XDI BENCHMARK SERIES

2025 Global Data Centre Physical Climate Risk and Adaptation Report

July 2025

Cross Dependency Initiative

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About XDI

Experts in physical climate risk since 2007

Backed by a team of specialists across science, engineering and software development, XDI (Cross Dependency Initiative) combines asset, climate change and contextual data to determine asset vulnerability, hazard exposure and the likely physical and financial impacts on assets from climate change and extreme weather.

Our data has been helping global leaders price physical climate risk since 2007, making the group the world's longest standing independent specialist in physical climate risk and adaptation analytics.

Today, XDI works with governments, corporates and the international finance sector, providing cutting edge analysis to help make informed decisions. XDI is part of The Climate Risk Group, a group of companies committed to quantifying and communicating the costs of climate change. XDI believes that physical climate risk data needs to be accessed and understood by everyone, including citizens and civil society organisations. To support this, XDI regularly releases public datasets to generate debate and understanding about the costs of climate change.

In 2025 XDI was named market leader in two of the world's most prestigious independent evaluations of climate risk analytics — the Forrester Wave™: Climate Risk Analytics Software and Verdantix's Smart Innovators: Physical Climate Risk Solutions.

XDI's goal is to accelerate action on climate change by embedding physical climate risk data in all decisions

FORRESTER®
Wave Leader
Forrester Wave Report, Climate Risk Analytics Software, Q2 2025

verdantix
Smart Innovator
Verdantix Smart Innovator Report, Physical Climate Risk Solutions 2024

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Our analysis of over 8,800 data centres worldwide reveals that climate risks are not a distant future concern—they are already affecting data centre viability today.

Contents

Foreword

Data centres are the silent backbone of the global economy—powering everything from banking systems and cloud storage to emergency services, communications networks, and logistics. As our digital dependence grows, so too does the demand for data centre infrastructure. We are seeing explosive growth in data centre construction worldwide, particularly in regions such as the Asia Pacific—one of the most climate-vulnerable regions on the planet.

This rapid expansion is taking place against a backdrop of increasingly severe and frequent extreme weather events. Flooding, storms, forest fires, and rising sea levels are exposing vulnerabilities in even the most advanced data centre facilities. Many are located in low-lying or coastal zones where storm surge and flash flooding can inundate equipment, disable power supply systems, and sever fibre-optic connectivity. In other regions, high winds and forest fires can damage critical infrastructure or disrupt access routes, delaying maintenance and emergency response.

While data centres are designed with redundancy and disaster recovery in mind, many existing sites were built based on historical weather patterns—not the escalating volatility of today's climate. Climate-exposed data centre operators face rising insurance costs, challenges securing coverage, and the threat of stranded assets as insurers and investors increasingly price in climate risk.

It is therefore imperative that asset owners, operators, and investors understand the physical climate risks facing both existing and planned data centres—and what steps can be taken to build resilience into these critical assets.

The '**2025 Global Data Centre Physical Climate Risk and Adaptation Report**' analyses the vulnerability of nearly 9,000 data centres around the world to eight climate change hazards, including Riverine and Surface Water Flooding, Forest Fire, Extreme Wind, Freeze-Thaw, Soil Movement, Tropical Cyclone Wind and Coastal Inundation. The analysis focuses on physical damage to building structures, examining how this risk increases over time.

In a world first, the analysis also quantifies the degree to which structural adaptation can reduce this risk, increasing the resilience of data centre infrastructure and potentially bringing down runaway insurance costs and investor flight.

About the dataset

Overview of risk to the infrastructure of 8,868 data centres - by state, country and region.

This report uses address data provided by Data Center Map to calculate the physical climate risk to 8,868 data centres around the world. Specifically, it analyses the risk to operational, under construction and planned data centres from 8 climate change hazards, under a high emissions scenario (RCP 8.5/ SSP 5-8.5), from now until the end of the century. In addition to looking at the status of the data centre, the dataset behind the analysis also differentiates between hyperscale and colocation facilities.

Although data is available for all years 1990-2100, the report has a focus on 2050 to show forward looking risk over the likely working life of these assets.

How is risk measured?

High, Moderate or Low Risk Properties (HRP, MRP or LRP).

In this report, data centres are categorised into High, Moderate or Low Risk Properties. These classifications are calculated by determining each property's probability of incurring direct financial loss from climate-related damage to infrastructure in any given year, and is expressed as a percentage of the replacement cost of each building. This percentage is known as Value at Risk. It does not include the cost of contents such as servers.

As the analysis looks at Value at Risk over decades, and because climate change damage risk is assumed to only ever be increasing, not decreasing, we use the term 'Maximum-to-Date Value at Risk', known as MVAR. This removes any short term anomalies.

High Risk: MVAR ≥ 1.0%

High probability of total or partial physical damage of a data centre within the design life of the building. Data centres in this category face a high risk of insurance becoming prohibitively expensive or withdrawn entirely. Adaptation is essential to ensure the ongoing viability of the data centre.

Moderate Risk:
MVAR ≥ 0.2% - MVAR < 1.0%

Data centre is exposed to extreme weather and climate change hazards capable of causing significant damage and resulting in increasing insurance costs - though probabilities or severities are moderate. Insurance is likely to be available, but expensive. Adaptation is recommended.

Low Risk: MVAR < 0.2%

Data centre is either not exposed to known extreme weather and climate change related hazards, or the probabilities and severities are very low. The net probability of significant disruption or damage is low and within typical industry and insurance provider risk tolerances for these data centres.

Increase in damage risk from extreme weather and climate change hazards

This metric looks at the increase in risk of damage across all data centres and from all hazards, from 2025 until 2100. This metric is important, because an asset's risk may increase significantly over a given period of time, but it still may not cross over a risk band threshold e.g. from Moderate Risk to High Risk.

Global ranking of data centre hubs by percentage of high risk data centres

As part of this global analysis of data centres we have also included a climate risk ranking. To determine this, we looked at the 100 states around the world with the highest concentration of data centres in this analysis (data centre hubs), then ranked them according to the percentage projected to be High Risk by 2050 under RCP 8.5/SSP 5-8.5, followed by the percentage projected to be Moderate Risk by 2050.

Why use RCP 8.5/SSP 5-8.5?

Evidence indicates that greenhouse gas emissions are flattening and annual emissions are not tracking to RCP 8.5/SSP5 - 8.5. This is a good sign, but RCP 8.5 is still an appropriate scenario to use in a prudent risk assessment, given that it remains a feasible bound of future levels of warming and impact. RCPs are based on cumulative greenhouse gases in the atmosphere, rather than annual emissions levels, and this concentration tracked closest to RCP 8.5 at least up to 2020. Feedbacks remain highly uncertain and aren't included in all models, so using a higher greenhouse gas emission scenario can be used as a proxy to capture low likelihood high-end impacts. Modelling potential severe (but not worst-case) outcomes is important.

Extreme heat

Extreme heat is not included in this first analysis of data centres as it generally does not result in significant physical damage to infrastructure. It is, however, responsible for productivity loss due to power outages, and is a major concern for data centre operators as temperatures increase. Therefore, a second analysis of productivity loss due to extreme heat is underway.

Data centre design

XDI uses an 'archetype' to represent the design of a data centre. Archetypes are standardised types of structures or infrastructure assets based on nominal industry design specifications and construction materials.

The Climate Risk Engines, which power XDI's physical climate risk analysis, use these archetypes to assess the likely damage and failure probability of an asset due to extreme weather and climate change hazards. The results are expressed in engineering or financial metrics.

For this analysis, a standard base archetype was used to represent all data centres. However, it is important to note that not all data centres are built exactly to the same standards or design, and some - particularly in countries with strong regulation - may be more resilient than others. We recommend in depth analysis of all data centres identified as being at high or moderate risk, using the specific details of the asset to provide greater granularity and accuracy.

Hazards analysed

Riverine Flooding
A riverine flood occurs when a river, stream, or other watercourse exceeds its capacity and overflows onto surrounding land.

Surface Water Flooding
A surface water flood occurs when rainfall exceeds the capacity of the ground, drainage systems, or infrastructure to absorb or manage it.

Coastal Inundation
Sea water flooding due to high tides, wind, low air pressure and waves can damage coastal land, infrastructure and buildings.

Extreme Wind
Unusually strong winds that exceed typical wind speeds associated with weather systems.

Forest Fire
A destructive fire that spreads via trees and forest. This definition does not include grass fires.

Freeze-Thaw
Freeze-thaw is the process by which porous materials such as concrete, brick and stone are damaged when liquid water freezes and the ice expands inside them, causing microscopic damage.

Tropical Cyclone Wind
Tropical cyclone winds are the strong, rotating winds associated with tropical cyclones (also known as hurricanes or typhoons depending on the region).

Soil Movement
Soil movement as a result of drought, causing contraction of clay soils, that can lead to the foundations of an asset shifting.

Adaptation

Investing in the resilience of data centre infrastructure is critical to ensure uninterrupted operation and reduce insurance costs. To demonstrate the benefits of investing in structural resilience, this report also calculates risk to infrastructure once readily achievable structural adaptations have been made to the data centre building design. XDI is able to make these calculations thanks to its engineering approach which constructs a digital twin of assets, and use of archetypes, which can be modified to explore how different structural interventions can impact the risk of physical damage from extreme weather and climate hazards.

The specifications of the base asset type and the adapted asset are provided in the appendix.

To understand more about our Structural Analysis approach, watch this video.

XDI's methodology documents can be accessed via our knowledge base, Learn XDI.

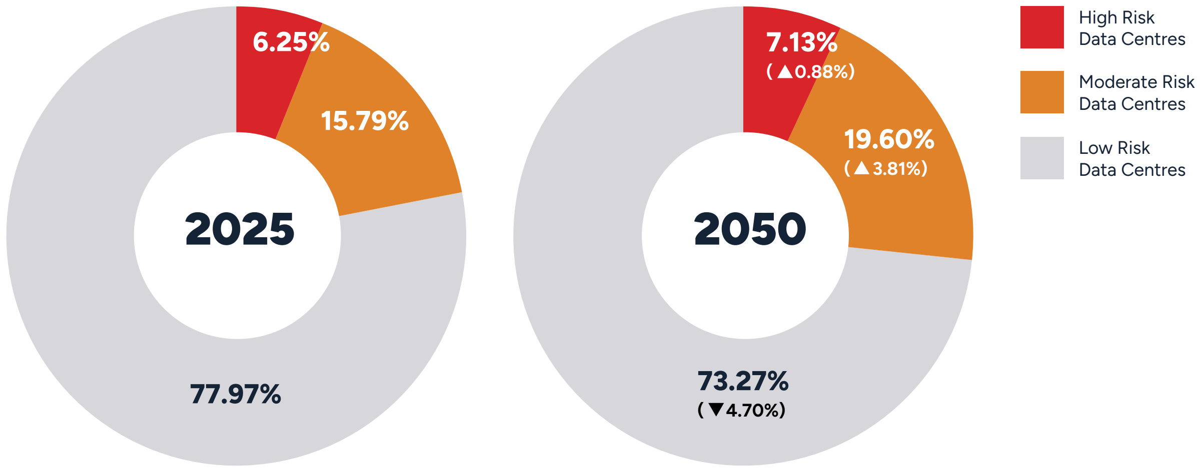
Data Center Map

Data centre information has been provided by https://www.datacentermap.com/.

Overview

Proportion of data centres at risk over time

The charts below compare the overall aggregated percentange of high, moderate and low risk data centres between 2025 and 2050.



Climate change hazards and data centres

The table below shows the impact of extreme weather and climate change hazards on data centre infrastructure.

Hazard	First-Order Risk Examples	Examples of Impact on Data centre	Level of Concern
Riverine Flooding	Severe damage to electronics, walls, roofs, and power systems from water ingress.	Prolonged downtime, data loss, service disruptions, and costly equipment replacement.	Very High
Surface Water Flooding	Damage to ground-level electronics, HVAC, and power systems from localised flooding.	Prolonged downtime, data loss, service disruptions, and costly equipment replacement.	High
Coastal Inundation	Flooding of buildings and ducting, water damage to cabling or cable landing stations, interruptions or damage to the power supply system, access issues.	Extended outages, regional infrastructure impacts, and significant recovery costs.	Very High
Extreme Wind	Structural damage to roofs, walls, and external infrastructure; debris impacts.	Prolonged downtime, regional grid failures, and service disruptions.	Moderate
Forest Fire	Direct flame, ember, or radiant heat damage to roofs, walls, and external components (e.g., cooling units).	Disruptions from cooling or power system failures, regional outages, or evacuation-blocked access infrastructure; costly equipment repairs.	High
Freeze-Thaw	Damage to porous materials (e.g., brick / concrete walls and foundations); minimal electronic impact.	Short-term disruptions from structural repairs or pipe bursts affecting cooling.	Low
Tropical Cyclone Wind	Severe structural damage to roofs, walls; debris exposing electronics.	Prolonged downtime, regional grid failures, and service disruptions.	High
Soil Movement	Foundation, walls and floors cracking from subsidence; minimal direct electronic damage.	Maintenance disruptions, potential long-term costs for foundation and civil engineering repairs.	Low to Moderate
Extreme Heat	Overheating of electronics if cooling fails; minimal structural damage.	Server shutdowns, data loss, grid strain, and service interruptions.	High

World Ranking: Top 100 data centre hubs (states) ranked by physical climate risk in 2050

The table below looks at the states around the world with the highest concentration of data centres in this analysis (referred to as data centre hubs) and ranks them by the percentage of these that are projected to be high risk by 2050.

The table also includes the percentage of data centres projected to be moderate risk by 2050 (% Moderate Risk Properties) as well as the overall increase in risk of damage to all data centre infrastructure (high, moderate, low risk) from climate change extreme weather in each hub, 2025-2100.

