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Environmental Mapping and Utilization as a Geography Learning Resource at Senior High School

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ABSTRACT

Local environments provide meaningful learning resources for geography education by enabling students to connect geographic concepts with real-world spatial phenomena. This study examines the spatial distribution of environmental learning resources, their utilization in geography instruction, and the teaching methods applied at State Senior High School 1 Purwokerto. The study employed a mixed-methods design that integrated GIS-based spatial analysis with an exploration of teachers' instructional practices and experiences. Data were collected through interviews, observations, and document analysis, and were analyzed using an interactive qualitative model combined with nearest neighbor analysis in ArcGIS 10.4. The findings identified 11 main learning resource locations across Banyumas Regency representing natural, social, and cultural environments. These locations were found to have a random spatial distribution; however, their use in instruction was determined mainly by relevance to learning materials, accessibility, and safety rather than geographic proximity. Teachers utilized the environment through observation, interviews, environmental analysis, basic mapping activities, and disaster simulation. The instructional approaches included field study, Project-Based Learning, Problem-Based Learning, and discovery learning, all of which promoted active, collaborative, reflective, and scientific learning. The study highlights the importance of integrating spatial analysis and environment-based pedagogy in developing contextual geography learning resources at the secondary school level.

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1. Introduction

Geography education in Indonesia is expected to move beyond a purely theoretical orientation and provide students with direct experiential learning opportunities (Nonkula, 2025). The utilization of the surrounding environment as a learning resource is essential, as it enables students to understand geographic concepts concretely and to relate natural and social phenomena to the realities of their immediate context (Mutesasira & Marongwe, 2025). However, geography instruction at the senior high school level remains predominantly classroom based and theory oriented, rendering concepts abstract and insufficiently contextualized (Blazquez-Salom & Blanco-Romero, 2021; Holgersen, 2021). Research by (Cifci & Dikmenli, 2019) indicates that the dominance of textbook-based instruction contributes to students' difficulties in connecting theoretical concepts with local realities. Therefore, the integration of the school's surrounding environment as a learning resource has become an urgent necessity (Rosita et al., 2025).

Conceptually, geography examines the interrelationships between humans and their environment, making it inherently compatible with environment based learning approaches (Rakuasa & Latue, 2023). At the senior high school level, a contextual approach is required to enable students to bridge theoretical knowledge with real world conditions. Nevertheless, the school environment has not been optimally utilized, largely due to the absence of systematic mapping and comprehensive analytical studies.

State Senior High School 1 Purwokerto possesses diverse natural and social environmental potentials; however, no prior study has specifically mapped these environmental features as geography learning resources. Previous research has primarily focused on instructional media or alternative learning resources, or has examined environment based learning without providing a detailed account of spatial mapping and the specific types of environments utilized (Eberth et al., 2025). Moreover, these studies have generally been descriptive in nature and have not employed a Geographic Information Systems (GIS) based spatial approach that is systematically integrated with geography learning content,

nor have they combined environmental mapping as a learning resource, Geographic Information Systems based spatial analysis, and teachers' pedagogical practices within a single, comprehensive research framework at the senior high school level. This study introduces a Geographic Information Systems based spatial approach to systematically map natural and social environmental resources surrounding State Senior High School 1 Purwokerto as geography learning resources and directly integrates them with the instructional strategies and methods employed by teachers. In doing so, it produces a structured spatial mapping framework that is aligned with curriculum content and pedagogically relevant to support geography teaching practices at the senior high school level.

Theoretically, the utilization of the environment as a learning resource aligns with the principles of constructivism and Contextual Teaching and Learning (CTL), which emphasize students' active engagement in knowledge construction (Romdhon et al., 2024; Sugiyono, 2013). The Contextual Teaching and Learning approach further underscores the importance of connecting instructional materials with authentic experiences (Mashudi & Azzhro, 2020). Environment based learning not only enhances students' understanding of geographic concepts but also fosters environmental awareness and responsibility (Oktavianto et al, 2024).

Although theoretically relevant, the implementation of environment based learning in geography remains suboptimal, particularly with respect to systematic mapping and strategic utilization (Mkhize, 2023). This study aims to map the spatial distribution of environmental features as learning resources, analyze patterns of environmental utilization, and identify the instructional methods employed in geography teaching at State Senior High School 1 Purwokerto. The analysis focuses on identifying the types and spatial distribution of environmental resources as learning assets and examining their alignment with the instructional strategies and methods implemented by teachers.

Theoretically, this study contributes to strengthening the conceptual foundation of locally contextualized geography learning through the integration of a spatial approach and the application of Geographic Information Systems in education. Practically, it offers recommendations to optimize the use of the environment as a learning resource, support the development of place-based learning, and enhance students' spatial thinking skills at the senior high school level.

2. Method

This study adopts a mixed methods approach**,** integrating both quantitative and qualitative methods. The quantitative method is employed to examine the distribution of environmental resources as learning sources for geography at State Senior High School 1 Purwokerto. In contrast, the qualitative method is used to explore teachers' perceptions, experiences, and practices in utilizing the surrounding environment as a source of geography instruction. This integrated approach also facilitates a deeper understanding of the school's social and cultural context and how teachers incorporate environmental resources into the teaching and learning process.

2.1. Time and Location of The Research

Research conducted at State Senior High School 1 Purwokerto, Banyumas Regency, Central Java (Figure 1). The research was conducted from June to October 2025. The research was conducted from June to October 2025.The research was conducted at this school because of its strategic location, the diverse natural and social environments surrounding the school, which can be used as learning resources in geography lessons, and the school's experience in utilizing the environment as a learning resource. The selection of a research location in qualitative research must consider the relationship between the location and the phenomenon being studied (Creswell, 2007).

