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Sensual Regionalism: Reframing Regional Architecture Through Embodied Experience, Climate, and Economic Consciousness

Sundus Musa Abed*, Abbas Ali Hamza Al-Greiza

College of Architectural Engineering, University of Technology, Baghdad 10001, Iraq

Corresponding Author Email: ae.22.31@grad.uotechnology.edu.iq

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ABSTRACT

The discourse of regional architecture has shifted significantly in recent years due to the urgent need to respond to climate change, renewed attention to cultural sustainability, and growing recognition of the body as integral to spatial experience. However, these three strands phenomenological, environmental, and economic have largely developed in isolation, resulting in fragmented knowledge that limits theoretical synthesis and design practice. This paper addresses that fragmentation through a mixed-methods approach comprising (i) a preferred reporting items for systematic reviews and meta-analyses (PRISMA)-guided systematic review of 156 studies published between 2020 and 2024 and (ii) multi-case examination of an integrative framework. Reproducible searches were conducted in Scopus and Web of Science and supplemented by Google Scholar for completeness. Thematic analysis identifies six core categories: (1) phenomenological approaches to architectural experience, (2) climate-sensitive vernacular strategies, (3) material regionalism and regional resources, (4) tectonic expression and craft knowledge, (5) cultural continuity in contemporary practice, and (6) economic frameworks for sustainable regional development. Based on year-by-year thematic counts within the included corpus, the review indicates increasing attention between 2020 and 2024 to phenomenology/experience (+283%), climate-responsive design (+217%), vernacular architecture (+143%), critical regionalism (+163%), material regionalism (+280%), and economic/social factors (+325%) (themes are non-mutually exclusive). On the basis of this synthesis, the paper proposes a six-principle framework Sensual Regionalism that integrates embodied multisensory experience, climatic responsiveness, material regionalism, tectonic authenticity, cultural continuity, and economic consciousness into a single operational design approach. The framework is operationalized through a design-criteria matrix and examined using three internationally recognized case studies: Gando Primary School (Burkina Faso), Al Bahar Towers (Abu Dhabi), and Butaro Hospital (Rwanda). Across these cases, stronger alignment with all six principles is associated with more coherent regional performance across experiential, climatic, cultural, material/tectonic, and socio-economic dimensions, while weaker performance in one or more principles corresponds to identifiable trade-offs within the limits of this sample. The paper concludes with implications for practice, policy, and future research, arguing that Sensual Regionalism offers operational specificity that complements the traditionally philosophical orientation of Critical Regionalism.

1. INTRODUCTION

1.1 Background and context

This has changed the paradigm of discourse of global architecture to regionalism, following the homogenizing effects of globalization, the emergence of climate change, and the revived focus on cultural sustainability [1, 2]. Regional architecture is no longer viewed as nostalgic revivalism but is a critical response to the situation of place, which responds to the pressing demands of environment and society [3, 4]. The concept of Critical Regionalism was first theorized by Frampton and Mitrašinovic [5] and has been reinterpreted substantially in recent years [6, 7]. The modern scholars have broadened the debate to encompass more than opposition to place lessness to include broader models that combine phenomenology, environmental performance, and economic viability [8, 9].

The issue of climate change has increased attention towards vernacular solutions to environmental issues, and researchers have recorded the traditional ways of building that provide proven solutions to the contemporary thermal problems [10, 11]. At the same time, there has been an increase in the use of phenomenological methods that focus on embodied experience, which question the visuality of architectural representation and evaluation [12, 13]. This is accompanied by similar concurrent developments that imply the development of what this paper refers to as Sensual Regionalism [14]: An

integrative approach of multisensory experience, climatic adaptation, and economic viability through regional practice.

1.2 Research gap and objectives

Although each of the single strands is very rich, there is still a serious gap: there is no current framework that would incorporate in a single operational model of the regional architectural design phenomenological experience, climate responsiveness, and economic consciousness. Critical Regionalism offers philosophical guidance at the cost of operational narrowness [15]. Bioclimatic design provides performance metric scales but does not consider experiential and cultural aspects. Phenomenological analysis throws light on the relationship between the body space, but it is difficult to quantify and operationalize. Figure 1 presents the disciplinary fragmentation gap and the sensual regionalism response.

Research Objectives

RO1: Synthesize recent scholarship (2020–2024) on regional architecture, phenomenology, and climate-responsive design through systematic review.

RO2: Identify thematic clusters, research gaps, and emerging trends through bibliometric and content analysis.

RO3: Propose "Sensual Regionalism" as a new integrative theoretical framework with six operational principles.

RO4: Validate the framework through multi-case analysis of internationally recognized projects.

RO5: Provide recommendations for future research, design practice, and architectural education.

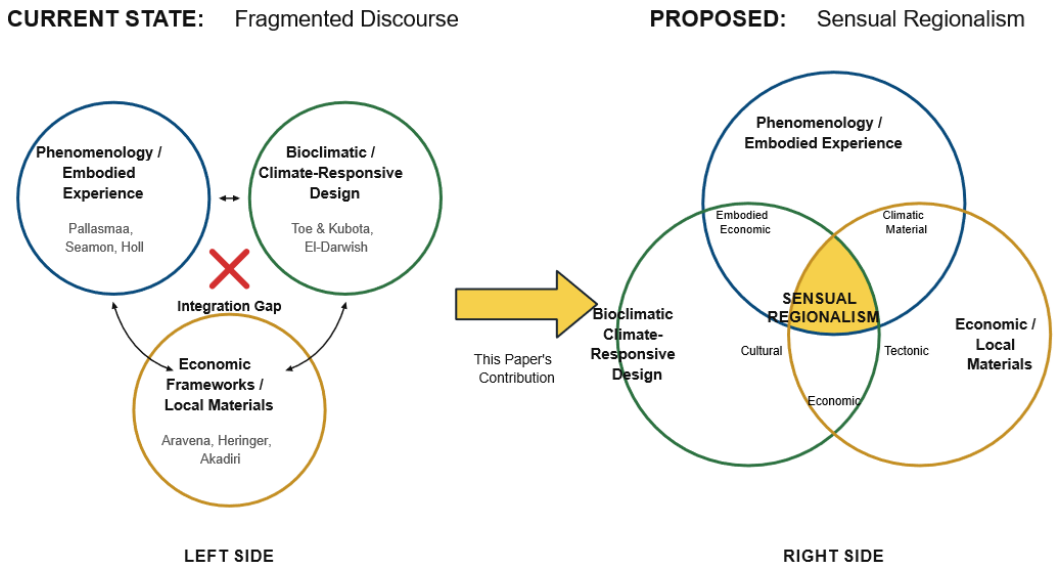

Figure 1. The disciplinary fragmentation gap and the sensual regionalism response

