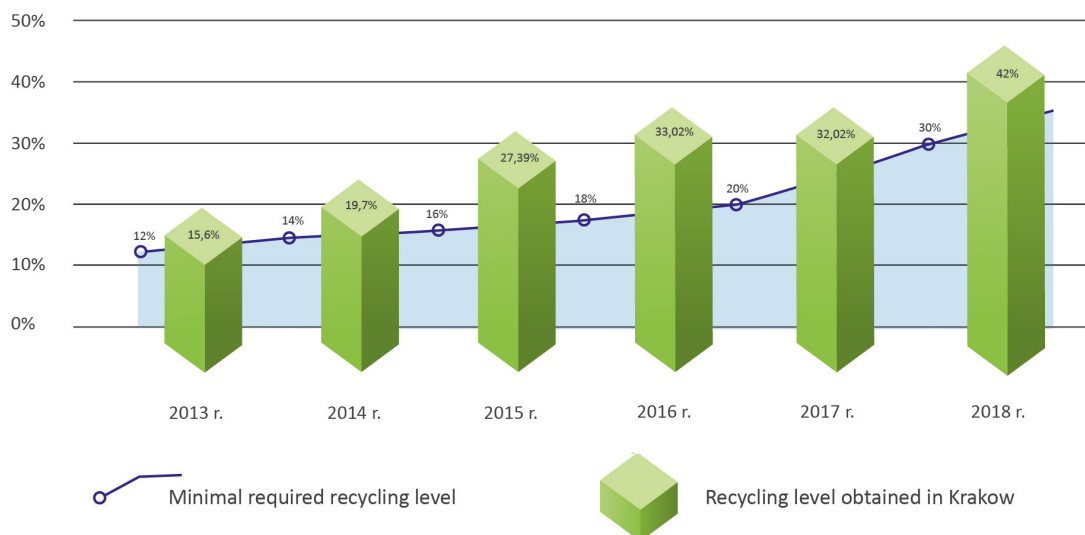


Figure 8.6. Recycling of recyclables in Krakow 2013–18

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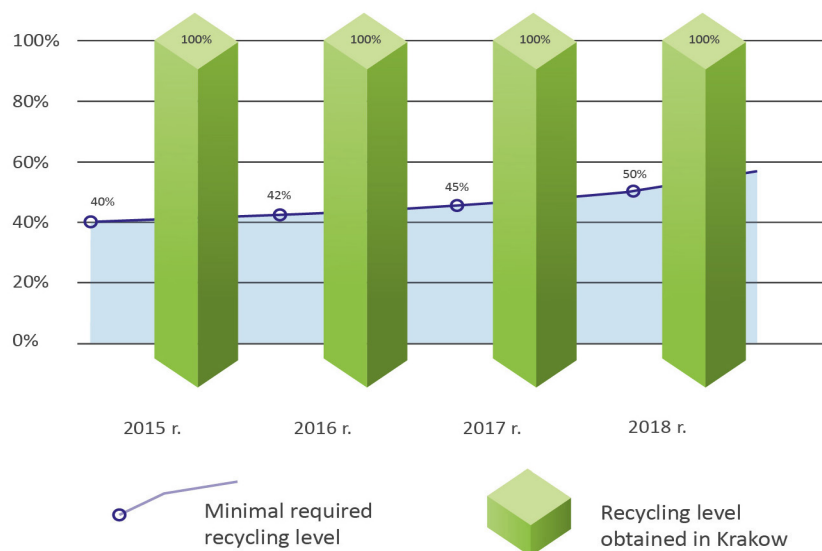


Figure 8.7. Recycling of demolition waste and rubble in 2015-18

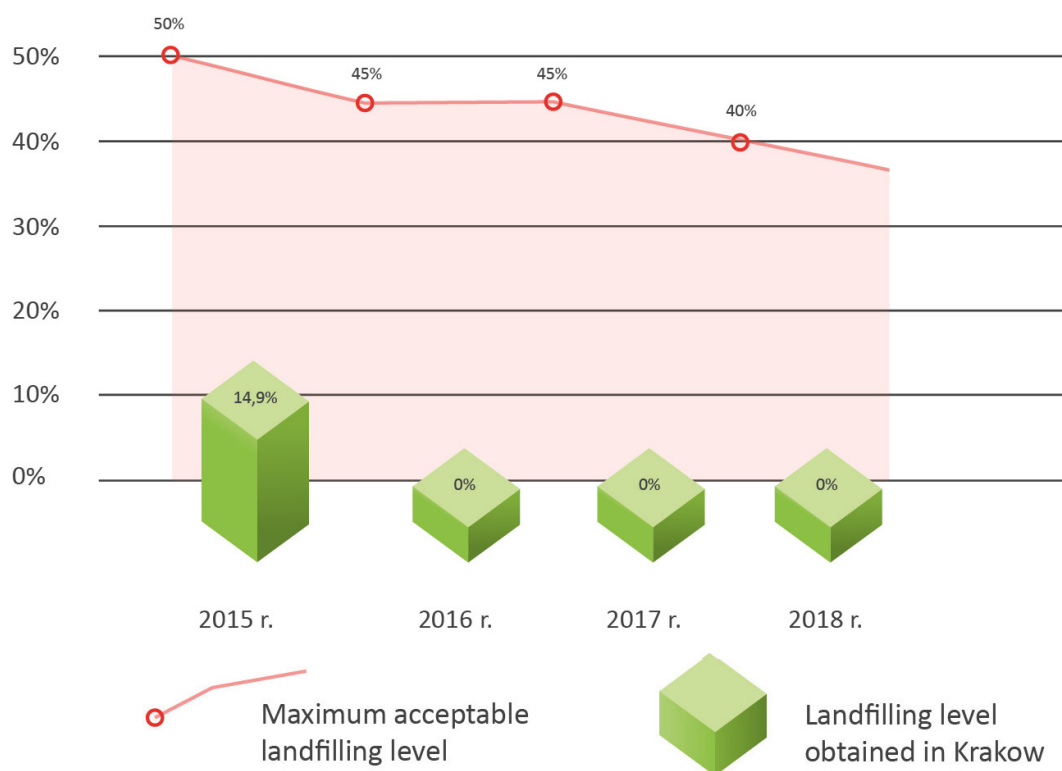


Figure 8.8. Biodegradable waste sent to landfill in 2015-18.

8C. Future Plans

Describe the future plans of the city in terms of progressing towards better waste management and the transition to a circular economy in a wider sense (i.e. maintaining the value of materials and resources within the system for as long as possible and closing material loops through activities such as green public procurement, reuse, repair, refurbishment etc.). Your response should address:

1. How your city is taking account of recently updated EU policy on waste management within the broader policy framework of the Circular Economy including a description of the short and long term objectives and targets for the future management of waste and measures to ensure these are achieved and monitored;
2. Your city's approach to the future management of plastics (inter alia taking account of the EU Strategy for Plastics in relation to the Circular Economy) and the prevention of food waste;
3. Other specific initiatives to promote the transition to a circular economy in your city.

(max. 800 words and five graphics, images or tables)

Krakow's trump cards in waste management include long-term experience, availability of modern facilities, and an established and diverse range of activities to maintain cleanliness in the municipality. Krakow was the first large city in Poland to operate an in-house system and entrust its operation to a utility – MPO.

The World Youth Days (WYD) event held in Krakow in 2016 was a perfect test of system efficiency. The event was highly successful on many levels, including cleanliness, and the efficiency of Krakow's services amazed pilgrims from around the world, some of whom even wrote to MPO directly with congratulations and praise. The company was also congratulated by the Polish President and the Bishop of Krakow.

Today, Krakow's waste management system is stable and mature, and its constant improvement in line with residents' needs is a priority for the municipal authorities. The future of the system is firmly bound to the idea of the circular economy, with its overarching principle of reduction of the volume of waste generated, and elimination of food waste and loss of recyclables. This requires continued development of educational activity, expansion of the already-comprehensive offer for schools in terms of waste prevention and reduction, and selective collection. A new educational programme to increase awareness of the need to reduce food waste is also planned. MPO has an extensive educational infrastructure, and is building another modern technological education centre adjacent to the waste processing installation. The Municipality intends to build further selective collection hubs, where citizens will be offered options to buy or exchange electronics, furniture, clothing and textile, and toys in order to limit waste volumes. The "Plastic-free Krakow" packaging reduction campaign was launched in 2019 (for bags, bottles, cutlery and straws). The future of the ISMMW lies in constant improvement of service standards and honing of the system, something that is also required by new legislation, including future EU recycling level indicators.

New IT tools are important for the future of customer service, e.g. the "Krakowska Segregacja na 5!" app which uses augmented reality to allow segregation bins to be tagged. Pointing a smartphone camera at a tag displays the type of waste that can be put in that type of bin.

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Figure 8.10. Operation of the waste segregation app.



8D. References

List supporting documentation, adding links where possible. Further detail may be requested during the pre-selection phase. Documentation should not be forwarded at this stage.

(max. 400 words)

Małopolska Region Waste Management Plan 2016–22:

<https://www.malopolska.pl/biznes/srodowisko/gospodarka-odpadami/plan-gospodarki-odpadami>
https://www.malopolska.pl/_userfiles/uploads/PGOWM_2016-2022.pdf

Investment Plan:

https://www.malopolska.pl/_userfiles/uploads/Plan%20Inwestycyjny_z%C5%82acznik%20nr%201%20PGOWM%202016-2022.pdf

List of types, locations, and capacities of waste recycling and management installations:

https://www.malopolska.pl/_userfiles/uploads/PGOWM_2016-2022_ZA%C5%81%C4%84CZNIK%20NR%203.pdf

National waste management plan:

<https://bip.mos.gov.pl/strategie-plany-programy/krajowy-plan-gospodarki-odpadami/krajowy-plan-gospodarki-odpadami-2022/krajowy-plan-gospodarki-odpadami-2022-przyjety-przez-rade-ministrow-uchwala-nr-88-z-dnia-1-lipca-2016-r/>
https://bip.mos.gov.pl/fileadmin/user_upload/bip/strategie_plany_programy/DGO/Krajowy_plan_gospodarki_odpadami_2022_M.P._poz._784_.pdf

Assessment of regulatory impact:

https://bip.mos.gov.pl/fileadmin/user_upload/bip/strategie_plany_programy/DGO/Ocena_Skutkow_Regulacji.pdf

National programme for waste prevention:

<https://www.gov.pl/web/srodowisko/zapobieganie-powstawaniu-odpadow>
<https://www.gov.pl/attachment/2fa5383b-063f-4bcc-9069-052e489c5fcf>

Implementation of programme for asbestos removal from the territory of Krakow to 2032:

https://www.bip.krakow.pl/?dok_id=90308

Krakow Development Strategy:

https://www.bip.krakow.pl/?dok_id=167&sub_dok_id=167&sub=uchwala&query=id%3D23155%26typ%3Du

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Report on the condition of the municipality:

https://www.bip.krakow.pl/?bip_id=1&mmi=15794&metka=1

Barycz Ecological Centre (in English):

<https://prowly-uploads.s3.eu-west-1.amazonaws.com/uploads/4794/assets/106508/original-cd689cd9e11b6123d367d04279684b4e.pdf>

History of MPO Krakow and the Polish local authority system for city cleanliness:

<https://prowly-uploads.s3.eu-west-1.amazonaws.com/uploads/4794/assets/106502/original-ce53787fcb427a75226aa304079c7b09.pdf>

Word Count Check

Please complete the below word count check for Indicator 8: Waste, Sections 8A, 8B and 8C.

As per the Guidance Note (Annex 2 of the Rules of Contest), the word count includes text in graphics/tables and the body of text. The word count excludes text in the original application form, captions and text in Table 1: Benchmarking Data - Waste.

Section	Number of words in graphics/tables	Number of words in body of text	Total number of words in graphics/tables and body of text	Max. words
8A	283	458	741	800
8B	76	900	976	1,000
8C	0	607	607	800

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9. Water

Refer to Section 2.9 of the Guidance Note

9A. Present Situation

Please complete the following table providing the most recent data that is available:

Table 1: Benchmarking Data – Water

Indicator		Unit	Year of Data
Domestic usage (drinking water) - litres per capita per day	126,7	Litres/capita/day	2018
Total usage (drinking water) - litres per capita per day	165	Litres/capita/day	2018
Water loss in pipelines	12,19	%	2018
Percentage (%) of total annual generated waste water load, connected to waste water collecting system + urban waste water treatment plants (UWWTPs)	99,5	%	2018
No. of WWTP	7	Number	2018
Total design capacity (Population Equivalent - PE)	1 161 137	PE	2018
Total load received by UWWTP (PE)	1 146 245	PE	2016-2018
Connection rate	98	%	2018
Treatment level which is applied in each UWWTP: secondary or more stringent; in this case, type of treatment: nitrogen and/or phosphorus removal, disinfection etc.	Płaszów, Kujawy, Wadów – nitrogen and phosphorus removal, Bielany, Kostrze, Sidzina, Tyniec – secondary treatment	Treatment level	2018
Waste water reuse (describe type of reuse)	1 technological processes, city cleaning, washing sewers.	%	2018
Water pricing (overall and split into water supply and waste water services, incl. taxes and service charges)	2,36	€/m ³ (overall)	2018
	0,98	€/m ³ (water supply)	2018
	1,38	€/m ³ (waste water supply)	2018

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Describe the present situation in relation to water management, including any relevant disadvantages or constraints resulting from historical, geographical and/or socio-economic factors which may have influenced this indicator.

Describe the current general features of waste water treatment according to national requirements and the requirements of the Urban Waste Water Treatment Directive (UWWTD, 91/271/EEC), and the situation regarding drinking water quality and the requirements concerning the Drinking Water Directive 98/83/EC.

Please provide information of the EU Water Framework Directive 2000/60/EC and its daughter directives regarding implementation.