The school environment provides direct access to various spatial and social phenomena relevant to geography learning. This condition supports contextual observation during the research process. It also allows students to connect classroom concepts with real conditions in the surrounding area. Therefore, the school offers a suitable setting for examining the use of the environment as a geography learning resource. The research setting also enables the integration of field-based learning activities with classroom instruction. This condition strengthens students' spatial understanding through direct interaction with real-world phenomena. It further supports the development of contextual and meaningful geography learning experiences.

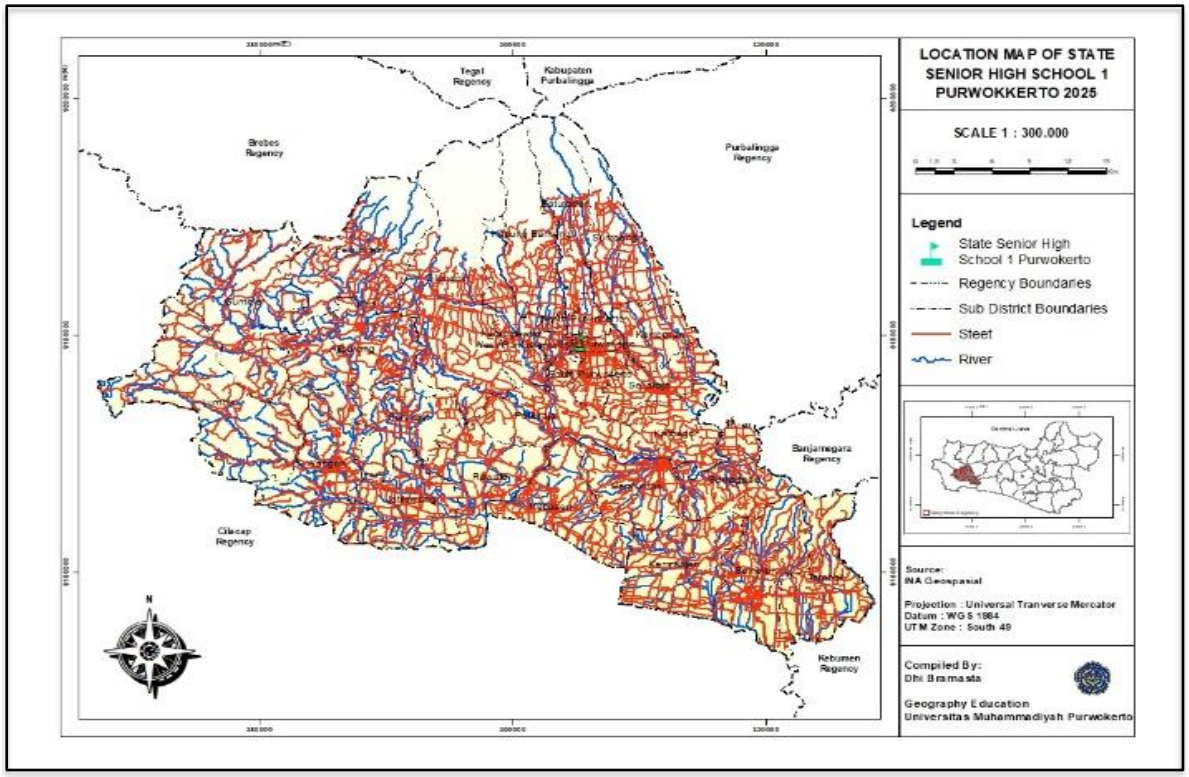

Figure 1. Map and Image of State Senior High School 1 Purwokerto

2.2. Data Source

The data sources consisted of two types, namely primary data and secondary data. Primary data were obtained directly from informants, specifically one geography teacher at State Senior High School 1 Purwokerto. This teacher was selected as the key informant because there is only one geography teacher at State Senior High School 1 Purwokerto, and this individual is directly involved in the utilization of the environment as a learning resource in both classroom based and field based learning activities (Patton, 2002). The next group of informants comprised students who were involved in environment based learning activities. The selection of student informants was determined using purposive sampling, namely eleventh grade students who had previously studied or were currently studying geography and were involved in learning activities that utilized the environment as a learning resource. These students were actively engaged in learning activities, capable of observing and utilizing the surrounding environment as a learning resource, and were selected based on variations in academic ability. The total number of student informants was 18, drawn from 11 eleventh-grade classes, each consisting of 36 students. The informants involved in this study are presented in Table 1.

Table 1. Research Informants

Number	Informant Code	Class/Position	Academik Ability
1	T-01	Geography Teacher	-
2	S-01	XI-1	High
3	S-02	XI-1	Medium
4	S-03	XI-2	Low
5	S-04	XI-2	High
6	S-05	XI-3	Medium
7	S-06	XI-3	Low
8	S-07	XI-4	High
9	S-08	XI-4	Medium
10	S-09	XI-5	Low
11	S-10	XI-5	High
12	S-11	XI-6	Medium
13	S-12	XI-6	Low
14	S-13	XI-7	High

15	S-14	XI-7	Medium
16	S-15	XI-8	Low
17	S-16	XI-8	High
18	S-17	XI-9	Medium
19	S-18	XI-9	Low

Secondary data in the form of syllabi, teaching modules, and reports or notes on activities involving the environment as a learning resource, which helps to understand how the environment is integrated in the planning and implementation of geography learning.

2.3. Data Collection Technique

Data collection techniques consisted of interviews, observations, and documentation (Mann & Saultz, 2019) in order to obtain a comprehensive understanding of the utilization of the environment as a learning resource in geography education. Semi structured interviews were conducted with geography teachers to obtain information regarding the use of the school's surrounding environment, the types of environmental objects employed, and the challenges encountered in integrating these resources into the learning process. The interview procedure involved the preparation of an interview guide, the implementation of semi-structured interviews, and the subsequent recording and categorization of data according to the research focus.

