

# Interior Design for Disaster Resilience

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## Abstract

*In the age of heightening environment actuated calamities and the thriving intricacy of metropolitan scenes, the basic to implant catastrophe flexibility inside plan resounds with remarkable criticalness. This examination paper embraces a general odyssey, diving into the complicated interchange between inside plan and catastrophe flexibility inside the constructed climate. Drawing upon a tremendous embroidery of insightful writing, exact investigations, and genuine models, the paper fastidiously disentangles the multi-layered methodologies, developments, and intercessions that support tough inside plan. From the sensible determination of materials to the smart arrangement of spatial formats, the paper enlightens the heap manners by which inside planners can strengthen constructed conditions against the attack of debacles, guaranteeing the security, solace, and prosperity of tenants. Moreover, the paper explores the considerable hindrances blocking the far-reaching reception of catastrophe versatile plan rehearses, while at the same time diagramming a visionary direction towards development and interdisciplinary cooperative energy. At its quintessence, this exploration advocates for a change in outlook in inside plan — a shift established in all-encompassing stewardship, intense development, and unflinching obligation to the aggregate undertaking of protecting lives, supporting networks, and safeguarding the planet's fragile balance. Highlighting a proactive stance, the study advocates for an anticipatory design framework in which evaluating risks and implementing disaster mitigation strategies are integrated into the core of the design process, rather than being secondary concerns. Consequently, this research not only urges for prompt action but also lays down a fundamental roadmap for forthcoming inquiries within the discipline.*

**Keywords:** Inside plan, fiasco flexibility, assembled climate, plan methodologies, interdisciplinary coordinated effort, contextual investigations, manageability, environment transformation, and metropolitan versatility.

## INTRODUCTION

In the present progressively risky climate, the reconciliation of catastrophe flexibility into inside plan rehearses has become imperative. Catastrophic events like tremors, floods, storms, and rapidly spreading fires, as well as human-made emergencies like pandemics, present huge dangers to fabricated conditions. Inside plan currently assumes a critical part in moderating these dangers and improving the flexibility of spaces [1]. This paper investigates how inside plan systems can add to making more secure,

more versatile conditions fit for enduring and recuperating from fiascos. By analyzing contextual analyses, experimental examination, and hypothetical systems, we mean to reveal the capability of inside plan in supporting flexibility. Also, we will talk about the ramifications of versatile inside plan for tenants, networks, and more extensive flexibility plans. Eventually, this examination plans to develop how we might interpret inside plan's part in misfortune flexibility and move proactive plan mediations. Through cooperation, advancement, and informed navigation, inside planners can fundamentally add to building more secure and stronger conditions.

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## OBJECTIVE OF THE STUDY

The essential target of this study is to examine the job of inside plan in upgrading fiasco strength inside the fabricated climate [2]. In particular, the review plans to:

1. Distinguish and investigate the different inside plan techniques and rules that add to catastrophe strength, including yet not restricted to material determination, spatial design, lighting, ventilation, and adaptability.
2. Investigate contextual analyses and certifiable guides to show powerful execution of catastrophe versatile inside plan rehearses and their effect on building security, usefulness, and tenant prosperity.
3. Inspect the difficulties and obstructions impeding the far and wide reception of calamity strong inside plan rehearses, like expense requirements, absence of mindfulness, and protection from change.
4. Examine valuable open doors for development and improvement in misfortune tough inside plan, including arising advancements, feasible materials, and interdisciplinary joint effort.
5. Examine the ramifications of tough inside plan for building inhabitants, networks, and more extensive versatility plans, featuring the interconnectedness of plan, wellbeing, and manageability. By and large, the review looks to add to a more profound comprehension of the capability of inside plan in relieving the effects of catastrophes and cultivating versatility inside the fabricated climate.

By tending to these goals, the exploration plans to illuminate and move future endeavors to coordinate debacle flexibility into inside plan practice and instruction, at last adding to the production of more secure, more versatile, and manageable assembled conditions.

