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The usefulness of public geoportal functions in planning and preliminary environmental assessment of rural areas

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ABSTRACT

Contemporary spatial planning and environmental engineering increasingly rely on geographic information systems (GIS), which enable the integration and analysis of spatial and descriptive data. The aim of this study was to assess the usefulness of selected public GIS tools in the preliminary environmental assessment of rural areas. The analysis was conducted on selected plots located in the Kamionka Wielka municipality. Browser-based functions available within these platforms were used to evaluate land use, nature protection areas, technical infrastructure, and potential natural hazards. The results confirm that GIS tools provide effective access to essential information such as cadastral data, planning documents, protected areas, and risk factors including landslides and mining zones. Despite offering only basic functionalities, public GIS services prove useful in the early stages of investment planning and environmental assessment in rural areas.

Keywords: geographic information systems, geoinformation, spatial data, environmental assessment, spatial planning.

INTRODUCTION

From GIS to SIS – evolving terminology

Spatial information system (SIS) is a set of hardware, software, and organizational procedures that enable the acquisition, storage, analysis, and visualization of data referenced to the Earth's surface [Ellul 2015; Jażdżewska 2021; Gotlib 2008]. Traditionally known as a Geographic Information System (GIS), over the past two decades this system has become tightly integrated with high-performance computing technologies, cloud infrastructure, mobile devices, and web services [Melo 2019; Eckes 2015; Goodchild 2015].

As the range of applications has expanded beyond strictly "geographic" issues – into fields such as environmental engineering, digital humanities, logistics, or public health – an increasing number of authors advocate for the broader term Spatial Information System. [Goodchild 2010; Gaździcki 2018; Ciula 2023; Generowicz 2023]. Some researchers argue that the term geographic may even be misleading in interdisciplinary contexts [Rozpondek 2016]. The very concept of SIS was formulated over three decades ago [Gaździcki 2007]. In this article, the term SIS is adopted as a broader and more inclusive designation for spatial information systems (the acronym GIS appears in cited sources and is used interchangeably in the literature).

Essential building blocks of an SIS

According to the conceptual framework outlined by Gaździcki [2006; 2013] and further elaborated by Bielecka [2006], an operational spatial information system (SIS) comprises seven interdependent components. The foundation of the system lies in its hardware infrastructure, which includes servers, workstations, mobile sensors, and network infrastructure. This is supported by software elements such as database engines, spatial libraries, and both desktop and web-based client applications.

Equally essential are the spatial data, consisting of vector and raster datasets accompanied by appropriate metadata. The effective functioning of the system also depends on financial resources, encompassing both capital investments and operational budgets. In addition, methodological frameworks – comprising standards and best practices for data acquisition, modelling, and quality assurance – are critical to maintaining data reliability.

System governance is ensured through administrative structures that uphold data integrity and security. Finally, the SIS is sustained by its human dimension: the users and producers of spatial information, including analysts, developers, decision-makers, and the communities that both supply and benefit from the data.

These components enable the implementation of four broad functional domains within the SIS. The first is data input, which involves data acquisition, digitisation, error detection, and editing. The second domain, data management, encompasses access control, search capabilities, validation procedures, and data archival.

Data processing constitutes the third functional area, including format conversion, data transformation, as well as spatial and statistical analysis. The final domain is data dissemination, realised through cartographic production, reporting, and interoperable spatial data services [Litwin 2015].

While this procedural categorisation follows the structure proposed by Kochanek [2015], in practice the functional groups often overlap. For instance, data validation may be regarded as both a management and a processing activity.

Spatial data, databases and file formats

As noted by Gaździcki [2007] and Litwin [2015], projects involving Geographic Information Systems (GIS) may allocate up to eighty percent of their total workload to the acquisition, cleaning, and organization of data. A crucial component in this process is the database that underpins the entire system. Descriptive and graphical data are stored in separate but tightly linked tables, which – as demonstrated by Miksa [2016] and confirmed in the analyses by Bielecka et al. [2018] – significantly improves the efficiency of subsequent data processing and retrieval.

Before actual data collection begins, it is essential to define the basic research assumptions, including the spatial and temporal scope of the analysis as well as the research questions. Decisions regarding the type and scope of data to be collected should consider not only the size of the study area and the required spatial resolution, but also the measurement accuracy and the specific time points at which the data are to be recorded [Izdebski, 2020].

Modern GIS platforms typically store data within a geodatabase, which serves as a container integrating feature datasets, feature classes, and non-spatial tables. Feature datasets group together feature classes that share a common coordinate system, thus enabling logical data organization – for instance, within a cadastral map of an entire city. A feature class contains a homogeneous collection of geometries of a single type (points, lines, polygons, or 3D solids), along with their associated attribute data. Additional data, such as field survey results, photographic documentation, or sensor logs, are stored in auxiliary tables.

Not all spatial data must be physically included within a geodatabase. Some exist as external resources referenced by the system via file paths or URLs. Examples include formats such as Shapefile – a classic, multi-component vector format still widely used despite being considered outdated; GeoTIFF – a raster file containing embedded georeferencing information; and NetCDF or GRIB – formats used in multidimensional modeling, typically for climate and oceanographic data [Yadav et al. 2024, Zelenin at al. 2022].

Regardless of the storage method, each spatial feature is represented by one of the basic geometry types: a point (defined by X,Y coordinates, optionally Z and M); a polyline (an ordered collection of vertices forming a line or curve); a polygon (a closed ring defining an area); or a multipatch (a collection of 3D surfaces used to represent real-world solids, such as building shells commonly employed in urban sunlight exposure analyses) [ESRI, 2023].