Observations were carried out by directly examining the learning process, both inside and outside the classroom, using observation sheets to document teachers' and students' activities as well as interactions in environment based learning. Observations also included plotting the coordinate points of environmental locations used as learning resources using the Global Positioning System (GPS), along with identifying environmental objects with the potential to serve as geography learning resources. This process was supported by recording the locations, characteristics of the objects, and their relevance to the learning materials. Meanwhile, documentation was conducted by collecting and reviewing supporting documents such as teaching modules, instructional materials, photographs of field activities, and school policy documents to ensure the validity of the data (Moleong, 2005).

2.4. Data Analysis Techniques

Analysis technique using interactive analysis (Creswell, 2007; Miles et al., 1992), by following thematic analysis toidentifyThe main themes relate to the use of the environment as a source for learning geography. Learning environments used as instructional resources should be closely aligned with curricular content to enhance geographic understanding. In geography education and environmental studies, water resource topics can be supported through the use of watersheds and reservoirs, which provide authentic contexts for examining water management, human environment interactions, and environmental sustainability (Young & Harshadeep, 2020). Concepts related to volcanism, landform development, and erosion may be effectively explored through field-based learning in volcanic slope areas, such as Mount Slamet, enabling learners to understand geomorphological processes and landscape evolution (Suprayogo et al., 2020; Young & Harshadeep, 2020).

Moreover, studies on biodiversity and forest ecosystems can be enriched by utilizing conservation areas, including botanical gardens, as learning sites for investigating endemic flora and montane forest ecosystems (Kadak, 2025). From an urban studies perspective, topics concerning economic activities, urban spatial patterns, social interactions, and population mobility may draw upon urban facilities such as markets, railway stations, and bus terminals, which function as economic nodes, shape urban structure, and facilitate transportation and social interaction (Kadak, 2025; Recio et al., 2019).

The analysis begins with data collection, data reduction, data presentation, Geographic Information System (GIS), verification or drawing conclusions, as illustrated in Figure 2. Environmental analysis as a learning resource links the distribution of the environment used by teachers as a source of geography learning with the nearest neighbor analysis using GIS application with Arcgis 10.4 software. To find out the distribution pattern of the environment as a source of geography learning used by geography teachers at State Senior High School 1 Purwokerto, whether it follows a random, clustered or uniform pattern, which is indicated by the size of the T or R value. The results of this analysis can provide an overview of the tendency why it shows a tendency towards a certain pattern, linked to the analysis of the factors that cause it.

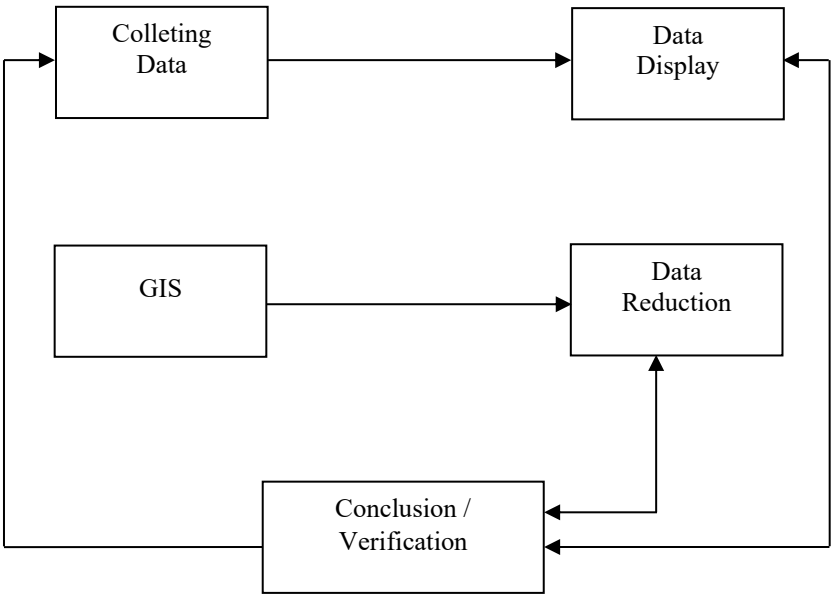

Figure 2. Interactive Analysis Model with Minor Changes
Source: (Miles et al., 1992)

The T value/nearest neighbor distribution index itself is obtained using the formula:

$T = \frac{j_u}{j_h}$

Note:

T : Nearest neighbor distribution index

j_u : The average distance measured between one point and its nearest neighboring point

j_h : Distancethe average obtained if all points have a random pattern $= \frac{1}{2\sqrt{p}}$

P : Density points per square kilometer, namely the number of points (N) divided by the area (A)

From the T value, it is then interpreted using Continum Nearest Neighbor Analysis, as follows:

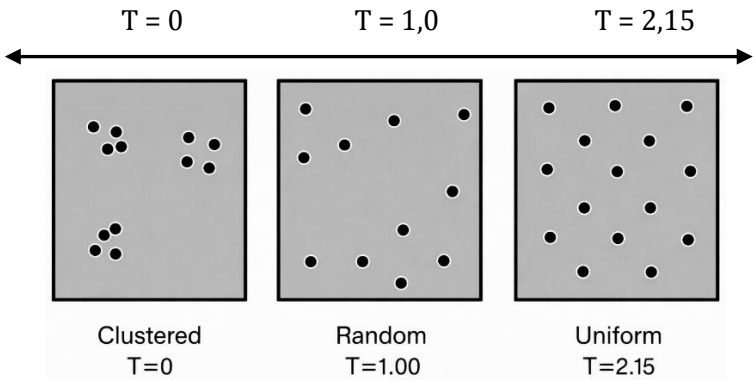

Figure 3. *Nearest Neighbour Analysis*
Source: (Bintarto, R dan Hadikusumo, 1982)

Description:

Nearest Neighbor Index (NNI), The Nearest Neighbor Index (NNI), commonly denoted as T or R, represents the ratio between the observed mean distance and the expected mean distance among spatial points. This index is widely used in spatial analysis to identify distribution patterns.