In detail, please make reference to:

1. Total water drinking water consumption (in cubic meters/year and litres/capita/year) including a breakdown for different sectors (e.g. households, industry, energy, agriculture, small business, tourism, public sector); describe plans currently in place to reduce water consumption and to improve water status
2. Proportion of urban water supply subject to water metering, both for domestic and non-domestic metering;
3. Source of water (surface water, groundwater) - make reference to aquifers and river basin management;
4. Quality of drinking water (e.g. how many days of non-compliance with the Drinking Water Directive?) - make reference to connection to large/small supplies;
5. Water loss in pipelines, leakage management and network rehabilitation; please provide information on leakage management and network rehabilitation;
6. Storm water management (including number of storm water overflows) and use of natural water retention measures (www.nwrm.eu) and/or sustainable urban drainage systems (SUDS);
7. How the links between water and energy consumption (water-energy nexus) if available provide data on yearly energy consumption (kWh/m³ of distributed water); describe measures in place to reduce/optimize the energy consumption for waste water plants or water supply services;
8. Compliance with the EU Water Framework Directive and other EU/national/regional legislation applicable at the city level indicating status of water bodies relevant for the urban area within the city limits and relevance of measures enshrined in the applicable river basin management plans; this shall include the status of the relevant river basin (e.g. water bodies in good/bad status; if information on droughts, scarcity; expected future trends);
9. Compliance with the EU Water Framework Directive and link to the relevant Flood Risk Management plans;
10. Use of 'non-conventional resources' and water recycling initiatives (rain water use and grey water or waste water reuse);
11. The scale of river restoration projects planned e.g. for resurfacing (lost) rivers, naturalising previous channeled rivers;
12. Projects to reconnect citizens with waterbodies e.g. creation of wetland parks, improving water quality to allow for swimming.

Include data and a short explanation for the following specific indicators. Provide explanation in the case of missing information.

1. Proportion (%) of total generated waste water load, not connected to waste water collecting systems and explanation of the type of waste water treatment applied to this fraction (reference to individual or other appropriate systems, i.e. IAS);

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2. If the city is located in an EU Member State include data on waste water treatment obligations according to the UWWTD (based on city's size and nature of the area of discharge);
3. Waste water collecting systems: main type of collecting system (combined/separated) and annual proportion (%) of COD-loads discharged via storm water overflows;
4. UWWTPs: organic design capacity (PE), most advanced treatment level, annual incoming and discharged loads (load or concentration) of BOD₅, COD, N_{tot} and P_{tot} and treated waste water amounts (m³/annum) of all UWWTPs serving the city. If the city is located in an EU Member State, indicate whether the UWWTP complies with the treatment requirements under the UWWTD;
5. Annual amounts of generated sewage sludge (tonnes/year) and description of treatment/disposal pathways (% of total amount);
6. Further information (e.g. on treated waste water reuse, economic sustainability, use of integrated constructed wetlands or other GI/nature-based solutions) is highly appreciated.

Please note:

In case the city is served by a private, or public/private services company, or your regional/national authorities are responsible for the water services, please provide the information requested and describe the additional city activities.

(max. 800 words and 5 graphics, images or tables)

9A. Present Situation

Table 1: Benchmarking Data - Water

Reliably

The water mains ring system, with its 11 network tanks, guarantees a reliable supply for residents. The network which was built between the 1960s and 1980s requires frequent repairs to fix leakages, reduce water losses and simply keep the supply going. Half the renovation works are carried by using no-dig technology, reducing negative impact on the city.

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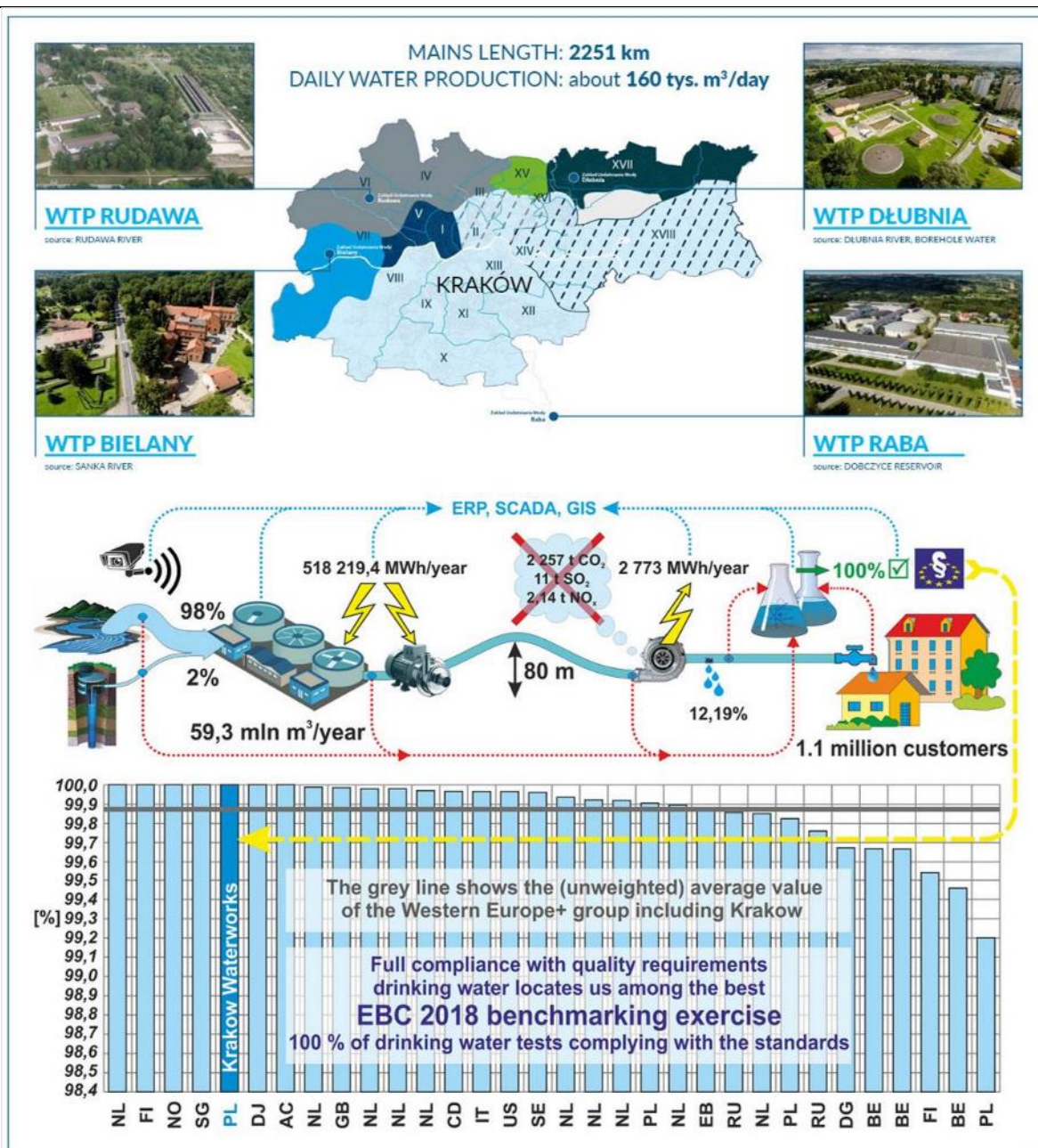


Figure 1

9B. Past Performance

Describe the measures implemented over the last five to ten years for improving water management, including waste water management. Describe the baseline (situation) ten years ago and comment on which measures have been most effective and what progress has been achieved.

With specific reference to waste water and drinking water, please note that if the city is located in an EU Member State, special reference should be given to non-compliance situation, exceedances and relevant infringement cases. Particular reference may be given to capacity building, measures for maintenance, management and restoration of waste water collecting systems and UWWTPs, as well as for water supply systems.

Make reference to:

1. Technical, nature-based, economic and institutional measures adopted and their effectiveness in achieving reduction of total water consumption or improvement of water status;
2. Bye-law implementation in relation to efficiency in water usage, tariff and metering systems and water quality;
3. Citizen engagement and public awareness initiatives;
4. Actual and projected improvements (in %) of water status/potential compared to 2009, when the first river basin management plans were to be in place.

Describe actions and activities carried out by the city (or service provider) over the last ten years to improve the situation (e.g. information of citizens, public activities such as flyer or public information desk).

(max. 1,200 words and five graphics, images or tables)

9B. Past Performance

Figure 6

DEVELOPMENT IN THE PERIOD 2009-2018

OVER 50% OF THE BUDGET WAS ALLOCATED
TO INFRASTRUCTURE DEVELOPMENT

PREVIOUSLY - 2009		CURRENTLY - 2018
2015 km	WATER SUPPLY SYSTEM	236 km 2 251 km
1607 km	SEWAGE SYSTEM	294 km 1 901 km
4 	WATER TREATMENT PLANTS	4 
7 	WASTEWATER TREATMENT PLANTS	7  HARMONISED WITH EU STANDARDS
297 thous. m ³ 	WATER SYSTEM TANKS security of water supply	310 thous. m ³ 
16 	PRESSURE BOOSTING STATIONS	23 
46 	WASTEWATER PUMPING STATIONS	75 
49 642 	NO. OF WATER METERS	10 192 59 834 
0	WITH RADIO-READING CAPABILITY	43 817 
3 	SEPTIC TRUCK DUMPING STATIONS	2  ENVIRONMENTALLY SAFE
0	SLUDGE INCINERATION PLANT	1  ENVIRONMENTALLY SAFE
2895 MWh 	ENERGY PRODUCTION	15 573.6 MWh

Sustainable development

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By looking ahead and getting ready for the phenomenon of metropolitanisation, the consolidation of the Krakow Metropolitan Area allowed WMK to embark in 2005 on an ambitious program of integrated reorganisation of the water and wastewater management systems in Krakow. The modernisation of the Płaszów and Kujawy wastewater treatment plants relieved the Vistula River. Thanks to Stages I-VI of the Krakow Water and Wastewater Management Project that has been financed by EU Funds, around 120 km of main sewers are to be renovated between 2005–2020. Some of them were built at the beginning of the previous century. All works have been carried out using no-dig technology. Whole project is improving the performance of the sewage network and reducing water infiltration, and therefore environmental impact.







Scopes of the great investments over the last decade were: improving access to drinking water, expanding the sewerage system, and developing environmental technologies.

Sustainable development of our infrastructure is based on three priorities:

- compliance with EU Directives and national regulations
- increasing access to water and wastewater networks
- cost-effective and low-carbon resource management.

Thanks to investments in water and wastewater facilities, residents enjoy a continuous supply of high-quality drinking water and can be confident that the wastewater they produce won't pollute the environment.

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-  modernisation and expansion of the Płaszów and Kujawy wastewater treatment plants – enhancing the living standards of the local population and protecting the environment
-  construction of the Sludge Incineration Plant – reducing the amount of sludge in the Kraków urban area
-  construction of the Górka Narodowa East tanks – water reserves for the city of Kraków
-  expansion of the sewage and water supply systems – increasing accessibility
-  reclamation of 18.5 ha of leachate lagoons – restoring the value of the land
-  development of the smart management system – monitoring the water system and reducing leakages

Investments conducted with the support of EU funding for the comfort of residents and protection of the environment.

Figure 7

Safety and comfort

The development of water treatment technologies allows to gain and maintain reliability of the water. Introduction of UV disinfection in drinking water treatment improved water taste and smell, retaining microbiological safety. Removal of chlorine gas used for disinfection seriously reduced the risk of major breakdowns.

Responsible infrastructure management

Development of infrastructure allows to comply with the Directives, although it requires continuous involvement in terms of maintenance and evolution, creating IT systems that use measurements and monitoring essential tools. The operating parameters of the system are monitored and visualised in SCADA. 100% of the network has been integrated with GIS which provides wide-scale access to information on the infrastructure and streamlines the internal information flow. It also supports the process of network development at all stages, allowing quick and accurate servicing of the network by field service teams. Everyday events in the vast water and sewage system are monitored at a management and control centre which reacts to notifications from residents, and coordinates the response to incidents and failures. An ERP system was introduced to enable analysis of the costs of the infrastructure's everyday operations, which allows us create new solutions for investment and optimisation.

The Energy Passive Wastewater Treatment Plant project [11] created an integrated energy management system in the water treatment plant which allows management of multiple energy sources and control systems.

Collect and reuse

Stormwater reuse is important for natural water resource saving. The scope of “Kraków rainwater small retention programme” started in 2011 is support for rainwater collect and reuse by donation for property owners. Water is used for local irrigation of lawns or gardens and other household purposes [3].

Seeking synergies

To improve the adopted technological solutions, we cooperate with high schools. R&D projects improve efficiency and reduce the environmental impact of our activities, helping to reduce water losses by better leak detection and corrosion protection, and advancing the development of treatment technology [10].

More conscious customers

Increasing access to network infrastructure translates into the number of serviced water meters. In 2009, when high accuracy remote meter reading was introduced, there were nearly 50,000 traditional meters in use. We operate more than 60.000 water meters at present, and ca. 80 % with remote communication. Our educational programmes influence water consumption per head, a number that is consistently falling. Investments and renovations, as well as the introduction of remote meter readings, also help reduce the water loss ratio.

