



Open Science
BRAZIL

DOI: <https://doi.org/10.37497/opsbrazil.48>

PREPRINT

FROM BUILDING CAPACITY TO DEVELOPMENT FEASIBILITY: AN INTEGRATED FRAMEWORK FOR EARLY-STAGE DEVELOPMENT DECISIONS

Da Capacidade Construtiva à Viabilidade
de Implantação: Um Modelo Integrado
para a Tomada de Decisões nas Fases
Iniciais de Empreendimentos Imobiliários

JOÃO VINICIUS ALVES MACIEL 

Entrepreneur and Project Manager in the Construction Sector · VD Soluções
E-mail: joaomaciel@vdsolu.com

ABSTRACT | The planning permission to build does not, in itself, establish whether a development should proceed. Between interpreting legal planning parameters and making an investment decision lie site conditions, infrastructure requirements, environmental constraints, product configuration, and uncertainties regarding cost and schedule. This paper presents an integrated analytical framework for the early stages of development, based on a targeted narrative review of scientific literature, technical documents, and legislation, combined with two illustrative professional experiences. The proposed framework comprises six dimensions: regulatory assessment, site characterization, infrastructure assessment, digital information management, technical coordination, and analytical consolidation. For each dimension, it specifies inputs, analytical operations, outputs, and the decisions affected. Economic considerations run throughout the framework through comparisons of alternatives, explicit assumptions, and identification of further investigations. A hypothetical numerical example demonstrates that greater saleable floor area may produce a lower incremental economic contribution. Drones, geographic information systems, and building information modeling are examined in terms of the information they provide, quality controls, and limitations. Professional accounts contextualize working interfaces without establishing effectiveness. The contribution lies in organizing the transition from permissions and fragmented data to traceable decisions to proceed, revise, investigate, or reject alternatives. The framework has not been empirically validated and does not replace specialist assessments, impact studies, or comprehensive financial analysis.

Keywords | Development Feasibility; Real Estate Development; Urban Zoning; Infrastructure; Information Quality; Project Coordination.

Submetido: 21-10-2026

Postado: 21-10-2026

e-ISSN: 2764-9822

Endereço de correspondência: João
Vinicius Alves Maciel – E-mail:
joaomaciel@vdsolu.com



Alumni.in 

RESUMO | O desenvolvimento de empreendimentos imobiliários envolve decisões que ultrapassam a A autorização urbanística para construir não determina, por si só, se um empreendimento deve ser executado. Entre a interpretação dos parâmetros legais de planejamento urbano e a tomada de decisão sobre o investimento, existem fatores como as condições do terreno, as exigências de infraestrutura, as restrições ambientais, a configuração do produto imobiliário e as incertezas relacionadas aos custos e aos prazos. Este artigo apresenta um modelo analítico integrado para as fases iniciais do desenvolvimento de empreendimentos imobiliários, fundamentado em uma revisão narrativa direcionada da literatura científica, de documentos técnicos e da legislação, combinada com duas experiências profissionais ilustrativas. O modelo proposto compreende seis dimensões: avaliação regulatória, caracterização do terreno, avaliação da infraestrutura, gestão digital da informação, coordenação técnica e consolidação analítica. Para cada dimensão, são especificados os dados de entrada, os procedimentos de análise, os resultados esperados e as decisões por eles influenciadas. As considerações econômicas permeiam todo o modelo por meio da comparação de alternativas, da explicitação de premissas e da identificação de investigações complementares necessárias. Um exemplo numérico hipotético demonstra que uma maior área comercializável pode resultar em uma menor contribuição econômica incremental. O uso de drones, sistemas de informações geográficas (SIG) e modelagem da informação da construção (BIM) é examinado considerando as informações fornecidas por essas tecnologias, seus mecanismos de controle de qualidade e suas limitações. Os relatos de experiências profissionais contextualizam as interfaces entre diferentes atividades técnicas, sem, contudo, constituírem comprovação de eficácia. A principal contribuição do estudo consiste em organizar a transição entre autorizações urbanísticas e dados fragmentados para decisões fundamentadas e rastreáveis, permitindo determinar se uma alternativa deve ser executada, revisada, submetida a investigações adicionais ou descartada. O modelo ainda não foi validado empiricamente e não substitui avaliações especializadas, estudos de impacto ou análises financeiras abrangentes.

Palavras-chave | Viabilidade De Implantação; Desenvolvimento Imobiliário; Zoneamento Urbano; Infraestrutura; Qualidade Da Informação; Coordenação De Projetos.

1. INTRODUCTION

A site may permit a particular use and substantial buildable floor area yet require a layout that is poorly suited to the intended development. Access locations, elevation differences, circulation space, and infrastructure solutions affect both product configuration and the resources required to deliver it. The initial decision therefore involves more than converting planning ratios into square meters: it requires understanding the conditions under which that potential becomes an executable and economically justified alternative.

This distinction matters to developers before acquisition, to coordinators managing technical disciplines, and to municipalities facing new demands on urban systems. For these stakeholders, the same increase in built floor area may have different implications: increased supply, additional investment requirements, pressure on services, or changes in circulation patterns. A useful assessment must make these relationships visible without assuming that all interests align or that a single indicator can settle the decision.