NNI < 1.0: The pattern tends to be clustered. The closer the value is to 0, the stronger and denser the clustering of points.

NNI = 1.0: The pattern is random, indicating no particular spatial structure and suggesting that the distribution occurs by chance.

NNI > 1.0: The pattern tends to be dispersed or regular, meaning that the spatial units are more evenly spaced. The greater the value above 1, the more uniform the spacing among the objects.

Z-Score, The Z-score indicates the statistical significance of the spatial pattern identified by the NNI analysis. It measures the degree to which the observed pattern deviates from the expected random distribution.

Large negative values (e.g., < −1.96): Indicate statistically significant clustering, suggesting that the clustered pattern is unlikely to have occurred by random chance.
Large positive values (e.g., > +1.96): Indicate a statistically significant dispersed or regular pattern.
Values close to 0: Suggest a random spatial distribution.

Observed Mean Distance, The Observed Mean Distance refers to the average of the actual distances measured between each point and its nearest neighboring point in the dataset.
Expected Mean Distance, The Expected Mean Distance represents the average distance expected under a hypothetical random distribution of points within the same study area.
p-value (Significance Value), Although not always presented as the primary statistic, the p-value typically accompanies the Z-score to indicate statistical significance. A very small p-value (e.g., < 0.05) suggests that the observed spatial pattern is statistically significant and unlikely to have occurred by chance.

2.5. Data Validity and Validity

The validity and credibility of the data, using triangulation techniques, namely combining various data collection techniques (interviews, observations, and documentation) and data sources (teachers, students, school documents). Used to verify the data obtained and ensure that the findings reflect the actual reality and member checking is carried out, namely returning the initial findings to the informant to verify whether the findings are in accordance with their views, aiming to ensure that the interpretation of the data carried out by the researcher is accurate and valid.

3. Results and Discussion

Our findings illustrate how environmental mapping supports geography learning at the high school level. This study identified eleven learning locations in Banyumas Regency. Figure 4 show is these locations represent natural, rural, and urban environments. Each location provides observable physical geographic and socio-economic phenomena. Spatial analysis revealed a random distribution pattern (NNR = 1.214). This pattern indicates that location selection was not based on geographic proximity. Instead, locations were chosen based on learning needs and learning topics. Therefore, teachers applied several criteria when selecting locations. These criteria included alignment with learning competencies, relevance of geographic phenomena, accessibility and safety, and potential for direct observation. The selected environments were then integrated into the curriculum through environment-based learning activities. Teachers guided students through field observations, interviews, mapping, and environmental simulations. The learning process also employed several active methods.

These methods included field studies, project-based learning, problem-based learning, and discovery learning. Field activities were supported by simple spatial tools and environmental measurements. Examples included the use of GPS, basic field instruments, and sketch mapping. Through this process, students developed contextual geographic understanding. They also strengthened spatial and critical thinking skills. In addition, students improved collaboration, communication, and environmental awareness. Practical geographic skills were also enhanced. However, implementation faced several challenges. These included time constraints, administrative permits, transportation logistics, and limited access to GIS technology.

These findings indicate that environment-based learning methods can effectively support the development of students' geographic competencies. The integration of field activities with classroom learning creates meaningful and contextual learning experiences. Therefore, strengthening institutional support and resource availability is essential to optimize the implementation of this approach.

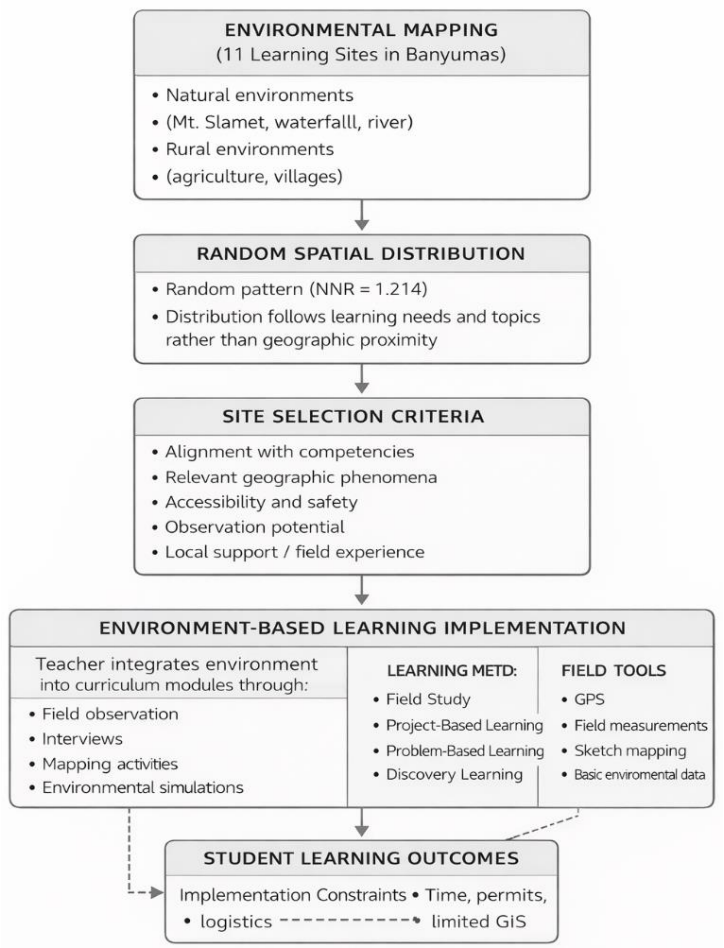

Figure 4. Model of Environment mapping and Utilization as Geography learning Resources in Senior High School

