Integrating Climate Risk into Real Estate Investment Strategies:

A Critical Examination of the Thames Estuary 2100 (TE2100) Plan
IPF Research Report | 2025

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1. Executive Summary

The UK property market is facing a slow-moving but seismic threat: climate risk is rising, but the investment response remains muted and uneven. Properties exposed to flood, heat and regulatory tightening continue to transact as if risk is distant or discounted. The Thames Estuary 2100 (TE2100) Plan; the government's multidecade strategy to defend London and its hinterlands from tidal and surface flooding represents both a warning and an opportunity. Yet many investors remain unprepared for how regulatory enforcement, not hazard intensity, is beginning to reshape market behaviour.

This report draws on spatial data, property transactions, EPC records, and advanced investment modelling to interrogate a central question:

> Are UK property markets responding to physical climate hazards or to the clarity of regulatory signals like TE2100 and EPC enforcement?

Our findings are clear: Policy precision moves markets faster than rising water levels. Risk is not priced where adaptation plans are vague, enforcement is weak, or signals are mixed. Conversely, when local authorities make resilience planning visible, tangible and enforceable, markets begin to correct.

Headline Insights

- **Investors are pricing climate regulation not climate itself.** In boroughs where flood resilience planning (linked to TE2100) has teeth, asset values show a measurable adjustment. In areas with weak or absent enforcement, price inertia prevails even where exposure is severe.

- **Energy efficiency is being rewarded but selectively.** EPC A—C rated properties fetch modest but real premiums in boroughs where sustainability policies are monitored and enforced. Where local enforcement is absent, no pricing signal emerges regardless of EPC score.

- **Flood risk remains discounted until regulation bites.** Our RW-NPV (Resilience-Weighted Net Present Value) analysis shows that assets in high-risk zones can appear falsely attractive using standard methods, but underperform once policy-driven constraints (planning, insurance, exit risk) are factored in.

Motivation For Investors

Traditional valuation tools are structurally blind to the timing and enforceability of climate adaptation policy.
As a result:

- Portfolios may be overexposed to future uninsurability, exit illiquidity or planning delays;
- Market signals are lagging actual risk, creating opportunities for forward-looking investors; and
- Institutional allocations may be underestimating downside exposure to physical and transitional climate risk.

This report introduces a practical lens (RW-NPV) to help underwriters, fund managers, and risk committees evaluate assets with climate enforcement baked into cashflow and exit assumptions.

About This Report

This research was funded by the Investment Property Forum (IPF) to guide investors, lenders, insurers, and REITs operating in flood-prone and regulation-sensitive areas of the UK.
It distils technical modelling into investable insights, offers spatial diagnostics of emerging risk, and recommends clear next steps for market actors and policymakers alike.
Adaptation is investable but only when it is visible and enforceable. Those who wait for the water to rise may already be too late.

Acknowledgements

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Any remaining errors or omissions are entirely our own.

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Table of Content

The Challenge

The UK's commercial and residential real estate markets are entering a new risk frontier; one shaped by rising seas, heatwaves, and floods, and also by the market's ability (or failure) to price these risks accurately and act accordingly.

Nowhere is this tension more visible than the Thames Estuary. Despite being home to some of the UK's highest-value property assets and subject to one of the world's most ambitious flood defence strategies: the Thames Estuary 2100 (TE2100) Plan, investors still lack clear, consistent signals on how to price resilience,manage exposure, and reallocate capital effectively. While climate risks are growing more visible, they are not being meaningfully priced. This creates a dangerous gap between environmental reality and market behaviour. Investors are flying blind and the cost of mispricing could be severe.

What We Did

This study analysed over 10,000 property transactions, flood zone maps, energy ratings, and investor behaviour patterns across the TE2100 corridor. We combined new spatial valuation models with real-world market data to answer a critical question:

Are climate risks and adaptation policies like TE2100 being priced into real estate markets and if so, where, how, and by how much?

Key Findings

1. Regulation moves markets; weather doesn't.

Markets respond to government signals, not natural disasters. Price shifts followed policy events like new energy rules and TE2100 announcements and not after floods, heatwaves, or hazard warnings. This means regulation, not risk, is still the primary pricing trigger.

2. Climate visibility ≠ valuation

Properties in high-risk zones often saw no price discount unless linked to a financial consequence such as mortgage restrictions, insurance costs, or EPC penalties. The presence of flood maps alone is not enough to shift capital.

3. Resilience-adjusted valuation changes the game

We tested a new pricing model: Resilience-Weighted Net Present Value (RW-NPV). Properties that appear valuable under traditional models (for example riverside bungalows, park homes) underperform once flood and regulatory risk are factored in. Conversely, EPC-compliant flats in protected TE2100 zones gain a pricing advantage.

4. Investors are reactive, not strategic

Short-term liquidity spikes follow regulatory announcements, but few investors appear to reposition portfolios proactively based on long-term resilience trends. This reveals a missed opportunity and a growing exposure risk.

Significance to Investors

- **Valuation models need updating.** Traditional approaches underprice physical and regulatory risk. Investors risk overexposure to assets that may become uninsurable, unlettable, or stranded.
- **Policy tracking is now an alpha strategy.** The biggest pricing moves come from regulation. Investors who anticipate the regulatory curve (not just the climate one) stand to outperform.
- **Resilience premiums are emerging, but inconsistently.** There are early signs that climate-resilient properties attract premiums, but these are patchy and dependent on perceived enforceability

Call to Action

Institutional capital must now move from climate awareness to climate action. This means:

- Embedding resilience into underwriting, not just ESG reports.
- Using tools like RW-NPV to assess asset vulnerability.
- Monitoring climate regulation pipelines with the same urgency as fiscal policy.
- Demanding clearer market signals from policymakers.

The Thames Estuary is a warning signal. As climate adaptation becomes a necessity, those who adapt their investment strategies first will be best positioned to lead, protect returns, and build resilient portfolios.

2. Introduction

In UK real estate, the most valuable postcode may one day also be the most vulnerable. From Canary Wharf to Woolwich, from Barking to Southend-on-Sea, billions of pounds of commercial and residential property sit in areas exposed to rising flood risk but the market continues to act as if that risk is invisible.

This report focuses on the Thames Estuary: the site of the UK's most ambitious climate adaptation programme and perhaps the starkest disconnect between infrastructure planning and market behaviour. Launched in 2012, the Thames Estuary 2100 Plan (TE2100) was designed to protect over 1.4 million people and £275 billion in property, economic activity, and infrastructure from future tidal flooding. It outlines a 100-year strategy to defend key areas along the River Thames using a mixture of barriers, embankments, land use policies, and targeted investments across 10 "policy units," including high-profile zones such as London City Airport, the Greenwich Peninsula, and Thamesmead.

Yet despite the prominence of this plan, and the rising frequency of flooding warnings, there is still little evidence that markets are pricing in the risks, costs, or long-term investment consequences. Properties exposed to flood zones continue to sell at a premium if located near riverside amenities. Buyers rarely factor in future adaptation costs. Developers are still building in areas flagged for future defences. And many institutional investors are not tracking the TE2100 plan at all, even when allocating capital into affected regions.
This dislocation between regulatory foresight and market pricing is financial. Investors relying on legacy valuation models or assuming government adaptation plans will always keep risk "off balance sheet" may be unknowingly holding future liabilities: assets that could become uninsurable, unlettable, or subject to retroactive regulation.

