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# Developing a framework on school resilience for risk-informed decision-making

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ABSTRACT

The Sendai Framework for Disaster Risk Reduction (SFDRR) 2015–2030 pursues the goal of preventing new risk, reducing existing risk, and managing residual risk through integrated and multi-sectoral interaction. It considers educational infrastructures pivotal, with the framework promoting resilient educational facilities as a global target for 2030. Schools, being a critical infrastructure, are crucial for building resilient cities and forming safe shelters or evacuation points in emergencies, alongside promoting a disaster risk curriculum. Asian countries have experienced multiple hazards and cascading risk patterns of climate change in the last few decades. Many countries such as India and Japan have generated school safety policies and disaster risk reduction plans for attaining the efforts of various frameworks, including SFDRR. While effective policies prevail, inefficient interoperability and disaggregated platforms result in poor ground-level management, such as in schools in hazard-prone areas. Past Incidents such as the 2004 Kumbakonam fire incidence, 2011 East Japan Earthquake, and Tsunami affecting schools point out the need of focusing on risk-informed school selection and planning rather than contemporary syllabus-based school selection.

The study aims to develop a 'School Selection Framework', which analyses extrinsic and intrinsic factors associated with school selection and safety, such as academic aspects, physical, human resources, and natural conditions. The methodology involves an integrative literature review on parental school selection, school safety, and resilience indices. It further identifies significant dimensions and indicators of school selection and safety to generate a conceptual framework for risk-informed school selection. The evaluation of articles based on the content analysis resulted in 18 significant dimensions contributing to school selection and school safety that was used to generate a conceptual framework for risk-informed decision-making. The study's outcome is to enhance the school selection process by mitigating the gap between the education system and disaster management, prompting the stakeholders to improve student safety.

## 1. Introduction

Climate change-induced disaster risk patterns, have been challenging the sustainable life of communities and have been promoting widespread damages and inequalities [1]. Centre for Research on the Epidemiology of Disasters [2] states that the world registered an average yearly loss of 162 billion US dollars during 2008–18(EM-DAT, 2019). The exposure and vulnerability to disasters have increased, putting more infrastructures at disaster risk. The Asia Pacific Report of 2019 states

that almost 40% of the disaster impacts are in social sectors such as education, and health, resulting in more profound inequalities. These infrastructures form the basis for shelter, rebuilding, and capacity improvement [2].

The education sector is one of the most affected by climate change-induced disasters [2]. Schools accommodate a vast, vulnerable child population and act as a significant facility for emergencies and capacity building. Various hazard risk patterns highly challenge Asian countries such as India because of geographic positioning and anthropogenic

reasons. This is significant as the region has one of the highest student populations in the world and has a history of student casualties during disasters such as the Gujarat Earthquake in 2001, the Kashmir Earthquake in 2005, and the 2011 floods of Pakistan [2]. Aside from short-term casualties and damages, these disasters have long-term effects on children. These promote absenteeism and long-term disruptions in the education delivery that eventually affect the children. The Sendai Framework for Disaster Risk Reduction thrusts on the importance of multi-hazard resilient educational infrastructures and identifies them as a significant driver for disaster risk management. Various measures involving identification, strengthening through investments, and programs are encouraged as a part of risk reduction measures [1].

While SFDRR thrust on risk-informed decision-making, conventional parental school selection/assessment studies suggest that school choice/decision-making is pivoted on academic aspects such as academic performances and curriculum [3], with less or no thrust on the growing concerns of disasters and climate change. This pattern of school selection is mainly characterised by poor knowledge or unavailability of comprehensive data sources concerning school selection and disaster resilience aspects resulting in poor decision-making. It eventually regulates the risk patterns and results in large-scale casualties as the vulnerable community is exposed to a hazardous environment under the pretext of better education. Past incidents of disasters in schools, such as the 2001 Gujarat earthquake, India points out the need to focus on school safety and curricula.

