Futureproofing APAC Banks & Savings

Stress test right today
Avoid hard landing from rising seas

CWR
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Central banks around the world have formed a 100+ member strong coalition under the NGFS to prepare for systemic shocks to the financial system from climate threats ahead. One such chronic risk, with the ability to sink the system, is sea level rise (SLR) as it will drastically redraw coastlines around the world threatening capital cities, trade, economic growth and livelihoods. APAC is especially exposed.

While central banks are pushing for stress testing of climate risks to manage and ensure financial resiliency, stress testing for physical climate risks lag that of transition risk. Yet, climate threats are accelerating as we have already warmed by 1.1-1.2°C today with a 50:50 chance of breaching 1.5°C by 2026. This means that climate impacts we were expecting to feel by 2100 are already happening today.

Worse still, our seas are also rising faster than we think, compounding risks. The global scientific consensus under the IPCC now warns that 2m by 2100 and 5m by 2150 “cannot be ruled out due to deep uncertainty in ice sheet processes”. Finance capitals like Singapore and New York are taking it seriously and are already preparing coastal defences for these levels today.

But banks are not stress testing at these multi-metre SLR levels and so billions of dollars of financing support for such transformative adaptation action to protect cities/countries is still missing. Moreover, stress tests at <1m of SLR have already revealed that material portions of banks loan books will be at risk from coastal threats. Continuing to stress test to the wrong scenarios and timelines means that banks are putting the financial system squarely in the path of a hard landing.

We therefore write this report to make an urgent case for banks to stress test right. This is imperative as our analysis of 17 major banks from 5 developed APAC countries/territories revealed that they face a triple whammy of concentrated SLR risks as well as gaps in stress testing methodology and climate strategies to mitigate such risks. Such materially significant gaps endanger the hard-earned savings of over 200 million people and could trigger shocks across the global financial system if risks are not managed.

As traditional risk management methods will not work to spread SLR risk, we have also provided an "8-Step Checklist to Futureproof Banks from SLR Risks" and have laid out a “3-Step Guide to Stress Test Right” to avoid systemic shocks and support transformative adaptation. We have also provided a “Double Blind” case study on Hong Kong to showcase additional exposure if banks and governments both use the wrong scenarios and timelines to mitigate SLR risks. We hope that the NGFS will build on the guides provided to push banks to stress test to the right timeline & “low-regret” scenario to avoid a hard landing from chronic risks stemming from rising seas.

About China Water Risk (CWR)
CWR is a non-profit think tank that aims to create a world where water and climate risks are embedded in business & finance. Since its launch in 2011, it has worked from its Hong Kong base to engage with global business and investment communities in understanding and managing various types of water risks in China and across Asia. CWR's collaborative reports with financial institutions, IGOs, scientists as well as government related bodies have been considered groundbreaking and instrumental in understanding Asia's water challenges. They have helped inform better decision-making today for a water secure tomorrow. Join the conversation at www.chinawaterrisk.org
How to read this report

The IPCC has warned policy makers that multi-metre sea level rise (SLR) cannot be ruled out by the end of this century. Yet, banks are not using multi-metre SLR levels to stress test loan books – this together with 1) accelerating SLR risks, and 2) lack of government adaptation action is a lethal combination that can trigger financial systems collapse. At the moment, both central banks and government adaptation action lag that of accelerating SLR risks exposing banks to triple whammy concentrated SLR risks exposure. As a result, even sophisticated financial systems in developed Asia are exposed as banks/central banks are on a “Double Blind Maximum Risk” path. As geo-locational SLR risks are sector agnostic, traditional methods of spreading risks won’t work – the only way banks can be resilient is if cities and countries are resilient. We therefore write this report to make an urgent case for banks to stress test right because only once banks “see” the real risks of multi-metre SLR, will they be able to support proactive governments and push laggard governments to put in place transformative adaptation plans and steer the financial sector away from “Systems Collapse” to “Managed Risk”.

CHEAT SHEETS

TO DO
- Path to staying afloat starts with stress testing right
- 5 must do’s for central banks & regulators to avoid systemic shocks triggered by SLR
- 8-Step Checklist to Futureproof Banks from SLR Risks

BANKS BEWARE
- 4 strategy pitfalls to avoid – don’t shoot yourself in the foot!
- Banks can’t rely on insurers as climate risks escalate & compound
- Banking on wishful thinking + stupid money = loan books at risk

ADAPTATION
- Transformative adaptation: 5 tips summarised from IPCC
- Government action on adaptation: CWR APACCT 20 Index
- HK Rising Seas Adaptation Is Way Behind New York & Singapore

ESCALATING SLR
- Sea levels – Rising faster than you think!
- 2-3m vs. 1m of SLR: significantly different impacts
- Tipping points may be triggered = rapid SLR by ~2060

AT-A-GLANCE FACTSHEETS: BANKS’ SLR EXPOSURE
- 5 country/territory factsheets: Australia, Hong Kong, Japan, Singapore, and South Korea
- Save HK Banks From Sinking (more detailed analysis on government, banks, and central bank)

SECTION I: Triple whammy! Concentrated loan book risks to SLR could sink savings
- Triple whammy due to sector agnostic geo-locational SLR risk explained;
- Recommendations to spread SLR risk; and
- 5 country factsheets - at-a-glance view of the risks facing the different countries/territories & their major banks.

SECTION II: Adaptation decides financial resilience! Banks must drive government action by stress testing right
- Analyses of government decarbonisation and adaptation strategies;
- Strategy pitfalls to avoid; and
- Matrix and flowchart showing path to resilience starts with banks stress testing right.

SECTION III: CWR 3-Step Guide to Stress Test Right for SLR Risks: Avoid hard landing & catalyse transformative adaptation
- In-depth steps on how to stress test right with longer timelines, using the “low-regret scenario”, and assessing government action; and
- Analysis of what triggering tipping points could mean for SLR.

SECTION IV: HK Double Blind Maximum Risk Case Study! HKMA & HK banks face systems collapse from huge SLR adaptation gaps
- Analyses of what’s at stake in HK from physical SLR risks & the lack of government adaptation action; and
- Highlights need for HKMA and HK banks to step up and lead, by first stress testing right to ensure their portfolios and HK are safe.
Why we are writing this report

Globally, APAC is the most vulnerable region to coastal threats with over 200 million people at risk from just one metre of sea level rise (SLR) according to the Ocean Policy Research Institute. CWR has been unpacking the financial materiality of complex risks from coastal threat impacts from SLR, storm surges and subsidence across APAC since 2019. Working together with the financial industry we created the CWR APACCT 20 Index which benchmarked 20 APAC capitals and economic hubs against coastal threats and governments’ response through adaptation action to help gauge absolute and relative risks.

These risks were explored in our 5-report “CWR Coastal Capital Threat Series” released in 2020 and we are pleased to see banks use these reports to help set scenarios for stress testing coastal threats. However, accelerating SLR and clear warnings to policymakers from the global scientific community under the IPCC that 2m of SLR by 2100 “cannot be ruled out” has brought forward the urgency to address existing issues in stress testing, and the need to stress test to this “low-regret” SLR scenario.

More material gaps were raised during our 2-hour session “Futureproofing Cities to Avoid Atlantis – Evolving Finance for Transformative Adaptation” in Singapore earlier this year at SIWW2022. We hosted frank discussions on coastal threats between the financial sector (The Bank of International Settlements, Citibank, Japan’s FSA, Manulife Investment Management Asia & Moody’s) as well as coastal defence city planners (Singapore, New York & Copenhagen), a large APAC real estate list-co and the co-Chair of the IPCC’s “Climate Change 2022: Impacts, Adaptation and Vulnerability”. SIWW is a strategic programme of the Singapore government; CWR was a thematic partner for “Building Resilience”.

What was made clear during the session was that there continues to be a gap between what finance is stress testing against compared to what scientists and proactive city planners are planning for. Currently, finance stress tests show that the risks are not that bad and do not warrant the need for the “transformative adaptation” that the IPCC is calling for. This gap makes it hard for banks to provide financial support for transformative adaptation projects that city planners want. The danger is that limited adaptation financing could lead to maladaptation, which will compound physical and therefore financial risks.

There were clear gaps between city planners/scientific community and the financial sector as to which scenarios to use when planning adaptation/assessing SLR risks. Since such gaps could sink the financial system and our savings, we are writing this report to “get everyone on the same page”. This is urgent because we have already warmed by 1.1-1.2°C today and there is now a 50:50 chance of reaching 1.5°C by 2026 – way off our Paris Agreement targets of limiting warming to below 1.5°C by 2100.

This means that climate impacts expected by 2100 are already felt today, with the worst yet to come; every year records will continue to be broken. Our current policy path (2.7°C) points to an abrupt jump in SLR after around 2060 leading to multi-metre SLR by the end of the century. Millions of people and countries across APAC will be affected as billions of dollars’ worth of homes, commercial buildings and activities, and critical infrastructure are located in low-lying coastal zones that will be permanently lost.

Indeed, our 5-report series released in 2020 found that at 2.9m of SLR, 28 million people from just 20 capitals and economic hubs in APAC would lose their homes, and urban real estate equivalent to 22 Singapores, and 20 ports and 12 airports would be permanently submerged, unless adequate coastal defences are mounted. These are significant tail risks and must be factored into valuations because the permanent loss of land will shorten the lifespan of all assets located there. Valuations should see downward revisions the way leaseholds are valued lower than freehold properties. Also, affected assets will eventually lose insurability status leading to mortgage and/or loan defaults.

Similar to Asian asset owners with high allocation to their domestic markets as highlighted in “Are Asia’s Pension Funds Ready For Climate Change?” by CWR, Manulife Asset Management, AIGCC, APAC bank loan books also have significant domestic skew. Therefore, the entire financial system in Asia could be at risk if banks are not acting. Indeed, our analysis of 17 major banks from 5 developed APAC countries/territories revealed multiple areas of concentrated risks as well as gaps in stress testing methodologies.
Banks’ resilience is tied to government action on coastal adaptation; however, we find significant gaps between their climate strategies. All these large gaps endanger the hard-earned savings of over 200 million people and could trigger shocks across the global financial system.\(^4\)

Since seas will continue to rise even if we are net zero today, we urge the financial sector to stress test right so as to properly “see” this chronic risk; this includes using longer timelines and “low-regret” SLR scenarios. This will help banks avoid a “Double Blind Maximum Risk” hard landing from chronic risks stemming from rising seas and pave the way towards engagement with governments for only by working with them and financing transformative adaptation can banks manage chronic risks stemming from rising seas.

We believe that central banks/banks from developed countries/territories in APAC can lead the way in building both financial resilience and transformative adaptation for the region. To lend urgency, this report therefore sets out to show that APAC banks are facing a triple whammy of material exposure to coastal threats. We have also provided a “Double Blind Maximum Risk” case study on Hong Kong to showcase additional exposure if banks and governments both use the wrong scenarios and timelines to mitigate SLR risks. In addition, we have laid out guidance on how to stress test right to avoid systemic shocks and support transformative adaptation.

APAC banks & regulators you’ve been warned – rising seas will sink savings, so stress test right today. If you can’t see “the real risks” ahead, how can you figure out how to survive and thrive in this changing climate.

**Acknowledgements**

CWR would like to thank the RS Group for making this report possible.

**Recommended Reading**

**APAC Coastal Threats**

**CWR APACCT 20 Index**

CWR Survival Guide to Avoiding Atlantis

**GBA Coastal Threats**

Creds: CWR analyses based on IPCC AR6 & astronomical high tide in Hong Kong; Digital Terrain Model (5m) from the Lands Department of Hong Kong; 3D photo-realistic model based on the Planning Department of Hong Kong; ESRI; Census & Statistics Department of Hong Kong; Planning Department of Hong Kong; Centadata 2019.
Executive Summary

Sector agnostic geo-locational sea level rise (SLR) risks = APAC banks face “triple whammy” hit with almost two-thirds of loan books (>US$5trn) at risk. 115+ central banks and regulators around the world under The Network for Greening the Financial System (NGFS) have recognised that physical climate risks can trigger global financial collapse. SLR is one such pervasive risk that can over-ride traditional risk spread methods with high-impact. We analysed 17 major banks from 5 developed APAC countries/territories with loan books totalling US$7.9trn to find significant exposure to “triple whammy” risks:

1. SLR is a locational risk, so domestic skew = amplified clustering risks: US$5trn (64%) of loan books skewed to domestic markets with significant populations & economic activity clustered in coastal zones;
2. Coastal nature of APAC = regional diversification offers little SLR protection: APAC is especially vulnerable with over 200mn people at risk from just 1m of SLR; and
3. Multiple sectors clustered in affected areas = sector spread offers no shelter: 62% of loan books concentrated in sectors vulnerable to coastal threats: real estate (US$3trn; 39%), wholesale & retail trade (US$1trn; 13%), and manufacturing & industry (US$0.7trn; 10%).

Detailed analysis of the “triple whammy” hit plus 5 country/territory factsheets: Australia, Hong Kong, Japan, Singapore and South Korea showing bank's SLR exposure are found in SECTION I.

We’re ~70yrs late, prioritise adaptation now! Even if we are carbon neutral today, seas will still rise; 1.1–1.2°C today ≠ 8m of SLR locked-in. The IPCC is now “virtually certain” that SLR is irreversible despite emissions so it’s not IF but WHEN sea levels will rise – the faster we warm, the faster they will rise. The WMO recently said there’s a 50:50 chance = 8m of SLR locked-in.

The IPCC is now “virtually certain” that SLR is irreversible despite emissions so it’s not IF but WHEN sea levels will rise – the faster we warm, the faster they will rise. The WMO recently said there’s a 50:50 chance that global temperatures will breach the 1.5°C Paris Agreement target by 2026 instead of by 2100. This means that 2100 climate impacts are happening today. At 1.1–1.2°C of warming, we have already locked-in around 8m of SLR. This sounds shockingly high but the reality is that sea levels were 6–9.3m higher the last time we were only 0.5–1°C warmer than the climate impacts are happening today. At 1.1–1.2°C of warming, we have already locked-in around 8m of SLR. This sounds shockingly high but the reality is that sea levels were 6–9.3m higher the last time we were only 0.5–1°C warmer than the pre-industrial period. APAC banks & governments must prioritise SLR adaptation. Also, as we will likely overshoot 1.5°C, remember: aiming for 1.5°C ≠ adapting to 1.5°C.

Window to address risks are closing as seas are rising faster than we think: IPCC now warns policy makers that 2-3m of SLR “cannot be ruled out” by 2100. The high-end of the SLR range under the worst-case scenario is ~1m by 2100. But scientists now worry that overshooting 1.5-2°C a lot sooner will trigger tipping points that accelerate SLR. This deep uncertainty around polar ice melt led the IPCC to include “low confidence” but “cannot be ruled out” SLR scenarios – the high-end of which ranges (depending on location) 2-3m by 2100. This scenario was included for the first time ever in the Summary for Policymakers due to its high impact and importance for “low-regret” adaptation planning. Impacts between 1m and 2-3m of SLR are vastly different – see maps in “2-3m vs. 1m of SLR: significantly different impacts” in SECTION II.

Blindsided! If we can’t see the risks, we cannot manage them: most banks are not stress testing to “low-regret”/“cannot be ruled out” levels or the right timelines. The NGFS has recommended banks to stress test their portfolio for climate risks against the worst-case scenario. Now that the IPCC has included a “cannot be ruled out” scenario, banks should be stress testing to this 2-3m SLR scenario instead of the previous 1m of SLR by 2100. As multi-metre SLR will redraw coastlines and pose existential threats to cities/countries as well as the global financial system, banks must stress test at these “low-regret” levels, otherwise they cannot “see” these “virtually certain” risks. However, testing to these levels are not prescribed and neither is the timeline for stress testing resulting in banks/regulators using different worst-case scenarios and timelines. As most NGFS members have run stress tests with a 30yr timeline, SLR risks are likely under-estimated; SLR only manifests in a material manner after 2050. Long-term time lines as well as “low-regret”/“cannot be ruled out” SLR levels should be thus be used to stress test to see the entire financial exposure to SLR – more in SECTION III: CWR 3-Step Guide to Stress Test Right for SLR Risks.

Banks’ resilience is tied to government adaptation strategies, but not all governments are effecting transformative adaptation. Multi-metre SLR will redraw coastlines so if governments do not have adequate adaptation plans, banks will be exposed. At 2-3m of SLR, the IPCC recommends transformative rather than incremental adaptation to protect cities/critical infrastructure. To effect transformative adaptation, governments should use “low-regret” SLR levels to plan adaptation – this allows flexibility in adaptation as projects can be carried out in phases that can be ramped up should SLR escalate. Yet, not all governments are doing this – both Hong Kong and Singapore are island city financial hubs, but have very different adaptation strategies. Singapore is adapting for 2-3m of SLR by 2100s and is raising critical infrastructure to 5m above mean sea levels. In comparison, Hong Kong is adapting to at most ~0.5m of SLR by 2100. See how 20 APAC capitals and economic hubs rank for coastal threats and government action in “Government action on adaptation: CWR APACCT 20 Index” in SECTION II. Moreover, escalating risks and lagging adaptation mean that banks could be left with carrying the risk – see “Banks can’t rely on insurers as climate risks escalate & compound” in SECTION I.
All paths to resilience start with banks stress testing right. Futureproofing the financial sector against SLR risks requires banks and governments to align their adaptation strategies. Currently, their mismatched strategies falls into four broad scenarios which have different outcomes for the financial system. Our analyses show that while Singapore is heading in the right direction, Hong Kong is stuck in Scenario 1:

- **Scenario 1: “Double Blind Maximum Risk” = likely path to Systems Collapse.** This represents the highest risk as neither banks nor governments are acting to properly assess/adapt for SLR risks. This path could lead to “Systems Collapse”. Our analyses show that Hong Kong is heading down this path – the HKMA’s pilot climate stress test in 2021 (which did not use the “low-regret”/“cannot be ruled out” levels) showed that 32% of property loan books in Hong Kong would be at risk from 0.55m of SLR at 2050; worse yet, the Hong Kong government is only adapting to 0.5m by 2100. Adapting to only 0.5m by 2100 instead of 2-3m as warned by the IPCC will put 24x more residential, commercial & industrial buildings at risk. The HK government/banks cannot afford to get this wrong – more detail in **SECTION IV: HK Double Blind Maximum Risk Case Study**.

- **Scenario 2: “Limited $$$ = Maladaptation & hard landing.** If banks are not stress testing right, they will not be able to support proactive governments with funding for their transformative adaptation plans. This could lead to maladaptation as the lack of financing will mean adaptation options are constrained. This gap was made clear during the CWR/SIWW joint session in April 2022 when we curated discussions between finance, city planners and scientists to kickstart the conversation on evolving finance to support transformative adaptation. Proactive city planners such as Singapore and New York City (which use 2-3m of SLR by 2100 to plan adaptation) continue to find different avenues to fund their transformative adaptation plans as private capital is still reluctant to support this directly. For more see “4 strategy pitfalls to avoid – don’t shoot yourself in the foot!” in **SECTION II**.

- **Scenario 3: 50/50 Chance: Banks Must Engage Governments.** If banks are stress testing right, they can play a vital role by engaging and driving governments to ensure that low-regret scenarios are used to effect transformative adaptation. In the case of the Hong Kong, which is very vulnerable to SLR, banks must first stress test right to see the sizeable loan books and then engage governments/corporates to design and implement well thought out plans to attack/defend/retreat against escalating SLR. As proper adaptation will reduce SLR risks, get on top of this with “Transformative adaptation: 5 tips summarised from IPCC” in **SECTION II**.

- **Scenario 4: Aim for “Transformative Adaptation” & soft landing.** This is the ideal situation where both governments and banks are acting, hence managing risks and providing banks the highest chance of staying afloat despite rising seas. As global adaptation finance lags, banks still have a key role in providing loans or innovating adaptation financing for proactive governments to implement transformative adaptation. This is the only way to avoid downward pressure equivalent to “freehold to leasehold” asset revaluations when SLR inundates assets.

Banks must prioritise “stress testing right” to see SLR risks as traditional risk management methodologies of spreading risks across sectors/regions won’t work. Also stress testing today allows time to spread and manage the triple whammy hit of concentrated SLR risks – see “Path to staying afloat starts with stress testing right”.

**Stress testing right today will break the negative feedback loop + push faster decarbonisation to slow down SLR.** As banks can’t “see” how plausible and significant SLR risks could be, they perpetuate the negative feedback loop where capital continues to flow to carbon intensive industries and locations vulnerable to SLR. Plus, they are not funding adaptation. Right now, 9 out of the 17 banks analysed rank within the top 60 most polluting banks globally; together these 9 APAC banks have provided US$560bn in fossil fuel financing since the Paris Agreement. Stress testing right today could thus add impetus to decarbonise faster and avoid further escalating SLR – more in “Tipping points may be triggered = rapid SLR by ~2060” in **SECTION III**. To avoid a hard landing, banks must both adapt and decarbonise. Don’t delay, start now – the longer banks wait, the worse it will become as we will hit soft and hard adaptation limits soon. Not sure how to start? Use our “8-Step Checklist to Futureproof Bank from SLR Risks”.

Central banks/regulators must provide more guidance on stress testing. Most banks are using short timelines and the wrong worst-case scenario to test stress; these coupled with lagging adaptation action by governments puts finance on a path of “Double Blind Maximum Risk”. To steer banks away from imminent “Systems Collapse” as SLR escalates, we urge regulators to provide clear and precise guidance to banks on SLR stress test parameters that include longer timelines and the “low-regret”/“cannot be ruled out” scenario. This guidance coupled with concrete examples/case studies on how banks should stress test for rising seas can help - here, we hope the Hong Kong case study in **SECTION IV** can be of use. Our full recommendations are set out in “5 Must Do’s for central banks & regulators to avoid systemic shocks triggered by SLR”.

Financial systems must evolve to survive SLR – the path is challenging but also offers opportunity. Innovative adaptation finance is a significant opportunity for banks and is currently being missed. However, it requires collaboration between finance, governments and corporates so banks must push central banks and regulators to start multi-stakeholder working groups to innovate new mechanisms/products and help finance transformative adaptation. After all, Singapore has signalled that it will require over SG$100bn to adapt for rising seas. Imagine how much Japan or other coastal countries will need – the amounts are daunting, yet necessary.
17 APAC banks across 5 countries/territories in APAC

17 APAC with loan books totalling US$7.9trillion have US$5trillion invested domestically. The banks analysed in this report are some of the largest in the region with a market cap totalling US$724bn (as of 19 Sep 2022) with loan books totalling US$7.9trillion (various year ends from Dec 2020 - Sep 2021). Yet as the chart below shows, 64% (US$5trillion) of this was lent domestically. Banks are listed according to domestic skew – with a high of 95% for KB Financial in South Korea to a low of 27% for HSBC in Hong Kong.