3.1. Environmental Distribution as a Resource for Learning Geography

The learning process at State Senior High School 1 Purwokerto is not limited to and utilizes the school's existing space and facilities. It can also take place anywhere, as long as the environment is conducive to learning. The environment can be used as a learning resource as long as it is supportive and relevant to the material being studied by students. The findings of this study are consistent with those reported by (O'Neill et al., 2024) which demonstrate that learning can also be done inoutsideschools by utilizing the natural and cultural environment as learning resources. This also aims to reduce learning boredom, increase learning motivation and creativity, and contextualize learning materials and students so they have a deeper understanding of the material. These results align with previous studies by (Puastuti & Sinthiya, 2021) which indicate that, the contextual learning approach in geography has been proven to increase students' motivation, understanding, and critical thinking skills because it links concepts with real phenomena in the surrounding environment.

Utilizing the environment as a resource for geography learning is carried out by utilizing the school's surroundings, the surrounding area of Purwokerto, and also places or institutions that have collaborated with State Senior High School 1 Purwokerto. The following are the environments utilized as resources for geography learning in Table 2.

Table 2. Environmental Distribution as a Geography Learning Resource for State Senior High School 1 Purwokerto

No	Place Name	Location	Coordinate	
			X (mT)	Y (mU)
1.	Baturraden Botanical Gardens	Baturraden Purwokerto, Banyumas	304869	9192001
2.	Slamet Mountain (Baturraden Slopes and Tourism Area/Baturraden Tourist Attraction)	Baturraden Purwokerto, Banyumas	304502	9191240

3.	Banjaran River	Kalipagu, Ketenger Baturraden	303283	9190016
4.	Cipendok Waterfall	Karangtengah Village, Cilongok District, Banyumas Regency	294304	9188569
5.	Wage Market	East Purwokerto District, Banyumas Regency	306749	9178709
6.	Bank Rakyat Indonesia (BRI) Museum	57 Jenderal Sudirman Street, Purwokerto	304149	9178988
7.	Bulupitu Terminal	Teluk Village, South Purwokerto District	307459	9176829
8.	Purwokerto Station	Kober, West Purwokerto District, Banyumas Regency	303759	9179516
9.	City Transportation (Protocol Roads)	Jenderal Sudirman Street, Purwokerto	305880	9178564
10.	Sokaraja Batik Village	Dewa Kusuma Street (Kauman), Sokaraja District	311713	9175412
11.	Serayu Movable Dam	Tambaknegara Village, Rawalo District, Banyumas Regency	301535	9167748

Sumber: Field Observation, 2025

The locations or environments used as geography learning resources are generally located around Purwokerto, Banyumas Regency. This is because the area around Purwokerto offers a variety of physical and social conditions that are representative for studying geographic concepts, such as landforms, land use, settlement distribution, and economic activities. Furthermore, it is effective because it facilitates access for field observations and saves time and money. These environments are not only geographically relevant but also support more meaningful, contextual learning.

The environments used as resources for learning geography include urban, rural, and natural areas. In urban areas, students can study topics such as land use, settlement patterns, and socio economic dynamics. In rural areas around Purwokerto, such as Baturraden, Kembaran, and Sokaraja, students can learn about agricultural land use, geomorphological conditions, and the relationship between humans and their natural environment. Furthermore, natural tourist areas such as the slopes of Mount Slamet, the Pelus River, and the Baturraden hot springs are also strategic locations for studying physical aspects of geography such as hydrology and volcanology. The distribution of the environment as a source of geography learning at State Senior High School 1 Purwokerto shown in Figure 4.

There are 11 environments used as geography learning resources, spread across various areas of Banyumas Regency, mostly around Purwokerto. The distribution of environments as geography learning resources is random across various areas of Banyumas Regency, as the selection of environments as learning resources is tailored to the material being studied by students, as explained by a geography teacher at State Senior High School 1 Purwokerto.

> "The selection of a location for learning resources generally takes into account several important factors to ensure that out-of-class learning remains relevant, safe, and meaningful for students. These include alignment with core competencies and learning objectives, the availability of relevant geographic objects and phenomena, ease of access and security of the location, the potential for direct observation and practical activities, the availability of local support or resource persons, prior field experience, or recommendations from the Geography Subject Teachers' Conference (MGMP)".

These findings are consistent with the statements of Azis et al., (2025); Sanchez Fuster et al., (2023), which emphasize that the selection of learning resource locations should be aligned with basic competencies and learning objectives, while also taking into account accessibility and safety considerations, in order to ensure that field based activities remain contextual, curriculum-integrated, and capable of providing direct observational experiences of relevant geographical phenomena.

