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Market Study

Trends & Opportunities In The
Adaptation & Resilience Bonds
Universe



BMI

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ASIAN INFRASTRUCTURE
INVESTMENT BANK

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Executive Summary

Climate adaptation and resilience (A&R) remains an underdeveloped segment of the climate bond market, despite rapidly intensifying physical climate risks and the inclusion of enhancing adaptation to climate impacts in the Paris Agreement (2015). Bond issuance to fund the mitigation of greenhouse gas (GHG) emissions, with a clear focus on limiting global warming and achieving net-zero GHG emissions globally, has benefitted from clear taxonomies, established metrics and deep investor familiarity. However, A&R continues to suffer from limited visibility, inconsistent definitions and fragmented disclosure. The bond market, with adaptation use of proceeds (UoP), shows increasing underlying investment activity. Still, there is limited visibility due to non-uniform reporting, inconsistent definitions (taxonomies) and fragmented data, making it difficult to assess existing A&R-aligned financing across the broader green, social, sustainability and sustainability-linked (GSSS) bonds universe. Adaptation-related bond UoP has been systematically underestimated, and private sector participation remains constrained.

This report responds to that challenge. Commissioned by the Asian Infrastructure Investment Bank (AIIB), it seeks to improve transparency around A&R-related bonds by clarifying what qualifies as an A&R investment, identifying where such investments already exist in capital markets, and assessing how issuance can be scaled. A central finding is that A&R UoP is currently almost entirely embedded within the broader GSSS bond universe, rather than expressed through explicitly labelled A&R instruments. This approach of including A&R UoP in broad GSSS issuance can be expanded and complemented by A&R-labelled bonds.

To support the report, a bespoke, unified database of global GSSS bonds with A&R UoP was created, as no consistent, market-wide dataset previously existed. The aim was not to define best practice for data providers and regulators, but to create an indicative dataset for analysing trends in A&R UoP. The database combines bond-level data from multiple providers with a transparent methodology to identify A&R-relevant UoP and estimate the indicative (not verified) share of proceeds allocated to A&R activities. The database analysis is complemented by structured engagement with issuers, investors and other market stakeholders to create the conclusions featured in the report.

The analysis shows that A&R-related UoP has expanded rapidly in recent years. Indicative A&R UoP within GSSS bond issuance has more than doubled since 2019, reaching approximately USD69 billion in the 12 months to Q2 2025. This was the first rolling 12-month period in which Asia-

Pacific UoP (USD25.2 billion) exceeded Europe's (USD24.6 billion), becoming the primary driver of A&R-related issuance. Asia-Pacific's A&R UoP during the period was more than four times larger than during Q3 2018-Q2 2019. North America A&R UoP (USD7.4 billion) slipped to third place, while UoP in Latin America (USD3.1 billion) and the Middle East (USD1.8 billion) grew substantially. The fastest-growing regions for A&R UoP (Asia-Pacific, Latin America and the Middle East) all combine rising exposure to physical climate risks with expanding infrastructure investment pipelines and maturing local capital markets.

The UoP analysis illustrates that A&R is an established category but is difficult to identify. It is rarely raised via dedicated A&R bonds and instead embedded in the wider GSSS labelled bond as a subset. Hence, most issuers already finance resilience-enhancing assets through conventional green and sustainability bonds, but clearer guidance and disclosure could enable them to more explicitly identify and scale A&R UoP without creating new bond structures.

Public sector issuers, including sovereigns, sub-sovereigns and public utilities, continue to account for the majority of A&R-related issuance. However, private sector participation is increasing, especially among banks, utilities and infrastructure-related corporates. This shift reflects improving disclosure practices, growing investor familiarity with adaptation concepts, and the increasing use of blended finance, guarantees and other risk-sharing instruments. Across regions and issuer types, water-related investments dominate A&R UoP, particularly projects linked to flood protection, drought resilience and water security.

Our engagement with private sector issuers as part of this research indicates that firms across sectors, including real estate, infrastructure, energy and commercial banking, are paying greater attention to climate-related risks to their assets. In contrast to mitigation, which aims to limit future climate change, A&R expenditure reduces exposure to realised physical climate risks. As these risks become more material, capital market financing of A&R can serve both as a signalling mechanism that an issuer attributes to managing these risks and as an efficient means of funding resilience investments. From a fixed-income perspective, A&R investments function less as impact-oriented expenditure and more as risk mitigation capital. Over time, issuers that systematically invest in resilience are likely to experience fewer climate-related disruptions and greater rating stability. Where A&R expenditure is clearly identified through appropriate labelling and disclosure, it can enhance market confidence in an issuer's resilience and overall risk profile.



Looking ahead, A&R bond market growth will be driven by rising physical climate risks, stronger regulatory and taxonomy signals, and increasing recognition that resilience investments can be financed through conventional GSSS bond structures and A&R-labelled bonds. An expanding and more diversified investor base, supported by blended finance and multilateral development bank (MDB)-led risk mitigation measures, will be central to this process. Middle-income economies, particularly in the Asia-Pacific region, are likely to account for a growing share of issuance. Water-related investments will remain dominant alongside a rising contribution from financing for heat- and disaster-related resilience.

MDBs will play a pivotal role in driving the next phase of A&R-related bond issuance. Beyond their role as issuers and investors, MDBs are shaping the analytical frameworks, disclosure expectations and risk-sharing mechanisms that underpin market confidence in the asset class. AIIB's involvement reflects the growing recognition that scaling A&R issuance will depend on making resilience investments more visible, credible and investable.



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Chapter 1. Introduction: Purpose And Methodology

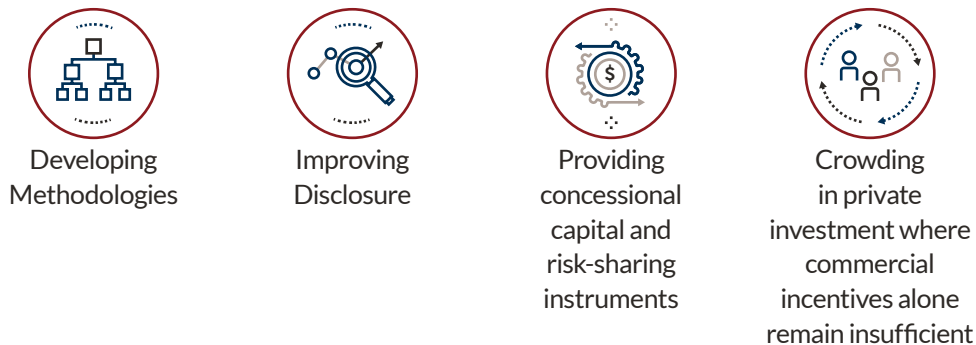
Climate finance has historically been dominated by investments in mitigation, with adaptation and resilience (A&R) significantly underfunded. Despite growing recognition that climate impacts are already affecting economies, infrastructure systems and communities, financial flows to A&R remain a small fraction of overall climate investment. Moreover, A&R finance is dominated by the public sector, with limited participation from private capital markets. As climate risks intensify, this imbalance has contributed to a widening gap between current A&R financing flows and the scale of investment required to protect economic growth, development outcomes and financial stability.

In the bond market, the lack of consistent methodologies for defining, identifying and measuring adaptation-related use of proceeds (UoP) is a structural constraint. Unlike mitigation, which benefits from relatively standardised metrics and project typologies, A&R investments are more context-specific, hazard-dependent and often embedded

within broader infrastructure or sustainability projects. This complexity has limited both issuer confidence in structuring A&R instruments and investor confidence in assessing their credibility and impact. Market engagement undertaken for this report confirms that awareness of what constitutes a credible A&R investment remains low.

Against this backdrop, the Asian Infrastructure Investment Bank (AIIB), whose mandate is to support investments in climate-resilient infrastructure and private capital mobilisation, is keen to support the development of scalable, credible A&R-related bond mechanisms. As a multilateral development bank (MDB) with a strong focus on infrastructure and climate resilience in Asia and beyond, AIIB is well positioned to help bridge the gap between public sector A&R priorities and private capital markets. Chapter 3 outlines the catalytic role that MDBs can play in facilitating greater private-sector A&R-related bond issuance, summarised in figure 1.1 below.

Fig 1.1: The Critical And Catalytic Role That MDBs Play



Source: BMI

This report was commissioned to help bridge the gap between public sector A&R priorities and private capital markets. The report’s primary purpose is to improve visibility and analytical clarity around the A&R bond market, with a particular focus on how capital markets are already financing resilience, often implicitly, through labelled green, social, sustainability and sustainability-linked (GSSS) bonds. Rather than focusing solely on the relatively small subset of bonds explicitly labelled as ‘adaptation’ or ‘resilience’, the analysis seeks to capture the much larger volume of A&R-aligned UoP embedded within the broader GSSS universe.

To do so, the study developed a bespoke, unified database of A&R bond UoP that did not previously exist in the market. Multiple data providers track labelled bond issuance, but none offer a comprehensive, consistent view of A&R-aligned UoP across issuers, regions and sectors. This report consolidates and harmonises data from several leading sources, applying a transparent methodology to identify A&R-relevant bonds, estimate the share of proceeds allocated to resilience outcomes, and classify those proceeds by physical risk and investment theme. The purpose of the report and database is not to prescribe



a definition of A&R, set out a roadmap for regulators or make recommendations to data providers. The database was created to provide a basis for analysing the existing bond market, in the absence of a pre-existing A&R focused dataset, to derive information on the status of A&R-related investments. The database was created using a 'top-down' approach, utilising aggregated bond data. The limited availability of granular bond UoP information from data providers constrained our ability to classify bonds precisely by A&R UoP. Therefore, the results are indicative and reflect broad themes and topics rather than verification at the individual bond level. Nonetheless, it attempts to provide a sound basis for drawing broad conclusions about the size and direction of A&R UoP in the GSSS bond market.

Summary Of Database Methodology

Chapter 3 draws on a bespoke database (BMI & AIIB-Amundi A&R Bond Database) developed specifically for this study to quantify A&R UoPs within the global green, social, sustainability and sustainability-linked (GSSS) bond market. The database focuses on estimated A&R-aligned UoPs embedded within labelled GSSS bonds, rather than on the much smaller subset of bonds explicitly labelled as

'adaptation' or 'resilience' instruments. This distinction is critical as most adaptation finance raised through capital markets is currently channelled via multi-purpose green or sustainability bonds rather than through standalone A&R labels. Roughly 99% of the indicative A&R UoPs identified in our database did not have an explicit A&R label attached to that bond.

The database was developed in response to a clear gap in existing market infrastructure. While multiple commercial and public data providers track labelled bond issuance, no unified and consistent dataset systematically identifies, quantifies and categorises A&R UoPs across the global GSSS universe. Existing datasets vary significantly in scope, depth and classification approaches, which makes cross-market comparison and aggregation unreliable without further processing.

To address this, data were consolidated from four complementary sources: Environmental Finance Data, the Luxembourg Green Exchange (LXE) green bond database, the Climate Bonds Initiative (CBI) and Sustainable Fitch. Combining these sources enabled broader market coverage while preserving analytical depth. The full BMI & AIIB-Amundi A&R Bond Database methodology is available at the end of this report.

Fig 1.2: Development Of The A&R Bond Database



Source: BMI & AIIB-Amundi A&R Bond Database

Building a consistent database required overcoming several challenges. Data providers apply different bond classifications, terminology and tagging conventions, and few explicitly identify adaptation UoPs. Disclosure quality also varies widely across issuers, particularly for older bonds and for sustainability-linked instruments. As a result, a structured, stepwise methodology was applied to standardise classifications and estimate A&R exposure in a transparent and replicable manner.

The resulting database provides a conservative, transparent estimate of A&R-aligned UoP within the global GSSS bond

market. It is designed to support consistent market sizing, issuer comparisons and trend analysis, while recognising the current limitations of disclosure and taxonomy alignment in adaptation finance.

All A&R UoP data are indicative and are based on the filtering process used to create the BMI & AIIB-Amundi A&R Bond Database. While it has not been verified through a bond-by-bond analysis, it nonetheless provides a sound basis for drawing broad conclusions about the size and direction of A&R UoP in the GSSS bond market. A full data methodology is available at the end of the report.



Overview Of Report Structure

Following a general overview of the key drivers of A&R bond market development in Chapter 2, Chapter 3 discusses emerging trends in the A&R bond market, while Chapter 4 provides insights into the A&R UoP. Analysis draws on the bespoke database developed under this project and insights gained through structured interviews with issuers,

investors and other bond market participants. Draft findings were further refined through consultation with external stakeholders, ensuring that the conclusions reflect both data-driven evidence and real-world market experience. The report concludes with reflections on emerging challenges and opportunities within the A&R bond market in Chapter 5.

Acknowledgement

The preparation of this report was led by members of the BMI Advisory team, a Fitch Solutions company, with guidance from Sustainable Fitch. The report was devised and developed by Torsten Albrecht, Julija Kuklyte Polycarp, Emily Zhou and Xianfu Lu at AIIB and Aric Wong, Noémie Flécheux and Frank Tsui at Amundi.

Amundi, as a leading asset manager in the GSS bond markets, is deeply committed to advancing climate-related finance and supporting the development of sustainable capital markets. In particular, Amundi supports the development of adaptation and resilience (A&R) bonds as an important and still emerging sub-segment of the labelled bond universe. As climate risks intensify globally, Amundi believes it is essential to foster progress toward clearer and more consistent framework standardisation. As a result, Amundi recognises the importance of CBI's work on the Climate Bond Resilience Taxonomy.

Amundi is pleased to support this paper, which contributes to improving awareness and analytical clarity around the A&R bond market. We believe it represents an important step toward strengthening market understanding, encouraging issuance, and supporting investor confidence. The building of capacity across the Climate Bond market is an ongoing effort that Amundi remains committed to.

The team is also grateful for the support of Carlotta Michetti, David Schaub-Jones and Wenhong Xie at Climate Bonds Initiative (CBI) and Anjali Viswamohanam, Monica Bae, Director and Jeffrey Tong at Asia Investor Group on Climate Change (AIGCC), who participated in the consultation process.

We would also like to thank all those that participated in the interviews associated with the report. Some interviewees wished to remain anonymous, we thank them for their time and expertise. For the interviewees who are quoted throughout this report we thank, Yoshi Yue, Associate Research Director, Sustainable Fitch, Jo-Lyn Low, Chief Financial & Corporate Officer, Amanat Lebuhraya Rakyat Berhad, Melissa Cheok, Associate Research Director, Sustainable Fitch and Matteo Bigoni, Head of Taxonomies, Climate Bonds Initiative.

Observations from Climate Bonds datasets reinforce the report's central finding: the main barrier to scaling adaptation and resilience (A&R) finance is not a lack of activity, but limited visibility and clear identification within existing instruments. In practice, A&R is rarely issued as a distinct label and is largely embedded within the broader green, social and sustainability (GSSS) bond universe.

To address this, Climate Bonds treats climate resilience as a cross-cutting analytical overlay within its data products. This is implemented through a structured sub-theme tagging approach, designed to systematically identify and surface 'hidden' resilience activities within use-of-proceeds. The methodology relies on a materiality-based assessment of issuer intent and project design, capturing activities that explicitly target climate hazards, vulnerability reduction and/or system resilience, while filtering out incidental co-benefits.

Since September 2025, this consistent, label-agnostic approach has improved comparability, strengthened transparency, and made climate resilience more visible and investable across the market. By clearly tagging resilience related activities, it also helps investors more easily identify credible adaptation opportunities, supporting the mobilisation of capital toward building long-term climate resilience.

For more information on Climate Bonds Data Products or to discuss access options, please contact the Climate Bonds team at globalfinancials@climatebonds.net.



Chapter 2. Drivers Of A&R Bonds Development

Key Takeaways

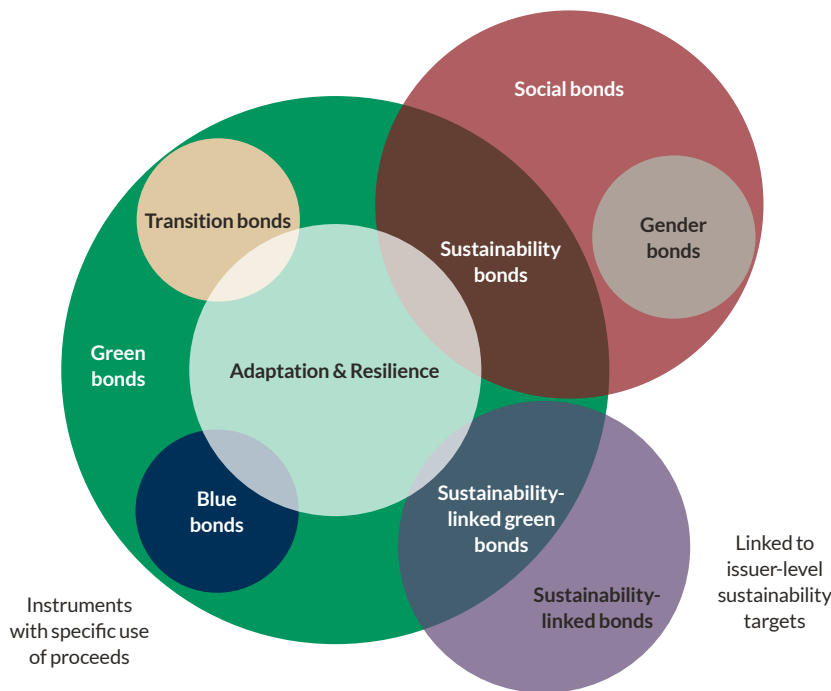
- A&R-related bonds are embedded within the broader GSSS universe, with most adaptation-related use of proceeds originating from mixed-use green and sustainability bonds rather than explicitly labelled A&R instruments.
- Regulatory and taxonomy developments are elevating A&R as the EU and ASEAN taxonomies, ISSB-aligned disclosure and development banks at the multilateral, regional and national levels are applying methodologies that require robust physical-risk assessments and resilience reporting.

Adaptation & Resilience Bonds Overview

A&R bonds are debt instruments designed to finance projects that enhance resilience to the physical impacts of climate change. Most A&R UoP originates from bonds

issued within broader green or sustainability frameworks, but with proceeds ring-fenced for A&R objectives such as flood management, drought management systems, coastal protection or heat-resistant infrastructure. A small minority of A&R UoP stems from bonds explicitly labelled as A&R bonds.

Fig 2.1: Where A&R Sits In The GSSS Bond Landscape
Green, Social, Sustainability And Sustainability-Linked Bonds



Source: BMI

A&R bonds are therefore a subset of the broader labelled bond universe, which encompasses Green, Social, Sustainability, and Sustainability-Linked (GSSS) bonds (see figure 2.1). Key A&R instruments include sovereign A&R bonds, corporate green bonds with A&R components,

and blue bonds targeting water and coastal resilience. A smaller set of sustainability-linked bonds (SLBs) ties coupon adjustments to resilience key performance indicators (KPIs), such as asset-level climate risk coverage.



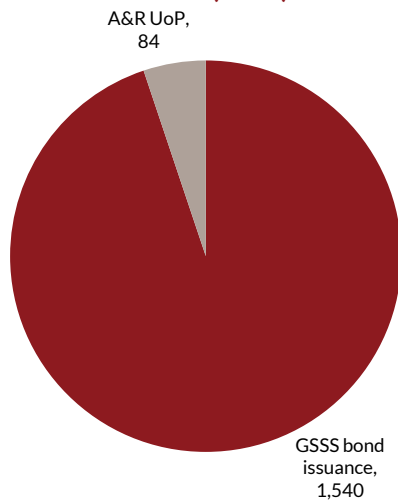
Fig 2.2: Climate Change Adaptation & Resilience Definitions

Climate Change Response	Definition
Adaptation	In human systems, the process of adjustment to actual or expected climate and its effects, to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects.
Resilience	The capacity of social, economic and environmental systems to cope with climate related hazardous events, trends or disturbances, responding or reorganising in ways that maintain their essential function, identity and structure, while also maintaining the capacity for adaptation, learning and transformation.