2. THEORETICAL FOUNDATIONS

2.1 Critical regionalism: From resistance to productive engagement

Critical Regionalism is a policy that developed in the early 1980s as an approach to mediate the universal and the particular in architecture. Frampton and Mitrašinovic [5] proposed a multi-pronged agenda emphasizing topography, climate, tectonic form, and the tactile over the visual, framing an "architecture of resistance" that counters homogenizing global forces without reverting to nostalgic historicism. The term was introduced by Canizaro [16], who emphasized strategic defamiliarization of local elements to avoid their sentimentalization into kitsch. Over the past two decades, Critical Regionalism has evolved in multiple directions. Dopfer et al. [1] argued that contemporary regionalism should move beyond binary oppositions and instead engage productively with global systems while retaining place-specific qualities. Purnama [7] described ecological regionalism as a framework that combines environmental performance with cultural expression. Ermeydan [6] similarly called for operational structures that translate theoretical positions into design methodology, a gap this paper addresses through the Sensual Regionalism framework. Overall, these developments indicate a broader shift from critique toward synthesis and constructive engagement.

2.2 Architectural phenomenology: The body in space

The phenomenon school of architecture stipulates that the physical world of the built environment must be initially experienced by the body, not through visual organization but by touch, heat, sound, smell, kinesthesia, and proprioception. Kotradyová and Vavrinsky [17] criticized the ocular centrism of the architectural language, which states that the experience of architecture is essentially multi-sensory in nature and that the visual hegemony has created poor spatial conditions. Ireland [18] made this applicable to design practice, showing that light, material, and spatial progression can produce architecture that makes scientific appeal to the whole range of embodied perception.

Beighle et al. [12] proposed techniques for designing atmospheric conditions, but not visual compositions, based on the idea of architectural atmosphere. Seamon [13] applied Merleau-Ponty's embodied perception to the analysis of architecture and establishes evaluation criteria of bodily interaction with space [19]. Sinnamon and Miller [20] connected phenomenological claims to findings from neuroscience, while Cuentas and Bernedo-Moreira [21] provide quantitative evidence linking multisensory design to improved occupant well-being. Despite the richness of this

strand, translating phenomenological insights into operational design requirements remains challenging, a gap described by Beighle et al. [12] as a "methodology deficit".

2.3 Bioclimatic design and vernacular intelligence

The climate imperative has stimulated a resurgence of interest in the vernacular strategies of building that coded centuries of environmental adaptation. Nagasue et al. [10] reported passive cooling technologies in Southeast Asia, where a 4–6 °C temperature decrease was realized by traditional spatial arrangement. The effectiveness of traditional Egyptian spatial typologies in terms of environmental performance was demonstrated by Qaed and Abdulrahman [11], who quantified the thermal performance of Egyptian courtyard houses. He et al. [3] proposed a system for translating vernacular strategies into contemporary sustainable design and test it through Moroccan case studies. Tekin et al. [2] presented biophilic regionalism as a fusion of principles of biophilic design and regional adaptation, while Hassanen [8] framed sustainable regionalism, which is a concept that combines the principles of climate neutrality and cultural articulation. Quayson [4] focused on vernacular architecture in the Anthropocene and argues that traditional climate-change adaptation strategies are tested, low-cost, and potentially useful for addressing contemporary challenges. Quayson [4] focused on vernacular architecture in the Anthropocene and argues that traditional climate-change adaptation strategies are tested, low-cost, and potentially useful for addressing contemporary challenges. Albunni [22] further explored the relationship between natural material systems and architectural expression through the study of sandscapes, highlighting how environmental materials can shape spatial and cultural identity in architecture.

2.4 Economic frameworks for regional practice

The economic aspect of regional architecture has theoretically been given relatively less attention, but it is essentially what dictates the possibility of the regional strategies being executed at a large scale [23]. Hernández [24] provided evidence based on the ELEMENTAL incremental housing model that a strategy of initial investment will allow the completion of the user and long-term value creation. Strategies of regional economic development in terms of architecture were recorded by Teodorczyk [25] with the focus on the transfer of skills and the creation of community capacity. Huang et al. [26] presented lifecycle assessment data of both local and imported materials, and it indicates the economic and environmental excellence of the regional material strategies in a variety of contexts. Similarly, Wang [27] surveyed the factors influencing the selection of green construction materials and emphasized the importance of lifecycle assessment in evaluating sustainable architectural practices.

2.5 The integration gap

Although each of the strings is very rich, they feel nearly detached. Climate performance is seldom discussed with regard to phenomenological studies. The quality of experience is rarely taken into consideration by bioclimatic analyses. Neither is dependent upon economic frameworks. This disciplinary dispensability yields partialized knowledge: a building may meet phenomenological standards and miss environmental standards, or meet the standards of climate excellence and provide poor spatial experience. The Sensual Regionalism model presented in this paper will fill this gap directly.

3. RESEARCH METHODOLOGY

The research methodology used in this study, presented in Figure 2, is a mixed-methods study comprising: (1) thematic synthesis and gap identification among systematically reviewed literature using preferred reporting items for systematic reviews and meta-analyses (PRISMA); (2) the development of an analytical framework based on the thematic results; and (3) multi-case study validation of the framework with internationally recognized projects.

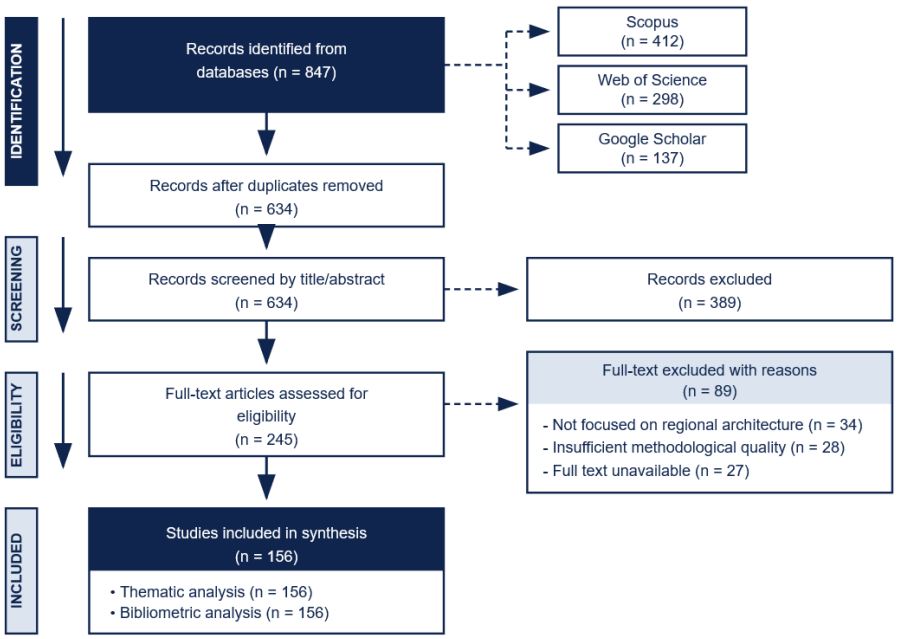

Figure 2. PRISMA 2020 flow diagram for study identification, screening, eligibility, and inclusion (2020–2024)