To address this existing gap in knowledge issue, the researchers have advocated literature-based research whereby significant studies are analysed for the parental school selection and school disaster resilience parameters to generate a conceptual framework for risk-informed school selection that would address both the school academic and school safety aspects. To solve the research problem, the authors have devised three key objectives for the study. They are:

- To carry out a detailed literature review to understand factors of school selection by parents
- To carry out a detailed literature review to understand school disaster resilience factors, and
- To generate a conceptual framework of significant indicators to guide risk-informed decision-making on school selection

## 2. Research methodology

The study follows an integrated literature review method [4] and deduces significant factors to address the aim of the study. The integrative literature review is a method that summarises past theoretical research to provide more comprehensive learning of a particular phenomenon or problem. The review involves problem identification, literature search, data evaluation, and analysis, finally presented as conclusions (ibid). The authors focused on two aspects of the study, school selection and school resilience, whereby integrative literature assessment of scholarly articles from 'Google Scholar' and 'Science Direct' search engine databases was used for data collection. The study was designed based on the following questions

- 'What are the significant factors influencing the selection of schools by parents?'
- 'What are the significant factors influencing the school disaster resilience?'

To address these questions, the researchers selected keywords such as school selection, parent-school choice, school disaster resilience etc., and searches were carried out in the aforementioned databases. Due to the large pool, advanced search options were used in respective search engines to filter insignificant literature. For Google Scholar, the researchers used the terms ("allinthetitle school selection", "allinthetitle parent school choice"-medical, university, B-school, dental),

("allinthetitle school disaster resilience", "allinthetitle school safety (with at least one of the words "disaster, "allinthetitle comprehensive school safety). For Science Direct' the researcher used advanced search options ("Title school selection", Title "school choice", Title "School safety", "School disaster resilience") were used for data collection. The final result comprised a total of 883 articles. These articles were further evaluated based on the abstract and contents to select the relevant research studies on parental choices and disaster resilience concerning schools. All studies that did not examine the influencing aspects concerning parental school selection and disaster resilience based on the results were excluded from the study. The final consisted of 59 research works, including 11 additional grey reports on school selection and school disaster resilience, which were selected through purposive sampling. The researchers utilised content analysis to identify the recurring dimensions and indicators for generating a comprehensive school selection and a disaster resilience table comprising dimensions and indicators. The selected pieces of literature are reviewed and analysed through the content analysis technique to generate the overall conceptual framework under the background of school selection and school resilience. The overall details of the literature review are discussed below in Table 1:

## 3. Literature review on parental school choices/ selection

School infrastructures are a significant part of nation-building, as countries such as India have seen tremendous growth in the school infrastructures and student population over the years [5]. While these growth patterns occur, the selection of schools in rural and urban households has been regulated by various factors. Parents play a significant role in the decision-making, which has implications for the health and wellbeing of the student community.

The parental choices are dependent on various factors and need a comprehensive literature review to understand the relevant aspects. The main objective of the research was to carry out a detailed literature review to understand the factors of school selection by parents. The major sub-objectives were

- To identify significant literature on parental school choices
- To analyse the significant factors contributing to the selection of schools by parents based on content analysis to generate the dimensions and influencing indicators

To analyse the factors influencing the school selection by parents, the researchers advocated a detailed literature review, the details of which are discussed below.

### 3.1. Discussions

Based on the content analysis, the researchers identified eight significant dimensions that play a significant role in the school decision-making by parents. The dimensions include School Academic

**Table 1**
Literature review process.

| Method | • Integrative literature assessment |
| --- | --- |
| Data collection and analysis | • Scholarly articles: Total of 883 |
| | • Selected from Google Scholar and Science Direct Databases |
| | • Using advanced search options used to filter insignificant literature |
| | • Evaluation based on the abstract, contents and indicator-based studies |
| | • Final 59 literature studies were selected and reviewed based on content analysis to generate critical dimensions and indicators |
| Result | • A conceptual framework for risk-informed school selection |

Performance, Teaching Staff Quality, Location and Transportation, School Environment, Socio-economic-cultural background, School Program and Features, Parents-Teachers Relations and Public and peer opinions. Fig. 1 below shows the number of repetitions of each dimension as per the content analysis. The most recurring aspect was the School's Academic Performance, and the least recurring were parents-teachers relations and public opinions.

