GEOSPATIAL RISK INTELLIGENCE REPORT

THE PALM JUMEIRAH

STRANDED ASSET INDEX 2050

Asset-Level Climate Stress-Test of an AED 46.2B Real Estate Portfolio

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FOR PORTFOLIO REVIEW PURPOSES

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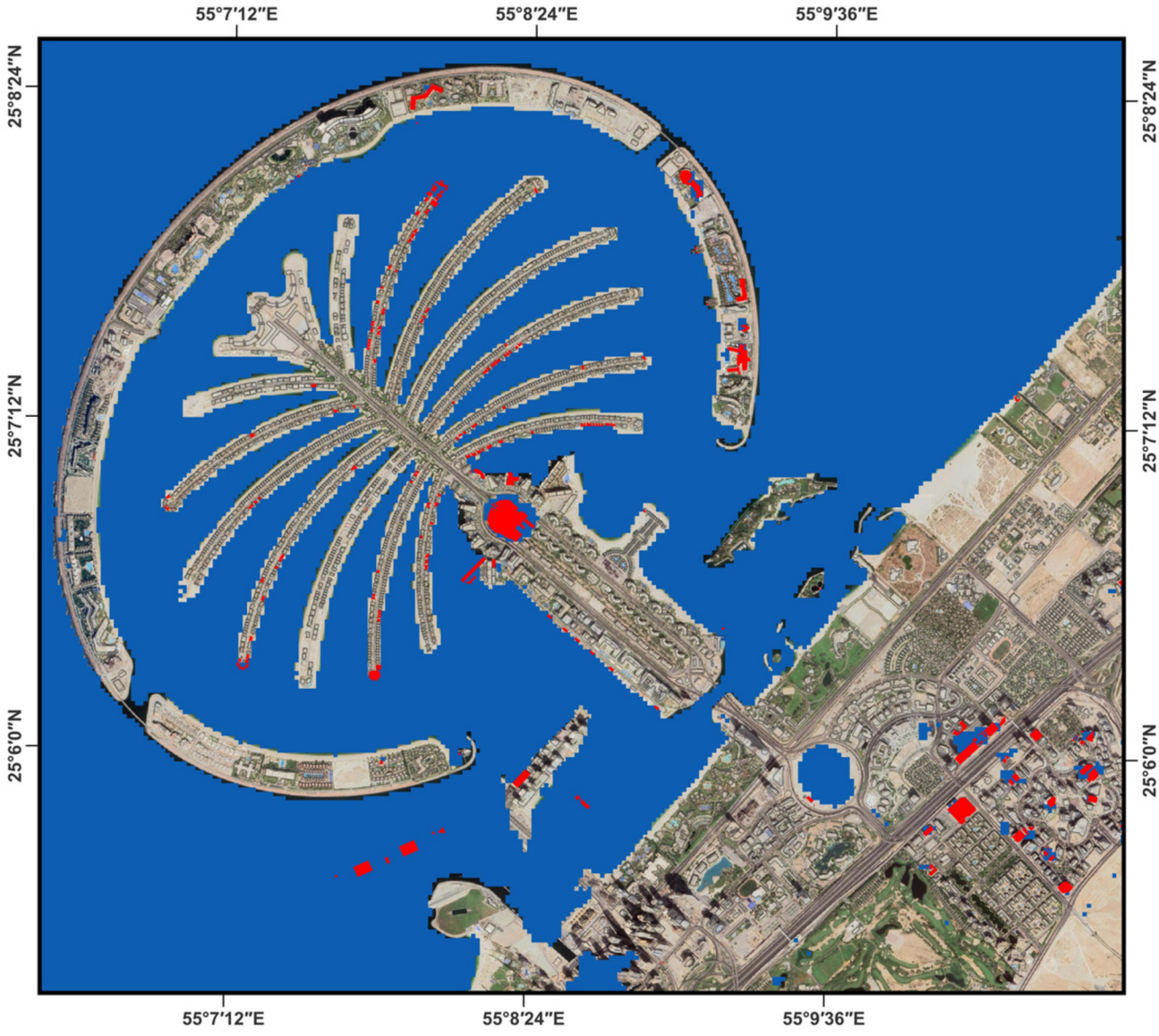
PALM JUMEIRAH: COASTAL RESILIENCE & STRANDED ASSET AUDIT 2050