From data acquisition to spatial data modeling

Efficient data acquisition and spatial data modelling form a single workflow: decisions taken in the field – accuracy, sampling density and timing – shape every later analytical step. Information may be collected directly (primary data obtained by survey, UAV photogrammetry, LiDAR or IoT sensors) or drawn from existing repositories (secondary data from open-data portals, commercial vendors or digitised archives). Primary data offer full control over precision and sampling design, whereas secondary data shorten lead time but require careful validation of accuracy classes, lineage and licensing [Mats et al. 2025]. Whatever the source, sampling schemes must guarantee that measurement points represent the underlying phenomena; otherwise subsequent spatial inference is compromised.

After initial cleaning and metadata harmonisation, observations are ingested into the project database. At this stage the analyst chooses an appropriate geometry type, sets the map scale and assigns objects to layers that share a coordinate reference system – decisions that together define the spatial data model [Goodchild 2018]. In practice the model relies on four geometry families: point objects (for example monitoring wells), polyline objects (river centrelines), polygon objects (land-parcel boundaries) and multipatch objects, which are three-dimensional surface collections suitable for volumetric features such as building shells used in daylight simulation [Zhang et al. 2023].

Proper modelling extends beyond geometry; it must also enforce topological relationships such as adjacency, containment and connectivity, ensuring, for example, that parcels do not overlap and that water mains form a connected network. Accurate topology underpins analyses like identifying neighbouring parcels, tracing pipe networks or locating parcels that intersect a floodplain [Kochanek 2015; Dangermond 2020].

Geographic information systems (GIS) are an important tool in environmental engineering, enabling the integration and analysis of spatial data to support decision-making processes. They are applied in flood risk modelling, water resource management [Ouhakki et al. 2024], and pollution emission analysis [Abdullah et al., 2021; Zhou et al., 2022]. GIS facilitates the monitoring of land cover changes, assessment of investment impacts on protected areas, and identification of ecologically valuable habitats [Gao et al., 2023; Zhou et al., 2021]. They are increasingly used in green infrastructure planning, climate impact assessments, and environmental impact evaluations [Gaska et al., 2021; Generowicz et al. 2018; Gronba-Chyła et al., 2025]. GIS is also significant in renewable energy planning, supporting site selection through analysis of solar radiation [Kwaśnicki et al. 2023; Kwaśnicki et al. 2024], wind conditions, and grid accessibility [Feng et al. 2020; Kochanek et al., 2024a; Kochanek et al., 2024b;].

MATERIALS AND METHODS

Research questions and hypotheses

The aim of this study is to evaluate the operational applicability of publicly accessible national SIS web portals in supporting preliminary environmental assessments for potential investment sites in rural areas. The analysis focuses on the functional capabilities of these portals in providing spatial data relevant to early-stage environmental engineering inquiries.The overarching hypothesis (H_0) assumes that the combined functionalities of selected SIS portals meaningfully support pre-screening decisions in environmental engineering for rural development areas.

To structure the investigation and enable systematic verification of the main hypothesis, four auxiliary research questions (RQs) were formulated, each addressing a key thematic area relevant to environmental pre-assessment:

- RQ1 (Cadastral and planning context): What information related to land records, topography, and spatial planning can be retrieved for selected parcels?
- RQ2 (Nature protection): What forms of legally defined nature protection apply to the study area?
- RQ3 (Transport impacts): How do available transport-related layers (road, rail, air) support preliminary assessments of noise impact?
- RQ4 (Natural hazards): What spatial layers related to environmental risks (e.g., floods, landslides, mining activity) are available, and what is their spatial resolution?
- Each research question is paired with a corresponding hypothesis:
- H1: Public SIS portals provide sufficient functions to retrieve basic cadastral attributes, terrain parameters, and land development infrastructure for selected parcels.
- H2: Portal functionalities allow for the identification of relevant environmental protection areas within the study site.
- H3: Road, rail, and air infrastructure (along with noise indicators where available) can be characterized using the provided tools.
- H4: Spatial layers related to key environmental hazards (landslide susceptibility, mining

areas, flood/waterlogging zones, monitoring boreholes) are identifiable via the portals.

The following subsections present the selection criteria for SIS portals, the functional evaluation framework, and the step-by-step research procedure conducted within a selected rural municipality.

Study area

In this study, randomly selected plots of land located in the municipality of Kamionka Wielka are the subject of research (Figure 1). The Kamionka Wielka commune has a rural character and is located in the southern part of the Lesser Poland Voivodeship. The commune is located in the Nowy Sącz district and borders with the communes of Nawojowa, Łabowa, Chełmiec and Grybów. Data from the Central Statistical Office in 2016 puts the population at 10 201 people. The municipality of Kamionka Wielka is located in the Carpathian area, which is located in the middle mountains. The average annual temperature in Kamionka Wielka is around 7.8 °C. There are air pollutants in the municipality of Kamionka Wielka, which are caused by the burning of solid fuels in households [Environmental Analysis Department Eco-precision, 2016].

Conducting a study based on the description of the rural commune of Kamionka Wielka is aimed at determining the application of Spatial Information Systems functions in Environmental Engineering. The purpose of the study understood in this way is of an exploratory nature, as the scientific knowledge of the application of Spatial Information Systems, which is the particular software generally available from the described field, is not widely known [Trocki, 2013].

Data sources and analytical tools

To support the analysis, selected publicly accessible geoportals were reviewed in terms of their available spatial data content, access model, and relevance to environmental site assessment. Table 1 provides an overview of the main data providers, access mechanisms, and core data types used in this study.