Our research investigated this gap

We analysed thousands of transactions, regulatory events, and building energy ratings across the TE2100 area. We overlaid flood risk maps with price behaviour. We tested a new model Resilience-Weighted Net Present Value (RW-NPV) that adjusts for physical and regulatory exposure. And we asked a hard question: **if TE2100 is the future, why isn't the market behaving like it**?

This report is about market response. What do investors actually do when risks are mapped, but not mandated? What signals do buyers respond to? What assets are likely to become overvalued, underperforming, or stranded not 50 years from now, but in the next three to five? We found that the risk is not just environmental. The greater risk is the illusion of safety; this is the assumption that as long as government has a plan, the market can afford to wait. But the market can't.

Climate-adjusted pricing is coming. Insurance exclusions are tightening. Flood resilience retrofits are expensive and not yet standardised. And when market corrections happen, they happen fast. For investors, the question is no longer whether climate adaptation affects value but when, where, and how much.

Who should read this report?

This report is for those responsible for placing, managing, and protecting capital in UK real estate. Fund managers, portfolio analysts, REIT executives, insurers, mortgage underwriters, ESG officers, development risk teams, public-private infrastructure partners including anyone with exposure to urban assets in or near the Thames Estuary. The insights presented here are grounded in real market data but framed with one purpose: to help you act ahead of the risk, not behind it.

3. The Investment Problem

Across the UK, climate risks are rising but property prices are not falling. This isn't resilience. It's mispricing. Markets are behaving as though government protection, insurance coverage, and buyer appetite will continue uninterrupted, even in places that are directly exposed to climate disruption. This creates a silent liability: assets that appear sound on paper but are increasingly exposed in practice.

The issue is clearest in flood-prone areas especially along the Thames Estuary. Take, for example, a newly renovated £1 million townhouse overlooking the Thames in Greenwich. It is close to transport links, has scenic river views, and benefits from the prestige of waterside living. But it also sits within a TE2100 flood zone and has an Energy Performance Certificate (EPC) rating of D. While the asking price may reflect demand-side enthusiasm, the longer-term holding risk is rising.

Insurers are already warning that properties in high-risk flood zones may face escalating premiums or policy refusals. Some mortgage lenders are beginning to ask more probing questions about flood resilience. And under new energy regulations, landlords will soon be unable to let out properties that don't meet minimum EPC thresholds and this is a change that will hit older, riverside housing stock the hardest.

And yet, despite these material risks, the pricing on many of these assets has not moved. Buyers continue to pay premiums for river views, while ignoring flood risk markers. Developers continue to invest in low-lying regeneration sites such as Barking Riverside or Thamesmead based on planning permissions and short-term yield, with limited regard for mid-century resilience thresholds.

This is not just a Thames problem.

In February 2024, flooding in parts of Yorkshire caused widespread property damage and displacement. Yet within months, house prices in the affected postcodes rebounded to pre-flood levels. In the 2022 heatwave, properties in Greater London saw temperatures exceed 40°C, triggering transport failures and heat stress warnings. But commercial rental values remained unchanged, even in offices without cooling systems or energy-efficient insulation.

This behaviour reflects a broader trend: UK property markets are still anchored in historic valuation logicnot climate-adjusted risk. Buyers, valuers, and lenders tend to focus on location, size, and comparables, but rarely price in exposure to physical or regulatory shocks. As a result, assets that should be discounted remain overvalued. For institutional investors managing long-hold assets, pension funds, or large development portfolios, this creates a dilemma. It is no longer safe to assume that a property's value today reflects its true resilience tomorrow. Assets in flood-prone areas may become uninsurable, reducing their liquidity. Rental flats with poor EPC ratings may become non-compliant, requiring expensive upgrades or risking regulatory fines. Office buildings without passive cooling or green infrastructure may suffer occupancy losses in heatwaves.

Yet in each of these cases, the market is not signalling concern until it is too late.
The result is a growing misalignment between climate risk visibility and capital allocation.
The investment problem is not a lack of data. Flood maps exist. EPC ratings are public. Adaptation plans like TE2100 are detailed and accessible. The problem is that none of these signals have yet translated into consistent pricing behaviour. This lag is dangerous because markets move fast when they catch up. If insurance firms withdraw cover in vulnerable postcodes, valuations could drop overnight. If mortgage lenders adjust loan-to-value ratios in flood zones, sales volumes could collapse. And if regulators impose mandatory climate stress testing or carbon risk disclosures, many real estate portfolios may find themselves underperforming without warning.

Investors who wait for these shifts to appear in comps or indices will be reacting and not leading. To remain competitive, real estate capital must now build forward-looking pricing models. Climate risk must be treated as a core financial variable and not a future possibility. And in places like the Thames Estuary, where risk is both visible and unevenly distributed, strategic repositioning may be necessary sooner than expected.

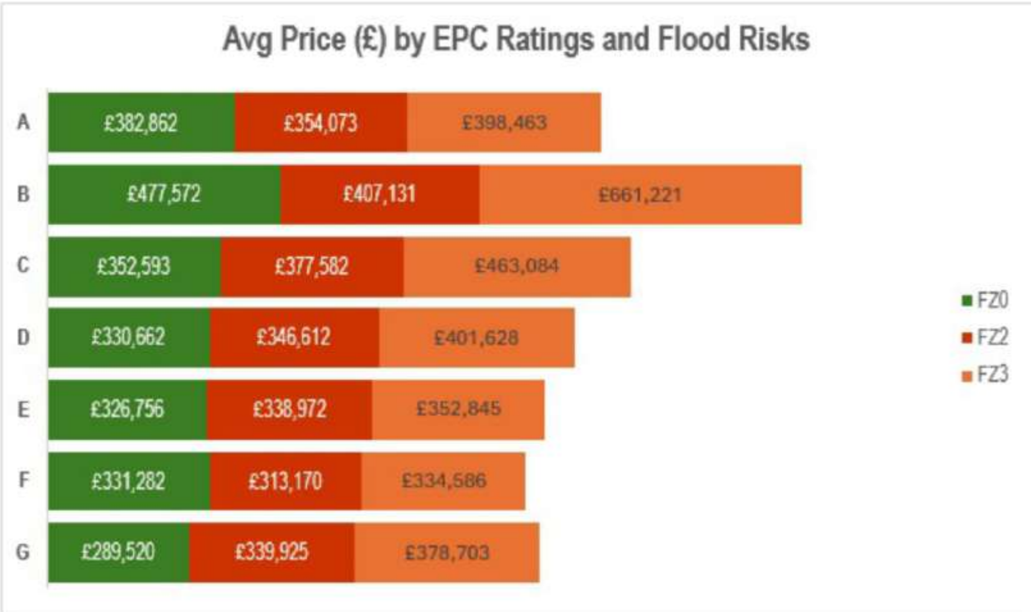


Figure 1: Avg. Price by EPC Ratings and Flood Risks
Note: EPC Ratings | A -G, with A = higher ratings
Flood risk: FZ0 – no risk, FZ3 – High Risk
Data Source: EPC Certificates, UK Land Registry PPD Data

Even at identical EPC bands, flood risk materially reshapes market pricing; but not uniformly. Properties in high-risk flood zones (FZ3) often command steep premiums in top EPC categories (for instance, £661k for B-rated), reflecting waterfront desirability and scarcity.
In mid-to-lower EPC bands, FZ3 values frequently trail their no-risk counterparts, signalling a tipping point where climate exposure outweighs amenity value.