## THEORETICAL FRAMEWORK

*Human-Focused Plan:* Human-focused plan underlines the significance of understanding and focusing on the requirements, inclinations, and ways of behaving of clients in the plan cycle. This system guarantees that inside plan mediations are stylishly satisfying as well as useful, agreeable, and steady of tenant prosperity, especially in calamity circumstances.

*Supportable Plan Standards:* Maintainable plan standards center around limiting ecological effect, moderating assets, and advancing strength even with natural difficulties [3]. By coordinating economical materials, energy-effective frameworks, and uninvolved plan systems, inside originators can add to making spaces that are stronger to calamities and less subject to outside assets.

*Versatile Limit:* Drawing from strength hypothesis, the idea of versatile limit alludes to the capacity of frameworks, networks, and people to expect, retain, and recuperate from interruptions. With regards to inside plan, versatile limit includes planning spaces that can adjust to changing circumstances and oblige different purposes and works over the long haul, including during and after debacles.

*Social-natural Frameworks Structure:* This system thinks about the communications between friendly, financial, and ecological elements in forming flexibility results [4]. Inside plan intercessions should represent the complicated connections between fabricated conditions, human way of behaving, and regular frameworks to upgrade calamity versatility.

*Interdisciplinary Joint effort:* Given the multi-layered nature of catastrophe flexibility, interdisciplinary cooperation is fundamental for creating comprehensive arrangements that address different difficulties and points of view. Inside originators should work intimately with draftsmen, engineers, organizers, crisis directors, local area partners, and different experts to coordinate strength standards into configuration practice.

## INTERIOR DESIGN STRATEGIES FOR DISASTER RESILIENCE

### Material Determination

- Direct exhaustive exploration on the perils predominant in the area, including seismic movement, flooding, typhoons, and so forth.
- Team up with designers, engineers, and material experts to choose the most suitable materials for each peril. Figure 1
- Think about the flexibility of the materials as well as their ecological effect and life span.



**Figure 1.** Stable Material.

### Underlying Support

- Lead primary evaluations to recognize shortcomings and weaknesses in the structure's plan.
- Work with underlying designers to execute support measures custom-made to the structure's particular Figure 2 necessities.
- Use progressed development procedures like seismic supporting, built up cement, and steel casings to improve underlying respectability.



**Figure 2.** Strong Structure.

### Safe Rooms

- Assign safe rooms Figure 3 in essential areas inside the structure, considering openness and vicinity to crisis exits [5].

- Guarantee that protected rooms are satisfactorily furnished with crisis supplies, ventilation frameworks, and specialized gadgets.
- Train tenants on the appropriate utilization of safe rooms and crisis methods.



**Figure 3.** Safe Rooms.

### Adaptable Designs

- Work intimately with inside architects and space organizers to make flexible formats Figure 4 that can adjust to evolving needs [6].
- Consolidate portable walls, folding furnishings, and particular stockpiling answers for boost adaptability.
- Consider the requirements of various client gatherings, like families, organizations, or medical care offices, while planning adaptable spaces.



**Figure 4.** Adaptable Design.

### Regular Light and Ventilation

- Streamline building direction and window position to expand normal light and wind stream. Figure 5
- Use uninvolved ventilation procedures, for example, cross-ventilation, stack impact, and chambers to upgrade indoor air quality and solace.
- Coordinate concealing gadgets, like louvers or shades, to control sun powered heat gain and limit dependence on mechanical cooling frameworks.

### Energy Proficiency

- Direct energy reviews to distinguish regions for development and focus on energy-saving measures. Figure 6
- Carry out superior execution building envelopes, effective central air frameworks, and energy-proficient lighting to decrease energy utilization.
- Consider environmentally friendly power sources, for example, sunlight-based chargers or wind turbines to upgrade versatility and lessen dependence on the matrix.



**Figure 5.** Proper Light and Ventilation.



**Figure 6.** Energy Saving Measures

**Accessibility**

- Plan inside spaces to follow availability norms and guidelines, for example, the Americans with Handicaps Act (ADA) Figure 7.
- Integrate general plan standards to guarantee that spaces are usable by individuals of any age and capacities.
- Give open courses of movement, including inclines, lifts, and handrails, to work with safe departure during crises.