The analysis was conducted exclusively using data available through three publicly accessible SIS web portals: geoportal.pl, geoserwis.pl, and sip.gison.pl. The study made use of browser-based tools provided within each platform's interface, including map visualization, object identification, thematic layer overlay, and basic spatial measurement functions.

The study adopted a review and exploratory approach, without the use of specialized GIS software, and the procedural steps were as follows:

1. Parcel selection – five parcels were selected for analysis using a stratified random sampling method, ensuring variability in terrain features (i.e., parcels located both in valley bottoms and on slopes).
2. Data acquisition – the portals provided access to thematic layers concerning land records, spatial planning, nature protection, transport

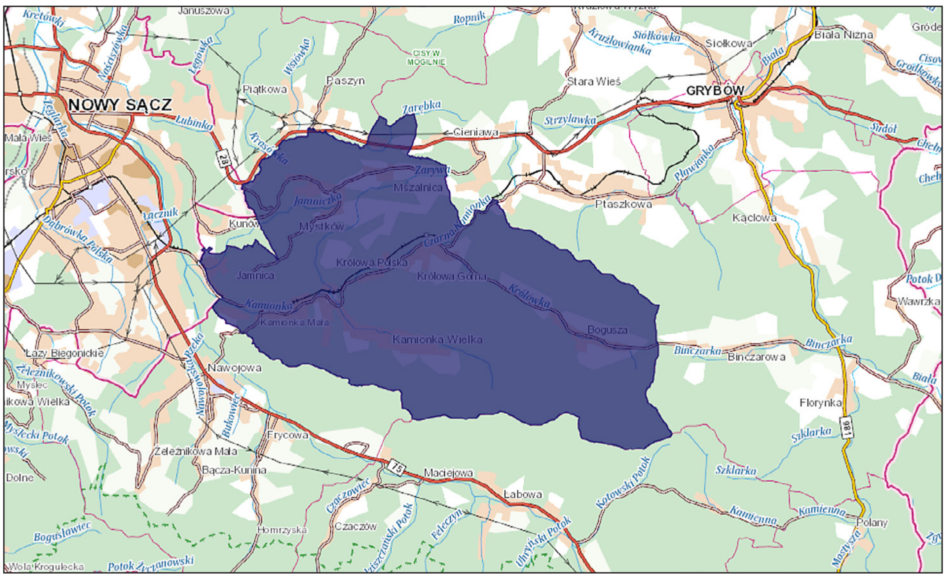

Figure 1. Location of Kamionka Wielka rural commune [geoportal.pl]

Table 1. Public geoportal data sources and core data types

Portal	Provider	Access model	Core data types*
geoportal.pl	Head Office of Geodesy and Cartography	OGC WMS/WFS, REST API	Cadastral parcels, topographic objects (BDOT10k), elevation models (NMT/DSM), noise maps, orthophotos
geoserwis.pl	General Directorate for Environmental Protection	OGC WMS/WFS	Protected areas (Natura 2000, landscape parks), environmental data bank, hazard layers
sip.gison.pl	GISON GIS-OnLine (municipal instance)	Web viewer, WMS	Municipal spatial development plans, utility networks

Note: Vector layers are provided as feature classes (points/lines/polygons); raster data includes tiled orthophotos and thematic grids, such as noise intensity.

networks, technical infrastructure, and environmental hazards.

3. Attribute analysis – selected attribute fields were examined within each thematic layer, such as land use designation, type of nature protection (e.g., Natura 2000), presence of infrastructure, and spatial relationship to hazard zones.
4. Terrain assessment – using digital elevation models (DEMs) with 1 m and 5 m resolution available in geoportal.pl, a visual assessment of slope gradients and landform structure was performed.
5. Hazard proximity analysis – measurement tools were used to estimate distances between selected parcels and potential sources of environmental stress, such as roads, railways, or zones of natural hazards (e.g., landslides, floodplains, mining areas).
6. Data usefulness evaluation – a general assessment was made of the availability and completeness of information provided by each platform, in the context of supporting a preliminary environmental assessment.

The interpretation of results was carried out using a qualitative research approach, focused on the content and accessibility of spatial information offered by public SIS portals. The aim was to determine the extent to which basic functionalities of national SIS platforms can support preliminary environmental screening of potential investment areas in rural municipalities.

RESULTS AND DISCUSSION

Cadastral, topography and planning (RQ1)

The first stage of the analysis involved examining cadastral data using the "Land and Building Register" function available on the geoportal.pl platform. This made it possible to accurately identify the parcel numbers located within the study area [Jonakowski, 2019a; Jonakowski, 2019b]. In addition to basic cadastral information, several existing land development features were identified, including: a residential building, a technically reinforced slope, access roads, green areas, street names, assigned building addresses, and permanent property fencing. These elements provided an important spatial context for further analysis of the functional characteristics and terrain conditions of the selected parcels.

Another aspect examined is planning and zoning [Feltynowski, 2015; Jonakowski et al., 2021]. The sip.gison.co.uk portal has a planning and zoning function, which is shown in Figure 2.

The next function analysed is the development of the analysed area. On the plots of land where the study is carried out there is:

- telecommunication network – orange colour, symbol 't',
- water mains – blue colour, symbol 'wd',
- electric power network – red colour, symbol 'e',
- sewage network – brown colour, symbol 'k'.

The last element analysed to determine the correctness of the first hypothesis is the terrain. Using the tools of geoportal.pl, a study of the terrain profile was carried out for 4 of the same terrain models, which are analysed every 1 m, 5 m, and 100 m.