Rank	Country	State/Province	# of operational and planned data centres analysed	% High Risk Properties	% Moderate Risk Properties	% Increase in risk of damage over time
1	China	Jiangsu	25	64.00%	32.00%	701%
2	India	Uttar Pradesh	21	61.90%	9.52%	111%
3	Germany	Hamburg	24	58.33%	0.00%	607%
4	China	Shanghai	51	49.02%	49.02%	778%
5	Russia	Moskva	20	30.00%	0.00%	152%
6	China	Guangdong	54	27.78%	70.37%	863%
7	Japan	Tokyo	57	26.32%	57.89%	400%
8	Thailand	Bangkok	26	23.08%	76.92%	480%
9	China	Hong Kong	89	20.22%	79.78%	261%
10	Denmark	Hovedstaden	25	20.00%	8.00%	1000%
11	United States	New Jersey	71	19.72%	19.72%	1000%
12	United States	Massachusetts	49	18.37%	4.08%	917%
13	United States	Oregon	124	17.74%	10.48%	35%
14	United States	Michigan	48	16.67%	2.08%	103%
15	Chile	Santiago	49	16.33%	83.67%	17%
16	Australia	Queensland	27	14.81%	37.04%	624%
17	Netherlands	Noord-Brabant	23	13.04%	0.00%	328%
18	United States	Connecticut	56	12.50%	7.14%	247%
19	Indonesia	Jawa Barat	33	12.12%	21.21%	112%
20	Indonesia	Jakarta Raya	42	11.90%	11.90%	272%
21	United States	Kentucky	35	11.43%	17.14%	110%
22	Canada	British Columbia	36	11.11%	11.11%	296%
23	Brazil	São Paulo	73	10.96%	8.22%	71%
24	United States	New York	114	10.53%	10.53%	624%
25	India	Tamil Nadu	29	10.34%	68.97%	180%
26	Canada	Ontario	99	10.10%	2.02%	64%
27	Netherlands	Noord-Holland	80	10.00%	5.00%	49%
28	Canada	Alberta	20	10.00%	0.00%	49%
29	France	Grand Est	20	10.00%	0.00%	66%

World Ranking: Top 100 data centre hubs ranked by physical climate risk in 2050 - Continued

Rank	Country	State/Province	# of operational and planned data centres analysed	% High Risk Properties	% Moderate Risk Properties	% Increase in risk of damage over time
30	United States	Wisconsin	41	9.76%	9.76%	207%
31	Italy	Lazio	21	9.52%	19.05%	33%
32	Belgium	Vlaanderen	34	8.82%	14.71%	734%
33	England	Berkshire	48	8.33%	0.00%	115%
34	United States	Pennsylvania	76	7.89%	10.53%	210%
35	England	Greater Manchester	27	7.41%	7.41%	45%
36	France	Hauts-de-France	27	7.41%	7.41%	400%
37	United States	Florida	112	7.14%	75.00%	1000%
38	Australia	New South Wales	87	6.90%	10.34%	347%
39	Singapore	Singapore	73	6.85%	4.11%	462%
40	United States	Missouri	44	6.82%	9.09%	3%
41	Australia	Victoria	47	6.38%	87.23%	831%
42	Poland	Mazowieckie	32	6.25%	6.25%	97%
43	United States	Washington	98	6.12%	9.18%	167%
44	United States	Iowa	82	6.10%	17.07%	13%
45	Japan	Osaka	33	6.06%	93.94%	144%
46	South Korea	Seoul	33	6.06%	36.36%	46%
47	Switzerland	Zürich	34	5.88%	23.53%	154%
48	India	Maharashtra	70	5.71%	65.71%	133%
49	China	Hebei	53	5.66%	37.74%	101%
50	United States	California	284	5.63%	18.66%	228%
51	United States	Arizona	126	5.56%	6.35%	46%
52	United States	Nebraska	36	5.56%	2.78%	12%
53	Russia	Moscow City	75	5.33%	5.33%	49%
54	United Arab Emirates	Dubai	20	5.00%	25.00%	1000%
55	United States	Illinois	196	4.59%	9.69%	41%
56	United States	Texas	312	4.49%	42.63%	35%
57	Ukraine	Kiev City	23	4.35%	17.39%	98%
58	France	Île-de-France	95	4.21%	8.42%	63%
59	United States	Tennessee	49	4.08%	10.20%	116%
60	Germany	Hessen	100	4.00%	30.00%	36%
61	United States	Colorado	50	4.00%	2.00%	1%
62	France	Auvergne-Rhône-Alpes	26	3.85%	26.92%	124%
63	United States	Minnesota	53	3.77%	11.32%	36%
64	Germany	Bayern	53	3.77%	9.43%	35%
65	United States	South Carolina	27	3.70%	22.22%	65%

World Ranking: Top 100 data centre hubs ranked by physical climate risk in 2050 - Continued

Rank	Country	State/Province	# of operational and planned data centres analysed	% High Risk Properties	% Moderate Risk Properties	% Increase in risk of damage over time
66	United States	Nevada	54	3.70%	3.70%	45%
67	New Zealand	Auckland	27	3.70%	3.70%	50%
68	Malaysia	Putrajaya	28	3.57%	96.43%	357%
69	United States	Ohio	174	3.45%	9.77%	34%
70	United States	Oklahoma	31	3.23%	9.68%	37%
71	United States	Virginia	529	3.21%	3.02%	85%
72	Turkey	Istanbul	38	2.63%	0.00%	16%
73	Ireland	Leinster	116	2.59%	0.86%	196%
74	United States	Utah	41	2.44%	7.32%	28%
75	China	Beijing	45	2.22%	26.67%	73%
76	Israel	Whole Country	48	2.08%	8.33%	90%
77	United States	Indiana	53	1.89%	7.55%	15%
78	Italy	Lombardia	61	1.64%	22.95%	91%
79	Germany	Nordrhein-Westfalen	62	1.61%	3.23%	10%
80	Canada	Québec	65	1.54%	15.38%	29%
81	United States	Georgia	131	1.53%	4.58%	66%
82	United States	North Carolina	80	1.25%	2.50%	49%
83	England	Greater London	82	1.22%	1.22%	93%
84	South Korea	Gyeonggi-do	23	0.00%	56.52%	64%
85	United Arab Emirates	Abu Dhabi	32	0.00%	40.63%	1000%
86	Latvia	Latvia	21	0.00%	38.10%	38%
87	Spain	Cataluña	28	0.00%	28.57%	67%
88	United States	New Mexico	21	0.00%	23.81%	3%
89	United States	Alabama	25	0.00%	20.00%	68%
90	Bulgaria	Grad Sofiya	22	0.00%	18.18%	32%
91	Spain	Comunidad de Madrid	48	0.00%	16.67%	115%
92	Romania	Bucharest	25	0.00%	16.00%	1%
93	United States	Maryland	27	0.00%	14.81%	1000%
94	India	Karnataka	29	0.00%	13.79%	223%
95	France	Provence-Alpes-Côte d'Azur	22	0.00%	13.64%	321%
96	South Africa	Gauteng	34	0.00%	11.76%	130%
97	India	Telangana	28	0.00%	7.14%	27%
98	Germany	Baden-Württemberg	36	0.00%	5.56%	57%
99	Czechia	Prague	21	0.00%	4.76%	9%
100	Sweden	Stockholm	43	0.00%	4.65%	3%

Insurance

Climate change-induced extreme weather events are significantly impacting the insurance landscape for data centres globally. In 2024, global insurance losses from natural catastrophes, including those affecting data centres, surpassed $135 billion, marking the fifth consecutive year with losses exceeding $100 billion

As a result, insurers are reassessing risk models, leading to higher premiums and stricter coverage terms for data centres, especially those located in high-risk areas.

What do XDI's High, Moderate and Low Risk categories mean for insurance?

- **High Risk:** Insurance premiums are at high risk of being prohibitively expensive or unavailable because of significant risk of damage from extreme weather and climate hazards.
- **Moderate Risk:** The property is exposed to some risk and insurance costs are increasing.
- **Low Risk:** Although there still may be some risk of damage from climate change hazards, they are not preventing access to insurance. Insurance costs may, however, be increasing because of international trends in global reinsurance markets which insurers rely on.

It is now critical for data centres to invest in resilience, not only to avoid operational disruption but to bring down escalating insurance costs and investor flight.

XDI's risk bands (Low, Moderate and High) are informed by the Federal Emergency Management Agency (FEMA) designations that are used for pricing a large number of insurance premiums in the USA. XDI has used FEMA's probability method and extended it to include a wider set of hazards. The XDI risk band results therefore provide an insight into the possible longer-term availability and cost of insurance.

For any real asset, availability and costs should be obtained from a commercial insurance company, as costs and availability vary between providers.

Adaptation

Investing in resilience

Adapting the design of infrastructure to account for climate change hazards is a critical step in enhancing its long-term resilience and functionality. Traditional design standards, often based on historical climate data, no longer provide sufficient protection in an era of increasing extremes. By incorporating forward-looking climate risk analysis into the planning, design and upgrade process, infrastructure can be better equipped to withstand hazards such as flooding, storms, extreme heat, or sea-level rise.

The 2025 Global Data Centre Physical Climate Risk and Adaptation Report calculates how adaptations to the design of a data centre can reduce damage risks from climate change hazards, minimise operational disruption and reduce insurance premiums.

The results

XDI applied plausible adaptation by modifying structural elements of the base archetype using readily available changes in materials and/or design specifications to increase its resilience. The 2050 lower-resilience outcomes were then compared to 2050 higher-resilience results.

Adaptation measures applied to the base analysis slashed the number of **High Risk** data centres by more than 2/3 in 2050 - from 632 to 175, a 72% reduction.

The number of **Moderate Risk** data centres around the world in 2050 was also dramatically reduced - from 1,738 (19.60%) to 511 (5.76%) - a 71% decrease, further strengthening resilience across the global fleet.

The overall **risk of damage to data infrastructure** from climate change hazards was also reduced by almost 3/4, with a 74% reduction.

Quantifying the cost benefit of adaptation for data centres

The applied adaptation measures reduce the average MVAR% by approximately 0.20% in 2025 to 0.28% in 2050. For a fleet of data centres estimated to be worth USD 4 trillion by 2030, this translates to between $8-11 billion in avoided damages each year. Over the 25-year period from 2025 to 2050, and applying a 6.5% discount rate, the Net Present Value (NPV) of these avoided losses is approximately $120 billion.

In simple terms, the data centre industry would realise a positive return on investment if it spends up to 3% of total asset value (building only, not including contents such as servers) — or roughly $120 billion — on climate adaptation or strategic relocation over that time horizon.

In addition, XDI estimates that without these adaptation measures, the costs of extreme weather insurance could be around 3 to 4 times more than what companies are paying today by 2050.

This highlights how readily achievable measures can significantly reduce risk over time, even under worsening climate conditions.

For this analysis, a standard base archetype was used to represent all data centres. However, it is important to note that not all data centres are built exactly to the same standards or design, and some - particularly in countries with strong regulation - may be more resilient than others. We recommend in depth analysis of all data centres identified as being at high or moderate risk, using the specific details of the asset to provide greater granularity and accuracy.

The limits of adaptation

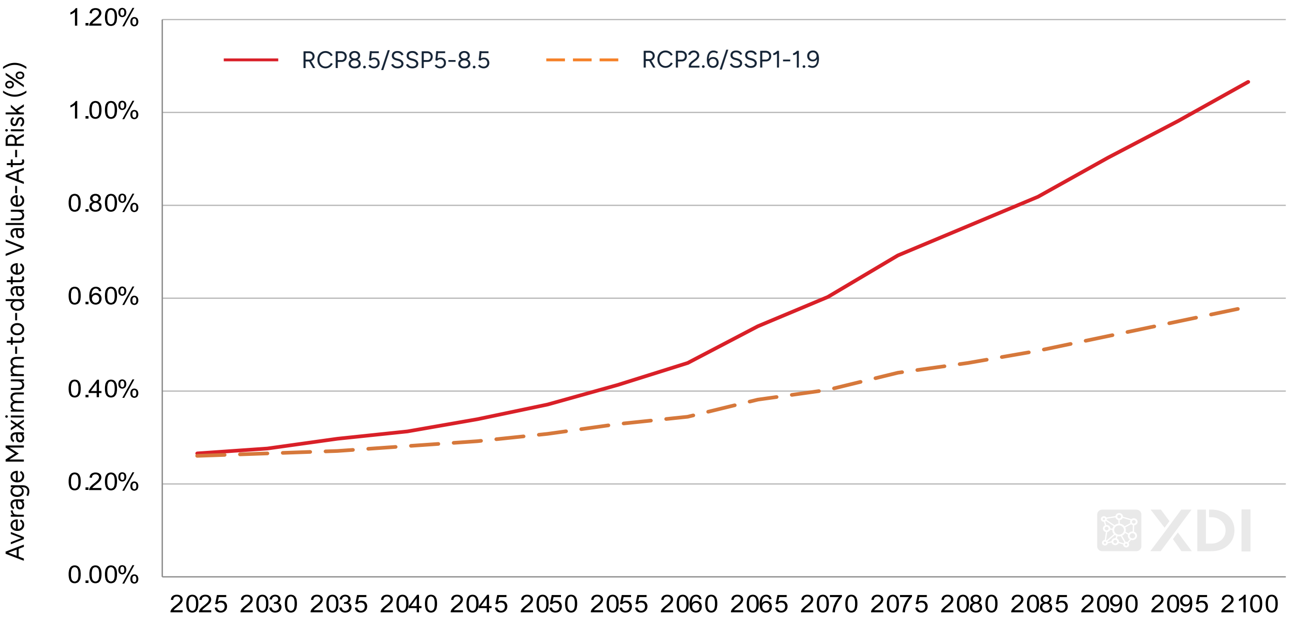
While structural adaptation can significantly reduce the physical damage risk to data centre infrastructure, it is not a silver bullet. Data centres depend on external systems - power, water, transport, telecommunications, emergency services - to function. Even if a facility is designed to withstand flooding or storms, it can't operate if the grid fails, fuel supplies for generators are cut off, or staff cannot safely access the site. This cross dependency means resilience must extend beyond the data centre itself to the wider infrastructure and systems that support it.

Importantly, adaptation should never be viewed as a substitute for emissions reduction. Climate change increasingly threatens the external systems and government functions that data centres rely on, particularly in regions facing strained public resources or governance challenges. While adaptation is essential, only reducing greenhouse gas emissions can address the root cause of climate risk. Without meaningful mitigation, even the most resilient data centre could still face failure as wider systems are overwhelmed.

Finally, not all data centres are suitable for adaptation. In this analysis, there were still hundreds of data centres still facing unacceptable risk from climate change hazards, even after interventions to make their infrastructure more resilient.

Adaptation is expensive, and not all structures can be made resilient. Reducing carbon emissions and preventing further global warming remains the most cost effective way to keep data centres operational.

