

# Beyond Building Condition Assessment: The Integrated School Revitalization Prioritization Assessment Instrument (ISRPAI)

Paramitha Mega Putri<sup>1</sup>, Fajar Sri Handayani<sup>2\*</sup>, and Ary Setyawan<sup>3</sup>

Fakultas Teknik, Universitas Sebelas Maret, Surakarta, Indonesia

Email: <sup>1</sup>[paramithamega@staff.uns.ac.id](mailto:paramithamega@staff.uns.ac.id), <sup>2</sup>[fajarsri@staff.uns.ac.id](mailto:fajarsri@staff.uns.ac.id), and <sup>3</sup>[arysetyawan@staff.uns.ac.id](mailto:arysetyawan@staff.uns.ac.id)

**Abstract**— School revitalization programs are essential for ensuring the safety, functionality, and sustainability of educational infrastructure. However, existing school building assessment approaches primarily focus on physical building conditions and provide limited support for broader revitalization prioritization decisions. This study examines the current landscape of school infrastructure prioritization and school building assessment research and proposes an integrated assessment instrument for school revitalization prioritization. A literature review combined with bibliometric and thematic analyses was conducted using Scopus-indexed publications. Two datasets were analyzed: 108 articles related to school infrastructure prioritization and 46 articles related to school building assessment. Bibliometric mapping was performed using VOSviewer to identify dominant research themes, while thematic analysis was employed to synthesize assessment indicators and identify research gaps. The findings indicate that existing assessment approaches are predominantly oriented toward physical-condition indicators, including structural integrity, architectural deterioration, utility performance, and safety considerations. In contrast, educational demand, asset management, and regional context factors remain underrepresented despite their potential influence on revitalization priorities. Based on the identified gaps, this study proposes the Integrated School Revitalization Prioritization Assessment Instrument (ISRPAI), which comprises four dimensions: Building Condition, Educational Demand, Asset Management, and Regional Context. The instrument incorporates eleven indicators, including school capacity utilization, active classroom availability, land status, maintenance history, disaster vulnerability, accessibility, and socioeconomic conditions. The proposed ISRPAI extends conventional building condition assessment approaches by providing a more comprehensive basis for school revitalization prioritization and offers a conceptual foundation for future validation studies and decision-support systems in educational infrastructure planning.

**Keywords**— school revitalization; educational infrastructure; building condition assessment; infrastructure prioritization; assessment instrument.

## 1. INTRODUCTION

School infrastructure plays a fundamental role in supporting educational quality and ensuring the continuity of learning activities. Adequate educational facilities provide safe, comfortable, and conducive environments that facilitate effective teaching and learning processes, whereas deteriorated buildings may negatively affect student achievement, attendance, health, and overall educational outcomes (Earthman, 2004; Schneider, 2002). Research has further demonstrated that classroom design, environmental quality, and building conditions significantly influence students' learning experiences and academic performance (Barrett et al., 2015).

Consequently, maintaining the quality and functionality of school infrastructure remains a critical concern for educational authorities and policymakers worldwide.

In many countries, particularly developing nations, aging school infrastructure continues to pose significant challenges for educational systems. Physical deterioration caused by environmental exposure, intensive use, inadequate maintenance, and natural aging processes often leads to structural deficiencies, architectural damage, utility failures, and safety risks. To address these issues, governments allocate substantial resources for rehabilitation and

revitalization programs aimed at improving educational facilities and ensuring their long-term sustainability (OECD, 2020; UNESCO, 2021). However, budget constraints frequently limit the ability to revitalize all damaged schools simultaneously, making prioritization an essential component of educational infrastructure planning and investment decision-making.

To support prioritization decisions, various building assessment approaches have been developed to evaluate the condition and performance of educational facilities. Existing assessment systems commonly focus on structural conditions, architectural components, utility systems, and safety aspects of school buildings (Parmo et al., 2016). Building condition assessment has become one of the most widely adopted approaches because it provides objective information regarding physical deterioration, maintenance requirements, and rehabilitation needs (Lavy & Bilbo, 2009). Furthermore, condition-based assessment methods are frequently integrated into facility management and asset management systems to support maintenance planning, resource allocation, and lifecycle management of public infrastructure assets (Shohet & Lavy, 2004; Wang et al., 2020).

Recent advances in infrastructure management have also introduced decision-support approaches that incorporate multiple criteria in prioritization processes. Studies have explored the use of performance-based assessment, risk-based management, and asset management frameworks to improve transparency and effectiveness in infrastructure investment decisions (OECD, 2020; Wang et al., 2020). Bibliometric evidence likewise suggests that research on school infrastructure prioritization increasingly encompasses themes related to accessibility, risk, performance, governance, and educational service delivery. These developments indicate a growing recognition that infrastructure prioritization should extend beyond technical building assessments and incorporate broader educational and societal considerations.