Based on the drawn area on the map, a plot of the terrain profile was obtained, which is analysed every 1 m. The length of the profile of the analysed area is 968.18 m. The length of the upstream sections is 449.2 m. In contrast, the length of the downward sections is 519 m.

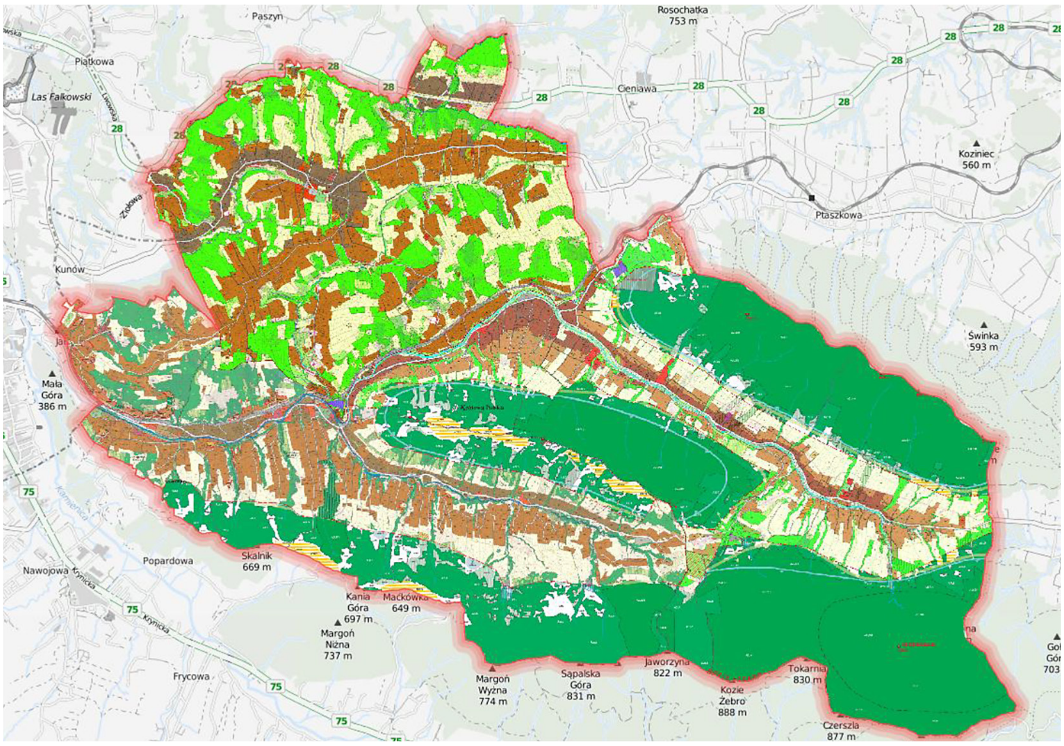

Figure 2. Planning and zoning of the study area

By performing a survey of the profile of the site, which is analysed every 5 m, the following results were obtained:
- length of the profile of the analysed terrain – 968.18 m,
- length of uphill sections – 407.8 m,
- length of downward sections – 560.4 m.

The third measurement that was made was the analysis of the drawn terrain every 100 m, where the length of the profile of the analysed terrain is 968.18 m.The length of the upward sections is 438.8 m. On the other hand, the length of the downward sections is 529.4 m. The last measurement that was taken was an analysis of the terrain profile every 1 m. In this case, the length of the profile of the analysed terrain is 968.18 m and the length of the uphill sections is 438.8 m. In contrast, the length of the downward sections is 529.4 m. In addition, the surface area of the study area can be calculated using geoportal.pl tools, which amounted to 4.88 ha. The details of the analysed terrain profile are illustrated in Figure 3.

The geoportal.pl programme has the possibility of calculating the volume of an embankment/ excavation. Based on the lines drawn, it is possible to determine the height of the highest and lowest point in the analysed area. The lowest height was 414.55 m. The highest height, on the other hand, was 443.89 m.

The next survey carried out was to examine the volume of ground masses from the plane. The area analysed occurs at a level of 427.90 m. The lowest elevation occurring on the plots surveyed is 412.07 m. In contrast, the highest elevation is 443.72 m, which is marked in red (Figure 4). The volume of land below sea level is 193589.89 m^3 and the volume of land above sea level is 122768.04 m^3.

The verification of the first hypothesis involved evaluating the availability of selected spatial data and functionalities in the study area using the geoportal.pl platform. The results of this assessment are presented in Table 2.

As shown in the table, all relevant functions and data layers were present within the study area. This confirms the usefulness of geoportal.pl for obtaining land registry and development data, analysing landforms, and reviewing planning and zoning information. Thus, the first hypothesis was fully verified.

Nature conservation (RQ2)

Using the geoserwis.pl portal, a wide range of environmental information can be identified,