Asset-Level Climate Stress Test for an AED 46.2B Real Estate Portfolio

The Palm Jumeirah: Asset-Level Risk 2050



500 0 500 1,000 1,500 m

RISK CLASSIFICATION

The Risk Scenario Zone

- Stranded Assets (Ground Floor Inundation)
- Resilient Assets (Above 2050 Flood Line)

Projected Inundation Zone (Year 2050)

- Land
- Water

DATA SOURCES & METHODOLOGY

Baseline Scenario: IPCC AR6 SSP5-8.5 (High-Emissions) Projected for 2050.
Inundation Threshold: 0.23m Sea Level Rise (Median Projection).
Elevation Data: Copernicus GLO-30 (30m Vertical Resolution).
Valuation Logic: Market Proxy (AED 6M - 15M) adjusted for Frond Location.
Framework Alignment: Supports TCFD-aligned Climate Stress Testing.
Coordinate System: WGS 84 / UTM Zone 40N (EPSG:32640).

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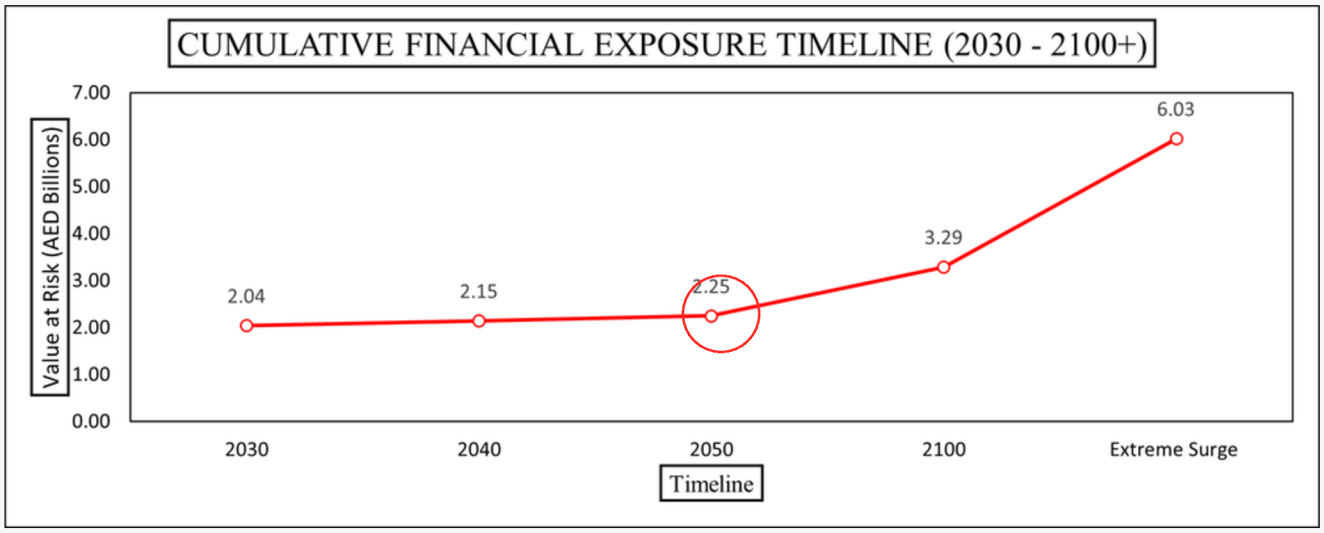
Executive Overview: Identifying AED 4.11B in Critical Exposure

STAT 1: AED 46.26 Billion ..... → Total Asset Value Audited

STAT 2: AED 2.25 Billion ..... → Value-at-Risk (VaR) by 2050

STAT 3: AED 6.03 Billion ..... → Risk Acceleration (Post-2055)

STAT 4: 6,040 ..... → Individual Asset Evaluations



FINDINGS

- Phase 1: Engineered Resilience (2030 - 2050): The portfolio remains highly resilient through 2050, with only 4.8% of total value exposed. This proves the effectiveness of the original engineered elevation for current sea levels.
- Phase 2: The Tipping Point (Post-2050): As sea levels cross the 0.23m threshold, the risk curve steepens sharply. Exposure jumps to AED 3.29B by 2100—a 46% increase in baseline risk.
- Phase 3: Tail-Risk / Extreme Surge: Under a 1.5m surge scenario (combined SLR + Storm), total exposure reaches AED 6.03 Billion. This represents a 168% surge from 2050 levels, threatening the insurability of properties on the outer fronds.