From the literature study, the researchers conclude that the most influential dimension concerning parental school selection is **'School Academic Performance'** [6,7,8]. Parents correlate 'good schools' with good academic performances that are indicated by the scores in SAT/ Terminal examinations and influence their school selection process [9,7,8,3]. Studies such as [10] suggest parents also value school achievements at national, international and regional levels as a significant indicator of school academic performance, which seems to influence their decision-making.

**Teaching Staff Quality,** determined by the availability of experienced teaching faculties, is another essential dimension in parental school selection studies [11,12]. The parent community considers 'good teachers' to have a major impact on students' educational quality [6]. Various sub-indicators, such as the availability of teachers with over 11 years of experience and the presence of teachers with post-graduate and higher qualifications, are also influential in the school selection process, as per the literature study [8]. Another primary dimension is **Location and Transportation**. Parents tend to choose schools based on the location and travel time, as these could influence the student's education considering the travel time spent [13] [14]. Studies suggest that parents view accessible location and transportation as an essential aspect of student safety [7]. Studies suggest that parents look for school at strategic locations so that it could promote safe travel, and student safety from traffic [7].

The **school Environment** Dimension, characterised by the natural, physical, and emotional environments, plays a significant role in school selection. Various indicators such as a safe and clean environment, adequate facilities, conducive classroom environment indicated by teacher-student relations, care, and disciplinary actions play a significant role in the decision-making, as these help in the overall progress of students, both academically and socially [11,15,13,3]. Studies suggest that regions of higher crimes, and dangerous suburbs, which indicate poor school environments, deter parental school choice. [6]. Further,

studies suggest that parents focus on the importance of smaller classroom sizes, as they believe it aids student learning. **School programs and features** such as curriculum, cost/fee, extra-curricular activities, and academic activities such as conferences and audience forums play a major role in decision-making [15,16]. Parents tend to choose schools based on the availability of STEM courses, academic opportunities such as academic conferences etc., that can influence the child's academic journey.

**Socio-economic-cultural dimensions** play a significant role in the school selection process. Social aspects such as age, gender, educational status of parent, a sexual affiliation of parents and economic aspects such as household income, number of workers per household, determines the selection of school types as the underprivileged would opt for government institutions (Abbie E. [17]) [18] [19]. Studies such as [11,12] suggest factors such as caste, similar religion, race, inclusivity etc., influence the school choices. Other dimensions such as **Parent-Teachers Relations** and **Public-Peer Opinions** influence parental school selection. Parents look for schools that regularly connect with them through meetings and update them about their children's progress, addressing their concerns and feed-backs [20]. Peer opinions play a major role in shaping the decisions as parents choose schools based on their peer presence [21]. Table 2 shows the compilation of dimensions and indicators from the study.

### 3.2. Inference

The study suggests that parents look for academic outputs, teaching quality, location and school environments for their school decision making. In the case of student safety, the study reveals that it is mostly on transportation and school surroundings for parents and aspects such as school disaster resilience do not influence their decision-making, indicating the disconnection between school disaster resilience and parental choices. This could be due to the lack of awareness among the parent community or the unavailability of comprehensive school selection frameworks, which eventually results in poor decision-making by parents, who are the most influential aspect of the education system. As indicated, there is a need for bridging the gap. The authors have subjected a literature study on school disaster resilience to identify and analyse the significant indicators.
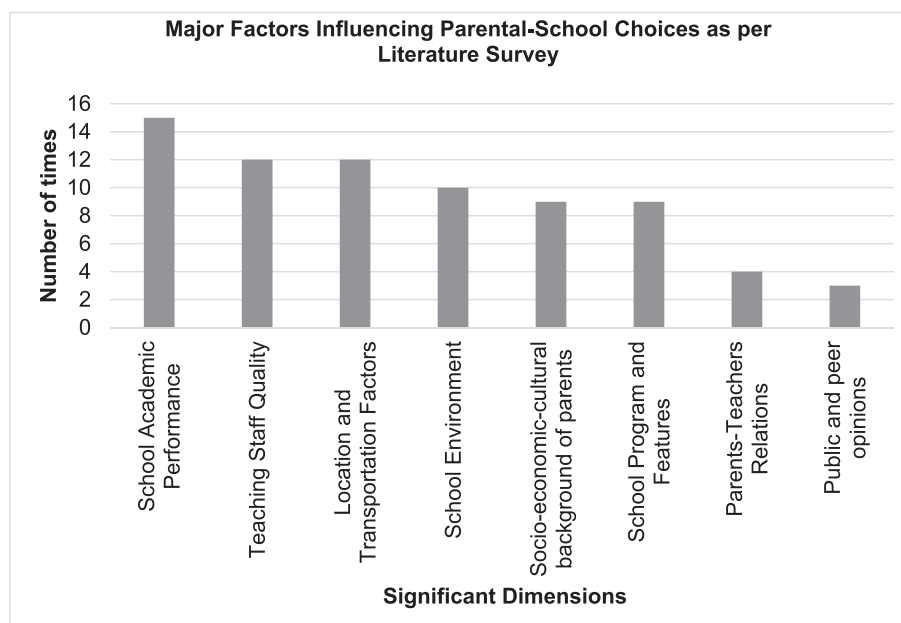