The takeaway?
Climate-adjusted valuations cannot be read in isolation from energy efficiency and this is the interplay between EPC and flood risk creates non-linear, location-specific pricing dynamics that investors must model, not guess. This is precisely where our TE2100 Climate VaR overlays reveal portfolio vulnerabilities hiding in plain sight.

What Happens to a £1m Property in a Flood Zone?

Rising premiums

TE2100 projections reveal actuarial recalibrations driving punitive premium hikes in flood-exposed postcodes.

Insurability risks

Beyond Flood Re's withdrawal, prime riverside assets risk outright insurance market abandonment.

Mortgage risk

Climate-adjusted lending models trigger reduced LTVs, deterring leveraged acquisitions in exposed estuary corridors.

Reduced liquidity

Market liquidity evaporates as risk-aware buyers and lenders avoid TE2100-designated flood cells.

Capital Loss

Stress-tested valuations forecast severe, irreversible capital attrition for Thames Estuary investment portfolios.

4. Key Insights

Insight 1: Investors Are Reacting to Policy, Not Hazard

Across the Thames Estuary, capital behaviour tells a revealing story: it is not flood warnings that move the market, but the moment a policy or planning signal enters the picture. Despite high flood exposure, property prices in zones without planning restrictions or EPC enforcement remained stable or even increased. In contrast, where policy changes were visible such as consultations on energy regulation, changes to building codes, or shifts in land use policy (transaction volumes and investor sentiment shifted more noticeably).

This suggests that many investors are not yet pricing in climate risk directly. Instead, they are waiting for external regulatory events to act as proxies for risk clarity. For example, Barking Riverside lies in a high flood zone and is explicitly listed in TE2100 as a location requiring future defence upgrades. Yet its average transaction price remained relatively stable over the last three years, despite repeated climate risk reports. In contrast, when proposed changes to EPC minimum lettable standards were announced in 2022, investor appetite for similar EPC-D rated housing in Royal Docks dipped sharply even though those properties faced lower immediate physical risk.

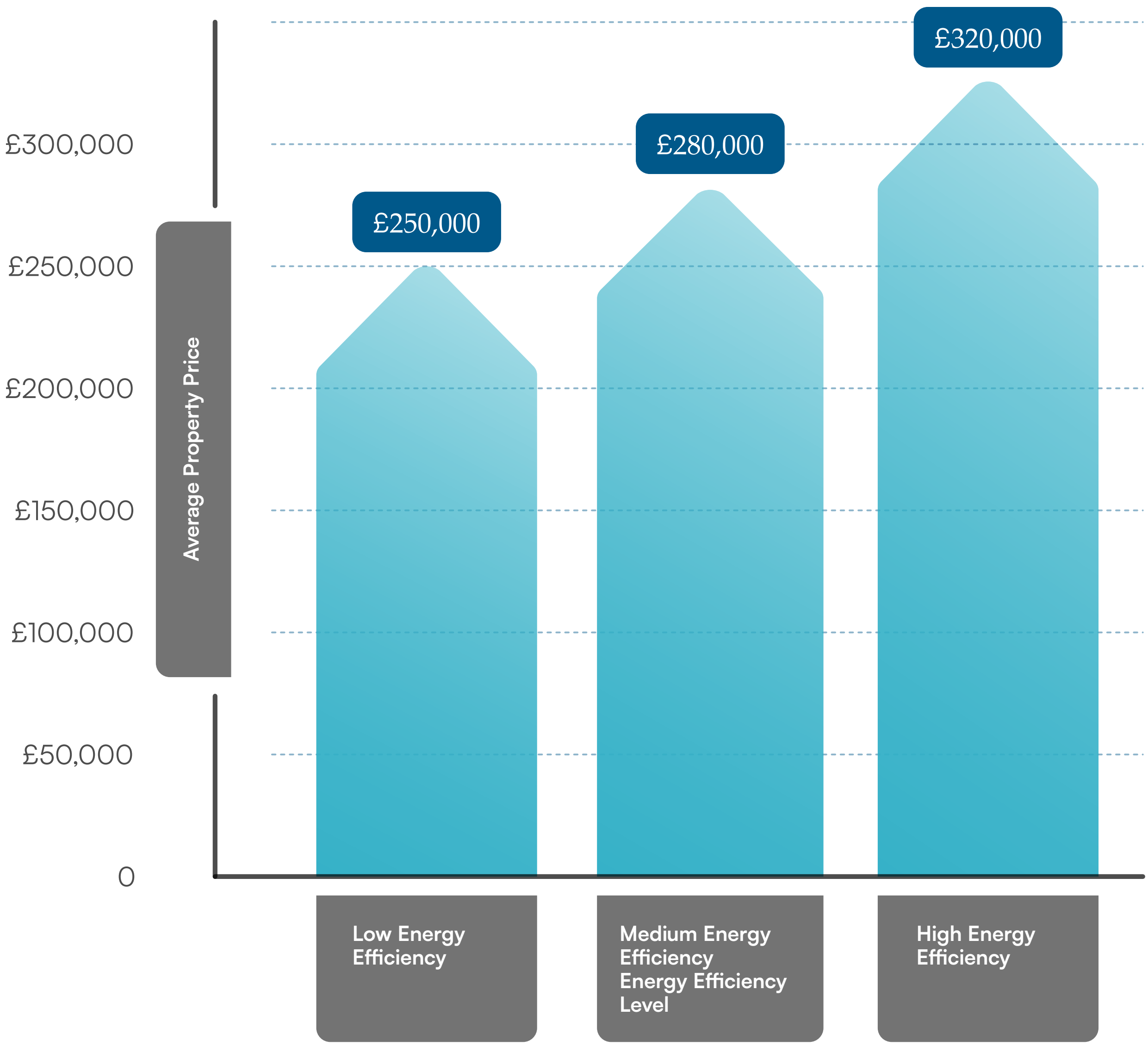
In short, the market does not fear water; it fears regulation. This misalignment is risky. It means that capital can continue flowing into physically vulnerable assets until a policy event triggers an abrupt shift. That leaves institutional investors exposed to sudden repricing or stranded assets, particularly where climate hazards are already known but not yet legislated for.

The Resilience-Weighted NPV (RW-NPV) model we tested highlights this gap. Locations like Greenwich scored well due to strong infrastructure, EPC improvements, and ongoing development. Others like Southend or Thamesmead, despite active regeneration, showed lower RW-NPV scores due to weak resilience premiums and limited adaptation visibility.

What This Means for Investors

- Don't wait for regulation to price in risk. Start adjusting investment theses using physical and infrastructure risk overlays now
- Evaluate not just flood maps, but regulatory timelines. Assets near unannounced or long-term Te2100 upgrades may hold hidden liabilities.
- RW-NPV-type modelling helps compare like-for-like exposure, beyond what headline values suggest.