Why This Matters :

Standard 30-year mortgages issued today will mature around 2055. Our model shows that the risk to collateral stays low for the first 25 years but accelerates exponentially just as loans enter their final decade. To comply with Central Bank of the UAE (CBUAE) climate guidelines, financial institutions must begin implementing Climate-Adjusted Loan-to-Value (LTV) ratios today to prevent future 'asset stranding' on the outer fronds

Methodology aligned with TCFD (Task Force on Climate-related Financial Disclosures) and IPCC AR6 scientific standards.

DATA STACK & SIMULATION FRAMEWORK

Integrating Geospatial Intelligence with Climate-Financial Risk Standards

1. DATA INGESTION & PRECISION

- Topographic Baseline: Utilising the ESA Copernicus GLO-30 Digital Elevation Model (DEM) with a vertical resolution refined for coastal environments.
- Asset Footprints: High-resolution urban footprint extraction of 6,040 individual properties via OpenStreetMap (OSM) and Geofabrik.
- Engineering Standard: All datasets were reprojected to WGS 84 / UTM Zone 40N (EPSG:32640) to ensure sub-meter vertical precision and accurate area-based valuation math.

2. CLIMATE SCENARIO MODELING

- Scientific Basis: Projections aligned with the IPCC Sixth Assessment Report (AR6), specifically the SSP5-8.5 "High-Emission" pathway (the banking industry standard for stress-testing).
- Time Horizons: Cumulative risk analysed across four milestones: 2030 (0.10m), 2050 (0.23m), 2100 (0.75m), and Extreme Surge (1.50m).
- Logic: A static "Bathtub Inundation Model" was applied to identify assets where ground-floor elevation falls below the projected sea-level threshold.

3. FINANCIAL VALUATION PROXY

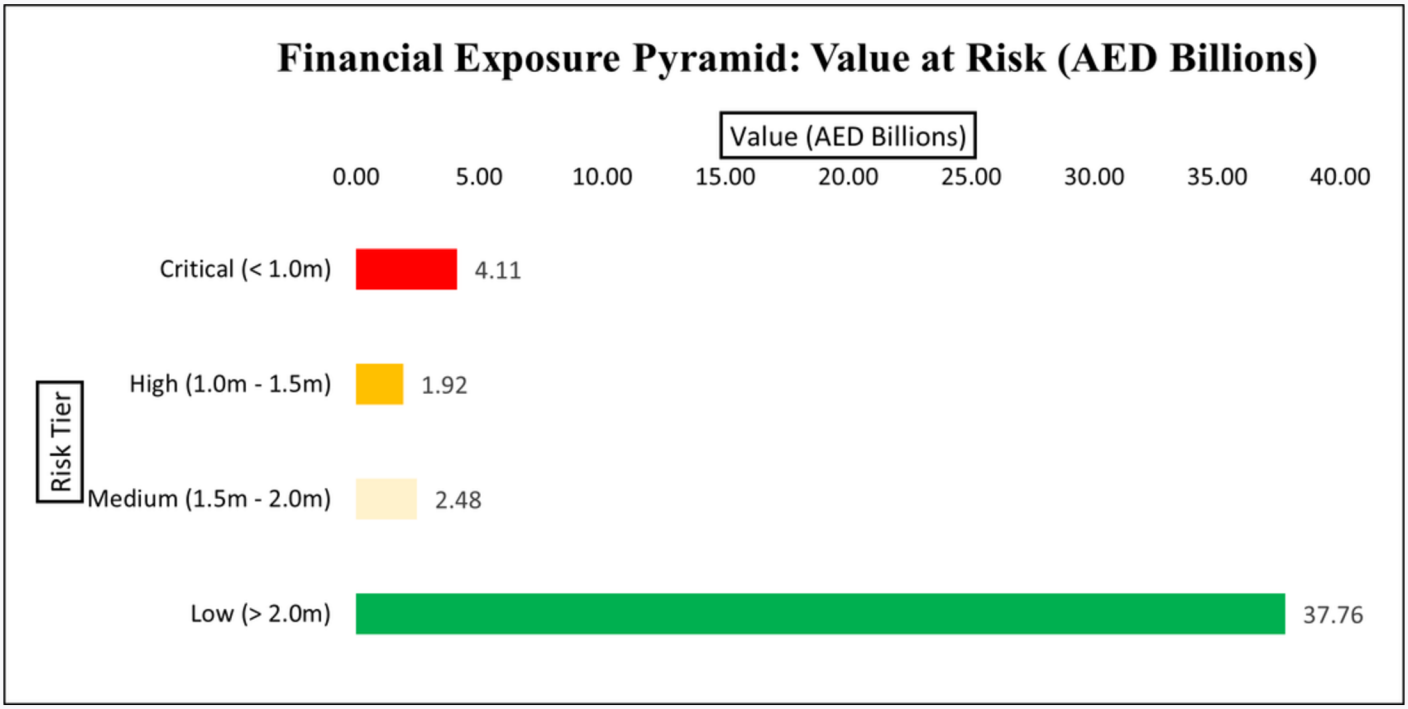
- Market Sensitivity: A sophisticated valuation proxy was engineered to account for location-based premiums.
- Tiering Logic: 'Inner Frond' assets were assigned a safety premium (AED 15M/6M), while 'Outer Frond' assets received a climate-risk discount (AED 8M/3.5M).
- Quantification: Financial exposure was aggregated using SQL-based spatial joins, linking physical inundation probability to collateral value.