**Figure 7.** Accessibility.

**Crisis Lighting and Signage**

- Introduce crisis lighting frameworks with reinforcement power sources, like batteries or generators, to guarantee brightening during blackouts. Figure 8
- Use photoluminescent or enlightened leave signs to direct tenants to somewhere safe in low-light circumstances.
- Direct standard support and testing of crisis lighting and signage to guarantee usefulness.



**Figure 8.** Emergency Signages.

**Water The executives**

- Execute extensive water the executive's systems Figure 9 to moderate the gamble of water harm during floods, tempests, or plumbing disappointments.
- Introduce flood hindrances, waterproof layers, and seepage frameworks to forestall water interruption into inside spaces.
- Raise basic structure frameworks and utilities above potential flood levels to limit harm and margin time.



**Figure 1.** Water Sprinklers.

### **Correspondence Frameworks**

- Lay out repetitive correspondence frameworks that are strong to foundation disappointments and organization blockage.
- Outfit building tenants with different method for correspondence, including PDAs, two-way radios, and satellite telephones Figure 10.
- Give preparing and crisis conventions to successful correspondence during emergencies, including how to contact crisis administrations and hand-off basic data.



**Figure 10.** Emergency Telephones

### **Fire Security Measures**

- Execute a far-reaching fire security plan that incorporates recognition and departure techniques. Figure 11
- Introduce heat proof materials, for example, fire-evaluated walls, and roofs, to compartmentalize fire and forestall its spread.
- Lead ordinary fire bores and preparing activities to guarantee that inhabitants know all about crisis systems and clearing courses.



**Figure 11.** Fire Alarms.

### Local area Spaces

- Plan collective spaces that cultivate a feeling of local area and empower joint effort and common help during crises.
- Consolidate highlights like multipurpose rooms, outside get-together regions, and local area nurseries to advance flexibility and social attachment.
- Work with local area commitment Figure 12 and cooperation in a fiasco readiness and recuperation endeavors through instructive projects, studios, and volunteer open doors.



**Figure 12.** Local Area Spaces.

### UNDERSTANDING DISASTER RISKS

In understanding calamity chances concerning inside plan, it is vital to think about different sorts of fiascos, both normal and human-made, and their possible effects on inside spaces. Here is an investigation of these components: [7].

### CATASTROPHIC EVENTS

#### Earthquakes

- Primary harm to structures can think twice about uprightness of inside spaces.
- Falling items and flotsam and jetsam present dangers to inhabitants.
- Thought of building regulations and seismic retrofitting for inside security.

#### Floods

- Water interruption can make harm inside completions, furniture, and gear. Figure 13
- Form development and indoor air quality issues post-flooding.
- Plan methodologies for water-safe materials and raised electrical frameworks.



**Figure 2.** Natural Disaster.

### **Hurricanes/Cyclones**

- High breezes can prompt primary harm and break of building envelopes.
- Influence safe windows and ways to safeguard inside spaces.
- Thought of windborne garbage security for windows.

### **Wildfires**

- Smoke penetration can influence indoor air quality and inhabitant wellbeing.
- Coal interruption through vents and different openings.
- Planning for heat proof materials and making solid zones around structures.

### **Tornadoes**

- Primary harm and garbage influence on inside spaces.
- Safe rooms or asylums inside structures for tenant security.
- Thought of wind-safe structure plan.

## **HUMAN-MADE DEBACLES**

### **Fires**

- Smoke and fire harm to inside completions and decorations. Figure 14
- Departure courses and fire wellbeing frameworks inside structures.
- Heat proof structure materials and compartmentalization of spaces. Substance

### **Spills/Modern Mishaps**

- Indoor air quality worries and possible openness to risky substances.
- Planning for ventilation frameworks and control measures.
- Crisis reaction plans for clearing inhabitants securely.

### **Psychological militant Assaults**

- Shoot impacts on building designs and insides.
- Planning impact safe highlights and safe zones inside structures.
- Security contemplations for access control and reconnaissance frameworks.