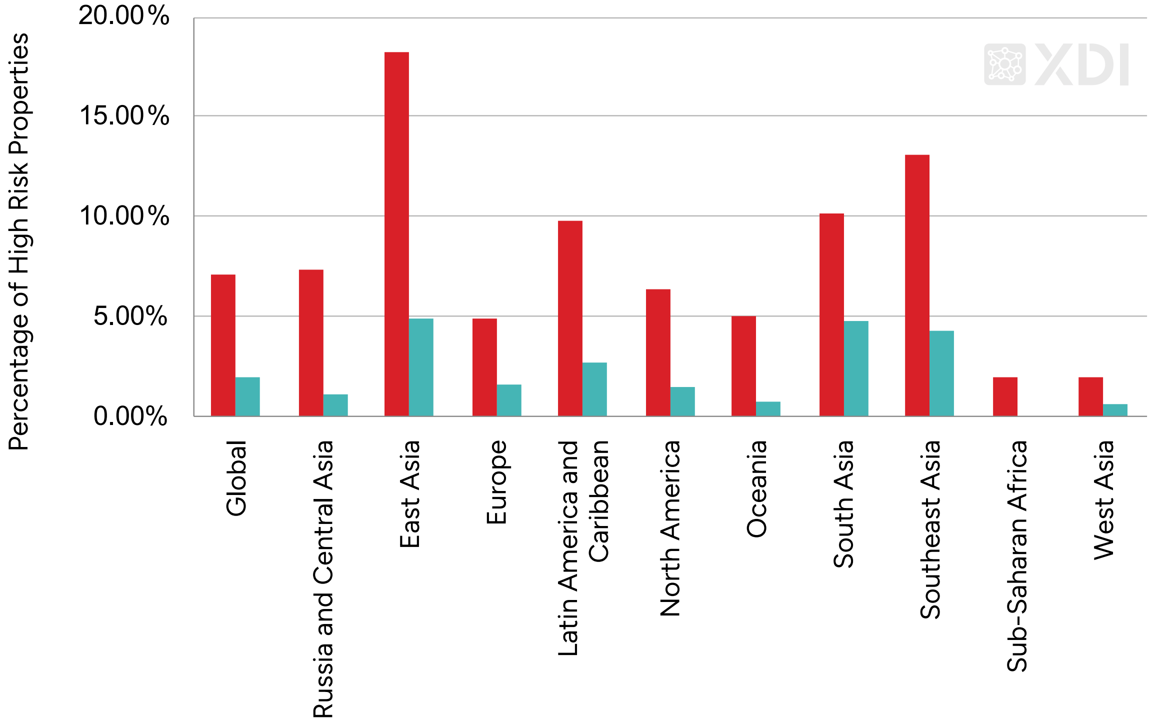
Global Average MVAR% Over Time



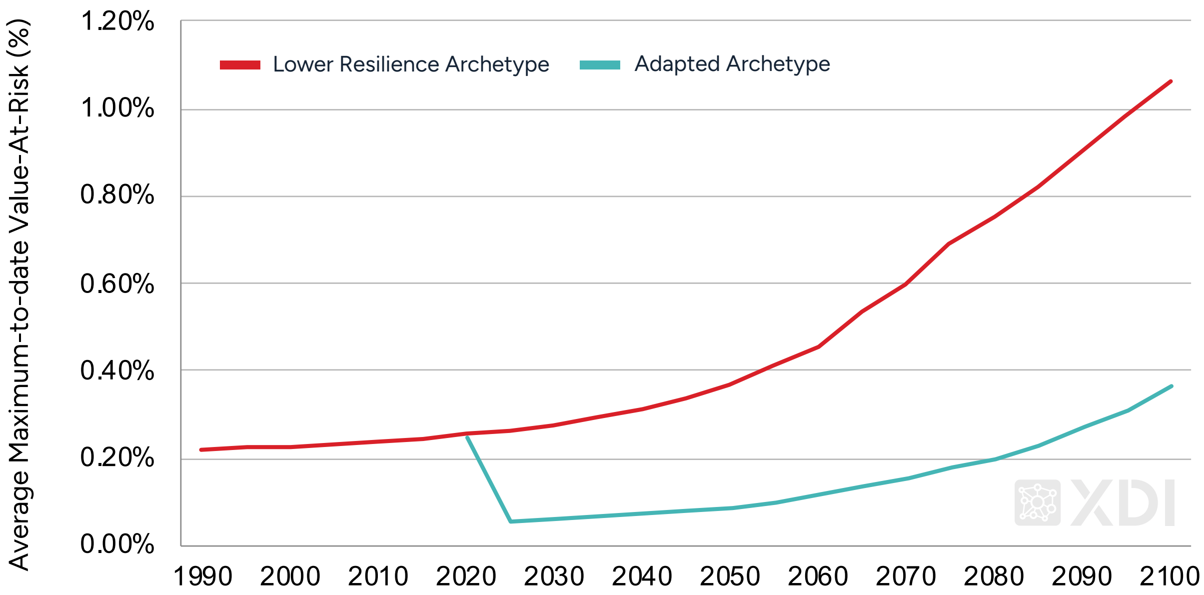
This graph illustrates the impact reduced emissions has on damage risk. It compares the damage risk of a high emissions scenario (RCP 8.5/SSP 5-8.5) with a low emissions scenario (RCP 2.6/SSP1-1.9), from 2025 to 2100.

2050 %HRP per region - Lower Resilience vs Adapted Archetype

The red column indicates the level of risk to data centre infrastructure in our first analysis, expressed as average MVAR. The green column shows how this risk is reduced when data centre infrastructure is adapted to increase resilience.



Global Average MVAR% Over Time

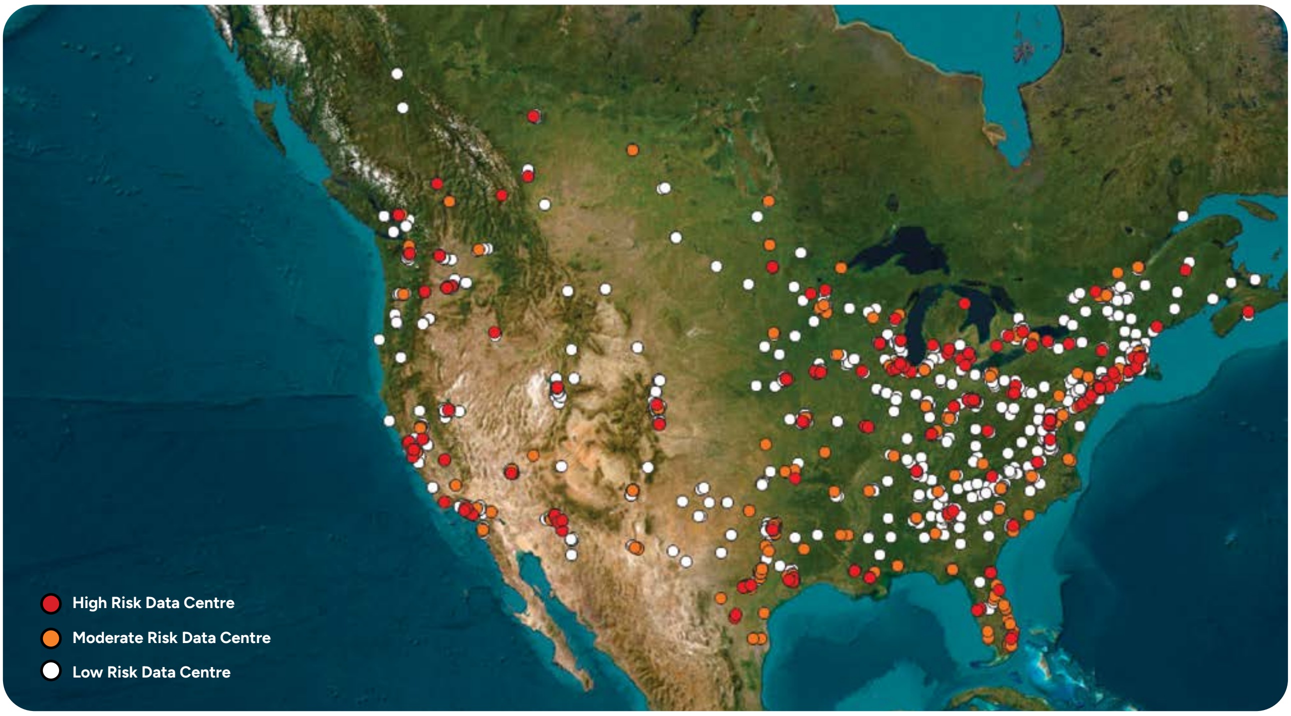


Global overview: the impact of adaptation on risk of damage to infrastructure by region in 2050

Region	Base archetype (lower resilience)	Adapted archetype (higher resilience)	Base archetype (lower resilience)	Adapted archetype (higher resilience)	Lower resilience vs. Higher resilience 2050
	% and # HRP 2050	% and # HRP 2050	% and # MRP 2050	% and # MRP 2050	% damage risk incr.
Globally	632 (7.13%)	175 (1.97%)	1738 (19.60%)	511 (5.76%)	-74%
Russia and Central Asia	13 (7.30%)	2 (1.12%)	16 (8.99%)	3 (1.69%)	-89%
East Asia	119 (18.25%)	32 (4.91%)	347 (53.22%)	189 (28.99%)	-63%
Europe	127 (4.97%)	41 (1.60%)	273 (10.68%)	75 (2.94%)	-70%
Latin America and Caribbean	43 (9.84%)	12 (2.75%)	153 (35.01%)	9 (2.06%)	-83%
North Africa	0 (0.00%)	0 (0.00%)	2 (6.67%)	0 (0.00%)	-97%
North America	230 (6.34%)	55 (1.52%)	507 (13.97%)	143 (3.94%)	-82%
Oceania	14 (5.00%)	2 (0.71%)	98 (35.00%)	18 (6.43%)	-84%
South Asia	28 (10.22%)	13 (4.74%)	104 (37.96%)	21 (7.66%)	-77%
Southeast Asia	49 (13.07%)	16 (4.27%)	135 (36.00%)	49 (13.07%)	-69%
Sub-Saharan Africa	3 (1.96%)	0 (0.00%)	50 (32.68%)	0 (0.00%)	-93%
West Asia	6 (1.97%)	2 (0.66%)	53 (17.38%)	4 (1.31%)	-87%

Regional Overview

North America



Data Centres Analysed:

3,629

Includes **380** operational hyperscale centres, **194** planned hyperscale centres and **466** other planned data centres.

Increase in Damage Risk:

+256%

More than **3-fold increase** in the risk of damage to data centre infrastructure from climate change hazards by 2100.

High Risk Property %:

6.34%

By 2050, **6.34%** of data centres in North America are projected to be classified as High Risk.

2050 Driving Hazards:

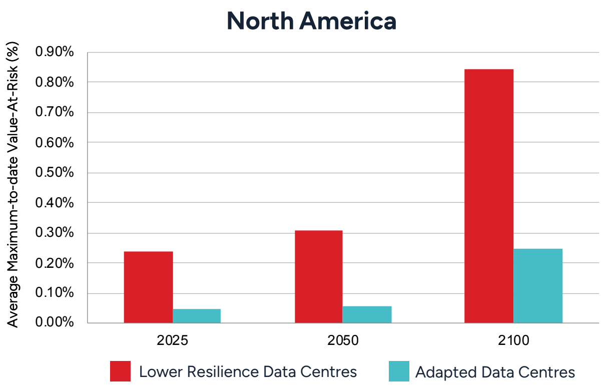
1. Surface Water Flood
2. Riverine Flood
3. Coastal Inundation

How can adaptation reduce risk?

This analysis shows how adaptations to the structure of data centres can reduce the risk of damage from climate change extreme weather.

The red column indicates the level of risk to data centre infrastructure in our first analysis, expressed as average MVAR. The green column shows how this risk is reduced when data centre infrastructure is adapted to increase resilience.

The analysis shows a possible **82% reduction** in risk of damage to data centre infrastructure for the year 2050.



	Base archetype (lower resilience)	Adapted archetype (higher resilience)	Base archetype (lower resilience)	Adapted archetype (higher resilience)	Lower resilience vs. Higher resilience 2050
	# and % HRP 2050	# and % HRP 2050	# and % MRP 2050	# and % MRP 2050	% damage risk increase
North America	230 (6.34%)	55 (1.52%)	507 (13.97%)	143 (3.94%)	-82%

North America at a glance

When it comes to numbers and technological edge, the United States is the data centre hub of the world, accounting for nearly half of global hyperscale capacity. Key hubs such as northern Virginia, Dallas (Texas), Silicon Valley (California), and Phoenix (Arizona) dominate due to their robust connectivity, access to renewable or affordable power, and business-friendly regulatory environments. However, surging demand from artificial intelligence, cloud services, and enterprise digitalisation is pushing development beyond traditional locations, driving record investment in secondary markets and rural sites with access to cheap land and scalable infrastructure.

Across the border in Canada, data centre hubs are emerging in major cities across the country. Toronto (Ontario), Montreal (Quebec), and Vancouver (British Columbia) are at the forefront, however other cities such as Calgary (Alberta), Quebec City (Quebec), and Waterloo (Ontario) are also becoming significant players in the data centre market.

United States

- 3382 of the data centres analysed in this report are located in the United States. Over 6% of these are projected to be high risk by 2050. However, in 16 states this percentage is 10% or over - or 1 in 10 data centres.
- New Jersey is the 11th most climate-at-risk hub in the world, with 1 in 5 data centres analysed projected to be high risk by 2050, largely driven by Coastal Inundation and Surface Water Flooding.
- It is closely followed by Massachusetts, Oregon and Michigan (ranked 12th, 13th and 14th). Oregon is notable for its Forest Fire risk - a significant and growing hazard.
- In hubs such as New York and Connecticut more than 1 in 10 data centres are projected to be high risk by 2050.
- Florida, which ranks 37th in this global analysis, is projected to experience some of the greatest increase in risk of damage from climate change hazards between now and the end of the century (>1000%) in the world, largely due to Tropical Cyclone Wind and then after 2050, Coastal Inundation.
- Surface Water Flooding and Riverine Flooding are the main drivers in high risk states.
- Virginia - home to 529 data centres and often referred to as the data centre hub of the world - ranks 71st in this analysis, with just over 3.21% of its data centres considered high risk by 2050. There are, however, 16 data centres in Virginia already considered high risk, reflective of the high concentration of data centres in this state.