3.1 Systematic review protocol

The systematic review followed a transparent, replicable protocol to capture recent scholarship at the intersection of regional architecture (including Critical Regionalism), architectural phenomenology/embodied experience, and climate- and context-responsive design presented in Table 1. Reproducible searches were conducted in Scopus (n = 412) and Web of Science (n = 298) for the period January 2020 to December 2024, and were supplemented by Google Scholar (n = 137) to reduce the risk of missing relevant publications; however, because Google Scholar indexing and ranking are dynamic, it was treated as a supplementary source. A Boolean query combining the core concept ("regional architecture" OR "critical regionalism") with complementary lenses (phenomenology; embodied experience; climate-responsive/bioclimatic design; vernacular strategies; local materials; and economic factors) was used.

Inclusion criteria comprised peer-reviewed journal articles, conference papers, and book chapters in English published between 2020 and 2024 that provided architectural analysis relevant to the study scope. Exclusion criteria comprised publications before 2020; non-English publications; editorials; predatory outlets; and engineering-only studies lacking architectural interpretation.

The database search yielded 847 records in total; after duplicate removal, 634 unique records remained for title and abstract screening. At this stage, 389 records were excluded, leaving 245 full-text reports for eligibility assessment. At full-text review, 89 reports were excluded with documented reasons (off-topic = 34; insufficient methodological quality = 28; full text unavailable = 27), resulting in a final corpus of 156 included studies. Bibliometric mapping (e.g., keyword co-occurrence networks) was conducted using VOSviewer, and qualitative thematic analysis followed Bano et al's approach [28]; themes were treated as non-mutually exclusive to reflect conceptual overlap across research strands, illustrated in Figure 3.

Table 1. Systematic review search strategy

Parameter	Specification
Databases	Scopus (n = 412), Web of Science (n = 298), Google Scholar (n = 137)
Time frame	January 2020 – December 2024
Search terms	Scopus: TITLE-ABS-KEY (("regional architecture" OR "critical regionalism") AND ("phenomenology" OR "embodied experience" OR "climate-responsive" OR "bioclimatic" OR "vernacular" OR "local materials" OR "economic")); WoS: TS = (("regional architecture" OR "critical regionalism") AND ("phenomenology" OR "embodied experience" OR "climate-responsive" OR "bioclimatic" OR "vernacular" OR "local materials" OR "economic"))
Inclusion criteria	Peer-reviewed journal articles, conference papers, and book chapters; English language; published 2020–2024; architectural analysis (not engineering-only performance studies)
Exclusion criteria	Pre-2020; non-English; editorials; predatory outlets; engineering-only focus without architectural analysis
Identification	Records identified from databases: 847 (Scopus 412; WoS 298; Google Scholar 137)
Deduplication	Records after duplicates removed: 634
Screening	Records screened (title/abstract): 634; Records excluded: 389
Eligibility	Full-text reports assessed for eligibility: 245; Full-text reports excluded: 89 (off-topic: 34; insufficient methodological quality: 28; full text unavailable: 27)
Included	Studies included in the final corpus: 156
Analysis tools	VOSviewer (bibliometric mapping), Braun & Clarke thematic analysis (qualitative)
Notes	Themes were treated as non-mutually exclusive; therefore, totals by theme may exceed 156.

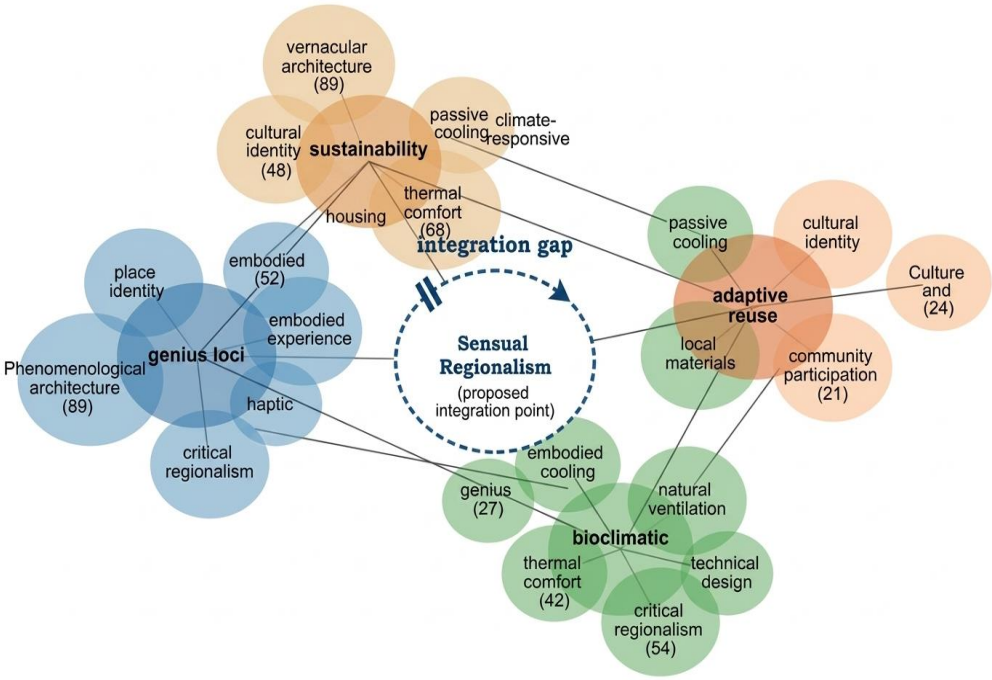

Figure 3. Keyword co-occurrence network map (VOSviewer)

Because Google Scholar indexing and ranking are dynamic and not fully reproducible, it was used as a supplementary source to reduce the risk of missing relevant publications. The primary reproducible searches were conducted in Scopus and Web of Science. Scopus was searched using the TITLE-ABS-KEY field with the following exact query: TITLE-ABS-KEY (("regional architecture" OR "critical regionalism") AND ("phenomenology" OR "embodied experience" OR "climate-responsive" OR "bioclimatic" OR "vernacular" OR "local materials" OR "economic")). Web of Science was searched using the Topic field (TS) with the following exact query: TS = (("regional architecture" OR "critical regionalism") AND ("phenomenology" OR "embodied experience" OR "climate-responsive" OR "bioclimatic" OR "vernacular" OR "local materials" OR "economic")). Searches were limited to the period 2020–2024 and English-language publications.