In Brazil, the City Statute links urban policy to infrastructure, public services, and the distribution of the benefits and burdens of urbanization. Excessive or inappropriate land use relative to infrastructure is among the situations land-use regulation seeks to prevent (Brasil, 2001, Art. 2). This principle situates development within the city but does not itself establish

the parameters applicable to each site. Identifying permitted uses, limits, and procedures depends on the rules relevant to the location and circumstances examined.

The guiding question is: how can an initial development assessment be organized to relate planning possibilities, site conditions, infrastructure, and economic assumptions using information appropriate to the decisions at hand? The objective is to present an operational framework for development feasibility assessment. Its scope extends from identifying an opportunity to deciding whether to investigate, modify, or abandon an alternative, before undertaking commitments that would be costly to reverse.

The proposed contribution is to make interfaces explicit. Rather than concluding the assessment with separate disciplinary diagnoses, the framework requires documenting how each item of information changes the layout, budget, schedule, or need for further investigation. It thereby organizes intermediate outputs that teams can examine and update. The paper does not claim to have invented integrated analysis; instead, it offers an applied synthesis of the problem of converting building capacity into a development decision.

The paper distinguishes external foundations, analytical propositions, and professional accounts. The literature informs the relationships discussed; the six dimensions constitute a proposed organization; and the experiences in Atibaia illustrate professional interfaces. This distinction allows a complete technical argument without attributing unmeasured economic outcomes or urban benefits to the examples.

2. WHAT IS ASSESSED IN A FEASIBILITY ASSESSMENT

2.1 Regulatory Possibility, Site Development, and Business Considerations

In this paper, regulatory possibility denotes the uses and configurations allowed under applicable rules, together with the conditions required to exercise them. It is not limited to the floor area ratio. Permitted floor area also depends on how parameters are defined and combined, applicable restrictions, and relevant procedures. A preliminary consultation informs assumptions and must not be mistaken for project approval.

Development feasibility concerns the physical, technical, environmental, and operational conditions required to implement a given alternative. It is not a fixed attribute of the site. It varies with the program, building placement, elevations, access, phasing, and selected solutions. A site can accommodate different configurations, each with distinct requirements. The relevant question is therefore not merely whether sufficient space exists, but which interventions make a particular use possible and how they affect the whole.

Economic feasibility relates these conditions to expected value or revenue, investment, costs, timing, and risk. Homes England (2021) includes construction, site preparation, infrastructure, professional services, financing, and marketing assumptions in development appraisal. Although designed for England, this breakdown helps clarify analytical categories. Its legal instruments, percentages, and local criteria are not adopted as Brazilian rules.

These three perspectives inform one another. A technically executable solution may entail costs incompatible with the intended product; an attractive commercial assumption may require an impermissible use; and a less intensive configuration may call for simpler interventions. Alternative assessment must preserve these distinctions. Chargeable floor area, gross built area, usable area, and saleable area require separate definitions and a documented conversion method, because they neither automatically represent the same quantity nor perform the same analytical function.

2.2 Infrastructure and Product Configuration

Kurvinen and Saari (2020), using modeled residential alternatives in Finland, relate density to infrastructure costs and examine ground conditions and parking. In the scenarios studied, costs per resident decline as density increases when parking is excluded; including parking structures can reverse the comparison. The implication here is limited: the study provides neither Brazilian prices nor a universally optimal density. It supports examining the solutions required by greater development intensity.

Within the proposed framework, this means assessing the development platform, buildings, and supporting systems together. Raising a site elevation to accommodate a program, for example, requires examining effects on earthworks, retaining structures, vehicle access, accessibility, and stormwater conveyance. This is a conceptual design relationship, not an account of an event at the developments discussed below. Its purpose is to show why architectural solutions and infrastructure budgets should not rely on incompatible assumptions.

Initial cost must also be distinguished from long-term obligations. A solution may reduce one construction expense while requiring greater maintenance, operational space, or energy. Another may bring an investment forward to enable later phases to be occupied. Comparisons must specify the time horizon and the party responsible for each obligation. When these differences are hidden in an average cost per square meter, precisely the information that distinguishes alternatives is lost.

2.3 Uncertainty and Decision Criteria

The Royal Institution of Chartered Surveyors (RICS, 2019) recommends stating development assumptions and testing the sensitivity of valuations to their inputs. In residual valuations, small changes in values and costs can materially affect outcomes. This is especially important at the early stage, when the apparent precision of a spreadsheet may exceed the quality of the information entered into it.

Moorhead et al. (2024) investigate feasibility assessment practices and hurdle-rate selection among professionals, primarily in Australia and New Zealand, using data collected in 2016–2017. They document variation in practice and risk treatment. The study does not provide a return threshold that can simply be transferred to another market. For the present

proposal, it reinforces the importance of making decision criteria and assumptions explicit rather than treating a selected rate or margin as sufficient justification.

The initial task is not to eliminate all uncertainty. It is to distinguish what already permits comparison, what requires investigation, and what prevents commitment. Information gaps, variation in estimates, and known constraints should be treated separately. An information gap concerning subsurface conditions is not a confirmed cost; a budget range is not a complete absence of information; and an applicable prohibition cannot be offset by expected revenue. This distinction guides both decisions and investment in further studies.