US$4trillion lent to real estate and trade – both vulnerable to coastal threats. Bank loan books are also highly skewed to vulnerable sectors as can be seen in the chart below. Real estate is vulnerable as very expensive real estate and critical infrastructure tend to be clustered along the coast – Australian banks have the highest skew to real estate but Singaporean and Hong Kong banks also face significant risk from their real estate portfolios due to a skew of 48% and 41% on average respectively. Trade is at risk due to the reliance on ports and airports that tend to be located along the coast as well – Japanese banks face the highest risk with a third of Mitsubishi’s and Sumitomo’s loan books concentrated in the sector. See SECTION I – Triple whammy! Concentrated loan book risks to SLR could sink savings.

Loan book skew may not tell the whole story – if available, don’t forget to assess profit exposure. To ensure consistency we only analysed loan book exposure as not all banks provide profit breakdowns by sector and locations. However, where possible, profit skew should also be assessed because even though Hong Kong banks look to have the lowest domestic loan book skew and are therefore the least vulnerable, some Hong Kong banks, such as HSBC, make most of their profit in Hong Kong and so are extremely tied to their domestic market. So banks, don’t sink APAC savings, start with our “8-Step Checklist to Futureproof Banks from SLR Risks” and learn how to stress test right today from SECTION III – CWR 3-Step Guide to Stress Test Right for SLR Risks.

Why we picked these banks

In 2020 CWR published a 5-report series “CWR Coastal Capital Threat Series”, which analysed the coastal threats facing 20 capitals and economic hubs in APAC from 14 countries/territories. These reports revealed concentrated tail risks in cities which has financial implications for banks. We follow up here with a deep dive – as we believe that central banks/banks from developed countries/territories in APAC can lead the way in building both financial resilience and transformative adaptation for the region, we analysed the implications of sea level rise on major banks from Australia, Hong Kong, Japan, Singapore and South Korea. Mismanagement of financial resiliency in the face of escalating climate risks will be disastrous so central banks and regulators, get on top of this with “5 must do’s for central banks & regulators to avoid systemic shocks triggered by SLR”.

Source: CWR, 2020 and 2021 Annual reports of the 17 APAC banks
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Source: CWR, 2020 and 2021 Annual reports of the 17 APAC banks
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Impacts could be worse

The city impacts above are extracted from the CWR report "Avoiding Atlantis: CWR APACCT 20 Index – Benchmarking coastal threats for 20 APAC cities with finance sector input" that was published in 2020. As granular elevation data was not available for all 20 cities the 30m-grid NASA SRTM (SRTM-30m) elevation data was used to map SLR risks for regional consistency in modelling SLR flooding for benchmarking purposes. Since our analyses show that impacts worsen when higher granularity maps (5m) are used, for more in-depth analysis, please use such maps to assess SLR risks where available. Also, local tide adjustments were not made and should be factored in when assessing impacts. Higher granularity and tide adjustments will provide a clearer picture of SLR impacts – see SECTION IV: HK Double Blind Maximum Risk Case Study!

**Significant impacts in 7 cities in these 5 countries/territories**

*Seven cities in five countries/territories at risk from coastal threats.* The 5-report series “CWR Coastal Capital Threat Series”, explored the coastal risks facing the largest cities in APAC. These five countries/territories have seven of those cities as the chart below shows. At 2.9m of SLR, which could be possible by the end of this century according to the IPCC, these cities would see 6/9 airports and all nine ports permanently submerged. In addition, 1,372km² of expensive coastal real estate would also be permanently lost. Clearly, what governments are doing to adapt impacts financial risks – so we also explore the quality of government adaptation action as financial resilience is tied to it – for more see SECTION II – Adaptation decides financial resilience!

Impact numbers below may look low, but risks are significant:

- Trade, a key economic driver, is vulnerable as most ports and airports are affected. SLR will have knock-on impacts on supply chains, as well as water, food & energy security, if the city is not adapted.
- The impacts illustrated below are likely underestimated as tides were not factored in – see box below for more. So, the impacts in Sydney, Singapore, and Seoul could be worse. For example, only 1% of Sydney’s land and population are at risk but in 2014 Australia’s Climate Council estimated that AU$226 billion in assets in coastal zones are at risk from just 1.1m of SLR. And in 2022, it reported that by 2030 1 in 25 Australian homes would be uninsurable. Another example is Singapore where despite 0.2% of the population and 5% of land area at risk from 2.9m of SLR, the government has taken a “low-regret” high emissions adaptation approach to protect all critical infrastructure to at least 5m+ above mean sea levels, signalling the importance of SLR risks.
- Meanwhile, despite Hong Kong’s impacts being greater than Singapore’s with 7% of the population and land at risk at 2.9m of SLR, the HKSAR government is taking a “just-in-time” low-to-medium emissions adaptation approach. Again, as tides are not factored in impacts will be higher – see SECTION IV: HK Double Blind Maximum Risk Case Study!

Source: CWR, Avoiding Atlantis (2020)
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Path to staying afloat starts with stress testing right

Seas are rising faster than we think – in addition to the worst case of ~1m of SLR, the IPCC warned policy makers that 2-3m “cannot be ruled out” by 2100. This is a material difference as it will redraw coastlines and trigger systemic shocks across financial systems if countries/cities are not adapting. The NGFS is moving to manage such risks by encouraging central banks to push banks to stress test right.

However, despite such effort’s banks are not stress testing right as they are not using the “low-regret”/“cannot be ruled out” scenario or long timelines. This means they can’t “see” plausible, significant SLR risks could be, so they continue to feed the negative feedback loop and do not provide funding for adaptation. Continuing this will lead to a “Systems Collapse” scenario. We therefore hope that banks and central banks/regulators use this report to help steer banks away from Scenario 1: Double Blind Maximum Risk, and towards Scenario 4: Transformative Adaptation.

Start with SECTION I to understand that traditional methods of spreading risk won’t work due to the Triple Whammy of concentrated loan books. Then move on to SECTION II to learn how to build resilience and align with government adaptation. As all paths to financial resiliency start with stress testing right, please see SECTION III: CWR 3-Step Guide to Stress Test Right for SLR Risks. To lend urgency to stress testing right we have highlighted Hong Kong as a case study as it is currently on a “Double Blind Maximum Risk” path. Please also see the following pages for 5 Must Do’s for central banks & regulators, as well as an 8-Step Checklist for banks.

Source: CWR
Infographic © China Water Risk 2022, all rights reserved.
5 must do’s for central banks & regulators to avoid systemic shocks triggered by SLR

SLR risks are geo-locational and sector agnostic = Triple Whammy concentrated exposure. As SECTION I highlights, the 17 banks analysed in APAC are all vulnerable due to the Triple Whammy of concentrated loan book risks to SLR. Therefore, traditional risk spreading methods will not work and government adaptation action is paramount. However, many governments are slow to act on adaptation as highlighted in SECTION II. To change this, banks need to stress test right as between the 17 banks analysed of the US$7.9trillion loan books, 64% (US$5trillion) was lent domestically and 73% (US$5.8trillion) was lent to sectors vulnerable to SLR.

Despite stress tests being carried out, banks are still on a path to hard landing/systems collapse. Most banks are currently following a path of Scenario 1: Double Blind Maximum Risk or Scenario II: Limited $$$ = Maladaptation from the chart on the previous page, as banks are using too short timelines and the wrong worst-case scenario in stress tests. To change this, regulators must provide clear and precise guidance to banks on SLR stress test parameters that include longer timelines and the “low-regret”/“cannot be ruled out” scenario. Once banks stress test to these new parameters, the need for transformative adaptation and rapid decarbonisation will become crystal clear.

To kickstart the journey to evolve financial systems towards transformative resilience, we recommend the following 5 must do’s for central banks and regulators:

1. **Make it mandatory for banks to stress test with long timelines.** Banks need to start looking at timelines beyond 30 years because some physical risks may manifest after that, but banks will not be able to support governments with their transformative adaptation plans if they can’t “see” the need for them due to short timelines. In addition, valuations may adjust years before the actual lack of insurance, plus finance could start to price in the physical impacts into terminal value calculations.

2. **Make it mandatory for banks to stress test to “low-regret” scenarios.** Most bank stress test scenarios include the worst-case but escalating risks and evolving climate science means that the “low-regret” scenario should also be stress tested for as the IPCC has warned that this “cannot be ruled out”. For SLR this means in addition to stress testing for ~1m of SLR by 2100, 2-3m of SLR should also be stress tested for – these are levels that Singapore and New York are adapting for. Central banks and regulators must start to specify these levels in guidance as leaving banks to decide will lead to various results that might not be comparable. Please see SECTION III for more details on stress testing better.

3. **Provide case studies/examples of stress testing for rising seas in guidance.** Currently, there are no concrete examples or case studies on how banks should stress test for rising seas. These are not one-off events but permanent so stress testing for this is different to acute risks which is what most banks are stress testing for. The Hong Kong case study in SECTION IV highlights the risks at various scenarios and explains why it is important to analyse the right timeline and scenario. This can be used as a case study, or CWR would be happy to draw up a more tailored case study to provide guidance for finance.

4. **Encourage the start of transformative adaptation finance working groups.** Adaptation finance is not straightforward as it will require collaboration between banks, insurers, multiple government departments and others. This has added to holding back adaptation finance. But we need adaptation finance and central banks can play a role in encouraging the formation of multi-disciplinary working groups who can brainstorm and innovate a way forward.

5. **Don’t delay taking action! Avoid negative feedback loop, Double Blind and maladaptation.** With the high probability that assets will be stranded even before rising seas due to the lack of affordable insurance, central banks need to act now. By encouraging banks to stress test better, we can avoid the following:
   - Negative feedback loop where capital continues to flow to carbon intensive industries and locations vulnerable to climate threats, which compound and accelerate portfolio risks;
   - “Double Blind Maximum Risk” scenario where both banks and governments do not see the need for transformative adaptation which is an extremely high-risk scenario most countries/cities are in; and
   - Maladaptation as proactive governments do not have the funds to carry out their transformative adaptation plans, and laggard governments are investing in adaptation that does not make sense.
8-Step Checklist to Futureproof Banks from SLR Risks

1. Learn how to stress test right to see the risks. As the flowchart in “Path to staying afloat starts with stress testing right” shows the path to resilience starts with stress testing right. Banks will never be able to manage their own risks let alone fully support transformative adaptation action when they can’t “see” how badly their loan books will be affected if they do nothing. Unfortunately, due to escalating climate risks there’s now more than one worst-case scenario for SLR – 1m (worst-case) vs 2-3m (“cannot be ruled out”/“low-regret”) by 2100 – see “Sea levels – Rising faster than you think!” in SECTION II.

The materially significant difference in impacts between these means that currently all banks are not stress testing properly. Given the “cannot be ruled out” warnings of multi-metre SLR by 2100 by the IPCC, banks must follow the IPCC’s SLR warnings to stress test to “low-regret” levels. Stress tests must also be carried out for longer time horizons to catalyse transformative adaptation, which will protect banks. So, stress tests cannot be done in isolation as what the government is or is not doing could make a big difference to stress test results – so read the following steps and also see SECTION III: CWR 3-Step Guide to Stress Test Right for SLR Risks.

2. Get on top of what governments are doing on adaptation. SLR is geo-locational and sector agnostic, so traditional methods of spreading risk will not work resulting in a Triple Whammy concentrated loan book risk for banks. The only way to ensure financial resilience is to ensure governments deliver transformative adaptation. As some governments are doing more than others, it is important to get on top of what governments are doing. For in-depth analysis on loan book risk see SECTION I: Triple whammy! Concentrated loan book risks to SLR could sink savings and for what governments/banks are or are not doing see SECTION II: Adaptation decides financial resilience!

Currently, many are either 1) using short term scenarios to plan adaptation, and/or 2) implementing incremental adaptation due to limited financing, rather than driving transformative adaptation. As such short term/incremental adaptation cannot cope with escalating climate risks, the IPCC warned that governments may inadvertently be locking in maladaptation today. So banks must engage with governments to assess their adaptation plans – they must be “low-regret” rather than ‘just-in-time’. See Step 3. Assess what governments are doing, or NOT doing in SECTION III.

3. For governments using “low-regret” scenarios to plan transformative adaptation = banks must support by providing adequate finance. There are proactive governments that are planning for long term risks now and have transformative adaptation plans that are flexible; this allows adaptation investments to be carried out in phases that can be ramped up if SLR impacts accelerate, or slowed down if SLR slows down. Banks have a key part to play whether it’s through providing loans or helping projects to raise financing.

Currently, because most banks can’t “see” the full extent because they’re not stress testing right, they’re unable to provide finance. This limited financing could lead to maladaptation and increase risks for the cities/countries and also impact banks loan books. Therefore, banks need to align with proactive governments and use “low-regret” scenarios to stress test their loan books. This will allow them to “see” the risks and make a business case for supporting the financing of transformative adaptation. Doing this will provide financial systems with the most protection against SLR deep uncertainties ahead – for an overview of various outcomes for financial systems from “Managed Risks” to “Systems Collapse” see “Mismatched bank & gov't climate adaptation strategies” in SECTION II.

“Adaptation pathways will support near term decision making to implement no-regret measures while identifying future options available should there be a need to adapt to even higher sea levels. And while Singapore is small, our highly varied land use means that we cannot apply a one-size-fits all solution everywhere.”

Hazel Khoo
Director of Coastal Protection Department
PUB (Singapore’s National Water Agency)

4. Where governments use ‘just-in-time’ adaptation banks must drive the transformative adaptation conversation. If governments are not doing enough, banks must play a major role in pushing and engaging them to do more. Banks are extremely powerful entities as they manage the savings of the country/territory, and this should be used to ensure government action will protect these savings. The only way that banks are resilient, is if the cities are with transformative adaptation. Proper planning takes time – so don’t wait. Besides, the longer you wait, the larger the exposure becomes due to the negative feedback loop – more in Step 7.

We have to be realistic, at 1.1-1.2°C today, we are already feeling impacts that we did not expect to feel until 2080-2100. As transformative adaptation is key for banks’ resilience it is important to get on top of what this is now. Just having an adaptation plan is not enough – they must be holistic and take into account all variables and scenarios. The IPCC has a number of recommendations on adaptation and how to avoid maladaptation – for more see the “Transformative adaptation: 5 tips summarised from IPCC”.
5. **Innovate financial products to support governments plan transformative adaptation.** As making a business case for adaptation is more complex than say investing in renewables, financial products will not be plain vanilla/quick wins. As such, most adaptation is financed by governments. But this will not be enough – for example, Singapore has signalled that it will require over SG$100bn to adapt for rising seas. Imagine how much Japan or other coastal countries will need – the amounts are daunting, yet necessary because the five countries/territories analysed in this report, which have very sophisticated financial systems, are all at risk from SLR.

Innovative adaptation finance is a significant opportunity for banks and is currently being missed. However, it requires collaboration between finance, governments and corporates so banks must push central banks and regulators to start multi-stakeholder working groups to innovate new mechanisms/products and help finance transformative adaptation. There won’t be any one size fits all remedies as the impacts of SLR are location specific, but this challenge can’t be overcome until everyone “sees” the materiality of the risks. Stress testing right will allow banks to kickstart innovate adaptation finance with multi-stakeholder collaboration towards transformative adaptation. For more on the risks facing these five developed countries/territories and therefore, the opportunity for banks, see “**Banks and SLR exposure – 5 country/territory factsheets**” in SECTION I.

6. **Engage corporates so that they are aligned with their adaptation plans.** Banks must engage their corporate clients on the risks and highlight to these firms that their assets and operations could be at risk due to physical impacts. Banks can then help them plan and raise capital to adapt. This latter aspect is currently a huge, missed opportunity in the banking sector as banks are providing very little support for adaptation for both corporates and governments. Indeed, some corporates have already started recognising SLR risks in their financial statements and some have started stress testing to “low-regret” scenarios. Banks must collaborate with such proactive corporates to further adaptation because SLR proof corporates = SLR proof banks. For an idea of how much real estate corporates could be at risk, see “Too much at stak e = HK can’t afford to get it wrong” in SECTION IV.

“Climate impacts are intensifying and accelerating, demanding “low-regret” transformative adaptation action. As the latest Intergovernmental Panel on Climate Change (IPCC) warned, multi-metre sea level rise by the end of this century cannot be ruled out. This year, to strengthen our belief in the GBA’s long-term growth potential, we commenced a local, detailed geospatial analysis of coastal threats. Our GBA portfolio was stress tested against three “low-regret” scenarios that factored in both sea level rise according to the latest IPCC findings and potential storm surges.”

7. **Avoid pitfalls! Ensure adaptation strategies align with reality & science.** Below are 4 main pitfalls to avoid:

   - Bank net zero strategy ≠ adapt for 1.5°C. We are currently heading to 2.7°C because carbon emissions continue to rise despite pledges made by governments and corporates. We could actually be reaching 1.5°C by as early as 2026 so banks should be adapting for current policy path of 2.7°C by 2100; adapting for 1.5°C by 2100 is planning to fail.
   - Mismatched climate strategies = negative feedback loop. Prioritising carbon over physical risks means banks under-estimate physical risks and perpetuate the negative feedback loop – capital continues to flow to vulnerable location as well as carbon intensive sectors, which compound and accelerates portfolio risks.
   - Limited financing leads to maladaptation, says IPCC. Financing of adaptation that isn’t thought through can lead to maladaptation. The lack of financing also leads to maladaptation as options are constrained.
   - Overshooting 1.5°C and waiting for tech to come to the rescue. Overshooting 1.5-2°C could lead to the triggering of tipping points, which will be dire for coastal populations. Tech will not be able to save us as a future reduction of emissions will not be able to reverse impacts, especially pertaining to SLR.

For more see “4 strategy pitfalls to avoid – don’t shoot yourself in the foot!” in SECTION II. Hong Kong is an example of falling into pitfalls – the government is adapting for the low-to-medium emissions scenario instead of the current high emissions path we’re tracking. Moreover, the HKMA is not taking to account possible tipping points and using the “cannot be ruled out” scenarios in stress tests. This means Hong Kong is following a “Double Blind Maximum Risk” scenario – for more see **SECTION IV: HK Double Blind Maximum Risk Case Study**!

8. **Prioritisation adaptation ≠ forgetting to push aggressive decarbonisation.** Adapting is not admitting defeat on reaching net zero emissions – banks must continue to push for aggressive decarbonisation because we are already at 1.1-1.2°C today and according to the IPCC overshooting 1.5°C will result in “irreversible impacts on certain ecosystems with low resilience, such as polar, mountain, and coastal ecosystems, impacted by ice-sheet, glacier melt, or by accelerating and higher committed sea level rise”. Continued warming will mean that we will start to hit soft and hard adaptation limits soon, as the “Effectiveness of most adaptation responses decreases drastically at global warming levels of 1.5°C to 2°C”. See more in “Tipping points may be triggered = rapid SLR by ~2060” in SECTION III. Banks must both adapt and decarbonise if they are to be resilient and avoid a hard landing.
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Central banks recognise materiality of chronic SLR risks, but stress test guidelines must improve

1. Use the right timeline – long-term, NOT short-term
2. Use the “low-regret” scenario, NOT just the worst-case
3. Tipping points may be triggered = rapid SLR by ~2060
4. Assess what governments are doing, or NOT doing

Section IV: HK Double Blind Maximum Risk Case Study!

HKMA & HK banks face systems collapse from huge SLR adaptation gaps

HKMA on a “Double Blind Maximum Risk” Path
“Double Blind Max Risk” = increased likelihood of HK banking systems collapse
HKSAR already facing risks from coastal threats
HK could face 10m+ storm tides by 2100
HK Rising Seas Adaptation Is Way Behind New York & Singapore
HKSAR revenue at risk from coastal threats = impact credit ratings
Too much at stake = HK can’t afford to get it wrong
Save HK Banks From Sinking

References

Disclaimer
Blindsided! If we can’t see the risks, we cannot manage them.
SLR risks are locked in, with irreversible rising seas. At warming today of 1.1-1.2°C, we have locked-in 6-9m of SLR – so it’s not a matter of IF but WHEN this will happen. The rate of rise is also accelerating as the world continues to warm – the worst-case used to be ~1m of SLR, now multi-metre SLR cannot be ruled out before the end of the century. These levels will redraw countries and pose existential threats to countries and the global financial system. Banks must “see” these “virtually certain” risks to avoid systemic shocks and ensure financial resiliency.
We now face the possibility of multi-metre SLR sooner...

“Global mean sea level rise above the likely range – approaching 2 m by 2100 and 5 m by 2150 under a very high GHG emissions scenario – cannot be ruled out due to deep uncertainty in ice-sheet processes.”

IPCC (2021)  
Summary for Policymakers  
Climate Change 2021: The Physical Science Basis (AR6 WGI)

“There are the two things to becoming resilient, a) know what will kill you and prepare the best the best that you can when these things do come to pass and b) know what you need to keep going and make sure you never run out.”

“Singapore has no choice but to be clear eye about climate change. Singapore is pancake flat, most less than 5m above sea level so wouldn’t take a lot for the sea to rise to turn us into a new Atlantis”.

Peter Ng Joo Hee  
Ex-PUB Chief Executive

“Climate impacts are intensifying and accelerating, demanding “low-regret” transformative adaptation action. As the latest Intergovernmental Panel on Climate Change (IPCC) warned, multi-metre sea level rise by the end of this century cannot be ruled out. This year, to strengthen our belief in the GBA’s long-term growth potential, we commenced a local, detailed geospatial analysis of coastal threats. Our GBA portfolio was stress tested against three “low-regret” scenarios that factored in both sea level rise according to the latest IPCC findings and potential storm surges.”

Link Real Estate Investment Trust  
Annual Report 2021/2022

SLR impacts will be severe even at <1m...

“We are one of the largest financial holders of real estate risk in Hong Kong, for example, speaking to one of the speakers in the afternoon Debra Tan, on CWR, we realized that if we don’t work with the government, if we don’t drive the right solutions with the government on protecting surge risks ... up to 25% of real estate exposure can come into risks so we need to continue to have that dialogue...We need to plan adaptation with clients what we would do and what would our developing clients would do”

David Liao  
HSBC APAC Co-CEO

“The results show that physical risks will be manifested in Hong Kong through two major types of climate hazards, namely typhoons and floods, causing devaluation of properties and business disruptions. Emphases of the assessment are therefore placed on the vulnerabilities of residential mortgages and other property-related lending in Hong Kong, which amounts to HK$2.9 trillion or 28% of the participating banks’ total lending... Based on the location information of the property collateral, the participating banks identify that 32% of their Hong Kong property-related lending is pledged with collateral located in vulnerable areas and thus exposed to material physical risk.”