Source: Climate Bonds Resilience Taxonomy Methodology

As illustrated in figure 2.3, A&R accounts for a small proportion of total climate and broader GSSS bond issuance. Our estimate puts A&R UoP issuance at USD83.6 billion in 2024. Despite capturing a relatively broad scope of A&R activities, this accounted for only 5.6% of the USD1.5 trillion in GSSS bond issuance in our database for 2024.

Fig 2.3: Global GSSS Bond Issuance And A&R UoP, USDbn (2024)



Source: BMI & AIB-Amundi A&R Bond Database

Taxonomies And Regulations Are Elevating The Importance Of A&R

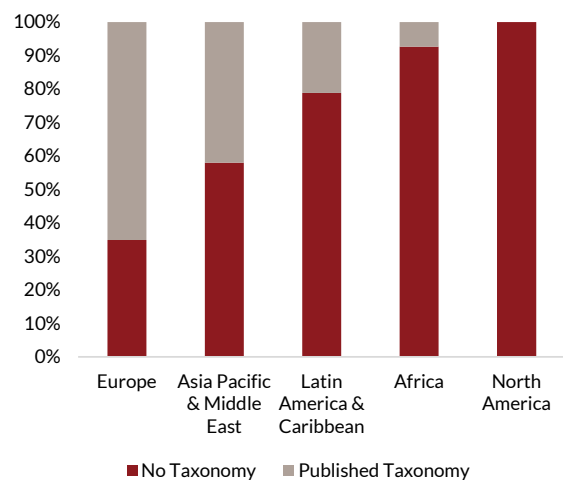
Taxonomies and regulatory standards are rapidly elevating the importance of adaptation and resilience in sustainable finance. Frameworks such as the EU Taxonomy, ASEAN Taxonomy and national green finance taxonomies now include explicit adaptation criteria that require issuers to assess physical risks, demonstrate resilience benefits and report adaptation-aligned expenditures. At the same time, disclosure regimes such as IFRS S2 and climate risk supervisory guidance are pushing investors and lenders to integrate physical risk considerations. Together, these developments are gradually mainstreaming A&R bond issuance and investment.

The EU A&R taxonomy is the most widely utilised mandatory taxonomy. This reflects the EU's dominance in A&R bond issuance – it accounts for more than half of cumulative global issuance in our dataset – as well as its influence on other regimes, including Singapore's taxonomy and the EU-China Common Ground Taxonomy.

The EU Taxonomy and ASEAN Taxonomy provide the clearest A&R coverage. This is achieved by defining explicit resilience criteria and linking them to disclosure through TCFD/ISSB-aligned reporting. China's Green Finance Catalogue and the EU-China Common Ground Taxonomy continue to focus mainly on mitigation, although planned revisions are expected to strengthen A&R alignment. Australia and Singapore are incorporating A&R and resilience concepts into forthcoming taxonomies linked to national disclosure regimes.

Despite this progress, A&R treatment and disclosure maturity remain highly uneven. While more than 50% of European markets are now covered by a national or regional sustainable finance taxonomy, the figure is closer to 20% in Latin America and less than 10% in Africa (CBI 2026 – figure 2.4).

Fig 2.4: Climate Finance Taxonomies – National And Regional Coverage



Note: Based on Climate Bonds Initiative regional groupings. Source: Climate Bonds Initiative, BMI



Voluntary frameworks seek to fill methodological gaps in mandatory adaptation taxonomies. Investor- and issuer-facing frameworks, such as the [Climate Bonds Initiative's Resilience Criteria and Taxonomy \(CBRT\)](#), define screening thresholds for investments that make a “substantial contribution” to resilience. Closely aligned with the EU Sustainable Finance Taxonomy and MDB methodology, the CBRT promotes interoperability, comparability and investor confidence, encouraging greater issuance of resilience-focused bonds. Other examples of voluntary frameworks include the IIGCC Climate Resilience Investment Framework and ICMA's Green Bond Principles: Adaptation & Resilience Guidance, which define metrics for avoided losses, vulnerability reduction and physical risk assessment. The [Joint MDB Methodology for Tracking Climate Change Adaptation Finance](#) guides the tracking of project-level adaptation finance and defines clear criteria for investment activities to qualify as adaptation.

Impact measurement, which captures the resilience outcomes of investments, is an important part of A&R because investors want to understand the results those investments deliver. Measuring such impacts adds credibility to A&R bond issuance and investing. One of the key frameworks under which common metrics for measuring A&R are evolving is the Global Goal on Adaptation (GGA) under the UNFCCC, which is at the

forefront of standardising adaptation results reporting across governments. The latest decision adopted at the Conference of the Parties (COP30 – Belém, Brazil 2025) supported the development of targets, sub-goals and a suite of indicators to track progress consistently across various economies. Other common frameworks include the MDBs' [Common Approach to Measuring Climate Results \(2024\)](#), a joint framework that links global adaptation outcomes to project-level indicators. Together, these types of reporting frameworks provide a clearer reference point for issuers seeking to demonstrate resilience outcomes and for investors assessing impact.

Regulatory incentives for A&R bond issuance remain limited but are gradually expanding through broader sustainable finance frameworks. Some jurisdictions, including Singapore and Japan, provide fiscal incentives or grant support for sustainable bond issuance. For example, the Monetary Authority of Singapore's [Sustainable Bond Grant Scheme](#) (SBGS) directly supports GSSS issuance by deferring or reimbursing the additional costs associated with engaging independent service providers for external reviews or ratings. Japan's Ministry of the Environment provides [subsidies](#) to offset the costs incurred by GSSS issuers. These measures indirectly support A&R by encouraging issuance of GSSS bonds more broadly, within which A&R UoPs are increasingly embedded.



Chapter 3. Quantifying The A&R Bond Market

Key Takeaways

- **The adaptation bond market is expanding rapidly.** Indicative A&R UoP in GSSS bond issuance has more than doubled since 2019, reaching USD69.0 billion in the 12 months to Q2 2025. While Europe remains dominant, growth is increasingly driven by middle-income economies in APAC, Latin America and the Middle East.
- **The public sector leads, but the private sector has a growing role.** Public entities still account for more than half of total A&R UoP, but private sector participation, particularly from banks, utilities and infrastructure firms, is accelerating.
- **Water is a primary driver of adaptation spending.** Water-related projects, especially flood protection and drought resilience, account for a substantial share of identified adaptation UoP. A proprietary Water Risk Index was therefore developed by BMI to screen for A&R-relevant water-related investments.
- **Emerging markets issuance has strong momentum.** Emerging markets, including China, Indonesia, Brazil and Mexico, are driving the next wave of adaptation issuance as local frameworks, investor bases and disaster risk exposure increase.

Global A&R UoP Has Doubled Since 2019

Global A&R UoP in GSSS bond issuance has surged over the past five years, in line with rising GSSS issuance. According to BMI & AIIB-Amundi A&R Bond Database, indicative quarterly A&R UoP totalled USD69.4 billion in the 12 months to Q2 2025, more than double the same value in Q2 2019 (USD29.9 billion). Although the quarterly series is volatile (with a peak of USD35.2 billion in Q2 2023), issuance volumes have clearly entered a structurally higher range since 2019. Cumulative A&R UoP was USD595.0 billion as of mid-2025, with 99% of this total stemming from GSSS bonds with A&R UoP rather than dedicated A&R bonds. Pure-play A&R entities, mostly water firms, accounted for around 2.5% of these UoPs. Pure-play A&R entities are discussed in more detail in Chapter 4.

At a global level, A&R UoP has been driven by increased GSSS bond issuance, of which A&R UoP is a subset. A&R UoP as a share of total GSSS issuance in our database has remained relatively stable at 4-9% since 2019, averaging 6.2% over the period. This includes UoP classified as A&R by the issuer, bond data aggregator or BMI. Climate Policy Initiative (CPI) data suggest that dual-use green bonds have been a primary driver of A&R UoP growth. According to the CPI, A&R UoP from green bond issuances [rose by USD7.9 billion to reach USD18.0 billion in 2023](#), almost entirely from bonds not explicitly labelled as A&R, but with A&R UoP. Increased issuance of dual-use bonds is partly due to issuers becoming better informed about which activities can be tagged as A&R under their respective green finance taxonomies.

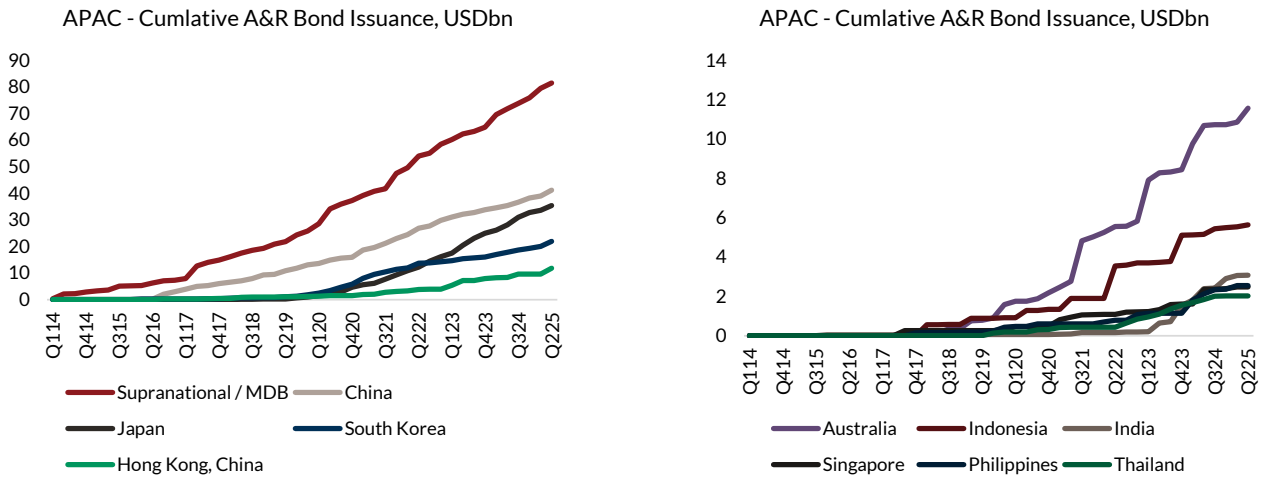


APAC's Role Is Rising

The Asia-Pacific (APAC) region accounts for a growing share of adaptation UoP. A global assessment, however, shows that Europe, specifically the EU, continues to account for the majority of issuance. Notably, issuance growth is slowing in Europe, while it remains robust in emerging issuance hubs in

APAC. Japan, Korea, Singapore and Australia have already developed roles in A&R UoP, and we highlight rapidly growing issuers such as China, Indonesia, India and Thailand (figure 3.3). Outside of APAC, significant recent drivers of A&R UoP growth include Mexico, Brazil, Chile, Saudi Arabia and the UAE.

Fig 3.3: APAC – Cumulative A&R UoP From GSSS Bond Issuance By Market, USDbn

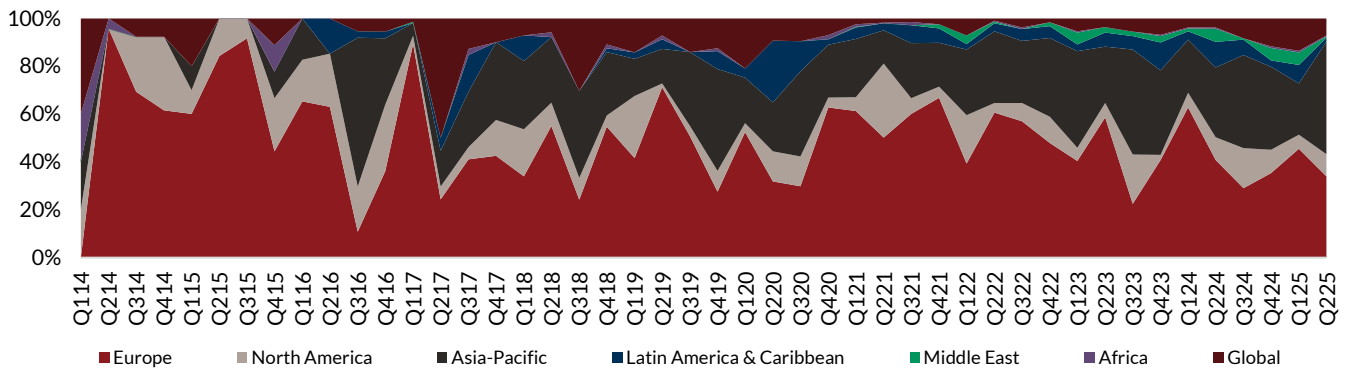


Source: BMI & AIIB-Amundi A&R Bond Database

Europe, specifically the EU, accounts for a dominant but declining share of global A&R UoP (figure 3.4). Since Q1 2014, the EU (50.9%) has accounted for more than half of cumulative adaptation UoP. This share has consistently

surpassed that of 'global' issuers such as the World Bank. However, this share is declining as issuance from other regions, particularly APAC, grows rapidly.

Fig 3.4: A&R UoP From GSSS Issuance By Region



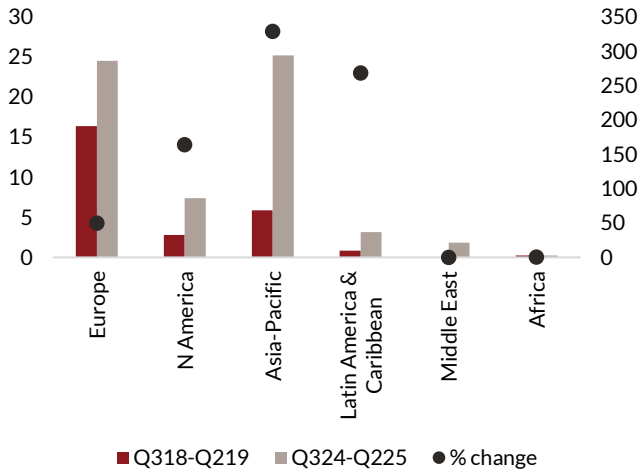
Source: BMI & AIIB-Amundi A&R Bond Database

APAC A&R UoP is expanding steadily and is now driving global growth. APAC A&R UoP in the 12 months to Q2 2025 was more than four times higher than at the same point in 2019 (figure 3.5). The quarterly total of USD9.3 billion in Q2 2025 was also the highest APAC A&R UoP on record. Europe's A&R UoP increased by a less significant 50% over the same period, understandable given the high growth base effects. Still, it comes at a time when the expansion of A&R financing tools is urgently required.

'Going back five years, almost all the investment in adaptation and resilience bonds was happening in Europe... but in the last few years... Asia-Pacific has seen huge growth in bond issuance, where some of the use of proceeds is going towards adaptation and resilience.' – CFO, Energy and Technology Issuer



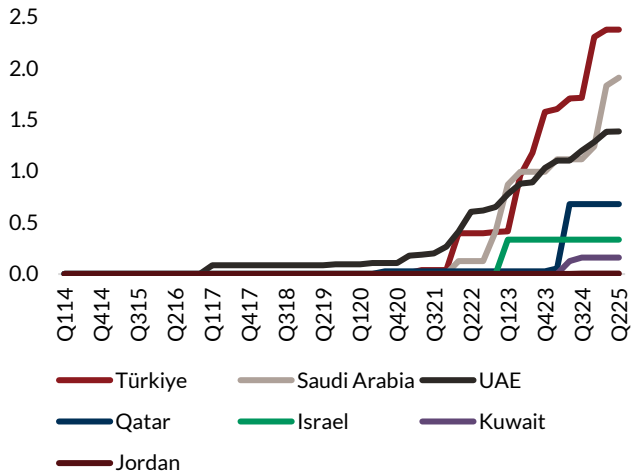
Fig 3.5: New A&R UoP From GSSS Issuance By Region



Source: BMI & AIIB-Amundi A&R Bond Database

In the Middle East, cumulative A&R UoP since the start of 2023 (USD5.8 billion) was more than triple all preceding UoP (USD1.7 billion). This has been driven by Türkiye (USD2.4 billion), Saudi Arabia (USD2.2 billion) and the UAE (USD1.4 billion) (figure 3.6).

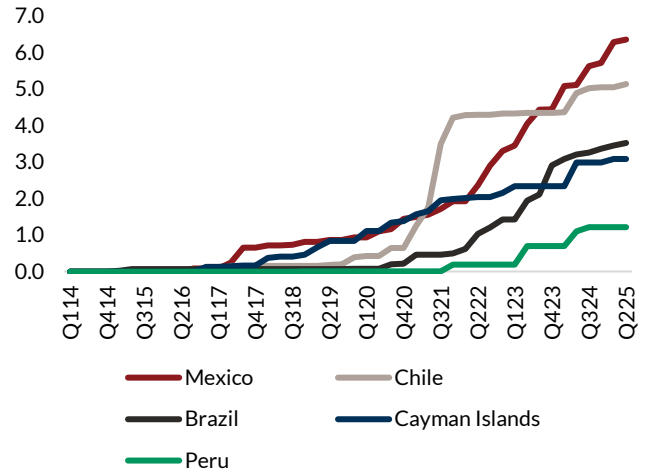
Fig 3.6: Middle East – Cumulative A&R Bond Issuance, USDbn



Source: BMI & AIIB-Amundi A&R Bond Database

Latin America's largest economies have also rapidly increased A&R UoP from GSSS bond issuance. Regional issuance has been volatile, but there has been strong cumulative issuance growth in Mexico (USD6.3 billion), Chile (USD5.1 billion) and Brazil (USD3.5 billion) (figure 3.7).

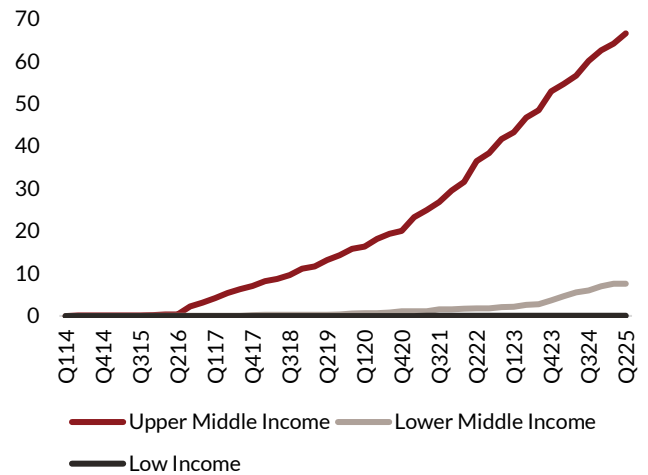
Fig 3.7: Latin America – Cumulative A&R UoP From GSSS Issuance, USDbn



Source: BMI & AIIB-Amundi A&R Bond Database

The geographical distribution of A&R UoP is shifting towards middle-income issuers. In 2016, high-income economies accounted for 90% of adaptation UoP. By 2025, this share had declined to 85% as issuance by middle-income economies increased.