3. METHODOLOGICAL APPROACH

This is a propositional technical-scientific paper based on a targeted narrative review and illustrative professional experiences. The literature search was conducted on September 29, 2026, through web searches and consultation of publishers' websites, repositories, and public or professional institutions. Portuguese and English search terms addressed development feasibility, infrastructure costs, density, integration of Building Information Modeling (BIM) and Geographic Information Systems (GIS), survey quality, drainage, and urban accessibility. No systematic review protocol was adopted, and exhaustive coverage of the literature is not claimed.

Sources were selected according to their relevance to a decision relationship, identifiability, and accessibility of the material needed to support each claim. Scientific articles were used for findings within their specific designs and contexts; technical documents for requirements and procedures; and official legislation for Brazil's general legal framework. International references are used conceptually without transferring local costs, standards, or conclusions. The synthesis organizes convergences and limitations rather than statistically aggregating heterogeneous results.

The framework was developed from six dimensions already formulated in the original draft. For each dimension, inputs, analytical operations, outputs, affected decisions, and limitations were defined. The contribution is this operational articulation, which remains a proposal. No prospective implementation of the complete framework, performance measurement, interviews for this paper, or comparative testing between teams was undertaken.

The accounts concerning the Sítio do Picapau Amarelo Theme Park (SPPA) and FLORA by Orna Inc. derive from the author's professional record in the original manuscript. Only the scopes declared there were used. No documentary dataset was assembled that would permit reconstruction of the decision sequence, auditing of the full execution of services, or measurement of outcomes. Accordingly, the experiences contextualize interfaces but do not validate the framework. The economic example in Section 4 is entirely hypothetical and independent of these developments.

4. INTEGRATED FRAMEWORK FOR DEVELOPMENT FEASIBILITY ASSESSMENT

4.1 Organization and Feedback Loops

The analysis is organized into six dimensions linked through identifiable alternatives. Each alternative must retain its program, areas, site information base, and layout assumptions. This identification makes it possible to determine whether a cost refers to the same configuration represented in a drawing and whether a regulatory conclusion concerns the use actually assessed. Without this correspondence, gathering documents in a folder does not constitute integrated analysis.

Table 1 summarizes inputs and outputs, supplemented by the procedures and limitations discussed in this section. Digital information management and technical coordination operate throughout the process; they do not begin only after other analyses are complete. Consolidation does not necessarily conclude the study either: it may return a specific question to site characterization or prompt a new layout alternative.

Table 1. Proposed dimensions and outputs for decision-making

Dimension	Core inputs and operations	Output and affected decision
1. Regulatory assessment	Relevant rules and documents; compare uses, parameters, and restrictions	Matrix of possibilities and points requiring confirmation; delimit permissible alternatives
2. Site characterization	Surveys and observations; interpret geometry, topography, cover, and surroundings	Qualified site information base; locate studies and define investigations
3. Infrastructure assessment	Layout alternatives; estimate requirements, interfaces, and quantities	Preliminary solutions and cost ranges; compare configurations and phases
4. Digital information management	Sources, models, and versions; check spatial reference and provenance	Traceable information base; accept, correct, or supplement information
5. Technical coordination	Disciplinary documents; examine conflicts and consequences	Register of interfaces and outstanding issues; revise layout, budget, and schedule
6. Analytical consolidation	Evidence, assumptions, and scenarios; compare criteria and uncertainties	Decision record; proceed, revise, investigate, or reject

Source: Prepared for this paper. The framework is a proposal and does not constitute an empirically validated protocol.

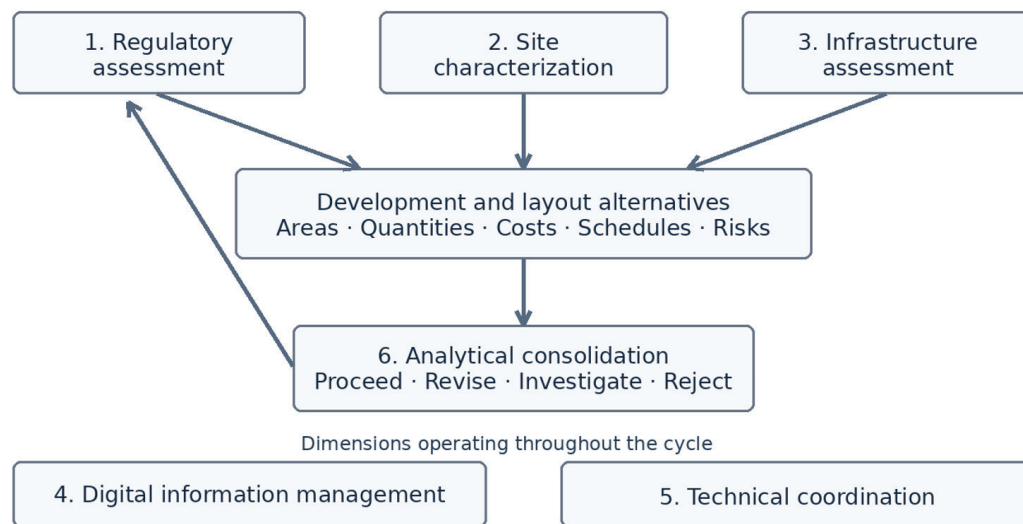


Figure 1. Alternatives link regulatory assessment, site conditions, and infrastructure; consolidation feeds questions back into the analyses. Digital information management and technical coordination accompany the entire cycle. Source: Prepared for this paper.