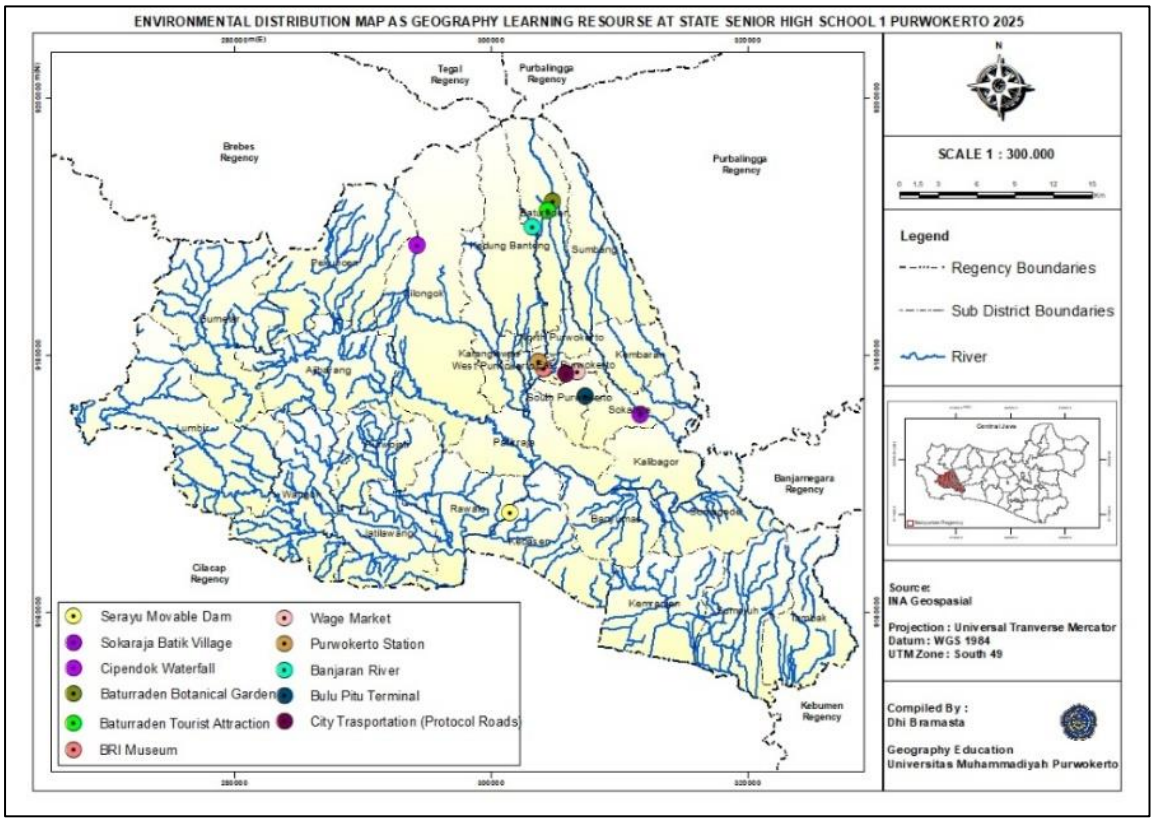

Figure 5. Environmental Distribution Map as a Geography Learning Resource for State Senior High School 1 Purwokerto 2025

The distribution pattern of environmental locations as learning resources is random, according to the Nearest Neighbor Ratio value of 1.214234 based on the average distance between one learning resource and another (observed mean distance) of 2992.9772 meters, while the average distance between health service facilities (expected mean distance) is 2464.9107 meters. The results of statistical calculations show a z-core value of 1.359298 and a p-value of 0.174052. These results indicate a random distribution pattern of the environment as a source of learning geography, this is because the distance between one location and another is irregular and does not have a uniform pattern, with an index value of 1.214234 approaching 1.0, these results are consistent with those reported by Bintarto, R dan Hadikusumo, (1982).

This random pattern arises because the selection of locations or environments as geography learning resources is determined by the instructional needs of the subject matter, the availability of relevant geographical phenomena, and the targeted basic competencies, rather than by specific spatial factors such as geographic proximity. Accordingly, each environment is chosen based on its alignment with particular instructional topics and its potential to provide observable and directly analyzable geographical features. As a result, the distribution pattern appears random, reflecting a contextual and adaptive orientation in the implementation of geography learning.

3.2. Utilization of the environment as a source of geography learning for teachers at State Senior High School 1 Purwokerto

Utilizing the environment as a resource for learning geography plays a crucial role in improving the quality of learning at State Senior High School 1 Purwokerto. State Senior High School 1 Purwokerto also utilizes the school's surrounding environment, enabling students to not only understand geographical concepts theoretically but also relate them to real world conditions. The utilization of the school's surrounding environment is consistent with the findings reported by Apriani & Rahmanelli, (2018) which demonstrate that utilization of the physical and non physical environment around the school is relevant to basic geography competencies and helps students understand the relationship between theory and real conditions in the field.

Utilizing the surrounding environment as a learning resource at State Senior High School 1 Purwokerto not only supports the implementation of a curriculum that emphasizes contextual learning but also strengthens students' critical and analytical thinking skills. This environment based education aligns with the perspectives articulated by Ernst & Monroe, (2004); Mawardi & Asri, (2024) which explain that, environmental-based education can significantly improve high school students' critical thinking skills. By engaging the real environment as an open laboratory, students can directly study various geospheric phenomena, such as erosion processes, land use dynamics, and changes in urban planning, as explained by a geography teacher at State Senior High School 1 Purwokerto.

> "The agricultural area in Baturraden provides an understanding"The material covers land use, soil types, and agricultural systems. The Banjaran River also provides students with an understanding of watersheds, erosion, sedimentation, and water pollution."

Teachers' strategies for utilizing the environment as a learning resource also determine the success of the geography learning process. Teachers guide students in simple explorations and research in the field, or conduct simulations, for example through field studies, regional mapping, and observations of the school and surrounding environment. Through these activities, students can connect the concepts and theories learned in class with real-world phenomena in their surroundings, thus making their understanding of the material more contextual and meaningful. Field study activities, regional mapping, and observations of the school environment and its surroundings are relevant to the perspectives proposed by Kriewaldt et al., (2023); Yli-Panula et al., (2020) which explain that geography learning becomes more lively and relevant to everyday life, while also strengthening students' character, making them more sensitive to local and global environmental issues.