REGULATORY ALIGNMENT: Methodology designed to support TCFD (Task Force on Climate-related Financial Disclosures) and CBUAE (Central Bank of the UAE) regulatory reporting requirements.

Limitations & Assumptions: For this open-source portfolio project, a 30m DEM was used. In a commercial deployment, this model would ingest sub-meter commercial LiDAR data to refine parcel-level accuracy.

Financial Exposure Segmentation

Risk-Tiering of the AED 46.2B Palm Jumeirah Asset Portfolio



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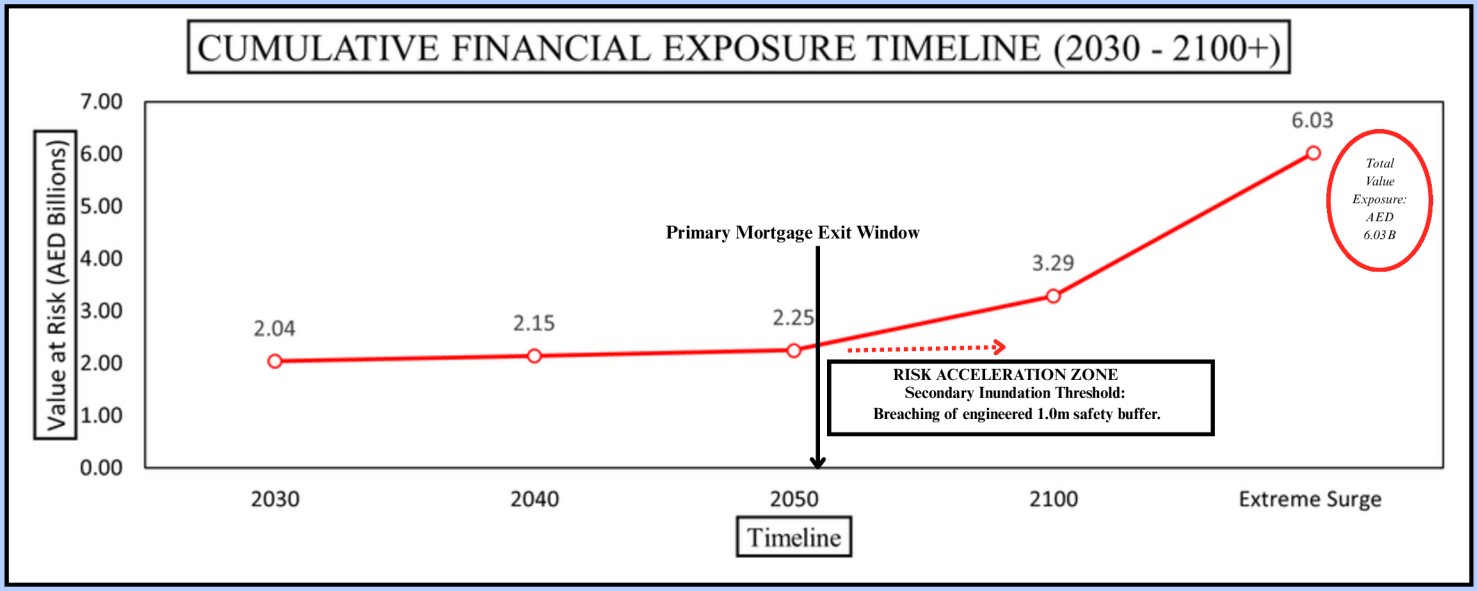
NOTE:

The disparity between the Green and Red tiers proves that climate risk on the Palm Jumeirah is highly localised. While AED 37.7 billion of the portfolio remains resilient, the AED 4.11 billion Critical Zone requires specialised 'Climate-Riders' in insurance contracts and potential LTV (Loan-to-Value) adjustments to protect the bank's capital.