4.2 Regulatory Assessment: Delimiting the Range of Alternatives

Inputs include legislation, relevant official mapping, and available property documentation. The analysis compares the intended use with applicable rules, recording the source, date, and interpretation adopted. A parameter directly established by the available material must be distinguished from an assumption requiring confirmation by the competent authority. A simplified consultation map cannot, by itself, resolve boundary ambiguities or particular documentary circumstances.

The proposed output is a matrix linking each condition to the affected alternative. Rather than recording only a maximum ratio, it identifies whether a configuration depends on clarification of a use, an access requirement, or an identified restriction. This guides subsequent investigations and prevents development of a solution based on merely presumed authorization.

The limitation is clear: a preliminary regulatory assessment does not replace specialized legal analysis, certificates, permits, or approval. Rules in force at the date of consultation also do not establish which regime applied to a previous project. The historical municipal framework for the professional examples is not reconstructed because the necessary documents were not included in the material examined.

4.3 Site Characterization: Turning Survey Data into Design Questions

Inputs include available geometry, topography, ground cover, built features, connections to the surroundings, and field observations. The analysis must identify both relevant characteristics and poorly understood areas. A three-dimensional surface may help examine

elevations, but it does not thereby demonstrate soil bearing capacity, the condition of buried utilities, or legal permission to intervene.

The proposed output is a qualified site information base accompanied by its limitations of use. The team must be able to identify where reliable information exists, where extrapolation has occurred, and which decisions require additional data. This output guides the preliminary location of platforms, access points, and infrastructure corridors, while indicating geotechnical, environmental, or cadastral investigations relevant to the alternative.

The level of detail must match the question. When initially comparing broad configurations, a less detailed representation may suffice, provided its limitations do not reverse the choice. For decisions sensitive to small elevation differences, the same data may be inadequate. Movement between these levels must be deliberate: increasing model detail without improving the underlying survey does not increase knowledge of the site.

4.4 Infrastructure Assessment: Making Implementation and Operational Conditions Explicit

Starting from the alternatives, this dimension examines access, circulation, earthworks, drainage, water and wastewater systems, power, and other systems actually required by the program. The result should not merely be a list of services. The central operation is identifying what changes between alternatives: network lengths, connection locations, the need for off-site works, preliminary quantities, and opportunities for phased construction.

Each estimate should record its origin, included scope, base date, and level of definition. A quantity derived from a preliminary study is not treated in the same way as one extracted from a detailed design. Interfaces still dependent on utility providers, public authorities, or areas outside the property must also be identified. The visual proximity of a utility network does not confirm available capacity or connection conditions.

The output combines preliminary solutions, cost ranges, and required investigations. It informs decisions about scale, location, and phasing. The main limitation is dependence on information that has not yet been finalized: assigning a single figure to an undefined solution may conceal risk, whereas making generic provisions for every possible problem may artificially render an alternative infeasible. Recording assumptions allows estimates to be revised as information improves.

4.5 Digital Information Management: Ensuring Information Is Fit for Use

This dimension receives documents, spatial datasets, models, and estimates from all workstreams. Its operation is to verify provenance, units, coordinate reference systems, dates, versions, and responsibility for issuance and revision. A common information base should distinguish what was measured, interpreted, estimated, or assumed. These states need not be expressed through a complex classification language; they must be clear to decision-makers.

The output is a traceable set of information in which drawings, models, and spreadsheets refer to the correct alternative. Before accepting information, the team checks whether its quality is appropriate for the intended use. The decision may be to proceed with a clearly defined caveat, correct a coordinate transformation, or request new data collection. The criterion is its effect on the analysis, not merely whether the file can be opened.

The limitation is the risk of mistaking an orderly environment for a reliable one. A version-controlled repository may still contain erroneous interpretations. Digital management must therefore preserve technical responsibility and the rationale for each revision. Accepting a file for consultation does not amount to approving it for cost estimating or construction.

4.6 Technical Coordination: Resolving Cross-Disciplinary Consequences

Inputs are the solutions developed and their assumptions. The analysis identifies geometric, functional, and sequencing conflicts: a utility crosses a proposed element; an elevation makes access difficult; or one phase depends on infrastructure scheduled for another. For each interface, the proposed approach identifies the decision required, disciplines involved, and effect on the alternative.

The output is a register of resolved interfaces and outstanding issues linked to document revisions. Closing an issue means more than moving an element in a model. If the solution changes quantities or phasing, the budget and schedule must be revised accordingly. Otherwise, drawings and economic appraisal describe different developments despite retaining the same filename or study title.

Technical coordination is not equivalent to comprehensive design validation. A clash-free solution may still be inadequately sized, functionally poor, or noncompliant with regulations. Specialist judgment remains necessary; coordination organizes dependencies and prevents a decision from being considered closed before its relevant consequences are examined.

4.7 Consolidation: Recording Decisions and Their Conditions

Consolidation compares alternatives against project-specific criteria: regulatory compliance, satisfaction of the program, technical conditions, investment, revenue prospects, schedule, and material risks. Criteria that cannot be offset by advantages elsewhere should remain visible. A prohibitive restriction, for example, does not disappear merely because another aspect promises higher revenue.