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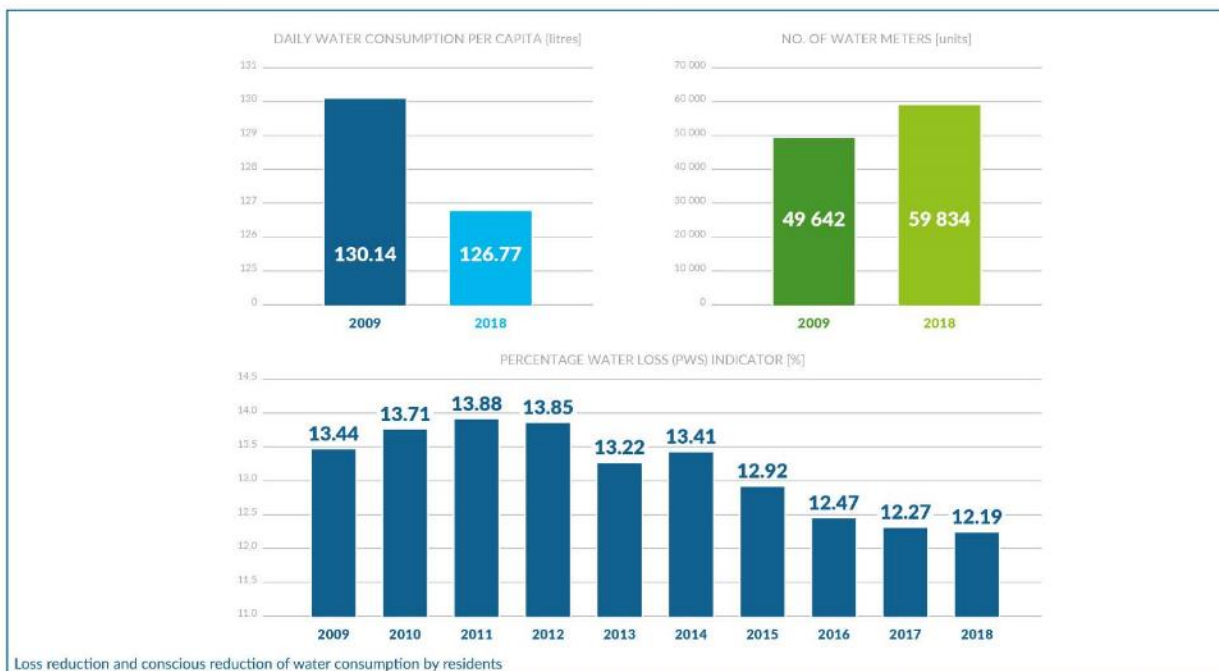


Figure 8

Residents have access to the online customer service desk, which: reduces the number of printed invoices, allows water consumption history to be traced, meter readings to be submitted, the electronic payment of bills, and issues to be addressed from home. In 2018, a modern Service Centre for residents was completed: designed to be comfortable and accessible, it also includes space for relaxation among nature in the adjacent park.

Engaged residents

The city's recent dynamic development has influenced the development of the water and sewage infrastructure. Thanks to public consultation and close cooperation with local community representatives who contribute to defining the direction of extension for the network, we can implement investments that ensure the sustainable development of the city and meet the needs of local residents. This approach allows our services to reach places where the needs are submitted. Public involvement also helps us reduce problems with odour, as we receive precise notification of any releases and can involve residents in helping to solve the problem.

All the company's activities are based on long-term development strategies and annual plans which aim to develop infrastructure and continuously improve service quality. This is reflected in customer satisfaction surveys, which rate WMK highest of all Krakow municipal utilities [9]. Year by year more citizens declare drinking tap water.

Reacting to expectations, we delivered a large fountain in one of Krakow parks, which, together with the surrounding green space, provides a comfortable and friendly space to relax.



Figure 9

Conscious communities

Respect for, and the responsible use of natural resources are values that we pass to future generations, and our multi-channel educational initiatives are dedicated to various age groups. For pre-school, primary and secondary school children [12] they are designed to shape environmental awareness. "In Krakow good water straight the tap" campaign communicates the high quality of Krakow's tap water and the safety of residents of the Krakow metropolitan area in terms of the supply of drinking water. We encourage to drink tap water rather than buying it in plastic bottles, which production and transport contribute to environmental degradation. Every year we distribute thousands of environmentally-friendly water bottles (especially to children), and persuade restaurateurs to serve tap water. We communicate the advantages of drinking tap water and showcase the investment projects that directly influence its high quality. We participate in the Municipality's events and serve tap water, organise workshops and "water festivals", install drinking fountains in schools, offices and hospitals, educate children and teenagers, and hold open days at our facilities. Our communication runs on many levels, including social media.

"It won't fit in a sewer!" campaign addresses the issues of using the municipal wastewater network and treatment, to show Krakovians that everyone has a direct impact on the environment.



MORE THAN 23,000 GRADUATES OF THE KRAKÓW
WATERWORKS EDUCATIONAL PROGRAMMES



9C. Future Plans

Describe the short and long term objectives for water management and the proposed approach for their achievement, including how they are influenced by the expected impacts from climate change and other long-term trends. Emphasise to what extent plans are supported by commitments, budget allocations, and monitoring and performance evaluation schemes.

Place particular emphasis on water quality goals and on key water saving and reuse targets for the future and the proposed approach to achieve these, including technical and nature-based measures incorporating water infrastructure to deal with future impacts of climate change.

Describe the future short and long term objectives for waste water treatment and management and the proposed approach, and specify the measures for their achievement. Emphasise to what extent plans are supported by commitments, budget allocations, and monitoring and performance evaluation schemes. Emphasise to what extent plans are triggered by the demands of EU and national regulations.

Please describe future action/plans taken regarding water (re-opening of water-courses, housing development with specific regard to water issues). Reference to legal action may be give (e.g. obligation for green roofing, subsidies for disconnection to sewer, unsealing measures); describe intentions and best practice measures and indicate its planning status (intention or detailed planning).

Refer to:

1. Improvement/maintenance/management of collecting systems;
2. Improvement of connection to collecting systems and to the UWWTPs (inter alia, additional percentage of PE forecasted to be connected);
3. Improvement of design capacity, treatment level and treatment performance of UWWTPs and indicate if these go beyond the requirements in the Directive;
4. Improvements of further environmental and economic aspects of waste water treatment (e.g. removal of emerging substance, micropollutants, pharmaceuticals, micro-plastic particles and pollution prevention measures; and measures on water reuse;
5. Measures to improve public information and participation;
6. Other improvements.

(max. 800 words and five graphics, images or tables)

9C. Future Plans

Development for residents and the environment

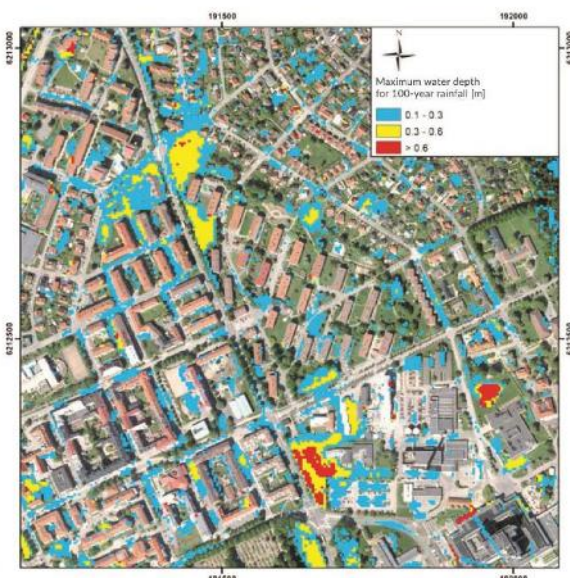
Our goal is to maintain current development of infrastructure priorities, although climate change requires a broader view of development and better management of resources. With increasingly frequent extreme weather events, the key task will be to ensure the security of high-quality drinking water, and develop retention-based solutions. Environmental education and public consultation will engage residents in forming solutions, developing blue-green infrastructure and delivering the highest quality of services. Implementation of innovative projects will allow us to identify new challenges arising from current and future European regulations and strategies regarding drinking water quality, responsible materials and energy management.

Figure 11

INUNDATION FORECASTING SYSTEM

- MONITORING
 - water level in the rivers
 - flow rate in the sewers
 - precipitation
- HYDROLOGICAL MODEL (surface run-off)
- 1D HYDRAULIC MODEL (rivers + drainage system)
- 2D INTEGRATED MODEL (rivers + drainage system + field)
- PRECIPITATION FORECAST (48 hrs)
- MAPS OF FLOODED AREAS
- OPERATOR'S CONSOLE

- MOBILE POSTS
 - field information collection
 - management
 - surveying of losses
- WEATHER RADAR
 - weather monitoring
 - measuring precipitation
 - warning about storms
- WEBSITE FOR THE GENERAL PUBLIC



Reaction to climate change: efficient infrastructure management

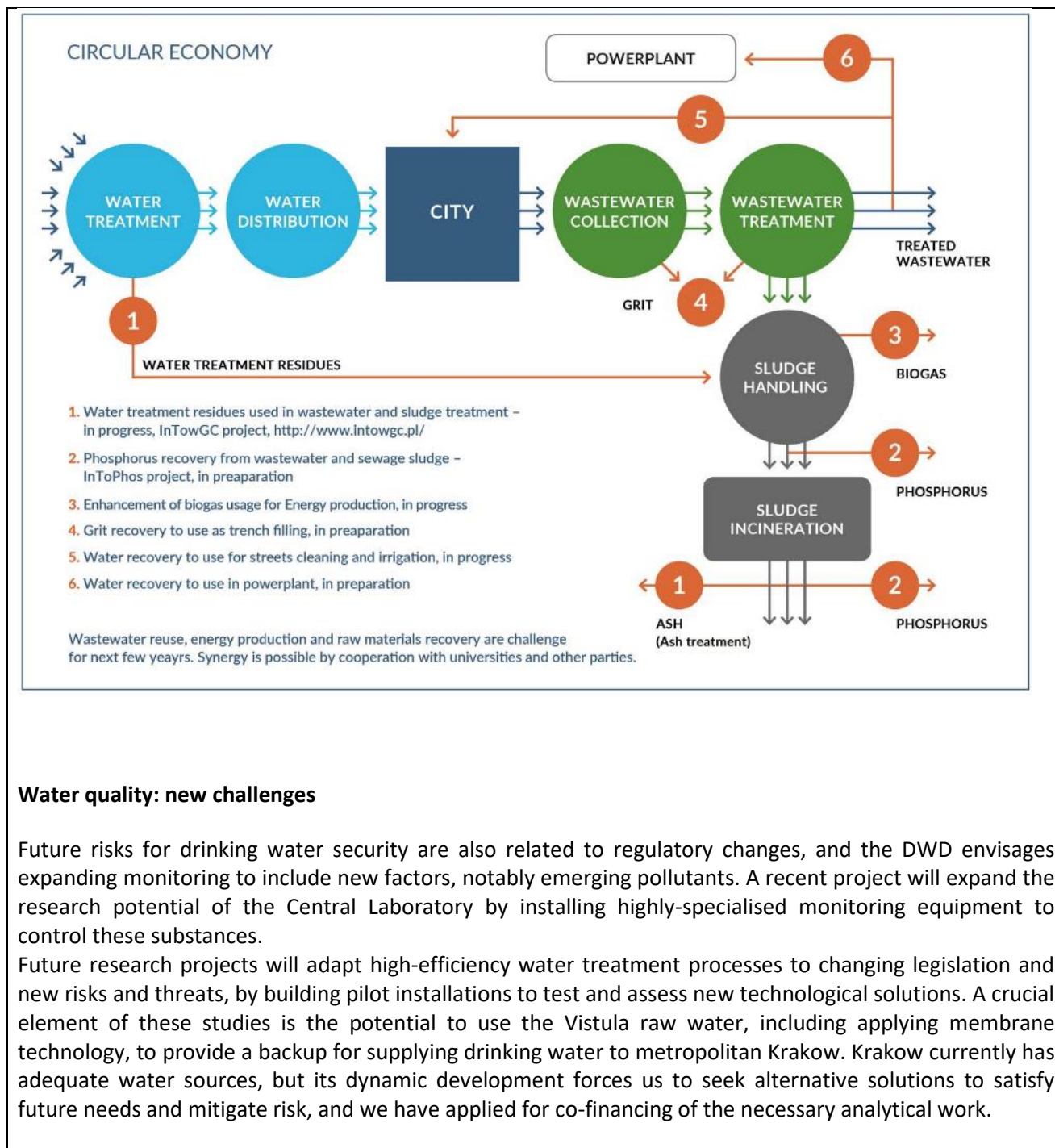
Our priority is to implement a system for monitoring the condition of the wastewater network and forecasting threats of overloading. The hydraulic model and measuring of flows and levels in the network, together with increased retention capacity, will help to protect recipient water bodies from overflows and flash flooding and allow the threats from “city floods” to be better understood. Their mapping will help to protect points that are critical for the efficient functioning of both the system and the city itself, and allow technical services to prepare and react more efficiently.

Retention development is based on building infrastructure and identifying small solutions. A new program, GRAD – Green Roofs as a Tool for Adapting Urban Areas to Climate Change [13] – was recently launched to promote green roofs and catalyse green roof strategies in Polish communes.

A real-time control model based on sensors and automatic leak detection systems is also being implemented to further reduce losses and improve infrastructure management.

Going Circular

Figure 12





THE VISTULA CONNECTS

NEW BOULEVARDS



Zarząd Zieleni Miejskiej w Krakowie

The city-forming project THE VISTULA CONNECTS is designed to improve the accessibility of areas along the Vistula, Prądnik, Białucha, Rudawa, Dłubnia and Wilga rivers through:

TRANSPORT

The development of more than 50 km of walking, cycling and canoeing routes along the Vistula river and its tributaries will connect different parts of Kraków in a whole new way. An innovative approach to transport – 6 Park&Bike stations

LOCAL PEOPLE

The riverfront areas offer many opportunities worth exploiting. The Vistula river and its tributaries will connect the local population and give them new leisure and recreational areas.

SUSTAINABLE DEVELOPMENT

The basis for the development concept is the conservation of the natural values of the Vistula river and its tributaries.