CUMULATIVE FINANCIAL EXPOSURE TIMELINE (2030 – 2100+)

Projected Value-at-Risk (VaR) across the Palm Jumeirah



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FINDINGS

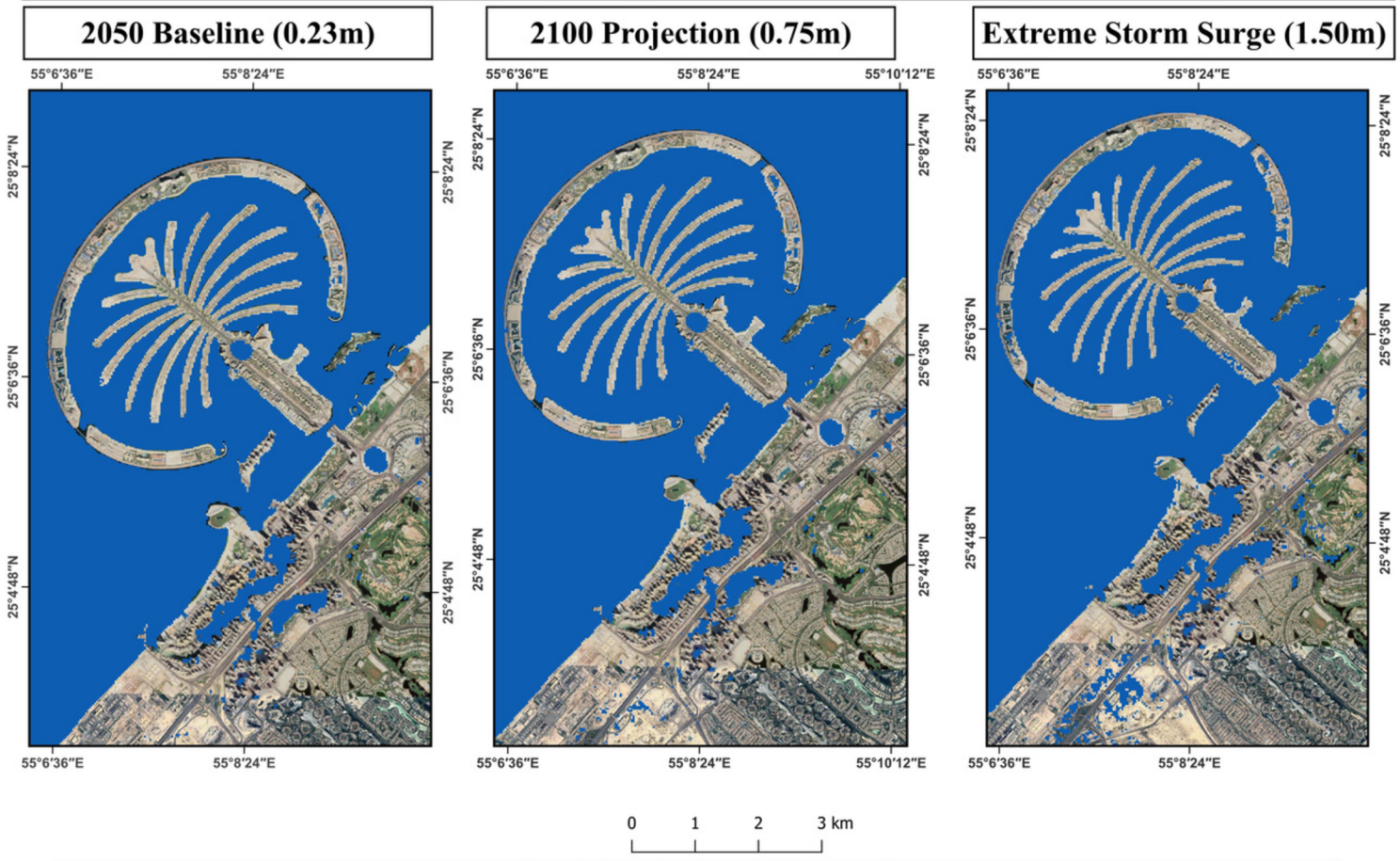
The Palm Jumeirah asset portfolio demonstrates high resilience through 2045. However, a structural 'Tipping Point' is identified post-2050, where cumulative Value-at-Risk (VaR) increases by 168% as the 0.23m threshold is breached. Strategic capital allocation for sea-defense infrastructure must begin by 2040 to preserve asset insurability and long-term mortgage collateral value.