Hong Kong Monetary Authority (2021)  
Pilot Banking Sector Climate Risk Stress Test
Banks face triple whammy chronic SLR risks

Sector agnostic geo-locational SLR risk = banks face triple whammy loan book hit. SLR is a pervasive threat as it will impact almost all economic and social aspects of a city/country/territory. As it is a sector agnostic geo-locational risk with a tendency to cluster, traditional risk management methodologies such as spreading risks across sectors and regions do not work. As a result, banks must be aware of significant triple whammy chronic SLR risks from:

1. SLR is a locational risk so domestic skew = amplified clustered SLR risks
2. Coastal nature of APAC = regional diversification offers little SLR protection
3. Multiple sectors clustered in affected areas = sector spread offers no shelter

This triple whammy increases the probability of systemic shocks if not managed. Whilst central banks under the NGFS are moving to manage such risks through stress testing, they are not moving fast enough to spread these risks as SLR is simultaneously accelerating. This huge chunk of currently unaccounted risks in coastal hotspots are clearly material.

17 major APAC banks with loan books of US$7.9 trillion are vulnerable to rising seas. We analysed 17 banks from 5 countries/territories with a market cap totalling US$724bn (as of 19 Sep 2022) + loan books totalling US$7.9 trillion (various year ends from Dec 2020-Sep 2021). These are from the most developed economies in APAC with sophisticated finance systems, yet all these could be at risk from underlying coastal threats as 4 of 5 of these countries/territories are islands. The following pages summarise the triple whammy facing these 17 banks and are followed by more detailed factsheets for the five countries/territories.

Individual country factsheets show unique threats = no one-size fits all solution. Each location faces unique risks, be it physical or related to government action or inaction. The latter is key to understand how risky bank portfolios are because the more governments are doing for each location, the less banks need to do. This is currently sorely under-appreciated and not assessed due to complexities in scoring action across countries/territories. For the purpose of this report, we have used the framework and scoring from the CWR APACCT 20 Index that was published in the 5-report series “CWR Coastal Capital Threat Series”.

Deep risks require transformative adaptation action to ensure the banks are resilient in the long term. It’s important that banks understand and accept these risks as only then will the need to collaborate with governments and transformative adaptation become much clearer because traditional risk spreading will be insufficient. The triple whammy explained over the next few pages can provide a better picture of what banks face, while banks and government actions are explored in SECTION II – Adaptation decides financial resilience!

17 APAC BANKS WITH LOAN BOOKS OF US$7.9 TRILLION. SIGNIFICANT DOMESTIC SKEW TO REGIONS THAT ARE VULNERABLE TO SLR + SECTORAL SKEW TO SECTORS THAT ARE VULNERABLE TO SLR

Source: CWR, 2020 and 2021 Annual reports of the 17 APAC banks
Infographic © China Water Risk 2022, all rights reserved.
1. SLR is a locational risk so domestic skew = amplified clustered SLR risks

Domestic skew varies from 27% to 95%. As the chart below shows, loan book domestic skew varies from 27% for HSBC to a high of 95% for KB Financial. Overall, Hong Kong banks have the lowest domestic skew at 34%, followed by banks in Singapore with 46%, which is not surprising given their status as regional/global financial hubs. The banks in the other three countries have a higher share of loan books skewed domestically with an average of 62% in Japan, 83% in Australia and 92% in South Korea. However, this is just loan book skew – HSBC for example, derives over 90% of its profits from Hong Kong and so is extremely at risk – see SECTION IV for more. Domestic profit numbers were not available for all banks, which is why only loan books were analysed.

Domestic loan book skew varies from a high of 95% at KB Financial Group to a low of 27% at HSBC…

…but this is just loan book skew, profit skew tells a different story

Overall, South Korean banks have the highest domestic skew…

…and Hong Kong banks have the lowest

Significant GDP concentrated in the coastal capitals & major cities of the five countries/territories = increased risks for the 17 banks
Beyond these major coastal cities, significant shares of populations in APAC are coastal = banks at risk from SLR. The APAC region is highly coastal due to history and trade, which has led to significant population and economic activity in large coastal capitals and economic hubs. Over 200 million people in APAC could be at risk from just one metre of SLR according to the Ocean Policy Research Institute. Of the five developed countries/territories, while Hong Kong and Singapore are island cities, up to 70% of Australia's population lives in 10 large coastal cities; 69% of Japan's population lives in 19 large coastal cities; and 40% of South Korea’s population lives in 8 coastal cities as the chart below shows. It is worth noting here that we are only showing coastal cities with populations larger than 300,000 as these will likely have higher economic value; risks will be higher if rural coastal populations were included. All these factors point to high coastal threat exposure for banks’ mortgage loan books, so rising seas could sink banks unless transformative coastal defences are put in place.

### 2. Coastal nature of APAC = regional diversification offers little SLR protection

Banks cannot ignore coastal clustering of regional loan book spread even if domestic market is safe. Are banks in Singapore safe because of how proactive their government is? No, because as seen in the Singapore factsheet later, even though the top three banks have 56% of their loan book skewed to Singapore, they still have 14% in Greater China, 8% in Hong Kong and another 15% in “Other”, which is highly likely to be very vulnerable Southeast Asian countries, such as Indonesia and Thailand. So, even when the domestic loan book is protected by local government adaptation action, banks must still ensure that their regional loan books are also protected by working with governments across all the countries they’re lending to and ensure that they have transformative coastal adaptation plans in place.

As the flow infographic on the next page shows, in addition to the five key markets, loans from the 17 banks flow to other countries/regions at risk

- **US$360bn to the UK mainly by HSBC:** The UK is also an island, exposed to significant risk – a recent WWF report estimates that coastal damage under a business-as-usual scenario could wipe out more than US$21bn off the UK’s economy every year by 2050. So, neither the UK nor Hong Kong will provide HSBC cover from SLR risks – these two locations account for 55% of HSBC’s loan book.
- **US$231bn to New Zealand:** All of its 3 large cities are coastal, and a report sponsored by the government found that homes in Wellington and Christchurch will face a partial insurance retreat from 2030 and the same will happen to Auckland and Dunedin a few years later with full insurance retreat for thousands of homes by 2050. However, the Mainland does face other risks from water scarcity and pollution to floods and droughts that are all accelerating.
- **US$100bn to Mainland China:** Despite a long coastline, the Mainland is not as exposed to coastal threats as other countries/territories. Only 9/20 large cities in Mainland China and less than 10% of the population are coastal so loans here might be safer. However, the Mainland does face other risks from water scarcity and pollution to floods and droughts that are all accelerating.
• **US$82bn to ASEAN:** The capital cities of Thailand and Indonesia are both sinking – this means that parts of Bangkok and Jakarta could see 1.94m and 2.37m of SLR respectively by as early as 2050. Plus, even though Malaysia’s capital of Kuala Lumpur is not coastal, all of the country’s ports vital for its economy are all located in areas vulnerable to coastal threats.

—but ASEAN is also a risk factor.

**Infographic © China Water Risk 2020, all rights reserved.**

Source: CWR, 2020 and 2021 Annual reports of the 17 APAC banks

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<td>Commonwealth Bank of Australia</td>
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**Note:** The table displays the loan book flows for regions vulnerable to coastal threats, highlighting the significant financial exposure of APAC banks to these risks.
3. Multiple sectors clustered in affected areas = sector spread offers no shelter

Sector diversification does not help spread SLR risks: 65-84% of total loan books from 17 major banks skewed to vulnerable sectors. Loan books are also clustered in vulnerable sectors as can be seen in the graphic below, for example:

- US$3 trillion in real estate – any of this by the coast is highly vulnerable and tends to be the most valuable in most cities;
- US$1 trillion in wholesale and retail trade – this sector requires the use of vulnerable ports and airports to function, putting these loans at risk;
- US$0.7 trillion in manufacturing – the sector relies on vulnerable ports and airports to import input goods as well as export the final good; and
- US$0.7 trillion in financial institutions – these will be subject to the triple whammy hit faced by financial institutions

Export-led growth in APAC brings greater risks as most airports and ports are low-lying and vulnerable to coastal threats. From the five countries/territories analysed 6/9 airports and all nine ports would be permanently submerged by 2.9m of SLR as shown in factsheets. On our current emissions policy path, this could be experienced within the next 80 years, with rapid SLR as early as 2060 due to collapsing ice sheets. Beyond the US$0.7 trillion in trade, loan books will be vulnerable as countries/territories are highly reliant on trade. Hong Kong and Singapore, where trade is over 3x the value of GDP, are especially vulnerable. Even in South Korea where trade is 0.7x GDP in terms of value, Australia where it is 0.44x and Japan where it is 0.3x, impacts will be significant. See the five individual country/territory factsheets for more.

54-72% of GDP skewed to vulnerable sectors in five countries/territories. The five countries/territories analysed in the report also have GDP that is skewed to sectors vulnerable to coastal threats, such as real estate, trade, manufacturing and finance as can be seen above. All of these are at risk due to their reliance on vulnerable locations and low-lying trade infrastructure (ports and airports) that in many cases have yet to be adapted.

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Banks must start stress testing for these risks as valuations might be affected sooner rather than later from losing insurance.
Banks can't rely on insurers as climate risks escalate & compound

With acute events compounding and becoming chronic and more severe, the insurance sector will re-think its risk appetite. Banks and investors continue to expect the insurance sector to insure away climate risks. But risks are no longer one-offs; instead, acute climate events are clustering and happening simultaneously. Plus, chronic risks such as SLR are accelerating, compounding already intensifying acute risks such as typhoons, heavy rains and floods.

Banks will be left with the risk as insurers have flexibility in exit. Flexibility is on the side of insurers due to short term contracts – insurance renewals are on an annual basis for most assets. As the graphic below shows insurers have flexibility on their side as premiums are typically renewed annually. So, they can continue to insure until it no longer makes sense, at which time they will either increase premiums or just pull out of vulnerable locations, leaving banks high and dry.

No insurance = no mortgage! Banks will be left holding risky assets that can't be sold. As insurance is a condition of lending, no insurance means that assets can only be bought with cash, limiting buyers and devaluing the asset. Bank loan books will clearly be at risk if this were to happen as homeowners with 20 years left on their mortgage may stop repaying their loans as their homes have dropped in value. Even businesses may not be able to repay loans if their operational disruptions cannot be insured any longer. So why are banks not considering this as an imminent risk? Especially when this could happen sooner than you think...

“If climate change means a home isn’t insured, then lenders could find that damage from flood, storm or fire results in the collateral value being significantly lower, and so their expected loss given default on climate-impacted properties is much larger.”

Jonathan Kearns
Head of Domestic Markets
Reserve Bank of Australia (RBA)

Insurance coverage could be lost before the physical climate risk is felt = earlier asset revaluations. Insurers are not great risk takers and are not going to wait for the physical impacts to actually be felt – they will pull out of vulnerable areas before this happens. This means that even if risks such as SLR are long term and could happen in 50-80 years time, if insurers start pulling out in 10-20 years assets would see a dramatic loss in value decades before facing any physical risks. This is already starting to happen – flood insurance in the US is getting more expensive, and Californians are finding it more difficult to get home insurance due to escalating wildfires as droughts worsen.

Lack of insurance + adaptation = assets stranded much earlier than from physical impacts. Even the insurance sector will be affected because as the CEO of AXA pointed out “A +4°C world is not insurable”. And sadly, that is the direction we are barrelling headfirst towards. So, if there is no insurance, assets will be stranded way ahead of any actual physical risk. This is because without insurance properties cannot be sold and the value of those properties will plummet. But it isn’t just property insurance but also mortgage insurance, operational insurance and trade insurance. The latter two will be affected because their day-to-day business will be affected by physical climate risks that insurers may no longer be able to cover. The only way out of this death spiral is for both banks and governments to decarbonise aggressively and to work together to drive and finance transformative government adaptation action. Unfortunately, banks and governments are doing neither – for more see SECTION II – Adaptation decides financial resilience!

Given the triple whammy exposure to SLR, traditional risk spread methods will not work, the only way forward is adaptation. However, there are limits to adaptation and the quality of adaptation must be considered.

So banks must adopt a two-pronged approach:

1. **Finance must coordinate and collaborate with the government.** What governments do or don’t do make a marked difference to the risks facing the financial sector. Therefore, banks must work with the government to understand its plans and also push for more action both on decarbonisation as well as for “low-regret” adaptation. Because the quality of adaptation is existential to banks, banks must ensure that governments do not maladapt and must drive finance towards transformative rather than incremental adaptation.

   Please see **SECTION II: Adaptation decides financial resilience!** for more on gaps in adaptation plus “Transformative adaptation: 5 tips summarised from IPCC”.

As each country/territory face unique SLR risks, there will be no one-size-fits-all adaptation plan. For an overview of the risks facing the five countries/territories, please refer to the individual factsheets on the following pages.

2. **Central banks and regulators must push banks to stress test better to see the triple whammy risks and avoid systemic shocks.** It is encouraging to see that multiple central banks around the world have started to pilot stress tests for climate risks. But there is still some way to go as typically only short timelines are being used and tipping points are not included even in worst-case scenario stress tests. This has resulted in a severe under-estimation of risks, which could trigger shocks.

   Because banks cannot see these triple whammy risks there is limited adaptation finance, which constrains adaptation options. Cities/countries are thus limited to incremental adaptation which will lead to maladaptation. As a result, there are significant financing gaps for cities that want to implement transformative adaptation.

   We realise that climate science is fast evolving and complex and bankers might not have time to deep dive into the science. So, we have laid out a step-by-step guide on how to stress test right for SLR and what pitfalls to avoid – please see **SECTION III: CWR 3-Step Guide to Stress Test Right for SLR Risks**.

Banks must stress test right because exposure could be existential – over 24x more residential, commercial and industrial buildings will be underwater just in HK if it adapts to the wrong scenario. The HKMA’s pilot climate stress test in 2021 showed that 32% of property loan books in Hong Kong would be at risk, but this was only for at most 0.55m of SLR.** Our Hong Kong deep dive showed that 43,000 more residential, commercial and industrial buildings would be at risk at 2-3m of SLR compared to 0.5m; this is 24x more buildings. This risk is real as the HKSAR government is lagging. So, if HK adapts to the wrong scenario, all of this would be left exposed – this is an existential risk for HK and its banks. Currently, the HKMA & HK banks are in a “Double Blind Maximum Risk” scenario as both the government and banks are not seeing nor addressing multi-metre SLR risks that the IPCC has warned of. Therefore, banks must stress test right, for longer time horizons and “low-regret” SLR scenarios, if they want to be able to support governments to adapt and ensure their own loan books are safe. Please see **SECTION IV: HK Double Blind Maximum Risk Case Study!** for more.

Don’t delay, start now. The longer banks wait the worse it will become. Continuing to support the fossil fuel sector will ensure climate impacts accelerate. Banks will likely have more of their loan books concentrated in vulnerable locations if the risks are not being considered while allocating capital. This negative feedback loop must be addressed – see how in “**Banks’ limited adaptation financing raises maladaptation**” in SECTION II. With escalating risks, increasing the likelihood of “no insurance”, banks must stress test right to see locked-in SLR risks today as this would give them maximum flexibility to spread and manage these risks. Banks, start with **“8-Step Checklist to Futureproof Banks from SLR Risks”** and central banks – see “**5 must do’s for central banks & regulators to avoid systemic shocks triggered by SLR”**.
Banks and SLR exposure – 5 country/territory factsheets

5 countries/territories facing significant but varied risks – 5 factsheets prepared to show the real risks. These factsheets provide an at-a-glance view of the risks facing the different countries/territories – even though each faces slightly different risks, all 17 banks are exposed. Therefore, in addition to breakdowns of country/territory GDP and bank loan books by location and sector, coastal risks have been mapped for key indicators including critical infrastructure. Furthermore, as government adaptation action is important, the factsheets include the rankings of the 7 cities within the 5 countries/territories in terms of government adaptation action in the CWR APACCT 20 Index.

A few things to note before diving into the factsheets:

- **SLR of 2.9m was used to map the risks.** The IPCC recently warned that 2-3m of SLR is plausible by 2100 due to ice sheet inconsistencies. Given rising carbon emissions a level of 2.9m of SLR was used to highlight SLR risks in 2100.
- **Value vs. % at risk must be considered.** Even though a small portion of a city may look at risk, coastal zones are typically extremely expensive, contain significant commercial activity and properties/infrastructure and also house significant portions of the population. The five country/territory factsheets do not contain value of land at risk but our Hong Kong case study in Section IV shows value of properties at risk.
- **Trade infrastructure mapped but other key infrastructure should also be analysed.** Whilst we have mapped ports/airports that are important for trade it is important to also map key essential such as basic needs, internet, water etc as these could disrupt the smooth running of a city and hinder the economic growth of a city. For example, our Hong Kong case study in Section IV highlights that the majority of Hong Kong’s basic needs are low-lying and thus vulnerable to coastal threats.
  
  “Because roads and trains run through the low-lying areas; hospitals, schools, and workplaces are all there. We cannot lose a big chunk of our city and expect the rest of Singapore to carry on as usual. Therefore, beyond localised measures, we need to protect entire areas, and the way to do that is to build coastal defences.”
  
  Prime Minister LEE Hsien Leong
  National Day Rally speech, 2019

**Risks could be worse because we traded local granularity for consistency.** As the factsheets were created to provide a comparative overview, we traded granularity for consistency. However, even with lower granularity, risks are significant as our at-a-glance factsheets show. To see the full extent of risks, we recommend to deep dive for each locality. We did this for Hong Kong and the risks are more severe as can be seen in **SECTION IV: HK Double Blind Maximum Risk Case Study!** It is important to keep this in mind when using global tools because the lack of granularity could underestimate risks – so banks should also seek out local data and experts.

A few things to note on factsheets that could increase the risks:

- **To ensure consistency tides were not included.** High tide levels differ by location but adding this would make the risks worse. For example, in Hong Kong high tide is 2.5m, which would mean total SLR of 5-6m. However, the flooding levels used give a good idea of exposure.
- **Map granularity could increase impacts.** As granular elevation data was not available for all cities the 30m-grid NASA SRTM (SRTM-30m) elevation data was used to map SLR risks for regional consistency. Our analyses show that impacts worsen when higher granularity maps (5m) are used, so for more in-depth analysis, please use such maps to assess SLR risks where available.
AUSTRALIAN BANKS & RISING SEAS

Banks analysed:
- Commonwealth Bank of Australia
- Westpac
- NAB
- ANZ

- Impact may look low in Sydney, but Australia’s Climate Council estimated that AU$226 billion in assets in coastal zones are at risk from just 1.1m of SLR.
- Coastal population (70%) & GDP skewed to vulnerable sectors (54%).
- Loans books domestic (83%) & skewed to vulnerable sectors (79%).
- Gov’t adaptation not great: ranked 11 of 20 cities in CWR APACCT 20 Index.
- Since the Paris Agreement, all 4 banks lent US$40bn to fossil fuels (2016-21).

LOCATIONAL SKEW TO COASTAL AREAS VULNERABLE TO SEA LEVEL RISE (SLR)

Locational loan book skew

- New Zealand 11%
- Other 6%
- Australia 83%

GDP concentrated in coastal capital

- Sydney 26%
- Other Australia 74%

Population concentrated in large coastal cities

- Pop of top 20 large cities - coastal 70%
- Pop of top 20 large cities - non-coastal 3%

WHAT’S AT RISK AT 2.9M OF SLR & GOVERNMENT ACTION: SYDNEY

- 59,526 people affected
- 132km² affected

Gov’t adaptation action score

A higher score = more action

MULTI-SECTOR EXPOSURE TO SLR

Loan book concentrated in sectors vulnerable to SLR

- US$2trillion

GDP concentrated in sectors vulnerable to SLR

- US$1.3trillion

Imports & Exports = 44% of GDP

HONG KONG BANKS & RISING SEAS

Banks analysed:
- HSBC
- Standard Chartered
- Bank of China (HK)
- Bank of East Asia

- 70% commercial & 27% pop clustered in reclaimed land; Port & airport hit.
- Coastal population (100%) & GDP skewed to vulnerable sectors (63%).
- Loan books domestic (34%) & also skewed to vulnerable sectors (77%).
- HSBC (HK’s biggest bank) has profits that are highly reliant on HK (>90%).
- Gov’t adaptation not good: ranked 12 of 20 cities in CWR APACCT 20 Index.
- Since the Paris Agreement, HSBC & Stand Chart lent US$170bn to fossil fuels (2016-21).

LOCATIONAL SKEW TO COASTAL AREAS VULNERABLE TO SEA LEVEL RISE (SLR)

- Locational loan book skew
  - Hong Kong 34%
  - Mainland China 6%
  - Other Asia 8%
  - UK 22%
  - Other 30%

- GDP concentrated in coastal cities
  - US$1.7trillion

- Population concentrated in coastal areas
  - 7 million

WHAT’S AT RISK AT 2.9M OF SLR & GOVERNMENT ACTION: HONG KONG

- 0.5mn Affected
- 75km² Affected

- Gov’t adaptation action score
  - Singapore
  - Jakarta
  - Shenzhen
  - Shanghai
  - Auckland
  - Tianjin
  - Quito
  - Osaka
  - Yangon
  - Manila
  - Sydney
  - Hong Kong
  - Suzhou
  - Tokyo
  - Aichi/Nagoya
  - Seoul
  - HCMC
  - Bangkok
  - Macao
  - Taipei
  - A higher score = more action

MULTI-SECTOR EXPOSURE TO SLR

- Loan book concentrated in sectors vulnerable to SLR
  - US$1.7trillion
  - Transport, comm, storage 4%
  - Wholesale/retail trade/trade finance/other commercial 6%
  - Professionals & Individuals 10%
  - Financial Institutions 11%
  - Manufact/industry 14%
  - Other 13%

- GDP concentrated in sectors vulnerable to SLR
  - US$0.3trillion
  - Real estate, professional & business services 10%
  - Ownership of premises 12%
  - Import/export, wholesale & retail trades 18%
  - Import/exports, social & personal services 21%
  - Others 16%
  - Financing & insurance 23%

Imports & Exports = 352% of GDP
JAPANESE BANKS & RISING SEAS

Banks analysed:
- Mitsubishi UFJ Financial Group
- Sumitomo Mitsui Financial Group
- Mizuho Financial Group

- Impacts material in Osaka & Aichi/Nagoya; even Tokyo loses port & airport.
- Coastal population (69%) & GDP skewed to vulnerable sectors (64%).
- Loan books domestic (62%) & also skewed to vulnerable sectors (74%).
- Govt adaptation action: Osaka does better, ranking 8 of 20 cities in CWR APACCT 20 Index, but Tokyo and Aichi/Nagoya lag, both ranking 14th.
- Since the Paris Agreement, MUFG & Mizuho lent US$337bn to fossil fuels (2016-21).