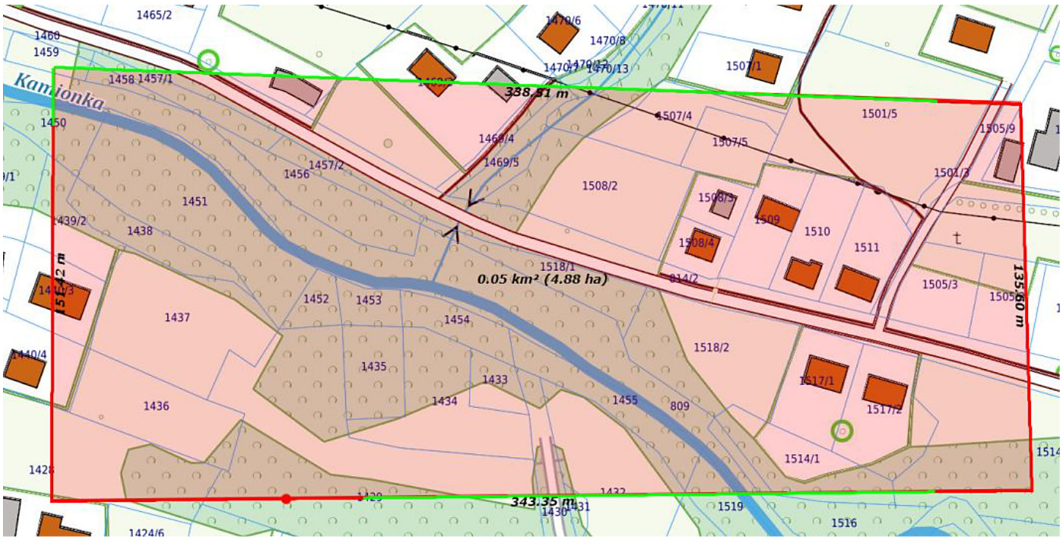

Figure 3. Terrain profile survey every 100 [m] and analysis of the ground surface

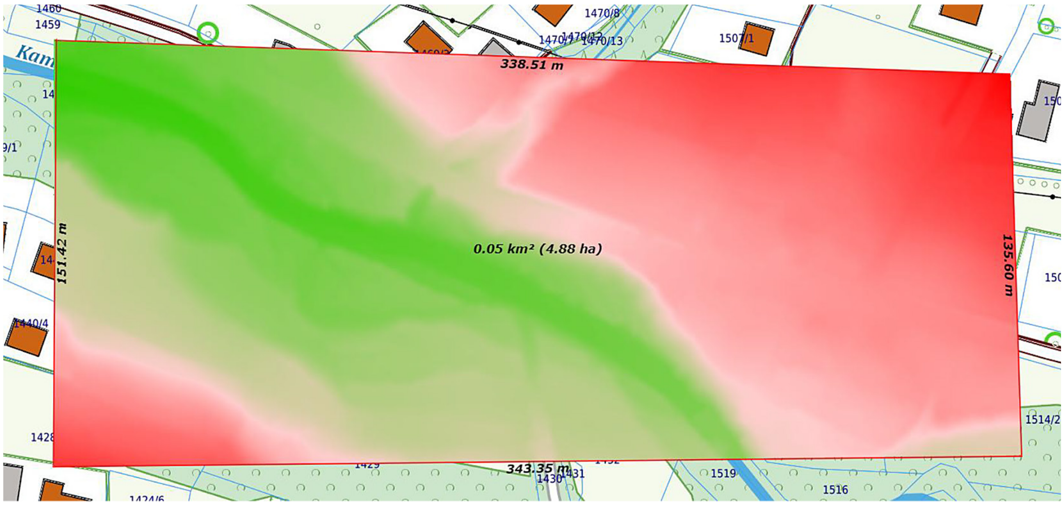

Figure 4. Survey of the volume of earth masses from the plane

Table 2. Comparison of test results for the first hypothesis

Functions of the portals surveyed	Study area
Land and building registration	Present
Planning and zoning	Present
Land development	Present
Landscaping	Present
Volume of masses varying from area	Present
Size of area	Present
Street names and addresses	Present

including: forms of nature conservation, geotourism facilities, zoological and botanical gardens, wildlife rehabilitation centres, changes to the boundaries of Natura 2000 areas, wildlife crossings, the presence of invasive alien species, natural monuments, and data from the national environmental information bank.

The study area is located within the South Walpole Protected Landscape Area. Based on data available in the environmental resource database, several habitat types of European importance were also identified, including:

- habitats and locations of protected reptiles (pink – Figure 5),
- habitats of protected amphibians (blue – Figure 5),
- habitats of protected mammals (red – Figure 5).

All forms of nature conservation identified in the area are presented in Figure 5. In addition, the portal's tools allow verification of potential environmental damage and contamination; however, no such threats were recorded within the analysed area.

Using geoserwis.pl, it is also possible to identify major rivers, major lakes, catchments, surface water bodies, groundwater bodies and the boundaries of the Regional Water Management Board. The study area belongs to the Regional Water Management Board in Krakow (Figure 6).

Another aspect examined is the form of state forest protection. Using the geoserwis.pl portal, it is possible to determine the ownership of the division outside the PGL LP, the branches outside the PGL LP, the forest district and the regional directorate of the LP. The abbreviation PGL LP stands for a state organisational unit, not being an enterprise, which operates on the territory of Poland. The abbreviation PGL LP should be expanded as Państwowe Gospodarstwo Leśne Lasów Państwowych, which means National Forest Enterprises The study area belongs to the Nawojowa Forest District. Additionally, in the study area there are:

- area of ownership of a division outside PGL LP (red colour – Figure 6),
- division outside PGL LP according to PUL – Forest Management Plan (dashed lines – Figure 6).

The study area is also covered by the Corine Land Cover 2018 programme, which aims to coordinate and standardise land cover information across Europe. The programme classifies land into 44 land cover categories and allows for temporal analysis of changes between 1990 and 2019 [EEA 2019]. The data are processed using specialised analytical tools integrated with high-resolution cartographic maps.

In addition, the geoserwis.pl portal provides access to layers identifying historical monuments as well as landscape viewpoints and walking routes. However, no such features were recorded within the analysed area.