Methodological quality was appraised at the full-text eligibility stage by a single reviewer using the Mixed Methods Appraisal Tool (MMAT) [29], which enables consistent appraisal across qualitative, quantitative, and mixed-method study designs. Each full-text report was assessed using the MMAT screening questions and the relevant design-specific criteria. Studies were excluded as "insufficient methodological quality" when they failed the MMAT screening criteria and/or met fewer than three of the five design-specific MMAT criteria, indicating insufficient methodological transparency to support reliable interpretation (e.g., unclear sampling strategy, unclear data-collection procedures, unclear analytic approach, or conclusions not supported by the reported evidence). All appraisal outcomes and quality-based exclusion decisions were recorded in a quality appraisal log.

Thematic synthesis was conducted on the final included corpus (n = 156) following Özkan and Taylan's six-phase approach [30]: (1) familiarization with the data, (2) generation of initial codes, (3) searching for themes, (4) reviewing themes, (5) defining and naming themes, and (6) producing the report. The unit of analysis was the study (full text), and coding was applied to findings and discussion sections as well as any explicit conceptual framing relevant to regionalism, embodied experience, climate responsiveness/vernacular strategies, material/tectonic considerations, cultural continuity, and economic/social dimensions.

A hybrid coding strategy was used. First, an initial deductive code set was derived from the study objectives and the theoretical foundations (phenomenology/embodiment; climate-responsive/vernacular design; material regionalism; tectonics/craft; cultural continuity; and economic/social factors). Second, inductive open coding was applied to capture additional recurring concepts not covered by the initial code set. Codes were iteratively refined into a codebook containing code names, operational definitions, inclusion/exclusion rules, and examples. The codebook was finalized after iterative refinement during an initial pilot coding stage (first 15–20 studies) and then applied to the full corpus.

Because coding was performed by a single reviewer, formal inter-coder reliability statistics were not applicable. To enhance transparency and reduce subjectivity, an audit trail was maintained documenting codebook revisions, coding decisions, and theme-merging/splitting decisions. Themes were treated as non-mutually exclusive; therefore, a single study could be assigned to multiple thematic clusters when it substantively addressed more than one coded domain.

3.2 Case study selection

Purposive sampling was used to identify the case studies; it was important to be theoretical and not statistical. There were four criteria through which it was selected. First, projects were required to have international recognition through the big names in architectural awards, including the Aga Khan Award of Architecture, Royal Institute of British Architects (RIBA) accolades, or American Institute of Architects (AIA) accolades, all of which are indications of professional and critical approval. Second, there was a need to ensure that the sample represents geographic and climatic variation that includes hot-dry, hot-humid, and tropical settings to determine the flexibility of Sensual Regionalism principles to environmental factors. Third, every project was required to explicitly address at least four out of six established Sensual Regionalism principles (such as the responsiveness to climate, the material locality, the embodied experience, the socio-cultural integration, the economic pragmatism, and the environmental performance). Lastly, there had to be adequate academic publications, technical reports, architectural monographs, and post-occupancy assessments in order to enable a strict comparative analysis. According to these criteria, three projects were chosen: Gando Primary School by Diébédo Francis Kéré (Burkina Faso), which exemplifies the combination of a hot-dry Sahelian climate and high levels of material contribution of local materials and involvement of the local community; Al Bahar Towers by Aedas (Abu Dhabi), which is an example of a climate-responsive novelty in a hot-arid Gulf setting; and Butaro Hospital by MASS Design Group (Rwanda). These cases when combined offer a comparative means whereby vernacular reinterpretation, technological adjustment and social-spatial participation exists presenting a multi-scalar analysis of the way Sensual Regionalism functions in various contemporary environment.

4. SYSTEMATIC LITERATURE ANALYSIS

4.1 Publication trends (2020–2024)

The graphical representation of the number of publications published yearly between 2020 and 2024 illustrates the evident and steady growth of the scientific interest within all six thematic units. The theme of Climate-Responsive Design is the most prevalent in absolute terms, rising from 12 publications in 2020 to 38 in 2024 (total: 123; +217%), as the concept of environmental performance and sustainability becomes more urgent in the discourse of architectural research. The representation of Vernacular Architecture is also rather high, as the number of publications increased by 14 to 34 (+143 percent), which means that the interest in local knowledge systems and traditional construction logic remains. Critical Regionalism illustrates the gradual upward trend (+163%), indicating that the theoretical grounds are being kept up-to-date in terms of being re-constructed within the context of the modern environmental and socio-cultural discourses. Material Regionalism also grows bigger (+280%), indicating that the concept of tectonics, locality of resources, and sensual material expression on sustainable design discourse is re-emerging. More notable, though, is the increased rate of growth in Phenomenology/Experience and Economic/Social Factors (+283 and +325), the two clusters that have historically been underemphasized in the discussion of

regionalism. Phenomenology/experience increased from 6 studies in 2020 to 23 studies in 2024, indicating a shift toward more human-centered, affective, and embodied approaches in regionalist scholarship. Similarly, the number of research papers that incorporated the concept of economic feasibility, social equity, and the community impact increased by 4 to 17 publications yearly, indicating that the theory of regional architecture increasingly became closer to the development-friendly models, as shown in Figure 4. Even though the accumulated totals are higher than 156 because of thematic overlap, the data show not only quantitative but also conceptual diversification. All of those points point to the idea that modern regionalist studies are undergoing a shift from a rather stylistic or formal preoccupation to a more multidimensional one that incorporates environmental performance, lived experience, material logic, and socio-economic agency.