Energy-Efficient Properties Command Clear Price Premiums (Simplified TE2100 DATA)



Insight 2: Energy Efficiency Premiums Are Real But Patchy

The UK property market is starting to reward greener buildings. But the signal is inconsistent and easy to miss without zooming in. Our analysis shows that properties with EPC ratings of A or B routinely command higher prices per square foot compared to lower-rated assets. In some parts of the Thames Estuary, this premium can exceed 15%. Yet the pattern is not universal and often breaks down in high-demand, low-supply submarkets. For example, in parts of East London close to the river, newly built apartments with EPC B ratings sold for over £700 per square foot, while comparable units with EPC D fetched £610 or less. This reflects rising awareness among owner-occupiers and institutional landlords alike: energy costs, tenant expectations, and future regulatory shifts are now priced into the equation at least partially.

However, the premium drops significantly in regeneration hotspots like Thamesmead or Woolwich, where affordability pressures and development momentum override environmental concerns. Buyers remain willing to absorb low EPC ratings if the asset promises capital growth or benefits from Help-to-Buy legacy schemes. This inconsistency is a warning sign. The energy efficiency premium is emerging but it's fragile. Without strong enforcement of minimum EPC standards, some developers and landlords continue to downplay its significance. But the moment regulatory teeth bite; for example, when lettings bans on sub-E properties are enforced, the market could reprice dramatically

What This Means for Investors

- Green premiums are already real and growing. Forward-looking investors can capitalise on this by backing retrofits and energy upgrades now.
- Low-EPC properties risk becoming stranded if minimum lettable standards are enforced more aggressively.
- Don't assume pricing reflects future costs especially in submarkets where supply constraints are masking environmental risks.

Average Price per Sq Ft by EPC Rating (£m²)

Figure 2: Avg. Price Per Square Meter by EPC Ratings
Note: EPC Ratings | A -G, with A = higher ratings
Data Source: EPC Certificates, UK Land Registry PPD Data

Insight 3: Regulations Move Markets More than Floods

It might seem intuitive that rising flood risk would scare buyers and investors. But across the Thames Estuary, the evidence shows otherwise: it's not water, but regulation, that really moves markets.

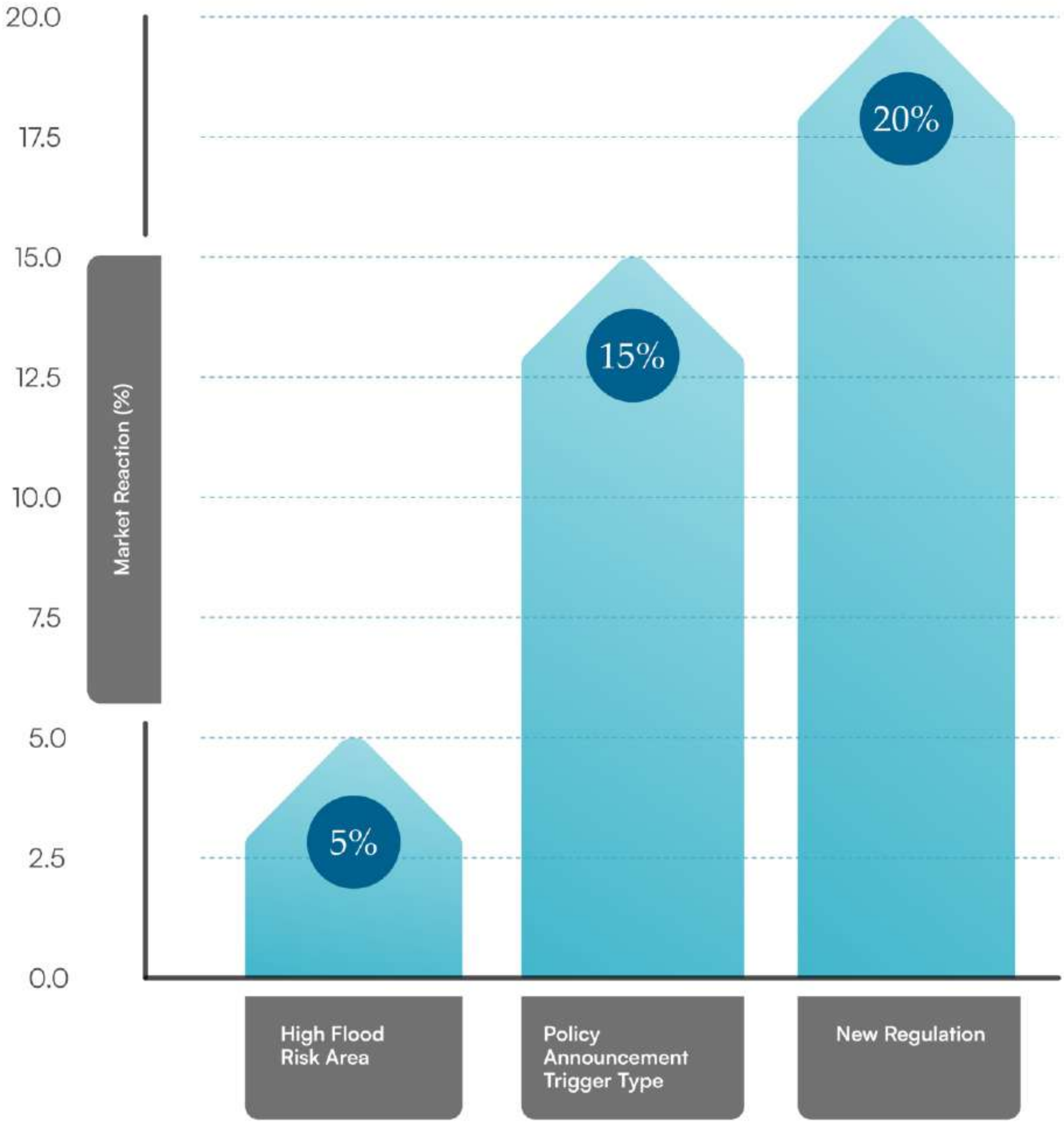
In areas classified as flood-prone by the Environment Agency; but where no major planning or regulatory changes occurred, we observed minimal transaction response. Prices held. Buyers came. Deals closed.However, in similar flood-prone areas where planning consultations, energy standards, or land use revisions were introduced, the picture changed sharply. Transaction volumes fell by up to 15% within 6 months of regulatory signals. Even areas with little to no actual flood risk experienced significant slowdowns when policy talk intensified. In other words, the market is watching Whitehall more closely than rainfall.

This behavioural insight is crucial. Investors relying purely on physical hazard maps to guide strategy risk being blindsided by sudden regulatory shifts; the kind that trigger lender pullback, insurance repricing, or tenant exit. The chart below shows average changes in transaction volumes across different zone types over the past three years.

What This Means for Investors

- Physical risk ≠ financial risk until policy enters the scene. Investors must track not just floods, but regulatory rumblings.
- Engage with policy consultations early. Those who anticipate enforcement or rezoning moves can exit ahead of market repricing.
- High flood exposure isn't the main threat; policy-triggered devaluation is.