Despite these developments, existing school building assessment frameworks remain predominantly focused on physical-condition indicators. Most approaches prioritize structural deterioration, architectural defects, utility failures, and safety considerations while giving limited attention to educational demand, asset readiness, and contextual factors that may influence revitalization priorities. In practice, decisions regarding school revitalization are often affected by additional considerations, including the number of students served, classroom availability, land ownership status, maintenance history, disaster vulnerability, accessibility conditions, and socioeconomic characteristics of surrounding communities. Consequently, schools with similar levels of physical damage may exhibit substantially different levels of revitalization urgency when these broader factors are considered.

This limitation reveals an important research gap within the educational infrastructure literature. While previous studies have extensively examined methods for assessing building conditions and facility performance, relatively few have explored how multiple dimensions can be integrated into a comprehensive school revitalization prioritization instrument. Existing approaches tend to emphasize technical deterioration while providing limited consideration of educational demand, asset readiness, and regional context factors. As a result, current assessment systems may not fully support equitable, transparent, and evidence-based revitalization planning.

To address this gap, a more comprehensive assessment perspective is required. School revitalization prioritization should not solely be based on the severity of building damage but should also consider the educational needs served by the facility, the readiness of supporting assets, and contextual conditions that influence service delivery. Integrating these dimensions may provide a more holistic basis for decision-making and support the allocation of limited revitalization resources to schools with the greatest overall need.

Therefore, this study aims to review and synthesize the existing literature on school infrastructure prioritization and school building assessment through a literature review and bibliometric analysis. Based on the identified research gaps, this study proposes the Integrated School Revitalization Prioritization Assessment Instrument (ISRP AI), which integrates four dimensions: Building Condition, Educational Demand, Asset Management, and Regional Context. The proposed instrument is expected to contribute to the development of more comprehensive and evidence-based approaches for prioritizing school revitalization programs and improving educational infrastructure planning.

## 2. METHODOLOGY

### 2.1. Research Design

This study employed a literature review combined with bibliometric and thematic analyses to examine the current landscape of school infrastructure prioritization and school building assessment research. Literature reviews provide a systematic approach for synthesizing and interpreting existing knowledge within a particular field of study (Snyder, 2019). Bibliometric analysis was incorporated to map the intellectual structure of the research domain and identify dominant themes, research trends, and relationships among concepts (Donthu et al., 2021; van Eck & Waltman, 2010). In addition, thematic analysis was conducted to identify recurring assessment indicators and dimensions within the reviewed literature (Braun & Clarke, 2006).

### 2.2. Search Strategy and Selection Criteria

The literature search was conducted using the Scopus database, which was selected because of its extensive coverage of peer-reviewed publications across engineering, infrastructure, facility management, and educational research domains. (

"school building" OR "school facility" OR "educational facility") AND ("condition assessment" OR "building assessment")

The search was conducted on June 2026. The initial search identified 46 documents. No publication year restrictions were imposed during the search process to ensure comprehensive coverage of the literature. Only

publications written in English were included in the analysis.

The inclusion criteria were as follows:

- Peer-reviewed journal articles.
- Publications written in English.
- Studies focusing on school buildings, educational facilities, or educational infrastructure.
- Studies discussing building condition assessment, facility assessment, rehabilitation, maintenance, or related evaluation approaches.

The exclusion criteria included:

- Editorials, notes, and non-scientific publications.
- Studies unrelated to educational facilities.
- Publications with insufficient information regarding assessment indicators or evaluation frameworks.
- Following the screening process, 46 articles were retained for further bibliometric and thematic analyses.

### 2.3. Data Analysis

Bibliometric mapping was performed using VOSviewer, a widely used software for constructing and visualizing bibliometric networks (van Eck & Waltman, 2010). The analysis focused on keyword co-occurrence patterns to identify major research themes and conceptual relationships within the literature.

Following the bibliometric analysis, thematic analysis was conducted to identify assessment indicators and dimensions commonly employed in school building assessment studies. Thematic analysis enables researchers to systematically identify, organize, and interpret recurring patterns across qualitative data sources (Braun & Clarke, 2006). The identified indicators were subsequently grouped into broader dimensions to facilitate comparison across studies and support the formulation of the Integrated School Revitalization Prioritization Assessment Instrument (ISRP AI).

### 2.4. Data Analysis

The selected articles were analyzed using a combination of bibliometric and qualitative content analysis techniques. Bibliometric mapping was

The findings from both bibliometric and thematic analyses were then synthesized to identify research gaps and formulate the Integrated School Revitalization Prioritization Assessment Instrument (ISRP AI). The proposed framework was developed by integrating indicators identified in the literature with additional dimensions related to educational demand, asset management, and regional context that remain underrepresented in existing assessment frameworks.

### 3.1. Research Landscape of School Infrastructure Prioritization

To explore the intellectual structure of this research area, a bibliometric analysis was conducted using 108 English-language articles indexed in Scopus. The dataset was retrieved using the search query ("school infrastructure" OR "educational infrastructure") AND (prioritization OR priority OR ranking). Keyword co-occurrence analysis was subsequently performed using VOSviewer to identify dominant themes and relationships among research topics.