The final record should identify the configuration assessed, its sources, key assumptions, and one of four decisions. Proceed means that sufficient evidence exists for the next defined commitment; revise means modifying the alternative; investigate means obtaining information capable of resolving a decisive uncertainty; and reject means abandoning the configuration under the conditions considered. None of these classifications constitutes a permanent feasibility certificate.

A useful decision also specifies what would cause it to change. If it depends on the capacity of a connection, the required confirmation should be identified. If it depends on a cost range, the influence of that range should be shown. This practice distinguishes a robust recommendation from a preference sensitive to a single assumption. Analytical depth increases with financial exposure and the consequences of the decision, without requiring full detailed design of every early-stage alternative.

4.8 Hypothetical Example: Additional Floor Area and Its Cost

Table 2 presents two fictional configurations for the same site. Both are assumed permissible solely for instructional purposes; neither represents SPPA, FLORA, or any other actual project. Alternative A is assumed to enlarge a development platform, requiring more extensive earthworks and retaining structures, whereas B accommodates a smaller platform. The additional infrastructure cost is an arbitrary assumption reflecting that difference, without a design or calculated quantities. Confirming it would be the technical uncertainty to investigate. The figures are not market benchmarks. Only sales revenue, construction, and infrastructure are compared. Land, taxes, professional services, financing, marketing, and other items are excluded; no conclusion is drawn regarding the overall feasibility of either option.

Table 2. Partial comparison of entirely hypothetical alternatives

Variable	Alternative A	Alternative B
Gross built area	9,000 m ²	8,750 m ²
Saleable floor area	7,200 m ²	7,000 m ²
Hypothetical sales price	BRL 4,500/m ²	BRL 4,500/m ²
Calculated gross revenue	BRL 32.40 million	BRL 31.50 million
Construction at BRL 2,000/m ² of built area	BRL 18.00 million	BRL 17.50 million
Hypothetical infrastructure	BRL 4.20 million	BRL 3.00 million
Partial balance: revenue less these two costs	BRL 10.20 million	BRL 11.00 million

Source: Prepared for this paper. The partial balance is not profit, residual land value, return on investment, or cash flow.

Alternative A adds 200 m² of saleable area and BRL 900,000 in gross revenue. However, it adds BRL 500,000 in construction costs and BRL 1.20 million in infrastructure costs. Considering only the items calculated, its incremental contribution is negative BRL 800,000. Looking only at saleable floor area would suggest an advantage that does not hold for this portion of the analysis. The difference does not prove that B is the better overall decision; it demonstrates the relationships that a conclusion must consider.

Holding floor areas and the cost difference constant, the common sales price at which the alternatives' partial balances would be equal is BRL 8,500/m²: BRL 1.70 million divided by 200 m². Alternatively, with the price fixed at BRL 4,500/m², A's additional infrastructure cost would have to fall from BRL 1.20 million to BRL 400,000 to equalize the balances.

These thresholds are not forecasts. They indicate how much an assumption would have to change to alter the partial comparison.

In an actual decision, the next investigation could focus on the infrastructure solution that differentiates the alternatives if it remained undefined. Sales values, market absorption, omitted costs, and the timing of expenditures would also need verification. A comprehensive comparison could reverse the preference, including because additional floor area changes taxes, marketing costs, and financing. The example illustrates the framework's function: formulate an economic question from a physical difference, locate its uncertainty, and direct the next study.

5. DIGITAL INFORMATION IN SUPPORT OF DECISION-MAKING

5.1 Data Capture, Representation, and Quality

Survey selection begins with the information required. Orthophotos allow visible features to be examined in a geometrically corrected representation; point clouds record three-dimensional positions; and surface and terrain models organize different representations of elevation. In this paper, a digital surface model (DSM) includes surfaces such as tree canopies and buildings, whereas a digital terrain model (DTM) represents the ground. Terminology and product structure must be stated because they are not uniform across applications. The U.S. Geological Survey specification (USGS, 2025) distinguishes these products, their classification, and reference systems.

Resolution and accuracy answer different questions: the former concerns represented detail; the latter concerns agreement with a reference. In a particular photogrammetric survey, Sanz-Ablanedo et al. (2018) show that evaluating only points used in adjustment can conceal errors revealed by independent checkpoints. Both the number and distribution of control points matter. For site development, this implies verifying positional quality before using elevations and surfaces to calculate quantities, without transferring a universal number of control points or fixed accuracy requirement to every flight.

Vegetation warrants explicit treatment. Skarlatos and Vlachos (2018) investigate vegetation removal from image-derived models and terrain reconstruction by interpolation. Filtering removes classified elements, but the resulting gaps remain dependent on visible information and the reconstruction procedure. This is not direct observation of concealed ground. LiDAR (light detection and ranging) provides returns that can be classified to represent terrain, but also requires control, classification, and verification; useful returns cannot be presumed under every type of cover (USGS, 2025).

In the proposed application, survey procurement should specify the decision question, area of interest, deliverables, and required verification. Data sufficient to document occupation may be inadequate for comparing earthwork volumes. If geometric uncertainty is decisive, the team should consider supplementary fieldwork, another method, or revision of the assumption. Equipment is selected according to these needs, considering acquisition, processing, and interpretation costs.