LOCATIONAL SKEW TO COASTAL AREAS VULNERABLE TO SEA LEVEL RISE (SLR)

- Locational loan book skew
- GDP concentrated in 3 major coastal cities
- Population concentrated in large coastal cities

WHAT'S AT RISK AT 2.9M OF SLR & GOVERNMENT ACTION: TOKYO, OSAKA & AICHI-NAGOYA

- WHAT'S AT RISK AT 2.9M OF SLR:
  - Impacts material in Osaka & Aichi/Nagoya; even Tokyo loses port & airport.
  - Coastal population (69%) & GDP skewed to vulnerable sectors (64%).
  - Loan books domestic (62%) & also skewed to vulnerable sectors (74%).
  - Govt adaptation action: Osaka does better, ranking 8 of 20 cities in CWR APACCT 20 Index, but Tokyo and Aichi/Nagoya lag, both ranking 14th.
  - Since the Paris Agreement, MUFG & Mizuho lent US$337bn to fossil fuels (2016-21).

MULTI-SECTOR EXPOSURE TO SLR

- Loan book concentrated in sectors vulnerable to SLR
- GDP concentrated in sectors vulnerable to SLR
- Imports & Exports = 31% of GDP

SINGAPORE BANKS & RISING SEAS

Banks analysed:
- Overseas-Chinese Banking Corp
- DBS Group Holdings
- United Overseas Bank

- Gov’t sees SLR risks as existential – adapting critical infra to 5m+.
- Coastal population (100%) & GDP skewed to vulnerable sectors (72%).
- Loan books domestic (46%) & skewed to vulnerable sectors (82%).
- Govt adaptation action: Excellent ranking 1st of 20 in CWR APACCT 20 Index.
- Singapore is the largest oil refueler in the world, handling over 50mn tonnes of bunker oil in 2021; Singapore’s maritime industry accounts for 7% of its GDP.

LOCATIONAL SKEW TO COASTAL AREAS VULNERABLE TO SEA LEVEL RISE (SLR)

What’s at risk at 2.9m of SLR & government action: Singapore

- Multi-sector exposure to SLR
  - GDP concentrated in transport, comm., storage 6%
  - Financial Institutions 9%
  - Professionals & Individuals 10%
  - Real estate 46%
  - Ownership of dwellings 4%
  - Construction & real estate 6%
  - Transportation & storage 6%
  - Finance & insurance 15%
  - Manufacturing 22%
  - Wholesale & retail trade 19%

- Imports & Exports = 321% of GDP

SOUTH KOREAN BANKS & RISING SEAS

Banks analysed:
- KB Financial Group
- Shinhan Financial Group
- Hana Financial Group

- Vulnerable airport & port put manufacturers at risk as trade is 69% of GDP.
- Coastal population (40%) & GDP skewed to vulnerable sectors (72%).
- Loan books domestic (92%) & also skewed to vulnerable sectors (65%).
- Gov’t adaptation not good: ranked 16 of 20 cities in CWR APACCT 20 Index.
- Since the Paris Agreement, KB Financial lent US$13bn to fossil fuels (2016-21).

LOCATIONAL SKEW TO COASTAL AREAS VULNERABLE TO SEA LEVEL RISE (SLR)

WHAT’S AT RISK AT 2.9M OF SLR & GOVERNMENT ACTION: SEOUL

MULTI-SECTOR EXPOSURE TO SLR

Adaptation decides financial resilience!
Banks must drive government action by stress testing right

SECTION II

Transformative adaptation will futureproof banks, but we’re far from it. There's nothing stopping us from building transformative adaptation, but banks and governments are not collaborating to effect this. We must be bold, realistic and pragmatic because we will not be able to defend everything. Banks must also be onside because financing must support transformation otherwise adaptation plans will be incremental and will not have the flexibility to cope with escalating climate risks. Prioritising transformative adaptation is not giving up on decarbonisation – it’s just being smart as there are deep uncertainties around climate impacts. Moreover, we’ve always underestimated climate impacts – at these levels of risks it is better to be safe than sorry.
We are late in the game – transformative adaptation is urgently needed…

“Most observed adaptation is fragmented, small in scale, incremental, sector-specific, designed to respond to current impacts or near-term risks, and focused more on planning rather than implementation”.

“Many initiatives prioritize immediate and near-term climate risk reduction which reduces the opportunity for transformational adaptation.”

“To minimize maladaptation, multi-sectoral, multi-actor and inclusive planning with flexible pathways encourages low-regret and timely actions that keep options open, ensure benefits in multiple sectors and systems and indicate the available solution space for adapting to long-term climate change.”

IPCC (2022)
Summary for Policymakers
Climate Change 2022: Impacts, Adaptation and Vulnerability (AR6 WGI)

“You must remember we face a unique challenge in this point in time. The evidence points to the need for a whole of society response to the climate change challenge. That transformation needs to happen in the next decade, so you really need something that is a rallying call for action.”

“The world is late to the adaptation game… the fact of the matter is that we live in a world where we already have global warming of 1.1°C and quite frankly the science is really clear, we live in an extremely dangerous world, right here, right now we don’t need any further warning to create a dangerous world…”

Debra Roberts
IPCC Co-Chair Working Group II

“This means that sea levels could be as high as 4 – 5 meters when extreme coastal storm surges coincide with high tides [in Singapore]… We are not taking any chances and will treat coastal protection with utmost seriousness…”

“Coastal protection is a long-term endeavour… And this is what Singapore is committed to, not only study and understand our risks and put in place measures but to also provide a financial environment where we can do all this sustainably.”

Hazel Khoo
Director of Coastal Protection Department
PUB, Singapore’s National Water Agency

“6 ft or 2m of sea level rise – and in those conditions we have not only significant flooding from coastal storm surges because we experience North Atlantic hurricanes, we have regular tidal flooding…”

Elijah Hutchinson
Vice President
NYC Economic Development Corporation

But we won’t be able to protect everything – there will be limits to adaptation…

“And we are very clear on the fact that there are limits to adaptation. Do not think you are going to be able to adapt your way out of this problem. Even at the current levels of warming, even with the best levels of adaptation, we cannot avoid losses and damages so that is something we need to prepare for. And certainly, as we go higher in terms of global warming levels adaptation options begin to fall off the table particularly those linked to nature-based solutions because at the higher temperatures ecosystems are simply can’t do what they need to do.”

Debra Roberts
IPCC Co-Chair Working Group II

“We are creating land use and development frameworks where we acknowledge that some parts of the city are areas that should not experience future growth, that is doesn’t make sense and in some areas in the city we have voluntary buy out programmes for property owners…”

Elijah Hutchinson
Vice President
NYC Economic Development Corporation
Government pledges on emission reduction ≠ action

Most governments have made grand pledges towards 1.5°C but are not actually curbing emissions. According to Climate Action Tracker (CAT) over 140 countries have announced or are considering net zero targets, covering 90% of global emissions. But many of these net zero targets are “unclear or not backed up by real-world action” – as the graphic below highlights, CAT’S analysis shows that “the design of net zero targets covering a total of 74% of global emissions remains insufficient”.

We are already at 1.1-1.2°C today, with a 50:50 chance of reaching 1.5°C by 2026. Unfortunately, decarbonisation complacency means that the 1.5°C temperature target by 2100 is unlikely; we are already at 1.1-1.2°C today. There is now a 50:50 chance of reaching 1.5°C by 2026 – we are way off our Paris Agreement targets of limiting warming to below 1.5°C by 2100. This means that climate impacts that we were expecting towards the end of the century are actually being felt today. The worst is yet to come as we continue to warm.

Our current commitments and policies put us at around 3°C by 2100 = abrupt jump in SLR after around 2060 more likely. Saying and promising is really not the same as doing because our current path gets us straight to a very dire 2.7°C (2.0-3.6°C). Scientists warn that at around 3°C we will likely see an abrupt jump in SLR after around 2060 leading to multi-metre SLR by the end of the century. Hundreds of millions of people across APAC will be affected as billions of dollars’ worth of homes, trade & commercial activities, and critical infrastructure located in low-lying coastal zones will be permanently submerged.

Continued decarbonisation complacency = 2m of SLR by 2100 “cannot be ruled out” says IPCC. Banks much heed the IPCC’s warnings because with the possibility of these multi-metre SLR levels there is a big difference in the impacts that will be felt in 2100 at 1.5°C vs. 3°C. Even though the former will lock-in certain impacts, it will avoid an abrupt jump in SLR that will happen around 2060 and leave millions of people homeless globally. “Sea levels – Rising faster than you think!” in this section goes into more detail on these differences and highlights that the latter scenario must be avoided yet that is the path we are currently on. Given the lack of action globally to curb emissions some governments are proactively protecting their coastlines through transformative adaptation plans that are tailored and flexible, yet many are lagging – see “Of the 7 city governments some doing more than others” for more.

Adapting to the wrong scenario = false sense of security and investment disaster!

Hong Kong is currently adapting for around 0.5m of SLR by 2100. At this level less than 2,000 residential, commercial and industrial buildings would be affected. But Singapore and New York City are adapting for 2-3m of SLR by 2100 – at this level over 45,000 residential, commercial and industrial buildings would be affected in Hong Kong. This means that if the HKSAR adapts to the wrong scenario, it is leaving over 43,000 buildings exposed, and most of these are homes. This would be disastrous for Hong Kong’s economy and society but also its banks. Banks have a major role to play in ensuring this is avoided – for more see SECTION IV: HK Double Blind Maximum Risk Case Study!
None of the 32 leading banks listed in nine major Asian markets meet targets to limit warming to 1.5°C by 2100, according to ARE.

The best bank only received a CC grade, and most had “barely started” their journey towards meeting Paris Agreement objectives. According to a report co-authored by Rainforest Action Network, which analysed 60 largest banks, US$4.6trillion has flowed to fossil fuels since the Paris Agreement; US$742bn was lent in 2021. American banks lead the way, but APAC banks are within the top 60 fossil fuel funders.

Banks must have better decarbonisation strategies

APAC banks are not taking sufficient action to meet Paris Agreement objectives. A 2022 report by Asia Research & Engagement (ARE) analysed 32 leading banks listed in nine major Asian markets and found that none of the banks analysed would meet targets set out in the Paris Agreement in 2015 so that we can limit warming to 1.5°C by 2100. Plus “Most banks are misaligned with their own national policies for decarbonisation”. The best bank according to the rankings was DBS which received a CC grade because it “has a long-term net-zero target but without short- and medium-term plans. The bank has clear board governance, risk assessment processes, and strategies for high-carbon-risk sectors, but policies have gaps or are not Paris-aligned”. This still isn’t good enough but sadly, all other banks covered in the report fair worse, with five having “barely started its journey and may not fully acknowledge climate-related risks”. But given how much money continues to flow to the fossil fuels sector, the above is not surprising.

Worse still, US$4.6trillion flowed from largest 60 banks in the world to the fossil fuel industry since the Paris Agreement. According to a report co-authored by Rainforest Action Network, which analysed 60 largest banks, US$4.6trillion has flowed to fossil fuels since the Paris Agreement; a shocking US$742bn was lent in 2021. That year, 8 banks from the US led the charge with US$242bn lent to fossil fuels and 22 banks from Europe lent US$114bn. Meanwhile, 12 banks in China lent US$127bn. So yes, we should focus on “end coal” in India and China but do not forget that we need to “end oil & gas”. The IPCC AR6 WGIII report is very clear that we have to cut oil and gas if we are to meet targets.

9 of the 17 banks in this report rank within the top 60 most polluting banks. US banks JP Morgan, Citib, Wells Fargo and Bank of America top the rankings. But as the chart below shows many APAC banks are not far behind – from those analysed in this report two are from Japan, two from Hong Kong, four from Australia and one from South Korea. Between them they have provided US$560bn of fossil fuel financing from 2016-2020.

Given the lack of decarbonisation by both governments & banks, adaptation should be more urgent, but it is NOT. Such expansive and continued fossil fuel support accelerates climate impacts, and so banks should also be aggressively financing adaptation. Yet annual adaptation finance in 2019/2020 was only US$46bn as “Stupid Money” on the following page shows. How can there be 16x more funding for an industry that is jeopardising our future compared to adaptation which will protect us? And bear in mind that the majority of adaptation is financed by the public sector, not the private sector. Only 7% of climate finance goes towards adaptation and most of this is from the public sector.
Banking on wishful thinking + stupid money = loan books at risk

44 of the 60 most polluting banks have net-zero commitments but provided US$146bn to fossil fuels in 2021 – are they hoping for a miracle? These banks have committed to net zero by 2050, yet they provided US$146bn in financing in 2021 for the 100 companies doing the most to expand oil, gas, and coal. Perhaps they are banking on carbon capture tech to suck up emissions, but this magic bullet that they’re hoping for doesn’t exist now. For example, in Canada, despite at least US$5.8bn of subsidies for carbon capture, utilization and storage, spent since 2000 the technology has only captured 0.05% of Canada’s emissions. Perhaps they’re banking on future tech to bring us back to 1.5°C by 2100 after likely overshooting this by 2026.

Overshooting 1.5°C will lock-in dire impacts; even at 1.5°C we must adapt. Reining in emissions and reaching net zero today will not stop SLR as we can’t “undo” processes that have already started. But this is still better than overshooting 1.5°C; according to the IPCC overshooting 1.5°C will result in “irreversible impacts on certain ecosystems with low resilience, such as polar, mountain, and coastal ecosystems, impacted by ice-sheet, glacier melt, or by accelerating and higher committed sea level rise”, which means that “some ecosystem-based adaptation measures will lose their effectiveness”. Again, do not forget that even if we’re at net zero today seas will continue to rise, and so we must adapt. Pretending it will be ok in the future is just banking on wishful thinking. If banks are really serious about 1.5°C, they must start decarbonising their loan books the hard way now. At the same time as we’re already feeling impacts we expected by 2100 today, they will have to seriously step-up collaborations with corporates and governments on aggressive adaptation. They should be supporting this with finance, which they are currently not as can be seen in the graphic below.

Stupid money: putting loan books at risk

Banks and countries must re-think their capital allocation decisions, or they will be shooting themselves in the foot. The graphic below highlights two such examples – on the left you see that the fossil fuel sector, which is the main culprit of climate change, received 16x more funding in 2021 than any adaptation projects globally. And the fossil fuel stat only looks at 60 banks, so the gap is likely wider. On the right is a Singapore and Hong Kong comparison – clearly Hong Kong needs to step up climate change, received 16x more funding in 2021 than any adaptation projects globally. And the fossil fuel stat only looks at 60 banks, so the gap is likely wider. On the right is a Singapore and Hong Kong comparison – clearly Hong Kong needs to step up its adaptation efforts because it has a lot to lose given that 32% of property loan books are at risk yet it is adapting to 1/6th of banks, so the gap is likely wider. On the right is a Singapore and Hong Kong comparison – clearly Hong Kong needs to step up its adaptation efforts because it has a lot to lose given that 32% of property loan books are at risk yet it is adapting to 1/6th of Singapore’s SLR adaptation levels – for more see SECTION IV: HK Double Blind Maximum Risk Case Study!

Missed opportunity #1: billions of dollars of fees from adaptation finance products. If Singapore is planning to spend SG$100bn on adaptation, other cities/countries/corporates will have to start spending these figures because the IPCC AR6 WGII makes it clear that the clock is ticking & the grand re-design of economies, cities, energy, food & lifestyles must start now. Banks can play a major role by helping to structure viable adaptation products, raising the capital, and investing in them. But this is much harder to do compared to mitigation finance due to the complexity and need for collaboration when it comes to adaptation finance as the revenue streams are not as cut and dry. But isn’t this something that a bunch of clever bankers can brainstorm on? Yes, but they aren’t because they still aren’t seeing how bad things can be and that there is and will be demand for this. These bankers better get cracking and follow our tips in “8-Step Checklist to Futureproof Banks from SLR Risks”.

Missed opportunity #2: investing in innovative resilience tech. Adapting coastlines for rising seas will require the building of infrastructure such as sea walls that will require immense amounts of cement and steel, both highly carbon intensive. Yet, there are new innovations in the old materials to reduce their carbon footprint that must be nurtured – why isn’t more money pouring into carbon sequestering cement, which we will need a lot of for coastal defences? Another missed opportunity is in re-thinking nature-based solutions more holistically instead of in a silo – for examples of this see CWR’s September 2022 newsletter: https://mailchi.mp/chinawaterrisk/newsletter-september-2022


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Stupid Money: Not making more $$$

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Sea levels – Rising faster than you think!

SLR is irreversible & will continue even if we reach net zero emissions today. Seas are now virtually certain to continue to rise regardless of emissions – the IPCC AR6 WGI stated that “Many changes due to past and future greenhouse gas emissions are irreversible for centuries to millennia, especially changes in the ocean, ice sheets and global sea level.” This means that it is “virtually certain that global mean sea level will continue to rise over the 21st century.” So overshooting 1.5°C and drastically cutting emissions later with direct carbon removal technologies will not slow down SLR – the only way to stop seas from rising faster is to reduce emissions today.

8m of SLR is already locked-in at 1.1°C-1.2°C – it’s not a matter of IF but WHEN. At today’s temperatures, we have already locked-in 8m of SLR so it’s not a matter of IF but WHEN will this happen. Although most of this may occur beyond 2100, the faster we warm, the more likely we are to see multi-meter SLR earlier. Sadly, the future is here as there is now a 50:50 chance that global temperatures will breach 1.5°C by 2026 instead of the Paris Agreement target of 2100. Given that continued warming could escalate SLR, the IPCC warned policy makers that 2-3m of SLR “cannot be ruled out” by 2100 if we continue our current emissions trajectory. It is thus imperative to fast-track decarbonisation today, if not we will head to the guaranteed future of 8m of SLR faster than we think.

Reality Check! The last time the earth was this warm, SLR was 6-9m. The last time we were 0.5°C-1°C warmer than the pre-industrial period, it was during the Last Interglacial (LIG) Period when SLR was as high as 9.3m. More worringly, global CO2 concentrations exceeded 400 parts per million (ppm) since 2013 – the last time our world faced similar CO2 concentrations (400ppm+) was in the Pliocene when seas were 25m higher! So we may have in fact already locked in 25m of SLR. Note that although COVID did lower emissions, levels have not dipped below 400ppm.

Current policy trajectory will trigger an abrupt jump in ice loss after around 2060 delivering multi-metre SLR. The latest science and findings from warming oceans to the polar regions do not bode well for SLR. Scientists worry that the current policy trajectory of 2.7°C (2°C-3.6°C) will trigger ‘an abrupt jump’ in ice loss after around 2060. This has led the IPCC AR6 WGI to warn for the first time in its Summary for Policymakers (SPM) that 2-3m of SLR “cannot be ruled out” by 2100. Overshooting 1.5°C in this decade will only add to the risk of rapid SLR.

How likely is 2-3m of SLR? All 2021-2022 observations point to a grim future of rapid SLR:

- The polar regions are warming at unprecedented rates – in March 2022, Arctic and Antarctic temperatures were already 30°C and 40°C above normal, respectively.
- Arctic summer is now as hot as the Mediterranean: In June 2020, the Russian town of Verkhoyansk, located 115km north of the Arctic Circle, recorded a record high temperature of 38°C. The WMO said that this extreme temperature was "more befitting the Mediterranean the Arctic".
- Collapse of ice shelf holding Thwaites Glacier: The Thwaites Glacier, a critical glacier in Antarctica, the size of Florida, will be responsible for about 4% of global annual sea level rise as it slowly melts into the ocean. However, scientists warned that an ice shelf holding the Thwaites Glacier could break apart within the next 5 years and result in more ice flowing off the continent into the ocean, meaning that the glacier’s contribution to sea level rise could increase by up to 25%. The collapse of the Thwaites Glacier could also destabilise the West Antarctica Ice Sheet that holds 3-4m of SLR.
- The ocean is also warming at the rate of detonating 7 atomic bombs per second: Thermal expansion is the biggest driver of SLR – it accounted for 50% of SLR from 1971-2018. Ocean temperatures in 2021 was the hottest ever recorded by humans. The amount of heat going into the oceans in 2021 was 235 zettajoules – this means that the rate of ocean warming in 2021 is equivalent to detonating seven Hiroshima atomic bombs every second. This is now higher than the rate of five atomic bombs per second over the past 25 years (1995-2020). Besides thermal expansion, hotter ocean temperatures are also speeding up marine ice sheet losses in the polar regions and accelerating SLR.

2-3m vs. 1m of SLR: significantly material impacts – see 3D maps on next page. Previous high emissions worst-case scenarios projected around 1m of SLR by 2100, which although high is more manageable than 2-3m. The impacts are illustrated in the 3D maps of Hong Kong’s financial district, Central on the following page. As can be seen, Central will not be permanently submerged with 1m of SLR but at 2-3m, large parts will be permanently underwater – rising seas will have reached past the headquarters of HSBC, Standard Chartered and Bank of East Asia. Note that impacts will be worse across both scenarios as the 3Dmaps only show SLR impacts – storm surge impacts from ever intensifying typhoons are not included. Clearly, banks need to start stress testing to the right scenario and timelines if they are to steer loan books away from such SLR risks. If they see the risks, they can push governments toward transformative adaptation – both New York and Singapore are doing this, protecting their cities to 2-3m by 2100; meanwhile Hong Kong is planning adaptation to 0.5m of SLR.
2-3m vs. 1m of SLR: significantly different impacts
Government adaptation increasingly urgent but lagging

Government adaptation action can greatly alleviate SLR risks for banks. Well thought out plans to attack/defend/retreat will help maintain stability despite accelerating SLR. This can be done through better coastal and urban zoning, disaster management, building sea walls, growing mangrove forests, increasing the capacity of reservoirs, strengthening and building canals or expanding the drainage capacity of the sewer system and so on. Whatever the methods the approach must be holistic as cities do not operate in isolation – adaptation plans must also ensure connectivity as well as water, food and energy security. If this is done well it will greatly alleviate risks for banks. However, since these are all beyond the control of the financial sector, banks must work closely with the government to ensure that their own adaptation plan dovetails to that of the government’s.

For an idea of how APAC cities stack up, please see the CWR APACCT 20 Index, which benchmarks physical risks from coastal threats as well as government adaptation action. The index can thus be used to indicate risk spread. We created this index with the help of over 100 financial experts from bank board directors to research analysts. The next two pages cover the results from the index in more detail, but what was clear is that government action can clearly increase or reduce the risk a city is facing.

Governments must deliver transformative adaptation as 2m of SLR by 2100 "cannot be ruled out". Our current climate action and policy path means that we can no longer ignore the IPCC’s warning that 2m of SLR by 2100 and 5m by 2150 "cannot be ruled out". Such multimetre levels will redraw coastlines and are existential for cities unless coastal defences are mounted. Any adaptation plans and action must be transformative for the city to survive. As rapid SLR will not occur until after around 2060 it is imperative to use long term (2100) SLR levels for adaptation planning today. This will ensure that plans have the flexibility to cope with future threats – this means if SLR accelerates, adaptation plans can be implemented earlier and obviously if SLR slows down, implementation can be delayed. Indeed, this is what the IPCC is calling for in “Climate Change 2022: Impacts, Adaptation and Vulnerability”; “Actions that focus on sectors and risks in isolation and on short-term gains often lead to maladaptation if long-term impacts of the adaptation option and long-term adaptation commitment are not taken into account”.