The second hypothesis, which assumes that the functions of the geoserwis.pl portal can be used to identify forms of nature conservation on the analysed plots, was confirmed. The platform enables access to data on various types of environmental protection, including legal forms of nature conservation, water protection zones, and state forest protection areas. The results of the verification for this hypothesis are presented in Table 3.

As shown in the table, several relevant forms of environmental protection were identified in the study area, including the presence of a landscape park, a water body, and areas of state forest protection. However, certain features – such as groundwater and surface water protection,

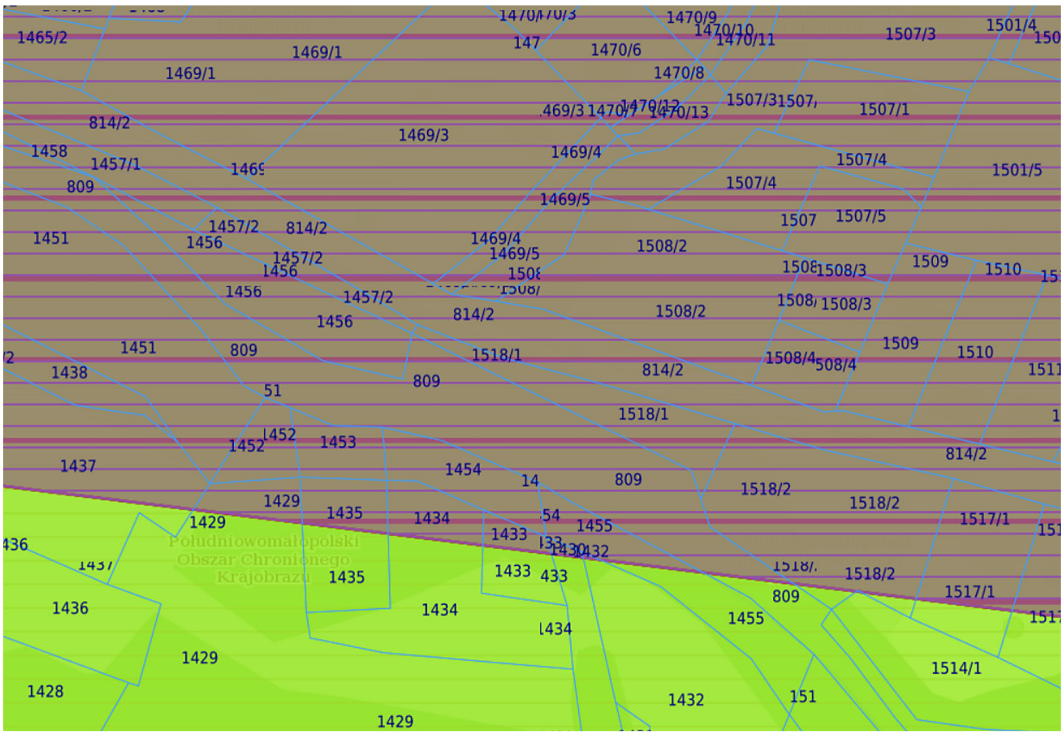

Figure 5. Environmental survey in the study area

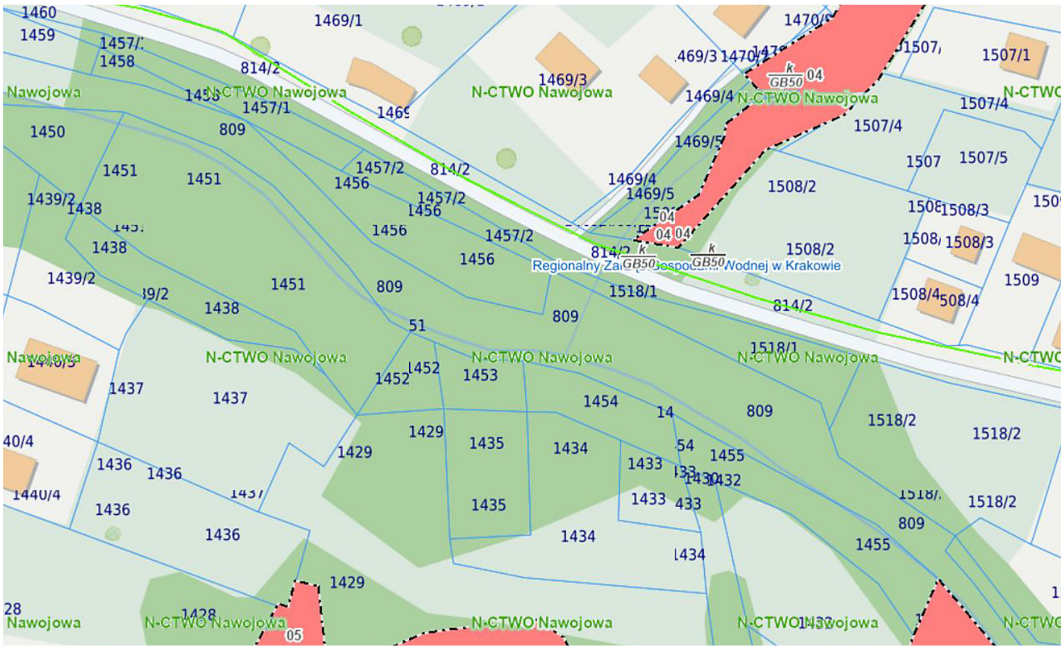

Figure 6. Survey of the forms of state forest protection and protection of groundwater and surface water

natural monuments, and historical monuments – were not present. Despite these absences, the overall availability of key conservation-related data in geoserwis.pl supports the correctness of the second hypothesis.