5.2 GIS, BIM, and Exchange Integrity

Geographic Information Systems (GIS) organize spatial relationships among the site, its surroundings, and thematic layers. Building Information Modeling (BIM) organizes information associated with development elements and disciplines. The proposed approach links these environments according to the decisions required: locating constraints and connections, developing alternatives, checking interfaces, and updating quantities. Combined use does not mean every analysis must be performed in a single software application.

Noardo et al. (2021) identified differences in support for georeferencing, geometry, and attributes when exchanging Industry Foundation Classes (IFC) files in the 2019 GeoBIM benchmark tests. This finding supports checking transferred content as well as visual appearance. Its scope is limited to the software and datasets examined at that time; it does not diagnose all current tools. For the proposed framework, verification should determine whether location, units, and properties required for decisions have been preserved.

Ford (2020), in UK BIM Framework guidance, describes a common data environment as a combination of workflow and technical solution, with revision control and information-use states. This guidance supports recording the purpose for which information was shared. A model intended for discussing alternatives should not automatically be treated as approved for construction. In the proposed practice, each decision refers to the version used and outstanding questions, allowing subsequent changes to be incorporated in a verifiable manner.

6. ILLUSTRATIVE PROFESSIONAL EXPERIENCES

6.1 Sítio do Picapau Amarelo Theme Park

The professional account concerning the Sítio do Picapau Amarelo Theme Park in Atibaia, São Paulo, records participation in drone-based aerial photogrammetric surveys, orthophoto production, as-built documentation, site development, drainage and parking-related studies, and technical coordination across different workstreams. This is the declared scope used in the analysis. The project's tourism and entertainment character provides context for discussing circulation, use of space, and infrastructure without establishing quantified demands for the development.

These activities bring together three families of information: records of existing conditions, development layout studies, and coordination documentation. Under the proposed framework, these families should maintain correspondence among the site information base, design assumptions, and issued documents. This is the interface that the account illustrates. Without a history of decisions, it is not possible to establish a sequence linking survey work, problem identification, and layout changes.

6.2 FLORA by Orna Inc.

For FLORA by Orna Inc., also in Atibaia, the account records participation in feasibility studies, master planning, site development, topographic surveys, analysis of environmental constraints, and technical coordination. These activities place the example at the intersection of site reconnaissance, preliminary spatial organization, and assessment of development conditions. The available material did not identify parameters that would permit quantification of restrictions or reconstruction of decisions among alternatives.

The connection to the proposal is the need to keep master plan assumptions consistent with site information and the constraints considered. This relationship is an analytical interpretation of the reported scope, not evidence that the six dimensions were applied to the development. Its value is to identify a recognizable professional interface whose empirical evaluation would require its own documentation.

Table 3. Interfaces illustrated by professional experiences

Aspect	Sítio do Picapau Amarelo	FLORA by Orna Inc.
Reported information	Aerial photogrammetry, orthophotos, and as-built documentation	Topographic surveys and environmental constraint analysis
Reported project activities	Site development, drainage and parking studies	Feasibility, master planning, and site development
Interface discussed	Existing conditions, studies, and technical documentation	Site, initial configuration, and constraints
Common scope	Technical coordination across different workstreams	Technical coordination
Interpretive limitation	No measured outcomes or reconstructed decision sequence	No measured outcomes or reconstructed decision sequence

Source: Synthesis of the author's professional account. The interfaces discussed are analytical interpretations, not evidence of the framework's effectiveness.

The two experiences illustrate different points of contact but share the challenge of coordinating information that affects site development. The comparison is not a representative sample. The absence of a documented history of alternatives prevents testing whether integration anticipated conflicts, changed decisions, or reduced rework. The accounts provide context; the technical mechanisms are supported by the literature and relationships articulated in the proposal.

7. DISCUSSION

7.1 What the Framework Organizes and What Remains Unproven

The proposal aligns with appraisal literature by keeping alternatives, costs, and assumptions under examination instead of inferring feasibility from permitted floor area. It also aligns with digital information research by requiring quality and traceability. Its operational contribution is to bring these requirements together in decision outputs and

link site or technical revisions to their economic consequences. The framework does not introduce a new profitability formula; it specifies the connections that must be maintained so that calculations describe the layout being assessed.

The hypothetical example illustrates the internal coherence of this sequence but does not measure its benefits. The professional accounts likewise do not permit comparison with another procedure. Practical usefulness therefore remains a hypothesis for evaluation. A clear matrix and a digital model do not establish that a team will make better decisions. They may even increase documentation effort without corresponding benefits if records are not used to resolve relevant questions.

A future application should track versions of alternatives, decisions, assumptions, and information available at the time of each choice. Proposed indicators include the proportion of assumptions with identifiable sources, the frequency of conflicts that change layouts or budgets, resolution time, and differences between initial estimates and comparable subsequent values. Counting issues alone would be insufficient: a team documenting more problems could appear worse than one recording fewer. Project size, complexity, stage, record completeness, and scope changes would have to be considered.

7.2 From the Development to the City

Private returns and urban outcomes have different boundaries. A study may account for development revenue while excluding service expansion, future maintenance, and effects on other areas. The Organisation for Economic Co-operation and Development (OECD, 2018) discusses relationships among urban form, transport, and service provision costs, emphasizing that average density alone does not describe spatial organization. Here, this leads to an analytical question: which demands and responsibilities does an alternative transfer beyond its boundaries?