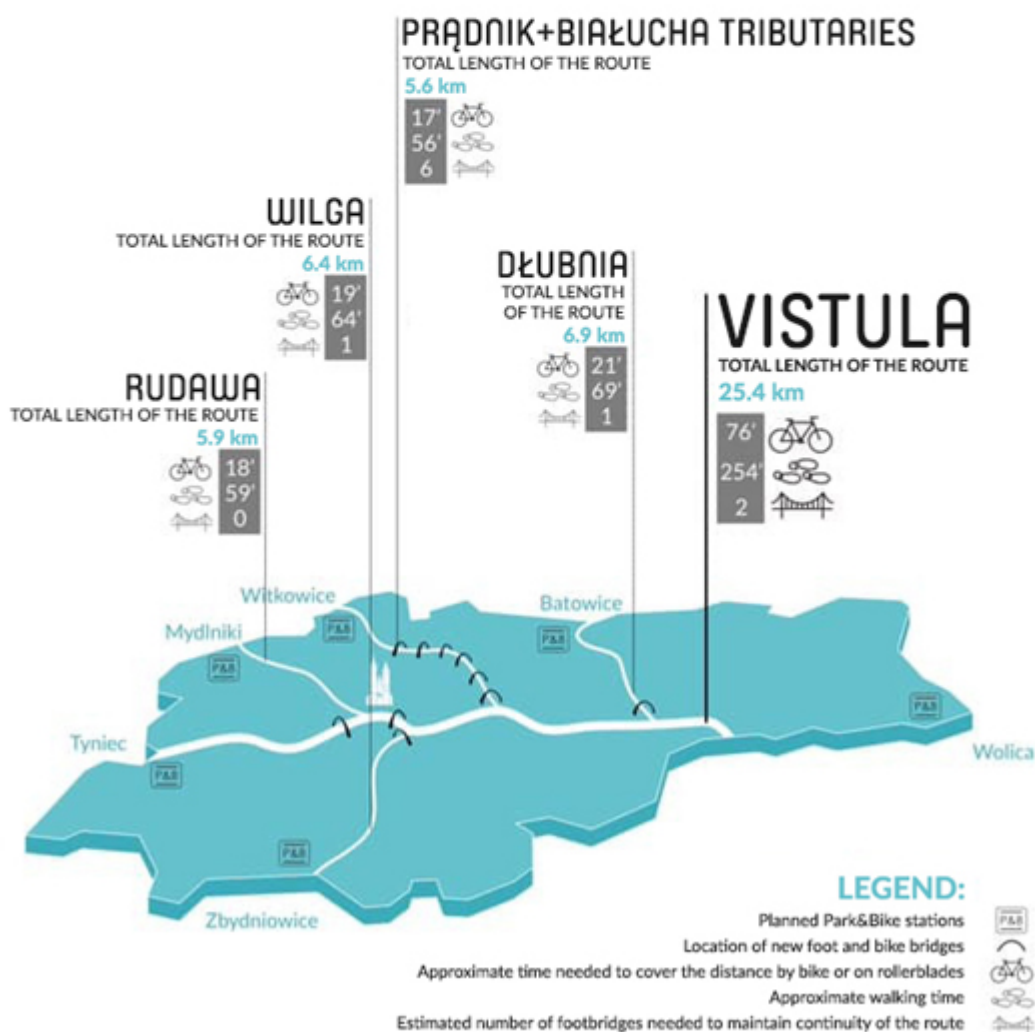


Figure 13

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9D. References

- [1] <http://www.wody.gov.pl>
- [2] www.pca.gov.pl
- [3] https://www.bip.krakow.pl/?dok_id=106464
- [4] <https://prostozkranu.krakow.pl/ciekawostki/jak-oszczedzac-wode.html>
- [5] <https://prostozkranu.krakow.pl/ile-wody-zuzywamy.html>
- [6] http://powodz.gov.pl/pl/plan_view?id=2
- [7] <http://dziennikustaw.gov.pl/du/2016/1911/1>
- [8] <http://stopsuszy.pl>
- [9] <https://khk.krakow.pl/pl/o-nas/badania-spoeczne/#>
- [10] <https://wodociagi.krakow.pl/projekty-badawczo---rozwojowe.html>
- [11] <https://wodociagi.krakow.pl/projekty-badawczo---rozwojowe/energetycznie-pasywna-oczyszczalnia-sciekow.html>
- [12] <https://wodociagi.krakow.pl/edukacja-ekologiczna.html>
- [13] <http://www.strategiezielonychdachow.eu/pl/o-projekcie>

Word Count Check

Please complete the below word count check for Indicator 9: Water, Sections 9A, 9B and 9C.

As per the Guidance Note (Annex 2 of the Rules of Contest), the word count includes text in graphics/tables and the body of text. The word count excludes text in the original application form, captions and text in Table 1: Benchmarking Data - Water.

Section	Number of words in graphics/tables	Number of words in body of text	Total number of words in graphics/tables and body of text	Max. words
9A	158	611	769	800
9B	123	1070	1093	1200
9C	62	723	785	800

10. Green Growth and Eco-innovation

Refer to Section 2.10 of the Guidance Note

10A. Present Situation

Please complete the following table providing the most recent data available:

Table 1: Benchmarking Data - Green Growth and Eco-innovation

Indicator		Unit	Year of Data
Number of electric (green) vehicles owned by the municipality	14 electric passenger cars 26 electric buses 8 service vehicles	Number	2018
Share of electric vehicles owned by the municipality (as a percentage of all cars owned by the municipality)	3,84% electric passenger cars 4,59% electric buses 3,98% service vehicles	%	2018
Number of charging outlets available for cars owned privately in the public space	0	Number	2018
Number of procurement contracts that include green issues	1108	Number	2018
Percentage of all procurement contracts that include green criteria	64,04%	%	2018
Share of the city budget dedicated to support environmental R&D by public and private entities	0,39%	%	2018
Number of jobs created in green economic activities including: i) Jobs created by municipality initiatives in the private and public sector; and ii) Jobs in the municipality	Jobs created by municipality initiatives in the private and public sector	43	Until 2018
	Jobs in the municipality	564	Until 2018
Number of initiatives for promoting and enabling sharing, reuse and repair such as, repair cafés, etc. initiated or facilitated by the municipality	27	Number	Until 2018

Describe the present situation in relation to green growth and eco-innovation, including any relevant disadvantages or constraints resulting from historical, geographical and/or socio-economic factors which may have influenced this indicator. Where available, information/data should be provided from previous years (5-10) to show trends.

Make reference to the below (note that the numbers listed below correspond to Figure 2.2 of the Guidance

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Note):

1. Innovations that address material/resource use, (substitution, minimisation of material use, closing loops, etc.) and reduce environmental impacts, i.e. measures to improve resource efficiency;
2. Awareness raising and training to encourage the development and up-take of environmentally friendly technologies, particularly through training in industrial and business settings; new business models (sharing schemes), including actions inspired by circular economy thinking;
3. Efforts to promote green skills or green jobs;
4. Efforts to promote Green Public Procurement (GPP) and other green policy measures;
5. Social innovation/stakeholder participation, including for example community programmes, that shows entrepreneurship and new ways of organisation that promote sustainable development and protect the environment locally and globally;
6. Efforts to drive innovation that address societal and particularly environmental challenges through creating the right enabling conditions, like putting in place advanced infrastructure (IT or more traditional) or investing in and partnering with innovators, platforms, clusters and hubs;
7. What efforts does the municipality make to stimulate sharing, reuse and repair different categories of goods;
8. Describe how green growth and eco-innovation improve the livability of the city in the area of various aspects such as health and safety.

(max.800 words and five graphics, images or tables)

Krakow has conducted for a long time numerous projects of different scale to integrate the activities of the Małopolska Region Environmental Protection Programme and the State Environmental Policy, which is based on EU guidelines. The goal is to realise the vision of a sustainable city, one that cares for its resources, improves inhabitants health, saves energy, minimises the consumption of new materials, maximises reuse, and strengthens environmentally beneficial behaviours among citizens of all ages.

As part of this, municipal utilities and businesses have initiated both large and small projects promoting everyday recycling, and the number of grassroots and municipal initiatives have been significantly growing over recent years.

For several years we have approached environmental protection and management of the ecology of the city in a comprehensive, integrated manner. The selective collection of five waste fractions, improving reuse and sorting at source, came into effect on 01/04/2019 (see Chapter 8 for detail).

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Last five years have demonstrated an increase in the number of green jobs in Krakow resulting from their promotion. Moreover, 36 start-ups were trained by the Central Europe Renovation Innovation Systems Network (CERlecon) in 2017–19 and presented four environmental projects: roof gardens, use of waste in arts

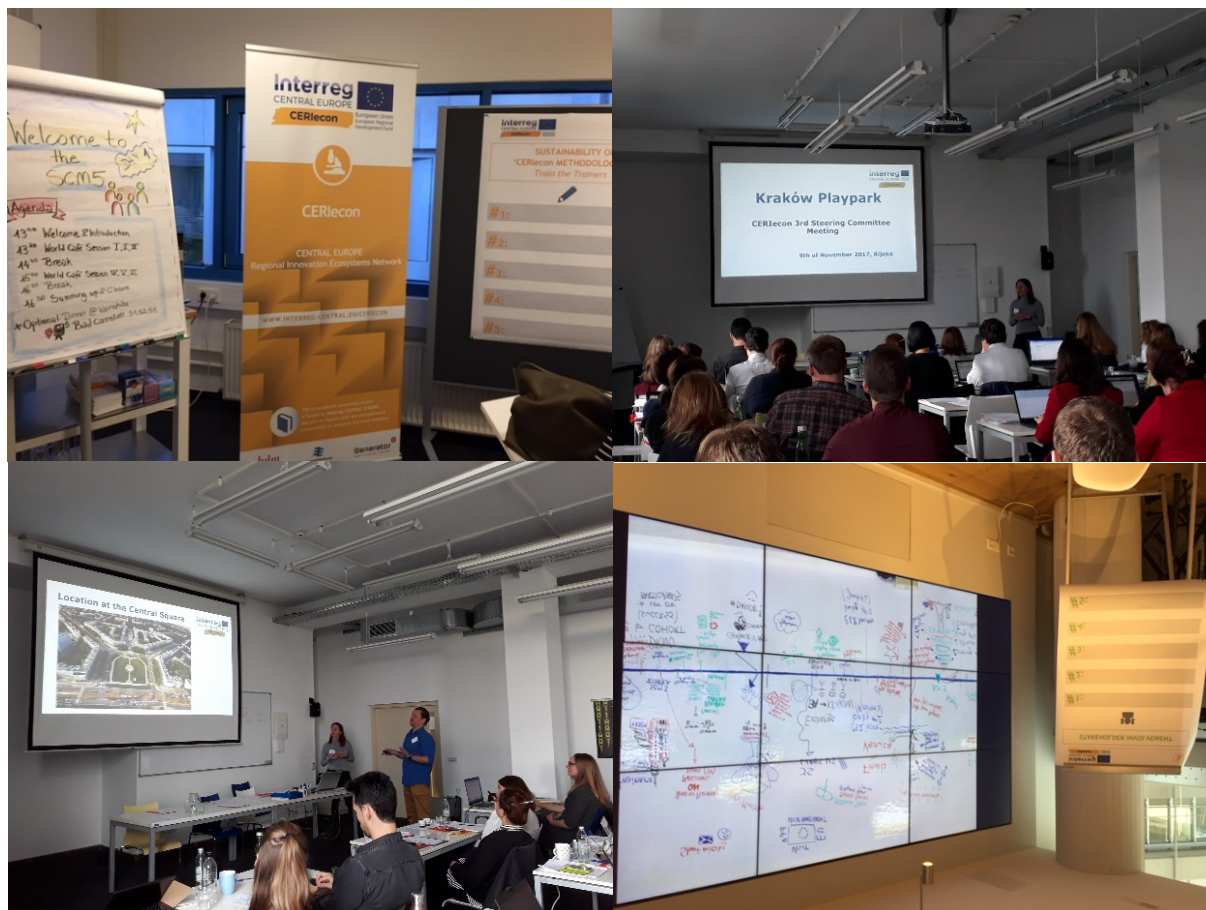


Figure 1. International CERlecon Project meetings

and crafts, manufacture of anti-smog masks, streamlining data acquisition for municipal transport.

Environmental criteria have been increasingly used in public procurement, with extra points awarded e.g. for the use of GOTS-certified eco-fibres, or delivery of chlorine-free bleached recycled paper. Environmental criteria, requiring a sustainable approach to natural resources are applied in assessing and comparing public procurement bids for services, supply, and construction works, e.g. the use of special tyres designed for grass mowers, and a ban on airblowers. Municipal employees can also use bicycles and electric vehicles.

A number of crucial initiatives and projects have been implemented to minimise the negative impact of pollutants on health and lives of residents and visitors, notably the Integrated System for Monitoring Spatial Data to Improve Air Quality in Krakow which is run in partnership with the Institute of Metrology and Water Management.

Moreover, efforts have been taken for a long time to protect people from excessive electromagnetic field pollution. Stationary and mobile equipment to monitor its intensity, including EMF meters and spectrometers has been purchased.