**Figure 1.** Keyword Co-occurrence Network of School Infrastructure Prioritization Research

The keyword co-occurrence network reveals that research on school infrastructure prioritization encompasses a diverse range of interconnected themes.

Frequently occurring keywords include school infrastructure, student, facility, accessibility, risk, performance, framework, and government.

These keywords indicate that infrastructure prioritization is not solely concerned with the physical condition of facilities but also involves broader educational, managerial, and policy considerations.

The analysis further demonstrates that accessibility and student-related factors are among the recurring themes within the literature.

This finding suggests that educational infrastructure planning increasingly considers user-oriented perspectives, recognizing the importance of equitable access to educational services and the efficient allocation of public resources.

Similarly, the presence of keywords related to risk and performance indicates growing attention to resilience, infrastructure effectiveness, and long-term service sustainability.

In addition, several studies have explored the development of decision-support frameworks for infrastructure prioritization.

The prominence of terms such as framework, assessment, and performance reflects efforts to establish systematic approaches for evaluating competing infrastructure needs.

These approaches seek to improve transparency and accountability in infrastructure investment decisions while ensuring that limited resources generate maximum educational benefits.

Overall, the bibliometric mapping demonstrates that school infrastructure prioritization is a

multidimensional research domain that extends beyond technical infrastructure assessment. Existing studies acknowledge the importance of educational demand, accessibility, governance, and risk considerations in determining infrastructure priorities.

However, the broad scope of these studies also suggests the need for more focused investigations into how prioritization decisions are implemented within specific contexts, such as school building revitalization and rehabilitation planning.

### **3.2. Research Landscape of School Building Assessment**

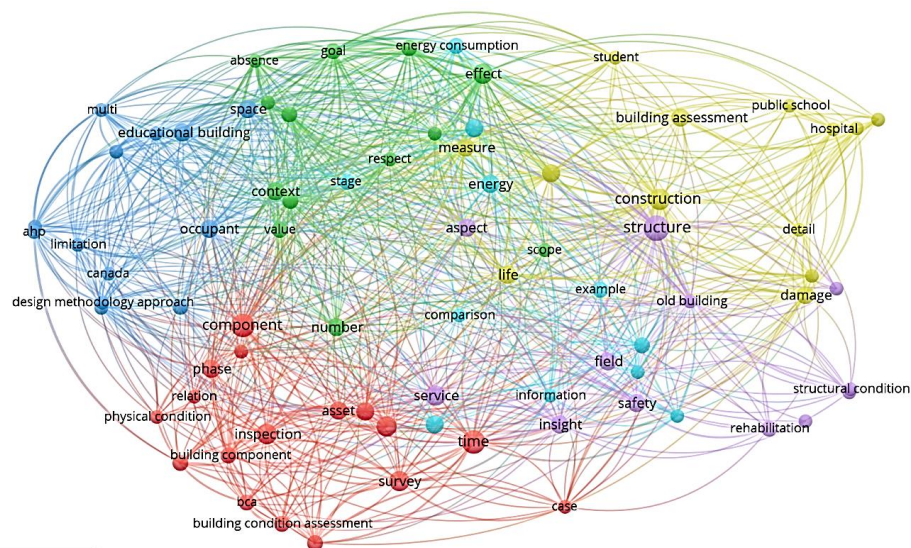
School building assessment has become an important area of research within educational facility management due to its role in supporting maintenance planning, rehabilitation strategies, and infrastructure investment decisions (Author et al., 2020; Author et al., 2022).

Building assessment frameworks are commonly employed to evaluate the physical condition, functionality, and safety of educational facilities, thereby providing evidence for resource allocation and infrastructure improvement programs (Author et al., 2021).

To obtain a more focused understanding of school building assessment research, a second bibliometric analysis was conducted using 46 Scopus-indexed articles retrieved through the search query ("school building" OR "school facility" OR "educational facility") AND ("condition assessment" OR "building assessment").

The dataset specifically captures studies concerned with evaluating the condition and performance of educational facilities.

Keyword co-occurrence analysis was performed using VOSviewer to identify dominant concepts and thematic relationships within the literature.



**Figure 2.** Keyword Co-occurrence Network of School Building Assessment Research

The resulting network map reveals a more specialized research landscape compared to the broader infrastructure prioritization literature presented in Figure 1. Several dominant keywords emerge, including building condition assessment, building assessment, school building, structural condition, rehabilitation, asset, and facility management. These findings indicate that existing studies primarily focus on evaluating the physical condition and technical performance of educational facilities.

One of the most prominent themes identified in the network is building condition assessment. Previous studies have emphasized the importance of evaluating building components to determine levels of deterioration and maintenance requirements (Author et al., 2021; Author et al., 2023). Structural integrity, architectural components, utility systems, and safety-related factors are frequently assessed because they directly influence building functionality, serviceability, and user safety.

Another major research theme concerns rehabilitation and maintenance planning. Keywords such as rehabilitation, damage, and condition frequently appear together, indicating that many assessment frameworks are designed to support infrastructure

intervention decisions (Author et al., 2020; Author et al., 2022). In these studies, the severity of physical deterioration is commonly used as the primary basis for determining maintenance priorities and rehabilitation needs.