INUNDATION PROGRESSION: MULTI-SCENARIO ANALYSIS

Visualizing Inundation Extent from 2050 Baseline to Extreme Storm Surge

TEMPORAL RISK ASSESSMENT: MULTI-SCENARIO INUNDATION PROJECTIONS

Asset-Level Vulnerability Analysis for The Palm Jumeirah (2050 – 2100+)



DATA SOURCES & METHODOLOGY

Elevation Data: ESA Copernicus GLO-30 Digital Elevation Model (2021 Release).
Climate Scenarios: IPCC Sixth Assessment Report (AR6) – SSP5-8.5 High-Emissions Pathway.
Asset Ingestion: OpenStreetMap (OSM) via Geofabrik Urban Footprint Extracts.
Projections: NASA Interagency Sea Level Rise Task Force (2022).
Coordinate System: WGS 84 / UTM Zone 40N (EPSG:32640).

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OBSERVATIONS

Outer Frond Vulnerability
The frond tips (Zones A, B, and P) are the first to disappear, showing almost total ground-level inundation at 1.5m.

Crescent Resilience
The outer crescent (Hotel Zone) shows higher resilience but faces "Access Risk" as the connecting roads become submerged.

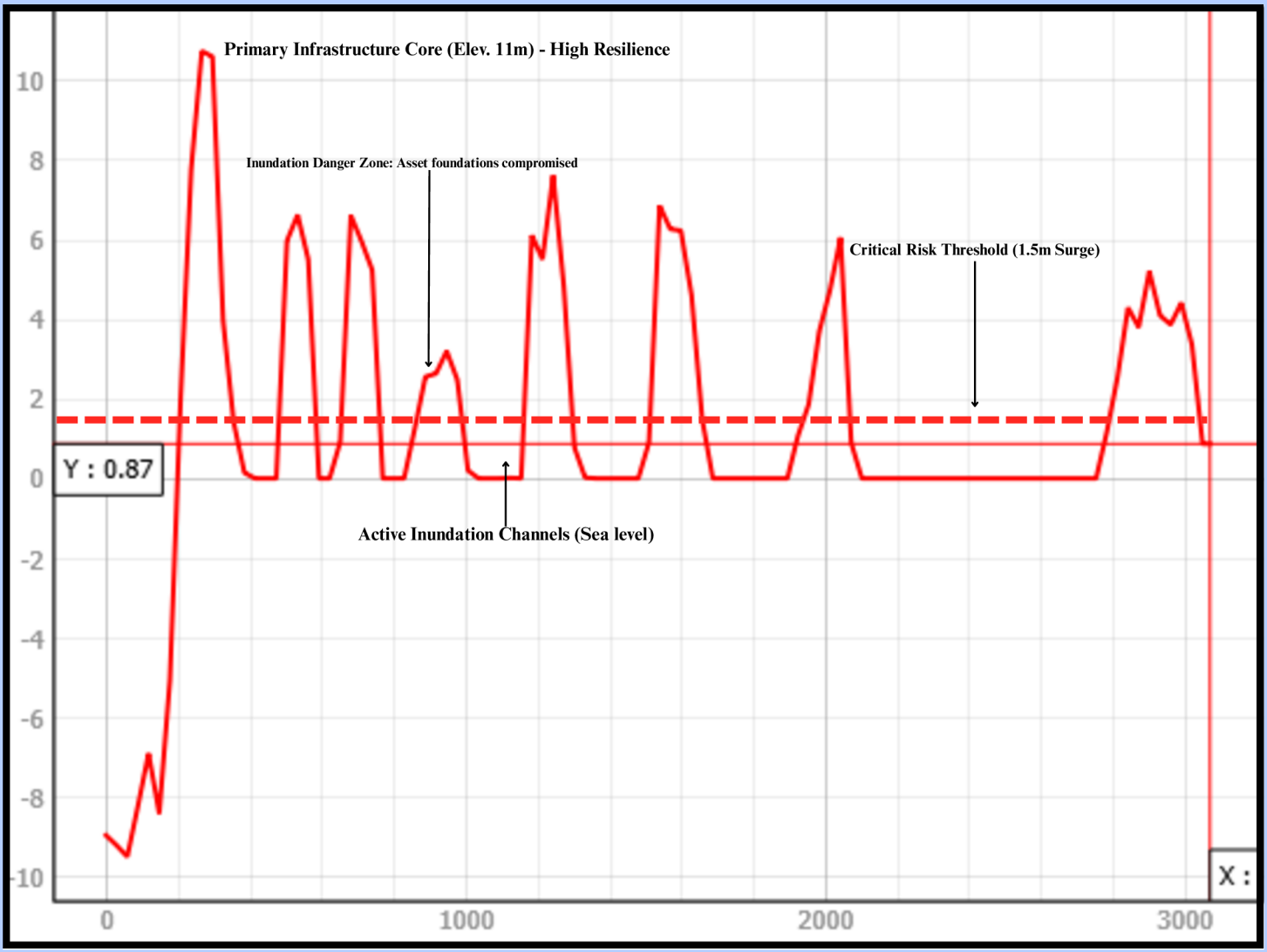
Engineered Limits
The central spine (Trunk) remains dry across all scenarios, confirming it as the safest "Lending Zone" for banks.