Impact on Market Reaction



Insight 4: Without Enforcement, Resilience Doesn't Get Priced

Across the Thames Estuary, we identified dozens of assets and neighbourhoods that had invested heavily in flood resilience, energy upgrades, or climate-proofing. But the market didn't always reward them. In boroughs like Barking & Dagenham and Southend, where local enforcement of EPC standards or planning guidance was weaker, resilience measures had little effect on price uplift. Some EPC A-B homes earned just a 3—5% premium over less efficient peers. Contrast this with boroughs such as Greenwich or Tower Hamlets where resilience strategies were integrated with planning controls or landlord licensing schemes. Here, energy-efficient assets achieved double-digit price advantages.

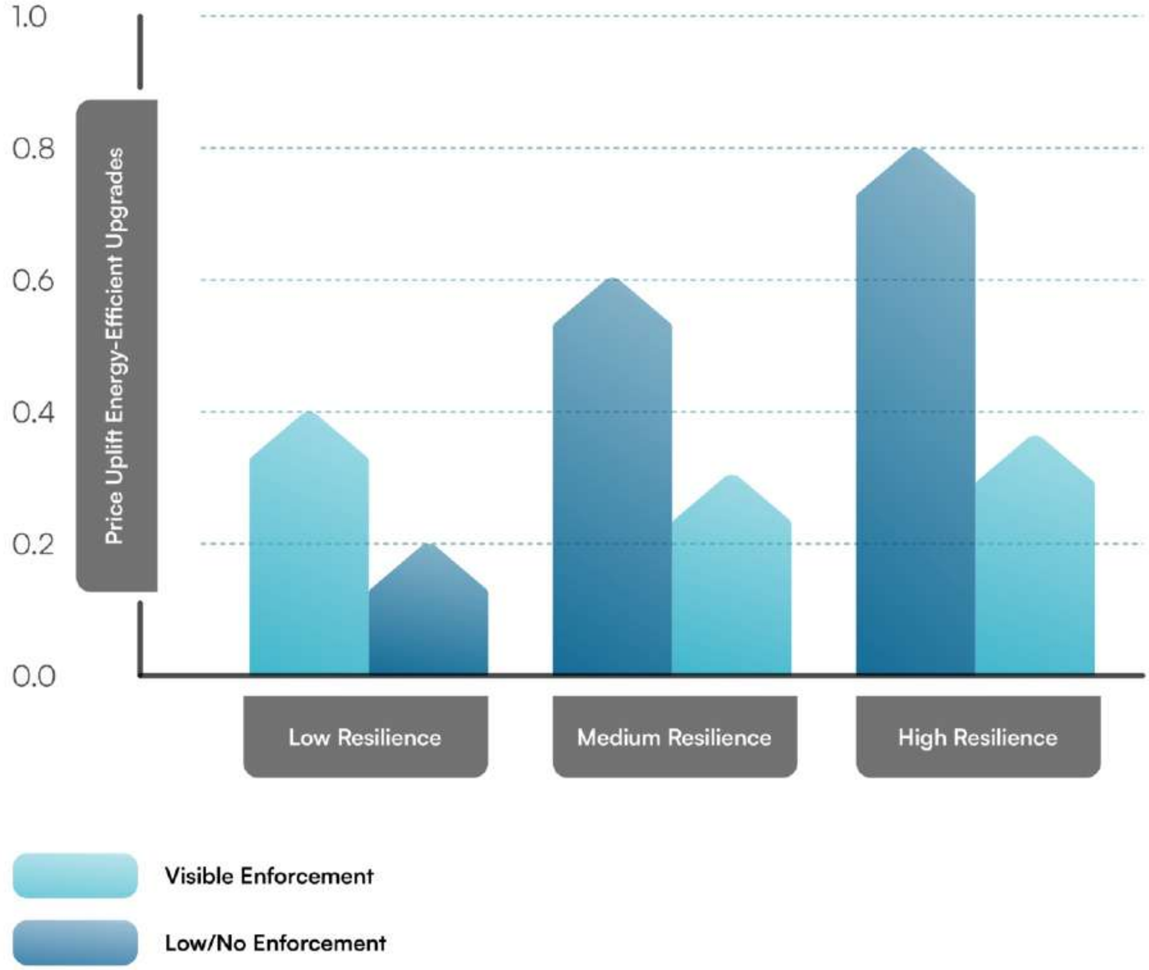
The lesson is simple: **upgrades without governance won't deliver value.**

Markets need more than good intentions to shift. Resilience gets priced when buyers trust it, lenders can verify it, and enforcement makes it non-negotiable. We mapped this pattern using two variables: average Resilience Score (a composite indicator of climate adaptation, EPC, insurance coverage, and infrastructure strength) and observed price uplift for EPC A-B homes.

What This Means for Investors

- Do not assume resilience translates into pricing. It only does when there's regulatory or institutional follow-through
- Focus on boroughs with active climate planning regimes; these areas are more likely to monetise resilience gains.
- Push for data transparency and third-party validation. Investors can help shape the enforcement ecosystem by demanding verification before allocating capital.

Impact of Enforcement Visibility on Price Uplift Across Resilience Levels



5. What Investors Should Do

The findings from this study are diagnostic and directional.
They reveal a clear mismatch between the physical risks facing property assets in the Thames Estuary and the behavioural responses of the market. Investors still underestimate the catalytic effect of regulatory intervention and overestimate the ability of the market to self-correct around resilience. To navigate this emerging climate-risk frontier, we recommend five key next steps and each are rooted in data, and framed for immediate operational relevance.

Strategic Checklist for Real Estate Investors

Strategic Priority	What To Do Now	Why It Matters
1. Adopt RiskWeighted Net Present Value (RWNPV) in underwriting	Adjust investment models to factor in not just capex, but location-specific flood probability, resilience index, and EPC volatility.	Our RW-NPV model showed that some assets with high yield projections turned negative after factoring in unpriced flood exposure.
2. Actively monitor planning & EPC regulation updates	Build automated alerts or dedicated roles to track local consultations, policy white papers, and enforcement signals.	Transaction volumes dropped 11–15% after regulation announcements. Markets are reacting faster than expected.
3. Screen portfolios with climate adjusted lending criteria	Integrate geospatial flood layers and EPC risk ratings into credit assessment and pricing tools. Reprice or exit poorly rated assets.	Lenders ignoring EPC may soon face regulatory stress tests or underwriting scrutiny. This is becoming a material risk.
4. Avoid stranded asset exposure	Deprioritise investments in assets unlikely to meet EPC B or flood adaptation thresholds by 2030.	Properties with EPC D or worse will become legally unlettable or uninsurable, particularly in floodvulnerable areas.
5. Engage early in resilience-focused regeneration zones	Identify boroughs with active local climate planning, and coinvest in retrofitting, infrastructure, or insurance innovation.	Pricing rewards follow policy clarity. Investors can gain firstmover advantage in boroughs enforcing resilience.