Fig 3.8: Global – Cumulative A&R UoP From GSSS Issuance By Income Classification, USDbn



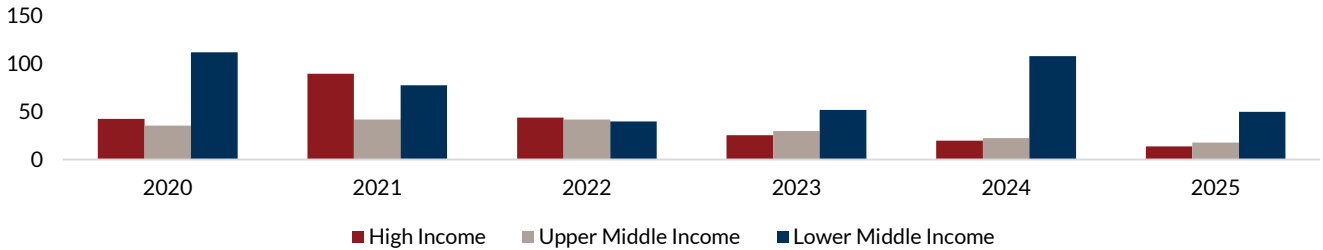
Note: Income classifications based on World Bank, 2025. Source: BMI & AIIB-Amundi A&R Bond Database



Most of this shift has been due to explosive growth in China's A&R UoP, which reached a cumulative USD41.4 billion in 2025 and accounted for more than half of all UoP

by middle-income economies. Aside from China, APAC has been a primary centre of middle-income adaptation growth, driven by Indonesia, India, Thailand and the Philippines.

Fig 3.9: Global - Cumulative A&R UoP From GSSS Issuance, % Change y-o-y



Source: BMI & AIIB-Amundi A&R Bond Database

Outside of APAC, middle-income economies, including Mexico, Brazil and Türkiye, have been significant drivers of A&R UoP growth (figure 3.10). Middle-income economies in Africa have been slower to ramp up adaptation-related

issuance, reflecting generally lower bond issuance activity. Nonetheless, the financial hubs of South Africa (USD0.6 billion), Mauritius (USD0.3 billion) and Egypt (USD0.4 billion) have commenced adaptation issuance.

Fig 3.10: Middle-Income Economies - Largest Cumulative A&R UoP From GSSS Issuance

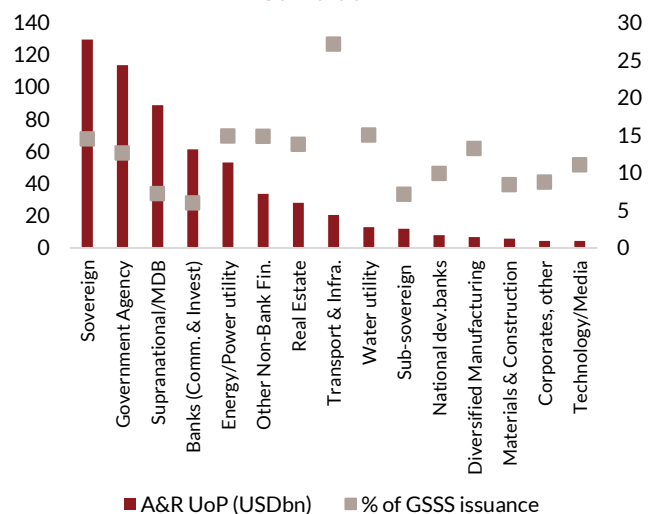
Country	Region	Total GSSS Issuance (USDbn)	Total Adaptation Issuance (USDbn)	A&R As % GSSS Issuance
China	Asia-Pacific	868.2	41.4	5.0
Mexico	Latin America & Caribbean	101.1	6.3	6.0
Indonesia	Asia-Pacific	39.5	6.1	15.0
Brazil	Latin America & Caribbean	76.1	3.5	5.0
India	Asia-Pacific	72.2	3.1	4.0
Philippines	Asia-Pacific	28.5	2.7	9.0
Türkiye	Middle East	45.3	2.4	5.0
Thailand	Asia-Pacific	26.8	2	8.0
Peru	Latin America & Caribbean	28.2	1.2	4.0
Malaysia	Asia-Pacific	24.1	1	4.0

Note: Income classifications based on World Bank, 2025. Source: BMI & AIIB-Amundi A&R Bond Database

The Public Sector Remains The Dominant Issuer

The public sector is the backbone of A&R finance, including bonds. Sovereigns, sub-nationals and supranationals account for the majority of tracked flows (figure 3.11). The CPI notes that public actors supplied around 90% of tracked broader A&R finance (of which bonds are a subset) in 2023. Motivations include funding National Adaptation Plans (NAPs), protecting public assets (coastal, water and health), providing public goods like water services, and leveraging concessional finance tools to crowd in private capital. Focusing on bond markets, the public sector remains the dominant issuer of bonds with A&R UoP. Sovereigns, multilaterals and other public entities accounted for 53% of A&R UoP in H1 2025, below the 70% peak of 2020, but similar to the 2016-2025 average of 57%.

Fig 3.11: Global - Largest 10 Issuer Types For A&R UoP, Cumulative

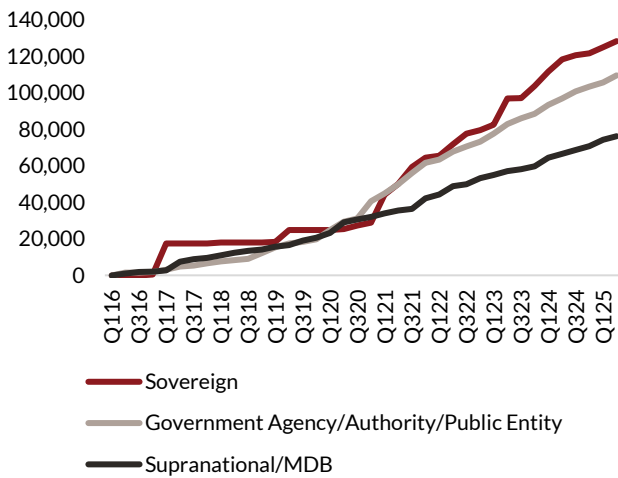


Source: BMI & AIIB-Amundi A&R Bond Database



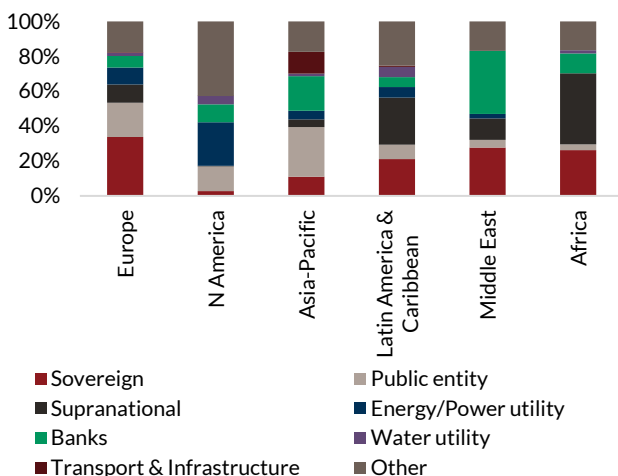
China's increasing role as a driver of A&R-related issuance has supported the public sector's share of adaptation UoP globally. In addition to China's sovereign and provincial issuance, state-owned banks, such as Agricultural Development Bank of China, and energy or utility companies, such as China Three Gorges Corporation and Beijing Drainage Group, have accounted for a substantial share of new A&R UoP.

Fig 3.12: Global - Cumulative A&R UoP From GSSS Issuance By Issuer Type, USDmn



Source: BMI & AIIB-Amundi A&R Bond Database

Fig 3.12a: Global - Share Of A&R UoP From GSSS Issuance By Issuer Type, %

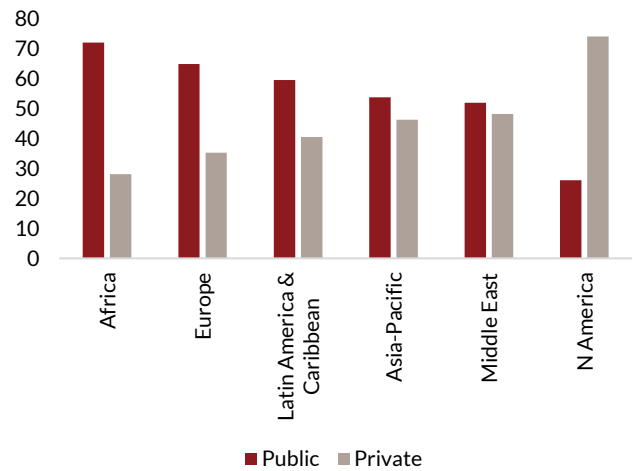


Source: BMI & AIIB-Amundi A&R Bond Database

There is a weak link between a region's level of economic development and the extent to which the public sector drives A&R UoP in that region. Admittedly, the lowest-income region, Africa, has the highest share of public sector A&R (70.2% – mostly supranationals – figure 3.13), while

the highest-income region, North America, has the lowest public sector share (26.0%). Europe also has a high public sector share of issuance (64.8% – mainly sovereigns), while the Middle East has a moderate public sector share (51.9%).

Fig 3.13: Global - A&R UoP From GSSS Issuance By Sector, % Of Total



Source: BMI & AIIB-Amundi A&R Bond Database

Different types of public sector entities drive issuance in different regions:

- In Africa, **supranational** entities (mainly MDBs such as the African Development Bank [AfDB] and the West African Development Bank) account for 40.7% of total A&R UoP, the highest share globally and significantly higher than the 4.5% in APAC (figure 3.14). That said, Africa's total supranational issuance of USD1.2 billion remains small in absolute terms, around one-fifth of the total in APAC. Aside from being exposed to the most acute physical climate risks, the least developed economies in Africa also tend to be where developed capital markets constrain the raising of private sector finance. Domestic public sector actors, such as sovereigns and state-owned enterprises, often have weaker credit ratings than those of developed markets, limiting their ability to raise debt. In this context, supranational entities are well placed to issue bonds for deployment in the region, leveraging their stronger credit ratings and investor networks.
- In Europe, the largest regional issuers of A&R-related bonds are **sovereigns** (33.7%) and other **public entities** (19.6%), accounting for the largest share of UoP. The largest European public issuers as of mid-2025 were the governments of France, Germany and the UK. French infrastructure agency Société des Grands Projets and the Netherlands' NWB Bank were other prominent public sector issuers. In contrast to Africa, the relatively less important role of supranational



organisations in Europe reflects stronger credit ratings for European sovereign and public entities, as well as more developed national bond markets, reducing the need for supranational organisations to act as anchor investors.

- In APAC, **government agencies and public entities** account for the largest share of A&R UoP (28.4%), partly driven by substantial issuance by China's state-owned firms. As of mid-2025, Chinese public entities accounted for 16.7% of cumulative APAC public entity UoP, with the largest examples being China Development Bank Corporation, Agricultural Development Bank of China, and the Municipality of Shenzhen. UoP by public entities in Japan is also substantial, including the Development Bank of Japan, the Urban Renaissance Agency, and the Tokyo Metropolitan Government.

MDBs As Critical Drivers Of A&R Bond Issuance

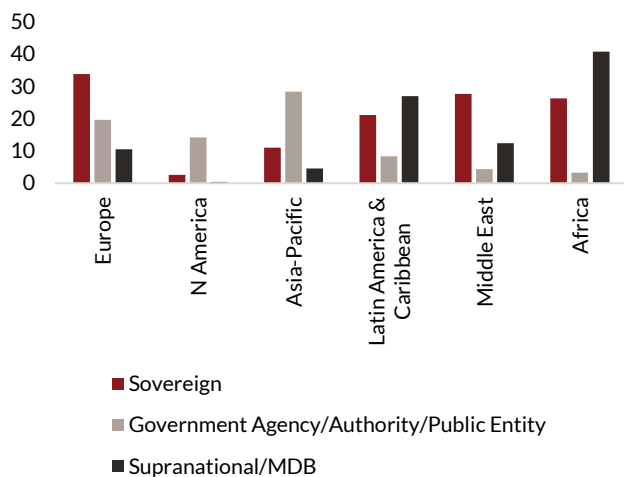
Multilateral development banks (MDBs) have been central to the expanding issuance of A&R-related bonds. Their influence extends far beyond their own bond programmes, as they play simultaneous roles as issuers, technical partners, policy enablers and market-makers. For instance, supranational assistance has helped boost issuance by sovereign and other public sector entities, which are the two largest issuer types. Together, these functions have been essential in building confidence in A&R bonds, reducing barriers to entry for other issuers and expanding the pipeline of investable climate resilience projects.

1. Multilateral Development Banks As Major A&R Issuers

MDBs have been among the most active A&R-relevant issuers globally. In our A&R Bonds Database, MDBs – including the World Bank, ADB, AfDB, IDB, EBRD and AIIB – account for USD89.0 billion, representing 14.9% of global A&R issuance (figures 3.15 and 3.17), third after sovereigns and other public entities. Their large, liquid, AAA-rated issuance programmes have helped normalise the use of A&R-aligned categories in labelled bonds, demonstrating proof of concept for other issuer types.

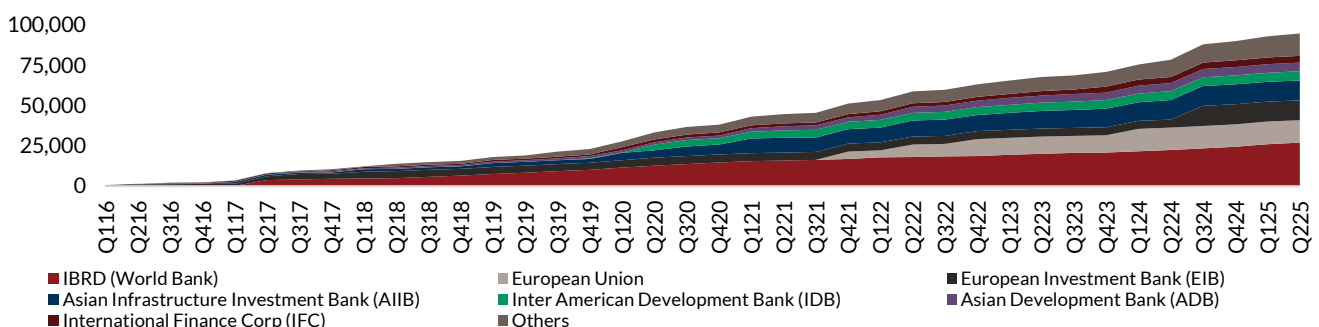
MDB issuance began rising steadily from around 2016, initially led by the IBRD (World Bank) and the European Investment Bank. The pace of growth accelerated from 2020, driven by increased issuance in Europe (particularly by the EU and the EBRD) and by MDBs headquartered in Asia (including the Asian Development Bank and Asian Infrastructure Investment Bank) and the Americas (notably the Inter-American Development Bank). In the early phase, adaptation- and resilience-related UoPs were typically embedded within broadly labelled GSSS bonds, and this remains the norm. However, following the EBRD's issuance of the first dedicated adaptation bond in 2019, the explicit labelling of A&R bonds has become more common, with AIIB leading this thematic issuance with three consecutive issuances since 2023 (see detailed AIIB example below).

Fig 3.14: Global – Cumulative Public Sector A&R UoP From GSSS Issuance By Region, % Of Total



Source: BMI & AIIB-Amundi A&R Bond Database

Fig 3.15: Cumulative A&R UoP In GSSS Bonds Issued By Multilateral Development Banks, USDmn



Source: BMI & AIIB-Amundi A&R Bond Database and AIIB Calculation.

Note: In the case of AIIB, the A&R Use of Proceeds was stipulated from the 2020 to 2024 project impact reports. Public information from the BMI-AIIB-Amundi Database would result in USD894 million, or 1.7% of total GSSS issuances, as disclosures of A&R lending in public databases from Sustainable Fitch, Luxembourg Green Exchange, Environmental Finance and Climate Bonds Initiative do not capture all A&R activities.



Spotlight: AIIB Using Adaptation Bonds To Mobilise Private Capital

AIIB is one of the few MDBs to issue thematic adaptation bonds and demonstrates how MDBs can use their balance sheet, credibility and standards to encourage and support private sector investment in A&R, especially in water and infrastructure, where private participation is otherwise limited. Proceeds from its A&R bonds have so far supported climate-resilient water systems, flood risk management, emergency infrastructure and municipal resilience programmes in markets such as Bangladesh and Uzbekistan. AIIB applies the MDB Joint Adaptation Methodology, climate-hazard screening and Paris Agreement alignment requirements to its issuances.

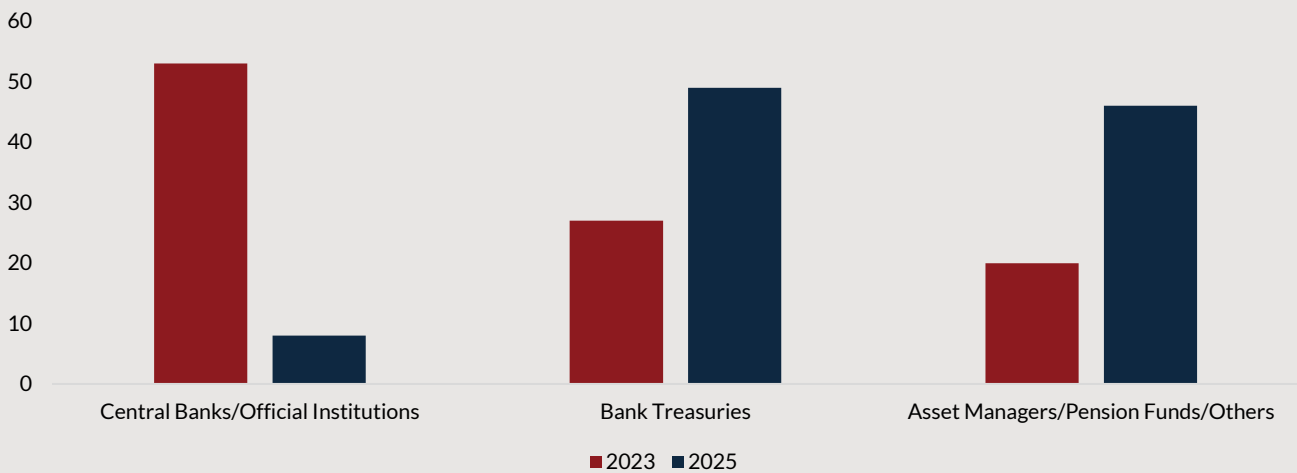
AIIB's [first Climate Adaptation Bond](#) was issued in 2023 as a AUD500.0 million, five-year benchmark, marking one of the first adaptation-labelled bonds from an MDB. The investor distribution was led by the public sector, with 53% stemming from public sector entities such as central banks and public institutions, followed by banks at 27% and asset managers at 20%. This pattern reflected the early dynamics of a new thematic product, where official institutions typically act as anchor investors to establish credibility and support market development.

The [second AUD500.0 million adaptation bond](#), issued in 2025, displayed a strikingly different profile. Official sector participation accounted for just 8% of investment, while private sector investors dominated the book as bank treasuries accounted for 49% and asset managers and pension funds for a further 46% (figure 3.16).

Significantly higher private sector participation in the second bond shows how MDBs can create market confidence in a new asset class. MDB-led instruments can convert niche public sector interest into broad private sector demand. Private investors demonstrate a stronger appetite once a product has become better understood and more firmly established. Building on this strong investment interest, the AIIB issued its third climate adaptation bond in February 2026.

'Additional issuance is driven by continued investor interest in climate-aligned products, and the strong reception to our previous two transactions.' – [Darren Stipe, AIIB Head of Funding](#)

Fig 3.16: Investor Distribution For AIIB's Two AUD500.0mn Climate Adaptation Bonds, %



Source: AIIB, BMI



Fig 3.17: Supranational Entities – Largest Cumulative GSSS UoPs Allocated To A&R

Issuer	Cumulative A&R UoP (USDmn)	A&R UoP As % Of Entity's GSSS issuance
IBRD (World Bank)	29,207	6.0
European Union	13,922	6.0
European Investment Bank	12,801	7.0
Asian Infrastructure Investment Bank	12,257	20.8
Asian Development Bank	6,401	16.0
Inter American Development Bank	5,972	12.0
International Finance Corp	4,922	18.0
International Development Association (World Bank)	3,860	6.0
Nordic Investment Bank	2,802	10.0
European Bank For Reconstruction And Development	1,813	17.0
Central American Bank for Economic Integration	1,283	17.0
African Development Bank	941	4.3
Arab Petroleum Investments Corp	870	58.0
Development Bank of Latin America and the Caribbean	820	11.6
Inter-American Investment Corp	737	14.6
The New Development Bank	592	4.0
International Fund For Agricultural Development	554	58.0
West African Development Bank	279	18.4
Islamic Development Bank	53	2.1
North American Development Bank	37	5.8

Source: BMI & AIIB-Amundi A&R Bond Database and AIIB Calculation.