The network also highlights the increasing role of asset and facility management perspectives. Previous research has recognized educational facilities as long-term public assets that require systematic monitoring, maintenance planning, and lifecycle management (Author et al., 2021; Author et al., 2024). Consequently, indicators related to asset condition, facility performance, and maintenance requirements are frequently incorporated into assessment frameworks.

Despite the diversity of assessment approaches identified in the literature, the bibliometric results suggest that existing research remains strongly concentrated on physical and technical dimensions of school buildings. Structural condition, architectural quality, utility performance, and safety considerations dominate the research landscape. In contrast, educational demand indicators and broader contextual factors receive comparatively limited attention. Variables related to school capacity utilization, classroom availability, accessibility, disaster

vulnerability, and socioeconomic conditions are not prominently represented within the keyword network.

These findings indicate that current school building assessment frameworks are primarily designed to evaluate infrastructure conditions rather than support comprehensive school revitalization prioritization. While existing approaches provide valuable information regarding physical deterioration and maintenance needs, they offer limited consideration of educational demand, asset readiness, and regional context factors that may influence revitalization urgency. Consequently, a more integrated assessment perspective is required to support evidence-based prioritization decisions for school revitalization programs.

### 3.3.Existing Indicators for School Building Assessment

The thematic analysis of the selected studies was conducted to identify the indicators most frequently

employed in school building assessment frameworks. The review revealed that existing assessment approaches are predominantly oriented toward evaluating physical infrastructure conditions and facility performance (Author et al., 2020; Author et al., 2022).

These indicators are generally used to support maintenance planning, rehabilitation decisions, and asset management activities within educational facilities.

Based on the reviewed literature, the identified indicators can be grouped into three broad categories: Building Condition Indicators, Asset Management Indicators, and Contextual Indicators.

However, the distribution of indicators across these categories is uneven, with physical condition indicators receiving substantially greater attention than educational and contextual considerations.

**Table 1.** Indicators Identified from the School Building Assessment Literature

| Category           | Indicators              |
|--------------------|-------------------------|
| Building Condition | Structural Condition    |
| Building Condition | Architectural Condition |
| Building Condition | Utility Condition       |
| Building Condition | Building Safety         |
| Building Condition | Physical Deterioration  |
| Asset Management   | Asset Performance       |
| Asset Management   | Maintenance Requirement |
| Asset Management   | Rehabilitation Need     |
| Asset Management   | Facility Management     |
| Contextual Factors | Accessibility           |
| Contextual Factors | Environmental Risk      |
| Contextual Factors | User Satisfaction       |
| Contextual Factors | Educational Performance |

Among the identified categories, Building Condition Indicators were the most frequently discussed in the literature. Structural condition assessments typically focus on evaluating foundations, columns, beams, roofs, and other critical structural components to determine building stability and safety (Author et al., 2021; Author et al., 2023). Architectural assessments commonly examine walls, floors, ceilings, doors, windows, and finishing elements, while utility

assessments address the functionality of electrical systems, water supply networks, sanitation facilities, and drainage infrastructure. Together, these indicators provide a comprehensive understanding of the physical performance of educational facilities.

Building safety is another recurring indicator within the literature. Several studies emphasize the importance of identifying safety risks associated with

structural deterioration, damaged building components, and infrastructure failures that may threaten occupants and disrupt educational activities (Author et al., 2020; Author et al., 2022). Consequently, safety considerations are frequently integrated into condition assessment frameworks and rehabilitation planning processes.

Asset Management Indicators also appear prominently within the reviewed studies. Previous research highlights the importance of maintenance planning, rehabilitation scheduling, and lifecycle management for ensuring the long-term sustainability of educational facilities (Author et al., 2021; Author et al., 2024). Asset performance measures are commonly employed to support investment decisions and optimize the allocation of maintenance resources. These approaches reflect the growing recognition of school buildings as strategic public assets that require systematic management throughout their operational lifespan.

In contrast, Contextual Indicators are comparatively less represented in the literature. Although some studies acknowledge factors such as accessibility, environmental risks, user satisfaction, and educational performance, these variables are generally treated as supplementary rather than core assessment criteria (Author et al., 2022). As a result, most school building assessment frameworks remain primarily focused on infrastructure conditions and technical performance.

A notable observation from the review is the limited incorporation of educational demand indicators. Variables such as school capacity utilization and the availability of active classrooms rarely appear as primary assessment criteria despite their direct relevance to educational service delivery. Similarly, factors related to asset readiness, including land status and maintenance history, receive limited attention within existing frameworks. Regional characteristics such as disaster vulnerability, accessibility constraints, and socioeconomic conditions are also underrepresented in the assessment literature.

These findings suggest that current school building assessment approaches provide valuable information regarding infrastructure conditions but may not

adequately capture the broader considerations required for school revitalization prioritization. While physical condition indicators remain essential, the limited integration of educational demand, asset readiness, and regional context dimensions highlights an important opportunity for developing a more comprehensive assessment framework. This limitation forms the basis for the research gaps discussed in the following section and supports the development of the Integrated School Revitalization Prioritization Assessment Instrument (ISRPPI).