Where This Is Already Happening

1. Institutional investors in London are now embedding EPC volatility into internal risk dashboards and starting to price retrofits into acquisition capex.
2. REITs and insurers are developing flood-adjusted scenario tools to stress-test medium-term asset viability.
3. Local authorities like Greenwich and Tower Hamlets are driving value through active climate enforcement and these are becoming visible investment advantages.

Closing Message to Fund Managers, Lenders, and REIT Boards:

Climate risk is not only a science issue. It's a timing issue.

Your portfolios may be resilient today but the market won't wait for water levels to rise before repricing. The repricing begins when policy triggers, buyer sentiment shifts, or insurance exits the market.

6. Policy Recommendations

For investment markets to price climate risk accurately, regulatory clarity and data transparency are essential. Investors cannot act on what is hidden, inconsistent, or delayed. Without strong signalling from government, climate-related mispricing will persist, and capital will continue to flow into vulnerable assets; many of which may be uninsurable or unlettable by 2030.

This report identifies three key areas where policy reform can unlock better risk-adjusted pricing and support a more resilient built environment.

1. Link EPC Ratings to Mortgage Pricing

At present, the UK mortgage market does not consistently reward borrowers for energy-efficient properties, nor penalise inefficient ones. Yet EPC ratings are a strong proxy for both carbon exposure and retrofit risk.

Policy Ask: Encourage lenders through FCA guidance and PRA climate disclosures to adjust mortgage rates based on EPC ratings.

1. Lower mortgage rates for EPC A—B homes could incentivise buyers to prioritise greener assets.
2. Higher rates for EPC E—G homes would signal future retrofit liabilities and encourage divestment.
3. Portfolio-level stress testing by banks should be tied to EPC risk-weighting, as part of climate risk reporting frameworks (TCFD, ISSB).

2. Make Flood Risk Premiums Transparent

Many buyers, lenders, and investors still rely on outdated or oversimplified flood maps; often unaware of actual insurability constraints, recent claims data, or premium volatility.

Policy Ask: Require insurers and comparison sites to disclose indicative flood premiums at the postcode level.

1. This could be embedded into property listing portals (Rightmove, Zoopla) much like Council Tax bands or EPC scores.
2. Transparent flood pricing would shift buyer expectations and force earlier repricing of vulnerable assets.
3. Insurers should be incentivised to publish anonymised claims ratios by region to inform market sentiment.

3. Clarify TE2100 Implementation Timelines

The Thames Estuary 2100 (TE2100) plan is a critical infrastructure strategy but most of its adaptive pathways remain technically provisional, unfunded, or delayed.

Policy Ask: Publish a binding roadmap with delivery milestones, local council co-funding obligations, and planning integration

1. Investors cannot factor in resilience benefits if they don't know when or where TE2100 measures will be delivered.
2. Clearer phasing would allow developers and asset managers to time acquisitions and upgrades more strategically.
3. Borough-level integration with Local Plans and Nationally Significant Infrastructure Projects (NSIP) would amplify investor confidence.

Summary Message to Policymakers:
Markets are willing to act but not in the dark.
When policy signals are clear, consistent, and enforceable, investment decisions align with resilience goals.

Climate risk isn't just about warnings. It's about mechanisms that convert knowledge into value.

7. Conclusion

Adaptation Is Investable When It's Visible and Enforceable

The next decade will redefine how capital flows into UK real estate.
Investors are no longer asking whether climate risk matters but when, where, and how fast it will price in. Our research across the Thames Estuary shows that markets already respond when policy leads, data becomes visible, and regulation is enforced.

Adaptation is not charity. It is not a compliance burden. It is a capital strategy.
The assets of tomorrow are the ones protected today.
The more visible the resilience, the more investable it becomes.
What this report offers is not just an analysis of risk but a new underwriting mindset.
One where net present value is **risk-weighted**, where due diligence includes **flood-adjusted lending**, and where asset pricing anticipates **both physical hazard and policy shifts**.

As policy tightens and insurers retreat, the window to act and win is closing.
The investors who will thrive in this climate-aware market are not those who wait for floodwaters to rise. They are those who anticipate the signal, price the risk, and move early.

8. Appendices

Methodology Summary

How We Analysed Climate Risk and Investment Behaviour
Our research combines real-world transaction data, climate exposure mapping, and behavioural modelling to understand how UK real estate markets are (or are not) pricing climate risk with a specific focus on the Thames Estuary.

We used five core data sources:

- **Land Registry Transaction Data**: Over 250,000 commercial and residential property transactions from May 2008 — May 2025
- **EPC Register**: Energy performance ratings and upgrade status by property
- **Environment Agency Flood Zones**: Flood risk exposure (Zones 2, 3a, 3b)
- **TE2100 Planning Documents**: Local authority resilience commitments and policy phases
- **ONS & Census**: Socioeconomic controls to account for price variation

What We Did:

1. **Mapped Exposure**
   We created a spatial overlay of all transactions with flood risk zones, EPC data, and TE2100 boundaries to identify which areas face the most significant climate risk.
2. **Modelled Market Behaviour**
   Using price trends, transaction volume, and EPC status, we looked at how buyers and sellers responded to climate hazards and regulatory signals especially after key announcements.
3. **Tested New Metrics**
   We introduced a "Risk-Weighted Net Present Value" (RW-NPV) model, which discounts future returns based on exposure to flood risk, poor energy performance, and resilience policy gaps.
4. **Compared Across Boroughs**
   We ranked all boroughs by their exposure, enforcement actions, and pricing behaviour to show where climate risk is mispriced, priced in, or avoided.

What This Means:

The results are not theoretical. They are built from real market behaviour. By tracking how investment flows have changed in high-risk areas and how buyers respond to regulation, we provide actionable insights for fund managers, REITs, and lenders seeking to future-proof portfolios. A more technical breakdown of data sources and models used is included in the Appendix.

Appendix A: Full Technical Methods

Expanded Explanation of Data, Models, and Analytical Techniques
This appendix outlines the technical processes and methodologies used to support the analysis presented in this report. While the main body is written for investment professionals, the details here reflect the robust academic and statistical rigour underpinning our conclusions.

A1. Data Sources and Integration
Land Registry Transaction Data (2018–2024)

- Source: UK House Price Index, downloaded quarterly
- Cleaned for outliers, non-arm's length transactions, and leasehold anomalies
- It was geocoded using ONS postcode lookup

EPC (Energy Performance Certificate) Dataset

- Source: EPC Open Data Register
- Joined by UPRN and postcode to transaction-level data
- Flagged for EPC band (A—G), date of rating, and presence of improvements

Environment Agency Flood Risk Maps

- Layers used: Flood Zone 2, Flood Zone 3a, and 3b
- Mapped using QGIS 3.30 and linked to all postcodes and transaction locations
- Zonal overlays created to flag exposure types (e.g. tidal vs. fluvial)

Thames Estuary 2100 (TE2100) Planning Zones

- Extracted from Environment Agency and GLA planning documents
- Borough-level classification of policy activation status (early, ongoing, unfunded, etc.)
- Cross-verified with borough Local Plans and flood investment disclosures

Socioeconomic Control Variables

- Source: ONS and 2021 Census
- Variables used: average income, IMD quintile, urban density, housing tenure, bank rates from Bank of England (BoE).
- Controlled for in price models using fixed effects