Canada

- 247 data centres in Canada were analysed for this report. Over 7% of data centres across the country are projected to be high risk by 2050. The risk of damage from climate change hazards is projected to double between now and the end of the century.
- Ontario has the highest concentration of data centres analysed in Canada (99), and ranks 26th in this analysis. 1 in 10 (10.10%) of these are already considered high risk, with Surface Water Flooding the driving hazard.
- It is followed by British Columbia, which ranks 22nd, and where more than 1 in 10 (11.11%) of data centres are already considered high risk. British Columbia is projected to experience a 4-fold (296%) increase in the risk of damage from climate change hazards between now and the end of the century (2025-2100).
- Data centres in Alberta carry a similar risk with 1 in 10 data centres projected to be high risk by 2050. Alberta comes 28th in our ranking.

Europe

Data Centres Analysed:

2,555

Including **91** operational hyperscale centres, **32** planned hyperscale centres and **183** other planned data centres.

Increase in Damage Risk:

+227%

More than **3-fold increase** in the risk of damage to data centre infrastructure from climate change hazards by 2100.

High Risk Property %:

4.97%

By 2050, **1 in 20** data centres in Europe are projected to be classified as High Risk.

2050 Driving Hazards:

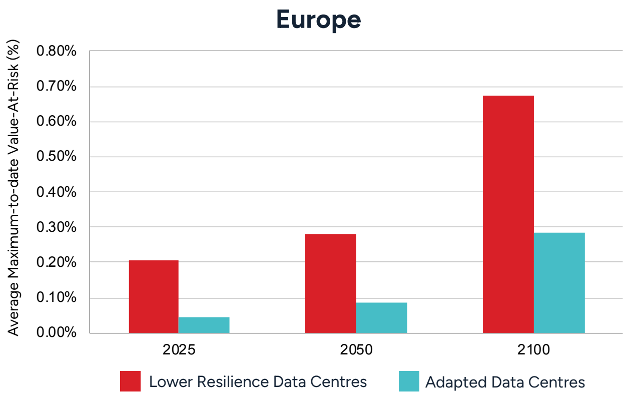
1. Coastal Inundation
2. Riverine Flood
3. Surface Water Flood

How can adaptation reduce risk?

This analysis shows how adaptations to the structure of data centres can reduce the risk of damage from climate change extreme weather.

The red column indicates the level of risk to data centre infrastructure in our first analysis, expressed as average MVAR. The green column shows how this risk is reduced when data centre infrastructure is adapted to increase resilience.

The analysis shows a possible **70% reduction** in risk of damage to data centre infrastructure for the year 2050.



	Base archetype (lower resilience)	Adapted archetype (higher resilience)	Base archetype (lower resilience)	Adapted archetype (higher resilience)	Lower resilience vs. Higher resilience 2050
	# and % HRP 2050	# and % HRP 2050	# and % MRP 2050	# and % MRP 2050	% damage risk increase
Europe	127 (4.97%)	41 (1.60%)	273 (10.68%)	75 (2.94%)	-70%

Europe at a glance

Europe's data centre landscape is undergoing a period of transformation and rapid expansion, but it faces strategic challenges as global competition intensifies. The FLAP-D markets—Frankfurt, London, Amsterdam, Paris, and Dublin—remain the continent's dominant data centre hubs, accounting for over half of all operational capacity.

The Nordic region is seeing a surge in hyperscale development driven by deliberate national strategies. Countries like Sweden, Norway, Finland, and Denmark are positioning themselves as ideal destinations leading to a "Nordic-first" strategy among many hyperscalers, with the regional data centre construction market expected to rise from US $1.88 billion in 2023 to US $3.18 billion by 2029.

Southern Europe is also starting to benefit from the decentralisation of Europe's data centre network. Cities like Lisbon and Barcelona are increasingly seen as viable hubs, buoyed by strong connectivity to submarine cables that link Europe with Africa and the Americas.

Europe lags behind the U.S. and China in total data centre construction.

Germany

- Germany is a leading global data centre hub with 365 data centres analysed. 7.95% of these are projected to be high risk by 2050.
- Hamburg is one of the (climate) riskiest hubs in the world, ranking 3rd in our global analysis, ahead of Shanghai, Guangdong, Tokyo and Bangkok. More than half (58.33%) of the data centres analysed in Hamburg are projected to be high risk by 2050 with the risk of damage from climate change hazards increasing 7-fold (607%) between now and the end of the century (2025-2100). Coastal Inundation is the main driver of this risk.
- Hessen (home to Frankfurt) has the highest concentration of data centres in Europe after Dublin. Hessen ranks 60th in our analysis, with 4% of data centres projected to be high risk by 2050.
- Bremen and Saarland also have a very high percentage of high risk data centres in Germany by 2050 - 71% and 25% respectively. They do not make it into the top 100 data centre hubs due to the lower concentration of data centres.

Denmark

- 14.81% of data centres in Denmark are projected to be high risk by 2050, and the risk of damage to data centre infrastructure from climate change hazards is projected to increase more than 9-fold (815%) between now and the end of the century. Coastal Inundation is the driving hazard.
- Most data centres in Denmark are in Hovedstaden where 1 in 5 (20%) data centres are projected to be high risk by 2050 and where the risk of damage to data infrastructure will increase exponentially (>1000%) if adaptation measures are not implemented. It ranks 10th for risk in this global analysis.

England

- 369 data centres in England were analysed for this report - the highest number after the United States and China. Damage risk to infrastructure from climate change hazards is projected to almost triple (180%) by the end of the century.
- Most data centres are located in Greater London (82), where there is a high reliance on protection offered by the Thames Barrier. Thanks to these, London ranks 83rd in this analysis.
- Outside of London, Berkshire is a notable hub with 48 data centres analysed. Almost 1 in 10 (8.33%) are already considered high risk, with Surface Water Flooding being the driving hazard. Berkshire ranks 33rd in our analysis and risk of damage to data centre infrastructure in this area is projected to more than double (115%) by the end of the century.

Republic of Ireland

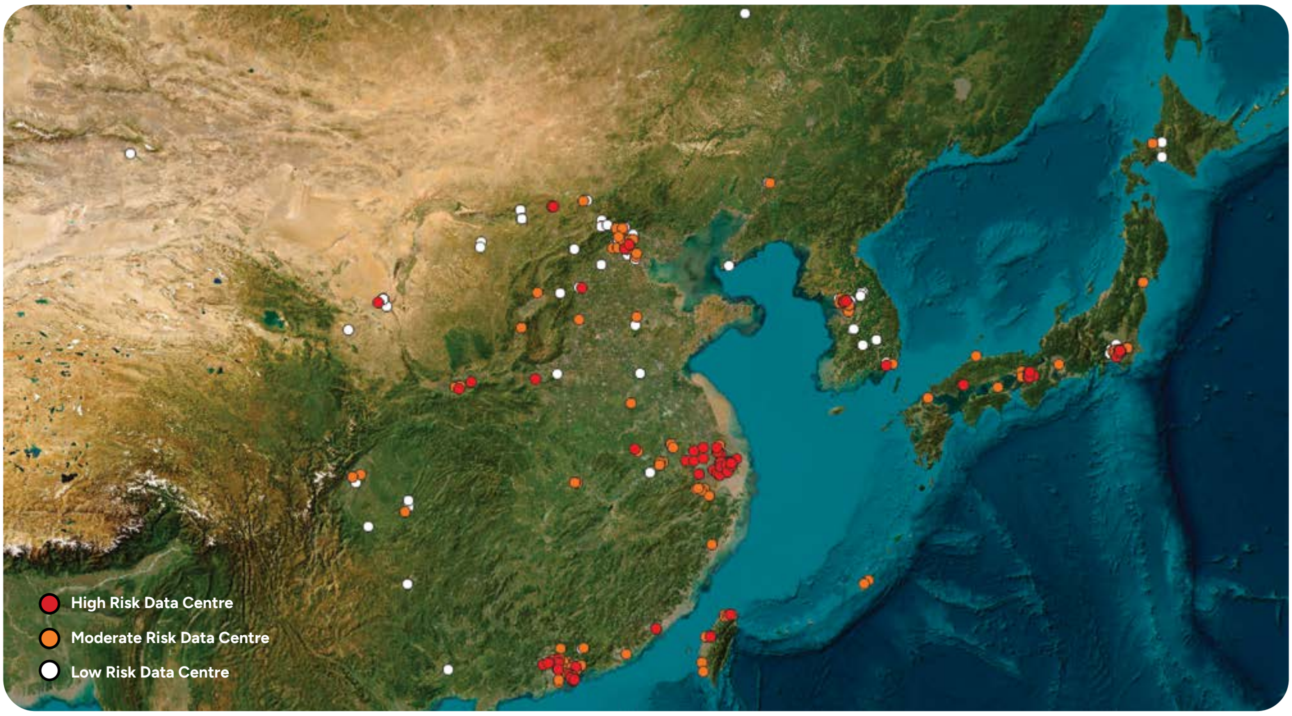
- 119 data centres in Ireland were analysed for this report, most of them in Dublin (Leinster).
- Leinster ranks 73rd in our analysis, with 2.59% of data centres here considered high risk by 2050. Damage risk from climate change hazards is projected to almost triple (196%) between 2025-2100.

Other

Other European states with 20 or more data centres analysed and high concentrations of high risk properties by 2050 include:

- Noord-Holland, Netherlands: 80 data centres analysed, 10% at high risk by 2050. Ranks 27th in the global ranking.
- Vlaanderen, Belgium: 34 data centres analysed, 8.82% at high risk by 2050. Ranks 32nd in the global ranking.
- Noord-Brabant, Netherlands: 23 data centres analysed, 13.04% at high risk by 2050. Ranks 17th in the global ranking.
- Lazio, Italy: 21 data centres analysed, 9.52% at high risk by 2050. Ranks 31st in the global ranking.
- Grand Est, France: 20 data centres analysed, 10% at high risk by 2050. Ranks 29th in the global ranking.

East Asia



Data Centres Analysed:

652

Including **34** operational hyperscale centres and **47** planned data centres.

Increase in Damage Risk:

+465%

Almost **6-fold increase** in the risk of damage to data centre infrastructure from climate change hazards by 2100.

High Risk Property %:

18.25%

By 2050, **almost 1 in 5** data centres in East Asia are projected to be classified as High Risk.

2050 Driving Hazards:

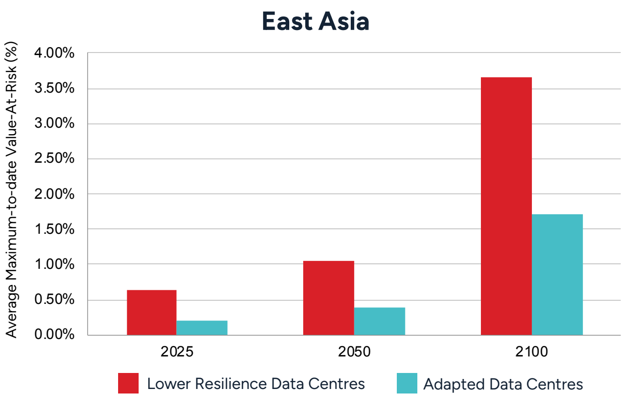
1. Coastal Inundation
2. Riverine Flood
3. Tropical Cyclone Wind

How can adaptation reduce risk?

This analysis shows how adaptations to the structure of data centres can reduce the risk of damage from climate change extreme weather.

The red column indicates the level of risk to data centre infrastructure in our first analysis, expressed as average MVAR. The green column shows how this risk is reduced when data centre infrastructure is adapted to increase resilience.

The analysis shows a possible **63% reduction** in risk of damage to data centre infrastructure for the year 2050.



	Base archetype (lower resilience)	Adapted archetype (higher resilience)	Base archetype (lower resilience)	Adapted archetype (higher resilience)	Lower resilience vs. Higher resilience 2050
	# and % HRP 2050	# and % HRP 2050	# and % MRP 2050	# and % MRP 2050	% damage risk increase
East Asia	119 (18.25%)	32 (4.91%)	347 (53.22%)	189 (28.99%)	-63%

East Asia at a glance

East Asia is one of the largest and fastest-growing data centre markets globally, with the sector projected to surpass US $60 billion by 2030. The region's growth is driven by rising digital demand, government support, and the expansion of cloud and AI infrastructure. China leads the pack, with major data centre clusters in Beijing, Shanghai, Shenzhen, and Guangzhou. Japan's Tokyo remains a key regional hub, serving both domestic users and international firms. In South Korea, Seoul plays a central role, supported by high broadband penetration and strong tech infrastructure.

Hong Kong acts as a strategic digital gateway between mainland China and the rest of the world, capitalising on its global financial status and strong network connectivity. Meanwhile, Taiwan is gaining prominence, with Taipei and Kaohsiung emerging as new data centre hotspots, thanks to a robust manufacturing sector and expanding tech ecosystem.

China

- 417 data centres in China were analysed for this report. Almost a quarter (22.54%) of data centres in China are projected to be high risk by 2050. Damage risk to infrastructure from climate change hazards is projected to increase more than 6-fold (535%) by the end of the century.
- Jiangsu is the world's (climate) riskiest data centre hub, ranking 1st in our analysis, with 64% of its 25 data centres projected to be high risk by 2050. The overall risk of damage to data centre infrastructure from climate change hazards in this region is projected to increase more than 8-fold (701%) between now and the end of the century (2025-2100).
- Shanghai ranks 4th in our analysis, with half (49.02%) of its data centres considered high risk by 2050 and an almost 9-fold (778%) increase in damage risk 2025-2100.
- Coastal Inundation is the driving hazard in Jiangsu and Shanghai.
- Hong Kong and Guangdong rank 9th and 6th respectively, and by 2050, 20-30% of data centres located in these provinces will be considered high risk. Tropical Cyclone Wind is the driving hazard for both.

Japan

- 141 data centres in Japan were analysed. Across the country, 1 in 10 data centres are already considered high risk, increasing to 14.18% by 2050.
- Most data centres in Japan are in Tokyo, followed by Osaka. Tokyo ranks 7th in this analysis, with more than a quarter (26.32%) of data centres projected to be high risk by 2050 and a 5-fold (400%) increase in risk of damage between 2025-2100.