**Fig. 1.** Influencing dimensions in parental school selection.

**Table 2**

Final dimensions and indicators as per the literature study.

| Dimension | Indicators as per literature review |
|---|---|
| School academic performance | • SAT scores, Progress test scores or Terminal Examination<br>• Performances/Academic Achievements at State, National and International levels |
| Teaching staff quality | • Faculty qualification (Master's, Bachelors)<br>• Experience (More than ten years, Entry level, Senior level) |
| Location and transportation | • Transport Availability (School Bus/ Public Transport)<br>• Distance and Travel Time |
| School environment | • Safe social and natural environment (Clean environment, safe, and crime-free location)<br>• Physical and Technological Facilities (Recreational facilities such as playgrounds and technologies such as Wi-Fi)<br>• Conducive classroom environment (teacher-student relations, batch size, student-teacher ratio),<br>• Disciplinary policies |
| Socio-economic-cultural dimension | • Socio-Economic Aspects (Age, education of parents, Workers per household, wealth/income, gender, Sexual Identity of students or parents)<br>• Cultural (Religion, caste, race) |
| School program and features | • Curriculum (Courses, Language/ Medium of Communication)<br>• Cost/fee,<br>• Extra-curricular activities,<br>• Academic activities such as conferences |
| Parents-Teachers relations | • Meetings, Progress updates, parents' feed-back |
| Public and peer opinions | • Information from friends and relatives |

Source- Compiled from the study.

## 4. Literature review on school disaster resilience

In the field of disaster management, resilience refers to the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions (UNDRR). Like parental choices, a detailed literature review was carried out to understand factors affecting school disaster resilience dependent on several factors. The major sub-objectives were

- To identify significant literature on school disaster resilience,
- To analyse the significant factors contributing to the school disaster resilience based on content analysis to generate the dimensions and influencing indicators

## 5. Discussions

Based on the content analysis, ten significant dimensions have been identified that play a significant role in school disaster resilience. The dimensions include physical condition, institutional issues, disaster education, natural condition, human resources, external relationships, psychosocial aspects, health and hygiene, transportation safety and cyber safety. Fig. 2 below shows the number of repetitions of each dimension as per the content analysis. The physical condition and institutional issues were the most recurring dimension in the school disaster resilience studies, whereas cyber and transportation safety are the least recurring dimensions.

**Physical condition** is the prime indicator of school disaster resilience. It is primarily seen as the condition of the school building as it has a direct impact on the overall functioning of the school and the continuation of education during a disaster. [22]. Physical condition has two key elements – structural elements and non-structural elements. Structural elements look into the quality of the construction, adherence to appropriate building codes, provision of emergency exits, the appropriate size of corridors and staircases, and appropriateness to physically challenged people. [22] [23]. Non-structural elements look into electrical installations, gas installations, non-structural mitigation measures carried out in libraries, laboratories, offices and classrooms, such as fixing and securing almirahs, shelves, blackboards, ceiling fans, coolers, water tanks etc. [24,25] to the walls or floor and keeping corridors and staircases clear of obstruction.