Transport infrastructure and noise (RQ3)

The third stage of the study carried out is an examination of road, rail and aviation infrastructure. To better illustrate the occurrence of noise emissions, the entire area of the Kamionka Wielka municipality was taken into account.

A map of the noise availability of road infrastructure, in the study area occurs in the village of Cieniawa, where the national road 28 runs. The function was used to determine the immission level of the LDWN noise indicator and the LN noise indicator for the national road 28 in the village of Chochle (Figure 7). The noise level ranges from 45 dB (orange, yellow colour) to 65 dB (red colour).

Using the geoportal.pl function, for road infrastructure it is also possible to determine:

- noise emission map,
- noise indicator immission map (LDWN),
- noise indicator immission map (LN),
- map of areas under acoustic protection of LDWN indicator,
- map of areas under acoustic protection of indicator LN,
- map of areas exposed to noise pollution LDWN indicator
- map of noise-prone areas with LN indicator,
- areas planned for implementation of measures within 5 years.

With regard to railway infrastructure, the geoportal.pl platform allows for the review of railway lines and the identification of 10 railway-road level crossings located within the study area. However, the geoserwis.pl portal does not provide noise emission or immission maps related to rail transport, which limits the ability to assess its impact on the acoustic environment. It is worth noting that such data are typically available only for major transport corridors and densely urbanised areas, usually in the vicinity of large cities.

The analysis of aviation infrastructure, conducted using the geoserwis.pl portal, confirmed the absence of airports, airstrips, and flight-restricted zones in the area of the Kamionka Wielka municipality.

Despite the limited availability of data concerning rail and aviation infrastructure, the range of information provided for road infrastructure – including detailed noise maps – confirms the usefulness of public spatial information systems for conducting preliminary assessments of transport-related impacts in rural environments.

The third hypothesis addresses the availability of spatial data related to road, rail, and

Table 3. Comparison of test results for the second hypothesis

Functions of the studied portals	Study area in Kamionka Wielka rural commune
Form of environmental protection	Present
Water body	Present
Protection of state forests	Present
Protection of groundwater and surface water	Not present
Natural monument	Not present
Landscape park	Present
Historical monument	Not present

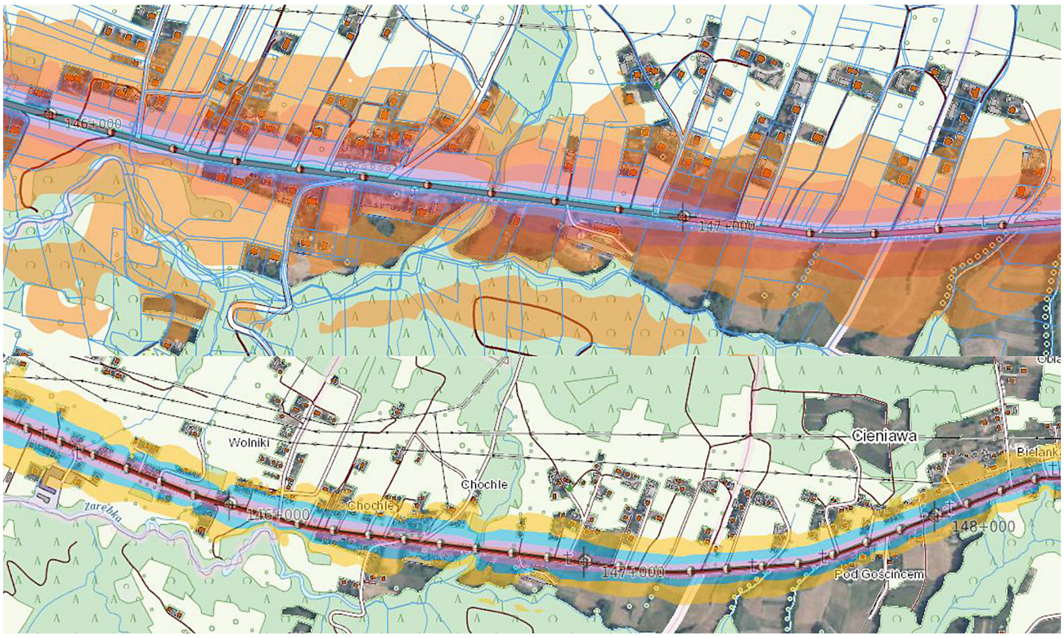

Figure 7. Noise immission map for LDWN noise indicator and LN noise indicator for national road 28 [geoportal.pl]]

aviation infrastructure. Its verification focused on the presence of noise level data and infrastructure features relevant to transportation systems. The results of this assessment are presented in Table 4.

As shown in the table, only the road infrastructure noise map is available for the study area. No data were found regarding railway noise levels or aviation-related spatial constraints. These gaps indicate that the third hypothesis is only partially confirmed, as not all relevant infrastructure-related data are accessible through the analysed portals.

Natural hazard layers and spatial resolution RQ4

The fourth and final stage of the conducted research focuses on analyzing natural hazards present in the rural commune of Kamionka Wielka [Benezienne, 2022].

Table 4. The comparison of research results based on third hypothesis

Functions of the surveyed portals	Surveyed area in Kamionka Wielka rural commune
Noise level of road infrastructure	Present
Noise level of rail infrastructure	Not present
Existence of airports	Not present
Existence of aviation restriction areas	Not present

With the help of the geoserwis.pl portal, it is possible to identify environmental damage and pollution – though such issues are not present within the study area. There are no mining shafts, drilling boreholes, or direct flood threats. However, several hydrological boreholes have been identified in the center of the village of Kamionka Wielka, along with the potential for flooding.