Note: In the case of AIIB, the A&R Use of Proceeds was stipulated from the 2020 to 2024 project impact reports. Public information from the BMI-AIIB-Amundi Database would result in USD894.0 million, or 1.7% of total GSSS issuances, as disclosures of A&R lending in public databases from Sustainable Fitch, Luxembourg Green Exchange, Environmental Finance and Climate Bonds Initiative do not capture all A&R activities.

2. Technical Assistance To Build Issuer Capacity

MDBs substantially reduce the cost and complexity of issuing A&R-aligned bonds by providing technical assistance, especially in middle-income economies with less mature bond markets. MDBs' Paris Alignment commitments require all operations to assess climate risks, giving them a strong incentive to support clients in developing climate risk screening, adaptation planning and internal procedures for resilience-aligned expenditure. Examples include helping utilities develop climate risk assessments, supporting sovereigns in establishing green or sustainability frameworks, and strengthening corporate climate risk governance so that issuers can credibly define A&R UoPs. This process can leverage research conducted by third-party data providers or industry groups, such as the CBI, the Sustainable Stock Exchanges Initiative and the [Asia Investor Group on Climate Change](#) (AIGCC).

'What we've seen in the market is that many issuers simply do not have the capacity to identify what adaptation is or how to structure it... This is a big challenge for scaling adaptation finance.' – **Matteo Bigoni, Head of Taxonomies, Climate Bonds Initiative**

Spotlight: ADB Support For PEA's Sustainability Bond (2024)

ADB provided extensive technical assistance to Thailand's Provincial Electricity Authority (PEA) for its inaugural sustainability bond, enabling the state utility to credibly incorporate adaptation and resilience into its financing framework. Through the GSS+ Bonds Initiative, ADB supported PEA in developing a sustainable finance framework aligned with international and ASEAN taxonomy standards, identifying resilience-aligned UoP such as microgrids and climate-resilient submarine cables, and strengthening internal systems for reporting and governance. This lowered transaction barriers and positioned PEA to access capital markets with a high-quality, adaptation-relevant GSSS issuance.

3. Policy-Based Lending

MDBs also use policy-based lending and upstream advisory to help national governments create enabling conditions for A&R issuance. This includes supporting taxonomy development, disclosure regulations, sovereign green bond frameworks and fiscal incentives. For example, MDB policy programmes in several Asian markets have



included commitments to develop national sustainable finance taxonomies aligned with global practices, lowering transaction costs and enabling sovereign or corporate A&R-labelled issuance.

Spotlight: Bangladesh Climate And Development Platform (2023)

Under the IMF RSF arrangement and the World Bank’s Green and Climate Resilient Development Policy Credits, the government of Bangladesh committed to climate finance reforms including integrating climate criteria into public planning, strengthening disaster risk financing and updating Bangladesh Bank’s Green Bond Financing Policy. These conditional reforms create the regulatory basis for sovereign and corporate A&R-aligned bond issuance.

4. De-risking To Encourage Investors

MDBs play a catalytic role in blended-finance structures, using guarantees, subordinated tranches or anchor investments to lower the perceived risk of A&R-related issuance by smaller sovereigns, sub-nationals or corporates. This reduces the cost of capital, improves credit quality and helps scale pilot transactions into repeat issuance.

Spotlight: Luxembourg-EIB Climate Finance Platform (LCFP)

LCFP is a joint initiative between Luxembourg and the EIB to mobilise and support investment in international climate finance, including adaptation. The Luxembourg government is contributing a first-loss guarantee to mitigate the risk for the private sector when co-investing in funds dedicated to climate change mitigation and adaptation. The platform provides equity and debt investments, often taking on a higher-risk position (e.g., in junior tranches of layered funds) to reduce the risk for other investors.

‘Because of the country risk... it was the MDB that came in and supported us... the challenge was the funding... not the construction.’ – CFO, Energy and Technology Issuer

The Private Sector Is Ramping Up Issuance

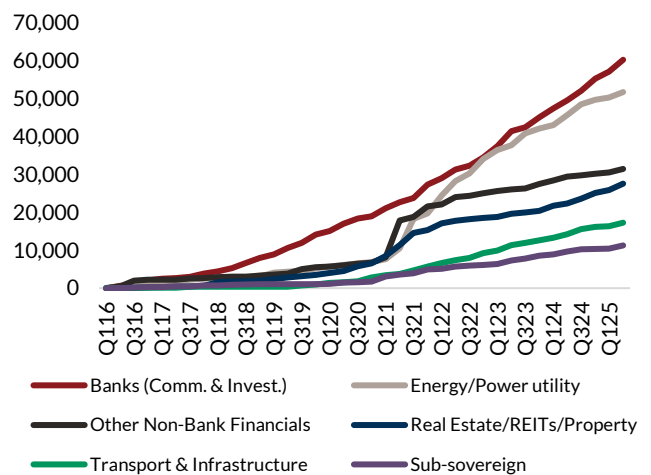
Private sector A&R bond UoP is increasing, but from a low base. Private sector issuance of GSSS bonds with A&R UoP has broadly tracked the growth in public sector issuance over the past decade and has accelerated more recently. Cumulative private sector A&R UoP increased by 17% y-o-y in the 12 months to Q2 2025 to roughly USD226 billion,

compared to a 12% increase in public UoP. Cumulative private sector A&R UoP in Q2 2025 was almost 300% larger than five years previously.

Financial institutions (banks, non-bank financials) are the largest private sector issuers of bonds with A&R UoP and account for around two-thirds of private sector A&R UoP within the BMI & AIIB-Amundi A&R Bond Database (figure 3.18). Encouraged by investor demand for labelled products, these firms issue sustainability/green bonds whose UoP include A&R lines (eg, resilient infrastructure lending, SME resilience). Banks (Commercial & Investment) have ramped up issuance since a dip during the Covid-19 pandemic and accounted for most of the A&R UoP by financial institutions in 2025.

Private sector non-financial corporations are also increasingly active issuers, most visibly in utilities, energy, water management, transport and real estate. Corporate assets face material physical climate risks, and disclosure mandates and frameworks (eg, IFRS S2/TCFD) encourage them to assess, manage and finance resilience.

Fig 3.18: Global – Cumulative A&R UoP From GSSS Issuance By Issuer Type, USDm



Source: BMI & AIIB-Amundi A&R Bond Database

Cumulative issuance of GSSS bonds with A&R UoP by **energy/power utilities** has increased rapidly in recent years, rising eightfold since 2020. As of Q2 2025, we estimate the cumulative A&R UoP at USD51.6 billion, up 13% y-o-y and 85% over the past three years. Energy/power utilities accounted for 8.9% of cumulative A&R UoP as of Q2 2025, double the share in 2020. This reflects increased awareness among power utilities of the need to manage risks related to wildfires, storms and flooding that damage transmission and distribution infrastructure. Indian energy and power firm Adani Energy Solutions highlights a data-led



assessment of climate risks to distribution infrastructure in its [sustainability report](#). Through its subsidiary utility, Adani Electricity Mumbai Limited, it has allocated USD75.0 million of funds to A&R UoP through its broader GSSS issuance.

'The environmental study... highlighted certain environmental risks and suggested solutions like the raised electricity grid platforms to reduce flooding risk.'

- CFO, Energy and Technology Issuer

Global A&R UoP by energy/power utilities have thus far been dominated by utilities in high-income economies, such

as in Europe, including Enel (Netherlands), Engie (France) and Terna (Italy), and North America, such as Southern California Edison Company and New York Power Authority (both US). Adaptation-related issuance in emerging economies has been slower to gather pace. Still, issuers gaining momentum include China Energy Investment Corp (China), Huaneng Lancang River Hydropower (China), Interchile SA (Chile), Continuum Green Energy (India), Adani Electricity Mumbai Limited (India) and Energy Absolute PCL (Thailand) (figure 3.19).

Fig. 3.19: Energy & Power – Largest Emerging Market A&R UoP Issuers, Ex-Europe & North America

Issuer	Country	Total A&R Issuance (USDmn)	GSSS Issuance	A&R As % Of GSSS
Interchile SA	Chile	1,000	2,400	41.7
China Energy Investment Corp Ltd	China	900	2,674	33.7
Huaneng Lancang River Hydropower Inc	China	556	5,061	11.0
Continuum Green Energy India Pvt / Co-Issuers	India	377	650	58.0
China Huadian Corporation	China	364	3,070	11.8
China Three Gorges Corporation	China	363	30,518	1.2
China Energy Conservation And Environmental Protection Group	China	347	1,169	29.7
Energy Absolute Pcl	Thailand	334	576	58.0
China Energy Conservation & Environmental Protection Group	China	256	1,148	22.3
Grupo Energia Bogotá S.A. E.S.P.	Colombia	232	400	58.0

Source: BMI & AIIB-Amundi A&R Bond Database



Chapter 4. Insight Into Use Of Proceeds

Key Takeaways

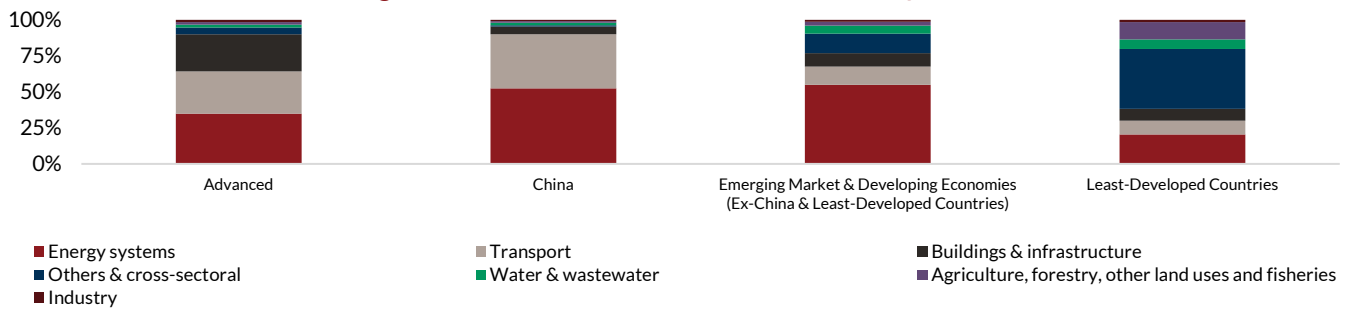
- Understanding how adaptation bond issuers allocate their proceeds is central to assessing which areas offer growth opportunities.
- A&R UoPs are concentrated in water-related infrastructure, with significant secondary commitments to agriculture, transport and infrastructure resilience.

Differences Between A&R And Mitigation Use Of Proceeds

Due to limited visibility into bond UoP at the aggregate level, it is challenging to assess the differences between mitigation and A&R bond UoP. However, we expect a similar pattern to broader climate finance trends. Investment in climate mitigation, which accounts for approximately 94% of total climate finance ([USD1.8 trillion in 2023, CPI](#)),

is concentrated in energy systems, transportation and buildings, sectors that typically generate predictable cash flows and measurable emissions reduction outcomes. Energy alone attracted USD831.0 billion in climate mitigation finance in 2023 ([CPI 2025](#)). These sectoral preferences are illustrated in figure 4.1. The data relates to total climate finance, including mitigation and A&R, but broadly reflects mitigation spending because mitigation accounts for 94% of the total.

Fig 4.1: Global – Climate Finance Investment By Sector



Note: Climate finance includes adaptation and mitigation, of which mitigation accounts for 94%. Source: CPI (2025), BMI

A&R finance is relatively more weighted to water, agriculture and disaster management, where returns are indirect and depend on avoided losses or social benefits. According to the CPI, water and wastewater (USD22.3 billion) led total A&R finance flows in 2023, followed by agriculture, forestry, other land uses and fisheries (USD6.5 billion) and disaster risk management (USD6.3 billion). These trends in total A&R finance are generally replicated in A&R bond UoP in our database (*analysis outlined below in the Water-Related Risks Attract Most Spending section*).

Water-Related Risks Attract Most Spending

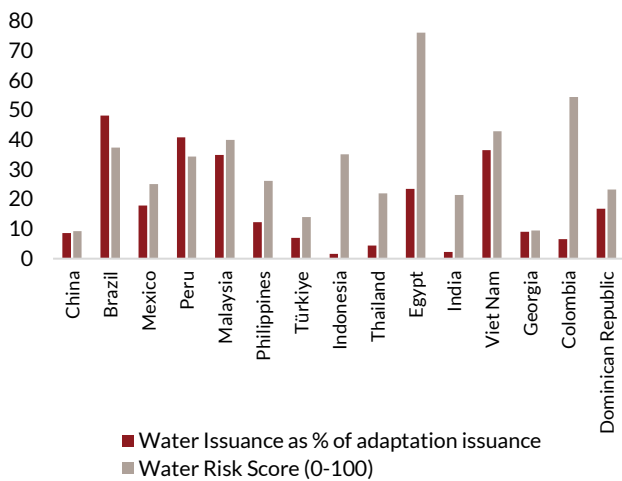
Water-related projects constitute a substantial share of global A&R bond UoP, according to our database, reflecting the central role of flood control, coastal protection and drought resilience in climate adaptation. The AIIB-Amundi A&R Bond Database filtered water-related UoP in the bond dataset to provide an additional filter to ensure that

climate vulnerability is the key underlying driver of issuance of such bonds. As water-specific investments were the largest category, a more granular approach was applied, utilising country-by-country natural-disaster risk data to further narrow the broad water-associated bond universe. That said, an analysis of this subset of bonds is important for understanding the key drivers of such issuance and the potential for more A&R bonds in this space.

Water-related investments have been a significant driver of adaptation issuance in middle-income countries. Across the middle-income economies in our A&R bond database, the average allocation to water-related UoPs was roughly 11%. In countries with particularly high water-related natural disaster risk, as measured by the Water Risk Index created with BMI ESG data, the proportion was even higher. For example, almost half of adaptation issuance in Brazil is tagged to water-related uses, while the share was 41% in Peru and 35% in Malaysia (figure 4.2).



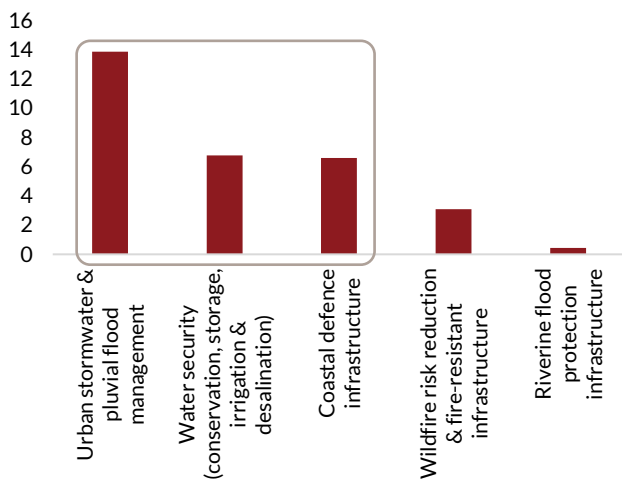
Fig 4.2: Middle-Income Economies – The 15 Largest Issuers Of Water A&R UoP From GSSS Issuance



Note: A higher water risk score (100) implies greater risk of drought or flood. Source: BMI & AIIB-Amundi A&R Bond Database and BMI ESG Data

This conclusion was reinforced by a more detailed analysis of the UoP data in our A&R Bonds Database, which highlighted flooding, particularly urban flooding, as the primary target of A&R-related bond issuance. Water-related risks, including flooding (urban, riverine and coastal) and water stress, accounted for 90% of the identified A&R UoP (figure 4.3).

Fig 4.3: Global – A&R Use of Proceeds Sub-Category, USDbn

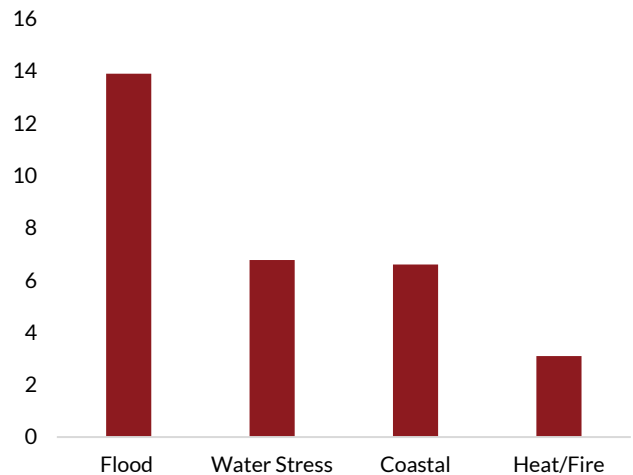


Source: BMI & AIIB-Amundi A&R Bond Database

Given the limited availability of detailed UoP sub-category data, we validated our findings by examining bonds through a different lens, the type of physical climate risk they sought to address. This analysis reinforced the dominance of water-related risks, as shown in figure 4.4, which searched for

text references to specific physical risks. Flood (USD13.9 billion), water stress (USD6.8 billion) and coastal inundation (USD6.6 billion) risks each far exceeded heat- and fire-related risks (USD3.1 billion), underscoring the central role of water resilience in global A&R financing.

Fig 4.4: Global – A&R Issuance By Physical Risk Category, USDbn



Source: BMI & AIIB-Amundi A&R Bond Database

Water utilities drive some of this water UoP allocation. Water utilities are a modest issuer of A&R-related bonds, accounting for 2.2% of cumulative A&R UoP in the A&R bond Database, but they allocate a relatively high proportion of GSSS bond proceeds to A&R. In our A&R database, 15.0% of GSSS bond issuance by water utilities was allocated to A&R UoPs, the second highest of the issuer types in our database after transport and infrastructure.

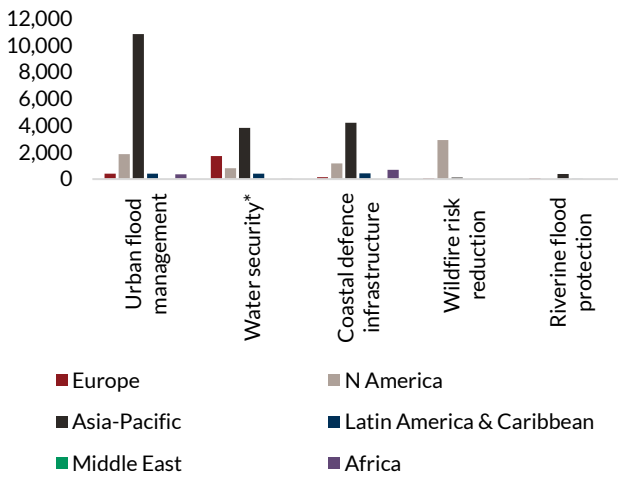
Across all regions, water utilities remain the most prominent example of ‘pure-play’ A&R issuers. The CBRT typically allows such issuers to qualify for A&R treatment automatically as long as (i) they provide an enabling contribution to resilience by delivering technologies, services or practices that measurably improve climate resilience; (ii) their core operations deliver a substantial contribution by reducing vulnerability or exposure to climate hazards; and (iii) they fall within sectors deemed eligible without project-level analysis. As a result, bonds issued by these entities are treated as 100% adaptation-aligned with respect to the use of proceeds. Based on a cursory categorisation of issuers, we estimate that around 12% of bonds in the A&R bond database were issued by pure-play entities and were automatically tagged as A&R bonds. Water companies dominate this group, accounting for 97% of the identified pure-play entities. Other categories, including flood protection, water technology and cooling materials, remain comparatively small but are gradually increasing in importance.