One application of utilizing the environment as a learning resource in learning is a fire disaster mitigation simulation activity, to connect the theory learned in class with real practice in the field, as shown in Figure 6.

Figure 6. Fire Disaster Mitigation Simulation Practice Carried Out in the School Environment (**Source:** Researcher Documentation, 2025)

In class, students learn basic concepts about the causes of fires, their impact on the environment, and effective mitigation and evacuation measures. After understanding the theory, teachers facilitate simulation activities in the school environment, such as emergency evacuation drills, the use of portable fire extinguishers (APAR), and the identification of fire prone areas around the school. Through these activities, students not only hone their critical thinking and problem solving skills but also foster awareness and responsibility for the importance of disaster preparedness in everyday life. In line with the findings of Khusna et al., (2025), which demonstrate that simulation-based instructional methods in disaster prone areas are proven to effectively enhance students' knowledge and preparedness at the secondary school level, this study underscores the critical role of simulation-based approaches in disaster geography education. Such approaches significantly contribute to improving students' preparedness for disaster risks, including fire hazards.

Utilizing the environment as a resource for geography learning is carried out on average once or twice per semester, aiming to provide students with an understanding of the relationship between classroom theory and field facts, providing more contextual learning. This aligns with research findings that fieldwork activities improve students' conceptual understanding, motivation, and ability to connect theory to real world conditions (Boyle et al., 2007). A form of learning that utilizes the environment as a learning resource, namely students observing the physical conditions of the school environment such as land use, vegetation, or social conditions such as population activities and public facilities. As demonstrated by the findings of Kent et al., (1997) demonstrating that such activities constitute recommended practices in environment based geography education. These observational activities also involve the collection of basic empirical data, including measurements of temperature, humidity, wind direction, and elevation, using instruments such as altimeters and Global Positioning System (GPS).

Regional dynamics, socio cultural conditions, and environmental conditions were obtained through interviews with informants. Based on the data obtained, students conducted simple mapping by sketching the area. The data obtained in the field was then compiled into a report and then discussed together in class in the form of a presentation. However, the utilization of Geographic Information Systems (GIS) has not been maximized, due to the constraints of inadequate device facilities and the complexity of operating the Geographic Information System toll. In line with the findings reported by Siljeg et al., (2022) more than 77% of teachers do not use GIS at all in teaching and learning activities due to limitations in software, licensing, and technical capabilities.

Learning that utilizes the environment as a learning resource improves student responsiveness in participating in learning. Students are more enthusiastic, feel valued and involved in learning, easily understand the material, and are actively involved in learning. Studies show that outdoor learning strengthens students' motivation and emotional engagement (Brookfield, 2022). In the learning process, teachers design environment based learning, develop data collection instruments, facilitate discussion activities, and provide guidance so that students can connect theory with phenomena in the field.

Learning that utilizes the environment as a learning resource, in addition to being environmentally designed, also aims to foster an attitude of environmental awareness, by directly observing various environmental phenomena, both those that have the potential to preserve or damage them. This provides knowledge about what actions need to be taken to maintain environmental sustainability. Research on the development of a character-based geography module on environmental awareness, which showed a significant increase in students' environmental awareness after the module was implemented, supports this opinion (Sariani, 2017).

The use of the environment as a learning resource is integrated into the curriculum through teacher designed teaching modules. An environment based learning approach is used as part of a contextual learning strategy that links geography material to real world conditions around students. Several forms of integration within the teaching modules include learning objectives designed to enable students to observe, analyze, and draw conclusions from various geospheric phenomena. Learning activities are designed with observation, interviews, and field discussions. Assessments are structured by considering the results of fieldwork, reports, and presentations of findings.

Utilizing the environment as a learning resource presents challenges in its implementation, such as the time available sometimes being insufficient to reach the intended location and carry out activities optimally. Permits and administrative issues, including obtaining permission from schools, parents, and relevant institutions, often take up time, reducing the effectiveness of the planned schedule. The constraints identified in the utilization of the environment as a learning resource are consistent with those reported in previous studies by Eddif et al., (2025); Mauro et al., (2024) which indicate that the main challenges in organizing a geology field trip include administrative issues (permits), logistics (including transportation), and limited time and teaching resources.

3.3. Learning Methods Used in Utilizing the Environment as a Resource for Learning Geography

State Senior High School 1 Purwokerto, utilizes the school's surroundings as a rich contextual medium for observing natural and social phenomena, such as landforms, land use, and community activities. Through field experiences, students not only understand theory but also relate it to the geographic realities they encounter firsthand. These findings are consistent with the results of previous studies (Setiawan & Saputra, 2022) the which indicate that learning approach that uses the

environment as a source of learning geography emphasizes the direct involvement of students with real conditions around them to strengthen understanding of geographical concepts.

Teachers apply various active and participatory methods to utilize the environment as a learning resource, such as field study, project based learning, and problem based learning. Through field study, students can directly observe geographic phenomena around the school. Project based learning encourages students to develop simple research projects based on environmental data, and problem based learning trains students to analyze and find solutions to local geographic problems. The combination of these three methods creates more contextual, engaging, and meaningful learning for students, according to the study Perkins et al., (2001); Rianti et al., (2024); Silviariza & Handoyo, (2020) shows that the application of project based learning models, problem-based learning, and spatial problem based learning in geography in an integrated manner is able to improve students' problem solving abilities, environmental literacy, and spatial thinking through direct connections between theory in the classroom and real learning experiences in the field.