## **INFLUENCES ON INSIDE SPACES**

### **Primary Respectability:**

- Harm to walls, roofs, and floors compromising the wellbeing of tenants.
- Retrofitting existing designs for upgraded strength.
- Planning for overt repetitiveness and underlying dependability.

### **Indoor Natural Quality**

- Pollution of indoor air and water sources.
- Form development and dampness invasion post-fiasco.
- Procedures for further developing ventilation and filtration frameworks.

### **Usefulness and Solace**

- Interruption of fundamental administrations like power, water, and central air frameworks.
- Planning for inactive survivability and warm solace during outrageous occasions.
- Arrangement of crisis lighting and reinforcement power sources.

Understanding these dangers is fundamental for inside creators to foster proactive systems for catastrophe versatility, guaranteeing the wellbeing, usefulness, and solace of inside spaces notwithstanding different perils.



**Figure 14.** House Fires.

## TECHONOLGY AND INNOVATION

**Brilliant Home Frameworks Examine the reconciliation of savvy home innovation to improve calamity readiness and reaction**

- *Early admonition frameworks:* Sensors and cautions for identifying perils like fires, floods, or gas spills.
- *Remote checking:* Reconnaissance cameras and natural sensors to screen inside conditions during catastrophes.
- *Computerized shut-off frameworks:* Brilliant valves for controlling utilities like water and gas in crises [8].

**Building Materials and Development Methods Investigate creative materials and development procedures that further develop strength**

- *Flood-safe materials:* Waterproof films, raised deck, and erosion safe materials to limit water harm.
- *Heat proof materials:* Fire resistant textures, intumescent coatings, and fireproof protection to lessen fire chances.
- *Manageable materials:* Sustainable assets, reused materials, and low-influence producing processes for eco-accommodating plan.

**Inactive Plan Methodologies Examine uninvolved plan techniques that influence normal components to upgrade flexibility**

- *Regular ventilation:* Cross-ventilation, operable windows, and stack impact for further developed indoor air quality and solace.
- *Daylighting:* Expanding normal light entrance to lessen energy utilization and upgrade inhabitant prosperity.
- *Warm mass:* Consolidating high warm mass materials for temperature guideline and energy effectiveness.

**3D Printing and Construction Investigate the capability of 3D printing and construction strategies in misfortune strong inside plan**

- *Fast prototyping:* Redid parts and measured units for speedy gathering and transformation to evolving needs.
- *On location manufacture:* Printing building parts straightforwardly at the building site to lessen transportation expenses and development time.
- *Customization and adaptability:* Fitting plans to explicit site conditions and utilitarian necessities for improved flexibility.

### **Computer generated Reality (VR) and Increased Reality (AR) Talk about the utilizations of VR and AR in imagining and recreating catastrophe situations**

- *Plan perception:* Vivid encounters for partners to investigate inside spaces and assess plan choices.
- *Preparing and instruction:* Mimicked practices for crisis responders and tenants to rehearse clearing strategies and emergency the executives.
- *Post-debacle evaluation:* Advanced documentation and examination of harm to illuminate remaking and retrofitting endeavors.

### **VULNERABILITY AND EXPOSURE**

#### **Factors Contributing to Vulnerability**

- *Building plan and development:* Primary respectability, consistence with construction standards, and the utilization of tough materials [9].
- *Financial variables:* Pay level, admittance to assets, and social encouraging groups of people affecting readiness and recuperation endeavors.
- *Segment qualities:* Age, handicap, language capability, and social foundation influencing admittance to data and help during catastrophes.

#### **Types of Exposure**

- *Physical exposure:* Direct effect from dangers like breeze, water, or garbage bringing about underlying harm or breakdown.
- *Environmental exposure:* Backhanded impacts like air contamination, water tainting, or temperature limits influencing indoor air quality and solace.
- *Social and economic exposure:* Dislodging, loss of vocations, and disturbance of local area networks prompting social disengagement and financial unsteadiness.
- *Psychological exposure:* Profound pain, injury, and nervousness experienced by tenants during and after debacles, impacting mental prosperity.