APAC is particularly dominant in water-related UoP categories, including urban flood management, water security and coastal defence. In fact, the only UoP categories in which APAC did not record the highest tagged issuance in the A&R Bond Database were wildfire risk and heat-resistant materials, where North America led (figures 4.5 and 4.6).

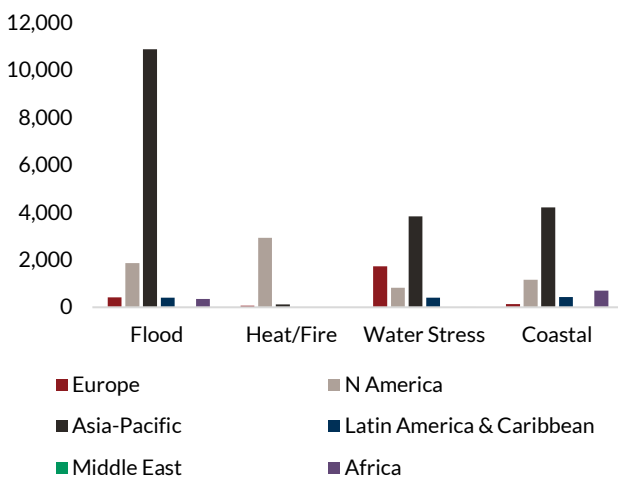
'APAC has been the fastest growing area... mainly led by issuers from China, Japan and Indonesia... Adaptation as a standalone UoP typically includes projects such as flood control measures, [and] installation of weather-monitoring systems.' – Yoshi Yue, Associate Research Director, Sustainable Fitch

Fig 4.5: Global – Cumulative A&R Use of Proceeds By Region, USDmn



*Includes water conservation, storage, irrigation and desalination. Source: BMI & AIIB-Amundi A&R Bond Database

Fig 4.6: Global – Cumulative A&R Physical Risk Category By Region, USDmn

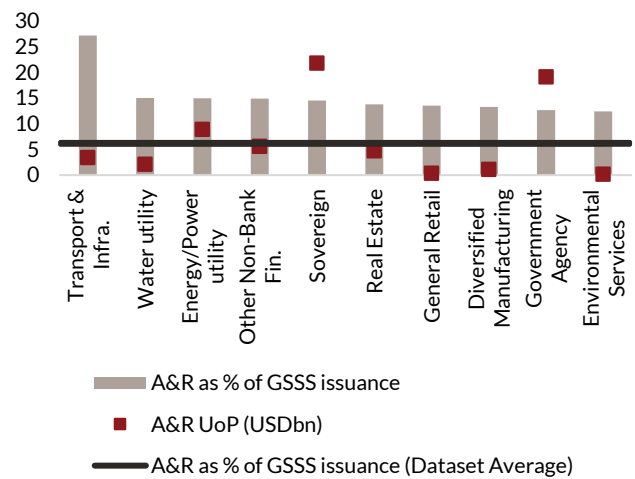


Source: BMI & AIIB-Amundi A&R Bond Database

Due to challenges in standardising comprehensive UoP data in the A&R bond database, we also drew on sectoral issuance trends to infer probable allocations. Where detailed classifications were unavailable, we assumed that a substantial share of proceeds from A&R-related bond issuance in sectors such as transport, energy and water would be directed toward projects that enhance the resilience of those sectors. These could include infrastructure hardening, grid reliability improvements or flood-resilient transport design.

On this basis, we estimate that the transport and infrastructure sectors, especially transport, are significant and growing recipients of A&R UoP. The transport and infrastructure sector allocated 27.2% of GSSS bond issuance to A&R UoP in our A&R bond database, the highest proportion of the 25 issuer types we classified, and higher than the dataset average of 6.2% (figure 4.7). Transport-focused entities dominated the list of issuers in this category, including major road and rail management companies in Japan, China, Korea and Thailand, and airport and port operators in China and Europe. This assumption is supported by evidence from CPI (2025) and UNEP (2025) on broader global adaptation finance, which identifies these sectors as among the largest recipients of broader A&R finance due to their high exposure to climate-related physical risks.

Fig 4.7: A&R UoP As % Of GSSS Issuance By Issuer Type



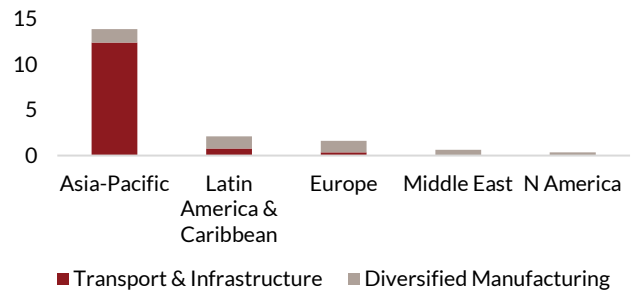
Source: BMI & AIIB-Amundi A&R Bond Database

Transport, infrastructure and diversified manufacturing account for a larger share of A&R UoP in APAC than in other regions (figure 4.8). This distribution suggests a strong concentration of A&R investment in transport infrastructure, logistics and industrial resilience, reflecting both the region's exposure to supply chain disruptions and



the growing role of corporates in financing physical risk management. Aside from heavy manufacturing operations, and considering A&R investments, our interactions with market participants identified the semiconductor sector as a growth area due to these facilities' high sensitivity to disruptions.

Fig 4.8: Select Issuer Types – Share Of A&R UoP From GSSS Issuance In Each Region, %



Source: BMI & AIB-Amundi A&R Bond Database

Case Study

ALR: Building Flood Resilience Into Malaysia’s Highways

About ALR

Amanat Lebuhraya Rakyat Berhad (ALR) is Malaysia’s largest urban highway operator, managing four major expressways in Greater Kuala Lumpur through a private, not-for-profit model that reinvests all surpluses. Its portfolio includes the SMART Tunnel, a dual-use asset that functions both as a road tunnel and as Malaysia’s most important flood-diversion system, placing ALR at the intersection of transport operations and climate-resilience delivery.

A&R Issuance Insight

In 2022, ALR issued a RM5.5 billion AAA-rated Sustainability Sukuk Murabahah, aligned with Malaysia’s SRI Sukuk Framework, to acquire its concessionaires. MYR10.0 million of sukuk proceeds were ring-fenced for explicit sustainability and adaptation-aligned activities, including flood gate upgrades, drainage improvements, tree planting and rainwater harvesting. Moreover, a significant share of the broader UoPs delivers material resilience value, especially through the SMART Tunnel’s flood-management function.

ALR stated that the 2022 Sukuk was a one-time issuance to purchase its concessions and that the organisation has no plans for additional labelled issuance.

Impact Snapshot

The SMART Tunnel has diverted 243.4 million m³ of floodwater across more than 630 flood events, preventing an estimated MYR4.7 billion in damages since 2007. This makes it one of South East Asia’s most effective urban flood mitigation assets. Complementary measures, such as tree planting, nature-based erosion control and water management improvements, further strengthen resilience across ALR’s wider network.

Spotlight On Hidden Adaptation UoPs

ALR’s A&R focus illustrates how infrastructure operators are already issuing GSSS bonds to finance measures that address climate risks specific to their operations and relevant to their markets. It also highlights that adaptation activities within mainstream infrastructure operations are under-represented in A&R UoP aggregates. According to the CBRT, infrastructure that manages stormwater, prevents flood damage and maintains essential services during extreme rainfall is categorised as adaptation aligned. This means that much of the spending on infrastructure like the SMART Tunnel, far beyond the specific ring-fenced MYR10.0 million for A&R, meets international adaptation criteria and could be labelled as such in future issuance.

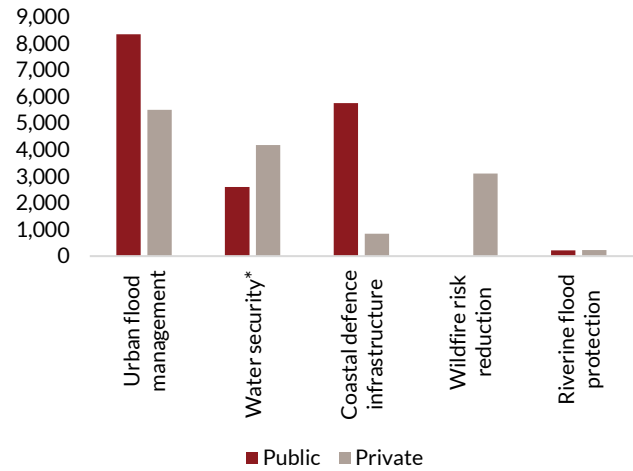
‘The focus of our issuance was primarily on the social impacts, with a small amount of proceeds allocated for a variety of environmental projects – but in reality, we spend considerably more than that on maintaining our flood mitigation asset.’ – Jo-Lyn Low, Chief Financial & Corporate Officer, Amanat Lebuhraya Rakyat Berhad



Private Sector Involvement Is Well Distributed

Private sector A&R UoP are distributed across all major categories in our database. The water-related segments exhibit particularly strong private participation, with notable activity in water supply projects, including conservation, storage, irrigation and desalination. This pattern aligns with evidence from the UNEP and the CPI, which indicates that agriculture and water resilience projects tend to attract more private investment than large-scale coastal or flood defence infrastructure projects. The A&R bond database also captures significant private-sector involvement in urban flood prevention projects (figure 4.9), reflecting growing interest in resilience measures that directly safeguard commercial assets and supply chains.

Fig 4.9: Global – Cumulative Private Sector A&R Bond Issuance By UoP Category, USDm



*Includes water conservation, storage, irrigation and desalination. Source: BMI & AIFB-Amundi A&R Bond Database

Case Study

SL Agritech: Financing ‘Pure-Play’ Adaptation Enablers

About SL Agritech

SL Agritech Corporation (SLAC) is the Philippines’ leading hybrid rice seed developer and a flagship private sector player in climate-resilient agriculture. The company operates seed production, R&D and processing facilities across Nueva Ecija, Tarlac, Davao del Sur and Davao Oriental, supporting smallholder farmers through contract-growing, hybrid seed adoption and yield-enhancement programmes. Its hybrid rice varieties are widely used across the Philippines and in export markets. They are designed to deliver higher yields and stronger resilience to pests, drought and extreme rainfall, which are key climate risks facing the sector.

A&R Issuance Insight

In 2022, SL Agritech raised PHP2 billion (USD38.8 million) through a Social Finance Instrument (corporate notes) structured under its newly launched Social Finance Framework (SFF). The notes, which were aligned with the ICMA Social Bond Principles and the ASEAN Social Bond Standards (and reviewed by DNV), were designed to finance projects with clear socioeconomic benefits, particularly for smallholder rice farmers.

Eligible projects included:

- Contract growing programmes for hybrid rice and seed production
- Hybrid rice technology demonstration programmes
- R&D of climate-resilient hybrid seed varieties
- Harvest performance award schemes to incentivise higher yields
- Plant expansion projects that create rural employment and strengthen supply chains

While issued as a Social Bond, these activities directly support A&R outcomes. Hybrid rice varieties are a central climate adaptation technology in the Philippines: they maintain yields under variable rainfall, recover faster from typhoon impacts and reduce farmer vulnerability to climate shocks. SLAC therefore represents a pure-play adaptation enabler, even without explicit A&R labelling.

The 2022 Social Bond remains SLAC’s only GSSS-labelled issuance, and the company has not announced intentions to issue more labelled bonds in the future.



A&R Framework And Project Selection

SLAC's Social Finance Framework establishes oversight through a Corporate Social and Sustainability Committee, which screens projects for socioeconomic impact, alignment with ICMA SBP and compliance with ASEAN Social Bond Standards. Although the framework does not explicitly reference 'adaptation', the project portfolio aligns with enabling adaptation pathways recognised in the MDB Joint Adaptation Methodology, the GCA/CBI Resilience Guide for Issuers, and the IIGCC Climate Resilience Investment Framework, which consider seed innovation, climate-resilient crop varieties, rural technical assistance and farmer capacity building as core resilience enablers.

The emphasis on R&D, farmer training and yield stability technologies fits within the 'climate-resilient agricultural practices' category of multiple adaptation taxonomies, even if the bond itself remains socially labelled.

Impact Snapshot

SL Agritech's programmes have expanded access to hybrid seed varieties that deliver significantly higher yields and improve performance under drought, wet season typhoons and intermediate El Niño/La Niña cycles. Contract-growing schemes provide stable incomes, reduce farmer risk exposure and accelerate adoption of seeds that increase climate resilience at scale. Plant expansion activities generate rural employment and strengthen domestic rice supply chains, supporting national food security objectives.

Spotlight On Pure-Play Entities

SL Agritech exemplifies a pure-play adaptation enabler, a private entity whose core business model directly increases its customers' resilience to climate hazards. Its hybrid rice R&D, farmer training programmes and seed production networks strengthen yield stability, reduce climate vulnerability and enhance national food security. Yet, like many agricultural issuers, SLAC finances these activities through social or green-labelled instruments, not explicit adaptation bonds.

Alignment With Emerging Taxonomies And Standards

The dominant A&R themes identified, particularly water management and resilient infrastructure, align closely with global frameworks defining A&R finance. The Paris Agreement and UN SDG 13 both prioritise resilience-building investments such as flood control, water security and climate-proofed infrastructure. The EU Green Bond Standard and EU Taxonomy explicitly list water supply resilience, wastewater treatment and disaster risk management as eligible adaptation activities, while ICMA's Green Bond Principles recognise similar categories under 'climate-change adaptation'.

In the APAC region, national frameworks such as the ASEAN Taxonomy v2 and the green finance guidelines of Japan and Singapore are aligned with these definitions, particularly in their focus on resilient infrastructure and

water systems in high-risk markets. The rise of resilience and blue bonds further reinforces global alignment, embedding adaptation objectives in coastal and urban infrastructure finance. As regulatory taxonomies adopt clearer guidelines for classifying and disclosing A&R issuance and UoP, these sectors are expected to benefit from increased funding levels.

More generally, analysis of National Adaptation Plans shows that developing and lower-income countries consistently identify water and sanitation, agriculture and food systems, infrastructure and human settlements, and energy access as priority sectors for reducing vulnerability. These priorities are highlighted in the [UNFCCC Progress Report](#), where most countries identify water management, resilient infrastructure and climate-resilient transport as key needs. Our UoP findings, concentrated in water, energy, power, infrastructure and transport, therefore closely align with these nationally identified adaptation priorities.



Chapter 5. A&R Bond Outlook

Key Takeaways

- Gaps in A&R regulation and a lack of bankable projects remain a challenge for private sector issuance, hence the public sector has dominated A&R UoP thus far.
- **The adaptation and resilience bond market is expected to expand steadily, and the private sector will play an increasingly important role.** This will be driven by the increasing financial materiality of physical climate risks, growing infrastructure adaptation needs in emerging markets and recognition that resilience investments can be financed through existing GSSS bond structures, rather than requiring standalone labels.
- **An expanding and more diversified investor base will also facilitate higher A&R bond issuance,** supported by blended finance structures, guarantees and risk-sharing instruments that improve risk-adjusted returns and make resilience investments more attractive to private capital. Private sector issuance will also be driven by the growing materiality of physical risk across fixed-income portfolios. As physical risks drive higher insurance claims, credit downgrades and asset write-downs, allocating to A&R bonds can help investors reduce exposure to climate-related loss events.
- **Middle-income markets, particularly in APAC, will account for a growing share of A&R-related issuance,** driven by rising exposure to physical climate risks, large infrastructure investment pipelines and greater issuer familiarity with integrating resilience objectives into conventional GSSS bond frameworks. Water-related investments will continue to dominate A&R bond issuance due to acute drought and flood risks.

Investor Outlook – Some Of The Challenges In Mobilising Private Sector A&R Finance

Encouraging private sector issuance of A&R bonds, and private sector investment in these assets, requires overcoming two interconnected barriers: gaps in A&R regulation and data, and a shortage of bankable projects.

1. Gaps In A&R Regulation And Data

Regulatory and data shortcomings have limited the visibility and traceability of A&R finance, shrinking the pool of A&R-labelled assets available to investors. This, in turn, weakens the incentives for issuers to market projects explicitly as A&R-related.

‘Investors are currently more comfortable with conventional green bonds and are still familiarizing themselves with climate adaption-specific issuances.’

– Jo-Lyn Low, Chief Financial & Corporate Officer, Amanat Lebuhraya Rakyat Berhad

Definitional Ambiguity

Unlike mitigation, A&R lacks a consistent definition across taxonomies and disclosure frameworks. A&R activities are frequently grouped with mitigation in broad categories such as *Green Buildings*. Dual-benefit projects, such as building insulation that reduces emissions and improves heat resilience, are often categorised only as mitigation,

undercounting A&R spending. Even when frameworks explicitly specify what qualifies as A&R activities, there is limited awareness of this nuance among issuers and investors.

‘Limited and fragmented taxonomies pose a challenge in that it is difficult to distinguish pure adaptation from mitigation.’ – Yoshi Yue, Associate Research Director, Sustainable Fitch

Inconsistent Data Aggregation

Even where regulations such as the EU Taxonomy require detailed disclosure of A&R UoPs, most commercial databases do not treat ‘A&R’ as a standalone classification. Analysts must therefore infer A&R relevance from free-text bond data columns, or follow hyperlinks through to bond-specific documentation, reducing comparability across datasets.

Hidden A&R Investment

Many projects that contribute directly to resilience, such as water and sanitation infrastructure, drainage systems or climate-resilient transport, are not labelled as “climate” finance at all, let alone as A&R. As stated in A&R frameworks such as the CBRT and Joint MDB Methodology, infrastructure projects can qualify as A&R investment if they are designed with physical climate risks to the structural integrity and service delivery of the assets in mind.



'Some issuers had adaptation and resilience assets, but they didn't really know... There was a clear lack of definitions and understanding by issuers of what is adaptation and resilience.' – **Matteo Bigoni, Head of Taxonomies, Climate Bonds Initiative**

2. Shortage Of Bankable A&R Projects

Investors consistently cite the lack of bankable A&R projects as a key constraint on scaling private finance. In practice, this means that few A&R initiatives meet the technical, financial and risk-return standards required by commercial lenders or institutional investors. Although A&R projects often deliver strong macroeconomic and social returns, they typically yield limited direct financial returns, generating cost savings rather than revenue. As highlighted by the [Asia Investor Group on Climate Change](#), adaptation priorities identified at the national or sub-national level by policymakers are typically not translated into clear pipelines of bankable, project-level opportunities with clear revenue models. Consequently, private capital continues to favour large, capital-intensive projects in sectors with well-defined income streams and risk frameworks.

Financial Viability

A project is 'bankable' when it produces reliable cash flows or savings sufficient to service debt or offer an adequate return. For instance, a solar farm earns income from electricity sales, whereas a flood defence wall prevents losses but generates no revenue. The UN estimates that roughly 70% of A&R financing needs are in non-market sectors, such as water, health and coastal protection, typically funded by the public sector.

'For issuers... they need something that can offer return on capital. And that is the current challenge... how are you actually getting your return on investment?' – **Melissa Cheok, Associate Research Director, Sustainable Fitch**

Risk Profile

Commercial financiers require transparent ownership, collateral and contractual certainty. Many A&R projects depend on shared or public assets (eg, drainage systems or coastal barriers) with diffuse beneficiaries and uncertain long-term returns, making risk assessment difficult.