**Institutional Issues** covers the arrangements mainly made at the institutional level regarding disaster management planning and preparedness in the school. It involves the availability of an updated School Disaster Management Plan (SDMP), hazard, vulnerability and capacity assessment (HVCA), disaster management organisation/committee and teams, emergency evacuation planning, demarcation of assembly points, availability of emergency alarm/fire alarm, fire safety equipment, First Aid Kits, the conduct of mock drills, CCTV surveillance, and provision of disaster management funds. [23] (Shaw and Shiwaku, 2015). Selecting a
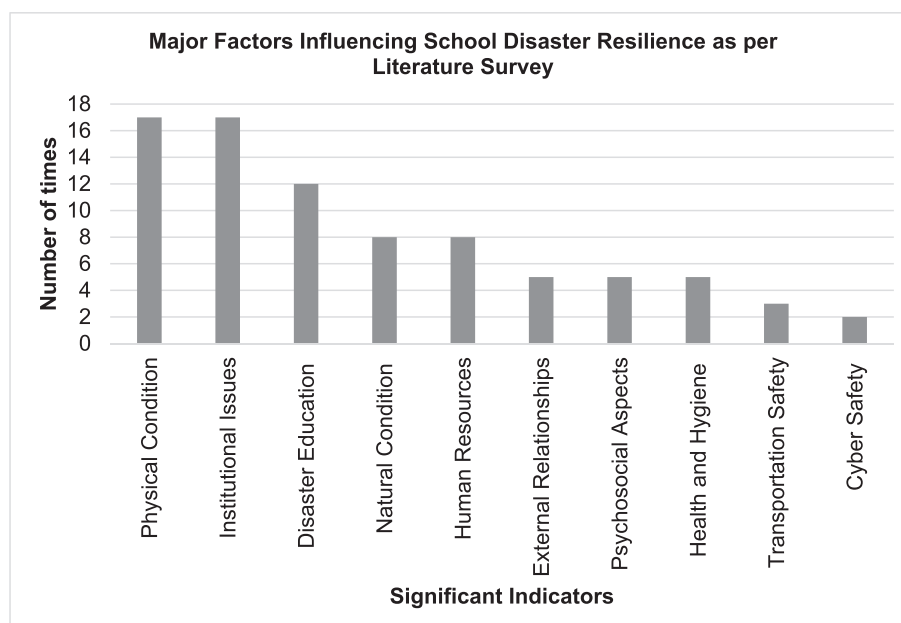


**Fig. 2.** Influencing dimensions in school disaster resilience.

site for establishing a school often considers **natural conditions,** especially the exposure of an area to different hazards. Natural conditions consider the frequency and severity of hazards in the school's area and their impact on the school. It also considers the surrounding environment, how far the school is from industrial areas, and harmful chemical exposure. [26,27,23,22].

**Disaster education** involves integrating disaster risk management (DRM) in the school curriculum, where disaster management is being taught as part of the curriculum in the schools and the availability of materials for teaching DRM. [28,29,22]. It also involves disaster management training and capacity building activities at the school level. **Human resources** indicator includes knowledge and awareness among teachers and students about DRM, regular training on DRM where school disaster management plan and its components are also shared among teachers and students, and the involvement of the Parents Teachers Association (PTA).

**External relationships** involve the school's linkages with external stakeholders. It considers collaboration, the relationship of the school to the community, mobilising funds, meeting with education departments and authorities, and liaising with emergency response agencies. [26,30,31]. **Psychosocial aspects** involve physical and emotional harassment, punishment, violence, delinquency, drug abuse, and child labour. [28] [24]. It also sees the efforts made by schools on gender sensitisation and providing a conducive reporting environment to the children. [31,32].

India's National Disaster Management Guidelines on School Safety Policy 2016 provides due weightage to the home-to-school-to-home approach. It defines school safety as "creating safe environments for children starting from their homes to their schools and back." [33]. States in India adhered to the guidelines and considered health and hygiene, transportation safety and cyber safety-critical for school safety. [34]. **Health and hygiene** involve food, safe drinking water, toilets and hygiene facilities. **Transportation safety** includes the protocol for transport facilities, transportation safety guidelines, use of authorised vehicles, and orientation of drivers on the safety of children. [35]. And **Cyber-safety** involves the components of internet security, management of e-waste, awareness regarding the safe use of technology, control over social networking sites, and cybercrimes. Table 3 enlist the identified dimensions and indicators collated from the study:

### 5.1. Inference

The study suggests that school disaster resilience relies upon several factors, including physical condition, institutional issues, disaster education, natural condition, and human resources being the key. From the parents' perspective, the overall school building as an infrastructure influences school choices; however, the safety concerns are more important. Similarly, while assessing the school curriculum, integration of disaster risk management is equally important. Overall, the studies that referred to school disaster resilience showed that the concept of disaster resilience is more associated with the academicians and practitioners related to disaster management rather than parents. The authors have composed a conceptual framework for risk incorporated school assessment to address both the user groups to bridge this gap.