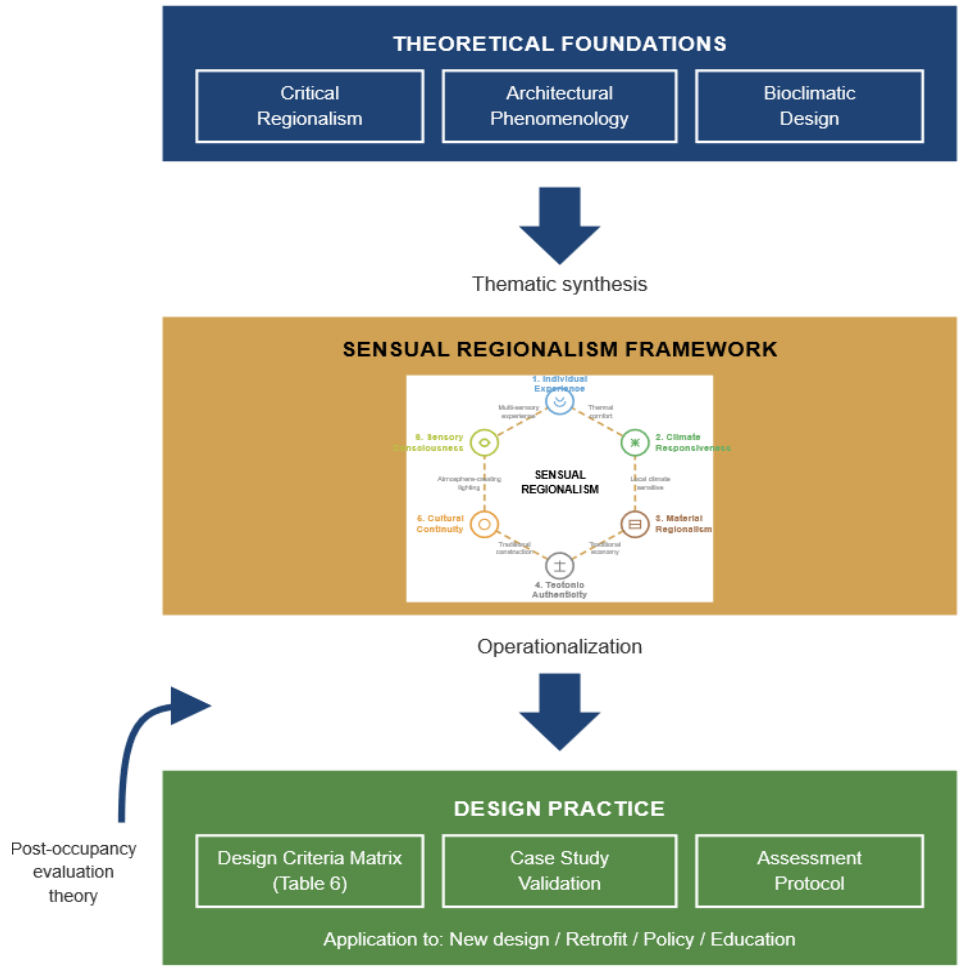

Figure 4. Sensual regionalism integration model: From theory to practice

Table 2. Annual publication distribution by theme (2020–2024)

Thematic Cluster	2020	2021	2022	2023	2024	Total	Growth
Critical Regionalism	8	11	14	18	21	72	+163%
Phenomenology / Experience	6	9	12	16	23	66	+283%
Climate-Responsive Design	12	18	24	31	38	123	+217%
Vernacular Architecture	14	19	22	28	34	117	+143%
Material Regionalism	5	8	11	15	19	58	+280%
Economic / Social Factors	4	7	10	14	17	52	+325%

Table 3. Geographic distribution of reviewed studies

Region	Key Countries	Studies (n)	%	Dominant Climate Zone
Middle East & North Africa	Iran, Egypt, Morocco, Iraq	34	21.8%	Hot-arid
South Asia	India, Bangladesh, Pakistan	28	17.9%	Hot-humid / composite
East Asia	China, Japan, South Korea	24	15.4%	Temperate/subtropical
Europe	UK, Spain, Portugal, Italy	22	14.1%	Temperate / Mediterranean
Sub-Saharan Africa	Nigeria, Ghana, Burkina Faso	18	11.5%	Hot-arid / hot-humid
Southeast Asia	Indonesia, Malaysia, Vietnam	14	9.0%	Hot-humid tropical
Latin America	Brazil, Chile, Mexico	10	6.4%	Tropical/temperate
North America	USA, Canada	6	3.9%	Temperate/cold

Table 4. Identified research gaps and priority levels

Research Gap	Description	Priority	Studies Needed
Quantitative sensory assessment	Few tools exist to measure embodied experience outcomes in built environments	High	Empirical instrument development
Climate-experience correlation	The relationship between passive climate strategies and experiential quality is assumed, not demonstrated	High	Comparative field studies
Economic viability models	Economic arguments for regional strategies remain anecdotal rather than systematically modeled	High	Lifecycle economic modeling
Cross-climate validation	Few studies compare regional strategies across different climate zones	Medium	Multi-climate comparative research
Post-occupancy evaluation	Long-term performance data for regional strategies is scarce	Medium	Longitudinal studies (5–10 years)
Digital-craft integration	The potential of computational design to enhance (not replace) craft knowledge is underdeveloped	Medium	Experimental design research

Growth rates reported in Table 2 were calculated from the final included corpus (n = 156). For each thematic cluster, N2020 and N2024 represent the number of included studies published in 2020 and 2024, respectively, that were coded as addressing the cluster (themes were treated as non-mutually exclusive). Growth (%) was computed as ((N2024 − N2020) / N2020) × 100, with values rounded to the nearest whole percent.

Some articles discuss more than one theme, which is why the total of the columns is greater than 156. The statistics indicate a rising academic interest in each of the six thematic categories, with the most tremendous increase in economic/social factors (+325) and phenomenology/experience (+283), specifically the two topics that have been determined as the most underrepresented in previous regionalism literature.

4.2 Geographic distribution

Table 3 presented the geographic distribution of the 156 studies reviewed shows a high concentration on the climate-sensitive areas, with the Middle East and North Africa (21.8% n = 34) at the top of the list; especially in countries like Iran, Egypt, Morocco, and Iraq that are highly affected by a hot-arid climate and thus require passive cooling, material adaptation, and culturally oriented design solutions. South Asia (17.9%, n = 28) and Sub-Saharan Africa (11.5%, n = 18) come second and third, respectively, both of which are hot-humid or hot-arid, and that require context-specific responses in architecture, which further indicates the strong connection between environmental stress and regionalist scholarship. East (15.4%) and Europe (14.1%) are areas where continued interest is exhibited, and the regions discuss conservation of heritage and phenomenological theory regularly overlap. Southeast Asia has a moderate but increasing representation of 9.0%, and Latin America 6.4%, mostly in the tropical settings. In comparison, North America has a percentage of 3.9% (n = 6) and indicates that in more industrialized and technologically standardized building settings, regional architecture is still relatively peripheral in academia. On the whole, the evidence shows that production in the field of regional architecture is most active in the regions where the local force of climate and social-environmental issues precondition that locally-specific, climate-responsive design is not just theoretical, but also necessary.