Within the study area, there are mining and extraction zones, sandstone deposits, landslides, and areas at risk of mass movements. Areas marked in grey indicate inactive landslides, while those in pink represent active landslides. Black outlines mark regions threatened by mass movements, and purple areas indicate zones where periodic landslides may occur. These elements are illustrated in Figure 8.

Based on the analyses conducted, the research hypothesis has been confirmed: the functions of the geoserwis.pl portal make it possible to identify natural hazards on the parcels under study. The portal provides data on the location of boreholes and drillings, areas at risk of floods and inundation, mining areas, and zones threatened by mass movements. The elements identified within the examined area – such as numerous hydrological boreholes and its situation within a flood-risk zone – confirm the effectiveness and usefulness of the tools offered by geoserwis.pl for assessing environmental hazards.

The fourth hypothesis focuses on the availability of spatial data related to natural hazards. The verification concerned the presence of such information as flood risks, hydrological and geological features, and mass movement zones. The results of the assessment are presented in Table 5.

As shown in the table, spatial data on waterlogging, hydrological boreholes, mining areas, and mass movement hazards are available in the study area. However, information on general boreholes and flood risk zones is missing. Despite these gaps, the presence of the majority of the relevant features supports the conclusion that the fourth hypothesis is affirmed.

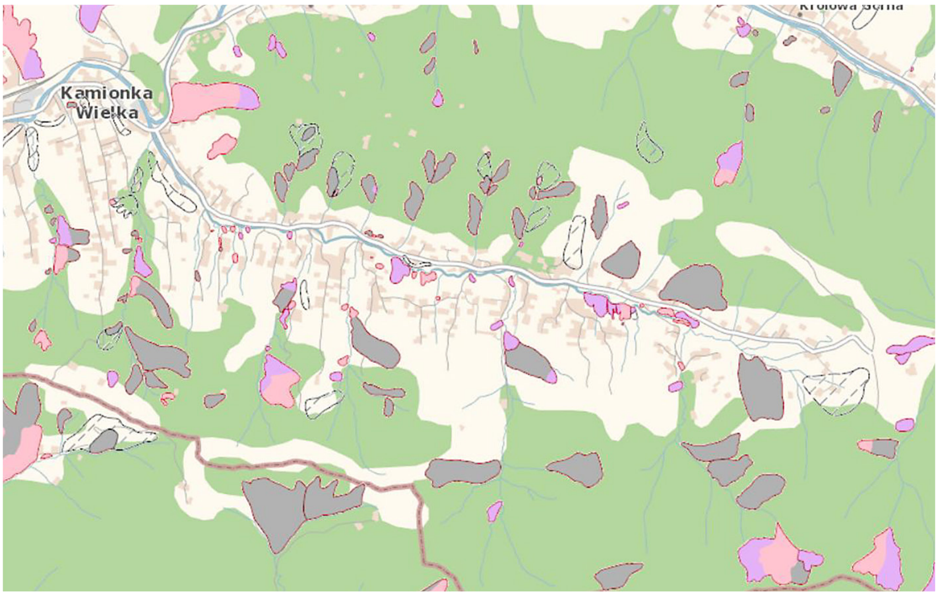

Figure 8. Study of risks from landslides and earth mass movements

Table 5. Comparison of research results on the basis of the fourth hypothesis

Functions of the studied portals	Study area in the municipality of Kamionka Wielka
Hydrological boreholes	Present
Boreholes	Not present
Flood risk	Not present
Waterlogging	Present
Mining area and terrain	Present
Mass movement hazard	Present

CONCLUSIONS

The conducted study demonstrated that publicly available SIS portals provide accessible and intuitive tools that support preliminary spatial analysis in the context of environmental engineering. Their functionalities allow for quick identification of spatial constraints – such as protected areas, flood-prone zones, or landslide risk – as well as basic contextual assessment, including topography, access to utilities, and noise exposure. These capabilities help effectively narrow down areas for further analysis at early planning stages, which is a valuable advantage in environmental and spatial planning processes.

However, the current use of these portals is mostly limited to single-layer, descriptive presentations and lacks advanced analytical capabilities. As such, SIS platforms like geoportal.pl, geoserwis.pl, and sip.gison.pl should be seen primarily as supportive tools rather than comprehensive decision-making systems. While they do not offer complex, decision-grade analyses – such as those requiring detailed quantitative data, geotechnical parameters, or suitability modelling – they provide efficient access to relevant datasets and enable data export for processing in external GIS and MCDA (Multi-Criteria Decision Analysis) tools.

Despite certain data restrictions, the research assumptions were verified, and H1, H2, and H4 were confirmed. Due to the lack of information on railroad and aircraft noise, hypothesis H3 was only partially validated. Additionally, the primary hypothesis (H0) was only partially confirmed: while the portals facilitate preliminary spatial evaluation, they do not offer comprehensive decision support in the absence of additional integration and sophisticated analysis.

From a practical standpoint, SIS portals should be treated as an initial data filter, useful for early-stage screening and site selection. To support comprehensive environmental assessments, the extracted data must be integrated into geodatabases and further analysed using multi-criteria evaluation methods and risk analysis.

Future research should expand the territorial scope to include multiple municipalities and incorporate the monitoring of data updates over time. It should also be emphasized that not all functionalities are uniformly available across geographic areas, meaning that the presence of specific data layers in one municipality cannot be automatically generalized to others. Therefore, comparative benchmarking with international geoportals is recommended, along with full implementation and documentation of the MCDA process and quantitative assessment of data quality – considering spatial accuracy, completeness, and provenance.

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