Maladaptation is highly possible due to the short-sightedness of governments, finance and corporates, so avoid these pitfalls – for how, see “Transformative adaptation: 5 tips summarised from IPCC”.

Beware, don’t get blindsided! Governments expected to act are not; some have better adaptation plans than others. Both Hong Kong and Singapore are island city financial hubs, yet they have very different adaptation strategies. Singapore is adapting for 2-3m of SLR by 2100 by raising critical infrastructure to 5m above mean sea levels. In comparison, Hong Kong is adapting to at most ~0.5m of SLR by 2100, whereas Singapore is adapting for 2-3m of SLR by 2100. However, since these are all beyond the control of the financial sector, banks must work closely with the government to ensure that their own adaptation plan dovetails to that of the government’s.

Goverments struggle to finance adaptation; let alone transformative adaptation = banks must do more. According to the Climate Policy Initiative, in 2019/2020 only US$46bn of climate finance went into adaptation; most of this was from the public sector. Yet, developing countries alone will need US$280-500 billion per year by 2050 according to the UNEP Adaptation Gap Report 2021. The gap is significant, and banks must do more to help governments. But first banks must “see” the risks their own loan books face with better stress tests because if not, they will not see the merit of supporting transformative adaptation projects. In addition, the stress test will provide banks with real impetus to engage governments that are lagging to do more. See SECTION III: 3-Step Guide to Stress Test Right for SLR Risks.

Beware! Don't get confused...

Aiming to decarb for 1.5°C ≠ plan adaptation for 1.5°C by 2100; adaptation aims must be in line with actual emissions path. Many governments and banks have pledged action to reach 1.5°C by 2100 and so have adaptation plans in place for a 1.5°C world. But the reality is that we are still heading for 3°C as no one is keeping their promises so emissions keep rising. So, adaptation plans for 1.5°C is being highly optimistic/naïve and this is planning to fail. Adaptation plans must be made for the worst-case scenario of 3°C because this is our actual path. Don’t wait, the longer governments and banks take, the higher chance of maladaptation, which will only make things worse. See “4 strategy pitfalls to avoid – don’t shoot yourself in the foot!”
Government action on adaptation: CWR APACCT 20 Index

This page has been extracted from our 2020 report “Avoiding Atlantis: CWR APACCT 20 Index – Benchmarking coastal threats for 20 APAC cities with finance sector input”, which sets out the full methodology and financial consensus on how to build these indices. Please refer to the report, which can be found at: https://www.chinawaterrisk.org/notices/avoiding-atlantis-cwr-apacct-20-index/

According to the CWR APACCT 20 Index, many governments in APAC are still not acting to adapt. The index benchmarked 20 APAC capitals and economic hubs for chronic risks presented by coastal threats. The index reflects impacts on land area, population, key infrastructure – stacked locked-in SLR risks for 1.5°C, 2°C, 3°C & 4°C were assessed for each indicator; subsidence, storm surge risks and government adaptation action were also included. The index was created with the support of over 100 finance experts from banks board directors and research analysis. Below is the 1.5°C CWR APACCT 20 Index, which used 2.9m of SLR – levels that at the time were expected far in the future but now could be felt by the end of the century. The chart of the right shows the index when government action is carved out so you can better gauge threats be it from physical risks/lack of government action compared to the full index (left).

Key points to note are:

- Accounting for physical risks alone, Manila is most at risk at #20 as it faces material subsidence as well as storm surges. However, since its government is taking action to reduce risks, it moves up six places from #20 to #14.
- The Greater Bay Area cities (Hong Kong, Macao, Guangzhou and Shenzhen) are all vulnerable to coastal threats. Besides Shenzhen, the other three cities fall in Quartile 4 of the ex Govt Action index. Significant action in the mainland lifts rankings for Guangzhou (#17 to #11) and Shenzhen (#12 to #8) but Hong Kong and Macao’s relative complacency causes them to stay in Quartile 4 in the 1.5°C CWR APACCT 20 Index.
- Other mainland Chinese cities of Shanghai and Tianjin also both improve their rankings due to significant government adaptation efforts. Shanghai jumps five places from #14 to #9 and Tianjin moves up from #9 to #6.
- Bangkok and Jakarta with a similar physical risk profile move in opposite directions – Bangkok slips down in ranking from #4 to #7 after adjusting for government action whilst Jakarta moves up from #5 to #3 with an ambitious plan to build a giant sea wall and move the administrative capital.
- Taipei & Tokyo are the worst performers. Taipei underperforms the most – physically, it is relatively less exposed at #10 but lagging government adaptation action means it drops 10 places and is relegated to the bottom at #20. Tokyo gives up 6 places, falling from #11 to #17, placing it in the bottom quartile as well.
- Seoul and HCMC also drop places post government action but not as drastically as Taipei and Tokyo.
The chart below shows the scores the seven cities received for government adaptation action in the CWR APACCT 20 Index – a higher score depicts more action, and a lower score shows less action by governments on adaptation for coastal threats. For full methodology and benchmarking parameters please refer to CWR’s 2020 report “Avoiding Atlantis: CWR APACCT 20 Index – Benchmarking coastal threats for 20 APAC cities with finance sector input”.

Singapore scores the highest for government adaptation action…

…Seoul is the worst, but Aichi/Nagoya, Tokyo and Hong Kong don’t fare much better…

…Osaka and Sydney are also slightly better but have a long way to go

Typhoon free Singapore is ahead of the rest as it sees it as a “life and death” matter and the message comes right from the top – the Prime Minister

Typhoon prone Hong Kong, Tokyo, Aichi/Nagoya and Seoul must do much better as they also face higher risks

The HKMA stress tests in HK for 2050 showed that HK$1trillion is at risk and this isn’t even for the “low-regret” scenario

If these governments don’t act fast, their credit ratings could be impacted

Of the 7 city governments some doing more than others

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Singapore scores the highest points for government adaptation action and it wasn’t surprising. Typhoon free Singapore is prioritising adaptation as it recognises the consequences of not acting – in his 2019 National Day Rally address, Singapore’s Prime Minister Lee Hsien Loong said: “We should treat climate change defences… with utmost seriousness. These are life and death matters. Everything must bend at the knee to safeguard the existence of our island nation.” It isn’t just talk – Singapore has pledged to spend over US$75bn on coastal protection, which is equivalent to about 20% of its annual GDP. The Prime Minister even states that new developments must be built four metres above mean sea level and critical infrastructure such as the port and airport will be raised to at least 5m above mean sea level.

Hong Kong, Tokyo, Aichi/Nagoya and Seoul are at the bottom. Given that the first three face greater typhoon risks and are also wealthy enough to do more, this was extremely surprising. For example, Hong Kong is only planning for medium-emissions by 2050; in short, SLR defence of 0.5m by 2100. Given how much is located along the coast in Hong Kong and how tied its revenue is to coastal infrastructure, the city should be doing much more. See “SECTION IV: HK Double Blind Maximum Risk Case Study” for more. The HKMA stress test for 2050 already shows that HK$1trillion is at risk. This will be worse if it were to stress test right – our Hong Kong case study shows inadequate adaptation action could expose 43,000 more commercial, residential and industrial buildings to permanent submersion from SLR. Note that neighbouring Shenzhen and Guangzhou fair better on adaptation scores – please see case studies in “Sovereigns at Risk – APAC Capital Threats – Re-ratings warranted as city capitals & GDP are materially exposed to coastal threats”.

Government action matters – sovereign credit ratings & corporate credit scores. Clearly, not all governments are acting even though they should. The lack of action will have knock-on effects on sovereign credit ratings, which will also affect the borrowing capabilities of all domestic corporates – see our 2020 report “Sovereigns at Risk: APAC Capital Threats” for more. Banks must do more to change this, but as the next page shows, banks are not doing very much on adaptation either. The HKMA stress test for 2050 already shows that HK$1trillion is at risk, let alone if it was to stress test right.
Currently adaptation finance is only 7% of climate finance & most of this is from the public sector. According to the Climate Policy Initiative, in 2019/2020 only US$46bn of climate finance went into adaptation as the chart shows. This falls way short of the UNEP’s Adaptation Gap Report 2021 estimate that annual adaptation costs in developing economies alone will be between US$155-330bn by 2030.

Limited adaptation financing constrains adaptation options & raises the likelihood of maladaptation. The lack of financing could lead to short term planning that could lock us into an adaptation path that would be difficult to deviate from because millions would have been spent on infrastructures that might not be flexible and adaptable to rising threats – for more see “Transformative adaptation: 5 tips summarised from IPCC”.

Financing gaps must be closed, or they will widen in the future. The IPCC notes that much of the adaptation action gap is due to the limitations of financing. The poor need it the most, yet the richest nations are still unable to raise the US$100bn per year they pledged to help them adapt; it has been 12 years since this was pledged. Moreover, not seeing the risks through proper stress testing will compound maladaptation risks as it will amplify the negative feedback loop as banks pour more finance into carbon intensive industries as well as locations vulnerable to rising seas – see the next page for more.

Even governments that are planning transformative adaptation need financing. Banks are not safe until transformative adaptation is implemented. So, they must support its financing as discussed previously in “Banking on wishful thinking + stupid money = loan books at risk” this is an opportunity for banks to create new revenue streams. Making an adaptation financing business case is near impossible without seeing the full extent of the risks with the right stress test. So, banks must first stress test right to evolve adaptation financing. Innovating adaptation financing is a key step towards resilience, see “8-Step Checklist to Futureproof Banks from SLR Risks”.

“...to ensure that we can afford the substantial capital outlay, [the Singapore] government has established a dedicated fund for coastal and flood protection in 2020 and this comes with an initial injection of 5 billion dollars. This fund will be complemented with other financing tools such as borrowing under the Significant Infrastructure Government Loan Act or Singa. The first Singa bonds were launched by Singapore’s central bank in September 2021 to finance major long-term infrastructure including coastal and drainage infrastructure in and we will also be exploring tapping into green bonds to finance our projects.”

Hazel Khoo
Director of Coastal Protection Department
PUB, Singapore’s National Water Agency

The annual cost of adaptation in developing economies alone will be between US$155-330bn by 2030...

... but adaptation finance falls dangerously short as only US$46bn went to it globally in 2019/2020...

...and all of this is from governments and development banks

Gaps in financing adaptation could lead to maladaptation which will only make risks worse...

...yet 12 years after their pledge the richest nations are still unable to raise the US$100bn per year for developing countries to adapt

Banks must step in because even wealthy proactive governments may struggle to raise funding for adaptation – this is a huge, missed opportunity

Singapore is raising billions of dollars for adaptation projects but not all countries will be able to do the same
4 strategy pitfalls to avoid – don’t shoot yourself in the foot!

1. Bank net zero strategy ≠ adapt for 1.5°C as decarbonisation requires collective action & we’re heading to 2.7°C.

Banks that stress test their loan books against short time horizons and to the wrong worst-case don’t “see” the risks their portfolios face. This has led many banks to aim for 1.5°-2°C in terms of decarbonisation with net zero strategies and thus have adaptation plans for the same scenario. But 1.5°C-2°C is aspirational and only achievable when collective action towards decarbonisation is happening; which isn’t at the moment. So, for resilience planning governments, finance and corporates should not pick scenarios based on the warming path they wish we will get to (1.5°C-2°C), but where we are actually heading (2.7°C). As succinctly summed:

“If we just make it simple 1.5°C, 3°C, 4°C scenarios, you can’t just run one climate scenario, what we really need to do is mitigate to 1.5°C and plan to adapt to 4°C. So, already talking about two different scenarios and what we are doing in practice, in the real world is mitigating to something well above 2°C and adapting to essentially nothing. So, that should be really really alarming because it’s… guaranteed failure”.

Eric Nietsch, Head of ESG
Manulife Investment Management Asia

2. Mismatched climate strategies = negative feedback loop. Prioritising carbon over physical risks leads to a false sense of security as assessing one set of risks but not the other will provide an incomplete picture of the risk landscape. Because of this, wrong investment decisions are being made that will add to risks and perpetuate bad decisions – banks will continue to lend to carbon intensive industries, which will escalate SLR risks in vulnerable coastal locations. At the same time, because banks cannot “see” the full extent risks, capital will also continue flowing to vulnerable locations, further compounding SLR risk exposure. This negative feedback loop will continue until chronic SLR risks are assessed and the sector can make proper risk evaluations.

3. Limited financing leads to maladaptation, says IPCC. Financing of adaptation that isn’t fully thought through can lead to maladaptation. Also, the lack of financing also lead to maladaptation as adaptation options are constrained. Short-sightedness is a key cause of maladaptation – we favour the short term and so our systems from business to finance also favour the short term. Our decision-making on adaptation is thus identified by the IPCC as “driven by short-term thinking or vested interests, funding limitations, and inadequate financial policies and insurance” – this blocks the path to effective adaptation. To break the cycle of the negative feedback loop and to avoid maladaptation finance must carry out better stress tests as the risks would be hard to ignore – see “Transformative adaptation: 5 tips summarised from IPCC” to avoid maladaptation, and Section III for how to stress test.

4. Overshooting 1.5°C and waiting for tech to come to the rescue. While stepping up finance and moving from incremental to transformational adaptation can help reduce bank risks, we must try our hardest not to overshoot 1.5-2°C as we will not be able to reverse impacts, especially pertaining to SLR. Overshooting could lead to the triggering of tipping points, which will be dire for coastal populations – see “Tipping points may be triggered = rapid SLR by ~2060”. The faster we warm, the closer we will be to hard adaptation limits. As Dr Aditi Mukherji, the co-lead author of the water chapter in the latest set of IPCC reports said: “Effectiveness of most adaptation responses decreases drastically at global warming levels of 1.5°C to 2°C”. The narrowing window of opportunity means that we no longer have the luxury of leaving adaptation to later. “Mitigation and adaptation efforts have to go hand in hand” she adds.
Transformative adaptation: 5 tips summarised from IPCC

The IPCC AR6 WGII report provides a lot of information about the need for adaptation – we have summarised some of this information into five tips below. Follow these to ensure cities, residents and economies are more resilient in the long term.

1. Fragmented action will not protect against complex cascading risks ahead. Some good news first: growing public and political awareness of climate impacts and risks means that 170 countries and many cities have included adaptation in their climate policies and planning processes.

But the bad news is that the AR6 WGII finds that “Most observed adaptation is fragmented, small in scale, incremental, sector-specific, designed to respond to current impacts or near-term risks, and focused more on planning rather than implementation”.

2. Maladaptation limits transformation & future solutions. The IPCC AR6 WGII report devotes a substantial amount of its Summary to Policymakers (SPM) to maladaptation and its pitfalls highlighting the problem of ignoring long-term impacts and adaptation commitments. The report summarises it well, “Actions that focus on sectors and risks in isolation and on short-term gains often lead to maladaptation if long-term impacts of the adaptation option and long-term adaptation commitment are not taken into account”.

Maladaptation is highly possible due to the short-sightedness of governments, finance and corporates. The right timelines are key when assessing risks and planning adaptation. Multiple stakeholders (business, finance and governments) will likely assess risks in the near-term and plan adaptation accordingly instead of analysing the risks in the medium and long term. Such actions could lead to a massive undervaluation of risks.

Let’s take SLR as an example – in the near-term, it poses little risk, in the mid-term, abrupt jumps cannot be ruled out and by the long term SLR could be existential to even cities like Hong Kong. Globally, on average, we could see SLR of 0.26m by 2050. However, if we don’t rein in emissions, according to the IPCC it “cannot be ruled out” that SLR will accelerate to 2m+ by 2100 and then accelerate again to 5m by 2150.

Clearly, if we only assess risks and plan adaptation for the near term, adaptation actions will only be incremental and will not be able to withstand escalating risks. If we were planning for 2m-5m of SLR in the long term, we would be bolder and more transformative with our adaptation actions than for 0.4-1m of SLR.

Short term planning could lock us into an adaptation path that would be difficult to deviate from due to the millions of dollars already invested leading to maladaptation. We cannot “undo” drainage/levees/sea walls that are not enough or suddenly redesign parts of a city as SLR accelerates. Short term spending on infrastructure must be part of an integrated long-term adaptive plan. Otherwise, like the IPCC cautions, we could box ourselves in if we are not careful.

3. Don’t look to the past when planning for the future – aim for low regret & flexible strategies. Short-term and long-term climate risk assessments could deliver wide outcomes (like in the case of SLR), and when this happens, we tend to look to past trends for answers. But climate science is fast-evolving so we must resist the pull of the past.

Given that we have underestimated impacts in the past, we could well underestimate them again in the future especially due to “deep uncertainty” ahead – please see “Tipping points may be triggered = rapid SLR by ~2060” in SECTION III for more. The AR6 accounts for this by providing a low confidence high emissions scenarios and using language like “cannot be ruled out”. Here, how much you do will depend on how much is at risk. If there is concentrated risk, to avoid human misery ahead, it is better to err on the side of caution and opt for low-regret scenarios when planning adaptation.

These adaptation strategies must be flexible – accelerating implementation as and when impacts escalate or when we have gathered better science to inform better decisions. They must be monitored, reviewed and updated constantly to remain adequate and up to date.
4. There are limits to adaptation – we won’t be able to fix everything & poorer countries will suffer more. The IPCC is clear – we caused this, but we may not be able to fix it “Climate change, through hazards, exposure and vulnerability generates impacts and risks that can surpass limits to adaptation and result in losses and damages”. The AR6 WGI identifies two types of limits to adaptation:

- **Soft adaptation limits**: Adaptation options may exist but are currently not available due to a range of constraints – primarily financial/poverty, governance/inequity, institutional and policy constraints or technical.

- **Hard adaptation limits**: No adaptive actions are possible to avoid intolerable risks – ecosystems that are already reaching or surpassing hard adaptation limits include some warm water coral reefs, some coastal wetlands, some rainforests, and some polar and mountain ecosystems.

While stepping up finance and moving from incremental to transformational adaptation can help overcome soft adaptation limits, sadly, many natural systems are already near the hard limits of their natural adaptation capacity. And further warming only means that more systems will reach their limits. The AR6 WGII is very clear – it explicitly warns that overshooting 1.5°C will be disastrous as we will not be able to reverse impacts.

The AR6 WGII is also very clear that we will not be able to protect everything – “Adaptation does not prevent all losses and damages, even with effective adaptation and before reaching soft and hard limits”. Ultimately, we may have to abandon regions that are undefendable or beyond the hard limits; we will have to put in “advance and planned relocation” strategies that are implemented over time so as to cause minimal disruptions to lives and livelihoods.

5. All together now – holistic efforts domestically & internationally. Visionary adaptation responses will have to be “Comprehensive, effective, and innovative” plus take into account all the points above. This requires an “all-together” approach towards resilience that includes ensuring water & food supply, low/no carbon power generation, sufficient financing as well as economic and social stability.

To deliver this, there needs to be transformative change in all our systems that serve us from government, business to finance as they were all designed to tackle the “old climate”. Each of these challenges are daunting on their own; together they are monumental but we have to start somewhere.

Besides adapting domestically, we will have to work together as the AR6 WGII warns: “Weather and climate extremes are causing economic and societal impacts across national boundaries through supply-chains, markets, and natural resource flows, with increasing transboundary risks projected across the water, energy and food sectors”. But this may prove difficult because global leaders can’t even get their act together to decarbonise or tackle COVID.

In the end, governments are supposed to serve the people, and we the people will have to demand this transformative change. But before we do that, we can take a good look at our own carbon-intensive, non-sustainable lifestyles and transform that first. If you don’t know where to start check out the CWR report “Together We Can: 8 Habit Changes for Below 2°C” – it has simple habit tweaks we can all do to kick start our journey toward a climate resilient future.

---

**Recommended reading**

- 8 Things You Need To Know About Water in the IPCC AR5
- 8 Things You Must Know to Survive
- Dire Impact Facts You Must Know
- Ice Tipping Points
Mismatches bank & gov’t climate adaptation strategies

Most banks and governments are currently not adapting and even if they are, strategies are misaligned. Clearly, banks and governments must align their decarbonisation strategies, but futureproofing the financial sector against SLR risks requires banks and governments to align their adaptation strategies. Currently, the combination of their strategies fall in four broad scenarios which have different outcomes for the financial system. These scenarios are described in the matrix below.

The highest risk is Scenario 1: Double Blind Maximum Risk where neither banks nor governments are acting to properly assess/adapt for SLR risks. On the other end is Scenario 4: Transformative Adaptation – this is the ideal situation where both governments and banks are acting, hence managing risks and providing banks the highest chance of staying afloat despite rising seas. Scenarios 2 and 3 fall in-between and success will depend on actions of the bank – banks will end up in Scenario 2: Limited $$$ = Maladaptation if they fail to provide governments with sufficient financing to support transformative adaptation. As for Scenario 3: 50/50 Chance: Banks Must Engage Gov’ts, the outcome will depend on whether or banks are successful in persuading governments to implement transformative adaptation or not. The various outcomes are illustrated in the flow chart on the following page.

**GOVERNMENTS**

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<td>If this were to happen, the negative feedback loop as explained in the previous page will continue and spiral leading to accelerating and compounding impacts. There will be little or no adaptation efforts, and any will likely lead to maladaptation. Money will be wasted on projects that will be useless in the long term. Worse still, incremental adaptation plans will compound risks as it provides a false sense of security and perpetuates the negative feedback loop. As most countries/cities are currently in this situation, banks must stress test right today to see this maximum risk to avoid financial systems collapse.</td>
<td>Most governments will struggle to fund all their climate action themselves and will need the support of private capital. However, without banks, it will be hard for governments to finance transformative adaptation projects to prepare coastlines for low-regret scenarios. This lack of financing is a major barrier to the long-term resilience of economies and could lead to maladaptation as governments that will not have the coffers to foot the bill for transformative adaptation will be forced into piecemeal action. Banks’ exposure to SLR risks will therefore remain very high.</td>
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<td>The financial sector yields significant power because it controls capital. If banks carry out stress tests and recognise how much of their loan books could be at risk, they can play a vital role by engaging and driving governments to ensure that the “low-regret” scenario is adapted for through transformative adaptation. Whether or not banks will be successful will depend on whether or not they have managed to persuade the government to implement transformative adaptation or not. If successful, banks will still need to finance transformative adaptation to ensure its implementation. Only then are risks managed, if not, banks will end up between Scenarios 1 &amp; 2.</td>
<td>This scenario offers banks the highest chance of avoiding systemic shocks. Once the risks have been assessed and governments have clear long term transformative adaptation plans in place, banks can turn to innovate adaptation financing products. As adaptation is complex, financing will not be plain vanilla/quick wins, so banks should lead collaborative groups to innovate new products that are tailored for each city/country. This is a missed opportunity as most banks are waiting for governments and regulators to tell them what to do. To get on this pathway, banks must first “see” the huge gaps in adaptation finance – they must start this journey by stress testing right today to support transformative adaptation.</td>
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Path to staying afloat starts with stress testing right

**SCENARIO 1**
- **Maladaptation**
  - Negative Feedback Loop perpetuates & compounds risks
  - Systems Collapse
  - Maximum Risk
  - Double Blind Maximum Risk
  - Sink Savings

**SCENARIO 2**
- **Maladaptation**
  - Limited financing leads to maladaptation
  - Limited $$$ = Maladaptation
  - Scenario 3

**SCENARIO 3**
- **Limited $$$**
  - Maladaptation
  - Scenario 4

**SCENARIO 4**
- **Managed Risk**
  - Banks support governments with adaptation $$$
  - Can banks drive governments to transformative adaptation?
  - If yes, then banks must engage government's transformative adaptation
  - If no, then Scenario 3 or Scenario 2

**BANKS STRESS TEST**
- Are banks using "low-regret" long-term scenarios to stress test?
  - If yes, then transformative adaptation
  - If no, then Scenario 3 or Scenario 2

**GOVERNMENTS**
- Are governments planning for "low-regret" transformative adaptation?
  - If yes, then transformative adaptation
  - If no, then Scenario 3 or Scenario 2
Regardless of scenarios, path to financial resiliency starts with stress testing right today. It is clear from the matrix above and flow chart on the following page that no matter what governments are doing, banks must stress test right in order to stay afloat. Otherwise, the chance of ending up in a “Double Blind Maximum Risk” scenario that could trigger financial systems collapse is high. Stress testing right with long timelines and “low-regret” scenarios will ensure banks “see” the risks they’re up against and provide banks with the best chance of a soft landing from SLR risks.