## 6. Conceptual framework for risk-informed decision-making

The literature study shows that the parental school selection does not consider the disaster resilience aspects. There is a huge gap in promoting an overarching approach for the same. School academics and school disaster resilience have been uncoupled while approaching education mainly because of the lack of awareness among the stakeholders concerning the importance of resilience in academics, especially in the wake of climate change. The authors conceptualised both aspects and presented them in a conceptual framework in Fig. 3 below.

On the one hand, the conceptual framework encompasses key

**Table 3**
Dimensions and indicators as per the literature study on school disaster resilience.

| Dimension | Indicators as per literature review |
|---|---|
| Physical condition | • Structural Element:<br> o Quality of the construction,<br> o Emergency exits with signage<br> o Measures for physically challenged,<br> o Structural safety audits,<br> o Appropriate size of corridors and staircases<br>• Non-structural Element:<br> o Electrical installations,<br> o Gas installations,<br> o Non-structural mitigation measures in libraries, laboratories, offices and classrooms (like almirahs, shelves, blackboards, ceiling fans, coolers, water tanks etc. are secured to the walls or floor),<br> o Corridors and staircases clear of obstruction |
| Institutional issues | • School Disaster Management Plan (SDMP)<br>• Hazard, vulnerability and capacity assessment<br>• Disaster management organisation and teams<br>• Emergency evacuation planning<br>• Demarcated assembly points<br>• Disaster management funds<br>• CCTV surveillance<br>• Designated nodal person<br>• Availability of emergency alarm/fire alarm,<br>• Fire safety equipments<br>• First Aid Kits,<br>• Conduct mock drills |
| Disaster education | • Integration of DRM in School Curriculum,<br>• DRM training and capacity building,<br>• Availability of materials for teaching DRM |
| Natural condition | • Frequency of hazards<br>• Severity of hazards<br>• Surrounding environment<br>• School is far from industrial areas, and harmful chemical exposure etc. |
| Human resources | • Knowledge and awareness of DRM among teachers and students<br>• Regular training on DRM<br>• Sharing of school disaster management plan<br>• Involvement of Parents Teachers Association (PTA) |
| External relationships | • Collaboration<br>• Relationship of school to community<br>• Mobilising funds<br>• Meeting with education departments and authorities<br>• Liaising with emergency response agencies |
| Psychosocial aspects | • Physical and emotional harassment<br>• Punishment<br>• Violence<br>• Delinquency<br>• Drug abuse<br>• Child labour<br>• Gender sensitisation<br>• Conducive reporting environment |
| Health and hygiene | • Food,<br>• Safe drinking water<br>• Toilets<br>• Hygiene |
| Transportation safety | • Protocol for transport facilities,<br>• Transportation Safety Guidelines,<br>• Use of authorised vehicles,<br>• Orientation of drivers |
| Cyber safety | • Internet security<br>• Management of E-waste<br>• Awareness regarding secure use of technology<br>• Control over social networking sites<br>• cyber crimes |