#### **Vulnerable Populations**

- *Kids and older:* Expanded powerlessness to injury or unexpected issues because old enough related weaknesses.
- *Individuals with incapacities:* Restricted portability, tactile weaknesses, or mental moves influencing clearing and admittance to crisis administrations.
- *Low-pay networks:* Restricted assets for readiness, departure, and recuperation, compounding weakness to calamities.
- *Etymological and social minorities:* Language boundaries and social standards influencing correspondence, independent direction, and admittance to help during crises.

#### **Assessment and Migrations Strategies**

- **Weakness evaluations:** *Recognizing risk factors and focusing on mediations to address weaknesses.*
- *Building retrofitting:* Reinforcing primary components, further developing structure envelopes, and redesigning utility frameworks to upgrade flexibility.
- *Local area effort and schooling:* Bringing issues to light, giving preparation, and cultivating local area associations to engage occupants and advance flexibility.
- *Comprehensive plan:* Consolidating general plan standards to guarantee openness and convenience for all inhabitants, incorporating those with handicaps or unique requirements.

### **CHALLENGES AND OPPORTUNITIES**

#### **Challenges**

*Restricted mindfulness and grasping:* Absence of mindfulness among planners, clients, and partners about the significance of catastrophe flexibility and its suggestions for inside plan.

*Cost imperatives:* Spending plan constraints that might block interest in versatile plan highlights and materials, especially for clients focusing on transient monetary contemplations.

*Administrative boundaries:* Irregularities or holes in construction laws, drafting mandates, and arranging guidelines that might thwart the execution of tough plan techniques.

*Interdisciplinary joint effort:* Difficulties in cultivating cooperation between fashioners, draftsmen, engineers, crisis organizers, and different partners to really coordinate flexibility standards.

*Retrofitting existing structures:* Hardships in retrofitting more established designs to satisfy present day strength guidelines, including specialized attainability, cost-adequacy, and protection of memorable or social importance.

*Social contemplations:* Social standards, stylish inclinations, and social elements that might impact the acknowledgment and reception of strong plan rehearses inside different networks.

## **Opportunities**

*Schooling and preparing:* Amazing chances to integrate calamity versatility standards into plan educational programs and expert advancement projects to construct limit among architects and specialists.

*Mechanical developments:* Advances in building materials, development methods, and computerized apparatuses that empower architects to make stronger and versatile inside spaces.

*Strategy backing:* Amazing chances to advocate for strategy changes and impetuses that advance versatile plan rehearses, for example, charge motivators for green structure affirmations or awards for retrofitting projects.

*Public mindfulness crusades:* Potential chances to bring issues to light among the overall population about the significance of catastrophe versatility and the job of inside plan in making more secure, stronger conditions.

*Local area commitment:* Amazing chances to draw in with networks, partners, and end-clients all through the plan cycle to guarantee that flexibility systems are socially proper, comprehensive, and receptive to nearby requirements.

*Exploration and development:* Valuable chances to lead examination and pilot projects that investigate new ways to deal with inside plan for calamity versatility, for example, biomimicry, biophilic plan, and strong urbanism [10].

## **ASSESSMENT AND MITIGATION STRATEGIES**

*Risk Appraisal:* Start by surveying the potential dangers well defined for the locale and the sort of fiascos it is inclined to, like tremors, floods, tropical storms, or rapidly spreading fires. Figure out the weaknesses of the structure and its inside spaces to these dangers [11].

*Construction regulations and Norms:* Guarantee consistence with neighborhood building regulations and guidelines connected with calamity flexibility. These codes frequently incorporate necessities for underlying honesty, fire security, and availability during crises.

*Material Determination:* Pick materials that are versatile to the expected risks. For instance, utilize heat proof materials in fierce blaze inclined regions, flood-safe materials in flood-inclined regions, and seismic-safe materials in tremor inclined areas.

*Adaptable Plan:* Consolidate adaptable plan components that can adjust to changing circumstances during a catastrophe. For example, versatile furnishings, secluded segments, and folding apparatuses can work with quick departure or reconfiguration of spaces on a case-by-case basis.