Small pocket parks are being developed and have a positive impact on the climate and environment. In

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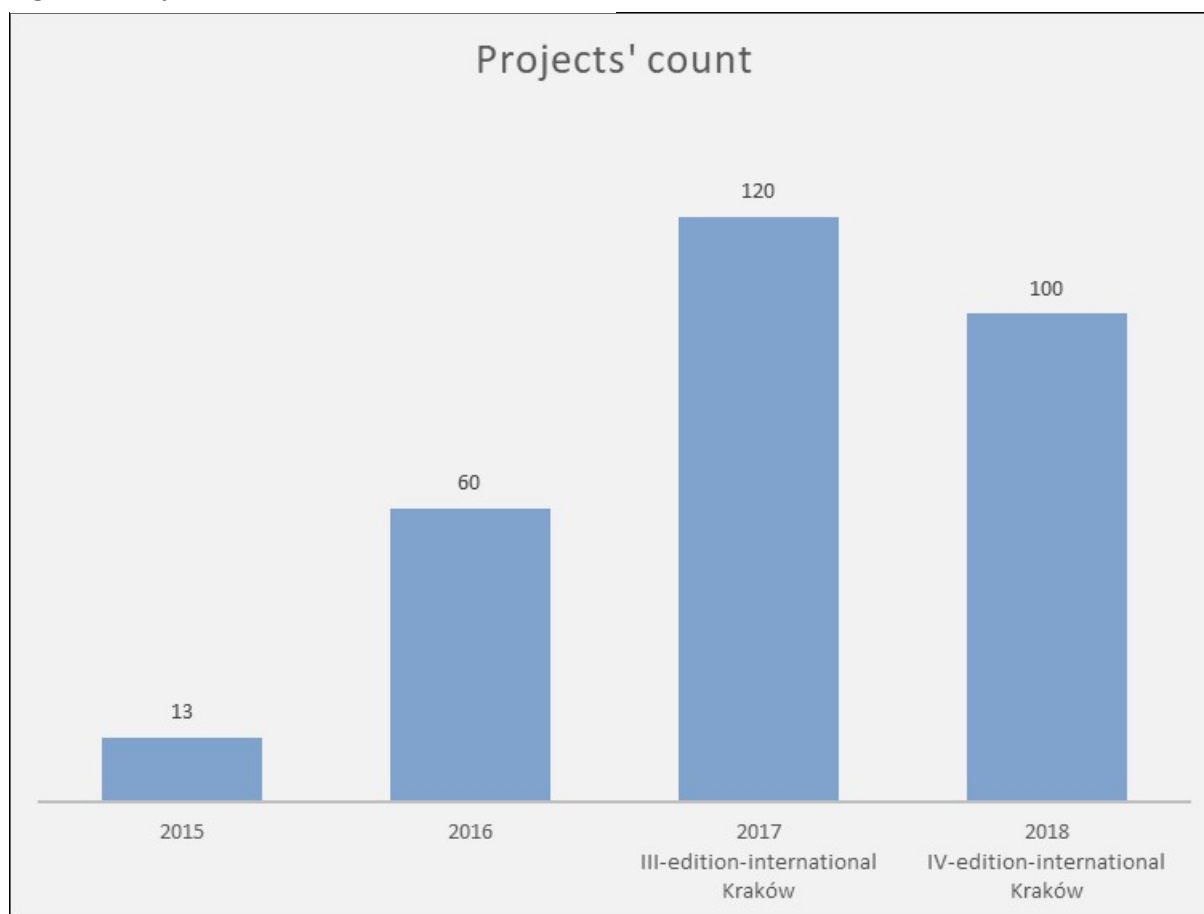
addition, the network of cycle routes is constantly expanding, which improves safety.

As all city users should play their part in caring for the environment (public engagement being one of most important factors) the municipality has conducted educational campaigns targeted towards employees and residents of all ages, including kindergartens, schools, universities, and seniors' clubs on the protection of natural environment encouraging all stakeholders' cooperation on improving the condition of the environment. Currently on early stage of nearly every project stakeholders are involved, allowed to become familiar with drafts, consult and participate. This allows to implement grassroots initiatives, listen to the voice of residents and results in mutual understanding.

For example, the Great Ecology Lesson at the TAURON Arena is a comprehensive presentation of pro-environment activities for residents. It presents key actions taken towards improving air quality, encouraging low-emissions transport and developing an innovative waste management system. Educational campaigns include Segregate Wisely: Gain More, The Droplet Academy, The Droplet's Ramble, Bathyscaph Expedition, That's Not For the Sewer, and an Educational Path through the Eco-Incineration Plant.

Continuous cooperation with universities is key for innovation. One of Krakow's flagship innovative solutions for sustainable city growth is Smogathon: a multidisciplinary, 24-hour-long hackathon for teams of academics, programmers, designers, entrepreneurs, sociologists, students, start-ups, and experts,. Their mission is to develop practical solutions to fight smog. The chart below shows changes in interest in Smogathon.

Figure 2. Projects' count



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10B. Past Performance

Describe the measures implemented over the last five to ten years concerning green growth and eco-innovation. Please comment on which measures have been most effective.

Make reference to:

1. Initiatives aimed at increasing green growth and eco-innovation, e.g. projects under Cohesion Policy funds, Horizon 2020, COSME, LIFE, Eco-innovation Action Plan (EcoAP), Green Public Procurement (GPP), as well as national policy initiatives;
2. How European and national policies have been transferred into policy action at city level;
3. The publication of reports, such as green accounts, that make clear the timely implementation of planned initiatives and the focus group they were written for;
4. Describe the actions the city took in order to develop the urban tissue/infrastructures in an innovative/sustainable way including actions inspired by circular economy thinking;
5. Name/describe what you consider to be the flagship of eco-innovation in your city.

(max. 1,000 words and five graphics, images or tables)

Krakow is a city of change, both in terms of geopolitics and society. This is reflected in changing mentality of citizens, civil servants and city authorities, as well as extensive hard investments and soft initiatives undertaken over the last decade in environmental protection, reversing climate change and improving the condition of city green infrastructure.

For years, projects focused on improving natural environment quality were integrated across many levels and conducted on sustainable principles, consistently with regional and national operational programmes. Maintaining this coherence is essential to ensuring Krakow's goal: a high standard of living for residents.

In 1995–2019, grants totalling nearly €80m were distributed from the Low Emissions Reduction Programme to replace 45,000 coal-burning stoves with environmentally-friendly heating systems, including those using RES (e.g. heat pumps). Large-scale thermal modernisation of buildings was started many years ago. During 2006–19, thanks to Municipal grants, a total of 2001 RES installations (photovoltaics, solar panels for hot water, heat pumps) were completed in private buildings.

The incineration plant built to resolve the need for waste management also produces heat and power. In 2014–15 street lighting was modernised as part of the SOWA programme (LED lights in street lighting).

Moving the public bus fleet to fully environmentally-friendly vehicles (2007–18) has helped reduce low-level emissions. Currently all 646 Krakow buses meet EURO 5 or 6 norms and more electric and hybrid vehicles are being added. 391 tram cars are also used.

The last decade saw multi-million investments in increasing access to drinking water, building a sewage system and developing environmentally-friendly technologies. Water and wastewater investments allow people to enjoy continuous supply of high-quality drinkable water and be reassured that their wastewater does not pollute the environment. The main objective of the Water and Wastewater Economy project, implemented from 2005, was to organise the water and wastewater management system in the city and the metropolitan area, improve the state of infrastructure and increase accessibility.

Krakow was among the first cities in Poland to sort waste, with first colour-coded containers for selective collections installed in public places in 1994. The Integrated System for Municipal Waste Management

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introduced in July 2013 is based on the processing hierarchy adopted in EU law.

As early as 1988, Krakow was Poland's first city to introduce sustainable mobility principles by setting up central restricted traffic and parking zones. Noise reduction measures were also applied, improving the acoustic environment.

The acquisition of land by the Municipality for the development of new green space is an important aspect of green infrastructure policy implementation in Krakow. The acreage of land purchased in 2016 was 15 times that in 2014.

The Krakow Environmental Protection Programme (2012) was the first in Poland to treat the issue of green infrastructure development extensively. In the last decade, three Natura 2000 areas protecting meadow habitats and rare and threatened butterfly species were created. The progressive development of the city, loss of soft landscaped areas, and care for the city's green space resulted in the formation of a new unit for the management of green space (ZZM). Since 2015, 31 city parks (including 26 pocket parks) have been built in various parts of the city.

Most of the projects described above were funded from the municipal budget or external funds (mostly EU).

Even before EU accession, Krakow launched EU co-financed projects to combat environmental pollution by seeking new solutions. One example is the Management of Solid Waste in Krakow (Stage I) project which focused on the development of modern solutions compliant with Polish and EU law. It was followed by the construction of the Waste Incineration Plant, which reduces waste volume and co-generates heat and power.

Soft partnership projects with foreign partners aimed at exchanging experiences in sustainable municipal growth have also played a major role. Over several years, the integrated LIFE project – Implementation of the Air Protection Programme for Małopolska Region – Małopolska in Healthy Atmosphere – has accelerated implementation of initiatives to improve air quality in line with the Air Protection Programme for the Małopolska Region.

A number of projects conducted in Krakow since 2007 have been financed from sources such as ERDF, ESF, national and regional operational programmes, EEA and Norway Grants:

- Waste Management in the Municipality of Krakow: Waste Collection Hubs,
- Installation of solar collectors on sports facilities,
- Municipal waste management programme,
- RES and thermal modernisation of the Residential Nursing Home in Łanowa Street,
- RES in sports facilities,
- Water and wastewater management in Krakow (stages II–IV),
- 10+ projects in public transport (tramline and Fast Metropolitan Rail construction and development, purchase of eco-buses, development of a public transport management system, construction of cycle paths, and P+R system),
- Low Emissions Reduction Programme and thermal modernisation,
- Revitalisation of Park Zabłocie, Liban Quarry and other post-industrial facilities.

Other non-investment projects in environmental protection, transport, and municipal economy included:

- EEA: Clean Krakow – Better Life, Integrated System for Monitoring Spatial Data for Air Quality Improvement in Krakow (MONITAIR),
- IEOP: Low Emissions Economy Plan for Municipality of Krakow, and Integrated Transport System for Metropolitan Krakow,

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- Urbact: USER, VitalCities, Ru:RBAN,
- Smart Energy in Europe: Caravel Civitas, Aeneas/Steer, Via Regia Plus, Transport Learning, CHALLENGE, STARS (with an educational element), SIFORAGE,
- Horizon 2020: Handshake-promoting bikes and Park4Sump improving car parking policy, Zero Emission Krakow,
- LIFE: integrated project on the Implementation of Air Protection Programme for Małopolska Region – Małopolska in Healthy Atmosphere and LIFE URBANGREEN,
- Interreg: INTHERWASTE (Interregional Environmental Integration of Waste Management in European Heritage Cities), URBAN GREEN BELTS, LOW-CARB – Capacity building for integrating low-carbon mobility planning in functional urban areas,
- and others co-financed from the 6th and 7th Framework Programmes and directly from the Commission's DGs.

These projects resulted directly from national and/or regional policies, fulfilling the operational programmes and simultaneously answering the needs defined in the Krakow Development Strategy.

10C. Future Plans

Describe the future short and long term objectives to promote green growth and eco-innovation and the proposed approach (strategy) for their achievement. Emphasise to what extent plans are supported by commitments, budget allocations, and monitoring and performance evaluation schemes.

Make reference to:

1. Plans to establish eco-innovation clusters, strategies and initiatives to attract public-private-partnerships for further developing eco-innovation and sustainable employment;
2. Future targets of how eco-innovations can be applied by the city, e.g. make reference to share of hybrid or fully electric cars in total stock of the public fleet, or plans to support the infrastructure development for electric cars in public areas (i.e. increase the number of charging points for electric cars in public car parks), sharing economy schemes (i.e. bike sharing), use of public procurement for innovation;
3. Participation at green business networks or partnerships and covenants and co-operation with knowledge institutions, such as universities;
4. Programmes to reach the population promoting green economy thinking;
5. Programmes to reach the industries promoting green economy thinking;
6. Identify one key future plan which is considered as the flagship of eco-innovation in your 'City of the Future'.

(max. 800 words and five graphics, images or tables)

The future strategic goals for Krakow are primarily sustainable environment, effective and eco-friendly transport, becoming a friendly city to live in, commonly accessible and high-quality public space. They stem from the Krakow Development Strategy 2030 and will be implemented through Sectoral Programmes and

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Projects. From the outset, it focused on open discussion and initiated various forms of citizen involvement. It was developed in cooperation with numerous groups and communities to create a shared vision of Krakow's future.

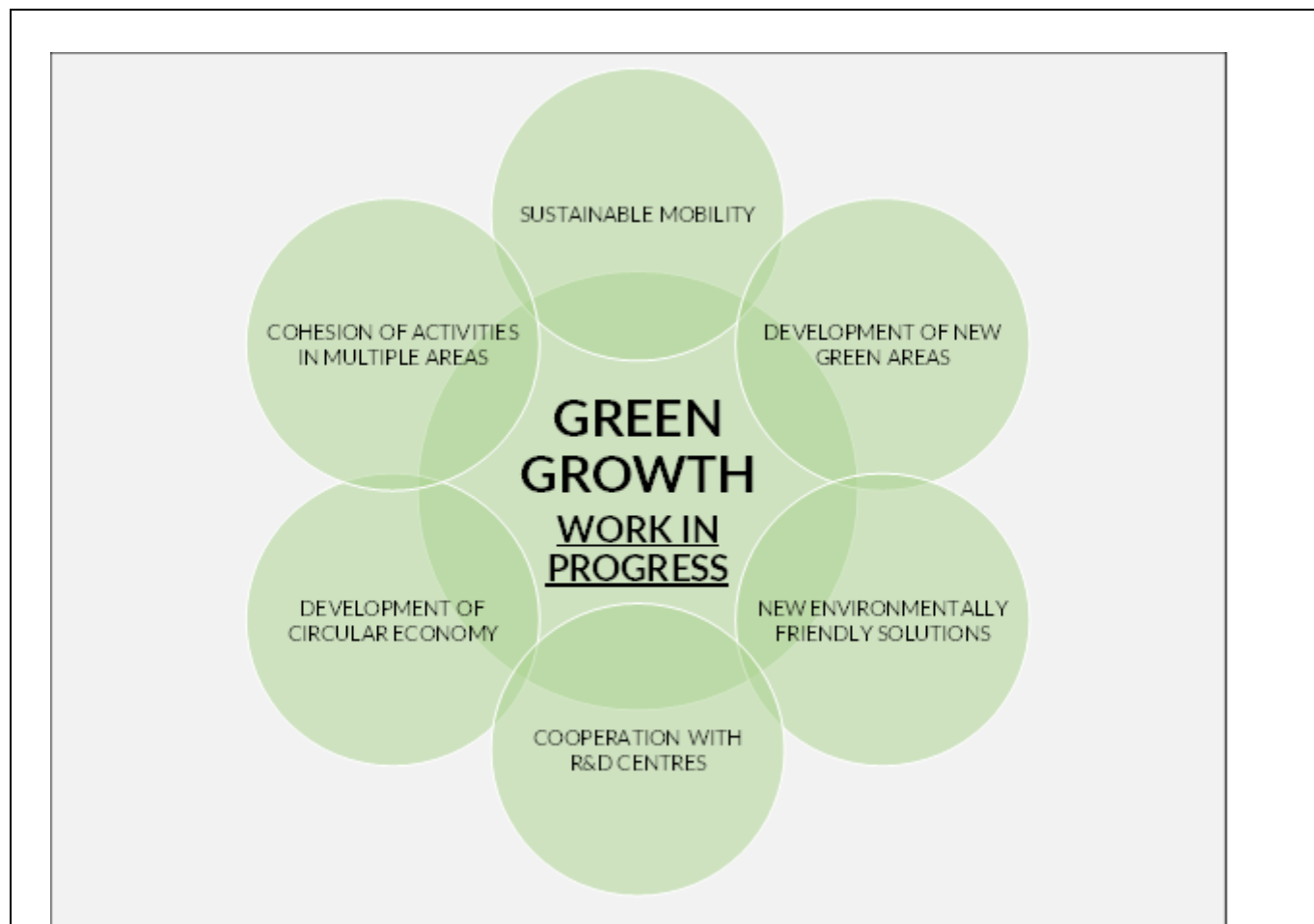
Its operational goals are:

- increased cooperation between business, academia, and local government for knowledge-based economy, including local academia,
- creating conditions for the creation of local start-ups and the development of a business-and-academic centre supporting intelligent technologies in Krakow,
- achieving high-quality environmental standards, particularly improved air quality and noise levels, as well as reducing electromagnetic fields,
- attaining high levels of public participation by encouraging a sense of shared civic responsibility (My City, My Cause), building a sense of neighbourhood identity, improving the system of public communication between local self-governments,
- becoming a metropolis with modern governance that reinforces civil participation in city management, coordinates public policies efficiently and transparently and manages rational zoning that aligns different interests,
- use of multiple financial, programme management, and organisational tools.