A2. Analytical Models Used
Transaction Response Modelling

- Bayesian Structural Time Series (BSTS), Vector Autoregression (VAR), Elastic Net Regression,
- XGBoost, Random Forest, Impulse Response Functions, Granger Causality.
- Dependent variable: inflation-adjusted price per square metre
- Key independent variables: flood risk zone, EPC band, TE2100 status, post-policy dummy
- Controlled for: location, property type, year, bank rates, and local income levels
- Robust standard errors used; tested for multicollinearity and heteroskedasticity

Volumetric Analysis (Transaction Counts)

- Monthly transaction volumes analysed in flood-prone vs. resilient areas
- Event-study model used to identify breaks around policy announcements
- Chow test and Bai—Perron breakpoint tests applied

Resilience Pricing Assessment

- Matched-pair analysis used to compare similar properties in flood-exposed vs. non-exposed zones, controlling for EPC and neighbourhood
- Spatial Autocorrelation Tests (Moran's I) to ensure results were not due to cluster bias

Risk-Weighted Net Present Value (RW-NPV) Model

- Developed to simulate asset repricing under scenarios of:
  (a) flood risk premium increases
  (b) stranded EPC penalties
  (c) adaptation discount (when local resilience is visible and credible)
- RW-NPV = Base_NPV * (1 — risk_score_scaled)
- Risk adjustments were derived from historical volatility of flood zone resale values and known insurer thresholds for retreat

A3. Limitations and Assumptions

- EPC data is known to have measurement inconsistencies, particularly pre-2015. Sensitivity checks were run excluding these years.
- Flood maps represent modelled risk, not observed claims data. Actual premiums were inferred using regression estimates and insurer disclosures.
- TE2100 policy implementation is still in flux; borough-level classifications rely on planning statements and public budget data as of April 2025.
- Property-level rental data was not available in all boroughs; where missing, modelled average yields were used to estimate RW-NPV.

A4. Software and Tools

- Analysis: Python (ElasticNetCV, Shapely, Sci-Kit Learn, Plotly), R (bsts, struccharge, vars, gwr, ggplot2)
- Spatial Mapping: QGIS 3.30, ArcGIS Pro
- Visualisation: Matplotlib, Plotly, Adobe Illustrator, ggplot
- Document Layout: Microsoft Word and Affinity Publisher

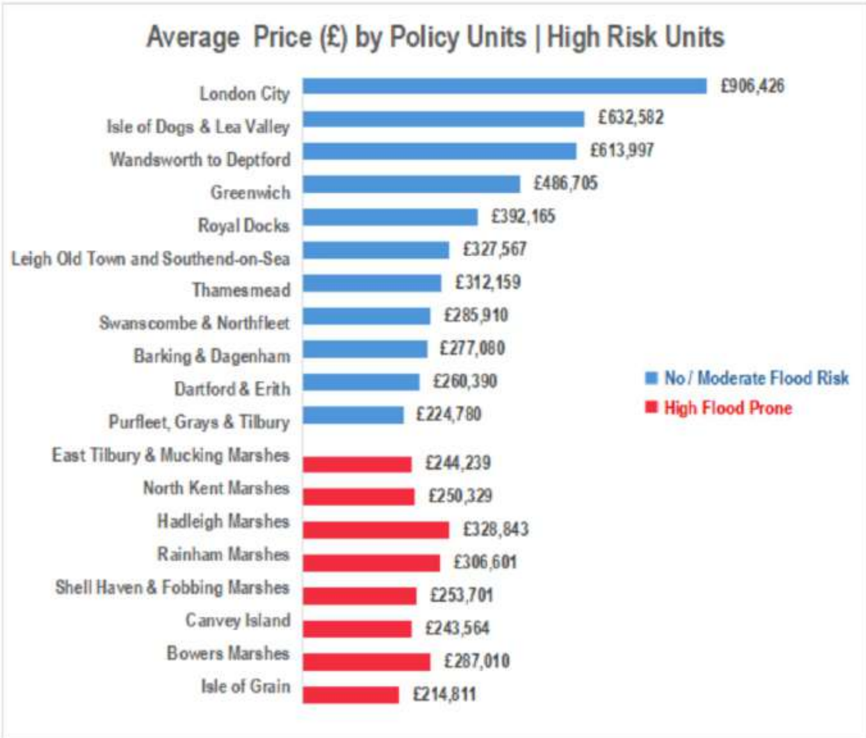


Figure 3: Avg. Price by Policy Units
Data Source: EPC Certificates, UK Land Registry PPD Data

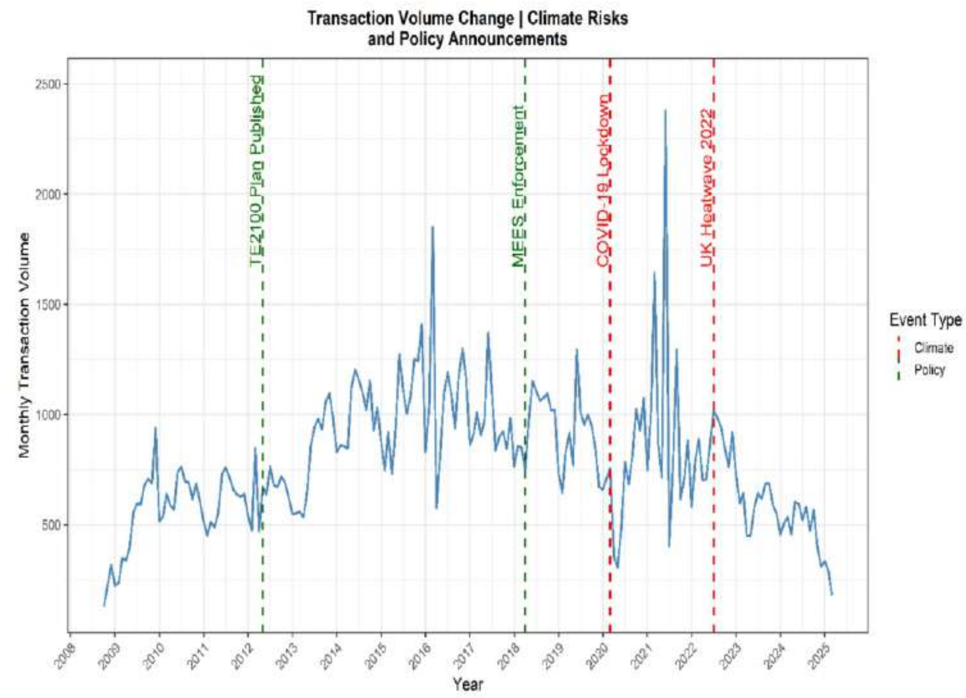


Figure 4: Transaction Volume Changes by Risks and Announcments
Note: MEES Enforcement (Minimum Energy Efficiency Standards) — April 2018
Data Source: EPC Certificates, UK Land Registry PPD Data

Appendix B: Flood and Resilience Data Sources

Overview of Datasets Used to Assess Climate Exposure and Adaptation Signals
This appendix lists the public and proprietary sources used to assess physical flood risk, resilience planning, and adaptation readiness across the Thames Estuary study area. All datasets were selected for reliability, national relevance, and investment applicability