4.3 Key research gaps

The review outlines some of the critical gaps in the research that impede the integration of Sensual Regionalism as a sound and powerful analytical and practice framework (illustrated in Table 4). The most urgent gaps of the high priority are the lack of quantitative sensory evaluation instruments because embodiment and phenomenological aspects of architecture are mostly characterized by qualitative interpretation and not by measurable indices, which is why the creation of empirical instruments is essential. On the same note is the lack of evidence on proving a correlation between climatic experience and climate: whereas passive and bioclimatic strategies are often presumed to improve spatial comfort and experiences, few comparative field research tests this association rigorously. Equally, the literature on economic viability has not been well developed, and arguments supporting local materials and regionalization tend to be convincing yet anecdotal without systematic lifecycle cost analysis that can provide policy and professional support. On a medium priority level, there is scant cross-climate validation in the literature, with few studies comparing the performance of similar regional principles across different environmental settings. Long-term post-occupancy assessments are also limited, and this limits information on permanency, human content, and time performance. Lastly, the possibility of a mix between digital technologies and the artisanal knowledge is conceptually rich but empirically very sparse, and it requires an experimental design study that would explore how digital devices can complement instead of de-skilling the local material smarts. All these gaps suggest that there is an urgent necessity to investigate the theoretical claims of modern regional architecture with the help of methodologically rigorous, interdisciplinary, and longitudinal studies.

5. THE SENSUAL REGIONALISM FRAMEWORK

5.1 Conceptual definition

On the systematic synthesis of 156 studies, this paper suggests Sensual Regionalism as an integrative framework to solve the above-identified disciplinary fragmentation, as shown in Figure 5. The word sensual is used intentionally to capture the entire gamut of bodily experience - tactile, thermal, acoustic, olfactory, kinesthetic, and proprioceptive - beyond the ocular centrism reproached by phenomenological scholars [16, 9].

$$\textit{Sensual Regionalism} = \textit{Embodied multisensory experience} + \textit{Climate-responsive environmental strategy} + \textit{Economic consciousness and local resource optimization unified through tectonic authenticity, material regionalism, and cultural continuity}$$

5.2 Six principles

Table 5 outlines six fundamental principles of Critical Regionalism in Architecture, focusing on the sensory experience, climatic adaptation, use of local materials, tectonic expression, cultural continuity, and economic sustainability. There is scholarly evidence that backs up each principle and measurable operational indicators where applicable to help make the principles more practical and measurable. All these dimensions together create a holistic environment for designing context-sensitive and sustainable built environments.

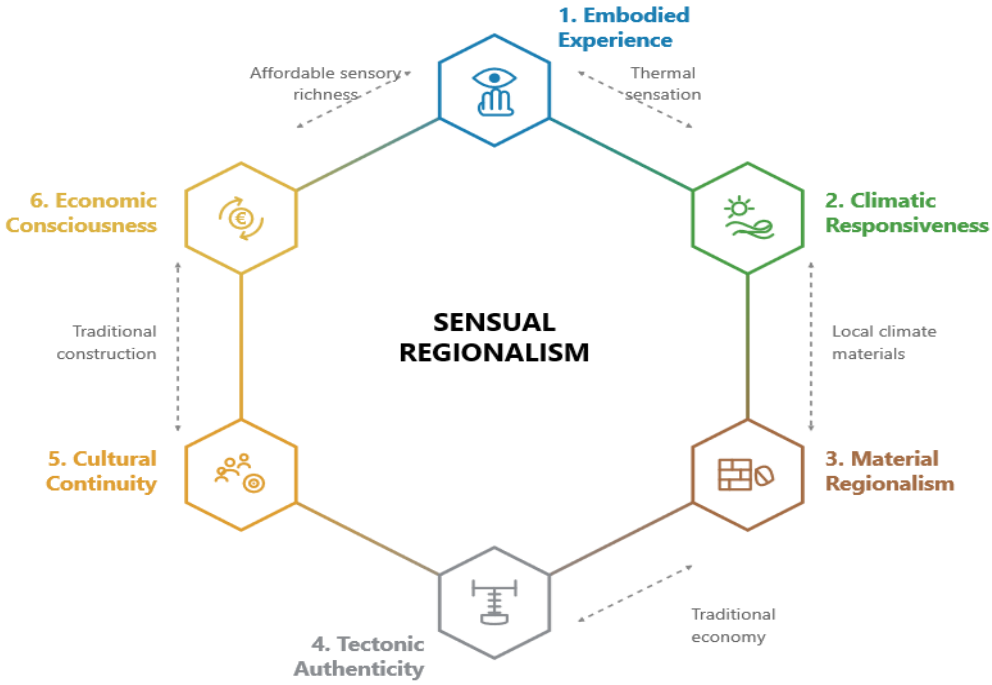

Figure 5. The sensual regionalism hexagonal framework

Table 5. The six principles of sensual regionalism

Principle	Definition	Supporting Literature	Operational Indicators
1. Embodied Experience	Design for multisensory engagement, haptic, thermal, acoustic, olfactory, rather than visual composition alone	Beighle et al. [12], Seamon [13], Sinnamon and Miller [20], Cuentas and Bernedo-Moreira [21]	Material texture variation; acoustic diversity; thermal gradient zones; olfactory planting
2. Climatic Responsiveness	Passive environmental strategies derived from vernacular intelligence, adapted to contemporary performance standards	He et al. [3], Nagasue et al [10], Qaed and Abdulrahman [11]	Passive cooling/heating %; natural ventilation rate; daylight autonomy; indoor thermal comfort hours
3. Material Regionalism	Local material sourcing balanced with performance requirements, emphasizing lifecycle sustainability	Dopfer et al. [1], Albunni [22]	% local materials by mass; embodied carbon ($kgCO^2/m_2$); material transport distance; recyclability
4. Tectonic Authenticity	Structural expression aligned with construction logic, supporting craft continuity and legible load paths	Frampton and Mitrašinovic [5], Patel [9], Teodorczyk [25]	Visible construction logic; craft labor hours; joint expression; structural-formal alignment
5. Cultural Continuity	Spatial organization that accommodates cultural practices and rituals without decorative pastiche culture as process, not ornament	Dopfer et al. [1], Ermeydan [6], Purnama [7]	Spatial fit for cultural practices; community consultation process; adaptive spatial elements
6. Economic Consciousness	Resource optimization across the lifecycle; community engagement; strategic constraint as design catalyst rather than limitation	Dopfer et al. [1], Hernández [24], Teodorczyk [25]	Lifecycle cost (m^2 year); local labor %; skill transfer programs; incremental adaptability

Table 6. Operationalized design criteria matrix for sensual regionalism assessment

Principle	Indicator	Low Performance	Medium Performance	High Performance
Embodied Experience	Sensory modalities engaged	1–2 (visual only)	3–4 (+ thermal, acoustic)	5–6 (full multisensory)
Climatic Responsiveness	Passive strategy contribution	< 20% of comfort hours	20–50%	> 50% of comfort hours
Material Regionalism	Local material by mass	< 30%	30–60%	> 60%
Tectonic Authenticity	Construction logic legibility	Concealed structure	Partially expressed	Fully legible tectonic
Cultural Continuity	Community engagement level	No consultation	Post-design feedback	Participatory co-design
Economic Consciousness	Local economic contribution	< 20% local labor	20–50% local labor	>50% + skill transfer

5.3 Design criteria matrix

Table 6 is an operationalized assessment matrix for sensual regionalism that outlines the measurable design criteria and performance levels for assessing sensual regionalism. Each principle is defined as being low, medium, and high performance based on the criteria of multisensory engagement, passive climatic strategies, use of local materials, and community participation. This scheme allows for a structured and comparative assessment of architecture projects with respect to contextual and cultural as well as sustainable design goals.