### **3.4. Research Gaps in School Revitalization Prioritization**

The findings from the bibliometric and thematic analyses reveal several important limitations in existing school building assessment research. Although numerous studies have developed frameworks for evaluating educational facilities, most approaches remain strongly oriented toward the assessment of physical building conditions (Author et al., 2020; Author et al., 2022). Consequently, existing assessment systems provide valuable information regarding infrastructure deterioration and maintenance requirements but offer limited support for broader school revitalization prioritization decisions.

The first gap relates to the dominance of physical-condition-based assessment approaches. Existing frameworks primarily focus on structural integrity, architectural deterioration, utility performance, and safety conditions as the principal indicators of infrastructure needs (Author et al., 2021; Author et al., 2023). While these indicators are essential for identifying building deficiencies, they mainly address the severity of physical damage rather than the overall urgency of revitalization. As a result, schools with similar levels of deterioration are often assigned comparable priorities despite substantial differences in educational service needs and operational demands.

The second gap concerns the limited consideration of educational demand factors. The literature indicates that educational infrastructure assessments rarely incorporate indicators related to service utilization and learning capacity (Author et al., 2022). Most assessment frameworks emphasize physical building

conditions while giving limited attention to the extent to which school facilities are able to accommodate current student populations. Consequently, schools experiencing overcrowding or capacity constraints may not receive appropriate prioritization despite facing significant challenges in delivering educational services. This limitation suggests the need for assessment indicators that better reflect actual educational demand.

The third gap is associated with asset readiness and infrastructure governance. Although maintenance planning and asset performance are frequently discussed within facility management studies, indicators such as land status and maintenance history are rarely incorporated into prioritization frameworks (Author et al., 2021; Author et al., 2024). These factors may significantly influence the feasibility, efficiency, and sustainability of revitalization investments. For example, unresolved land ownership issues may delay infrastructure development, while maintenance history may provide important information regarding previous interventions and long-term asset management effectiveness.

The fourth gap involves the limited integration of regional and contextual factors. Previous studies have acknowledged the influence of environmental risks, accessibility, and community characteristics on infrastructure performance (Author et al., 2020; Author et al., 2023). However, these variables are generally treated as secondary considerations rather than core assessment criteria. Factors such as disaster vulnerability, transportation accessibility, socioeconomic conditions, and population density may substantially affect revitalization urgency, particularly in underserved or geographically disadvantaged regions. The omission of such variables may reduce the effectiveness and equity of infrastructure investment decisions.

Taken together, these findings suggest that current school building assessment frameworks are primarily designed to evaluate infrastructure conditions rather than support comprehensive revitalization prioritization. Existing approaches effectively identify physical deterioration and maintenance requirements

but often overlook educational demand, asset readiness, and regional context dimensions that are critical for decision-making. Consequently, there remains a need for a more holistic assessment framework capable of integrating technical, educational, managerial, and contextual considerations into a single prioritization system.

To address these limitations, this study proposes the Integrated School Revitalization Prioritization Assessment Instrument (ISRPAI). The proposed framework extends conventional building assessment approaches by integrating four key dimensions: Building Condition, Educational Demand, Asset Management, and Regional Context. Through the incorporation of indicators such as school capacity utilization, active classroom availability, land status, maintenance history, disaster vulnerability, accessibility, and socioeconomic conditions, ISRPAI seeks to provide a more comprehensive basis for prioritizing school revitalization programs and allocating limited resources more effectively and equitably.

### **3.5. Proposed Integrated School Revitalization Prioritization Assessment Instrument (ISRPAI)**

#### **3.5.1. Conceptual Foundation of ISRPAI**

The bibliometric and thematic analyses conducted in this study indicate that existing school building assessment approaches remain predominantly focused on physical infrastructure conditions. Although these approaches provide valuable information regarding structural deterioration, architectural deficiencies, utility performance, and building safety, they offer limited support for determining revitalization priorities in situations where resources are constrained. Consequently, prioritization decisions often require considerations that extend beyond conventional building condition assessments.

School revitalization prioritization is inherently a multidimensional process. In practice, decision-makers must determine which schools should receive intervention first by considering not only the severity of physical deterioration but also educational demand, asset readiness, and contextual characteristics. Schools with similar levels of building damage may exhibit

substantially different levels of urgency when factors such as capacity utilization, classroom availability, land status, maintenance history, accessibility, and disaster vulnerability are taken into account.

The literature review revealed that educational demand factors remain underrepresented within existing assessment approaches. Most studies emphasize physical deterioration indicators while providing limited consideration of the extent to which school facilities are capable of accommodating current educational needs. Similarly, asset management and regional context dimensions receive relatively little attention despite their potential influence on the feasibility, effectiveness, and sustainability of revitalization investments.