This question corresponds to Brazil's Neighborhood Impact Study (Estudo de Impacto de Vizinhança, EIV). The City Statute assigns municipal legislation the task of defining developments subject to this instrument and requires consideration of positive and negative effects, including mobility and urban facilities. An EIV does not replace an Environmental Impact Assessment (Estudo de Impacto Ambiental, EIA) when required under environmental legislation (Brasil, 2001, Arts. 36–38). The proposed framework replaces neither study and does not assert that they were required for the professional examples.

Drainage illustrates the importance of scale. The U.S. Environmental Protection Agency (EPA, 2006) modeled residential scenarios in which runoff comparisons per unit of developed land differ from comparisons per dwelling and for the same number of homes within a watershed. The lesson is to specify the denominator and area of influence. The report does not justify concluding that greater density solves site drainage or converting annual results from its scenarios into design peak flows.

For mobility, Pereira et al. (2020) provide a Brazilian reference for measuring access to employment, education, and healthcare by location and travel time. This approach

allows questions beyond the number of parking spaces. However, geographic access does not establish service capacity, affordability, or quality. Development-level application must combine access conditions, transport modes, schedules, and demand with studies appropriate to the circumstances.

Environmental solutions also require operational continuity. The EPA's bioretention handbook (2023) associates long-term performance with inspection, maintenance, records, responsible parties, and resources. Proposing a facility is therefore only part of the decision: its ongoing function must also be defined. The handbook serves as a technical organizational reference without turning U.S. frequencies, dimensions, or procedures into local requirements.

Under the framework, these interfaces should produce observable records: capacity requiring confirmation; necessary expansion; responsibility for implementation and operation; areas receiving the effects; and affected groups. Job creation, economic activity, and tax revenue are relevant considerations but do not, individually, establish a net benefit. Assessing them would require distinguishing temporary and permanent effects, public and private costs, displacement of activities, and territorial distribution. Responsible development thus rests on verifiable conditions of an alternative rather than a generic sustainability label.

7.3 Proportionality, Information Economy, and Time

The framework should be adapted to project scale and the decision at hand. For a simple development, an adequate site information base, focused studies, and a record of assumptions may suffice for initial screening. In multiphase developments with complex access and many disciplines, coordination mechanisms may require greater formalization. Such adaptation does not eliminate dimensions; it changes the effort required to address them. Requiring the same technological environment in every situation would confuse the instrument with the objective.

Priority should be given to information capable of changing a choice or the conditions for proceeding. If the preferred alternative depends on a poorly defined retaining-structure cost, an investigation targeted at that uncertainty has a clear decision-making purpose. If further detailing merely improves the appearance of an assumption already ruled out for another reason, it has lower priority. This logic does not mean reducing mandatory surveys; it means organizing additional investigation within applicable requirements and accepted risks.

Time must also be included. Two alternatives with similar total costs may require expenditure at different times, have different confirmation schedules, and offer products with different sales absorption rates. A phase is self-contained only if it has the operational conditions it needs. The assessment must therefore compare physical and financial phasing, distinguishing costs, estimated revenues, capital requirements, and outcomes. The partial example does not calculate these effects and must not substitute for cash-flow analysis.

The risk remains of expressing weak assumptions with excessive precision. Ranges require justification; scenarios should represent coherent changes among inputs; and

probabilities should not be assigned merely because software can simulate them. The most detailed assumption is not necessarily the most reliable. A decision record should state what is supported, what is assumed, and what change would require reassessment.

Transferability also has limits. Much of the literature consulted comes from other countries and addresses contexts different from Brazilian tourism, industrial, or residential development. The narrative review uses targeted selection and does not guarantee comprehensive coverage. The proposal organizes pertinent questions, but its suitability for each development type, team, and context requires examination. Comprehensive economic appraisal and specialist investigations remain separate tasks linked to the alternatives and decisions that the framework helps organize.

8. CONCLUSIONS

Moving from building capacity to development feasibility requires converting permissions, surveys, and business intentions into alternatives whose conditions can be examined. This paper presented a six-dimensional framework with inputs, operations, outputs, and limitations, linked to four decisions: proceed, revise, investigate, or reject. Economic considerations enter at the stage of developing alternatives through effectively usable areas, infrastructure requirements, and assumptions regarding costs, schedules, and revenues.

The conceptual outcome is a traceable organization of interfaces. A change in the interpretation of site conditions, the layout, or a technical solution must be reflected in the documents and estimates that depend on it. Technology provides tools for maintaining this correspondence when data quality, exchange integrity, and intended use are controlled. Urban assessment broadens the examination to demands, responsibilities, and effects beyond private financial calculations.

The professional experiences delimit interfaces of practice; the fictional example demonstrates an arithmetic relationship; neither validates the framework's effectiveness. Such evaluation requires documented monitoring of applications and comparison of decisions and outcomes. Within these limits, the paper's contribution is to make explicit the conditions under which a development opportunity merits proceeding. The best use of a site emerges from the relationship among program, layout, resources, and city, assessed with information sufficient for the commitment being considered.