6. CASE STUDY VALIDATION

In order to go beyond the theoretical postulation, the Sensual Regionalism framework is tested against three globally-known projects that are chosen due to the geographic variety of location, climate change, and reported coverage of a variety of framework dimensions.

In Tables 7 and 8, two architectural case studies are compared and contrasted, using the lens of sensual regionalism to explore the contextual and sustainable approaches. Gando Primary School, designed by Diébédo Francis Kéré, exemplifies the high achievement of all the principles by incorporating local materials, participatory building, passive cooling methods and deep community involvement. However, Aedas's Al Bahar Towers demonstrate a strong climatic and cultural responsiveness by their high-tech reinterpretation of the traditional mashrabiya system with lower scores in material regionalism and local economic contribution because of their high-tech dependence.

Table 7. Case study 1: Gando Primary School Diébédo Francis Kéré, Burkina Faso [31]

SR Principle	Evidence in the Project	Performance Assessment
Embodied Experience	Earth floor transmits cool thermal sensation; perforated clay-pot ceiling creates dappled light patterns; cross-ventilation provides continuous airflow sensation on skin	**HIGH** 5 sensory modalities engaged (visual, thermal, tactile, acoustic, kinesthetic)
Climatic Responsiveness	Double-roof system with ventilated cavity achieves significant passive cooling in 40°C+ climate; no mechanical HVAC required	**HIGH** >80% passive comfort hours achieved
Material Regionalism	Compressed earth blocks (CEB) produced on-site from local laterite soil; rebar from recycled steel; raised corrugated metal roof	**HIGH** >70% local materials by mass
Tectonic Authenticity	Load-bearing CEB walls clearly legible; raised roof structure expressed as separate element; clay pot ceiling inserts visible as construction logic	**HIGH** fully legible tectonic expression
Cultural Continuity	Community built the school collectively (participatory construction); spatial organization reflects local gathering patterns; school became community center	**HIGH** full participatory co-design and construction
Economic Consciousness	Budget: ~$50,000; community labor reduced costs by ~60%; skills transferred to community (CEB production now a local industry)	**HIGH** >80% local labor + lasting skill transfer

Note: HVAC = Heating, Ventilation, and Air Conditioning

Table 8. Case study 2: Al Bahar Towers Aedas Architects, Abu Dhabi [32]

SR Principle	Evidence in the Project	Performance Assessment
Embodied Experience	Dynamic mashrabiya screen creates shifting light patterns throughout the day; occupants experience a constantly changing visual and thermal environment	**MEDIUM** primarily visual and thermal modalities
Climatic Responsiveness	Responsive shading system reduces solar gain by ~50%; inspired by traditional mashrabiya but actuated with modern sensors; reduces cooling load by ~20%	**HIGH** significant measurable passive contribution
Material Regionalism	Polytetrafluoroethylene (PTFE)-coated fiberglass panels; steel and glass tower construction — primarily imported high-tech materials	**LOW** < 20% local materials; high-tech imported systems
Tectonic Authenticity	The mashrabiya screen is a clearly expressed secondary skin separate from the primary structure; mechanism is legible	**MEDIUM** partial expression (screen vs concealed core)
Cultural Continuity	Mashrabiya is a deeply rooted Islamic architectural element; the project reinterprets its logic (shading + privacy + visual filter) using contemporary technology	**HIGH** genuine cultural logic extraction
Economic Consciousness	Premium construction budget; limited local labor engagement; operational savings from reduced cooling offset by high capital cost	**LOW** premium budget, limited local economic contribution

6.1 Cross-case synthesis

The three case studies show the power of the framework as an analytic tool. Both community-based initiatives in resource-constrained Sub-Saharan Africa, Gando and Butaro, score HIGH on all six principles, indicating that economic constraint is not a stop to Sensual Regionalism, but rather a launchpad to design excellence that is integrated (Principle 6). The failure of Al Bahar Towers, relevant to material regionalism and economic awareness despite its high-tech technological approach and cultural sensitivity, is a phenomenon that a solely climate-based analysis would overlook, thereby showing the diagnostic usefulness of the six-principal framework.

Within the three case studies examined, stronger alignment with the six Sensual Regionalism principles is associated with more coherent regional performance across experiential, climatic, cultural, material/tectonic, and socio-economic dimensions. Conversely, weaker performance in one or more principles corresponds to observable trade-offs in the reviewed documentation. These findings are indicative rather than universal and should be tested across a larger and more diverse set of projects.

Table 9 will examine the MASS Design Group Butaro Hospital project in Rwanda using the principles of sensual regionalism, which shows a high level of environmental, cultural and social sustainability. High performance is achieved in all the criteria with the use of natural air, locally

sourced materials, expressive tectonic systems and culturally responsive spatial organization. In addition, the hospital demonstrates tremendous economic and community impact in the form of local workforce participation, skills transfer, and creation of long-term local industries.

Table 9. Case study 3: Butaro Hospital MASS Design Group, Rwanda [33]

SR Principle	Evidence in the Project	Performance Assessment
Embodied Experience	Natural ventilation creates continuous air movement; locally quarried volcanic stone provides rich tactile surfaces; gardens produce therapeutic olfactory environment; spatial sequence through courtyards modulates kinesthetic experience	**HIGH** 5+ modalities engaged (visual, thermal, tactile, olfactory, kinesthetic)
Climatic Responsiveness	Cross-ventilation design eliminates need for mechanical HVAC in tropical highland climate; orientation maximizes prevailing breeze capture; operable windows throughout	**HIGH** 100% naturally ventilated (critical for infection control)
Material Regionalism	Locally quarried volcanic stone for walls; local eucalyptus timber for structures; community-produced bricks; imported materials limited to medical equipment	**HIGH** > 70% local materials by mass
Tectonic Authenticity	Stone masonry walls clearly load-bearing; timber roof trusses expressed; construction logic legible throughout	**HIGH** fully legible, honest construction
Cultural Continuity	Courtyard typology references Rwandan spatial traditions; community consultation throughout; healing gardens integrate traditional medicinal plants	**HIGH** participatory design with cultural spatial logic
Economic Consciousness	$6M budget (fraction of comparable international hospitals); 3,500+ local workers employed during construction; stone quarrying became a permanent local industry; "Lo-Fab" (locally fabricated) strategy generated $1.3M in local wages	**HIGH** transformative local economic impact + skill transfer