Currently most APAC banks and governments analysed are in Scenario 1 or 2. As the matrix above shows, Scenarios 1 and 2 have the highest risk – this is because banks in the countries we’ve analysed are using the worst-case and not the “low-regret” scenario to stress test SLR risks. Hong Kong is heading down Scenario 1: Double Blind Maximum Risk, meanwhile, Japan’s FSA although stress testing to the right timeline, has yet to carry out stress tests at the “low-regret” scenario. Clearly, this must change as these two high risk scenarios will lead to either hard landing or financial systems collapse. The only way out is for banks to stress test right today. Even in the case of Singapore, where the government is heading towards transformative adaptation, banks will still need to support with billions of dollars of financing to ensure implementation so that SLR risks are managed. The Monetary Authority of Singapore (MAS) is currently stress testing – it will be interesting to be see which scenarios they use.

Stress testing right will set banks on a path towards Scenario 3 & 4 and financial resiliency. Only when banks see the risks can they engage and support the government on their path towards transformative adaptation. This is now more urgent as SLR risks are accelerating. Moreover, transformative adaptation needs time, so banks must start stress testing right now. Do not wait for the government to “adapt right” and even if the domestic government is acting there is the regional loan book to consider – triple whammy concentrated loan book risks to SLR mean that even Singaporean banks cannot afford to be complacent. See SECTION I: Triple whammy! Concentrated loan book risks to SLR could sink savings.

Central banks & regulators must pave the way by providing guidance to stress test right. Most banks will not carry out better stress unless they have to, so central banks & regulators have a major role to play – provide better guidance on how to stress test for coastal threats and make these stress tests mandatory. We have set out “5 must do’s for central banks & regulators to avoid systemic shocks triggered by SLR” later on in this section.

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CWR 3-Step Guide to Stress Test Right for SLR Risks: Avoid hard landing & catalyse transformative adaptation

No matter what governments are doing banks must stress test right in order to stay afloat

Scenarios 1 and 2 have the highest risk but that’s where most APAC governments and banks are...

...the only way to change this is for banks to stress test right today

When banks “see” the risks, they can support proactive governments & engage laggard government

Central banks have a key role to play by providing guidelines for banks on how to stress test better
CWR 3-Step Guide to Stress Test Right for SLR Risks:
Avoid hard landing & catalyse transformative adaptation

SECTION III

The path to financial resiliency starts with stress testing right. The NGFS has recognised that climate risks can trigger systemic shocks across the global financial system and has asked banks to stress test for worst-case scenarios to assess such risks. However, multiple worst-case scenarios for SLR has caused confusion. Banks, finance and regulators have yet to factor in tipping points that can result in “cannot be ruled out” 2-3m of SLR by 2100. They should be using these “low-regret” levels of SLR to stress test instead of ~1m. Escalating risks and knowledge gaps mean that stress testing wrong could leave banks “Double Blind” with maximum risk. All this can be avoided, if regulators push banks to stress test right – this will help banks “see” risks and finance transformative adaptation.
Banks, finance and regulators have yet to use “low-regret” scenarios for stress testing...

“What we probably need to appreciate is that what we are all doing is doing scenario analysis and the real stress testing is slightly different. For example, should we be incorporating tipping points into stress tests because scenario analysis, RCPs don’t take into account tipping point so those are the kind of things we need to work on but I think we are making slow and steady start. Banks, finance and regulators have yet to use "low-regret" scenarios for stress testing…”

Dr Mayank Kaul  
MD & Head of Real Estate Risk, Asia Pacific, Europe, Middle East & Africa  
Citibank

“We are right now working on how to develop a certain set of data for analysing physical risks and the goal is to incorporate certain elements of tipping points as part of the plan but at the same time because the scenario development is based on certain global collaboration with climate science, so tipping points discussion is not scientifically fixed unfortunately.”

Satoshi Ikeda  
Chief Sustainable Finance Officer  
Japan Financial Services Agency

“So, in order to hope for the best but plan for the worst we really have to take action really before 2030 to mitigate climate change but then we need to be planning for adaptation out to 2100.”

Eric Nietsch  
Head of ESG, Asia  
Manulife Investment Management Asia

Some corporates and governments are using “low-regret” scenarios for planning...

“Results of these “low-regret” stress-tests revealed: Around half of our GBA assets demonstrate strong resilience against coastal flood risk, and day-to-day operations will likely be minimally affected even in the 8m stress test… These findings provide a firm baseline, against which to plan, track and allocate further resilience improvements to build a climate-informed portfolio. Some corporates and governments are using “low-regret” scenarios for planning…”

Link Real Estate Investment Trust  
Annual Report 2021/2022

“The region, actually the whole world needs adaptation finance… We need to be innovative in finance… How can we look at some of the adaptation finance projects that actually are so critical and viable? An example, when we look at adaptation finance, we usually think of sea walls, hard engineering solutions but actually, adaptation finance is also about sustainable food production systems, a sustainable water production system. Water is going to get scarce in some places while it is going to get too much, inundated in other places. So, for water that is something to basic to human lives, how can we ensure it is adapted to new climate conditions? How do we fund that?”

Grace Fu  
Singapore Minister of Sustainability and the Environment
Central banks recognise materiality of chronic SLR risks, but stress test guidelines must improve

Central banks under NGFS are pushing stress testing but no guide provided on SLR risks = inconsistent assessments. The creation of NGFS, which now has 116 central banks and financial supervisors as members, kickstarted stress testing by banks for physical (both acute and chronic) and transition climate risks. This is positive as it forces banks and investors to focus on the risks they face from climate change. However, no stress testing guidelines are provided leading banks to use multiple time horizons to stress test risks. As banks tend to look at shorter rather than longer timelines, most central banks are stress testing to shorter timeframes. This increases the risks of being blindsided as SLR risks do not manifest in the near term but from 2050 onwards.

Already shorter term SLR tests show materially significant risks for bank loan books. The large-scale financial stress tests run by central banks have highlighted the materiality of climate risks. For example, the HKMA pilot stress test of its banking sector involving 27 banks revealed that almost HK$1trillion worth or 32% of participating banks’ mortgage and property lending are vulnerable to climate impacts mainly from flooding and typhoons. Yet, the results could be worse given accelerating SLR as warned by the recent IPCC report – see SECTION IV for more.

Yet such risks are undervalued because the wrong scenario and timeline are used in stress tests.

- Using the wrong timeline – the risks will be felt in 50-80 years but assessments are being carried out only for the next 5-30 years, which means valuations are not being adjusted even though the lifespan of certain projects and investments will be 50-80 years – for more see Step 1. Use the right timeline – long-term, NOT short-term.
- Using the wrong worst-case scenario – climate science is still evolving, and we continue to under-estimate the worst case; the IPCC has many ranges for the worst-case scenario, but most are not using the “low-regret” scenario, where the IPCC warned that that 2m SLR by 2100 and 5m of SLR by 2150 "cannot be ruled out due to deep uncertainty in ice sheet processes" – for more see Step 2. Use the “low-regret” scenarios, NOT just the worst-case.

Clearly, to see the full risk, both timeline and worst-case scenario must be correct. Even though current stress tests show some risks, they could be much worse as they don’t use the right timeline or worst-case scenario with tipping points. In addition, complacency remains as many banks hope that insurers will bear the risk, but that’s highly unlikely to be the case. So, stress tests must improve as risks are currently being undervalued leading to continued investment in carbon intensive industries and a lack of investment in adaptation. For more on the problem of banks relying on insurers see “Banks can’t rely on insurers as climate risks escalate & compound” in SECTION I.

As government adaptation action can mitigate risks = government action must be taken into account viz-a-viz the stress test. Governments that are proactive will considerably reduce the risks that banks are facing. But the same is true for governments that are not acting or could be making things worse with their short sightedness. Banks are currently not acting on engaging governments because they themselves don’t understand the risks, but this must change – for more see Step 3. Assess what governments are doing, or NOT doing.

Therefore, follow the CWR 3-Step Guide to Stress Test Right for SLR Risks to avoid hard landing and catalyse transformative adaptation. Due to the current inconsistencies in stress testing and the under valuation of chronic SLR risks we have prepared a 3-step guide to help banks stress test better and understand the ‘real’ risks they’re facing. This will help banks ‘see’ the full extent of their SLR risks so that they can put in place proper resilience plans to deal with the triple whammy exposure and to avoid systemic shocks to the financial system. This is important as traditional risk management methods do not work for sector agnostic and geolocational concentrated SLR risks. Depending on whether the government is or is not carry out adequate adaptation, seeing these risks will also help banks appreciate the step to drive and finance transformative adaptation. See the 3-Step Guide on the following pages and the “8-Step Checklist to Futureproof Banks from SLR Risks”.

The lack of appropriate stress testing guidelines for SLR risks has led to short term time horizons being used = hides the materiality of future SLR risks

Even with short term time horizons HKMA's stress test showed that 32% of HK bank property loan books at risk from floods & typhoons

But risk to loan books will be higher if longer timelines and “low-regret” scenarios were used in stress tests

Stress tests must improve because SLR risks are being undervalued and are thus not being addressed

But it’s not just the physical risk, because if governments are acting the risk will be lower and vice versa

The CWR 3-Step Guide to Stress Test Right for SLR Risks will help banks ‘see’ the full extent of their SLR risks so that they can fastrack action to ensure they are resilient
1. Use the right timeline – long-term, NOT short-term

**RECOMMENDATION:**

- Use long-term (50-80 year) timelines for stress testing as chronic climate risks will not manifest in a material manner in the next 5-30 years (before 2050).
- Long term timelines are in line with the IPCC recommendations and will catalyse transformative adaptation, whereas shorter timelines will likely lead to maladaptation.
- For better “futureproof” planning for new infrastructure projects longer timelines must be used; this also helps banks avoid sinking money into maladaptation.

Chronic risks such as from sea level rise will be felt in 50-80 years’ time but most stress tests and risk assessments are being carried out only for the next 5-30 years. The stress tests being run by 29 NGFS members were highlighted in the NGFS report “Scenarios in Action: A progress report on global supervisory and central bank climate scenario exercises” in 2021 and as the graphic below shows the majority are looking at 30-year time horizons at the most. Some are even only looking at 0-5 years only. The two that are looking at 80 years are the Japan Financial Services Agency/Bank of Japan for physical risks and Banco de la República (Colombia) for GDP effects. This means the 20 of the 29 central banks that are stress testing to 30 years or less could be severely underestimating SLR risks – for perspective, the global average SLR in the worst-case scenario is 0.26m by 2050, but SLR could be anywhere from 0.66-1.04m under the same scenario by 2100 and 2m+ by 2100 under the IPCC’s “cannot be ruled out” scenario.23

But the lifespan of many houses and infrastructure projects are over 50 years. Banks provide long term mortgages and project finance for houses and infrastructure such as airports and ports that have much longer lifespans. Even if chronic risks don’t affect them during the span of a loan, what happens to these loan repayments once future coastal threats start to be priced in? Because it will happen sooner rather than later especially as climate risks are accelerating. In fact, assets could be stranded much earlier than impacts, leaving banks bearing the risks – see “Banks can’t rely on insurers as climate risks escalate & compound” in SECTION I.

Mass re-evaluation of significant tail risks from chronic SLR risks will turn all vulnerable assets from “freehold” into “leasehold” valuations. An asset that will eventually be permanently submerged should not command the same valuation as one that does not face this future. Currently, valuations have not fully priced this in. But it will happen because a “freehold” asset that will be permanently submerged and is in a vulnerable location where the government and/or asset owner are not adapting has now become a “leasehold” property – as the graphic below shows. This asset will struggle to find insurance in the long term and will also not be able to be used as its lifespan has been cut short. Therefore, it should not command the same value as the “freehold” property. Sooner or later, markets will start to price this in – if SLR will affect a property by 2100 it should be priced at a ~20% discount compared to a freehold property in a city such as Singapore.24

Banks must use long-term (50-80 year) timelines for stress testing as this is in line with the IPCC recommendations.

Stress tests run by 29 NGFS members show that most are looking at 30-year time horizons...

... some are only looking at 0-5 years when barely any SLR will be felt.

This means banks stress testing to 0.26m of SLR by 2050 instead of 2m+ by 2100 will not fast-track their adaptation or decarbonisation action...

... even though bank mortgage books and infrastructure lending could be affected by SLR...

... as asset revaluations will not wait for the physical impact – it will happen years and maybe decades ahead.

---

**MOST NGFS MEMBERS RUN STRESS TESTS WITH A MAXIMUM 30 YEAR TIMELINE**

![Source: CWR, NGFS (2021) Scenarios in Action A progress report on global supervisory and central bank climate scenario exercises. Infographic © China Water Risk 2020, all rights reserved.](image-url)
A freehold asset that is vulnerable to SLR by 2100 will become a “leasehold” property as its lifespan has been cut short…

…and should be priced at a ~20% discount compared to a freehold property in a city such as Singapore.

Insurance matters – their action can bring forward asset revaluations and strandings

Central banks must act now to ensure banks…

…stop investing in carbon intensive industries and vulnerable locations

…stress test right to support proactive governments & engage laggard gov’ts

…providing funding to avoid maladaptation

Asset write-offs could be earlier because insurers will stop insuring. Insurers have flexibility on their side as premiums are renewed annually. This means that insurance can be suddenly lost due to it becoming too expensive or certain locations no longer getting coverage. This could happen years before any physical risk is felt, which means assets could be stranded with their value at zero – for more see “Banks can’t rely on insurers as climate risks escalate & compound” in SECTION I.

Given significant exposure, risk management needs time so banks need to start now. With the high probability that assets will be stranded even before rising seas due to the lack of affordable insurance, central banks need to act now. By encouraging banks to stress test better, we can avoid the following:

- Negative feedback loop where capital continues to flow to carbon intensive industries and locations vulnerable to climate threats can be slowed;
- “Double Blind Maximum Risk” scenario where both banks and governments do not see the need for transformative adaptation which is an extremely high-risk scenario most countries/cities are in; and
- Maladaptation as proactive governments do not have the funds to carry out their transformative adaptation plans, and laggard governments are investing in adaptation that does not make sense.

For more details on these pitfalls please see “4 strategy pitfalls to avoid – don’t shoot yourself in the foot!” in SECTION II. Don’t be lulled into a false sense of security that material SLR impacts will only happen in the second half of the century. We cannot be complacent; we need to start now because transformative adaptation needs time to plan and implement.

With long timelines in place, we must now ensure that stress tests are carried out using the right “worst-case” scenarios – more on this in Step 2.
2. Use the “low-regret” scenario, NOT just the worst-case

**RECOMMENDATIONS:**

- Use the “low-regret” scenario to stress test loan books – so use SLR levels that the IPCC warned “cannot be ruled out” of over 2m by 2100. The CWR APACCT 20 Index can be used to analyse what the “low-regret” case means for the 20 APAC cities in the index.
- This is higher than the worst-case scenario SLR of 1.04m and will allow for adaptation planning flexibility to cope with escalating and compounding risks.
- Climate threats are accelerating and if tipping points are triggered, there is a possibility of rapid SLR by ~2060 – so it’s better to be safe than sorry with “low-regret” scenarios.

The IPCC provides various sets of worst-case scenario SLR figures. As per the chart on the next page, the IPCC has various sets of worst-case SLR estimates for 2100 ranging on the top side from 1.04-2.33m. This causes confusion for stress testing as many select the 1.04m scenario as “the worst-case scenario” if stress testing for 2100. However, there are clearly other even more “worst-case” scenarios to consider that include dynamic processes known as marine ice cliff instability (MICI) and marine ice sheet instability (MISI) that could accelerate sea level rise. Moreover, the oceans are warming faster than we thought, not only accelerating such melt, but also ramping up the thermal component part of SLR. Once these and other latest scientific observations are included SLR could be as high as 2.33m.

To ascertain the “real worst-case” risk exposure, IPCC “cannot be ruled out” numbers should be used. The latest IPCC AR6 “Climate Change 2021: The Physical Science Basis” warned that 2m of SLR by 2100 and 5m by 2150 “cannot be ruled out due to deep uncertainty in ice sheet processes”. It is important to note that this sentence was not buried in the deep depths of the ~4,000 page report but was highlighted in the Summary for Policymakers. Clearly, the scientific community is concerned; also highlighted in the same summary was the fact that SLR is irreversible; “Many changes due to past and future greenhouse gas emissions are irreversible for centuries to millennia, especially changes in the ocean, ice sheets and global sea level.” It is now “virtually certain that global mean sea level will continue to rise over the 21st century”.

The “low-regret” IPCC “cannot be ruled out” scenario ranges from 1.63-2.33m. The high or top-end of the range should always be used for stress testing. For this scenario there are two ranges as per the chart on the following page – the 17th-83rd percentile range of the distribution curve is 0.66-1.63m and the 5th-95th percentile range is 0.53-2.33m. We recommend using the high/top-end of the ranges to stress test – so somewhere between 1.63-2.33m. However, for the most accurate stress test, local SLR should be used e.g. the local “low-regret” scenario for Hong Kong is closer to 3m – so 2-3m should be used for Hong Kong. These are also in-line with the various ice expert papers (SEJ 2019 & Kopp et al. 2017). Local tides must also be factored in.

CWR APACCT 20 Index can be used to see what the “low-regret” case means for 20 APAC cities. The 1.5°C CWR APACCT 20 Index, where SLR of 2.9m was mapped, uses similar SLR levels to the top-end of the “low-regret” range. The IPCC worst-case numbers and ice sheet expert numbers are also similar. Therefore, the maps, stats and rankings included in “The CWR Coastal Capital Threat Series” can be used to understand the absolute and relative risks facing the 20 APAC capitals and economic hubs covered in the series, by 2100. However, note that mapping at lower granularities and local tides were not included. So, while the index is a good indicator of risk, we recommend specific location deep dives for full assessment.

Climate science is still evolving + climate threats are accelerating = the “worst-case” keeps getting worse. When we wrote the CWR coastal threat reports in 2020 and suggested that the index benchmark level of 2.9m can be used to gauge SLR risks by 2100 instead of by 2200 due to MISI and MICI, many thought we were too aggressive. But now, in 2021 the IPCC warned of “cannot be ruled out SLR” of 2.33m in the Summary for Policymakers. The rate of ice sheet loss has increased by a factor of 4 between 1992-1999 and 2010-2019. Continued ice loss over the 21st century is now “virtually certain” for the Greenland ice sheet. Since, we may now hit 1.5°C in 2026, ocean warming will accelerate, increasing the likelihood of rapid SLR after around 2060 – for more see “Sea levels – Rising faster than you think!” in SECTION II. We’ve always underestimated impacts so it is better to be safe than sorry and use the higher worst-case SLR estimates for stress testing.
What governments are doing to adapt to climate impacts can help mitigate SLR risks as can risk assessments by banks if conducted properly. So, we have provided a quick summary of various key scenarios in below.

Overview of the different worst-case scenarios vs adaptation efforts and risk assessment at 2100

LATEST SLR PROJECTS VS ADAPTATION PLANNING & RISK ASSESSMENTS

The IPCC AR6 has various sets of high emissions scenarios. The first set takes into account MISI but not MICI. The subsequent sets include MICI – the high-end of these range from 1.22m to 2.33m. Aside from the first set which is classified as “medium confidence”, all other sets are “low confidence” because there are “deep uncertainties” in ice sheet dynamics (MICI & MISI). As climate science is fast-evolving and these “deep uncertainties” could bring high impacts, the IPCC has included the highest of these sets in its Summary for Policymakers – denoted in the chart above as ‘AR6 Cannot be ruled out’. This underscores the importance of the “cannot be ruled out” range for adaptation planning today.

The IPCC “cannot be ruled out” scenario jibes with ice sheet experts. This scenario is more likely if we continue down 3°C path because picking a later net zero date could trigger faster Antarctica melt & rapid SLR earlier. The latest research cited in the IPCC AR6 showed that 1.5-2°C will likely result in Antarctica ice loss at a rate similar to that today whereas a current policies path of 3°C could trigger “an abrupt jump” in ice loss after around 2060 due to the destabilisation of the West Antarctic Ice Sheet caused by the retreat of the Thwaites Glacier.36 This abrupt jump could deliver multi-meter SLR by 2100. As shocking as this could be, the ice loss could be further accelerated if we inadvertently trigger more tipping points – for more see the next page.

Government SLR planning level can vary significantly from 0.49-3m, either reducing or compounding risks. While Singapore and New York are matching what ice sheet experts are warning about, Hong Kong is not even close to IPCC figures. This has major risk implications – see Step 3 for more.

Use the CWR APACCT 20 Index to start your risk assessments. The index used SLR to a similar level to the ice sheet experts, Singapore and New York. Therefore, it can be used to benchmark risks for the 20 cities covered in the index. However, note that mapping was conducted at lower granularities and local tides were not included. So, while the index is a good indicator of risk, we recommend specific location deep dives for full assessment – see box below for more.

Central banks stress testing needs to improve. Of the three governments mentioned in the chart above, only the HKMA has provided public stress test levels. While the HKMA did not disclose specific SLR levels used in the stress test, it did indicate that 2050 worst-case scenarios were used – this point to local HK SLR levels of 0.32-0.55m. These are low compared to SLR levels that the IPCC and ice sheet experts are warning about as well as what Singapore and New York are adapting for. Yet even at these levels, risks are significant as the stress test showed that 32% of property loan books could be at risk – see SECTION IV for more.