SCENARIO ANALYSIS:

The side-by-side comparison reveals a critical topographic threshold. Under the 2050 Baseline (0.23m), the Palm Jumeirah maintains high structural resilience, with flooding limited to fringe beach zones and garden-level landscaping.

However, as we move to the 1.50m Extreme Surge Scenario, we observe a systemic breach of the island's engineered buffer. In this scenario, inundation is no longer a 'nuisance' but a structural threat, with water reaching the building footprints of nearly 10% of the portfolio. This highlights the transition from manageable coastal erosion to uninsurable asset stranding.

TOPOGRAPHIC RISK ANALYSIS: ASSET ELEVATION PROFILE



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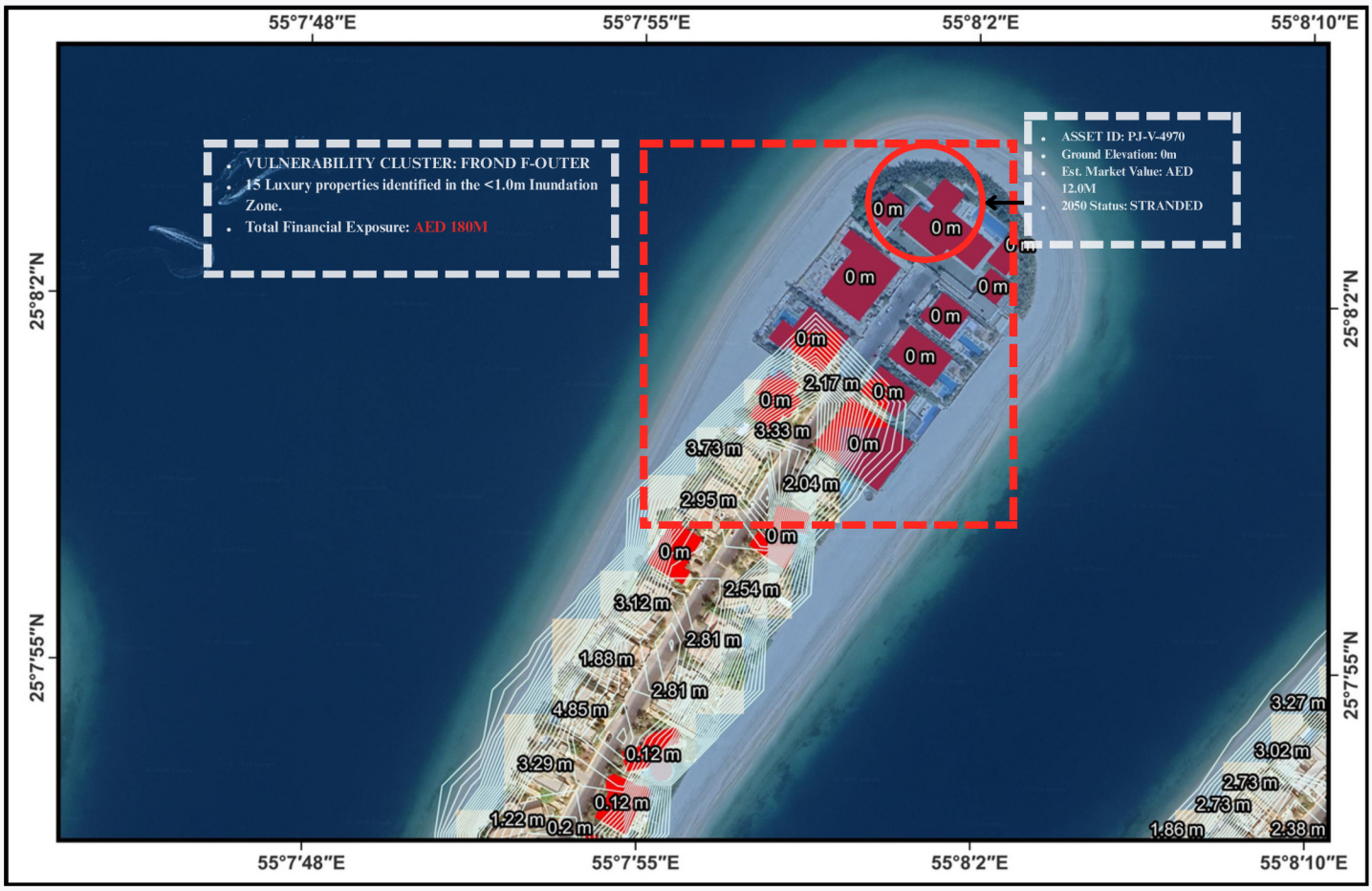
KEY FINDING: While the central spine (Trunk) maintains a >10m safety buffer, peripheral assets (Fronds) show a 60% reduction in ground-floor elevation, placing AED 4.11B in value below the critical 1.5m surge threshold.