The application of geography learning methods State Senior High School 1 Purwokerto focuses not only on mastering theoretical concepts but also on developing a scientific attitude and environmental awareness. Through exploratory, collaborative, and analytical activities, students are trained to think critically, work collaboratively, and understand the interrelationships between humans and space. This approach aligns with findings Rizaldi et al., (2024) which proves that ecology based outdoor learning (Geo Activity Learning) can improve ecological literacy and students' understanding of the relationship between humans and the physical environment. Thus, geography learning that utilizes the environment as a learning resource can shape students who are not only academically intelligent but also possess a high level of geographic awareness and ecological responsibility. As shown in figure 7 .

Figure 7. Learning Activities on the Banjaran River: Hydrology, Environment, and Spatial Analysis (**Source:** Researcher Documentation, 2025)

In hydrology lessons, students engage in hands-on activities in rivers using project based learning methods to enhance their understanding of hydrological systems and environmental awareness. This approach is effective because it involves direct observation of the river's physical condition, environmental quality, and the identification of problems such as sedimentation, erosion, or pollution. This method emphasizes identifying environmental problems in the field through observation signs of erosion such as cliff landslides or exposed tree roots, noting sedimentation namely the presence of piles of sand or mud in certain parts of the river and finding potential pollution, such as garbage, dark colored water, or waste streams.

Learning methods frequently used by teachers in learning that utilize the environment as a learning resource include field observation, which provides students with the opportunity to directly observe

geospheric phenomena, such as land use, river conditions, or community social activities. Project Based Learning (PjBL) is also implemented, by giving students assignments to create thematic maps, environmental condition reports, documentary videos, and infographics based on observations. This has been demonstrated in geography education research as a learning strategy that improves conceptual understanding and geographic thinking skills through real world experiences (Hua et al., 2024). After completing the field activities, group discussions and presentations were held. The findings were discussed and then presented to the class. This was to train students' collaboration and communication skills.

Problem based learning, discovery learning is a learning approach that teachers also implement in fieldwork. Problem based learning is used to develop critical thinking and problem solving skills, especially when students are confronted with real world phenomena in their environment (Munawaroh & Masruri, 2019). Students are encouraged to identify and analyze environmental problems encountered during fieldwork, such as water pollution or land use change, and then collaboratively seek solutions. Problem-based learning helps students learn independently and collaborate in solving complex problems. The application of discovery learning aims to independently discover geographical concepts or principles through observation and exploration of the environment. This approach fosters students' curiosity and engagement in the learning process.

The learning process also utilizes learning support tools such as the Global Positioning System (GPS). GPS is used to record coordinate points that will later be used in creating digital maps. This is done to develop an understanding of modern spatial technology and improve students' ability to geospatial data interpretation. Furthermore, it also hones students' critical thinking skills by analyzing the distribution patterns of geographic phenomena and the relationships between elements on the maps they create, then discussing these findings. This activity strengthens their spatial abilities and conceptual understanding of geography. However, the map creation carried out by students is still a simple map, namely a sketch, due to the limitations of the necessary equipment and time.

The implementation of the learning process is certainly inseparable from assessment, as is the case with learning that utilizes the environment as a learning resource. Assessments conducted by teachers are tailored to the methods applied in the learning process. The assessments conducted by geography teachers at State Senior High School 1 Purwokerto include process assessment, product assessment, formative and summative assessment, and reflective assessment. Assessments are conducted using a rubric to ensure objectivity and transparency.

Process assessment is used to observe student engagement and participation during fieldwork, including attitudes, cooperation, and initiative in identifying geographic phenomena and collecting data. Product assessment is used to assess student work, such as thematic maps, posters, and presentations of field findings. Assessment aspects include completeness, data accuracy, and analytical skills. Reflective assessment provides students with the opportunity to reflect on their learning experiences through journals or class discussions, demonstrating their understanding and attitudes toward the environment.

The next steps in the assessment process are formative and summative. Formative assessment is conducted during the learning process to provide feedback and help students improve their learning outcomes. Summative assessment, on the other hand, is conducted at the end of a unit or project to evaluate competency achievement. Comprehensive assessment provides assurance and demonstrates that environment-based learning, utilizing the environment as a learning resource, not only improves students' knowledge but also improves their skills and positive attitudes toward the environment.

Learning methods that utilize the environment as a resource for geography learning offer the advantage of increasing student engagement and motivation. Direct learning in the environment increases student engagement because the material is related to phenomena frequently encountered in their daily lives. Other benefits include developing practical skills, such as observation, analysis, mapping, and decision making. This additional advantage has also been reported by Inainfe et al., (2025) which state that it enhances environmental awareness and facilitates the understanding of abstract concepts.

4. Conclusion

The surrounding environment of State Senior High School 1 Purwokerto offers extensive and diverse potential to be utilized as a learning resource in geography education, encompassing natural, social, and

cultural dimensions. The integration of the local environment into geography instruction represents an effort to contextualize geographical concepts by linking theoretical material with regional realities. This approach is implemented through various learning activities, such as field studies, direct observation, simulations, interviews, and basic mapping exercises. The selection of learning resources is grounded in the relevance of local geographical phenomena to instructional objectives and is systematically incorporated into lesson planning, with the utilization of eleven distinct environmental settings as learning contexts.

The application of active learning strategies, including field study, project based learning, problem based learning, and discovery learning, effectively bridges the gap between classroom based geographical concepts and real world phenomena. The use of the surrounding environment as a learning resource not only enhances students' conceptual understanding but also fosters the development of critical thinking skills, spatial abilities, and environmental awareness. Therefore, this approach facilitates the effectiveness of geography instruction by integrating empirical learning experiences within established pedagogical frameworks.

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Data availability. The data used in this study are not publicly available due to restrictions associated with the data source and research policy.

AI Use Declaration. The authors declare that Artificial Intelligence (AI) tools were used only to assist with language editing and improving the clarity of the manuscript. All analyses, interpretations of data, and conclusions presented in this study remain the full responsibility of the authors.

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