indicators of disaster resilience and the other academic assessments. All 18 indicators, 10 of disaster resilience and eight of academic assessment, together bring synergy to promote safety education and quality education. While looking at school academic performance, parents can also look at the school's achievements in adhering to the safety standards. While looking at the school programme and features, they can enquire to
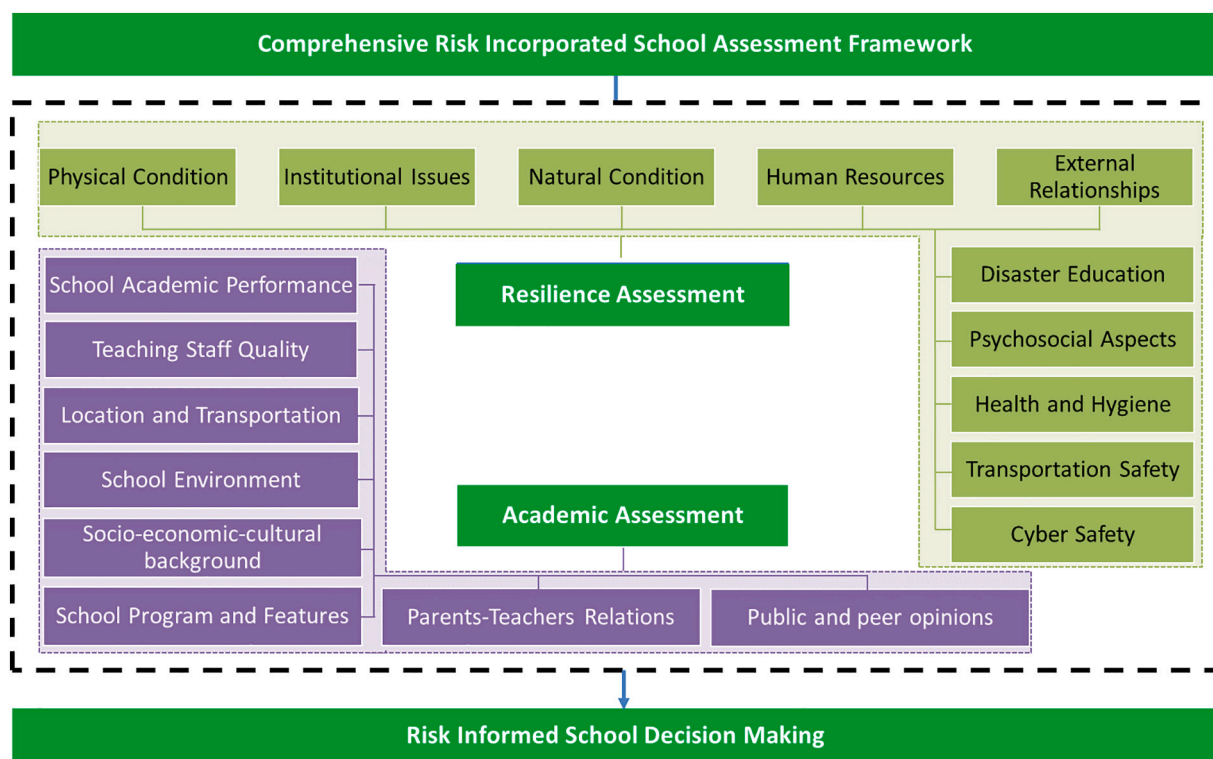
**Fig. 3.** Conceptual framework for risk-informed decision-making.

what extent the school encourages the integration and teaching of fundamentals of disaster risk management in the classrooms. Few components of physical condition, natural condition and school environment are more interlinked to each other where parents can emphasise not only structural and non-structural factors associated with the school building and school premise at large but also the surrounding areas where the school is located. The school's external relationships govern Parents-teacher relations and public and peer opinions. It is linked to the concept of school-community where both school and the neighbouring community share a symbiotic relationship and benefit from each other, especially in times of disaster.

## 7. Discussion

The study addresses the critical challenges associated with school selection and school safety, which stakeholders primarily understated in the academic sphere. Firstly, the integrative literature review suggests that parents are biased in their assessment concerning the schools for children. Parents, who are the choice makers concerning the schools, primarily focus on the school's key academic dimensions, such as performances in terminal examinations and available faculty, with less thrust on indicators relevant to disaster resilience and community engagement. This is evident mainly by the frequency of dimensions such as parent-teacher relations, school environment compared to academic performances, and teaching staff quality. Besides, the concept of safety in the case of school selection aspects is primarily focused on transportation, and crime-related safety, which forms a minuscule of the school safety, as per the authors. This has generated a scenario where schools function without much focus on disaster resilience, thereby creating vulnerable conditions for school children in India [36]. The research community seems to have taken less interest in formulating policies about this existent gap. The authors could not locate research articles that addressed these two aspects concurrently.