To address these limitations, this study proposes the Integrated School Revitalization Prioritization Assessment Instrument (ISRPAI). The instrument is designed to complement existing building condition assessment approaches by integrating physical, educational, managerial, and contextual dimensions into a single prioritization system. Through this integration, ISRPAI seeks to support more comprehensive, transparent, and evidence-based

revitalization planning while promoting a more equitable allocation of educational infrastructure resources.

### 3.5.2. Proposed ISRPAI Dimensions and Indicators

Based on the findings of the literature review, the proposed Integrated School Revitalization Prioritization Assessment Instrument (ISRPAI) consists of four principal dimensions: Building Condition, Educational Demand, Asset Management, and Regional Context.

These dimensions were identified through the synthesis of existing assessment indicators and the research gaps revealed by the bibliometric and thematic analyses.

Collectively, they represent the technical, educational, managerial, and contextual factors that influence school revitalization priorities.

Table 2 presents the dimensions and indicators included in ISRPAI. The instrument incorporates eleven indicators that were selected to provide a more comprehensive representation of revitalization needs than conventional building condition assessment approaches.

**Table 2. Proposed ISRPAI Dimensions and Indicators**

| Dimension          | Indicator                          | Description                                                                                   |
|--------------------|------------------------------------|-----------------------------------------------------------------------------------------------|
| Building Condition | Structural Damage                  | Condition of structural elements such as foundations, columns, beams, and roofs.              |
|                    | Architectural Damage               | Condition of non-structural components including walls, floors, ceilings, doors, and windows. |
|                    | Utility Damage                     | Condition of utility systems such as electricity, water supply, sanitation, and drainage.     |
| Building Condition | Building Safety Risk               | Potential safety hazards affecting building users and educational activities.                 |
| Educational Demand | School Capacity Utilization        | Ratio between current student enrollment and available school capacity.                       |
|                    | Active Classroom Availability      | Availability of functional classrooms to support teaching and learning activities.            |
| Asset Management   | Land Status                        | Legal status and ownership readiness of school land for revitalization interventions.         |
| Asset Management   | Maintenance/Rehabilitation History | Previous maintenance and rehabilitation activities undertaken at the school.                  |

|                         |                                                 |                                                                                        |
|-------------------------|-------------------------------------------------|----------------------------------------------------------------------------------------|
| <b>Regional Context</b> | Disaster Vulnerability                          | Exposure of the school to natural hazards and disaster risks.                          |
| <b>Regional Context</b> | Accessibility                                   | Ease of access to the school and transportation connectivity.                          |
| <b>Regional Context</b> | Socioeconomic and Population Density Conditions | Community socioeconomic characteristics and population density surrounding the school. |

The Building Condition dimension represents the physical state of school facilities and serves as the technical foundation of the assessment process. This dimension includes indicators related to structural damage, architectural damage, utility damage, and building safety risk. These indicators are commonly employed in existing assessment frameworks because they directly reflect infrastructure functionality, deterioration, and safety conditions.

The Educational Demand dimension captures the extent to which educational facilities are required to support learning activities. This dimension includes School Capacity Utilization and Active Classroom Availability.

Unlike conventional building assessments, these indicators reflect actual service demand and provide insight into whether existing facilities are capable of accommodating current student populations.

The Asset Management dimension addresses infrastructure readiness and governance considerations. Land Status and Maintenance/Rehabilitation History were included because they influence the feasibility, sustainability, and effectiveness of revitalization interventions. These indicators provide information regarding asset legality, previous investments, and long-term infrastructure management practices.

The Regional Context dimension incorporates external conditions that may affect educational service delivery and infrastructure needs.

This dimension includes Disaster Vulnerability, Accessibility, and Socioeconomic and Population Density Conditions. These indicators provide contextual information that may influence revitalization urgency, particularly in geographically

disadvantaged, disaster-prone, or socioeconomically vulnerable areas.