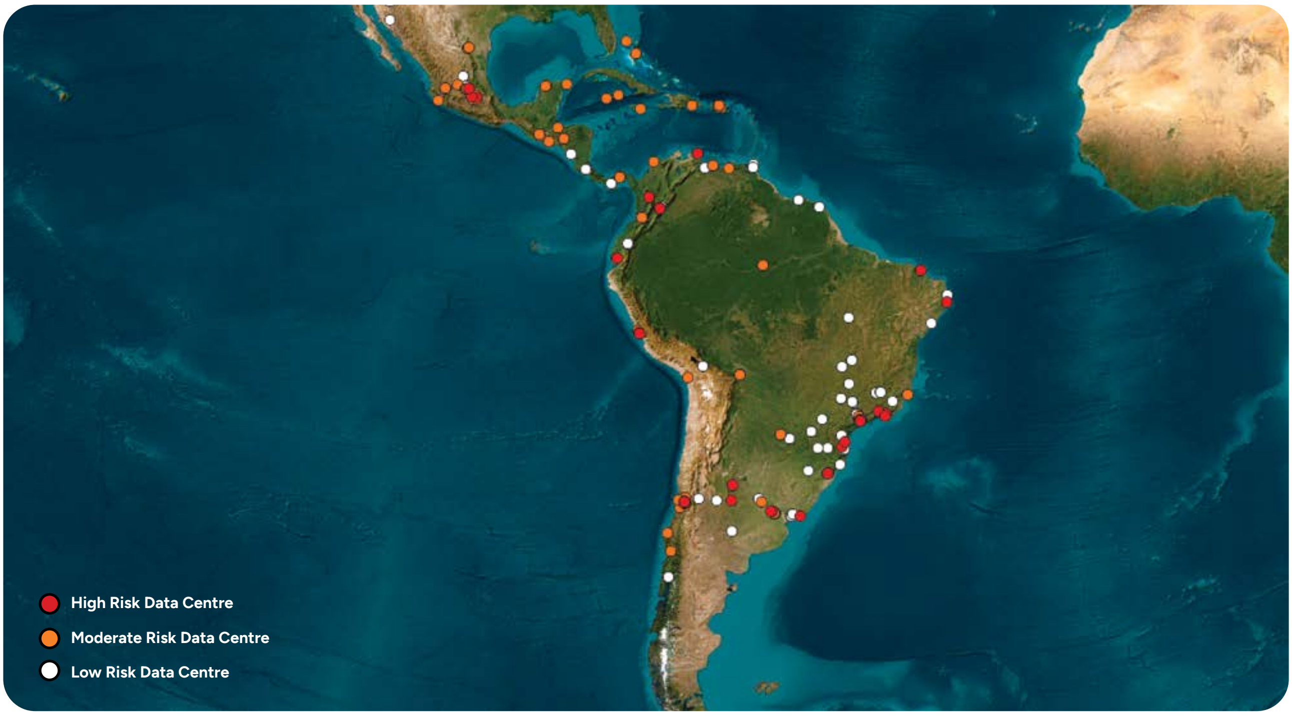
South Korea

- In South Korea, 4.23% of its 71 data centres are projected to be high risk by 2050, most of them concentrated in Seoul, which ranks 46th in our analysis. 6.06% of data centres here are projected to be high risk by 2050.

Taiwan

- In Taiwan, 9.09% of its data centres are projected to be high risk by 2050. Most data centres are located in Taipei.

Latin America and Caribbean



Data Centres Analysed:

437

Including **2** operational hyperscale centres, **7** planned hyperscale centres and **38** other planned data centres.

Increase in Damage Risk:

+184%

A **3-fold increase** in the risk of damage to data centre infrastructure from climate change hazards by 2100.

High Risk Property %:

9.84%

By 2050, **1 in 10** data centres in Latin America and Caribbean regions are projected to be classified as High Risk.

2050 Driving Hazards:

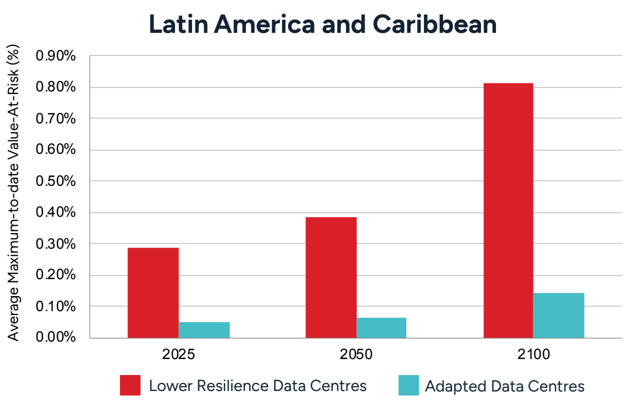
1. Riverine Flood
2. Surface Water Flood
3. Tropical Cyclone Wind

How can adaptation reduce risk?

This analysis shows how adaptations to the structure of data centres can reduce the risk of damage from climate change extreme weather.

The red column indicates the level of risk to data centre infrastructure in our first analysis, expressed as average MVAR. The green column shows how this risk is reduced when data centre infrastructure is adapted to increase resilience.

The analysis shows a possible **83% reduction** in risk of damage to data centre infrastructure for the year 2050.



	Base archetype (lower resilience)	Adapted archetype (higher resilience)	Base archetype (lower resilience)	Adapted archetype (higher resilience)	Lower resilience vs. Higher resilience 2050
	# and % HRP 2050	# and % HRP 2050	# and % MRP 2050	# and % MRP 2050	% damage risk increase
Latin America and Caribbean	43 (9.84%)	12 (2.75%)	153 (35.01%)	9 (2.06%)	-83%

Latin America and Caribbean at a glance

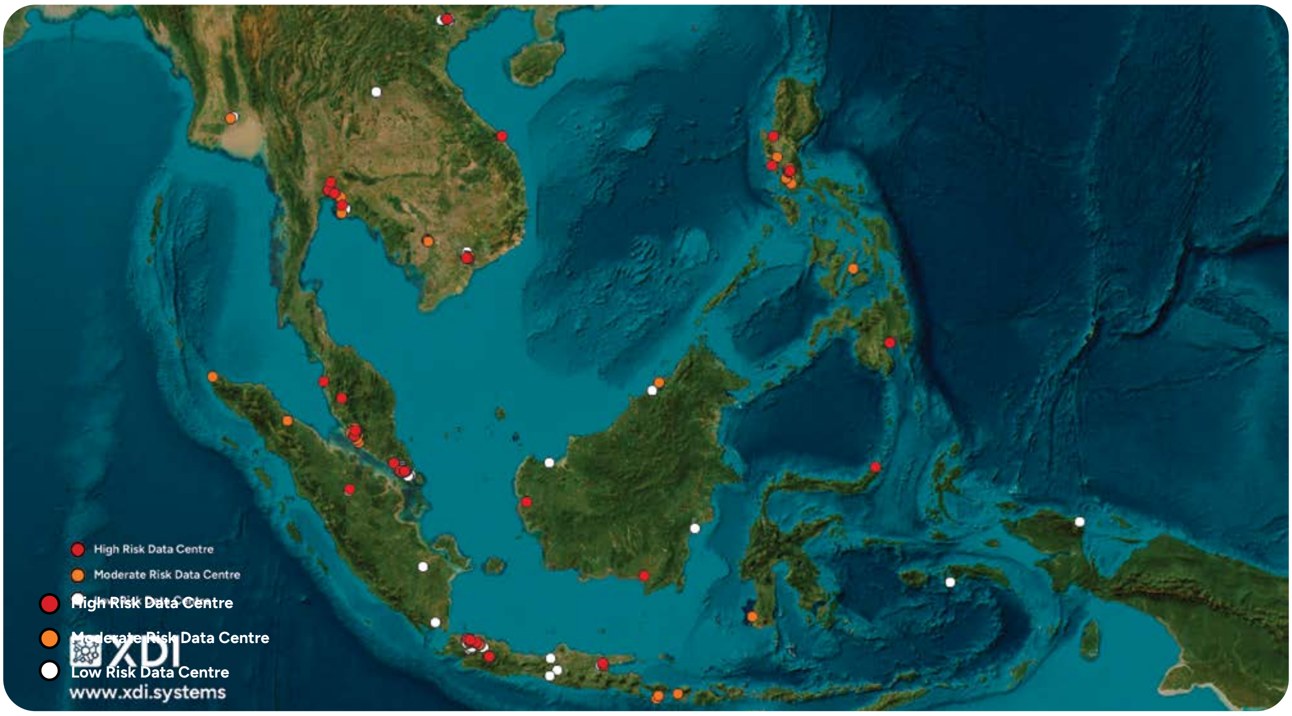
The data centre market in Latin America is expected to double over the next five years or so, from around US $5/6 billion in 2023 to US $8-10 billion by 2029. The market is dominated by Brazil, Mexico and Chile, with Colombia, Peru, Costa Rica and Panama as emerging centres for investment. The most active data centre companies in the region include Scala, Equinix, Cirion, Ascenty, Kio and Odata.

The vast majority of data centre projects in Latin America are located in major urban centres such as Sao Paulo (Brazil), Rio de Janeiro (Brazil), Santiago (Chile) and Bogota (Colombia). However in Mexico, data centre projects have emerged largely in Querétaro rather than Mexico City. As land becomes more expensive and local companies step in to fill increasing demand, it's expected that there will be more remote data centre "cities" emerging across Latin America, resulting in greater demand for greenfield water and power infrastructure requiring investment and financing.

The Caribbean data centre market is small but growing.

- This region has two data centre hubs included in our global ranking: Santiago (Chile), and Sao Paulo, (Brazil).
- Santiago is the most climate-at-risk data centre hub in Latin America and the Caribbean. 49 data centres in Santiago were analysed, 16.33% of which are projected to be high risk by 2050, largely due to Riverine Flooding. Santiago ranks 15th in our global analysis.
- Sao Paulo in Brazil is home to the highest number of data centres in Latin America analysed in this report (73) and it ranks 23rd in our analysis. More than 1 in 10 (10.96%) data centres in Sao Paulo are projected to be high risk by 2050 with Riverine Flooding the driving hazard.
- Although not included in our global ranking, Buenos Aires is notable for its high percentage of high risk data centres: almost 1 in 5 data centres are already considered high risk, mostly due to Riverine Flooding.
- Rio de Janeiro (Brazil), Queretaro (Mexico) and Bogota (Colombia) all have 15-20 data centres each, of which around 15% are projected to be high risk by 2050.

Southeast Asia



Data Centres Analysed:

375

Including **12** operational hyperscale data centres, **6** planned hyperscale centres and **16** other planned data centres.

Increase in Damage Risk:

+372%

Almost **5-fold increase** in the risk of damage to data centre infrastructure from climate change hazards by 2100.

High Risk Property %:

13.07%

By 2050, **1 in 3** to **1 in 4** data centres in Vietnam, Phillipines and Thailand are projected to be classified as High Risk.

2050 Driving Hazards:

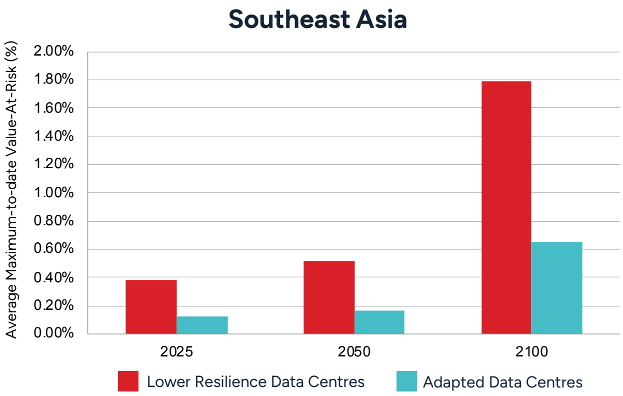
1. Riverine Flood
2. Surface Water Flood
3. Tropical Cyclone Wind

How can adaptation reduce risk?

This analysis shows how adaptations to the structure of data centres can reduce the risk of damage from climate change extreme weather.

The red column indicates the level of risk to data centre infrastructure in our first analysis, expressed as average MVAR. The green column shows how this risk is reduced when data centre infrastructure is adapted to increase resilience.

The analysis shows a possible **69% reduction** in risk of damage to data centre infrastructure, and the percentage of High Risk data centres could be **reduced by 2/3** for the year 2050.



	Base archetype (lower resilience)	Adapted archetype (higher resilience)	Base archetype (lower resilience)	Adapted archetype (higher resilience)	Lower resilience vs. Higher resilience 2050
	# and % HRP 2050	# and % HRP 2050	# and % MRP 2050	# and % MRP 2050	% damage risk increase
Southeast Asia	49 (13.07%)	16 (4.27%)	135 (36.00%)	49 (13.07%)	-69%

Southeast Asia at a glance

The Southeast Asia data centre market is poised for rapid expansion, with total investments expected to grow from USD 13.71 billion in 2024 to USD 30.47 billion by 2030, registering a compound annual growth rate (CAGR) of 14.23% Hyperscale investment is a key driver—75% of hyperscaler needs in the region are met through leased facilities, with global tech giants like AWS, Microsoft, and Meta pouring billions into countries such as Malaysia, Thailand, and Indonesia. Governments are actively promoting this expansion, offering incentives and infrastructure support.

Singapore is the largest data centre market in the region, hosting many global players.

Malaysia is a major hub with a strong presence of colocation and hyperscale operators. Johor City leads investment due to favorable land and government incentives.

Thailand is an emerging hub after Malaysia and Indonesia. Bangkok is a key location for operators.

In **Indonesia**, Jakarta and Yogyakarta are key markets.

However, as this rapid growth shifts supply to emerging markets (particularly Indonesia, Malaysia, and Thailand) —partly in response to land and energy constraints in Singapore—it also introduces new exposure to physical climate and natural disaster risks.

XDI's 2024 Gross Domestic Climate Risk Report identified provinces in Southeast Asia as being some of the most vulnerable to climate change extreme weather in the world. This is supported by the dataset underpinning this analysis which identifies Vietnam, Thailand and the Philippines as carrying the greatest risk. The combination of booming data centre construction and high physical hazard exposure raises critical questions about resilience.

Indonesia

- With 126 data centres analysed, Indonesia is the data centre hub of the region. However, 1 in 10 (9.52%) data centres across the country are already considered high risk and overall damage risk is set to triple by the end of the century. The driving hazard is Riverine Flooding.
- Most data centres in Indonesia are located in Bandung (Jawa Barat) and Jakarta (Jakarta Raya). These two hubs rank 19th and 20th in our global analysis, with approximately 12% of the data centres projected to be high risk by 2050 and the risk of damage to infrastructure doubling (Jawa Barat - 112%) and almost quadrupling (Jakarta - 272%) by the end of the century.