'At the end of the day, returns still drive markets... pension funds are financially driven. What yields are these? What's the risk?' – **Portfolio Manager, Asia-based Pension Trust**

Scale And Replicability

Investors seek projects that are sufficiently large and standardised to efficiently absorb capital. A&R projects are often small, local and highly site-specific, which increases transaction costs and limits aggregation or securitisation.

Revenue Model Clarity

A&R investments usually focus on avoided losses, such as reducing flood damage, which are hard to monetise. Without explicit revenue mechanisms, such as tariffs, insurance premiums or resilience service payments, banks struggle to structure such A&R-focused loans or bonds.

These barriers help explain why private investors have typically favoured mitigation investments over A&R.

Mitigation opportunities resemble the kinds of projects investors already understand: large-scale, revenue-generating assets such as renewable power, electric transport or energy-efficient buildings. They generate steady, contract-based cash flows (for example, through power-purchase agreements) and often qualify for government incentives or carbon credit revenues, all of which support conventional project finance structures. They also deliver clear, quantifiable outcomes such as emission reductions that align with corporate net-zero targets and ESG metrics.

'Mitigation is easier because there is a clear revenue model... for adaptation, the returns are less clear, and that's why the private sector has not come in.' – **Senior Climate Resilience Architecture Specialist, Regional Development Bank**

Emerging Trends Supporting A&R Financing Growth

Intensifying climate risks will drive structural growth in A&R-related bond issuance in both the public and private sectors. As extreme weather events become more frequent and costly, and as urban expansion in vulnerable regions with weak resilience increases exposure, governments, businesses and investors will face rising losses and mounting pressure to respond. This will result in increased demand for resilience financing that can be channelled into structured instruments, such as A&R-related bonds.

'It's about protecting operations – how do we ensure continuity of operations with these kinds of environmental risks?' – **Jo-Lyn Low, Chief Financial & Corporate Officer, Amanat Lebuhraya Rakyat Berhad**



In the private sector, this process will be accelerated by mandatory physical risk disclosures under IFRS S2 and CSRD compelling corporates and financial institutions to quantify and mitigate climate risks, strengthening the rationale for issuing and investing in A&R bonds. Ultimately, rising natural disaster risks will increase the perceived materiality of climate hazards, especially among ratings agencies. This will increase A&R UoP as a share of total GSSS bond issuance, particularly in emerging markets where climate hazards are relatively high. The following issuer types have established a base to continue showing strong issuance growth, building on their robust momentum since 2020:

- Banks (Commercial & Investment)
- Other Non-Bank Financials
- Energy/Power utility
- Real Estate
- Transport & Infrastructure

'Flood prevention, heat resilience, safeguarding public health, service continuity, avoided losses – all of these become more critical for communities and businesses as the climate changes and adverse weather events becomes more extreme.' – **Melissa Cheok, Associate**

Research Director, Sustainable Fitch

Allocation to A&R UoP will be supported by ongoing efforts to formalise A&R finance taxonomies. Taxonomies play a critical role in scaling sustainable finance by providing clarity, consistency and comparability on what qualifies as eligible investment. For issuers, they offer a structured framework to define use of proceeds and demonstrate credibility, while for investors, they reduce due diligence costs and enable more confident capital allocation.

In this context, the Climate Bonds Initiative's [Climate Bonds Resilience Taxonomy \(CBRT\)](#) stands out as a leading framework for adaptation and resilience. It translates complex and often fragmented resilience concepts into a clear, science-based classification of credible, investable activities. In doing so, it directly addresses one of the market's core challenges: making adaptation more visible, comparable and investable at scale.

Climate Bonds Resilience Taxonomy

The Climate Bonds Resilience Taxonomy (CBRT) is a science-based framework, developed as a structured database, for identifying, classifying, and qualifying investments that support climate adaptation and resilience. It captures activities that address the physical impacts of climate change and enhance resilience to climate-related risks.

Rather than prescribing a fixed list of eligible investments, the CBRT provides a positive, science-based reference point for credible resilience investments. This approach supports market integrity, while allowing flexibility to reflect evolving practices and innovation.

The CBRT:

- defines categories of adaptation and resilience investments, supported by associated criteria.
- supports bond structuring, certification under the Climate Bonds Standard (v4.3) and market alignment.
- enables consistent and comparable identification of resilience activities across sectors and jurisdictions
- is developed through a globally applicable, multi-stakeholder process grounded in climate science.

The CBRT aims to accelerate the allocation and mobilisation of capital towards climate resilience by improving the identification and assessment of eligible investments, particularly within debt instruments such as bonds and loans.

It can also support capital allocation decisions by financial institutions, corporates, and public bodies, and inform the development of national and regional sustainable finance taxonomies that incorporate adaptation and resilience considerations.

The framework is particularly suited to use-of-proceeds financing, where capital is allocated to clearly defined activities. By clarifying what qualifies as a climate resilience investment, the CBRT strengthens transparency, reduces the risk of misclassification and greenwashing, and supports the scaling of credible climate resilience finance.



As classification standards improve, A&R bonds are becoming a more integrated and investible component of sustainable finance. The USD350.0 million Tokyo Resilience Bond, issued by the [Tokyo Metropolitan Government](#) in June 2025 and certified under the Climate Bonds Initiative's Resilience Criteria and Taxonomy, offers a clear example of how standardised frameworks catalyse investment. Oversubscribed seven times, the bond attracted USD2.5 billion of bids from 120 institutional investors. The refinement and communication of the latest A&R frameworks with issuers, investors and other market makers such as investment banks and ratings agencies will also increase awareness of the opportunities for issuance and investment in this space.

'Governments can clarify the framework... the criteria to identify an A&R bond. That can help the issuer and encourage the investor to invest more.' – **Portfolio Manager, Asia-based Asset Management Company**

There is huge room for growth, as the gap between A&R needs and current financial flows remains vast. COP29 marked a significant advance for A&R finance. Delegates adopted the New Collective Quantified Goal (NCQG), committing to mobilise at least USD300 billion annually by 2035 for developing countries and to work towards USD1.3 trillion per year from all sources by that date. However, the 2025 [UN Adaptation Gap Report](#) warns that by 2035 developing economy adaptation finance needs will be at least 12 times higher than current international public flows. The Glasgow Climate Pact (COP26) goal of doubling 2019 adaptation finance by 2025 (to around USD40 billion) is expected to be missed, and the NCQG of USD300.0 billion per year by 2035 will fall short of estimated needs of USD310.0 – 365.0 billion (USD440.0-520.0 billion adjusted for inflation). A&R bonds alone cannot fill this financing gap, particularly given the reluctance of governments in low- and middle-income economies to take on debt at this scale. Nonetheless, the size of the adaptation financing gap highlights the potential for significantly expanding A&R bond issuance.

The UN estimates that the private sector could ultimately deliver 15-20% of priority national adaptation needs by 2035, mainly in market-based sectors and middle-income economies. Achieving an increase from current levels of around 3% will require de-risking and concessional mechanisms to increase the attractiveness of A&R bonds to private sector investors.

An Expanding Investor Base Will Also Facilitate Issuance

Institutional investors – such as pension funds, insurers, sovereign wealth funds and asset managers – are now the

primary buyers of A&R-relevant bonds. Importantly, their motivations are shifting. Rather than viewing adaptation purely as an impact or ESG allocation, investors increasingly see A&R exposure as a tool for managing financial risk, protecting long-term asset values and reducing exposure to worsening physical climate hazards.

A&R Issuers Provide Portfolio Risk Mitigation

As physical risks drive higher insurance claims, credit downgrades and asset write-downs, investing in firms that allocate capital to A&R investments via bonds allows investors to reduce exposure to climate-related loss events. This shift mirrors the rising adoption of climate risk disclosure regimes (eg, IFRS S2/TCFD) and the growing materiality of physical risk across fixed-income portfolios. The IIGCC's Climate Resilience Investment Framework (CRIF) highlights this evolution, explicitly linking resilience investments to credit preservation, reduced volatility and improved long-term value stability across diversified portfolios. A&R-labelled or dual-use bonds help issuers deploy proceeds to reduce physical risk and strengthen the resilience of water, transport, real estate or energy assets that underpin financial markets, thereby signalling lower physical risks to investors.

'If the money can help the corporate protect its normal operations... [the bond] mitigates the corporate risk and therefore our portfolio risk.' – **Portfolio Manager, Asia-based Asset Management Company**

Blended Finance Is Making A&R Bonds More Attractive To Investors

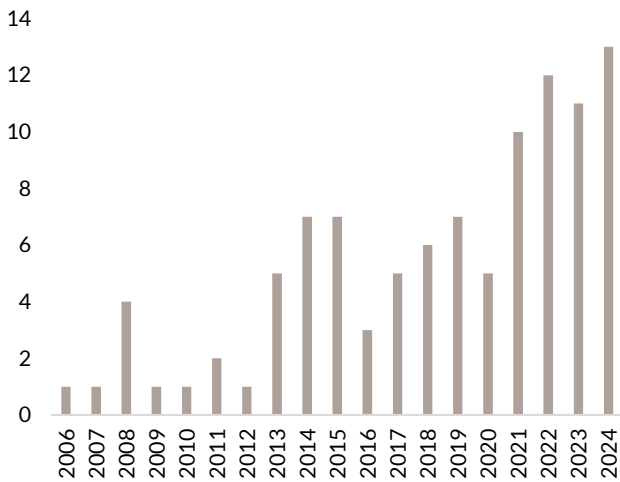
Innovative financing mechanisms are also lowering perceived risks for private investors. Blended finance structures, involving guarantees, first-loss tranches or subordinated capital, are beginning to reshape the economics of A&R investment. According to the [Climate Resilience Alliance](#), the annual blended A&R deal count doubled between 2019 and 2024 (figure 5.1), with combined transactions totalling around USD6 billion over the period. These structures reduce uncertainty around long-tenor, climate-exposed assets and make it easier for private capital to enter higher-risk markets.

Public sector actors play a critical role in providing blended finance. As noted, the public provision of subordinated tranches or anchor investments lowers the market risk of A&R-related issuance by private entities. These mechanisms convert high-risk adaptation investments, previously financed almost entirely by public budgets, into investable, tradable securities suitable for institutional portfolios.

'The AAA rating of multilateral development banks... is the cushion, and it will be the catalyst in order to bring investment in from the private sector.' – **Senior Climate Resilience Architecture Specialist, Regional Development Bank**



Fig 5.1: Global – Blended Climate A&R Deal Count



Source: Climate Resilience Alliance, 'A&R finance and the private sector: opportunities and challenges for developing countries', September 2025, BMI

Greenwashing Regulations Are Aligning Investment Aims With A&R Products

Regulation is also increasing demand for credible A&R-labelled instruments. In Europe, the Sustainable Finance Disclosure Regulation and the EU Taxonomy require asset

owners and managers, especially Article 8 and Article 9 funds, to demonstrate alignment with environmental objectives, including climate adaptation. A&R bonds with Taxonomy-aligned UoP provide a compliant, reportable pathway for investors seeking credible adaptation exposure.

Sustainability-Linked Insurance And Catastrophe Bonds Will Tap New Investor Types

Sustainability-linked insurance (SLI) and catastrophe bonds could also broaden the investor base for adaptation-aligned bond issuance. Insurers increasingly link premium reductions to demonstrable resilience investments, creating a direct financial incentive for corporates to finance adaptation measures, potentially through bond issuance. By monetising adaptation through lower insurance costs and improved insurability, SLI helps address a key barrier to A&R bond issuance: the difficulty of quantifying returns on resilience investments. Parallel innovations in sustainability-linked catastrophe bonds similarly tie premiums to hazard risk reduction. As insurance and capital markets converge through these instruments, insurers, reinsurers and insurance-linked securities investors could become an important new source of demand for adaptation-aligned bonds.

Case Study

Tokyo Metropolitan Government: Setting The A&R Benchmark

About Tokyo Metropolitan Government

The Tokyo Metropolitan Government (TMG) administers one of the world's largest urban economies and serves more than 14 million residents. As Japan's political and economic centre, Tokyo faces growing exposure to extreme climate hazards, including typhoons, storm surges, flooding and coastal erosion. These risks require substantial adaptation investment to protect lives, infrastructure and economic activity. TMG has a long track record of green and social issuance and is now positioning itself as a global leader in resilience finance.

A&R Issuance Insight

In October 2025, TMG launched the TOKYO Resilience Bond, the world's first bond to be certified under the Climate Bonds Initiative's (CBI) Resilience Criteria and Resilience Taxonomy. The issuance sets a benchmark for science-aligned adaptation and resilience financing.

The certification process, verified independently by R&I, applies the full Climate Bonds Standard (v4.3), meaning that TMG's bond is the first globally to carry a resilience-specific certification rather than a mitigation-focused green label. This enables investors to confidently allocate capital to adaptation-aligned assets with external validation.



The bond's proceeds finance a wide suite of climate resilience projects under the TOKYO Resilience Project, including:

- Upgrading small and medium rivers to reduce flood risk
- Reinforcing river and stormwater facilities
- Developing and upgrading coastal protection for the Port of Tokyo and surrounding islands
- Undergrounding utility poles to prevent collapse during typhoons
- Sediment disaster prevention infrastructure
- Renovating port facilities serving remote islands vulnerable to coastal hazards

While TMG has not released a formal pipeline of future resilience bonds, its consistent annual presence in Japan's sustainable finance market and its stated commitment to 'leveraging the power of finance' for climate resilience suggest that further labelled issuance is likely.

Impact Snapshot

The investments supported by the TOKYO Resilience Bond are designed to protect millions of residents, maintain liveability and safeguard critical infrastructure during climate shocks. By reinforcing waterways, coastal zones and urban lifelines (eg, power lines), TMG aims to preserve essential services during extreme rainfall and typhoons. The bond also supports resilience in remote island communities, strengthening evacuation capacity and coastal protection infrastructure to reduce disaster losses.

Spotlight On An A&R-Specific Framework

TMG's issuance represents a major evolution in the adaptation finance landscape, marking the first use of CBI's Climate Resilience Taxonomy (CBRT) in a live bond deal. Unlike general green bonds, where adaptation UoP are often small and inconsistently defined, the CBRT provides science-based, hazard-aligned criteria for identifying, screening and verifying resilience projects.

'This first Certification under the Resilience Taxonomy creates a new generation of resilience and adaptation-focused finance, a landmark moment for the sustainable finance market.' – **Sean Kidney, CEO, Climate Bonds Initiative**

The issuance demonstrates how A&R-specific frameworks can create clarity and investor confidence, enabling issuers to bring forward pure adaptation bonds rather than embedding resilience components within broader sustainability structures. The strong market response shows that investor demand exists when adaptation is well defined and externally verified. [Oversubscribed](#) seven times, the bond attracted USD2.5 billion in bids from 120 institutional investors.

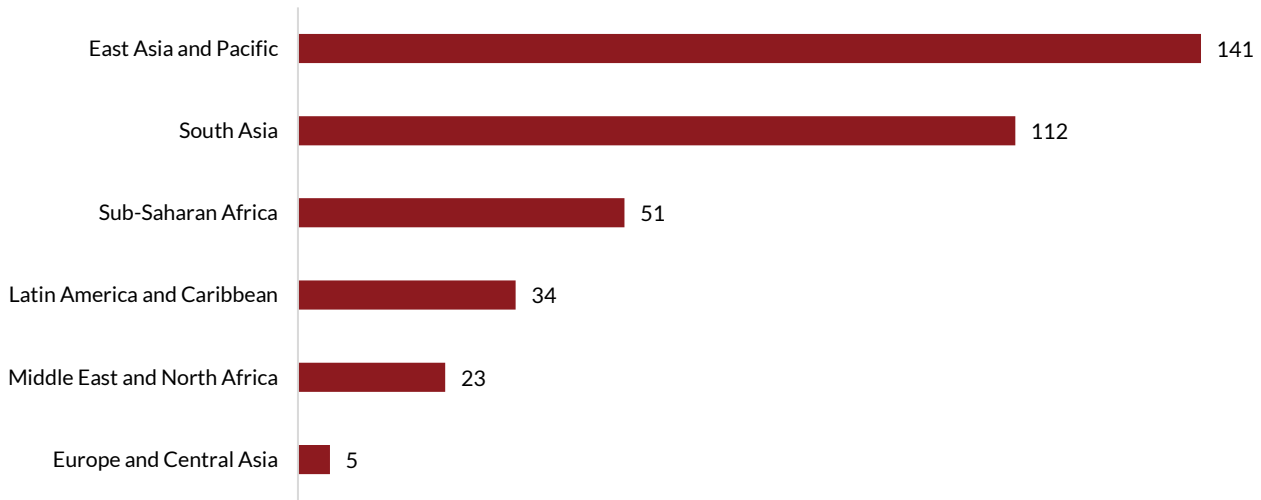
The A&R Issuance Landscape Will Shift Towards Middle-Income Countries, Particularly In APAC

A&R's share of total GSSS UoP is likely to rise as major issuers with mature sustainable bond markets expand their A&R focus. Several large issuers, such as China (5%), Brazil (5%) and Malaysia (4%), currently allocate only a small proportion of their green or sustainability-labelled bonds to A&R-related activities. However, these markets already have the institutional frameworks, investor bases

and regulatory mechanisms in place to scale rapidly. As A&R becomes a stronger policy and investment priority, these established issuers are well positioned to channel greater volumes of capital into resilience-focused projects. A small change in allocation shares would have a significant impact on A&R issuance volumes. If China, Brazil and Malaysia alone had allocated 10% of GSSS UoP to A&R, cumulative A&R UoP by middle-income countries would be USD50.0 billion greater, or roughly double.



Fig 5.2: Annual A&R Finance Requirements By Region (USDbn)

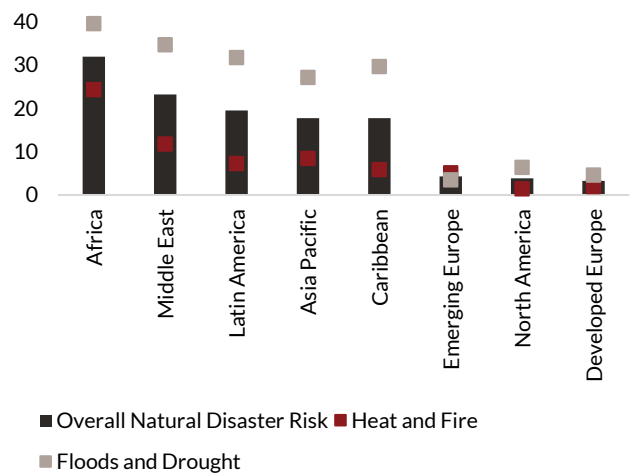


Note: 2023 constant prices. Source: UN Adaptation Gap Report, 2025

APAC will become a particularly important driver of adaptation issuance. This is based on the strong momentum that large APAC issuers such as China, Japan and Korea have already shown over recent years, as well as surging issuance from developing economies such as Indonesia, Thailand, Malaysia and the Philippines. APAC stands out as a region where increasing climate risk intensity will be complemented with rapidly increasing bond market depth, creating strong potential for A&R bond issuance growth. The A&R Bond Database shows that APAC A&R issuance in Q2 2025 was four times higher than in 2019, led by China, Indonesia, India and Thailand. High natural disaster risks in Africa will encourage strong A&R issuance growth in the region (figure 5.3, with the projected financial A&R exposure highlighted in figure 5.2). However, as discussed in Chapter 3, this will continue to be driven by public sector issuance in the near term.

'China has done a great job at turning the market on its head in terms of size and issuance... China is extremely important in the green bond market.' - CBI

Fig 5.3: Higher Natural Disaster Risks Will Drive Adaptation Finance In Emerging Economies



Note: A higher score implies greater risk of natural disasters. Source: BMI ESG Data



Case Study

ADBC: Scaling Agricultural And Rural Resilience Through Policy Green Bonds

About ADBC

The Agricultural Development Bank of China (ADBC) is one of China's three national policy banks, mandated to support food security, rural revitalisation and poverty alleviation. Its extensive nationwide network finances agricultural infrastructure, rural water systems, environmental protection and social development. Through this role, ADBC is a central actor in strengthening China's rural climate resilience.