REFERENCES

- Brasil. (2001). Lei nº 10.257, de 10 de julho de 2001 [Law No. 10,257 of July 10, 2001]. Regulamenta os arts. 182 e 183 da Constituição Federal, estabelece diretrizes gerais da política urbana e dá outras providências [Regulates Articles 182 and 183 of the Federal Constitution and establishes general guidelines for urban policy]. https://www.planalto.gov.br/ccivil_03/leis/leis_2001/l10257.htm
- Ford, J. (2020). Guidance Part C: Facilitating the common data environment (workflow and technical solutions) (D. Churcher, S. Davidson, & A. Kemp, Eds.; 1st ed.). UK BIM Framework. <https://www.bimbaa.org.uk/>

ukbimframework.org/wp-content/uploads/2021/02/Guidance-Part-C_Facilitating-the-common-data-environment-workflow-and-technical-solutions_Edition-1.pdf

Homes England. (2021, December 10). Financial viability for housing-led projects. <https://www.gov.uk/guidance/financial-viability-for-housing-led-projects>

Kurvinen, A., & Saari, A. (2020). Urban housing density and infrastructure costs. *Sustainability*, 12(2), Artigo 497. <https://doi.org/10.3390/su12020497>

Moorhead, M., Armitage, L., & Skitmore, M. (2024). Real estate development feasibility and hurdle rate selection. *Buildings*, 14(4), Artigo 1045. <https://doi.org/10.3390/buildings14041045>

Noardo, F., Krijnen, T., Arroyo Otori, K., Biljecki, F., Ellul, C., Harrie, L., Eriksson, H., Polia, L., Salheb, N., Tauscher, H., van Liempt, J., Goerne, H., Hintz, D., Kaiser, T., Leoni, C., Warchol, A., & Stoter, J. (2021). Reference study of IFC software support: The GeoBIM benchmark 2019—Part I. *Transactions in GIS*, 25(2), 805–841. <https://doi.org/10.1111/tgis.12709>

Organisation for Economic Co-operation and Development. (2018). Rethinking urban sprawl: Moving towards sustainable cities. OECD Publishing. <https://doi.org/10.1787/9789264189881-en>

Pereira, R. H. M., Braga, C. K. V., Serra, B., & Nadalin, V. G. (2020). Desigualdades socioespaciais de acesso a oportunidades nas cidades brasileiras – 2019 [Socio-spatial inequalities in access to opportunities in Brazilian cities – 2019] (Discussion Paper No. 2535). Instituto de Pesquisa Econômica Aplicada. <https://repositorio.ipea.gov.br/handle/11058/9586>

Royal Institution of Chartered Surveyors. (2019). Valuation of development property (1st ed.; reissued in April 2023 as a professional standard). <https://www.rics.org/profession-standards/rics-standards-and-guidance/sector-standards/valuation-standards/valuation-of-development-property>

Sanz-Ablanedo, E., Chandler, J. H., Rodríguez-Pérez, J. R., & Ordóñez, C. (2018). Accuracy of unmanned aerial vehicle (UAV) and SfM photogrammetry survey as a function of the number and location of ground control points used. *Remote Sensing*, 10(10), Artigo 1606. <https://doi.org/10.3390/rs10101606>

Skarlatos, D., & Vlachos, M. (2018). Vegetation removal from UAV derived DSMs, using combination of RGB and NIR imagery. *ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, IV-2, 255–262. <https://doi.org/10.5194/isprs-annals-IV-2-255-2018>

U.S. Environmental Protection Agency. (2006). Protecting water resources with higher-density development (EPA 231-R-06-001). https://www.epa.gov/sites/default/files/2014-03/documents/protect_water_higher_density1.pdf

U.S. Environmental Protection Agency. (2023). Bioretention design handbook: Designing holistic bioretention for performance and longevity (EPA 841-B-23-002). https://www.epa.gov/system/files/documents/2023-11/bioretentiondesignhandbook_plainnov2023.pdf

U.S. Geological Survey. (2025). Lidar Base Specification 2025 rev. A. <https://www.usgs.gov/ngp-standards-and-specifications/lidar-base-specification-online>

BIOGRAPHY

João Vinicius Alves Maciel is an entrepreneur and construction project manager with approximately 18 years of professional experience in the Architecture, Engineering, and Construction (AEC) sector. His expertise encompasses residential, commercial, industrial, tourism, and urban development projects, with a focus on territorial planning, real estate feasibility assessment, infrastructure, and technical project coordination. His professional experience includes the application of digital technologies such as drones, aerial

photogrammetry, LiDAR, and Building Information Modeling (BIM). His project portfolio includes the Sítio do Picapau Amarelo Theme Park and FLORA by Orna Inc., both located in Atibaia, São Paulo, Brazil.

João Vinicius Alves Maciel é empresário e gestor de projetos na área da construção, com aproximadamente 18 anos de experiência no setor de Arquitetura, Engenharia e Construção (AEC). Sua atuação abrange o desenvolvimento de empreendimentos residenciais, comerciais, industriais, turísticos e urbanos, com ênfase em planejamento territorial, análise de viabilidade imobiliária, infraestrutura e coordenação técnica. Possui experiência na aplicação de tecnologias digitais, incluindo drones, aerofotogrametria, LiDAR e Building Information Modeling (BIM). Entre os projetos de sua trajetória profissional, destacam-se o Parque Temático Sítio do Picapau Amarelo e o FLORA by Orna Inc., ambos localizados em Atibaia, São Paulo.