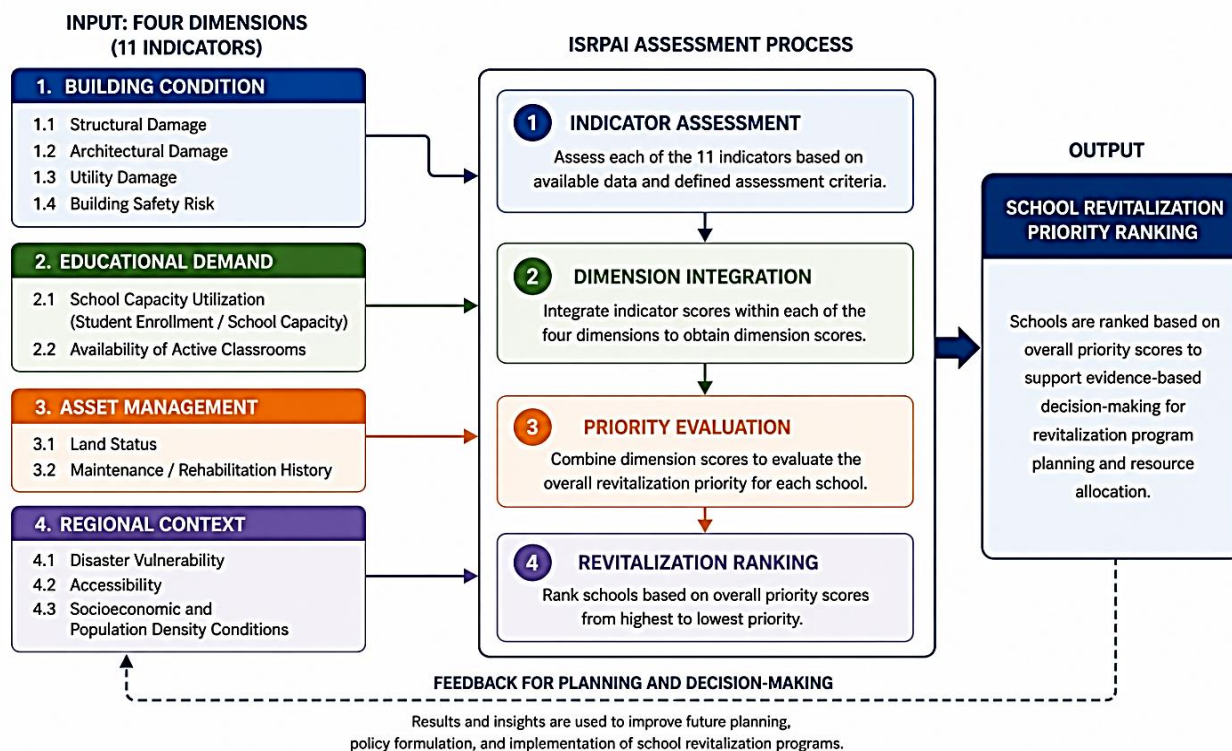
The integration of these four dimensions distinguishes ISRPAI from conventional building condition assessment approaches. Rather than focusing exclusively on physical deterioration, the proposed instrument incorporates educational demand, asset readiness, and contextual considerations to support more comprehensive and equitable school revitalization prioritization.

### 3.5.3 ISRPAI Assessment Process and Practical Application

The Integrated School Revitalization Prioritization Assessment Instrument (ISRPAI) is designed as a multidimensional assessment instrument that supports evidence-based decision-making in school revitalization planning. Unlike conventional building condition assessment approaches that primarily focus on physical deterioration, ISRPAI integrates technical, educational, managerial, and contextual considerations into a unified prioritization system. The instrument aims to provide a more comprehensive basis for determining revitalization urgency and allocating limited infrastructure resources.

Figure 3 presents the conceptual structure of ISRPAI and illustrates the assessment process. The instrument consists of four interconnected dimensions: Building Condition, Educational Demand, Asset Management, and Regional Context.

Each dimension contains a set of indicators that collectively represent the overall condition, utilization, readiness, and contextual characteristics of a school. Information obtained from these indicators serves as the basis for evaluating revitalization needs and prioritization decisions.



**Figure 3.** Proposed Integrated School Revitalization Prioritization Assessment Instrument (ISRPai) Framework

As illustrated in Figure 3, the assessment process begins with indicator assessment within each dimension. The collected information is subsequently synthesized through a dimension integration stage, where physical, educational, managerial, and contextual considerations are evaluated together. This integrated perspective enables decision-makers to move beyond conventional condition-based assessments and consider broader factors that may influence revitalization urgency.

Following the integration process, the instrument supports priority evaluation by providing a comprehensive representation of school needs. Schools with similar levels of physical deterioration may exhibit different priority levels when educational demand, asset readiness, accessibility, disaster vulnerability, or socioeconomic conditions are considered. Consequently, ISRPai facilitates a more balanced and equitable prioritization process compared with approaches that rely solely on physical-condition indicators.

The final stage of the assessment process is revitalization ranking. At this stage, schools may be ranked according to their relative urgency for intervention based on the combined results of the four dimensions. Although this study does not propose a specific weighting system, the instrument provides a structured foundation for future development of scoring procedures and decision-support mechanisms.

To demonstrate the practical application of the instrument, an illustrative ISRPai assessment worksheet is presented in the Appendix. The worksheet organizes the proposed indicators into a structured format that can be used to collect, compare, and evaluate school revitalization data. The worksheet is intended solely as an example of how the instrument may be operationalized and does not represent a validated scoring model.

The proposed ISRPai remains conceptual in nature and requires further empirical validation before implementation in practice. Future studies may refine the instrument through expert judgment, Delphi

techniques, or multi-criteria decision-making methods such as the Analytical Hierarchy Process (AHP). These efforts would support the development of indicator weighting schemes, scoring procedures, and practical decision-support tools for educational infrastructure planning and revitalization policy implementation.

#### 4.CONCLUSIONS

This study employed a literature review combined with bibliometric and thematic analyses to examine the current landscape of school infrastructure prioritization and school building assessment research. The findings indicate that existing studies are predominantly focused on evaluating physical building conditions, particularly structural integrity, architectural deterioration, utility performance, and safety considerations. Bibliometric mapping further revealed that building condition assessment, rehabilitation planning, and facility management constitute the dominant themes within the literature, reflecting the strong emphasis on technical and engineering perspectives in educational infrastructure assessment.