A&R Issuance Insight

ADBC has become one of the most active issuers in China's labelled bond market. According to CBI's [China State of the Market 2024](#) report, the bank issued CNY22.0 billion (USD3.1 billion) of aligned green bonds in 2024 alone, across five transactions, accounting for half of China's development bank green bond issuance that year.

While most proceeds finance broader green and rural environmental projects, CBI identifies around USD519 million of 2024 issuance (~17%) as A&R-aligned, specifically focused on climate-smart agriculture and rural water management. These include irrigation improvements, water-soil conservation, watershed rehabilitation and rural wastewater projects, all of which are core categories under China's green bond catalogue and align with international adaptation frameworks.

ADBC issues under a Green and Sustainability Bond Framework aligned with ICMA Principles, supported by annual allocations and second party opinions. Its eligible categories of clean water and sanitation, pollution control and sustainable agriculture, map closely to recognised adaptation pathways.

Given ADBC's large outstanding balance and the favourable regulatory environment in China, additional issuance is likely, although no public commitments have been made yet.

Impact Snapshot

ADBC's labelled bond proceeds support infrastructure that stabilises agricultural yields, expands rural water supply, improves environmental conditions and reduces households' exposure to climate-related hazards. Many of these impacts, such as improved irrigation reliability, wastewater management and ecosystem restoration, directly contribute to resilience even when reported under environmental or social headings.

Spotlight On Social Co-Benefits

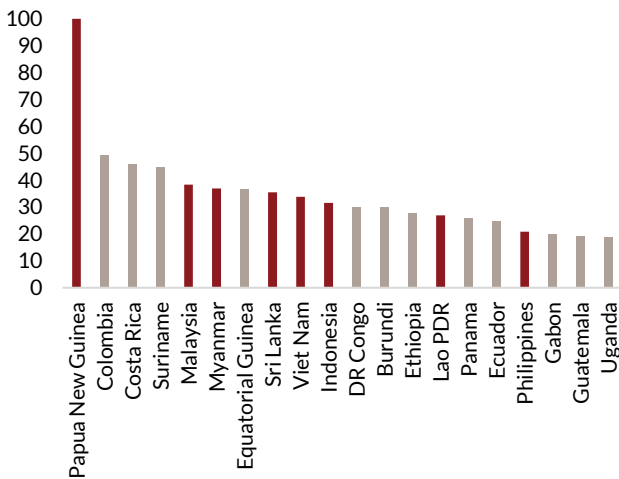
ADBC exemplifies how large-scale policy finance can deliver adaptation and social development simultaneously. Rural water upgrades, climate-smart irrigation and land rehabilitation projects improve climate resilience while supporting income, food security and health outcomes in vulnerable communities. MDBs can support policy banks better identify and tag resilience outcomes, using adaptation taxonomies, hazard mapping and results frameworks, so that investors can recognise the dual climate-and-social value of these bonds. Making these co-benefits explicit would significantly increase the visibility and scale of A&R activities within China's rural development finance.



Water Risks Will Continue To Dominate Issuance, But Heat And Fire Issuance Will Increase Significantly

Urban flood protection will remain the largest adaptation issuance category. It is the largest risk category that we could isolate in the A&R Bond Database (see Chapter 4 for more detail). We expect this trend to continue as rising urban flood risks affect cities, which contain the most valuable physical assets and, in most countries, the largest populations. Flood risks in APAC will be particularly acute in Papua New Guinea, Malaysia, Myanmar, Sri Lanka, Viet Nam, Indonesia, Lao PDR and the Philippines (see figure 5.4 for the BMI Flood Risk Index of the most exposed markets).

Fig 5.4: Flood Risk Index – The 20 Most Exposed Countries

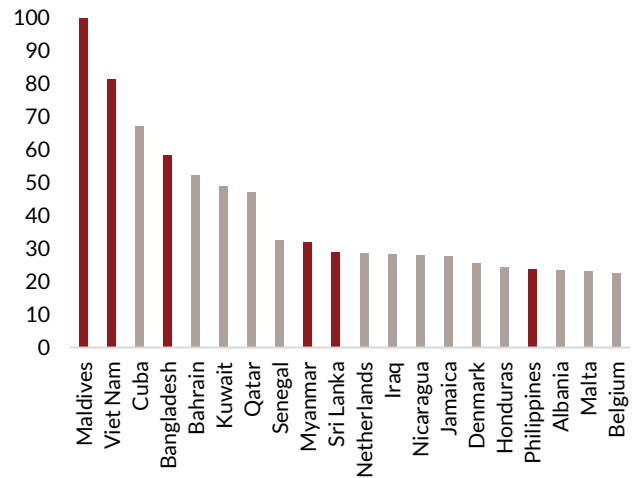


Note: Scores 0-100, with a higher value implying more risk. The series estimates the average share of the population affected by flooding between 2013 and mid-2025 and combines this with a country-specific resilience score. Source: BMI ESG Data

Coastal defence infrastructure will also remain significant.

It is currently only a small proportion of the physical risk-tagged UoP that was isolated in the A&R Bond Database (as noted in Chapter 4). However, coastal protection will be complementary to urban flood protection, as so many urban agglomerations are on the coast. In APAC, risks from coastal flooding are particularly acute in the Maldives, Viet Nam, Bangladesh, Myanmar, Sri Lanka and the Philippines (see figure 5.5 for the BMI Coastal Flooding Risk Index of the most exposed markets).

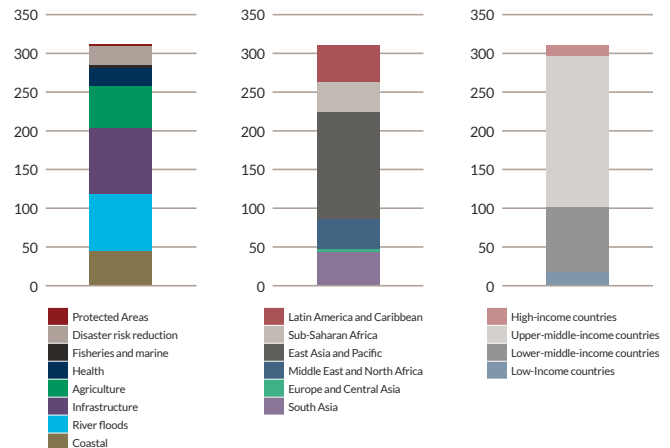
Fig 5.5: Coastal Flooding Risk Index – The 20 Most Exposed Countries



Note: Scores 0-100, with a higher value implying more risk. The series combines the ND-GAIN estimate of coastal flooding exposure with a BMI country-specific resilience score. Source: ND-GAIN, BMI ESG Data

Forecasts from the UN in Figure 5.6 underscore the importance of adaptation to flood and coastal physical risks in middle-income countries, particularly in East Asia and the Pacific.

Fig 5.6: Estimated Costs Of A&R By Region, Income & Sector For Developing Countries In 2035 (USDbn)



Note: 2023 constant prices. Source: UN Adaptation Gap Report, 2025

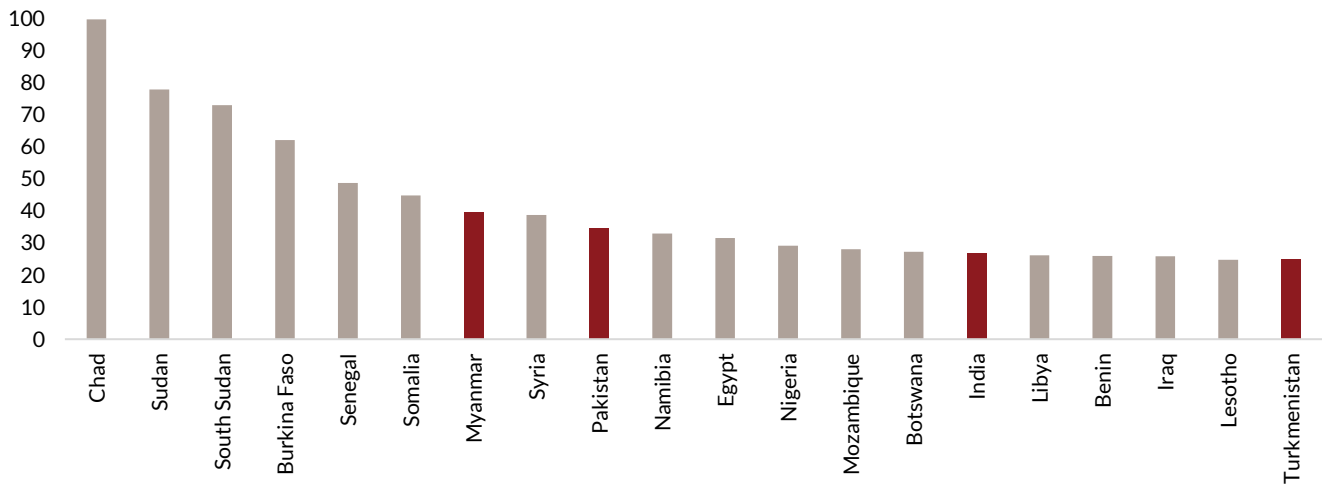
Heat and fire resilience spending will remain lower than water-related spending, but it has the potential to grow rapidly from a small base. The A&R bond database isolates just 19 of nearly 30,000 bonds that specifically mention heat and fire risks as a primary target of the bonds' UoP (noted in Chapter 3). While limited data mean the real figure is higher, it suggests that issuers are not significantly targeting heat and fire risks. This will change as heat and



fire risks increase. In APAC, heat and fire risks are already elevated in Myanmar, Pakistan, India and Central Asian countries such as Turkmenistan, Tajikistan and Uzbekistan

(see figure 5.7 for the BMI Heat And Fire Risk Index of the most exposed markets).

Fig 5.7: Heat And Fire Risk Index – The 20 Most Exposed Countries



Note: Scores 0-100, with a higher value implying more risk. The series estimates the average share of the population affected by heat and fire-related natural disasters between 2013 and mid-2025 and combines this with a country-specific resilience score. Source: BMI ESG Data

Case Study

HB-XM: Using Guarantees To Unlock Long-Tenor Water Resilience Finance

About Hoa Binh – Xuan Mai Clean Water

Hoa Binh-Xuan Mai Clean Water Co. Ltd. (HB-XM) is a wholly owned subsidiary of AquaOne, a leading private water utility group in Viet Nam. AquaOne develops and operates large inter-regional surface water treatment systems serving major urban and industrial centres. HB-XM was established to deliver the Xuan Mai Water Supply System, a greenfield scheme providing up to 150,000m³/day of treated water to rapidly growing districts of Hanoi and neighbouring communities.

A&R Issuance Insight

In 2024, HB-XM issued VND875.1 billion (approximately USD34 – 35 million) of 20-year green project bonds, marking the longest-tenor non-financial corporate bond in Viet Nam in more than a decade. The bond obtained a AAA rating through a full guarantee from GuarantCo, de-risking the structure for domestic investors. Proceeds finance the entire Xuan Mai Water Supply System, including raw water intake, treatment facilities, transmission pipelines, storage and distribution infrastructure. These investments directly enhance climate resilience by improving water security, reducing reliance on stressed groundwater sources and increasing the system’s ability to maintain supply during droughts, floods and power disruptions.

HB-XM has signalled its intention for a second project bond for the Xuan Mai – Hanoi transmission company, through AquaOne, but has not announced a wider labelled-bond programme beyond these project-level issuances.

A&R Framework And Project Selection

The [HB-XM Green Bond Framework](#) is aligned with ICMA’s Green Bond Principles and reviewed by FiiRatings, GGGI and development partners. Eligible categories include Sustainable Water and Wastewater Management, Energy Efficiency and Renewable Energy. The framework mandates project-level metrics (treated water volumes, leakage rates, energy savings) and integrates an HSES policy and SDG mapping (notably SDGs 6, 11 and 13).



Although the framework does not label the project as adaptation, its contribution to regional water security, amid rising hydrological stress, aligns strongly with adaptation pathways under the CBI Resilience Taxonomy and the definition of adaptation activities outlined in the joint MDB Methodology for Tracking Adaptation Finance.

Impact Snapshot

The system will help Hanoi reduce dependence on stressed groundwater and improve supply reliability for peri-urban districts facing shortages. Advanced metering and leakage detection systems target losses below 5%. Elevated storage and gravity-fed distribution enhance resilience during power outages and flood events, while planned rooftop solar reduces operational emissions and supports energy continuity. Social co-benefits include local employment and community infrastructure support.

Spotlight On The Role Of Guarantees In Scaling Adaptation Finance

The Xuan Mai issuance demonstrates how credit enhancement can be a decisive factor in unlocking long-tenor, local currency bonds for climate-resilient infrastructure. The deal structure combined long-term fixed-rate bonds guaranteed by GuarantCo and floating-rate loans from a major local Vietnamese bank. The unconditional guarantee from GuarantCo elevated FiiRatings credit rating of the VND875.1 billion bond to AAA domestically. This significantly broadened the investor base and allowed the issuer to place a 20-year local currency bond, a rarity in Viet Nam's corporate market and unheard of for a first-time issuer in the water sector. GuarantCo is a guarantee facility under the Private Infrastructure Development Group that provides credit enhancement to mobilise local currency financing for infrastructure in emerging markets.

'This option also provides opportunities for multiple infrastructure projects in Viet Nam in general with the target of financing for sustainable development.' – **Hung Manh Pham, Chairman and CEO of Hoa Binh-Xuan Mai**



Appendix

1. Definitions

Adaptation and Resilience (A&R)

Investments that reduce exposure or vulnerability to the physical impacts of climate change, or that strengthen the ability of systems, assets or communities to withstand and recover from climate-related shocks.

Adaptation and Resilience-related Bonds

Bonds in which some or all proceeds are allocated to A&R-aligned activities, regardless of whether the bond is explicitly labelled as an adaptation or resilience instrument.

Use of Proceeds (UoP)

The specific projects, assets or expenditures financed by a bond. A&R classification in this report is based on UoP rather than bond labels.

A&R-Aligned Use of Proceeds

Portions of bond proceeds allocated to activities that credibly address physical climate risks, such as flood protection, drought resilience or heat adaptation.

Green, Social, Sustainability and Sustainability-Linked (GSSS) Bonds

A collective term for labelled bonds issued under recognised frameworks:

- Green bonds finance environmental projects
- Social bonds finance social projects
- Sustainability bonds combine green and social uses
- Sustainability-linked bonds (SLBs) link financial terms to issuer-level sustainability targets.

Physical Climate Risks

Risks arising from the direct impacts of climate change, including:

- Acute risks: floods, storms, wildfires, heatwaves
- Chronic risks: water stress, rising temperatures, sea-level rise.

Water-Related Investments

Projects related to water supply, treatment, storage or management. These are treated as A&R-aligned only where they address climate-driven risks such as drought or flooding.

Water Risk Index

A country-level indicator developed for this report to adjust water-related bond issuance based on exposure to floods and droughts, as well as national resilience capacity.

Flood Risk

The likelihood and potential impact of riverine, pluvial or coastal flooding associated with climate variability and extreme weather events.

Drought Risk

The likelihood and severity of prolonged water scarcity driven by climate conditions.

Heat Risk

Risks arising from extreme temperatures, including impacts on health, infrastructure performance and energy systems.

Coastal Risk

Risks associated with sea-level rise, storm surge and coastal erosion.

Public Issuers

Sovereigns, sub-sovereigns, public agencies, state-owned enterprises and public utilities. Multilateral development banks.

Private Issuers

Privately owned financial institutions and non-financial corporates operating on a commercial basis.

Supranational Entities

Multilateral development banks and regional economic institutions that operate across national borders.

Blended Finance

The strategic use of concessional capital, guarantees or risk-sharing instruments to mobilise private investment in projects or investments such as bonds.

Risk-Sharing Instruments

Financial mechanisms, such as guarantees or insurance, that transfer or mitigate risk to improve the appeal of A&R projects or bonds to private investors.

Middle-Income Economies

Countries classified as middle income by the World Bank, which account for a growing share of A&R-related bond issuance in this report.

Emerging Markets

Low- and middle-income economies with expanding capital markets and rising exposure to physical climate risks.



2. BMI & AIIB A&R Bond Database Methodology

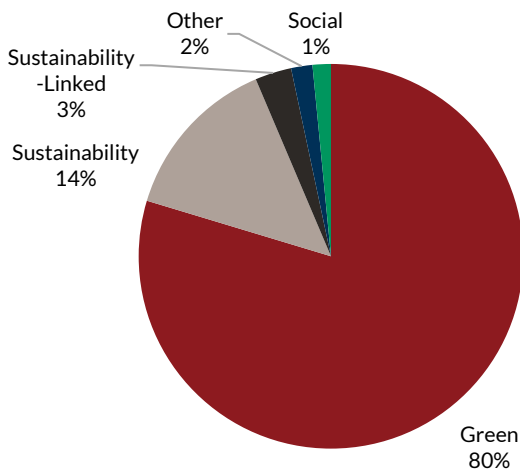
This is the full methodology of the BMI & AIIB A&R Bond Database. This part of the Appendix focuses on the primary challenges encountered during the creation of the database and the solutions implemented to address them.

Summary

We analysed roughly 80,000 Green, Social, Sustainability and Sustainability-linked (GSSS bonds) to create a database of nearly 30,000 A&R bonds, most of which were not explicitly labelled as A&R by the issuer. The original combined database from four suppliers (Sustainable Fitch, Luxembourg Green Exchange, Environmental Finance, Climate Bonds Initiative) comprised roughly 80,000 GSSS bonds, mainly green, sustainability and sustainability-linked bonds (Appendix.1).

The purpose of the report and database is not to define a prescriptive roadmap for regulators or data providers. The database was created to provide a basis for analysing the bond market, in the absence of a pre-existing dataset. It was created using a 'top-down' approach, utilising aggregated bond data, rather than 'bottom-up' analysis of every bond. The limited availability of granular bond UoP information from data providers constrained our ability to precisely filter bonds by A&R UoP, and the results are therefore indicative rather than verified. Nonetheless, it provides a sound basis for drawing broad conclusions about the size and direction of A&R UoP in the GSSS bond market.

Fig Appendix.1: Distribution Of Issuer Labels In The Full GSSS Bond Database



Source: BMI & AIIB-Amundi A&R Bond Database

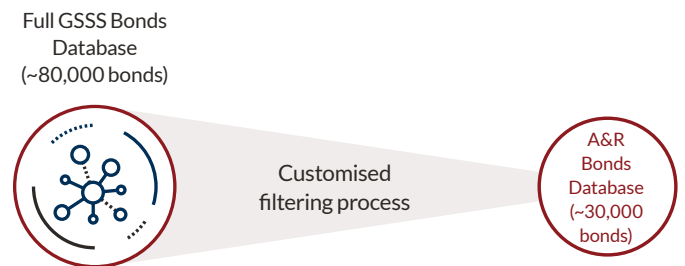
The A&R Bond Database was built using a customised filtering system to tag A&R bonds and isolate the proportion of issuance attributable to A&R. This rule-based approach extracted the maximum identifiable adaptation content from every bond, harmonising outputs across datasets while maintaining methodological transparency. The result was a global A&R bond database of almost 30,000 bonds, where at least a percentage of each bond's use of proceeds (UoP) is designated to A&R purposes.