The effectiveness of operations will be underpinned by monitoring and evaluation, the results of which will be fed back into decision-making processes and used to initiate public debate in the city, with the active participation of the Strategy Council which will act as an advisory body.

Krakow plans to achieve the goals of Strategy 2030 by better management of resources, use of economic instruments favouring environmental protection, implementation of innovative projects, a more efficient water and waste management policy and efforts to support sustainable consumption and production.

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Future projects (prepared and planned) aligned with these goals include:

- A project in the Zabłocie Social and Economic Innovation Cluster 20.22 to implement Smart City ideas by developing an innovation space focused on the needs of the city and its residents. Its activities will be profiled according to the needs of user group needs in the following areas: smart people, smart living, smart environment, smart economy, and smart governance. – Housing 18 early-stage enterprises (predictably 89 users) in the Cluster indirectly implies the creation of conditions for employment, especially for the young and well educated. Investment in the site will result in highly energy-efficient buildings where the Shared Space will be functionally and spatially flexible and divided into entrepreneurial, creative, social innovation, municipal, integration and technical and administrative zones.
- The Municipality's planned electro-mobility project will bring together 21 entities owned by the Municipality into a purchasing group. It will run joint procurement of 47 electric vehicles, 39 charging stations and associated systems. Some 30% of Krakow rolling stock will soon be zero-emission, and the work of the Purchasing Group will be extended to cover non-passenger transport vehicles.
- An Energy Island on the TAURON Arena site. The concept is being developed for solar energy infrastructure reducing facility management costs.
- The Municipality is planning to develop a repair and reuse site for items that could be repaired or gain a new life or new value. This is consistent with the first level of the waste processing hierarchy, and meets the general principles of the EC environmental protection programme enshrined in the EC Treaty, i.e. prevention and precautionary principles. Moreover, it will meet the conditions of a circular economy.
- ATELIER, part of Horizon2020, is being launched to develop Energy Positive Districts by developing smart solutions tailored to local conditions. ATELIER is a smart city programme involving 30 partners (8 European cities) that undertook to implement Energy Positive Districts and want to disseminate the

Figure 3. Green growth

lessons learnt to other European cities.

- Implementing a system of buried and semi-buried containers in the Municipality of Krakow.
- Better Energy for Cities: a community project for citizens that aims to build high awareness of and involvement in energy-related subjects by developing a unique alliance of local groups (public administration, business, and community activists) and the simultaneous coordination of actions in multiple areas (education, consumer, communication); the project aims to give residents the tools and knowledge necessary for conducting efficient and independent energy transformations in their immediate environment.
- innovative technologies for recovery of raw materials and processing of multicomponent waste within the integrated structure of Krakow waste management, and an innovative low-energy method for removing nitrogen compounds from municipal sewage.

10D. References

List supporting documentation, adding links where possible. Further detail may be requested during the pre-selection phase. Documentation should not be forwarded at this stage.

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(max. 400 words)

1. Municipal websites on projects co-financed from external funds:
<http://www.bip.krakow.pl/?mmi=79> and www.ue.krakow.pl
2. Lifescience Innovation Cluster:
<https://lifescience.pl/>
3. Krakow Development Strategy. This is Where I Want to Live. Krakow 2030
<https://www.bip.krakow.pl/index.php?mmi=47>
4. Municipal investments map (completed):
<https://www.google.com/maps/d/viewer?mid=1Z2HQtkFvPGgJCcbuLY6s6aZdukj16zGf&ll=50.04695387481719%2C20.004108300000098&z=12>
5. Municipal investments map (planned):
<https://www.google.com/maps/d/viewer?mid=1kDtYUdnJc4vnTp19AlVc6pbxBTA3C218&ll=50.04325589259416%2C20.00368165000009&z=12>
6. Carpooling:
https://zikit.krakow.pl/strona_glowna/215102,artykul,carpooling_czyli_razem_jezdzimy_samocho-dem.html
7. Environmental protection (with documents):
http://www.krakow.pl/nasze_miasto/1363,artykul,srodowisko.html
8. Business and investor support, and innovative economy:
https://business.krakow.pl/start/210498,artykul,centrum_wspierania_inwestorow_i_innowacyjne_i_gospodarki.html
9. Municipal website on cooperation with business and modern entrepreneurship:
https://business.krakow.pl/start/164662,artykul,programy_miejskie.html
10. Smoghaton:
<https://smogathon.com/pl/strona-glowna/>
11. Educational programmes:
 - Waste (MPO): <http://www.mpo.krakow.pl/edukacja/programy-edukacyjne>
 - Water and wastewater (MPWiK): <https://www.mpwik.com.pl/view/edukacja>
 - Municipal heating (MPEC):
http://www.mpec.krakow.pl/files/documents/Program_edukacyjny.pdf
 - Waterworks: <https://akademikropelki.krakow.pl/>
 - Incineration: <https://khk.krakow.pl/pl/ekospalarnia/edukacja-ekologiczna/>
 - ZZM, eco-education: <https://zsm.krakow.pl/dla-krakowian/edukacja.html>

Word Count Check

Please complete the below word count check for Indicator 10: Green Growth and Eco-innovation, Sections 10A, 10B and 10C.

As per the Guidance Note (Annex 2 of the Rules of Contest), the word count includes text in graphics/tables and the body of text. The word count excludes text in the original application form, captions and text in Table 1: Benchmarking Data - Green Growth and Eco-innovation.

Section	Number of words in	Number of words in	Total number of words in	Max.
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	graphics/tables	body of text	graphics/tables and body of text	words
10A	0	793	793	800
10B	0	974	974	1,000
10C	30	741	771	800

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12. Governance

Refer to Section 2.12 of the Guidance Note

12A. Plans and Commitments

Please complete the following table providing the most recent data available:

Table 1: Benchmarking Data – Governance

Commitments	Yes/No	Date From:	Comments
Signatory of CoM	No		
Aalborg signatory	No		
ISO14001 for municipal operations	Yes	2019 2015 2015	The Municipal Cleaning Company (MPO) The Municipal transport company The Krakow Municipal Water and Sewage Company (WMK)
Eco-management and audit scheme for municipal operations	Yes	2006	Quality management system

Vision and Strategy

Describe if the city has a clearly defined, widely understood and supported **integrated environmental vision** for the city, for example as part of a broader commitment to urban sustainability.

Is this vision reflected in different **strategies and plans**, for individual sectors? Please list the most important strategies and plans and indicate their relationship to the overall vision and whether they have been formally adopted by the city council.

Describe the short and long term objectives of the **integrated environmental vision** and the proposed approach for their achievement.

Describe present and future **projects that demonstrate your commitment to integrated management** of the urban environment.

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Historical, Geographical and/or Socio-economic Factors

List any disadvantages resulting from historical, geographical and/or socio-economic factors, which may have influenced this indicator.

(max. 800 words and five graphics, images or tables)

12A. Plans and Commitments

Vision and Strategy

Krakow Development Strategy. This is Where I Want to Live. Krakow 2030[1] defines the vision, mission, and six strategic goals.

Vision:

KRAKOW: a modern metropolis, buzzing with culture, open, wealthy, safe and friendly, proud of its historical heritage, co-created by citizens.

Mission:

To develop a smart metropolis ensuring high quality of life, building a creative economy, shaping the spatial environment, respecting nature, and developing cultural potential through cooperation with different sectors and in partnership with citizens.

Figure 1 Goals of the Strategy[1]: key issues for the development of a resident-friendly city and efficient mechanism for its implementation: Policies. [12D]

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The Strategy[1] follows the Smart City model, which minimises energy consumption, champions protection and adaptation to climate change, reduces pollution, and manages resources using sustainable principles and modern technologies.

As a modern metropolis where cultural, economic, and social development complement each other, the integration of Krakow's activities is addressed by two key strategic objectives (IV and V). We work in partnership (V: Participatory Budget, Local Initiative, public consultations) based on the assumption that it leads to a resident-friendly city (IV). Safety, comfort, and high quality of life are assured by new public

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spaces (pocket parks) and revitalisation of existing parks as places for meetings, activities, and community integration.

Revitalising urban space by allocating new functions aligned with residents' expectations, while simultaneously caring for the environment and educating, improves comfort and also safety. Incentivisation of healthy lifestyles takes various forms including fare reductions, free public transport for children and teenagers, eco-friendly transport.



Figure 2 Participation in the development of a resident-friendly city: with residents and for residents

Implementation of the vision and mission is based on the policies, programmes, and projects approved by the Municipal Council (table in 12D). Each sector runs tasks fulfilling long-term strategy and policy.

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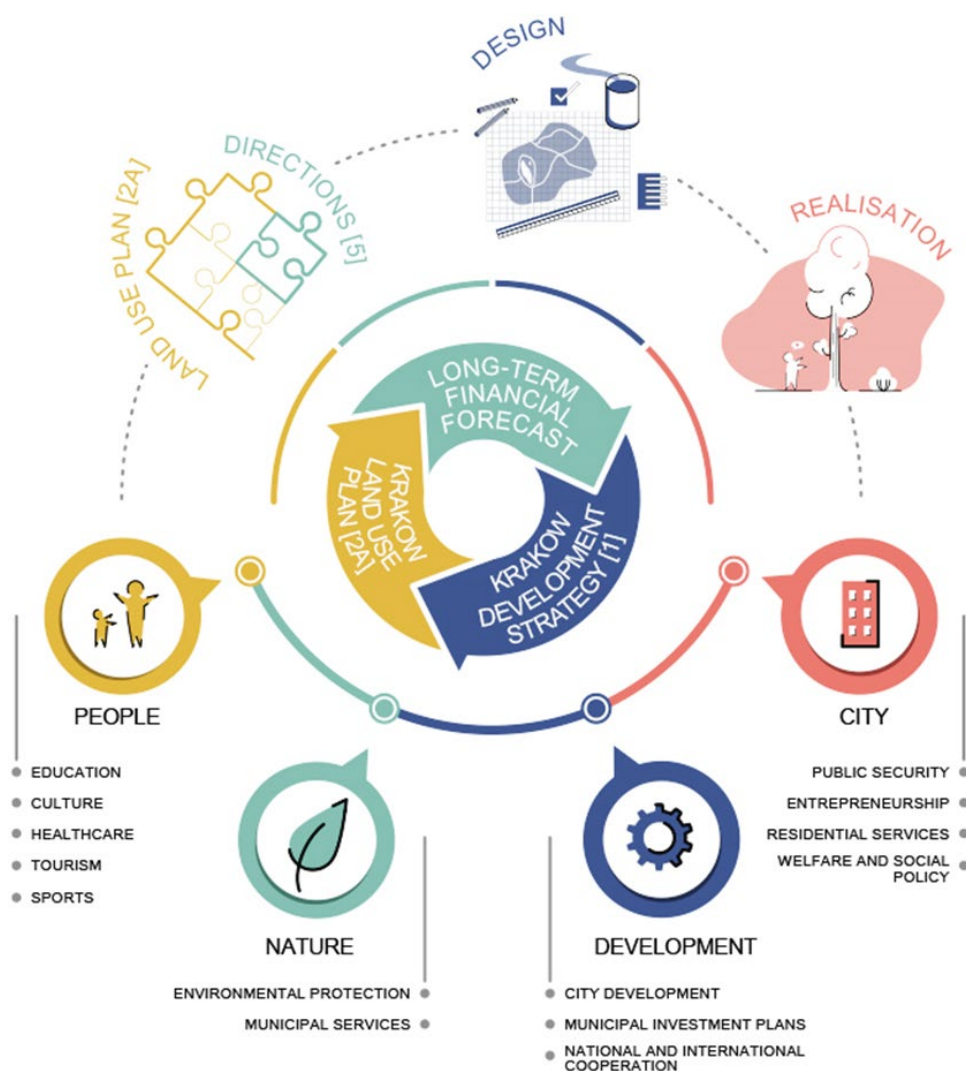


Figure 3 Case study in implementing policies and programmes

We consider external conditions in protecting the environment, and focus on nature, landscape, water, air, waste management, and environmental education. In 2018 strict nature conservation measures covered 5331.19ha of the city (Natura 2000: 384.39ha, nature reserves: 48.58ha, landscape parks: 4753.6ha, ecological grounds: 144.62ha). To increase biodiversity, the Old Trees programme protects trees that are not nature monuments (325), reinforced by converting lawns into floral meadows (>20ha) and siting beehives in the city. Krakow reforested 8.7ha of clearings and planted 23ha of new forest under a programme that will add 20ha more by 2020. The Municipality continuously buys private land, and zoning plans increase the share of public greenery, which helps special municipal units set up to improve water management and air quality (Water Infrastructure Team, Climate-Energy-Water Management, Air Quality Department). Krakow was first to introduce a Clean Air programme, financing the exchange of solid fuel heaters and installation of solar panels. It is the only place in Poland with anti-smog legislation that bans

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burning coal and wood (01/09/2019). Eco-education supports all activities conducted by all municipal units with teams that participate in city events (>50/year) and promotes urban gardening, rain gardens and water retention, biodiversity, waste sorting, effective energy consumption, composing, RES, changing food habits, limiting plastic use etc. Schools and individuals are also targeted (Young Krakovians Academy, Droplet Academy, Symbioza Centre for Ecological Education). Activities are described in the individual sections.