Malaysia, Singapore

- Malaysia and Singapore both have over 70 data centres each, with 7-8% projected to be at high risk by 2050. Data centres in both countries see a 4 and 6-fold increase respectively in overall risk of damage 2025-2100.
- In Malaysia, most data centres analysed are in Putrajaya, south of the capital Kuala Lumpur. This hub ranked 68th for risk in our global ranking, with 3.57% of data centres projected to be high risk by 2050, and a more than 4-fold (357%) increase in risk of damage from climate change hazards between now and 2100. Notably, almost all (96.43%) data centres in Putrajaya are projected to be at moderate risk by 2050.

Vietnam, Philippines, Thailand

- Vietnam, the Philippines and Thailand are the riskiest countries in the world for data centres, with 1/4 to 1/3 projected to be high risk by 2050.
- In our global ranking of data centre hubs, Bangkok comes 8th, with almost a 1/4 (23.08%) projected to be high risk by 2050. Riverine flooding is the driving hazard.
- Hubs in Vietnam and the Philippines are not included in our global ranking, however data centres in Ho Chi Minh, Hanoi and Manila should be noted for carrying particularly high risk - 22.22-33.33% by 2050.

West Asia

Data Centres Analysed:

305

Including **9** operational hyperscale centres and **18** planned data centres.

Increase in Damage Risk:

+828%

More than **9-fold** Increase in the risk of damage to data centre infrastructure from climate change hazards by 2100.

High Risk Property %:

1.97%

By 2050, **1.97%** of data centres in West Asia are projected to be classified as High Risk.

2050 Driving Hazards:

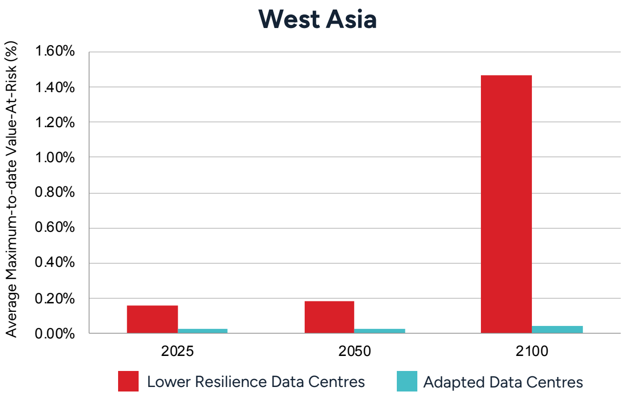
1. Riverine Flood
2. Surface Water Flood
3. Extreme Wind

How can adaptation reduce risk?

This analysis shows how adaptations to the structure of data centres can reduce the risk of damage from climate change extreme weather.

The red column indicates the level of risk to data centre infrastructure in our first analysis, expressed as average MVAR. The green column shows how this risk is reduced when data centre infrastructure is adapted to increase resilience.

The analysis shows a possible **87% reduction** in risk of damage to data centre infrastructure for the year 2050.



	Base archetype (lower resilience)	Adapted archetype (higher resilience)	Base archetype (lower resilience)	Adapted archetype (higher resilience)	Lower resilience vs. Higher resilience 2050
	# and % HRP 2050	# and % HRP 2050	# and % MRP 2050	# and % MRP 2050	% damage risk increase
West Asia	6 (1.97%)	2 (0.66%)	53 (17.38%)	4 (1.31%)	-87%

West Asia at a glance

The data centre market in West Asia is rapidly expanding, with the United Arab Emirates (UAE) and the Kingdom of Saudi Arabia (KSA) leading the charge. In the UAE, Dubai has emerged as the primary hub, driven by ambitious government initiatives. With 99% of the population online and active, data consumption in the Emirates is among the highest in the region, fueling a project pipeline worth over US $1.6 billion. Abu Dhabi also plays a growing role, supported by national strategies to digitise public services and attract international investment.

Major players such as AWS, Equinix, Oracle, Etisalat, and du are investing heavily in the region, responding to strong demand for cloud services and growing interest in edge computing.

- In this analysis, four data centre hubs from the region were included in our global ranking: Israel, Istanbul, Abu Dhabi and Dubai.
- The 20 data centres analysed in Dubai carry the highest risk in the region with 1 in 20 (5%) data centres projected to be high risk by 2050. Dubai is projected to experience an exponential increase in the risk of damage from climate change hazards (>1000%) between now and the end of the century. It ranks 54th in our global analysis of data centre hubs.
- Like Dubai, Abu Dhabi is projected to experience an exponential increase in the risk of damage from climate change hazards (>1000%) between now and the end of the century. It ranked 85th. Although no high risk properties in Abu Dhabi were identified, over 40% of data centres were projected to be at moderate risk showing the broad exposure to climate change hazards.
- In Turkey, Istanbul had the most data centres analysed (38 out of Turkey's total of 79). 2.63% are projected to be high risk by 2050.
- In Israel, most data centres are located in Tel Aviv. 2.08% are projected to be high risk by 2050 and the risk of damage to infrastructure from climate change extreme weather is set to double between now and the end of the century. It ranks 76th for climate risk in this analysis.

Oceania

Data Centres Analysed:

280

Including **10** operational hyperscale centres, **7** planned hyperscale centres and **27** other data centres.

Increase in Damage Risk:

+478%

Almost **6-fold increase** in the risk of damage to data centre infrastructure from climate change hazards by 2100.

High Risk Property %:

5.0%

By 2050, **5.0%** of data centres in Oceania are projected to be classified as High Risk.

2050 Driving Hazards:

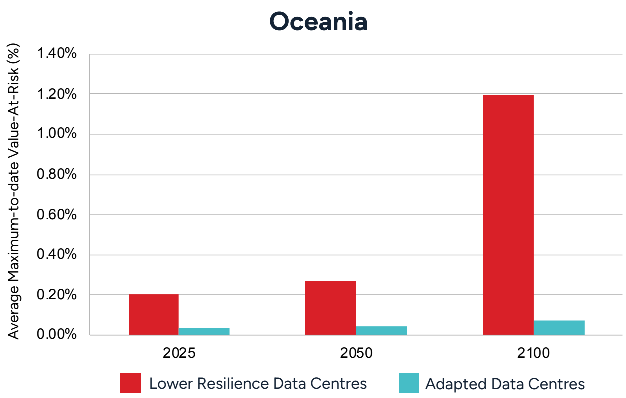
1. Surface Water Flood
2. Riverine Flood
3. Tropical Cyclone Wind

How can adaptation reduce risk?

This analysis shows how adaptations to the structure of data centres can reduce the risk of damage from climate change extreme weather.

The red column indicates the level of risk to data centre infrastructure in our first analysis, expressed as average MVAR. The green column shows how this risk is reduced when data centre infrastructure is adapted to increase resilience.

The analysis shows a possible **84% reduction** in risk of damage to data centre infrastructure for the year 2050.



	Base archetype (lower resilience)	Adapted archetype (higher resilience)	Base archetype (lower resilience)	Adapted archetype (higher resilience)	Lower resilience vs. Higher resilience 2050
	# and % HRP 2050	# and % HRP 2050	# and % MRP 2050	# and % MRP 2050	% damage risk increase
Oceania	14 (5.00%)	2 (0.71%)	98 (35.00%)	18 (6.43%)	-84%

Oceania at a glance

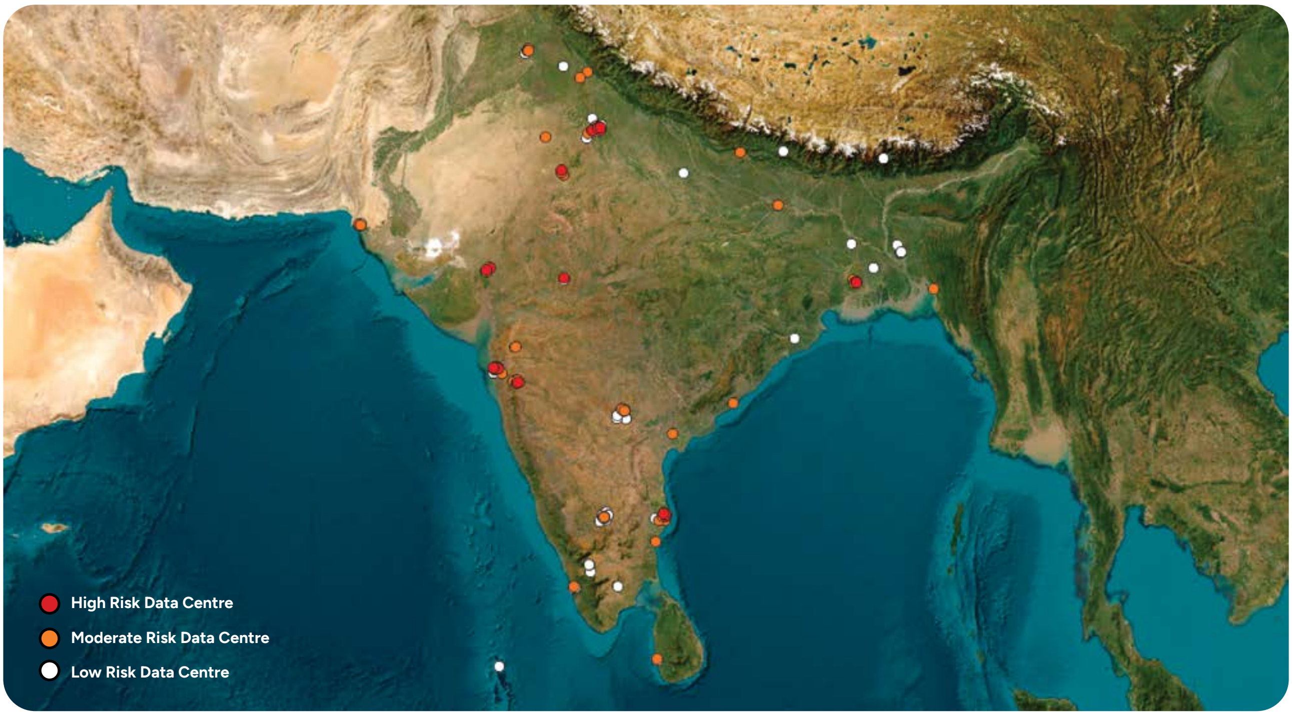
Australia and New Zealand are emerging as significant hubs due to their strategic locations, robust infrastructure, and commitment to sustainability.

Australia hosts over 200 data centres, primarily concentrated in major cities like Sydney, Melbourne, Brisbane, Perth, and Adelaide. Sydney and Melbourne are the primary hubs, attracting hyperscale providers such as Microsoft Azure, AWS, Equinix, and AirTrunk. The country benefits from extensive submarine cable connections to Southeast Asia and the U.S., enhancing its global connectivity.

New Zealand is positioning itself as a green data centre destination, leveraging its abundant renewable energy resources and cooler climate. Auckland stands out as the primary hub in New Zealand, with its strategic location offering proximity to fast-growing markets in Australia and Southeast Asia.

- For this report, 220 data centres in Australia were analysed and 52 in New Zealand. New Caledonia, Guam, French Polynesia, Papua New Guinea and the Solomon Islands were also included.
- Data centres in Queensland, Australia, are the most at risk in the region, with 14.81% projected to be high risk by 2050, driven by Surface Water Flooding. The risk of damage to data centre infrastructure in this state increases more than 7-fold (624%) between now and the end of the century. Queensland ranked 16th in our global analysis.
- In Australia, the vast majority of data centres (87) are located in Sydney, New South Wales, where the risk of damage from climate change extreme weather to data centre infrastructure is projected to increase more than 4-fold (347%) 2025-2100. 6.90% of these data centres are projected to be high risk by 2050. The driving hazard is Surface Water Flooding. It ranks 38th.
- Victoria sees the greatest increase in damage risk of all Australian states, with a more than 9-fold (831%) increase 2025-2100. The percentage of high risk properties in Victoria escalates dramatically after 2050 to almost 1 in 15 (6.38%) properties due to Coastal Inundation. Victoria ranks 41st.
- Risk to Auckland's 27 data centres increases by 50% from 2025 to 2100, and 3.70% of properties are projected to be high risk by 2050. Auckland ranks 67th in our global analysis.

South Asia



Data Centres Analysed:

274

Including **5** operational hyperscale centres, **6** planned hyperscale centres and **21** other planned data centres.

Increase in Damage Risk:

+181%

Increase in the risk of damage to data centre infrastructure from climate change hazards set to **almost triple** by 2100.

High Risk Property %:

10.22%

By 2050, more than **1 in 10** data centres in South Asia are projected to be classified as High Risk.

2050 Driving Hazards:

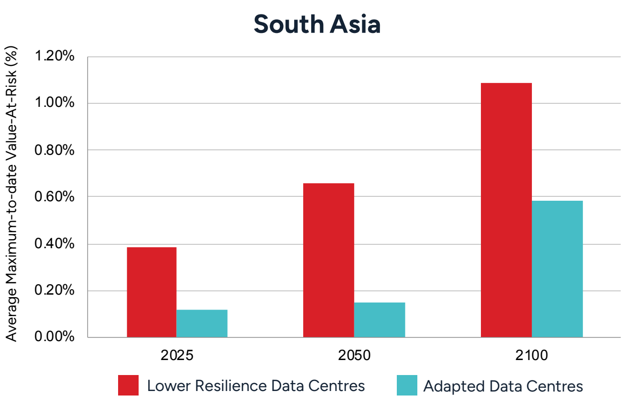
1. Coastal Inundation
2. Riverine Flood
3. Surface Water Flood

How can adaptation reduce risk?

This analysis shows how adaptations to the structure of data centres can reduce the risk of damage from climate change extreme weather.

The red column indicates the level of risk to data centre infrastructure in our first analysis, expressed as average MVAR. The green column shows how this risk is reduced when data centre infrastructure is adapted to increase resilience.

The analysis shows a possible **77% reduction** in risk of damage to data centre infrastructure, and the percentage of High Risk data centres could be **more than halved** for the year 2050.



	Base archetype (lower resilience)	Adapted archetype (higher resilience)	Base archetype (lower resilience)	Adapted archetype (higher resilience)	Lower resilience vs. Higher resilience 2050
	# and % HRP 2050	# and % HRP 2050	# and % MRP 2050	# and % MRP 2050	% damage risk increase
South Asia	28 (10.22%)	13 (4.74%)	104 (37.96%)	21 (7.66%)	-77%

South Asia at a glance

India is the dominant force in South Asia's data centre landscape, accounting for the vast majority of the region's capacity and investment. Its data centre industry is set to witness remarkable growth, with the expansion expected to drive a demand for 10 million sq. ft. of real estate space, an attract investments worth USD 5.7 billion.