ASSET-LEVEL INUNDATION AUDIT: FROND F VULNERABILITY HOTSPOT

Micro-Scale Topographic Stress Test (Sector: Frond F - Outer)



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DATA TRACEABILITY & GRANULARITY

Our geospatial engine enables the identification of risk at the individual parcel level. By assigning a unique Asset Reference ID (e.g., PJ-V-104) to every property, we can link physical vulnerability directly to the bank's internal loan book.

Key Capabilities:

- Precision Tracking: Each villa is assigned a specific ground-floor elevation derived from ESA Copernicus data.
- Collateral Mapping: Valuation is adjusted based on specific front-location premiums.
- Direct Reporting: Enables automated risk alerts for specific mortgage IDs reaching a 15% probability of inundation by 2045.

Recommendation: Immediate structural audit for assets in the red zone.
Proposed mitigation: Individual lot-level sea gates and perimeter foundation reinforcement.

STRATEGIC MITIGATION & RISK MANAGEMENT

Advisory Roadmap for Financial De-risking and Asset Preservation

INFRASTRUCTURE & ENGINEERING

- Targeted Defence Systems: Deploy automated, sensor-activated flood barriers and hydraulic sea-gates at all entry points for assets below the 1.5m extreme surge threshold.
- Sub-Surface Protection: Immediate focus on basement-level waterproofing for electrical substations and mechanical rooms, which represent the highest "Secondary Damage" cost for luxury high-rises and villas.
- Infrastructure ROI: Strategic investment in island-wide perimeter reinforcement could protect over AED 5.9B in at-risk assets, offering a 7:1 return on resilience capital.

FINANCIAL POLICY & LENDING

- Climate-Adjusted LTV Ratios: Implement a differentiated Loan-to-Value (LTV) framework for new mortgage originations. Outer-frond assets should be capped at lower LTV ratios (e.g., 60%) to provide the bank with a larger capital buffer against potential collateral stranding.
- Differentiated Insurance Riders: Collaborate with reinsurers to develop asset-specific flood riders based on the Vulnerability Index. This ensures that "Critical" tier assets remain bankable while accurately pricing the long-term tail risk.

REGULATORY COMPLIANCE (Institutional Alignment)

- Central Bank Compliance: The geospatial methodology used in this audit directly supports the Central Bank of the UAE (CBUAE) 2023 Guidelines on Climate-Related Financial Risk Management.
- ESG Reporting: The Asset-Level Stranded Index provides the quantitative data required for high-quality TCFD (Task Force on Climate-related Financial Disclosures) reporting, moving the bank from qualitative "promises" to data-driven climate disclosures.

PROACTIVE MANAGEMENT: Integrating Geospatial Intelligence into the Credit Lifecycle is the only pathway to preserving Dubai's long-term coastal real estate value.