The development of the A&R Bond Database enabled the evaluation and analysis of global bond issuance associated with A&R at a:

- Market level (regional comparison and country focus)
- Sectoral level (issuer types)
- A&R risk focus (specific UoP sub-categories such as 'flood prevention', and specific physical risks such as 'wildfires and heat.' Please see Appendix 8 and Appendix 9, page 39, Physical Risks Keyword Searches Overview, for full list)

The vast majority of bonds in our A&R Bond Database were not explicitly flagged as A&R by the issuer. They were included in the A&R Bond Database because we classified a portion of the issuance as qualifying as A&R, based on the filtering process described across a six-stage process below.

Fig Appendix.2: Development Of The A&R Bond Database



Source: BMI & AIIB-Amundi A&R Bond Database

Step #1: Capturing All A&R bonds

Before we could analyse adaptation and resilience (A&R) bond trends, we needed to construct a global A&R bond database. Using four GSSS bond data providers enabled us to compile a database of approximately 80,000 individual GSSS bonds, some of which included A&R-related issuance.

A challenge at this point emerged: few of the primary data providers included a dedicated adaptation category to filter UoP, with A&R-related activities often embedded within broader labels such as 'Green Buildings' or 'Sustainable



Infrastructure.’ As each dataset had a different set of data columns, no single filtering rule could be applied uniformly across all datasets. A unique set of rules had to be applied to

each dataset. For instance, one data provider’s dataset had 463 columns, while another provided 53.

Fig Appendix.3: GSSS Bond Data Providers – Unique Inputs

Data Provider	How The Datasets Supported The Project
Climate Bonds Initiative	Provided extensive market coverage and strong standardisation, with consistent classification of bond UoP aligned to recognised climate taxonomies. Included clear identification of key thematic categories, supporting analysis of adaptation and resilience activity.
Environmental Finance	Delivered wide coverage of the GSSS bond market, with clear identification of primary UoP categories and select tagging of adaptation-related investments. Provided accessible SDG alignment insights, supporting high-level thematic analysis.
Luxembourg Green Exchange	Offered broad coverage of labelled GSSS bonds, with structured UoP categorisation and select identification of adaptation-related activities. Included headline SDG alignment information, supported linkage between bond UoP and broader sustainability objectives.
Sustainable Fitch	Provided highly granular, bond-level detail, with extensive breakdowns of UoP categories and percentage allocations for a select bond set. Includes explicit assessments of adaptation and resilience relevance, alongside detailed SDG alignment analysis, supporting in-depth classification and filtering.

Source: BMI & AIIB-Amundi A&R Bond Database

Solution: A Customised A&R Filtering System

To address this, we built a customised A&R filtering system to tag A&R bonds and isolate the proportion of issuance attributable to adaptation. This rule-based approach extracted the maximum identifiable adaptation content from every bond, harmonising outputs across datasets while maintaining methodological transparency.

1. 3rd Party UoP Classification

This filtering step accounted for 99% of the final A&R bond total. A bond was deemed A&R if any of the following filters were flagged:

- » **UoP Categories:** Climate Change Adaptation, Sustainable Water Wastewater Management, Food

security, Ecological protection and climate change adaptation, Water, Unallocated A&R

- » **UoP Description Keyword Search:** adaptation, resilience, resilient, disaster, hazard, emergency, wildfire, flood, drought, stormwater, coastal, erosion, landslide, heatwave, early warning, water, wastewater, drinking water, sanitation, WASH
- » **KPI Description Keyword Search:** water, withdrawal, drought, service continuity, stormwater, flood, early warning, resilience, adaptation, A&R
- » **UN Sustainable Development Goal Search:** We tagged bonds listing the following SDG target numbers as A&R-related.

Fig Appendix.4: UN SDG Number And Description

SDG Number	Description
6.4	Substantially increase water use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity.
6.5	Implement integrated water resources management at all levels, including through transboundary cooperation as appropriate.
6.6	Protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.
11.5	Significantly reduce the number of deaths and people affected and substantially decrease the direct economic losses caused by disasters, including water-related disasters.
13.1	Strengthen resilience and adaptive capacity to climate related hazards and natural disasters in all countries.
14.5	Conserve at least 10% of coastal and marine areas, consistent with national and international law and based on the best available scientific information.
15.3	Combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world.

Source: UN



2. Issuer type

If the issuer is considered a pure-play A&R entity (e.g., Water utility, flood protection, grid resilience, etc), then the bond is tagged as A&R. Approximately 12% of the bonds in the dataset originated from entities classified as 'Pure-Play' issuers. Almost all (97%) of these were water utilities. Most of these bonds were already tagged as A&R via the first filter (3rd Party UoP classification). Therefore, the Issuer Type filtering process added only around 1% to the final A&R bond total. The full list of pure-play categories was as follows:

- » Water Utility
- » Water Tech & Treatment
- » Flood Protection
- » Cooling & Reflective Materials
- » Grid Resilience
- » Parametric Insurance & Risk Pools
- » Pumps & Pumping/Backup

Step # 2: Removing Duplicates From The Combined Dataset

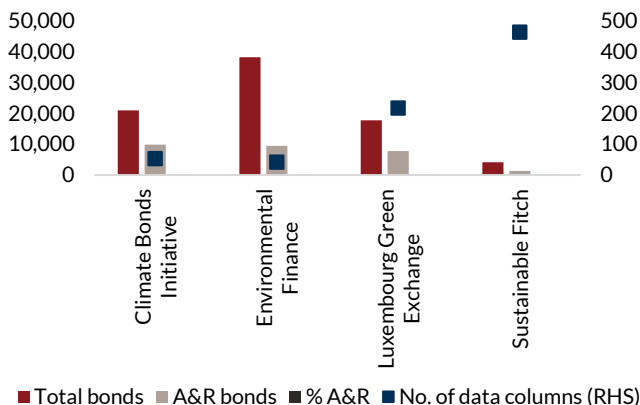
Challenge: Overlapping datasets

We needed a consistent approach for handling duplicate bond entries across the consolidated dataset, as around 25% of the combined bond universe overlapped across providers.

Solution: Applied a consistent provider-selection rule

We applied a consistent rule to select a single source record for each duplicate bond, based on the extent and relevance of bond-level information available. Some providers offered more detailed bond fields, while others covered a broader universe of bonds. The rule retained the most informative record available for each overlapping entry.

Fig Appendix.5: Number of Bonds By Data Provider



Source: BMI & AIB-Amundi A&R Bond Database

Step #3: Classifying Issuer Types

Issuer classification posed a challenge when developing the A&R Bond Database due to inconsistent labelling across the four data providers, which together produced 106 overlapping issuer categories. To ensure comparability, all entities were remapped to a customised taxonomy. Using text analysis, web searches and manual verification, large categories were disaggregated (eg, separating energy, automotive and infrastructure firms) and overlapping categories merged. This process consolidated 106 issuer types into 25 coherent, sector-specific categories suitable for analytical comparison.

Fig Appendix.6: Breakdown Of Issuer Types In The A&R Bond Database

Issuer Type	A&R Use Of Proceeds (USDbn)	No. Of A&R Bonds
Sovereign	129.5	377
Government Agency/ Authority/Public Entity	113.6	7,838
Supranational/MDB	88.8	2,333
Banks (Commercial & Investment)	61.3	2,495
Energy/Power Utility	53.1	728
Other Non-Bank Financials	33.5	994
Real Estate/REITs/ Property	28.0	678
Transport & Infrastructure	20.5	258
Water Utility	12.8	4,365
Sub-Sovereign (States/ Provinces/Cities)	11.8	7,023
National Development Banks	8.0	74
Diversified Manufacturing	6.7	246
Building Materials & Construction	5.8	179
Corporates, Other	4.4	215
Technology/Telecom/ Media	4.3	68
Food, Beverage & Tobacco	3.0	86
General Retail	2.3	97
Asset Managers/ Securities/Broker-Dealer	2.0	34
Insurance	1.7	31
Environmental Services	1.1	59
Automotive Manufacturer	0.8	54
Natural Resources	0.6	26
Education/Non-profit	0.1	196
Healthcare	0.1	15
Chemicals	0.0	2

Source: BMI & AIB-Amundi A&R Bond Database



Step #4. Determining The Share Of Each Bond Allocated To A&R

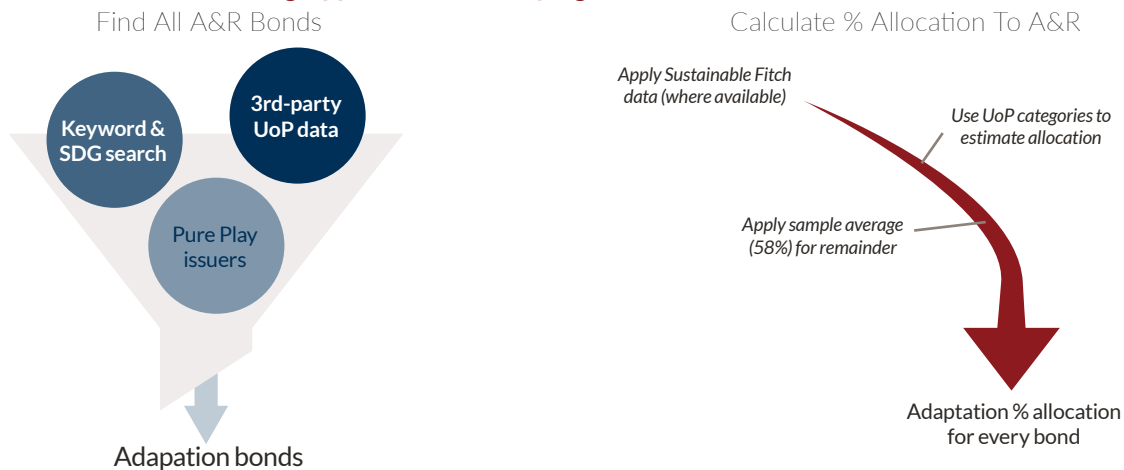
Sustainable Fitch provided a comprehensive breakdown of UoP % allocations, accounting for ~5% of the A&R sample. The remaining A&R bonds (~95%) did not provide details on how much of the overall bond issuance was allocated to A&R.

Solution: A&R Allocation Estimation

We developed a set of allocation rules based on the data available for each bond.

1. Due to the depth of insight into specific bonds, we prioritised the Sustainable Fitch data when combining the four datasets. This allowed us to utilise the UoP % allocations provided for all of these bonds (~5% of the A&R bond dataset).
2. For other bonds where various categories or SDGs were listed, the % allocation was estimated by calculating the proportion of these categories that qualified as A&R (eg, if 2 out of the 6 UoP categories listed for that bond qualified as A&R, then the A&R allocation was deemed to be 2/6 = 33%).
3. For bonds issued by pure-play companies (Water utility, flood protection, grid resilience, etc), the A&R allocation was deemed to be 100%, unless a percentage <100 could be determined by one of the above rules.
4. For bonds where it was not possible to create an estimate using the above methodology, we applied the average % allocation from the dataset (58%).

Fig Appendix.7: Developing An A&R Bond Database



Source: BMI & AIB-Amundi A&R Bond Database

Step #5: Determine The Use of Proceeds Sub-Categories

Classifying A&R bond issuance by UoP sub-categories and specific physical risks was challenging due to limited and inconsistently structured source data. UoP information in provider datasets was sparse and recorded in free-text fields, while issuer documentation, though richer, could not be manually reviewed across nearly 30,000 bonds.

Solution: Customised Keyword Searches

We developed a keyword-based search methodology targeting relevant free-text columns to identify A&R-related UoP sub-categories (figure Appendix.8). This approach prioritised specificity over breadth of coverage, enabling targeted identification of A&R themes (eg, urban stormwater or pluvial flood management) and specific physical risks (Flood, Heat/Fire, Water Stress, Coastal) for deeper analysis.

Customised searches were run across the UoP and KPI description fields, though only two data providers offered searchable text columns (Sustainable Fitch and Luxembourg Green Exchange), reducing the sample to about one-third of the complete A&R bond database. However, the large average bond value in this subset meant that these bonds accounted for roughly 80% of total A&R bond issuance.

UoP Sub-Categories: A total of 648 bonds contained matches to our keyword search, totalling USD30.8 billion A&R UoP, or 5.2% of the total A&R UoP in the bond database. The results are discussed in detail in Chapter 4 of the report.



Fig Appendix.8: UoP Sub-Category Keyword Searches Overview

UoP Sub-Category	Keywords
Heat-resilient materials & surfaces	Reflective Coating, Urban Heat Island, Heatwave, Extreme Heat, Heat Stress, Thermal Stress, District Cooling
Wildfire risk reduction & fire-resistant infrastructure	Wildfire, Fire, Bushfire
Water security (conservation, storage, irrigation & desalination)	Drought, Water Scarcity, Water Stress, Cistern, Irrigation, Desalination
Urban stormwater & pluvial flood management	Stormwater, Drainage, Inundation, Flood
Riverine flood protection infrastructure	Levee, Erosion, Landslide
Coastal defence infrastructure	Coastal, Seawall, Sea Wall, Storm Surge, Sea Level, Revetment, Breakwater, Groyne, Tidal Gate, Tidal Barrier

Source: BMI & AIIB-Amundi A&R Bond Database

Results: Physical Risks

A total of 624 bonds matched the keyword search, totalling USD30.3 billion A&R UoP, or 5.1% of the total A&R UoP in the Bond Database. The results are discussed in detail in Chapter4 of the report.

Fig Appendix.9: Physical Risks Keyword Searches Overview

Physical Risk Category	Heat/Fire	Water Stress	Flood	Coastal
Key words	Wildfire	Drought	Flood	Coastal
	Heatwave	Irrigation	Erosion	Seawall
	Extreme Heat	Water Scarcity	Landslide	Storm Surge
	Heat Stress	Water Stress	Stormwater	Sea Level
	Thermal Stress	Desalination	Inundation	Sea Wall
	Urban Heat Island	Cistern	Drainage	Revetment
	Reflective Coating	Water shortage	Levee	Breakwater
	District Cooling			Groyne
	Fire			Tidal Gate
	Bushfire			Tidal Barrier

Source: BMI & AIIB-Amundi A&R Bond Database

Step #6: Adjusting Water Issuance

Water-related bond issuance presented a key methodological challenge: not all water investments qualify as A&R finance. For instance, projects in economies with low exposure to climate-induced floods or droughts may have limited A&R relevance. To address this, we developed a quantitative Water Risk Index to calibrate the share of water issuance attributable to A&R. This was done from a 'top-down' perspective, utilising country-by-country natural disaster risk data, rather than at a bond-by-bond level.

Creating a Water Risk Index

Firstly, we needed a way to rank water risks by country. We created two series for each country. One for floods and one for droughts. Both were based on BMI's ESG Natural Disaster Risk data, which estimates the average share of the population affected by these natural disasters between 2013 and mid-2025.

For each series, the value was combined with a country-specific Resilience score from BMI's Natural Disaster data. The resulting resilience-adjusted flood and drought series were then combined to create one water risk value per country. Values ranged from 0% to 100%, with 100% indicating the highest risk.

Having created the water risk index, we identified three potential options for capturing water issuance.

1. Include all water-related bond issuance in the A&R total.
2. Only count water-related bond issuance as A&R for the most vulnerable countries (eg, the highest quartile in the water risk index).
3. **Include water issuance in the A&R total proportionally based on the level of country-specific risks.**

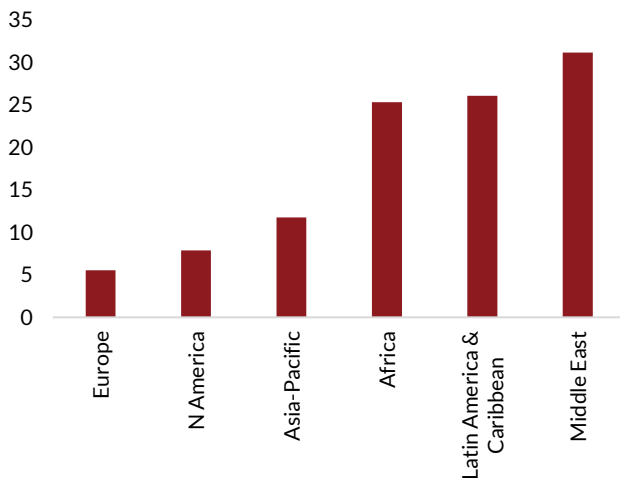


We chose option 3, as we believed this removed non-A&R water-related bond issuance from the database, while still reflecting country-by-country variations in water-related risks.

We multiplied 'Water issuance' (USD value) by 'Water risk index' (value between 0 and 100%) to create an adjusted USD value for each bond. This adjusted the water issuance total for each country based on the level of water risk in that country. For instance, Indonesia has a water risk score of 35%, meaning that 35% of water-related bond issuance in Indonesia counted towards the country's A&R total. In contrast, Japan has a water risk score of 6%, so only 6% of Japan water-related bond issuance counted towards A&R.

Due to the adjustment, just 5% of the water-related issuance in European countries was added to the A&R issuance total in this region. In contrast, 12% of water-related issuance in APAC and 30% in the Middle East was included in each region's A&R issuance total (figure Appendix.10).

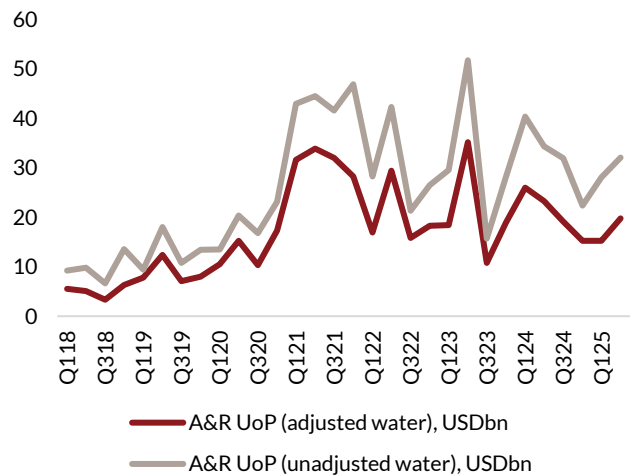
Fig Appendix.10: Adjusted Water UoP As A % Of Unadjusted Water UoP Total



Source: BMI & AIIB-Amundi A&R Bond Database

The water adjustment reduced the total A&R issuance in our dataset, as illustrated in figure Appendix.11.

Fig Appendix.11: Total A&R UoP With And Without Water Adjustment



Source: BMI & AIIB-Amundi A&R Bond Database



3. Interview Methodology

To support BMI’s secondary research, stress test trends and validate the findings from the BMI & AIIB-Amundi A&R Bond Database, in-depth qualitative interviews with senior stakeholders through the A&R and GSSS bond supply chain were hosted.

BMI and AIIB developed screening criteria and conversation guides to investigate challenges, solutions and opportunities

in the A&R bond market, and to assess how it may evolve and how supranationals can sustain and expand their role as both a “catalyst and cushion” for A&R bond issuance, with a particular focus on the private sector.

Interviewee candidates across issuers (sourced from the BMI & AIIB-Amundi A&R Bond Database issuers), investors, market data providers and supranationals were sourced by an expert network and BMI conducted the interviews.

Fig Appendix.12 Interviewee Overview

Interviewee Type	Position	Company/Entity
Issuer	CFO	Amanat Lebuhraya Rakyat Berhad
Issuer	CFO	Energy and Technology Issuer
Issuer	AVP Sustainable Finance	Asia-based Bank
Investor	Portfolio Manager	Asia-based Asset Management Company
Investor	Portfolio Manager	Asia-based Pension Trust
MDB	FI EM Risk Officer	Regional Development Bank
MDB	Senior Climate Resilience Architecture Specialist	Regional Development Bank
Market Data Provider	Associate Research Director	Sustainable Fitch
Market Data Provider	Associate Research Director	Sustainable Fitch
Market Data Provider	Head of Taxonomies	CBI

Source: BMI



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