Major hubs include Navi Mumbai, Bangalore, Noida, Chennai, and Hyderabad—cities that together host nearly all of India's operational capacity. Navi Mumbai alone holds 44% of the national market. Hyperscale operators like AWS, Microsoft, and Google are investing in new cloud regions, such as Mumbai, Chennai, Hyderabad, and Bengaluru, while domestic players expand their colocation facilities. The Indian government has supported this growth through regulatory reforms, infrastructure investment, and energy incentives.

While India leads, other South Asian countries are also advancing, notably Pakistan and Bangladesh.

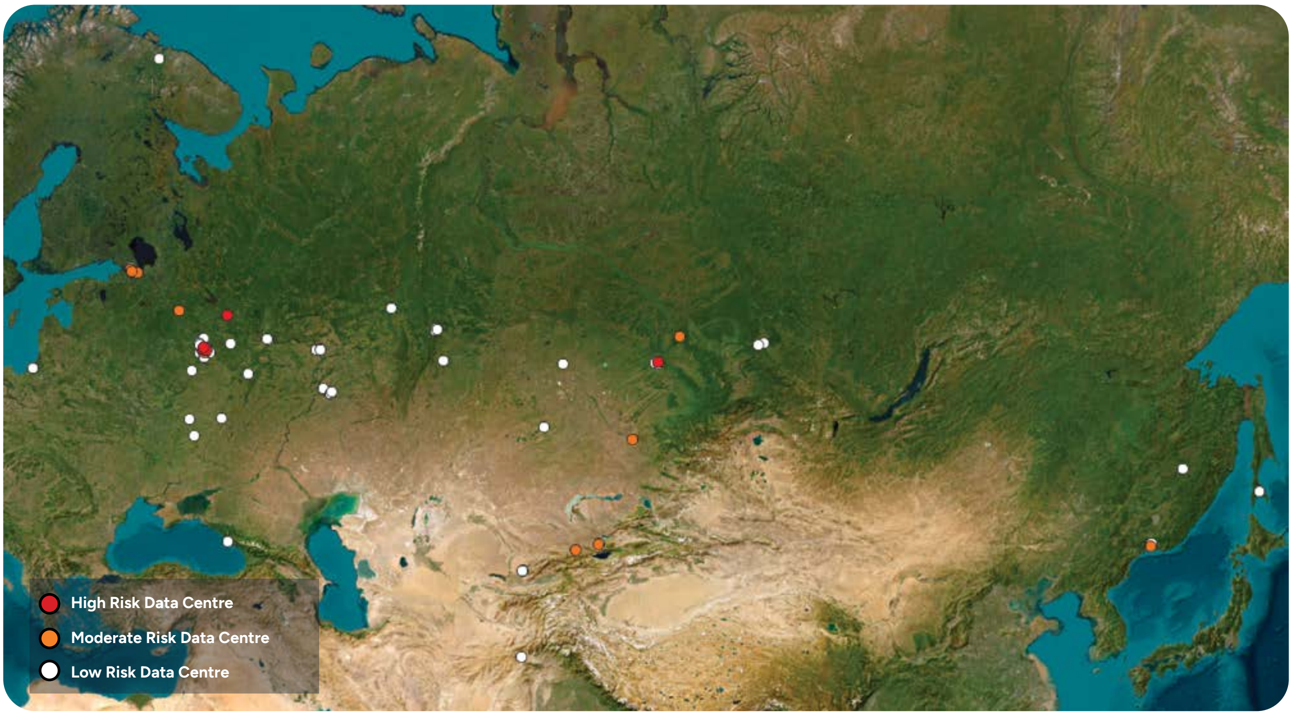
India

- 228 data centres in India were analysed for this report. Across the country, risk of damage to data centre infrastructure from climate change extreme weather almost triples (180%) from 2025-2100. More than 12% of data centres in India are projected to be high risk by 2050.
- India has 5 data centre hubs in our top 100 global ranking: Uttar Pradesh, Chennai (Tamil Nadu), Mumbai (Maharashtra), Bengaluru (Karnataka) and Hyderabad (Telangana).
- India's 21 data centres in Uttar Pradesh are some of the most vulnerable to climate change extreme weather in the world and a staggering 61.90% are already considered high risk. It ranks 2nd in our global analysis of data centre hubs. The risk of damage to data centre infrastructure from climate change hazards is projected to more than double (111%) by the end of the century.
- In Maharashtra - home to the highest concentration of India's data centres - 5.71% of data centres are projected to be high risk by 2050, with overall risk of damage to data centre infrastructure more than doubling (133%) by 2100. There are four existing or planned data centres in Maharashtra that our analysis suggests could already be high risk and require further investigation. The hub ranks 48th in our global analysis.
- In Tamil Nadu, where numerous data centres are concentrated in Chennai, more than 1 in 10 are already at high risk and more than 2/3rds are a moderate risk. Tamil Nadu ranks 25th in our global analysis.

Pakistan and Bangladesh

- For this report, 22 data centres in Pakistan and 13 in Bangladesh were analysed. They carried low and moderate physical risk from the hazards analysed. Neither of these countries had sufficient concentrations of data centres to be included in the global ranking.

Russia and Central Asia



Data Centres Analysed:

178

Including **3** operational hyperscale centres, **1** planned hyperscale centre and **9** other planned data centres.

Increase in Damage Risk:

+81%

81% increase in the risk of damage to data centre infrastructure from climate change hazards by 2100.

High Risk Property %:

7.3%

By 2050, **7.3%** of data centres in Russia and Central Asia are projected to be classified as High Risk.

2050 Driving Hazards:

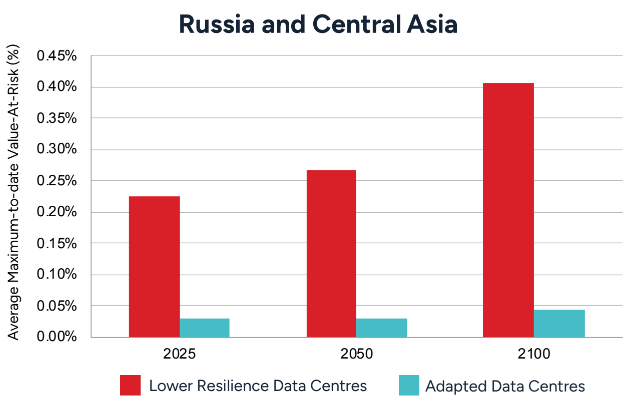
1. Riverine Flood
2. Surfacewater Flood
3. Extreme Wind

How can adaptation reduce risk?

This analysis shows how adaptations to the structure of data centres can reduce the risk of damage from climate change extreme weather.

The red column indicates the level of risk to data centre infrastructure in our first analysis, expressed as average MVAR. The green column shows how this risk is reduced when data centre infrastructure is adapted to increase resilience.

The analysis shows a possible **89% reduction** in risk of damage to data centre infrastructure for the year 2050.



	Base archetype (lower resilience)	Adapted archetype (higher resilience)	Base archetype (lower resilience)	Adapted archetype (higher resilience)	Lower resilience vs. Higher resilience 2050
	# and % HRP 2050	**# and % HRP 2050**	**# and % MRP 2050**	**# and % MRP 2050**	**% damage risk increase**
Russia and Central Asia	13 (7.30%)	2 (1.12%)	16 (8.99%)	3 (1.69%)	-89%

Russia and Central Asia at a glance

Russia's data centre market is predominantly concentrated in Moscow and its surrounds, which hosts approximately 65–70% of the country's commercial data centre capacity. St. Petersburg follows as the second-largest hub.

Beyond these primary cities, there is a growing emphasis on developing data centres in other regions to decentralise infrastructure and cater to local demands. Cities such as Novosibirsk, Ekaterinburg, Kazan, and Vladivostok are emerging as potential sites for data centre expansion, aiming to enhance regional connectivity and support local digital economies.

Central Asia's data centre market is in a nascent stage but is experiencing rapid growth. As the region's largest economy, Kazakhstan is a focal point for data centre development.

- In this analysis, 167 data centres in Russia were analysed. Small numbers of data centres in Kazakhstan, Uzbekistan, Afghanistan and Kyrgyzstan were also included.
- Moscow City ranks 53rd in our global ranking with 5.33% of the 75 data centres analysed projected to be high risk by 2050. Riverine flooding is the driving hazard.
- Moskva (the region surrounding Moscow) carries the highest risk in Russia, with almost a third (30%) of its 20 data centres already considered high risk. Riverine flooding is the main driving hazard. It ranks 5th in our global ranking.

Sub-Saharan Africa

Data Centres Analysed:

153

Including **1** planned hyperscale centre and **7** other planned data centres.

Increase in Damage Risk:

+263%

263% increase in the risk of damage to data centre infrastructure from climate change hazards by 2100.

High Risk Property %:

1.96%

By 2050, **1.96%** of data centres in Sub-Saharan Africa are projected to be classified as High Risk.

2050 Driving Hazards:

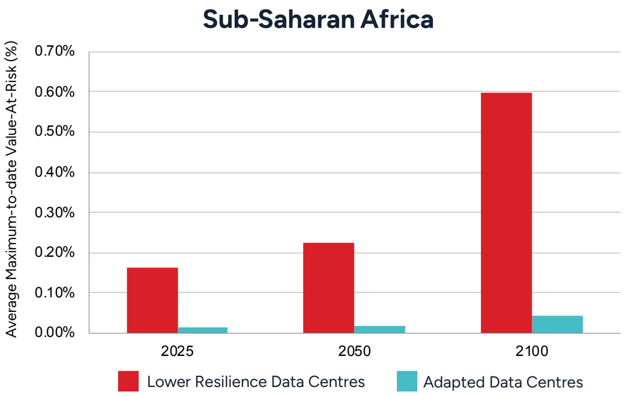
1. Riverine Flood
2. Tropical Cyclone Wind
3. Surface Water Flood

How can adaptation reduce risk?

This analysis shows how adaptations to the structure of data centres can reduce the risk of damage from climate change extreme weather.

The red column indicates the level of risk to data centre infrastructure in our first analysis, expressed as average MVAR. The green column shows how this risk is reduced when data centre infrastructure is adapted to increase resilience.

The analysis shows a possible **93% reduction** in risk of damage to data centre infrastructure for the year 2050.



	Base archetype (lower resilience)	Adapted archetype (higher resilience)	Base archetype (lower resilience)	Adapted archetype (higher resilience)	Lower resilience vs. Higher resilience 2050
	# and % HRP 2050	# and % HRP 2050	# and % MRP 2050	# and % MRP 2050	% damage risk increase
Sub-Saharan Africa	3 (1.96%)	0 (0.00%)	50 (32.68%)	0 (0.00%)	-93%

Sub-Saharan Africa at a glance

Most data centres in Sub Saharan Africa are concentrated in South Africa, Kenya, and Nigeria, which together account for the majority of the region's capacity. South Africa is by far the largest and most advanced market, with Johannesburg and Cape Town hosting facilities from global providers such as Amazon Web Services (AWS), Microsoft Azure, Teraco, and Africa Data Centres.

Kenya and Nigeria are emerging as East and West Africa's respective data centre leaders.

Nairobi's status as a regional tech and fintech hub, combined with government support and submarine cable access, has made it a key destination for investment from firms like IXAfrica and Africa Data Centres. Lagos, Nigeria's commercial capital, is also experiencing rapid growth with new hyperscale and colocation developments underway. While other countries—such as Ghana, Rwanda, and Ethiopia—are seeing early-stage investment, infrastructure challenges and regulatory uncertainty remain hurdles to broader regional growth.

- 49 data centres in South Africa were analysed for this report, followed by 16 in Kenya, 16 in Nigeria, and small numbers across the rest of the region.
- South Africa was the only Sub Saharan country with a data centre hub included in the top 100. Gauteng, home to Johannesburg, ranked 96th in our global analysis.
- Physical risk in the region is low compared to other regions, although Nairobi and Lagos both see exponential growth in the amount of damage from climate change extreme weather as we head to the end of the century (>1000%).

North Africa

Data Centres Analysed:

30

Including **2** planned data centres, no hyperscale centres.

Increase in Damage Risk:

+313%

More than **4-fold** increase in the risk of damage to data centre infrastructure from climate change hazards by 2100.

High Risk Property %:

0%

By 2050, **0%** of data centres in North Africa are projected to be classified as High Risk.

2050 Driving Hazards:

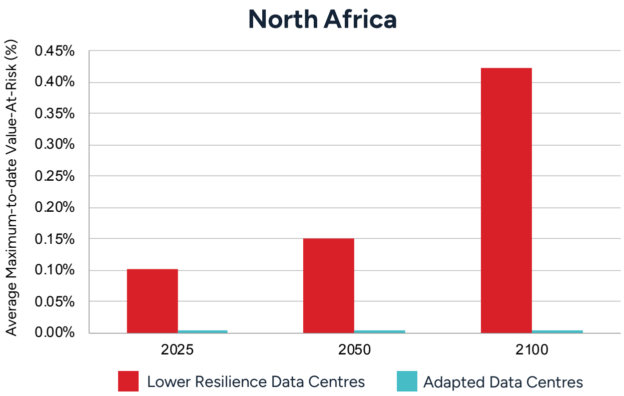
1. Surface Water Flood
2. Extreme Wind
3. Riverine Flood

How can adaptation reduce risk?

This analysis shows how adaptations to the structure of data centres can reduce the risk of damage from climate change extreme weather.

The red column indicates the level of risk to data centre infrastructure in our first analysis, expressed as average MVAR. The green column shows how this risk is reduced when data centre infrastructure is adapted to increase resilience.

The analysis shows a possible **97% reduction** in risk of damage to data centre infrastructure for the year 2050.



	Base archetype (lower resilience)	Adapted archetype (higher resilience)	Base archetype (lower resilience)	Adapted archetype (higher resilience)	Lower resilience vs. Higher resilience 2050
	# and % HRP 2050	# and % HRP 2050	# and % MRP 2050	# and % MRP 2050	% damage risk increase
North Africa	0 (0.00%)	0 (0.00%)	2 (6.67%)	0 (0.00%)	-97%

North Africa at a glance

Data centres in North Africa are an emerging but increasingly important part of the region's digital transformation and economic development. While the region still lags behind more mature markets, North Africa is seeing steady growth in data infrastructure investment, particularly in countries like Morocco, Egypt, and Tunisia.