India, which is a hotspot for climatic hazards, may require more research in the field to support its 200 million-plus population enrolled

at schools. This is essential as most schools do not even have functional fire safety systems [36]. The issue could be resolved by associating with significant partnerships among agencies involved in disaster risk reduction. Such as national and local disaster management agencies, fire safety departments and engineering cells of the education department, etc., whereby efficient planning concerning school safety, alongside school academics, is promoted. The above-formulated framework (Fig. 3) could be utilised to carry out awareness programs. The framework envisages promoting a common platform for various agencies to achieve the common goal of a safe and secure education. Secondly, the disaster resilience assessment concerning schools showcases that most studies focus on physical condition, institutional issues, disaster education, etc. This involves intrinsic factors such as building safety and fire system management to extrinsic factors such as external relationships with disaster management agencies, the presence of hazardous industries nearby, etc. While the emerging challenge associated with cyber security is discussed barely in most of the literature, there is a growing need for supporting policies in the field. This is essential as the students encounter a digital world where cybercrimes could form the basis for large-scale cyber disasters. Students and parents should be educated on the protocols and instruments for promoting adequate cyber security, such as child lock systems, as these would help generate resilience towards cyber disasters. This could also address the goal of NDMA of "the creation of safe environments for children starting from their homes to their schools and back." The study showcases that while the need for a more comprehensive assessment of schools, no critical framework has dealt with the issue so far, as per the literature study.

Therefore, the authors have formulated a conceptual framework for risk-informed decision-making that addresses both the school academics and resilience altogether, creating pathways for further research on the tools and instruments that help generate a better school grading, thereby empowering the goal of a safe and secure education. The framework has been worked out to support the present demands for parents and disaster management authorities, whereby emerging issues such as cyber security are also incorporated. Besides, the framework has opened ways of

incorporating public integration through promoting dimensions that will ensure the critical engagement of the community and other stakeholders under various aspects of school selection and resilience, such as a novel curriculum based on disaster resilience, and so on. The framework can eventually form the basis for research and policies for achieving the goals of SFDRR, 2015.

## 8. Way forward

It is evident from the study that traditional approaches related to school selection and disaster resilience could result in poor school choices. The study draws a key conclusion on the current state of research in school selection and resilience and has worked out to address the disconnection in the research by formulating a conceptual framework for risk-informed decision-making. The framework can be supported by successive research that would generate tools and instruments for school academics and resilience assessment, thereby forming the scientific basis for promoting policies for the effective management of the school infrastructures. As a way forward, the authors suggest generating a comprehensive assessment based on the framework, addressing the key concerns of parents and other stakeholders. This could formulate the key challenges of the current school infrastructure. The outcome would further form the basis of the key policies and programs that administrative departments for social resilience undertake and can influence the overall attitude of the community and school authorities. This can also reveal the correlation between academic quality and school safety. However, it requires a concerted effort, backed by administrative measures to support such studies, and policymakers should assist the community and the school authorities in achieving the target.

## 9. Limitations of the study

The study focuses on generating the indicators and conceptual framework primarily based on secondary literature and can be influenced by local parameters, policy and institutional arrangements in action. The framework has the scope of contextualising it based on the need and local parameters institutionalising school education and disaster resilience. The authors also believe that it may contribute to a discussion on grading a school based on its resilience to climate-related disasters and academics. In the future, the results of the comprehensive risk-informed school selection framework need to be linked to societal action planning and analysis for effective disaster management.

## CRediT authorship contribution statement

**Vipul Kumar Nakum:** Methodology, Data curation, Writing – original draft, Software, Validation, Visualization, Investigation, Writing – review & editing. **Muhammed Sulfikkar Ahamed:** Methodology, Data curation, Writing – original draft, Software, Validation, Visualization, Investigation, Writing – review & editing. **Saki Isetani:** Data curation, Writing – original draft, Software, Validation, Visualization, Investigation, Writing – review & editing. **Ranit Chatterjee:** Conceptualization, Supervision, Writing – review & editing, Methodology. **Rajib Shaw:** Conceptualization, Supervision, Writing – review & editing, Methodology. **Hanae Soma:** Data curation, Writing – original draft, Software, Validation, Visualization, Investigation, Writing – review & editing.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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