Must consider locational variances, tides, storm surge and subsidence

All of the numbers discussed on these two pages only relate to SLR. And these are also all global averages – SLR differs from location to location. In addition, high tides, storm surges from typhoons and subsidence must be considered. These all vary by location. For more on how to build scenarios to include these please see CWR’s report “Changing Risk Landscapes: Coastal Threats to Central Banks” published in 2020.
Tipping points may be triggered = rapid SLR by ~2060

We must avoid triggering “large-scale singular events”. These would cause “abrupt, drastic, and sometimes irreversible changes in physical, ecological, or social systems”. These events include the change of the cryosphere (frozen water part of the Earth), slowdown of the Atlantic Ocean current, El-Nino Southern Oscillation as a global mode of climate variability, and the role of the Southern Ocean in the global carbon cycle. At current warming levels, these events are at “moderate risk” but will transition to “high risk” at 1.5°C-2°C, which is imminent.17

Beyond 1.5°C, we will trigger further acceleration of ice melt bringing forward multi-metre SLR by a century. A report released by cryosphere scientists after the COP26 meeting last year warned that “we cannot negotiate with the melting point of ice” and must remain close to 1.5°C because “Even today, having already exceeded 1.2°C, the lower boundary of essentially permanent SLR is now 2–3 meters; but this can be slowed to occur over many centuries with a 1.5°C peak and steadily declining temperatures thereafter. However, 2 meters could be reached by 2100 with current emissions, and an ultimate 15–20 meters would occur should temperatures peak between 2–3°C. Recovery from this would be greater than 10,000 years and only with temperatures below pre-industrial; ice sheets cannot grow back except in ice age conditions”.36 So, even temporarily overshooting 1.5°C will lock in long term SLR impacts.

On our current policy path of 2.7°C by 2100, this will “push ice sheets in ways not seen since the end of the last Ice Age”. Cryosphere scientists warn that “Sea-level rise of more than 1 meter already by 2100 is possible”. Also “Virtually no glaciers will remain anywhere on the globe outside the Arctic, Patagonia and Himalayas, where only 20–35% of ice will remain.” Besides causing SLR this would be disastrous for the 1 in 2 Asians that live in the 10 river basins that flow from the Asia's Himalayan water towers. Although such ice melt may be locked in, staying closer to 1.5°C could make the difference between rapid and disruptive loss of snow and glacier systems. The slowdown of melt will allow us more time to adapt. However, to deliver this we will need to cut emissions in the near term, preferably in the 2030-2040 timeframe – the earlier the better.

Faster permafrost melt will be disastrous = release carbon feedback loops that will accelerate warming. Today permafrost regions are already releasing the same amount of greenhouse gases as Germany’s annual GHG emissions.37 As ice and snow cover dwindles the surface of the permafrost regions are becoming darker absorbing more sunlight, in turn accelerating their melt. Even at below 2°C surface permafrost will largely disappear below the Arctic Circle and from nearly all mountain regions globally, bringing with it extensive infrastructure damage.38 We must rein in emissions to slow down permafrost thaw, as permafrost holds twice as much carbon as the atmosphere today.38 Studies show that much of the shallow permafrost, 3m deep or less, will thaw if the world remains on its current trajectory.39

Accelerated terrestrial and ocean warming = brings forward rapid SLR. Polar observations have been grimmer than expected, which means that there is a real chance that all of the above could happen earlier than expected especially as carbon emissions continue to rise. This had led some scientists to warn that this could trigger an abrupt jump in ice loss resulting in rapid SLR after ~2060, leading to multi-metre SLR by 2100, especially if we go beyond our current emissions path of 2.7°C by 2100.39

Better safe than sorry – proactive governments are factoring in tipping points & planning for “low-regret”. Advanced city planners such as Singapore and New York are planning for 2-3m of SLR by 2100 to account for these tipping points. However, deep uncertainties around the above, the fact that all polar observations are worse than expected, and sluggish action to curb emissions, have led scientists to worry that rapid SLR could happen after ~2060.40 Therefore, planning adaptation to 2-3m of SLR will allow governments to react fast if SLR is accelerated as plans would already be in place. Governments not planning for this would get caught out and banks’ lending there will be exposed.

Bankers have yet to factor in tipping points for stress testing but have signalled that they should be factored in. Our discussions in Singapore during the CWR/SIWW joint session in April 2022, revealed that banks have yet to factor such tipping points in their stress tests. However, given that the IPCC has now warned that multi-metre cannot be ruled out by 2100, regulators/bankers present have signalled that they should be factored in. However, bankers are reluctant to move without direction from the regulator, so everyone is in a holding pattern, which means banks/regulators still don’t have a grasp of their real risks ahead. Central banks must ensure that tipping points are factored into stress testing so that finance can ensure portfolios are being accurately assessed and capital allocation decisions make sense.

“We are right now working on how to develop a certain set of data for analysing physical risks and the goal is to incorporate certain elements of tipping points as part of the plan but at the same time because the scenario development is based on certain global collaboration with climate science, so tipping points discussion is not scientifically fixed unfortunately.”

Satoshi Ikeda
Chief Sustainable Finance Officer, Japan FSA

“What we probably need to appreciate is that what we are all doing is doing scenario analysis and the real stress testing is slightly different. For example, should we be incorporating tipping points into stress tests because scenario analysis, RCPs don’t take into account tipping point so those are the kind of things we need to work on but I think we are making slow and steady start…”

Dr Mayank Kaul
MD & Head of Real Estate Risk, APAC & EMEA, Citibank
3. Assess what governments are doing, or NOT doing

**RECOMMENDATIONS:**

- Banks need to see these risks so that they can drive governments who are not using the “low-regret” scenario to plan transformative adaptation to do so. Such transformative adaptation plans will reduce banks’ risks.

- Banks’ stress tests to the “low-regret” scenario will align with proactive governments that are implementing transformative adaptation. This will catalyse banks to innovate adaptation financing, which is sorely missing now.

- Should risks escalate, with tipping points triggered, which could mean rapid SLR by ~2060, adaptation implementation can be fast-tracked as plans would be in place.

- Build on the framework to benchmark government adaptation action used in the CWR APACCT 20 Index. Weightings were informed by consensus from input from over 100 finance professionals.

**Government SLR planning level can vary significantly from 0.49-3m, either reducing or compounding risks.** As per the chart in Step 2, it is clear that government action can vary significantly even across three island city financial centres. Singapore and New York are adapting for 2-3m by 2100, while Hong Kong is aiming for ~0.5m at best by 2100. So, while Singapore and New York are accounting for tipping points described in the previous page, Hong Kong is not – it has selected a low-to-medium emissions scenario for adaptation. Such wide gaps in SLR adaptation clearly leads to higher risks for banks lending to Hong Kong, especially since we’re on a high emissions path. This means that banks in Hong Kong are a lot more worse off than those in Singapore and New York due the government action on adaptation lagging. Because if Singapore is planning for 3m and Hong Kong is only planning for 0.5m, which city would you rather invest in? Let’s not forget Hong Kong has typhoons, Singapore does not.

**Mismatch between bank scenario testing and what cities are planning for = finance gaps for transformative adaptation.** Given that banks are yet to fully understand and analyse the impact of tipping points on climate risks, cities that are ahead will struggle to find funding from the private sector to adapt for this in the long term. Banks need to catch up and central banks/regulators must provide more guidance on how the financial sector should consider tipping points – because things that looked highly unlikely are now looking more likely as emissions are yet to peak and climate science continues to grow. Banks’ stress tests to the “low-regret” scenario will align with proactive governments that are implementing transformative adaptation and this will catalyse banks to innovate adaptation financing, which is sorely missing now.

**Even “rich” cities like Singapore and New York need innovative adaptation financing.** Singapore has been able to raise billions of dollars for its adaptation plans, but Singapore understands that it cannot survive alone and needs its neighbours and trading partners to do the same. This led to CWR being invited to be a thematic partner for Resilience Building at the SIWW 2022 and curating a session between finance, city planners and scientists to kickstart the conversation on evolving finance to support transformative adaptation.
Progressive adaptation can help mitigate risks – but only the right type. Setting a higher and longer term SLR target as advised by the IPCC will help catalyse transformative adaptation that can be implemented in phases. These phased build outs can be accelerated should risks escalate and tipping points are triggered. Even rapid SLR by ~2060 can be defended if adaptation implementation can be fast-tracked as plans would already be in place. However, if lower short terms SLR projections were used for adaptation planning, such flexibility will not be possible. Sadly, many countries, due to limited financing, have adopted this wait-and-see progressive adaptation approach – picking a shorter timeline and then ratcheting up later with incremental adaptation. However, such incremental adaptation would be difficult as previous efforts would have already locked in fixed investments into areas, which in a multi-metre SLR scenario, governments may have retreated from as they are undefendable. So bankers beware – back the right type of progressive adaptation.

Government adaptation action can reduce the risks facing finance and corporates. The CWR APACCT 20 Index highlighted that if governments are doing more on adaptation their cities will face relatively less risks and increase its ranking in the index – see “Government action on adaptation: CWR APACCT 20 Index” in SECTION II for more. CWR built this index with the support of over 100 finance professionals – to benchmark government adaptation action, a framework with 14 indicators within four categories was used as can be seen below. This framework can be used as a first step to understand what governments are doing.

We also recommend you read our report “Changing Risk Landscapes: Coastal Threats To Central Banks – Everything you need to know about sea level rise, storm surge & financial regulations to recalibrate risks” to help gain a better understanding on how to build coastal threat scenarios.

- 8 things you must know about SLR
- How to build coastal threat scenarios
- The latest on how finance plays catch up to the new risk landscape

There is a lot of science and complex interlinking risks that must be unpacked to stress test better – if you need any help, feel free to get in touch with CWR at info@chinawaterrisk.org.
HK Double Blind Maximum Risk Case Study!

HKMA & HK banks face systems collapse from huge SLR adaptation gaps

SECTION IV

Hong Kong comprises 200+ islands – it is vulnerable to SLR. With 70% of economic activities clustered in low-lying reclaimed land, it is not surprising that HKMA stress tests showed that around a third of Hong Kong banks’ property loan books are vulnerable to climate risks, especially floods and typhoons. However, the HKMA’s 2050 worst-case scenario stress tests means that at most SLR of 0.55m was used to assess risks – this is far from the 2-3m of SLR, which the IPCC warned “cannot be ruled out” by 2100. Sadly, the HK government is defending the SAR to the low-to-medium emissions scenario – in short 0.49m of SLR by 2100. This huge adaptation gap brings high exposure and could trigger systems collapse. Currently, because the HKMA, HK banks and the government are all using the wrong timelines and wrong scenarios, HK banks are on a “Double Blind Maximum Risk” path – neither “seeing” nor preparing for future risks. The HKMA must thus push banks to stress test right and steer away from “Systems Collapse”/“Hard Landing”, towards “Managed Risk”.

Significant exposure with <1m of SLR + adaptation plans lag…

“The results show that physical risks will be manifested in Hong Kong through two major types of climate hazards, namely typhoons and floods, causing devaluation of properties and business disruptions. Emphases of the assessment are therefore placed on the vulnerabilities of residential mortgages and other property-related lending in Hong Kong, which amounts to HK$2.9 trillion or 28% of the participating banks’ total lending…

Based on the location information of the property collateral, the participating banks identify that 32% of their Hong Kong property-related lending is pledged with collateral located in vulnerable areas and thus exposed to material physical risk.”

“From 1954 to 2015, sea levels in Hong Kong rose around 20cm. Meanwhile, typhoons have increased in intensity and frequency. Nevertheless, preparation for rising water levels is piecemeal and insufficient. Guangdong is busy building sea walls to protect vital assets, but Hong Kong has no concrete plans for coastal flooding, and while its airport is building a 6.5m sea wall, there is no clear plan for the roads and rail feeding into the transport hub.”

Charles Yonts
Ex-Head of Power and ESG Research

“Hong Kong’s future as a global finance hub is tied to what its government does to protect and adapt the HKSAR for clearly material coastal threats. While HK should aim its decarbonisation actions for a low emissions scenario, it should not use a low-to-medium emissions scenario to plan adaptation especially when there’s now a 50/50 chance we will breach 1.5°C by 2026.”

“Hong Kong must close existing gaps and bring its adaptation levels closer to those of other financial hubs to stay relevant, otherwise a credit rating downgrade could be on the cards. Finance must start collaborating and engaging with the government to ensure Hong Kong is resilient, for only then will the financial sector be resilient to chronic climate risks like sea level rise.”

Dharisha Mirando, CWR
Finance Engagement & Water Risk Valuation Lead

“In this fashion within both the PRC and Hong Kong SAR, government agencies are encouraging debt investors to be more prudent in issuing credit for development in areas vulnerable to known climate hazards, but a clear and formal process for doing so in both jurisdictions has yet to be defined.”

Urban Land Institute (2022)
Mitigating Climate Risk Impact to Real Estate Value in the Greater Bay Area
Significant exposure with <1m of SLR + adaptation plans lag...

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Based on the location information of the property collateral, the participating banks identify that 32% of their Hong Kong property-related lending is pledged with collateral located in vulnerable areas and thus exposed to material physical risk.”

“The participating banks project that the expected credit losses (ECLs) of their property related lending in Hong Kong will rise sharply under the physical risk scenario. The 1-year ECLs of the banks’ Hong Kong residential mortgages are projected to surge 25 times from HK$0.7 billion to HK$17.3 billion under the scenario, indicating a substantial increase in the risks faced by the banks in this area”.

Hong Kong Monetary Authority (2021)
Pilot Banking Sector Climate Risk Stress Test

“From 1954 to 2015, sea levels in Hong Kong rose around 20cm. Meanwhile, typhoons have increased in intensity and frequency. Nevertheless, preparation for rising water levels is piecemeal and insufficient. Guangdong is busy building sea walls to protect vital assets, but Hong Kong has no concrete plans for coastal flooding, and while its airport is building a 6.5m sea wall, there is no clear plan for the roads and rail feeding into the transport hub.”

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Urban Land Institute (2022)
Mitigating Climate Risk Impact to Real Estate Value in the Greater Bay Area
HKMA on a “Double Blind Maximum Risk” Path

Hong Kong banks are currently following the “Double Blind Maximum Risk” scenario as can be seen from the chart below. This is because Hong Kong’s government is adapting for the wrong scenario and HKMA is stress testing to the wrong timeline and scenario. This means that neither can “see” the sizeable risks ahead and are not planning for transformative adaptation. This “doubleblindness” puts Hong Kong on a dangerous path of maximum risk as banks continue to invest in carbon intensive industries as well as locations and sectors vulnerable to SLR. The HKMA can rectify this by pushing HK banks to stress test right – only then can it engage with the government to drive transformative adaptation to move away from “Systems Collapse”, towards “Managed Risk”.

Source: CWR
Infographic © China Water Risk 2022, all rights reserved.
“Double Blind Max Risk” = increased likelihood of HK banking systems collapse

63% of domestic loans in Hong Kong are skewed to sectors vulnerable to coastal threats. The chart below shows that of the HK$7.2trillion dollars of domestic loans in Hong Kong as of the end of 2021, 63% were skewed to sectors vulnerable to coastal threats – 47% in total to the property sector, 7% to trade financing, 5% to wholesale and retail trade and 4% to manufacturing.

HKMA stress test covered bank loan books accounting for 80% of the sector’s total lending. Given the risks, in December 2021 the HKMA published the findings of its pilot climate risk stress test that involved 27 banks, including 20 major retail banks and seven branches of international banking groups. The loan books were stress tested for three scenarios: two transition risk scenarios (disorderly and orderly) to a low-emission economy and a physical risk scenario of worsening climate risks at mid-century. This means that the physical risk stress test was carried out for at most SLR levels of 0.55m by 2050.

The results showed that physical risks will manifest in Hong Kong through two major types of climate hazards: typhoons and floods. The main reason these risks were identified was because they will cause the devaluation of properties and business disruptions, which are significant loan components for the banks. For example, residential mortgages and other property-related lending from the 27 banks analysed amounted to HK$2.9trillion or 28% of their total lending. As HKMA’s own stats show that domestic loans to the property sector amount to HK$3.4trn, HK$0.5trillion of property loans have still not been evaluated.

HK$1trillion worth or 32% of participating banks’ mortgage & property lending are vulnerable to climate impacts. According to the stress test done under the high emission pathway (current emissions path – RCP8.5), devaluation from physical damages could be more than 50% for some properties in vulnerable areas and in total could affect ~HK$1trillion worth of loans by 2050. This led the report to state “the banks need to set aside additional provisions for the loans concerned”. Note that these losses resulted from a stress test at levels of local SLR at 2050 of 0.32-0.55m

Credit losses will see a 3x increase but could be much higher. Total expected credit losses (ECLs) of the banks’ property-related lending in Hong Kong are estimated to be three times more than those in Q4 2020. The majority of this is from residential mortgages, where the ECLs are projected to surge 25 times. Given that there is a lot of commercial property located in vulnerable coastal locations in Hong Kong, we would expect all ECLs to be much higher.

Stress test results will be a lot worse if scenarios and timelines were adjusted. HKMA stress tests were performed for the worst-case scenario (RCP8.5), not “low-regret”. So, at SLR levels of 0.32-0.55m instead of 2-3m. The time horizon was also shorter – 2050 instead of 2100.
HK banks clearly at risk if HK adapting to wrong levels…

…they are lower than what HKMA is stress testing for - 0.16-0.35m by 2050 instead of 0.32-0.55m per the HKMA stress tests

… Singapore and New York are accounting for tipping points by using the levels warned by the IPCC, but HK is not

Unlike Singapore HK is also in the path of typhoons and may need to defend against 10-12m by 2100

HK cannot afford to not take this seriously as 82% of the government’s revenue is at risk

24x more buildings are at risk at the levels Singapore and NYC are adapting for compared to what HK is adapting for – what does this mean for bank mortgage and property loan books?

As all four major banks analysed are at risk and must start moving HK away from the "Double Blind Maximum Risk" scenario

Obviously, stress test results will be a lot worse if scenarios and timelines were adjusted. By looking at this short timeline as well as ignoring tipping points, HKMA and the banks cannot “see” how bad SLR risks could be. In addition, multi-metre SLR by 2100 will compound typhoons risks from which material impacts are already felt today.

Worse still, Hong Kong is adapting for a mere 0.5m of SLR at best by 2100. There are two huge problems with this:

1) SLR adaptation defence plans are less than HKMA stress tests: the Hong Kong government is preparing for coastal defences for SLR of 0.49m by 2100; in other words, SLR defence of 0.16-0.35m by 2050. Clearly, this is significantly less than the 0.32-0.55m per the HKMA stress tests. Since we are on a 2.7°C trajectory, the HKMA SLR scenario is more likely than not. More worryingly, sea levels in Hong Kong have been rising rapidly with more than 0.2m since 1990.1

2) SLR defence does not take into account IPCC’s “cannot be ruled out” level unlike Singapore and New York: While Singapore and New York are accounting for tipping points by using the levels warned by the IPCC to plan adaptation, Hong Kong is not – it has selected a low-to-medium emissions scenario for adaptation. Such wide gaps in SLR adaptation clearly lead to higher risks for banks’ lending to Hong Kong, especially since we’re on a high emissions path.

This means that banks in Hong Kong are a lot more worse off than those in Singapore and New York due laggard government action. Because if Singapore is planning for 3m and Hong Kong is only planning for 0.5m, which city would you rather invest in? Let’s not forget Hong Kong has typhoons, Singapore does not.

For more see “HK Rising Seas Adaptation Is Way Behind New York & Singapore”.

Hong Kong also faces typhoons so storm surge must be factored in = defend against storm tides of 10-12m by 2100. Taking into account high tide and SLR, storm tides from Super Typhoons by 2100 could be 10-12m in Hong Kong and the city must be able to defend itself against this. Already the growing intensity of typhoons means that material impacts from typhoons are already felt today. See “HK SAR already facing risks from coastal threats” as well as “HK could face 10m+ storm tides by 2100” on the following pages.

Physical coastal threats + laggard government action puts 82% of HKSAR government revenue at risk = credit rating downgrade. The main sources of the HKSAR’s revenue relate to real estate and trade, which could be affected by rising seas unless the government adapts. If the government does not adapt for coastal threats, the HKSAR’s sovereign credit rating could be affected and so could the credit rating of all banks’ lending to Hong Kong and companies that are based in Hong Kong – for more see “HKSAR revenue at risk from coastal threats” = impact credit ratings” later.

Major property skew puts loan books at risk. In a “low-regret” 2-3m scenario compared to a 0.5m SLR scenario, 43,000 more residential, commercial and industrial buildings would be at risk in Hong Kong; this is 24x more buildings – for more on these impacts, see “Too much at stake = HK can’t afford to get it wrong” later. These are significant differences and if HK adapts to the wrong scenario, all banks and corporates will be severely exposed to SLR risks leading to a high chance of financial systems collapse. There’s also no contingency plan in place – without planning transformative adaptation today, when SLR escalates as tipping points are breached, there will be no flexibility of bringing forward transformative adaptation implementation.

Significant triple whammy exposure for each of the four large HK banks. Traditional risk management of locational and sectoral spread won’t work as Hong Kong banks have loan books with heavy concentration in Hong Kong and other vulnerable locations as well as at-risk sectors. For more see “Save HK banks from sinking”.

Double blind! HKMA incorrect stress test + government inaction = maximum risks. As the flowchart shows, Hong Kong is following a “Double Blind Maximum Risk” scenario where neither the banks or governments are stress testing properly nor recognise the need for transformative adaptation. This is a dangerous, high-risk scenario – the best way to avoid it is for HKMA to set better stress test guidance – HKMA should follow our recommendations in “5 must do’s for central banks & regulators to avoid systemic shocks triggered by SLR”, and should following the “CWR 3-Step Guide to Stress Test Right for SLR Risks” set out in SECTION III.
HKSAR already facing risks from coastal threats

Hong Kong is hilly, but 27% of the population and 70% of economic activities are low-lying. 6% of the land in Hong Kong is reclaimed and low-lying and this is where you will find 27% of the population and 70% of economic activities. Also, the port, airport and almost all infrastructure necessary for its basic needs, including water and sewage treatment, energy, data centres, cold storage, and oil bunkering are located in coastal low-lying areas – see “8-Factsheet Survival Guide for HK to survive rising seas” released in 2022 for more.