Note: HVAC = Heating, Ventilation, and Air Conditioning

7. DISCUSSION

7.1 Theoretical implications

The Sensual Regionalism project is a forward-looking development in architectural theory, as it positively addresses the historic conflict between phenomenological meaning, environmental performance, and economic feasibility through the regional practice. Whereas Critical Regionalism has provided a very strong ethical-cultural critique of placeless modernity, it has tended to be conceptually full but operationally weak, and practitioners have been unable to have evaluative criteria on how to implement it. The suggested model maintains the ethical obligation to the place-based design, respect towards climate, culture, material locality, and human experience, but it translates these values into six clear principles that have quantifiable indicators (see Table 6). In such a way, it transforms regionalism into a more interpretive position to a performance-based and evaluative framework. It is this framework that helps architects to assess embodied experience, climatic responsiveness, material sources, socio-economic value, and long-term viability using similar metrics in comparison to rhetoric. Through an expression of explicit analytical categories and connection to evident design effects, Sensual Regionalism will close the longstanding divide between philosophical desire and practical practice and enhance the theoretical integrity and practical usefulness of regional discourse in the modern architectural production.

7.2 Comparison with existing frameworks

Table 10 compares four different frameworks for architectural regionalism, which show a progression from theory to practice. In contrast, Kenneth Frampton's Critical Regionalism [5] is more philosophically opposed to being placeless; Sustainable Regionalism and Biophilic Regionalism bring in some level of environmental and experiential considerations. Sensual Regionalism is, on the other hand, as it is introduced in this paper, a fully operational set of ideas, where senses-based experience, climatic responsiveness, materiality, tectonics, cultural continuity and economic conscience are taken as fundamental measurable concepts, which have been substantiated by case studies.

Table 10. Comparative analysis of architectural regionalism frameworks

Dimension	Kenneth Frampton's Critical Regionalism [5]	Sustainable Regionalism [8]	Biophilic Regionalism [2]	Sensual Regionalism (This Paper)
Embodied experience	Implied (tactile/visual)	Not addressed	Partial (biophilic affect)	Core principle — multisensory
Climate responsiveness	Implied (climate as factor)	Core focus	Partial (nature connection)	Core principle — measurable
Material regionalism	Tectonic emphasis	Lifecycle focus	Natural materials	Core principle — lifecycle + local
Tectonic authenticity	Core emphasis	Not addressed	Not addressed	Core principle
Cultural continuity	Resistance to placelessness	Partial	Partial	Core principle — processual
Economic consciousness	Not addressed	Partial (sustainability)	Not addressed	Core principle — lifecycle
Operational criteria	No (philosophical)	Partial	Partial	Yes — design criteria matrix
Case study validation	No	Limited	Limited	Yes — 3 international cases

7.3 Practical implications for design

To the practitioners, Sensual Regionalism offers: (1) a 6-principle checklist to evaluate regional design decisions at all stages of the project; (2) quantifiable measures to complement the current environmental assessment tools Leadership in Energy and Environmental Design / Building Research Establishment Environmental Assessment Method (LEED, BREEAM) with experiential, cultural, and economic aspects; (3) a list of evidence-based strategies based on climate zone (Table 10 in the original systematic analysis); and (4) design criteria matrix (Table 6) as an active assessment tool that can be adjusted to the needs of different projects.

7.4 Sustainability and policy dimensions

As Gando and Butaro case studies show, Sensual Regionalism is consistent with the UN Sustainable Development Goals (SDG), in particular, SDG 11 (Sustainable Cities), SDG 13 (Climate Action), SDG 8 (Decent Work), and SDG 12 (Responsible Consumption). In this case, the economic consciousness principle offers a model to connect architectural practice with local economic development, a field that is mostly covered by the current sustainability assessment instruments. The policy implications are the possibility of introducing Sensual Regionalism prerequisites into the national building codes, especially those in developing nations where vernacular intelligence is a resource with high importance and low exploitation [1].

7.5 Limitations

The present study has a number of limitations. To start with, the systematic review might also limit the inclusion of non-English literature, especially Arabic, Chinese, and Spanish literature, which continues to be a core of the discussion on regional architecture. Second, the framework needs additional empirical success that may be achieved by post-occupancy evaluation (POE) and increased sample sizes of case studies. Third, the bibliometric analysis is a reflection of the indexing biases of the databases selected. Fourth, the analyses of the case studies are in a retrospective form based on published documents instead of actual field research, which would be more productive in terms of sensory and experience evaluation. Finally, because screening and quality appraisal were conducted by a single reviewer, inter-rater agreement could not be calculated; future work should use dual independent screening/appraisal and report agreement.

8. CONCLUSION

The research has incorporated the recent literature on regional architecture, phenomenology, and climate-responsive design by conducting a systematic review of 156 articles published from 2020 to 2024. The review brings out six overarching thematic clusters and, most importantly, points out the consistent dislocation of phenomenological, environmental, and economic strands of discourse in regional architecture.

To overcome this fracturing, the paper gives birth to Sensual Regionalism - a six-principle integrative model that includes embodied experience, climatic responsiveness, material regionalism, tectonic authenticity, cultural continuity, and economic consciousness. The framework is operationalized by an operational design criteria matrix that gives a measurable level of indications to each principle (Table 6), and tested by using three internationally recognized case studies that test the analytical and diagnostic strength.

Key Contributions

- **Theoretical:** Sensual Regionalism brings three previously discontinuous disciplinary streams together - phenomenology, bioclimatic design, and regional economics - into one coherent system.
- **Methodological:** The design criteria matrix (Table 6) offers the operational specificity that Critical Regionalism has historically been lacking.
- **Empirical:** The three-case examination indicates that projects exhibiting stronger alignment with all six principles demonstrate more integrated regional performance, while projects with weaker alignment in one or more principles exhibit clearer trade-offs within the limits of this sample.
- **Practical:** The framework provides practitioners, educators, and policymakers with a practical tool for action-based assessment of a regional design.

With climate change increasing and cultural homogenization growing faster, a greater urgency to find an architecture that is experientially rich, environmentally responsive, culturally continuous, and economically generative is becoming increasingly evident. The answer to this need offered by Sensual Regionalism is a stringent, operationalized answer to the need - and a platform in future research that would bridge the understanding of the architectural theory with the lived reality of buildings and their communities.

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NOMENCLATURE

PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
POE	Post-Occupancy Evaluation
LEED	Leadership in Energy and Environmental Design
BREEAM	Building Research Establishment

	Environmental Assessment Method
HVAC	Heating, Ventilation, and Air Conditioning
CEB	Compressed Earth Blocks
SDGs	Sustainable Development Goals
MMAT	Mixed Methods Appraisal Tool