Despite advances, the region faces infrastructure challenges, However, with rising digital demand and ongoing investment, North Africa's data centre market holds strong long-term potential.

- The dataset underlying this report includes analysis of data centres in Egypt, Libya, Algeria, Morocco, Tunisia and Sudan. However the numbers are too low to draw any regional conclusions.

Conclusion

Data centres are the critical infrastructure of the global digital economy, essential to everything from emergency communications to financial transactions and artificial intelligence. Yet as this report makes clear, these facilities are increasingly exposed to escalating climate hazards that threaten their physical integrity, operational continuity, and insurability. Our analysis of over 8,800 data centres worldwide reveals that climate risks are not a distant future concern—they are already affecting data centre viability today, with some regions facing exponential increase in damage risk as we head towards the end of the century.

The implications extend far beyond individual facilities. Data centres underpin systems of national security, financial stability, and global trade. When they fail, entire sectors can be disrupted. Moreover, these facilities are long-lived assets: while hardware may be replaced every 15–20 years, the buildings themselves may last more than five decades. The decisions made today—about where and how we build and upgrade data centres—will shape systemic resilience for decades to come.

This report also offers tools to manage this risk. By modifying building design specifications and incorporating structural adaptation measures, significant reductions in damage risk can be achieved. These findings reinforce the importance of moving beyond exposure mapping toward asset-specific analysis that accounts for location, construction, and vulnerability. Not all risk can be engineered away, but failing to incorporate these insights into infrastructure planning increases the likelihood of stranded assets and uninsurable facilities.

For governments, asset owners, insurers and financial markets, this report is a call to action. Physical climate risk is now a material factor in infrastructure investment, insurance underwriting and national resilience planning. We urge stakeholders to integrate this data into procurement, risk management, and regulatory frameworks.

We also strongly call on all sectors to double down on efforts to reduce carbon emissions, as this is by far the most cost effective and efficient way to reduce damage and disruption.

The cost of inaction will be measured not only in financial terms, but in the reliability of the digital infrastructure on which modern society depends.

As the world's longest-standing specialist in physical climate risk, XDI remains committed to providing the data, tools and analysis needed to support climate-resilient investment. We will continue to expand the reach and resolution of our models, including future assessments of heat-related operational risk. Resilience is no longer optional. It is foundational to the secure, sustainable operation of the global digital economy.

Case Study: Assessing a large site for a data centre

Using the XDI Climate Risk Hub's
Large Site Screen Tool

Scenario

A real estate consultancy has been engaged by a world-leading technology company to find a suitable location to build a hyperscale centre. Three green field sites and one brownfield site (a former power station) are under consideration. The real estate consultancy has asked XDI to undertake a due diligence assessment of the sites to identify if there are physical climate change risks that may result in disruption to operations or sooner-than-expected capital expenses.

How did XDI's Climate Risk Hub Help?

The real estate consultancy is a subscriber to XDI's self-drive platform, the XDI Climate Risk Hub. This allows them to access physical risk analysis for individual assets and portfolios on demand.

They select the Large Site Screen Tool and define the boundary for the entire brownfield site under consideration, entering the asset's key design characteristics.

The Large Site Screen Tool then generates multiple points at regular intervals across the defined site for analysis.

Results are generated instantly and show that over time, Tropical Cyclone Wind and Riverine Flooding are likely to impact the site's operations. The analysis also identifies the site's riskiest point as being the eastern most corner where modelling indicates that flooding is likely to exceed the current floor height.

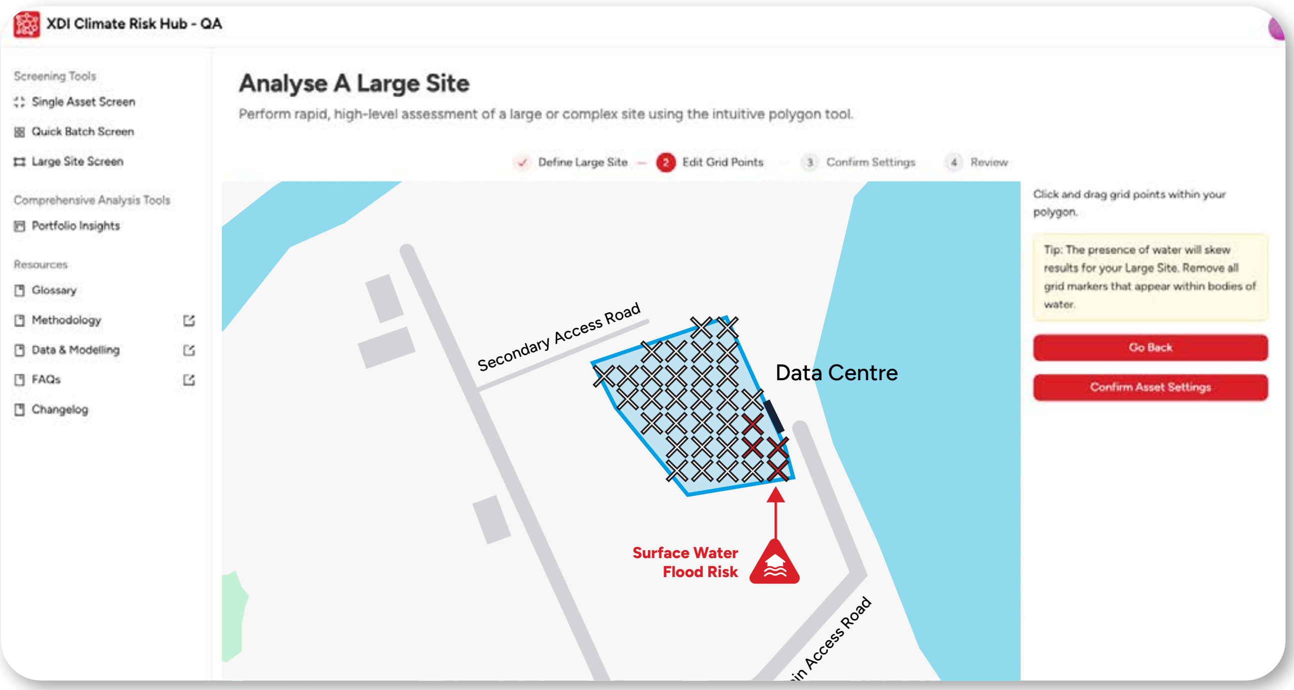
Metrics provided include Average Maximum-to-date Value-At-Risk (MVAR), Failure Probability, Productivity Loss, # and % of High, Moderate and Low Risk points, Total Technical Insurance Premium, Climate Adjusted Value, Significant Hazards, and ABC risk band ratings.

The consultancy then repeats this process with the other locations under consideration, using XDI's industrial archetype.

Results

The insights allow the consultancy to assess the long term viability of the investment under multiple climate scenarios, and directly compare the physical climate risk of the different sites.

The consultancy presents the results of the Large Site Screening to their client, who is keen to explore the viability of the brownfield site further. The consultancy then engages XDI to conduct a Large Site Analysis.



Case Study: Adapting for the future

Scenario

A technology company wanted to improve the resilience of one of its data centres. The data centre had already been impacted by severe storms and is located in a region identified as being vulnerable to increasing climate change extreme weather events. The company approached XDI to conduct a comprehensive assessment of its current infrastructure, and explore readily available and cost-effective modifications that could improve its resilience.

How did XDI help?

- In-depth analysis of climate-related risks for large-scale infrastructure
- Assessment of on-site and surrounding risks using XDI's unique meshing capability
- Comparison of cost-benefit of different adaptation options

XDI carried out point-based analysis of the data centre area using asset details provided by the client for enhanced granularity and accuracy. This Large Site Analysis looked at over 4000 points across the site, spaced at regular intervals.

Analysis of the surrounding area, including access roads, was also conducted.

The analysis enabled hot spots and high-risk dependencies to be easily identified, and for each point to be analysed in detail to determine its risk from hazards over time and under different climate scenarios.

Results

The analysis found:

- A significant amount of important electrical infrastructure was low lying with no flood protections in place.
- Fire risk was identified at the north of the site closest to a nearby forested area.
- The south west corner of the building was particularly vulnerable to flooding.

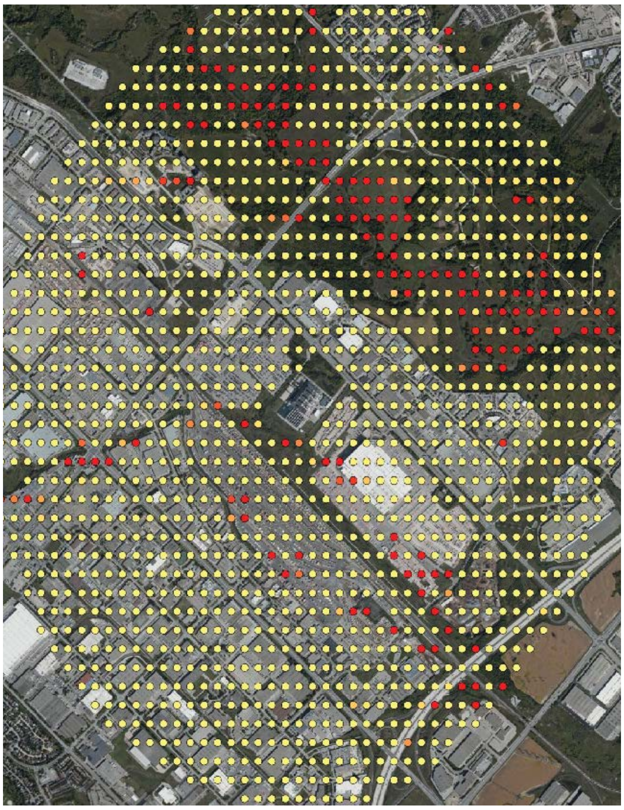


Image: An example of XDI's mesh analysis of on-site and surrounding critical infrastructure

- The guttering was found to be inadequate to manage the higher volume of rainfall associated with global warming.
- Roof materials were found to be insufficient to withstand wind speeds.
- The site was dependent on a single access road, near to an area identified as being at high risk of riverine flooding. Analysis of the surrounding area revealed that in the event of flooding, the road would become impassable, cutting off access to the site.

Results were quantified using the following metrics:

- Maximum Value at Risk (MVAR)
- Technical Insurance Premium
- Failure Probability
- Hazard breakdown of MVAR

Exploring adaptation pathways

XDI's systems isolate elements of the building design most at risk allowing asset managers to plan future capital expenditure on adaptation.

The company was able to test a number of different adaptation options by exploring building modifications to address climate impacts covering the assets' intended operational life. The return on investment of these adaptation pathways was also tested.

Modifications to improve resilience

- Floor height above ground level was adjusted in the tool to represent different flood mitigation strategies—such as raising critical infrastructure, installing flood barriers or walls, and creating flood-proof building envelopes. These scenarios were tested against projected flood levels to inform upgrades that reduce flood risk.
- Upgrades to stormwater capacity were explored by adjusting protection levels to different surface water flood return periods (e.g., 1-in-20 and 1-in-50 year events), representing the adequacy of drainage systems to expel, discharge, or divert floodwaters and reduce risk.
- Different roof structures were tested against a range of wind speed thresholds (e.g., 1-in-500 and 1-in-1000 year events) to identify options with improved performance under extreme wind conditions.
- Different air conditioning unit performance ratings were tested against a range of projected extreme temperature thresholds (e.g., 42°C and 45°C), recognising that units currently rated for 42°C may become inadequate as climate change increases the frequency and intensity of extreme heat events. To improve fire resilience, fire retardant coatings and external sprinkler systems e.g. at the apex of the roof were investigated.
- Adjustment to access road placement and heights were tested to ensure it could withstand worsening flooding events.

Together with XDI, the client explored the cost-benefit of a number of options and decided on a series of modifications that would result in a 78% reduction in risk of damage from climate change and extreme weather to the data centre. It would also result in reduced insurance premiums and significantly fewer operational disruptions.

The company then took the analysis to work with their engineers on developing an upgrading plan for its fleet of data centres.

The analysis also provided data ready for integration into the client's annual sustainability report.

Further Information

Methods Background

XDI analysis is powered by the Climate Risk Engines, one of the most flexible, powerful and trusted sources of physical climate risk data in the world.

The Climate Risk Engines use engineering-based methods to assess exposure and vulnerability of asset archetypes to understand the likely damage and failure probability of assets caused by extreme weather and climate change hazards.

Results are expressed in a range of engineering or financial metrics to inform decision making at all scales.

XDI aims to ensure that the full extreme weather and climate change risk space has been properly explored. Practically this means selecting high emission pathways and testing hazards using the individual regional models which most exacerbate each hazard.

Read XDI's public Methodology for an overview of our approach to physical climate risk analysis, specifically the structural analysis methodology.

Access to the 2025 Global Data Centre Physical Climate Risk and Adaptation Dataset

The Access to the 2025 Global Data Centre Physical Climate Risk and Adaptation Report is based on an in-depth analysis of nearly 9,000 data centres. If you would like further information about the underlying dataset, please email media@xdi.systems.

Third Party use of this data

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Appendix

Analysis Settings

Investing in the resilience of data centre infrastructure is critical, to reduce insurance costs and to ensure uninterrupted operation, which is essential for everything from financial transactions to hospital records and emergency communications. To show how investment in resilient infrastructure can reduce risk, this report also calculates risk to infrastructure once structural adaptations have been made to the data centre building design. XDI is able to make these calculations thanks to its engineering approach which constructs a digital twin of assets, which can be modified to explore how different structural interventions can impact the risk of physical damage from extreme weather and climate hazards.

Key asset design specifications and analysis assumptions	**Lower Resilience**	**Higher Resilience**
Flood/Inundation defences and exposure limits.	Known defences have been enabled. Additionally all assets within flood prone areas are protected to a 1 in 20 year event for each flood based hazard.	Unchanged
Floor Height Above Ground (metres, impacts all flood based hazards)	0.2 metres	1 metre
Extreme Heat - Temperature threshold (return frequency)	95th percentile (1 in 20 year event, 5% exceedance probability)	99th percentile (1 in 100 year event, 1% exceedance probability)
Extreme Wind Threshold (return frequency)	1 in 500	1 in 1000
Cyclone Wind Speed Threshold	Wind speeds associated with a category 3 cyclone	Wind speeds associated with a category 4 cyclone
Foundation Design	Rigid foundation not accounted for	Rigid foundation accounted
Preventative actions against freeze-thaw damage	Not considered	Considered

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