Figure 4 Key actions in environmental protection

Our projects form a network of activities subjected to the vision of integrated environmental management. Activities connect greenspaces (Vistula Unites: Vistula Park for the river and six tributaries), increase their

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number the city centre (Garden Street “Woonerf” concept), and bestow new aesthetic qualities and functionalities that reflect residents’ needs to public spaces (twice awarded Ogrody Krakowian pocket parks). Activities favouring development of interpersonal relations and social activation (Let’s Meet in the Backyard) – revitalisation of spaces within residential compounds, network of Senior Activity Centres. Development of interchanges and Park-and-Ride facilities, increasing the share of environmentally-friendly transport and development of the Krakow Fast Tram all improve air quality and comfort of life in the city. Modernisation of the drainage system and extension of the heating network optimise economic performance. The Garden with the Class project develops school gardens and has environmental and social dimensions, as does modernisation of sports and recreation infrastructure in schools and districts.

Historical, Geographical and/or Socio-economic Factors

Krakow is situated in the Vistula Valley which is fed by six rivers and the point at which multiple uplands and valleys come together.

Although Krakow is today a city of “green transformation”, with dynamic development of green space, reliable information about the environment, education, and growing environmental awareness – we are still suffering the consequences of attempts to transform Krakow into an industrial centre.

Our strengths:

- attractive landscape and nature
- waste and wastewater management
- drinking water quality
- heat distribution network

Opportunities:

- increased awareness and pro-environment behaviours
- unique protected areas
- development of RES technologies
- EU climate and environmental policy

Weaknesses:

- air pollution
- low building energy efficiency
- unequal access to the sewage system
- low share of RES

Threats:

- air pollution
- increasing number of cars
- investor pressure on development
- climate change.

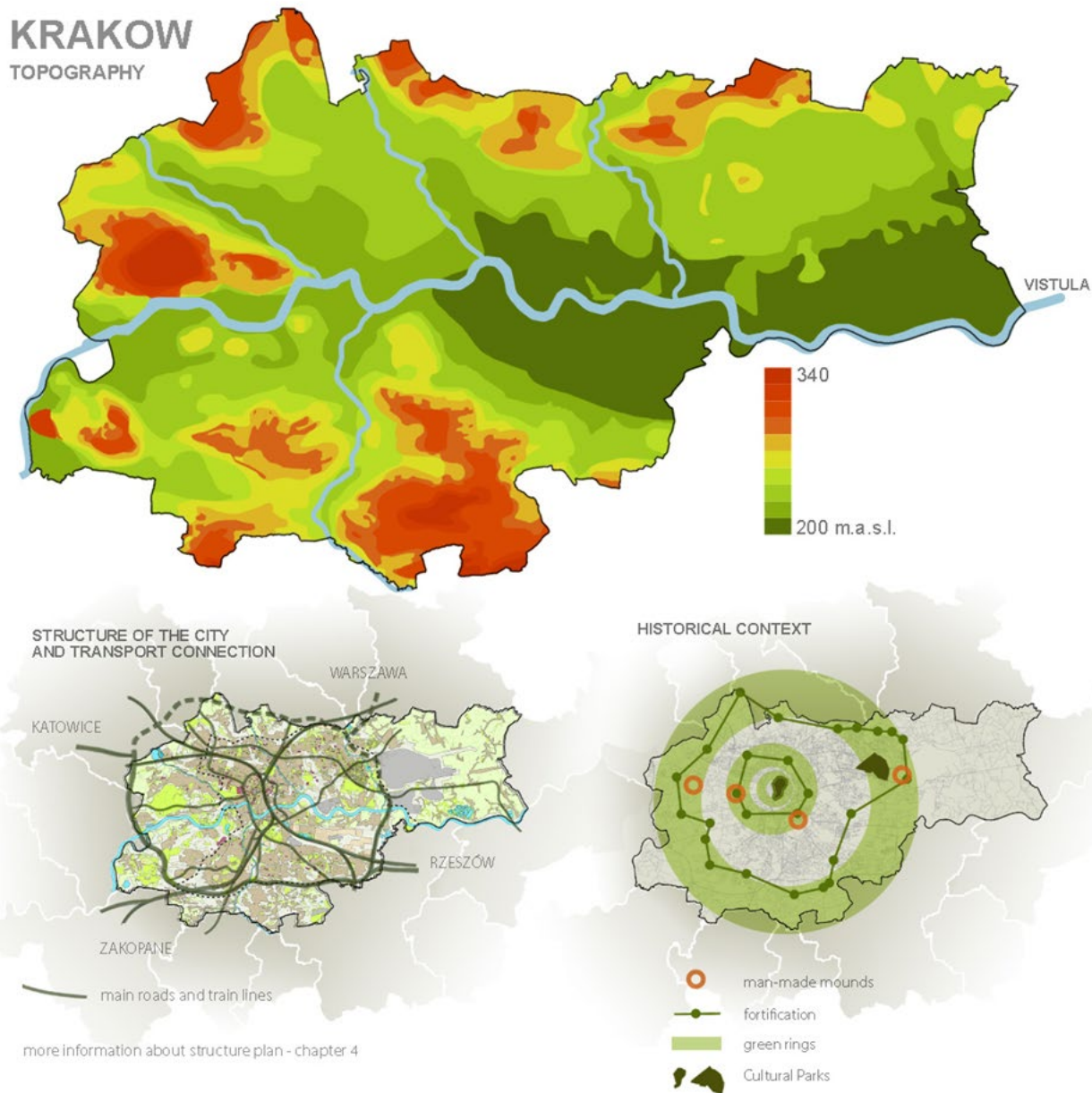


Figure 5 Geographical context

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12B. Governance and Management Arrangements

Organisation

Describe the organisational structure of the city council (administration) and show how the environmental vision/strategies are embedded in the organisation.

Please include an organogram and indicate which department or political body is the driving force behind the environmental vision/strategies.

Budget

Is there a dedicated budget for implementing the environmental vision? If so please describe it.

Management, Monitoring and Evaluation

What management tools are used, to achieve your environmental objectives and targets? For example, sustainability impact assessment of policy proposals, cross departmental project structures, etc.

Describe the system of monitoring, reporting and evaluation of implementation of your environmental strategy and projects. What is generally reported to whom at what frequency?

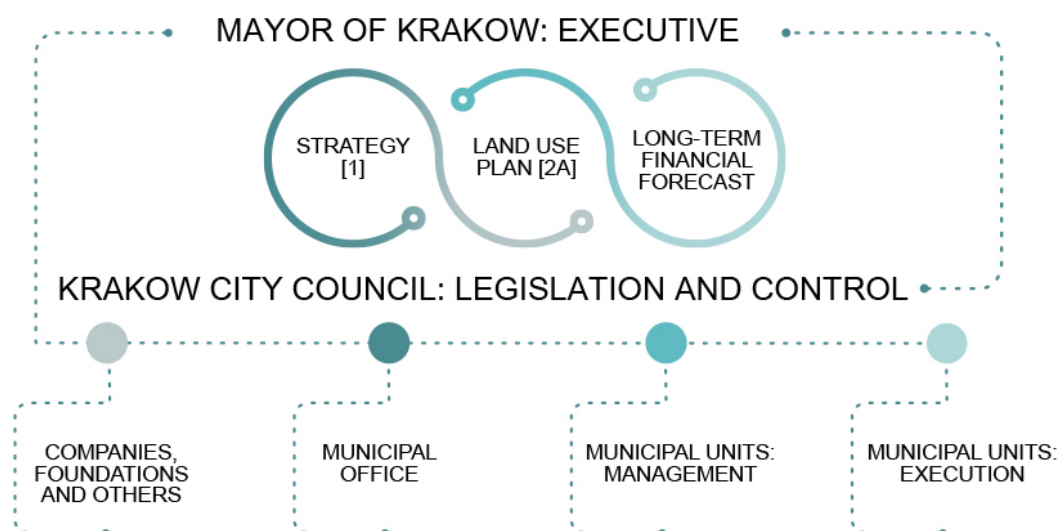
In delivering its environmental policy does the city use any innovative approaches, tools or instruments?

Leadership by the City Council

Is the city council (administration) leading by example in environmental behavior? With reference to the commitments to ISO14001 and Eco-management and Audit Schemes listed in Table 1: Benchmarking Data - Governance, describe your activities regarding environmental management systems, green public procurement, skills development etc.

(max. 600 words and five graphics, images or tables)

The Krakow Municipal Council and its three environmental committees manage the city. The Council approves the Strategy[1], policies, and strategic programmes while the executive consists of the Mayor and his deputies, one of which is responsible for sustainable development and supervising operational aspects



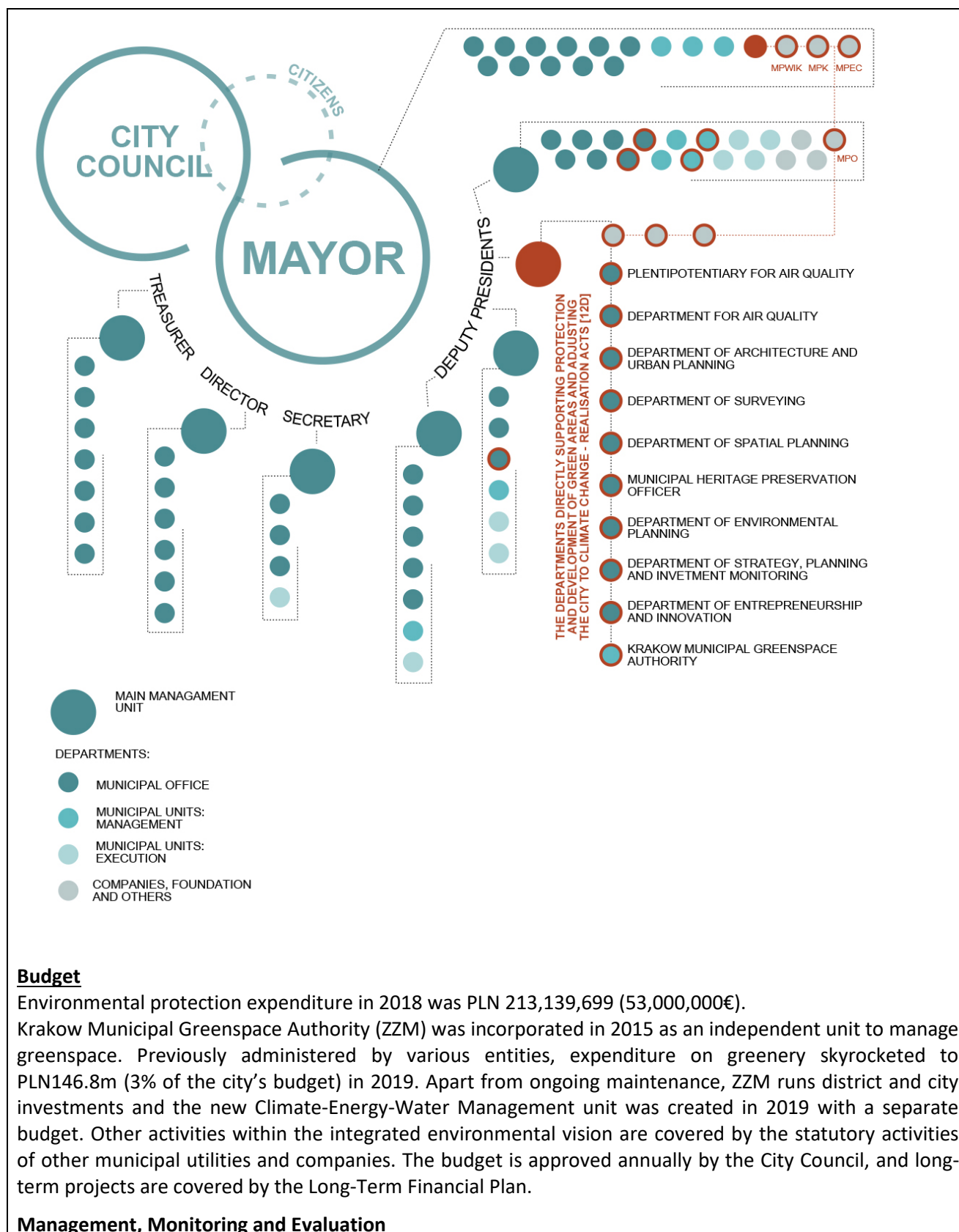
of environmental policy, monitoring and evaluation.