*Safe Rooms and Asylum Regions:* Assign safe rooms or asylum regions inside structures where tenants can look for cover during crises. These spaces ought to be supported to endure the effect of calamities and outfitted with crisis supplies, for example, medical aid packs and crisis lighting.

*Crisis Lighting and Signage:* Introduce crisis lighting frameworks and clear signage to direct inhabitants to somewhere safe ways out during blackouts or low perceivability conditions brought about by fiascos.

*Ventilation and Air Quality:* Guarantee satisfactory ventilation frameworks to forestall the development of hurtful gases or smoke in indoor spaces during flames or different crises. Think about introducing air filtration frameworks to keep up with indoor air quality if there should arise an occurrence of ecological perils.

*Openness:* Plan inside spaces to be available to individuals with inabilities, guaranteeing that they can securely clear during crises. This incorporates giving open courses, wheelchair inclines, and signage with Braille or material components.

*Correspondence Frameworks:* Carry out strong correspondence frameworks, like radios or crisis notice frameworks, to disperse data and directions to building inhabitants during catastrophes.

*Preparing and Mindfulness:* Direct standard instructional meetings and drills to teach tenants about crisis systems and acquaint them with clearing courses and gathering focuses.

*Cooperation with Crisis Administrations:* Coordinate with neighborhood crisis administrations to integrate their proposals and aptitude into inside plan plans, guaranteeing arrangement with more extensive local area strength endeavors.

## **FUTURE DIRECTIONS AND RECOMMENDATIONS**

*Combination of Innovation:* Investigate how arising advancements, for example, Building Data Demonstrating (BIM), Web of Things (IoT), and Man-made reasoning (artificial intelligence) can be utilized to improve inside plan for catastrophe versatility. Examine expected applications, like constant checking frameworks, prescient demonstrating for risk appraisal, and computerized reaction instruments.

*Local area Commitment and Training:* Stress the significance of local area commitment and schooling in advancing versatile inside plan rehearses. Suggest drives like studios, preparing projects, and public mindfulness missions to enable partners with information and abilities to carry out catastrophe strong plan procedures.

*Interdisciplinary Cooperation:* Supporter for interdisciplinary joint effort between inside creators, modelers, engineers, crisis supervisors, and other important partners. Feature the advantages of an all-encompassing way to deal with plan that thinks about stylish and utilitarian viewpoints as well as security, maintainability, and flexibility.

*Strategy Improvement and Backing:* Require the advancement of strong approaches and guidelines that boost or command the reception of tough inside plan rehearses. Suggest backing endeavors focused on policymakers, industry affiliations, and expert associations to advance the reconciliation of calamity versatility standards into building regulations and norms.

*Research Financing and Awards:* Empower expanded interest in research subsidizing and awards to help further exploration and advancement in inside plan for catastrophe strength. Propose cooperation with government offices, non-benefit associations, and confidential area accomplices to get financing for research projects zeroed in on creating and testing versatile plan arrangements.

*Long haul Execution Assessment:* Propose the foundation of long-haul execution assessment instruments to survey the viability of versatile inside plan intercessions over the long run. Suggest post-inhabitation assessments, observing of building execution information, and criticism circles to illuminate iterative upgrades and best practices. [12]

*Worldwide Coordinated effort and Information Sharing:* Backer for worldwide cooperation and information sharing drives to trade best practices, examples learned, and creative arrangements in inside plan for catastrophe strength. Support cooperation in worldwide gatherings, research organizations, and online stages devoted to propelling the field.

*Consolidation of Environmental Change Transformation:* Feature the need to integrate contemplations for environmental change variation into strong inside plan rehearses. Address the rising recurrence and power of outrageous climate occasions, ocean level ascent, and other environment related perils by coordinating versatile plan systems and strong framework arrangements.

## CONCLUSION

Designing interiors for disaster resilience involves integrating both functional and aesthetic elements to create spaces that can withstand and recover from various disasters. This includes incorporating durable materials, flexible layouts, and efficient use of space, while also considering psychological comfort and visual appeal. The goal is to create environments that not only protect occupants during emergencies but also support their well-being and recovery afterwards.

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