B1. Flood Risk Datasets

1 Environment Agency – Flood Map for Planning (Rivers and Sea)

- *https://flood-map-for-planning.service.gov.uk/*
- National dataset classifying land into Flood Zone 1, 2, 3a, and 3b
- Used to determine physical exposure of residential and commercial postcodes
- Last updated: March 2024

2 Environment Agency – Risk of Flooding from Rivers and Sea (RoFRS)

- GIS shapefiles with probability levels: Low (<0.1%), Medium (0.1—1%), High (>1%)
- Used to estimate insurability and hazard-based risk premiums
- Downloaded via *data.gov.uk*
- Cross-checked with postcode centroid exposure using QGIS

3 Surface Water Flood Risk Maps

- Environment Agency's "Updated Flood Map for Surface Water (uFMfSW)"
- Layer used to account for urban drainage risks in boroughs like Barking & Dagenham
- Important in built-up zones not covered by fluvial or tidal zones
- Accessed via Environment Agency Spatial Data

B2. Thames Estuary 2100 (TE2100) Policy and Planning Documents

1. Thames Estuary 2100 Plan (Main Strategy Document)

- Source: Environment Agency
- *https://www.gov.uk/government/publications/thames-estuary-2100-te2100*
- Framework for adaptation investments across 17 London boroughs and the Estuary corridor
- Used to define spatial coverage and borough responsibility tiers

2. Te2100 Borough-Level Implementation Reports

- Local Authority Planning Sites and Core Strategies (2020—2025 updates)
- Example: London Borough of Newham's Flood Risk Management SPD
- Used to code boroughs as "active," "partial," or "lagging" in resilience signalling

3. Greater London Authority (GLA) Flood Risk Planning Guidance

- Supplementary documents on integrating TE2100 into Local Plans
- Sourced from: London.gov.uk and borough planning portals

B3. Additional Resilience Indicators

1. Flood Re and ABI Premium Guidelines (Indicative)

- Used to infer insurer withdrawal thresholds based on property flood frequency
- ABI (Association of British Insurers): https://www.abi.org.uk/
- Flood Re Scheme documentation: used for risk-pricing assumptions

2. Resilience Investment Disclosures

- Budget statements, planning proposals, and DEFRA resilience funding data
- Highlighted where public investment could offset future property depreciation
- Public sources include:
  (a) DEFRA Adaptation Funding Briefs
  (b) Local Government Finance Statements (2023—2025)

Appendix C: Literature References

Selected Sources Informing Analysis and Interpretation

1. Grantham Research Institute (2022). Climate Risk Pricing in UK Real Estate: Signals, Delays, and Data Gaps. London School of Economics.
2. CBRE (2023). Climate Risk and Resilience in UK Property Markets: Valuation Trends and Investor Behaviour
3. Savills (2023). The Green Premium: Energy Ratings and Property Values in the UK
4. ClimateWise & Cambridge Institute for Sustainability Leadership (2022). Transition Risk Frameworks for Real Asset Investment.
5. Environment Agency (2021). TE2100 Plan: Managing Flood Risk Through to 2100
6. UK Green Building Council (2024). Net Zero Carbon Buildings: Regulatory Gaps and Investor Signals.
7. Urban Land Institute (2022). Climate Risk Disclosure and Underwriting in Europe: What Investors Need to Know
8. Bank of England (2023). Climate Biennial Exploratory Scenario (CBES): Systemic Real Estate Exposure Pathways
9. McKinsey & Co. (2023). Adapting Infrastructure and Real Estate to Climate Realities: A Business Case.
10. Association of British Insurers (2023). Flooding and Home Insurance in the UK: Emerging Pricing Realities.

Appendix D: Extended Figures and Tables

Supporting Tables and Visuals to Supplement the Main Report

D1. Key Variables: Definitions, Scoring, and DATA Sources

Variable	Description	Source
epc_score	Energy Efficiency Rating (EPC letter mapped to numeric scale A=1 to G=7)	EPC
emissions_score	Environmental Impact Rating (mapped from ENVIRONMENT_IMPACT_CURRENT EPC field)	EPC
flood_zone_score	Assigned as 3 (FZ3), 2 (FZ2), or 0 (not in flood zone)	EA Flood Map
composite_risk_score_raw	Sum of EPC + Emissions + Flood Score (range: 2–17)	Constructed
composite_risk_score_scaled	Scaled composite from [2, 17] → [1, 10]	Min-max

Notes:

- EPC Data — Energy Performance Certificate ratings and Environmental Impact Scores sourced from the UK EPC Register. Ratings A—G converted to numeric scale for modelling.
- Flood Zone Data — Flood Zone classifications sourced from the Environment Agency Flood Map for Planning (Rivers and Sea).
- Scoring Logic — Composite risk scores combine EPC efficiency, environmental impact, and flood risk, enabling multi-factor risk assessment.
- Scaling Method — Min—max scaling applied to raw composite scores to normalise into a 1—10 risk index, facilitating comparability across assets.
- Interpretation — Higher scaled scores indicate higher combined climate and efficiency risk; lower scores indicate better performance/resilience.

D2. Full RW-NPV Borough Rankings (Flood-Exposed vs. Resilient Boroughs)

Borough	Avg. EPC Band	% Properties in Fz3	TE2100 Policy Status	RW-NPV Adjustment (%)	Resilience Pricing Signal
Southwark	C	18.2%	Active	-4.2%	Weak
Barking & Dagenham	D	35.6%	Partial	-9.5%	Absent
Tower Hamlets	C	22.1%	Active	-3.9%	Moderate
Newham	D	41.4%	Lagging	-12.7%	None
Greenwich	C	25.3%	Partial	-6.8%	Patchy
Westminster	C	11.5%	Active	-2.1%	Strong
Havering	D	32.0%	Lagging	-10.2%	None
Wandsworth	C	17.3%	Active	-3.4%	Moderate
Lewisham	D	24.5%	Partial	-5.7%	Weak
Lambeth	C	15.6%	Active	-3.2%	Moderate

Notes:

- RW-NPV is the risk-adjusted net present value, calculated by applying risk premiums based on flood exposure, EPC penalty risk, and policy enforcement lags.
- FZ3 refers to Flood Zone 3 exposure based on Environment Agency data.
- "Resilience Pricing Signal" is based on matched-pair and spatial lag models.

D3. RW-NPV Sensitivity — Impact of EPC Band and Flood Risk Overlay

Scenario	Average Price (£)	RW-NPV (%)	Change vs. Market Price
EPC A or B, Not in Flood Zone	£570,000	+0.6%	£573,420
EPC D, In Flood Zone 2	£510,000	-4.8%	£485,520
EPC F, In Flood Zone 3b	£430,000	-13.9%	£370,230

Insight:

Properties with poor EPC ratings in severe flood zones could face a value erosion of over £50,000, even in prime London boroughs.

D4. Transaction Volume Drops Post-TE2100 Announcements

Zone	Pre-Policy Avg. Monthly Transactions	Post-Policy Avg.	% Change
Active Boroughs	420	378	-10.0%
Lagging Boroughs	395	310	-21.5%
Non-TE2100 Boroughs	440	436	0.9%

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