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Figure 1 Cooperation of municipal departments, units, and utilities on the implementation of Strategy[1] and Environmental Programmes[12D]

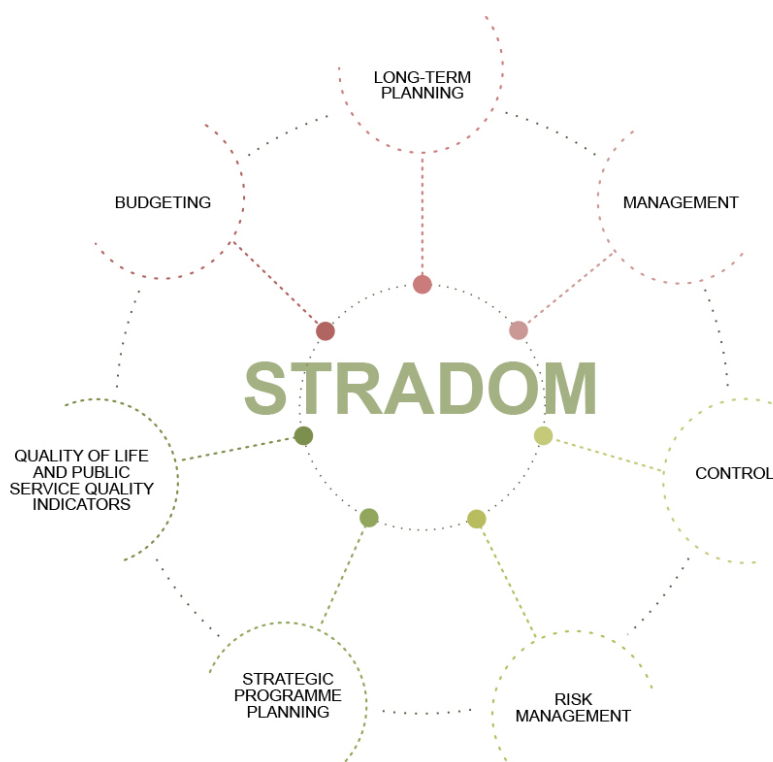
Figure 2 Organogram - City administration diagram

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The integrated management system in 16 areas is based on the STRADOM IT system that integrates strategic and operational management, and brings together Strategy[1] with strategic programmes, budgets, the Long-Term Financial Forecast, and sectoral indicators(see Good Practice 1).



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The STRADOM monitoring and reporting system is used to generate:

- an annual Report on the Condition of the Municipality presented to the Krakow City Council. It summarises policy, programme and strategy implementation, resolutions, and participatory budgets
- annual reports on the implementation of the Strategy, presented by the Mayor to the Council
- annual analyses of individual fields, presented by coordinators to the Mayor
- semi-annual reviews presented by the coordinators to the Mayor.

In delivering its environmental policy does the city use any innovative approaches, tools or instruments?

Yes, they are described in section 10.

Leadership by the City Council

Representatives of the City Council and the Mayor, as well as individual units and municipal utilities provide examples of pro-environment activities based on quality management and management methodology consistent with ISO14001.

Municipal institutions participate in the Plastic-Free Krakow project that removed bottled water from their offices, and replaced it with reusable flasks and filtered tap water. Similar measures were introduced in Krakow's schools together with use of less plastic cutlery and paper, more appropriate materials for classes,

Figure 3 STRADOM integrated IT system for strategic and operational management and recommendations for school shops.

In line with the Act on electromobility, the municipal fleet is mostly hybrid vehicles with an increasing share of electric cars. Procurement processes apply environmental criteria, e.g. operators of green spaces cannot use air blowers, are expected to use zero/low-emission vehicles and tools (reducing both pollution and noise), and use slick tyres.

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Krakow's public entities and businesses run a loyalty programme for bike commuters, promoting healthy lifestyles and the switch from cars to bikes.



Figure 4 Mayor of Krakow, Professor Jacek Majchrowski , and city authorities participating in the development of the Green City with residents and for residents.

12C. Partnerships and Public Involvement

Which stakeholders have participated in the development of the city's environmental vision and associated strategies and action plans (e.g. contribution of civil society and citizens)?

How was the participation organised?

How are stakeholders involved in the on-going integrated environmental management of your city?

Involvement of Citizens

Describe your activities and engagement with the different communities within **your city that contribute to the development or implementation of your environmental vision and strategy.**

Please reference any structures/projects/programmes that you have in place to involve particular groups of society e.g. young people, elderly citizens, disabled, deprived citizens, or people from different ethnic

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groups.

Describe the goals of these activities, e.g. awareness raising, shared responsibility, policy development, etc.

Co-operation and Learning

Does your city co-operate with other authorities at different levels or other organisations (regional, national, EU, international) on environmental and sustainability issues? Which of these co-operation activities or projects has your city initiated or acted as leading partner? Please also refer to your participation in European funded projects and to your commitment to international initiatives, charters, etc. (For example Agenda 21, Aalborg Commitments, Covenant of Mayors, C40, Climate Alliance, ICLEI, EUROCITIES, etc.).

Public Awareness and Involvement of your Bid to be the European Green Capital

Demonstrate public awareness of this bid i.e. public consultation, access/availability to read etc.

(max. 800 words and five graphics, images or tables)

NGOs participated in preparing the city Strategy[1] with the Committee for Civic Dialogue on the Environment, the Krakow Council of Public Benefit Organisations and governmental institutions. Section II of the Strategy describes their engagement, and the process is described in IV stages and 8 steps. The documents detailing the vision (Directions[5], Study[2], and MPZP[3]) were drafted with experts and consulted with citizens.

Directions[5] was prepared using a participatory/expert methodology throughout, the most important stages being citizen participation in consultations, workshops, and discussions conducted in all districts, as well as incorporating written suggestions.

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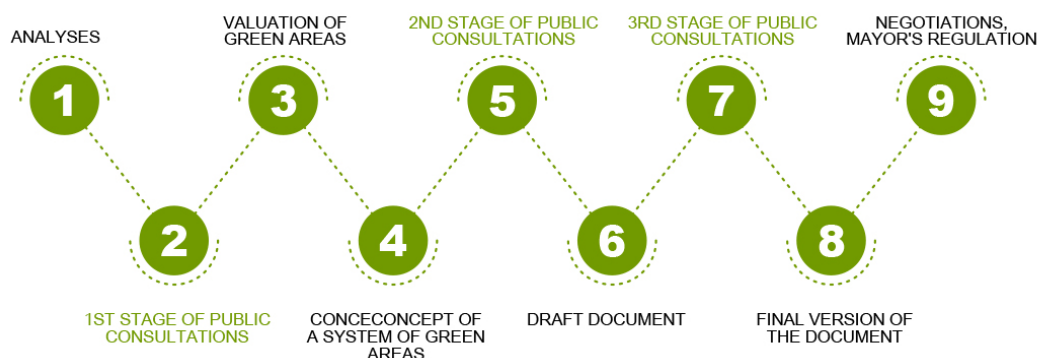


Figure 1 Development of Directions[5] – diagram

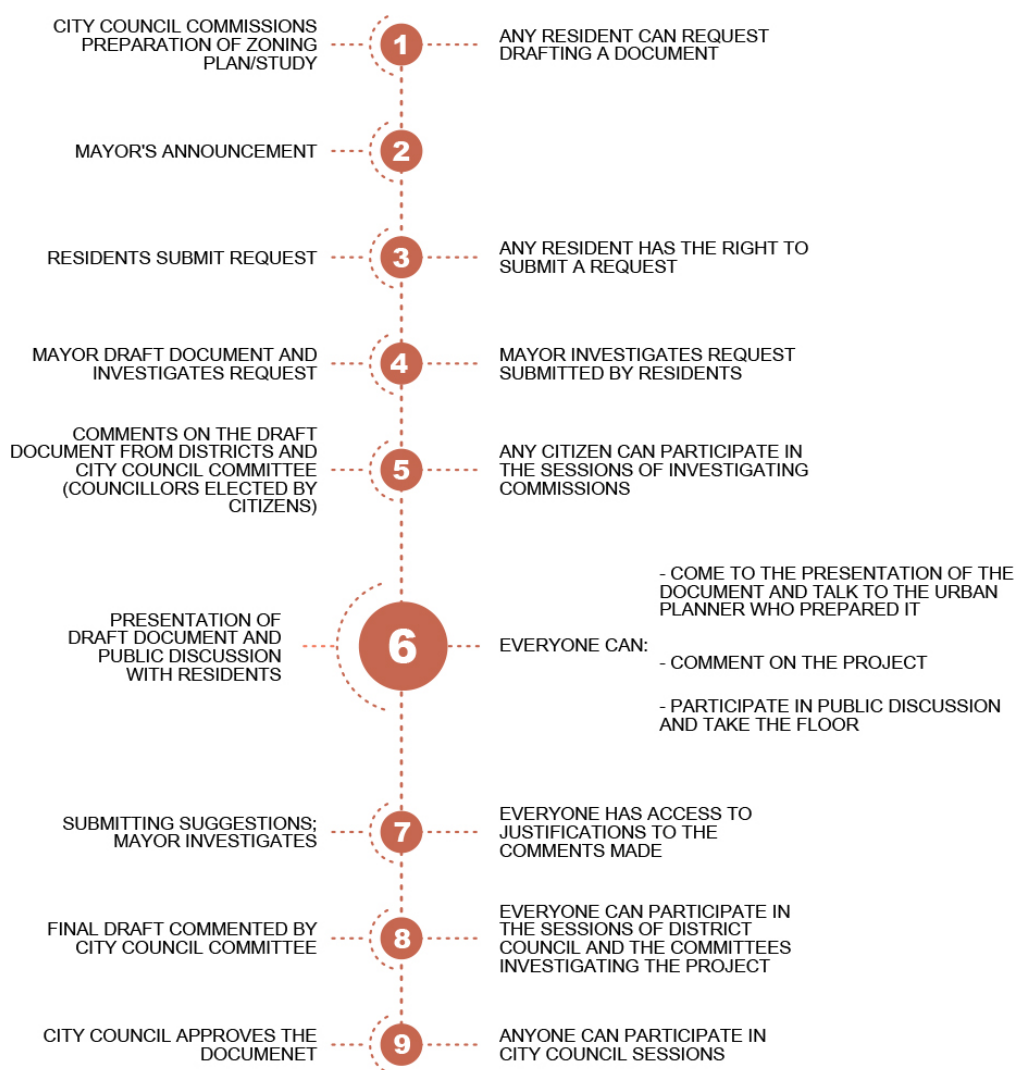


Figure 2 Development of Study[2] and Zoning Plan[3] – diagram

Citizens participate in city governance through representatives in:

- Krakow Council of Public Benefit Organisations
- Committee for Civic Dialogue on Environment
- Krakow Senior Citizens, Youth, County Civic Council of People with Disabilities Councils

NGOs can participate as a party in any decisions involving environmental protection

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12D. References

List supporting documentation, adding links where possible. Further detail may be requested during the pre-selection phase. Documentation should not be forwarded at this stage.

(max. 400 words)

Link	Document	Access
[1]	Krakow Development Strategy 2030	https://www.bip.krakow.pl/index.php?dok_id=94892
[2]	Report on the conditions and intended purposes of land development in the City of Krakow	https://www.bip.krakow.pl/?bip_id=1&mmi=48
[3]	Local Zoning/Master Plan (MPZP)	http://planowanie.um.krakow.pl/bpp/plany_obow.htm http://www.bip.krakow.pl/?bip_id=1&mmi=412
[4]	Local Zoning/Master Plan for Selected Natural Areas of Krakow	https://www.bip.krakow.pl/?dok_id=102579 Stage I https://www.bip.krakow.pl/?dok_id=80571 Stage II
[5]	Directions for the Development and Management of Green Areas in Krakow	https://www.bip.krakow.pl/?dok_id=115159
[6]	Municipal Programme for the Revitalisation of Krakow	https://www.bip.krakow.pl/?sub_dok_id=944
[7]	Environmental Protection Programme for Krakow 2012–15, accounting for tasks completed in 2011 and prospects for 2016–19	https://www.bip.krakow.pl/?dok_id=53605
[8]	County Program for increasing Krakow Forestation 2018–14	https://zsm.krakow.pl/nowe-lasy.html
[9]	Krakow Municipal Greenspace Authority	https://zsm.krakow.pl/

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[10]	STRADOM	https://www.bip.krakow.pl/?dok_id=67584
[11]	Air Protection Programme for the Małopolska Region	https://bip.malopolska.pl/umwm,a,1283890,uchwala-nr-xxxii45117-sejmiku-wojewodztwa-malopolskiego-z-dnia-23-stycznia-2017-r-w-sprawie-zmiany-u.html
[12]	Programme for Protecting the Environment from Noise for Krakow 2019–23	Link to the programme
[13]	Małopolska Region Waste Management Plan	https://www.malopolska.pl/_userfiles/uploads/PGOWM_2016-2022.pdf
[14]	Symbioza Centre for Environmental Education	http://symbioza-krakow.pl/
[15]	Programme for Limiting Low Emissions for Krakow	Link to the programme
[16]	Małopolska Region Development Strategy 2011–20	Link to the programme
[17]	Low Emissions Management Plan for the Municipality of Krakow	Link to the programme
[18]	Krakow Programme for Supporting Entrepreneurship and Economic Development of the City 2016–20	https://www.bip.krakow.pl/?dok_id=84680
[19]	Program of Thermal Modernisation of Family Homes for Krakow	https://www.bip.krakow.pl/?dok_id=105496
[20]	Programme for Environmental Protection against Electromagnetic Fields (PEM) for Krakow 2018–22	https://www.bip.krakow.pl/?news_id=99077
[21]	Municipal Programme for Krakow's Revitalisation	Link to the programme
[23]	Self governance	http://www.bip.krakow.pl/zalaczniki/dokumenty/n/220965/karta
[24]	Organisational Structure of the Municipal Administration	https://www.bip.krakow.pl/zalaczniki/dokumenty/n/245278/karta
[25]	Update of Environmental Protection Programme for 2020–30	awaiting resolution

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[26]	Plan of Adaptation to Climate Change	awaiting resolution
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Word Count Check

Please complete the below word count check for Indicator 12: Governance Sections 12A, 12B and 12C.

As per the Guidance Note (Annex 2 of the Rules of Contest), the word count includes text in graphics/tables and the body of text. The word count excludes text in the original application form, captions and text in Table 1: Benchmarking Data - Governance.

Section	Number of words in graphics/tables	Number of words in body of text	Total number of words in graphics/tables and body of text	Max. words
12A	28	771	799	800
12B	123	426	549	600
12C	0	781	781	800