HK already facing 5-7m storm tides. Hong Kong is in the path of typhoons and each year is affected by multiple. The HKSAR is currently well prepared for these but so far it has been lucky. Super Typhoon Mangkhut hit Hong Kong in 2018 but if it hit Hong Kong directly at high tide impacts would have been much worse, an “Unlucky Mangkhut”. As the 8 factsheets highlight, an "Unlucky Mangkhut" could bring storm tides of 5-7m across HK today. If this were to happen, at 6m, 22% of the population as well as 10% of land along with the airport, port and CBD will be flooded as the chart and map below show. In fact, a large part of Hong Kong’s financial district, Central, will be underwater – see graphic below. By 2050, the IPCC says an event like Mangkhut could occur every year in low-lying cities.12

Infographic © China Water Risk 2020, all rights reserved.

An Unlucky Mangkhut hit can flood HK’s financial district, Central if no coastal defences are put in place. By 2050, the IPCC says an event like Mangkhut could occur every year in low-lying cities.

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HK could face 10m+ storm tides by 2100

Hong Kong must prepare as the IPCC has warned that 2-3m of SLR by 2100 “cannot be ruled out”[42]. The latest science from warming oceans to the polar regions do not bode well for SLR. Scientists worry that the current policies & actions trajectory of 2.7°C (2°C-3.6°C) will trigger “an abrupt jump” in ice loss after around 2060 making multi-metre SLR by 2100 possible. This has led the IPCC to warn of 2-3m of SLR by 2100. Latest observations are even more worrying: the ice shelf holding the Thwaites Glacier (the size of Florida) could collapse in 5 years’ time destabilising the West Antarctic Ice Sheet and trigger rapid SLR.

Storm surges from typhoons + tides & SLR = 10-12m. Super Typhoon Mangkhut in 2018 already brought storm tide impacts around 4-5m in Hong Kong. IPCC warned extreme sea level event like 1/100 year storm will likely happen annually by 2050. Since Mangkhut is only a 1/50-100 year storm, the reality is that storms by 2100 could be a lot higher than Mangkhut. This isn’t about scaremongering but about planning for all eventualities, so that HK can continue to enjoy its place as a major economic hub. HK cannot be planning for the best case when globally actual policies indicate 2.7°C by 2100 – this is wishful thinking and will lead to disastrous consequences.

Already at 6m, significant amount of commercial property & homes will be at risk. According to “8-Factsheet Survival Guide for HK to survive rising seas” published in 2022 by CWR, just 6m would impact over HK$461 billion of property value from the Top 10 housing estates in Hong Kong, with 43% of the residents affected. Out of all 1.62mn residents would be affected, poor households will suffer the brunt of the impact. Our analyses also revealed that at any one time around a quarter of over 6,000+ property listed for sale are vulnerable to coastal threats. The exposure increases with value – 29% of listed property value for sale worth HK$38bn will be affected at 6m. Such levels could be seen with an “Unlucky Mangkhut” today or permanent submersion by 2100 under the IPCC “cannot be ruled out” scenario. For more please see the “Protect Our Homes” factsheet. As the 3D map below shows, large swathes of the Kowloon District will be submerged.

Critical infrastructure for trade & basic needs are also low-lying. Trade and the economy could be at risk due to port and airport vulnerabilities, plus, many are not aware that much of HK’s basic needs are low-lying. Rising seas could threaten up to 80% of HK’s water supply, almost 100% of electricity supply, 73% of data centres and 100% of oil bunkering. Key road links, underground transport as well as ferries will also be impacted to a significant extent. At 6m, Hong Kong Island would be isolated as all access points will be affected. For more please see the following factsheets: “Shore Up Trade Resilience”, “Secure Basic Needs”, and “Stay Connected! Don’t Get Stranded”.

Our trajectory of 2.7°C (2°C- 3.6°C) by 2100 will trigger “an abrupt jump” in ice loss after ~2060 making multimetre SLR by 2100 possible.

Entire districts such as the Kowloon Peninsula can be sunk unless we effect transformative adaptation to 2-3m of SLR by 2100 like Singapore & New York. Surely, HK should heed the IPCC’s warning of 2-3m of SLR by 2100.

Storms by 2100 could be a lot higher than Mangkhut, so HK must start planning for 10-12m storm tides by 2100.

Even at 6m over HK$461bn of property value from the Top 10 housing estates and 43% of the residents would be affected...

…and 29% of listed property value for sale worth HK$38bn will be affected.

Rising seas could threaten ~80% of HK’s water supply, ~100% of electricity supply, 73% of data centres & 100% of oil bunkering.
HK Rising Seas Adaptation Is Way Behind New York & Singapore


To kickstart the journey towards transformative adaptation highlighted in the article below, the HKMA should push banks to stress test right to "low-regret" scenarios.

Has Hong Kong got its coastal defense levels against rising seas right? It had better, as sea level rise (SLR) is an existential threat to Hong Kong – a sizeable portion of our homes, almost all basic needs and key transportation links that are essential for survival are ALL low-lying.

If we use the wrong SLR levels to plan adaptation, our new “Defend HK Property from Submersion” factsheet shows that 38,426 more residential buildings and close to 5,000 more commercial & industrial buildings will be exposed to rising seas. Indeed, up to 82% of the HKSAR’s revenue streams could be affected by rising seas as seen in our new “Futureproof HK Revenues” factsheet. Even our HK$20bn+ betting revenues will be at risk as we can’t access our racecourses – check out the flood maps in Happy Valley & Sha Tin.

Is this alarmist or are multi-metre sea level rise impacts for real?

Well … it’s real enough for New York and Singapore as they’re using multi-metre SLR estimates to plan long term adaptation. Both cities are using 2-3m of SLR by 2100 to plan resilience so that their adaptation plans to protect against rising seas can be transformative rather than incremental. BTW Hong Kong is using only ~0.5m by 2100. To say that there is a gap is an understatement.

Clearly, we are worried, and it gets worse …

HK’s adaptation plans ignore IPCC’s recommendations on multiple fronts …

The Hong Kong’s Drainage Services Department (DSD) 2018 Stormwater Drainage Manual notes adaptation action for the low-to-medium emissions scenario of 0.49m of SLR by 2100. A low-to-medium emissions scenario (RCP2.6-4.5) means an average warming range of ~1°C to ~1.8°C by 2100 but we have already warmed by 1.1°C-1.2°C today and there’s now a 50:50 chance that we will breach 1.5°C by 2026.

Since current global climate policies & actions put us on path of around 2.7°C (2°C-3.6°C) by 2100, surely the DSD should pick the high emissions scenario for adaptation planning? Given the state of current global affairs adapting to the high emissions scenario is prudent as it would reflect reality, not wishful thinking.

To be fair to the DSD, climate science is fast evolving and there was still hope of cutting emissions back in 2018 when they set a level of 0.49m. However, the same excuse cannot be used for the latest Coastal Hazard Study released by the Civil Engineering and Development Department (CEDD) in April 2022 which was 8 months after the IPCC’s AR6 Climate Change 2021: The Physical Science Basis. The latter clearly warns that 2m of SLR by 2100 and 5m by 2150 “cannot be ruled out due to deep uncertainty in ice sheet processes”.

Why did AECOM, not advise CEDD accordingly? Instead, AECOM recommended that CEDD to adopt a “progressive adaptive approach” under a “medium GHG concentration scenario” and focus on devising enhancement measures up to 2050; in short, 0.16-0.35m of SLR by 2050.

While the AECOM-CEDD report does say it will have flexibility in design allowance so that adaptation actions can be changed or updated as climate impacts change, it is hard to see how planning for 0.16-0.35m of SLR by 2050 will allow flexibility, as works will already be locked in. We cannot “undo” drainage/levees/sea walls that are not enough or suddenly redesign parts of a city as SLR accelerates. This means that when risks escalate, adaptation actions will only be incremental – something else that the IPCC warned against.

Haven’t they read the IPCC AR6 Climate Change 2022: Impacts, Adaptation and Vulnerability published in February 2022? It devotes a substantial amount of its Summary to Policymakers (SPM) to painstakingly highlight maladaptation and the pitfalls of ignoring long-term impacts.

While AECOM-CEDD are on the right track with a “progressive adaptive approach”, rather than setting a lower shortterm SLR target and ratcheting up to cater for rising risks, they should have set a higher longer-term SLR target as advised by the IPCC. This would allow them to catalyse transformative adaptation which can be implemented in phases; these phased build-out can be accelerated should rapid SLR occur.

“Actions that focus on sectors and risks in isolation and on short-term gains often lead to maladaptation if long-term impacts of the adaptation option and long-term adaptation commitment are not taken into account.”

AR6 Climate Change 2022: Impacts, Adaptation and Vulnerability:
While the AECOM-CEDD report has used the wrong scenario at least the Hong Kong Monetary Authority (HKMA) has got it right (somewhat)… With ~HK$1trn of mortgages/loans at risk, the HKMA, DSD and CEDD need to get on the same page!!

The HKMA has been conducting climate risk stress tests using the worst-case scenario; in other words, the high emissions scenario. Finally, a government department that has picked the right scenario! Clearly bankers are more realistic than engineers about the global trajectory of GHG emissions.

According to the HKMA, the stress test of physical risks across 27 banks revealed that around HK$1trn of mortgages/property loans are vulnerable to coastal risks, mainly from flooding & typhoons. These stress tests were conducted for a 2050 timeline which under a high emissions scenario points to 0.32-0.55m of SLR.

The fact that the CEDD is planning adaptation for the same timeframe at lower levels of SLR (0.16-0.35m) means that wrong adaptation levels by the CEDD and/or the DSD could put the whole HK banking system at risk. This exposure gap will widen with time because whilst SLR levels will likely rise at similar rates to 2050 for both the medium & high scenarios, under the high emissions scenario rising seas will likely accelerate rapidly after around 2060. By 2100, DSD is protecting HK to only ~0.5m whereas impacts could be anywhere from 1-3m.

As adaptation planning to 2050 will not be able to cope with such rapid acceleration of SLR, both New York and Singapore are clearly not taking any chances and have heeded the IPCC’s warnings of multi-metre SLR and are using 2-3m of SLR by 2100 to catalyse transformative action and implementing adaptation in phases. Doing this will reduce impact risks for their banks as the city can ratchet up implementation as risks accelerate.

Hong Kong should follow suit. Already for HK banks, HK$1trn is at risk at 0.32-0.55m of SLR, imagine the impacts at 2-3m of SLR when 38,426 more residential buildings and close to 5,000 more commercial & industrial buildings will be submerged!

Since such levels of exposure would certainly trigger financial collapse, different government departments across Hong Kong must start coordinating their resilience works at once. HK bankers cannot assume HK engineers are working off the same scenarios. The clock is ticking … HK seas have already risen by around 0.2m since 1990.

To get everyone on the same page, we have prepared a “8-Factsheet Survival Guide for HK to avoid Atlantis”. Hopefully, these will prevent banks and corporates from shirking their responsibilities with “I didn’t know” when faced with mandatory disclosure of material climate risks under the new ISSB standards. Let there be no doubt – rising seas are pervasive threats and will impact every aspect of a HKer’s life. We must set up a coastal defence task force that not only straddles all departments but has teeth to make tough decisions – such as which areas should be protected, and which abandoned to rising seas. The HKMA has been conducting climate risk stress tests using the worst-case scenario; in other words, the high emissions scenario points to 0.32-0.55m of SLR.

HK is behind … not planning for “low-regret” adaptation levels = planning to fail

While New York and Singapore have such coastal defence task forces, HK is sorely missing one. The Steering Committee on Climate Change and Carbon Neutrality is not going to cut it – all of them have other fulltime day jobs; defending HK against rising seas is a fulltime job. Besides, it is more focused on carbon transition, not adaptation.

This was made painfully clear to us in the 2-hr discussion session we hosted earlier this year where Singapore’s national coastal defence director, New York City’s resilience lead and IPCC WGII co-chair were present. Representatives from BIS, Japan’s FSA, Citi, StanChart, Moody’s and Manulife were there too as we hashed out a path forward to finance transformative adaptation.

We wished we could have included government representatives from the SAR but only LINK-REIT, Hong Kong’s largest property listco was well versed enough about adaptation to be present; kudos to them … it has stress tested its portfolio for low-regret levels of coastal threat impacts – see its latest annual report.

Of course, we hope that these low-regret levels will never happen. We don’t want a world where emissions keep rising, but we have to be realistic. Given the coastal defence efforts of the two other island financial centres – New York and Singapore, HK must step up or rising seas could strip its status as the premier international financial centre in Asia. Its position as a global shipping and aviation hub could go too.

It is worth remembering here that even if the world reached net-zero emissions today, seas will continue to rise; this trend is locked-in and irreversible. Is 2-3m of SLR by 2100 too much? Well … the last time the earth was this warm (0.5°C-1°C warmer than pre-industrial period), sea levels were 6-9m higher than the levels today; the last time the earth had carbon levels at around 400ppm, seas were 25m+ higher.

It’s not a matter of IF but WHEN these SLR levels will materialize … so it’s best to be prepared. Do not be fixated on “exactly when and how likely these sea levels will happen”, because we have already been warned of the rough ballpark. The right question here is “can HK afford not to adapt for multi-metre SLR?” New York and Singapore clearly have thought these through, so must Hong Kong.
HKSAR revenue at risk from coastal threats = impact credit ratings

**Up to 82% of HKSAR annual revenue at risk.** If adequate coastal defences are not mounted, 82% of the HKSAR’s revenue could be at risk as it is skewed to property and trade as the graphic below shows. For more see the factsheet “Futureproof HK Revenues”.

**Sizeable impacts + government inaction = credit rating downgrades.** This could happen in Hong Kong as it has significant amounts of people and commercial activity in low-lying coastal zones and 82% of revenue is at risk from coastal threats as the graphic below shows. Yet, government adaptation action lags as highlighted in “HK Rising Seas Adaptation Is Way Behind New York & Singapore”. It’s not just Hong Kong, but even Japan and Taiwan could experience the same as explained in the 2020 CWR report “Sovereigns at Risk – APAC Capital Threats – Re-ratings warranted as city capitals & GDP are materially exposed to coastal threats”.

**2020-2021 HKSAR GOVERNMENT REVENUE AT RISK FROM COASTAL THREATS**

- **HK$12bn** Collected from import duties but our airport, ports and key links are low-lying. See extent of impacts now...
  - Trade

- **HK$22bn** Collected from lottery and betting so what happens when we can’t get to the races?
  - Connectivity

- **HK$81bn** HKSAR revenues are taxes paid by residents. See which homes are vulnerable to coastal threats...
  - Homes
  - Basic Needs

- **HK$108bn** Other revenues

- **HK$89bn** Land premium

- **HK$136bn** Property related taxes, duties, rates & investment
  - HK Property
  - Northern Met

- **HK$136bn** Profits tax from corporations

- **HK$136bn** Duties, Bets, sweeps tax & lotteries fund

**DEFEND HK AGAINST RISING SEAS NOW**

- 14% HKSAR revenues are taxes paid by residents. See which homes are vulnerable to coastal threats...

- 38% HKSAR revenues are derived from the property sector. See what’s at risk from rising seas before buying!

- 47% HKSAR domestic loan books are skewed towards property so banks could go underwater too...

**Source:** CWR, 2022, Futureproof HK Revenues

Infographic © China Water Risk 2022, all rights reserved.
Too much at stake = HK can’t afford to get it wrong

SLR of 0.5m vs 2-3m: Hong Kong adaptation level vs IPCC “cannot be ruled out” levels. The latest IPCC report has warned policy makers that 2-3m of SLR “cannot be ruled out” by 2100. Yet, Hong Kong’s current adaptation plans are using ~0.5m by 2100. This huge adaptation gap has severe implications. As the graphic below shows, adaptation to 0.5m of SLR will protect 1,800+ residential, commercial, and industrial buildings at risk; however, 38,426 more residential, 2,967 more commercial and 1,968 more industrial buildings will be exposed to rising seas if multi-meter SLR manifests by the end of the century.

This huge adaptation gap brings high exposure and could trigger systems collapse. Since the HKMA is not stress testing to these “low-regret”/“cannot be ruled out” levels either both the government and banks are blind to escalating SLR risks. HK banks and HKMA must lead the way by using the “low-regret” scenario and long timelines in their stress tests. They must then engage the government to do the same to ensure transformative adaptation. And HK banks must do this because they have a lot of skin in the game with massive exposure to real estate as can be seen in the factsheet “Save HK banks from sinking seas”.

Stress test right to avoid maladaptation and financial collapse. Pick the right levels & the right timeline! Planning adaptation to lower levels by 2100 or using a shorter timeline like 2050 will likely result in maladaptation especially since rapid SLR will likely only occur after ~2060 on our current emissions path. We all hope we don’t end up in a world where emissions keep rising with 2-3m of SLR by 2100, but this must be planned for, if not Hong Kong is planning to fail. It’s safer to use a 2100 timeline like New York & Singapore to catalyse transformative rather than incremental adaptation, which is flexible and can react to rapid SLR if it accelerates after ~2060.

Planning for the worst-case does not mean that billions of dollars have to be invested in infrastructure today. Instead, it means there is a transformative adaptation plan in place and build out can be accelerated should SLR escalate. Here, it is also important to ensure that such transformative adaptation is financed to ensure implementation, for only then will the city be adequately defended against coastal threats and SLR risks managed across bank loan books. For an at-a-glance overview of the vulnerability of HK banks to SLR please see the “Save HK banks from sinking seas” factsheet on the next page.

43,000 more residential, commercial and industrial buildings will be at risk at 2-3m of SLR compared to ~0.5m that HK is adapting for

The majority of the difference is due to residential buildings...

...but the value of commercial and industrial buildings should be considered

HK banks and HKMA must stress test to “low-regret”/“cannot be ruled out” levels to close this adaptation gap

They need to start picking the right timelines and scenarios...

...because it’s better to plan for the worst-case than not be ready when the worst-case becomes reality

Note: 172,091 residential buildings, 5,446 commercial buildings & 7,101 industrial buildings analysed
Source: CWR, 2022. Defend HK Property from Submersion-factsheet
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32% of banks’ HK property loan books at risk from typhoons and floods according to the Hong Kong Monetary Authority’s climate stress test.

63% of domestic loans in Hong Kong are skewed to sectors vulnerable to coastal threats. The chart above shows that of the HK$7.2 trillion dollars of domestic loans in Hong Kong as of the end of 2021, 63% were skewed to sectors vulnerable to coastal threats – 47% in total to the property sector, 7% to trade financing, 5% to wholesale and retail trade and 4% to manufacturing.

According to the HKMA climate stress test done under the high emission pathway, devaluation from physical damages could be more than 50% for some properties in vulnerable areas & in total could affect ~HK$1 trn worth of loans by 2050. The HKMA states “banks need to set aside additional provisions for the loans concerned”. Note: these tests were conducted under worst-case, not “low-regret” scenarios – see next page.
Domestic skew
27-81% of HK bank loan books have domestic skew. A high domestic skew does not have to be a problem if the gov’t is proactive and acting. The problem for banks in HK is that gov’t adaptation action currently lags, putting the financial system at risk.

Pie charts only show loan book skew. Given this, HSBC looks to be the safest with only 27% of loans books in HK. But, if we look at profits HSBC could be one of the most vulnerable as it derives 90%+ of its profits from HK according to its 2020 Annual Report.

Vulnerable sectors. The highest sector skew was to real estate – from 36% at BoC (HK) to 46% at BoEA. This aligns with HKMA figures – 47% of domestic loans are to real estate.

CWR analyses show that homes, as well as commercial & industrial properties, are very vulnerable to sea level rise (SLR) risks. And even those who think they’re safe are not as they could be stranded as access links are underwater. And, it’s not just real estate as loan books are skewed to transport, manufacturing/industry & trade, that rely on vulnerable ports & airports.

Sectoral skew
54-77% of HK bank loan books skewed to vulnerable sectors. The highest sector skew was to real estate – from 36% at BoC (HK) to 46% at BoEA. This aligns with HKMA figures – 47% of domestic loans are to real estate.

CWR analyses show that homes, as well as commercial & industrial properties, are very vulnerable to sea level rise (SLR) risks. And even those who think they’re safe are not as they could be stranded as access links are underwater. And, it’s not just real estate as loan books are skewed to transport, manufacturing/industry & trade, that rely on vulnerable ports & airports.

Double Blind Maximum Risk
HKMA’s 2050 worst-case scenario stress tests means that at most SLR of 0.55m was used to assess risks. Incidentally, this is close to HK gov’ts defense levels of 0.49m by 2100 under the low-to-medium emissions scenario. As HKMA & HK gov’t are using the wrong timelines and scenarios, HK banks are now on a “Double Blind Max Risk” path as neither are “seeing” nor preparing for future risks of 2-3m of SLR by 2100 as warned by the IPCC.

Meanwhile other financial hubs like New York & Singapore have transformative adaptation levels that are 4-6x that of HK. Thus, HKMA must push banks to stress test right to close these huge adaptation gaps and avoid financial systems collapse.

HK gov’t lags SG & NYC
Future adaptation panning levels

Source: CWR analyses based on HKMA website – Monthly Statistical Bulletin; Hong Kong Monetary Authority (2021) Pilot banking sector climate risk stress test; 2020 and 2021 Annual reports of the four banks; Drainage Services Department 2018; SIWW 2022 Thematic & Business Forums

Contact us: info@chinawaterrisk.org
We drive the global water & climate risk conversation with...
For more at-a-glance factsheets on Hong Kong...

On 23rd August 2022 CWR released a new 8-Factsheet Survival Guide to help Hong Kong navigate and survive rising seas, which pose multiple existential threats to the region. The HKSAR is behind other island financial hubs: New York and Singapore are using projected levels of rising seas for adaptation planning that are 4-6x HK’s!

If HK gets it wrong, up to 82% of the HKSAR’s revenue streams could be underwater. Plus, Hong Kong could lose homes, critical infrastructure and basic needs to permanent submersion unless it takes proactive action to effect transformative “low-regret” adaptation for locked-in multi-metre sea level rise. Sadly, the poor will suffer more than the rich from coastal threats. But even the rich, high up in the Peak may not be safe as the entire HK Island could be stranded from rising seas.

Climate threats are accelerating. New York and Singapore have clearly thought these escalating risks through, and are planning adaptation for 2-3m of sea level rise (SLR) by 2100. So must Hong Kong re-examine its exposure to coastal threats and be climate ready – there is simply too much at stake if it gets adaptation levels wrong! The SAR government must select the right levels to futureproof its revenues, protect homes and trade from going underwater, and secure basic needs as well as local connectivity routes as they are all low-lying.

Invest wisely in the future … arm yourself with knowledge from CWR’s 8-Factsheet Survival Guide for HK to survive rising seas – they are stuffed full of startling as well as alarming facts that are essential for this changing climate. Start to Re-IMAGINE HK now!

**Futureproof HK Revenues**
**Defend HK Property from Submersion**

**Shore Up Trade Resilience**
**Protect Our Homes**

**Stay Connected! Don’t Get Stranded**
**Secure Basic Needs**

**Climate Ready Northern Metropolis**
**Re-IMAGINE HK**
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Notes

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