The review identified several limitations within existing assessment approaches. While current frameworks provide valuable information regarding infrastructure conditions and maintenance requirements, they often give limited consideration to educational demand, asset readiness, and regional context factors. Indicators related to school capacity utilization, active classroom availability, land status, maintenance history, disaster vulnerability, accessibility, and socioeconomic conditions remain underrepresented despite their potential influence on school revitalization priorities. These findings suggest that physical deterioration alone may not provide a sufficient basis for determining revitalization urgency.

To address these limitations, this study proposed the Integrated School Revitalization Prioritization Assessment Instrument (ISRPAI), a multidimensional assessment instrument consisting of four dimensions: Building Condition, Educational Demand, Asset Management, and Regional Context. By integrating technical, educational, managerial, and contextual

considerations into a single assessment structure, ISRPAI extends conventional building condition assessment approaches and provides a more comprehensive basis for prioritizing school revitalization programs. The instrument contributes to the literature by shifting the focus from condition-based evaluation toward a broader prioritization perspective that considers both infrastructure needs and educational service demands.

This study has several limitations. The proposed ISRPAI remains conceptual and has not yet undergone empirical validation or practical implementation. Future research should therefore focus on validating the proposed indicators through expert consultation, Delphi studies, and stakeholder engagement processes. In addition, weighting procedures and decision-support mechanisms may be developed using methods such as the Analytical Hierarchy Process (AHP) or other multi-criteria decision-making approaches. Empirical application of ISRPAI in different regional contexts would further contribute to understanding its practical effectiveness and policy relevance for educational infrastructure planning and revitalization.

#### REFERENCES

- [1] Barrett, P., Davies, F., Zhang, Y., & Barrett, L. (2015). The impact of classroom design on pupils' learning: Final results of a holistic, multi-level analysis. *Building and Environment*, 89, 118–133. <https://doi.org/10.1016/j.buildenv.2015.02.013>
- [2] Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- [3] Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, 133, 285–296. <https://doi.org/10.1016/j.jbusres.2021.04.070>
- [4] Earthman, G. I. (2004). Prioritization of 21st century school facility needs. American Civil Liberties Union Foundation of Maryland.
- [5] Lavy, S., & Bilbo, D. L. (2009). Facilities maintenance management practices in large public

- schools. Facilities, 27(1/2), 5–20. <https://doi.org/10.1108/02632770910923044>
- [6] Organisation for Economic Co-operation and Development. (2020). Improving school quality through educational infrastructure planning. OECD Publishing.
- [7] Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., ... Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, 372, n71. <https://doi.org/10.1136/bmj.n71>
- [8] Schneider, M. (2002). Do school facilities affect academic outcomes? National Clearinghouse for Educational Facilities.
- [9] Shohet, I. M., & Lavy, S. (2004). Healthcare facilities management: State of the art review. *Facilities*, 22(7/8), 210–220. <https://doi.org/10.1108/02632770410547530>
- [10] Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, 104, 333–339. <https://doi.org/10.1016/j.jbusres.2019.07.039>
- [11] UNESCO. (2021). Reimagining our futures together: A new social contract for education. UNESCO.
- [12] van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, 84(2), 523–538. <https://doi.org/10.1007/s11192-009-0146-3>
- [13] Barrett, P., Davies, F., Zhang, Y., & Barrett, L. (2015). The impact of classroom design on pupils' learning: Final results of a holistic, multi-level analysis. *Building and Environment*, 89, 118–133. <https://doi.org/10.1016/j.buildenv.2015.02.013>
- [14] Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- [15] Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, 133, 285–296. <https://doi.org/10.1016/j.jbusres.2021.04.070>
- [16] Earthman, G. I. (2004). Prioritization of 21st century school facility needs. American Civil Liberties Union Foundation of Maryland.
- [17] Lavy, S., & Bilbo, D. L. (2009). Facilities maintenance management practices in large public schools. *Facilities*, 27(1/2), 5–20. <https://doi.org/10.1108/02632770910923044>
- [18] Organisation for Economic Co-operation and Development. (2020). Improving school quality through educational infrastructure planning. OECD Publishing.
- [19] Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., ... Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, 372, n71. <https://doi.org/10.1136/bmj.n71>
- [20] Schneider, M. (2002). Do school facilities affect academic outcomes? National Clearinghouse for Educational Facilities.
- [21] Shohet, I. M., & Lavy, S. (2004). Healthcare facilities management: State of the art review. *Facilities*, 22(7/8), 210–220. <https://doi.org/10.1108/02632770410547530>
- [22] Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, 104, 333–339. <https://doi.org/10.1016/j.jbusres.2019.07.039>
- [23] UNESCO. (2021). Reimagining our futures together: A new social contract for education. UNESCO.
- [24] van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, 84(2), 523–538. <https://doi.org/10.1007/s11192-009-0146-3>