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A nighttime photograph of a city skyline, likely Singapore, viewed from across a body of water. The skyline is filled with illuminated skyscrapers and buildings, with lights reflecting on the water's surface. The sky is dark, and the overall scene is vibrant with city lights.

LINKING WATER RISK AND FINANCIAL VALUE – PART I

CONSIDERATIONS FOR THE FINANCIAL SECTOR



Imprint

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1 Summary

Freshwater is a scarce resource and the competition for it will intensify in the coming decades. At the same time, climate change is affecting freshwater resources. Droughts and floods will become more frequent and extreme in the future. It will become increasingly important to manage finite resources efficiently, keep them clean, and protect them from extreme weather events.

However, these changes affect companies in different ways. Where a company's assets are located, the nature of its business, and how water is managed can give rise to market and operational risks, as well as regulatory and reputational risks. At the same time, change can also create opportunities.

To analyse the risk exposure in production, it is necessary to assess a company's water dependency, water risk exposure, and ability to respond or adapt. If these risks occur – as was the case during Europe's record-breaking heatwaves in the summers of 2018 and 2019 – this has the potential to impact an affected company's financial performance. Falling revenues, rising production costs, and a lack of growth impact a company's earnings and its financial statements. Changes in financial ratios, in turn, could lead to changes in credit ratings and can influence lending and investment decisions. An analysis of these interdependencies is therefore particularly necessary for financial institutions with a high level of exposure to particularly vulnerable industries or regions.

Most of the focus in the water risk space to date has been on the development and provision of frameworks, logic, and tools to support the assessment of water risk for corporate users. Far less attention has been paid to how water risks manifest as financial impacts.

This report explores the linkages between water risk and financial impact.

Freshwater is a scarce resource and the competition for it will intensify in the coming decades.

More specifically, Part I of this report aims to:

- 1) Provide a primer to those in the finance sector getting started on the links between water risk and financial impacts;
- 2) Outline a framework to concretely link basin water risk¹ drivers with business risks and financial impacts; and
- 3) Offer guidance and recommendations for how investors can engage those leveraging their funds on water risk management.

This report highlights a clear framework to link basin and operational water risk exposure to business and financial impacts and, in turn, financial industry implications.

In addition, the report outlines four key ways in which financial institutions can respond by:

- Ensuring integration of water risk assessment and response into decision-making processes;
- Strengthening water risk analysis capabilities in the financial industry;
- Driving disclosure of water risks and greater transparency of water data; and
- Demonstrating a willingness to act.

Lastly, this report underlines that, increasingly, water is not simply a risk issue, but a multi-billion dollar opportunity for investors.

We hope that through this series of reports, investors will be better equipped to understand the importance of water risk, its financial materiality, and able to better engage with companies to ensure their funds are less exposed to water risks.

¹ Basin water risk is the risk facing a given site that stems from its geographic context and relates to how a site's water use is dependent upon others upstream.



2 Need for action

*“Water is the driving force
of all nature.”* *Leonardo da Vinci*

From the
UN's point
of view, the
consequences
of climate
change will
be felt
primarily
through the
medium
of water.

Water is essential for all life on earth. Freshwater, in particular, is extremely important for society but accounts for only 2.5% of total global water.

UNESCO estimates that some 3.6 billion people (51% of the world's population) already live in areas that are expected to be affected by water poverty for at least one month a year. According to forecasts, this figure will rise to around 4.8 to 5.7 billion people by 2050.

Already today, more than 25 million people are displaced every year by droughts, floods, and other extreme weather events. The World Bank estimates that this number will increase to 140 million refugees by 2050.

These refugee flows have the power to trigger political volatility. The Syrian civil war, for example, was preceded by one of the most severe droughts the country has ever experienced from 2007 to 2010. The drought, combined with weak water use regulations, led to a decline in crop yields and a rural exodus of farmers, who accounted for 25% of Syria's gross domestic product before the drought. Between 2002 and 2010, the urban population in Syria grew by over 50% from 8.9 million to 13.8 million people. Researchers suspect that the rapid urbanisation accelerated by water shortages was partly responsible for social conflicts that ultimately led to the outbreak of civil war.

From the UN's point of view, the consequences of climate change will be felt primarily through the medium of water. Not without reason, the Fifth Assessment Report of the Intergovernmental Panel on Climate Change describes in detail the impact of climate change on the global water cycle and water supply.

It affirms that the frequency and especially the intensity of floods and droughts will increase by the end of the century. The World Economic Forum also considers water risks to be one of the greatest global risks facing the economy in the coming years.

2.1 Water risks in production

Water challenges can affect companies in many different ways. Water risks to business are typically broken into physical, regulatory, and reputational risks. Water scarcity, for example, is a potentially material physical water risk for companies that have water-intensive production processes. This includes water-dependent sectors, such as:

- Agriculture
- Beverage industry
- Textiles
- Mining
- Energy (e.g. hydropower, coal)
- Transport

In 2018, CDP (Carbon Disclosure Project) noted that the mining and energy sectors alone reported US\$30.1 billion in financial impacts.

Ceres provides a useful schematic of the links between water risk drivers (“basin water risks” for the purposes of this report), financially material business risks, and financial impacts (see Figure 1). What is important to note however, is that context (water risk drivers) combines with business operations and response to affect the level of the respective business risk’s financial materiality. Companies face risks of their own making (due to the nature of their business and quality of response), as well as risks that are beyond their direct control, like water, which is a shared common pool resource.

Water risks are typically broken into physical, regulatory and reputational risks.

Market risks:

The beverage industry, for example, is exposed to high risks in its supply chains for agricultural raw materials. Around 70% of the world’s fresh water is used to grow crops and animal feed. To meet the needs of an estimated population of approximately 10 billion people, water demand is expected to increase by 55% and food demand by 60%. Supply chain risks include increased volatility in prices for raw materials and reduced supply security. CDP Water Security noted that in 2018 alone there were US\$38.5 billion in reported losses due to water risks. This applies not only to regions with high water stress, but also to supposedly “safe” regions, as the 2018 drought in Germany showed [see Box 1].

Business and financial impacts of key water risk drivers

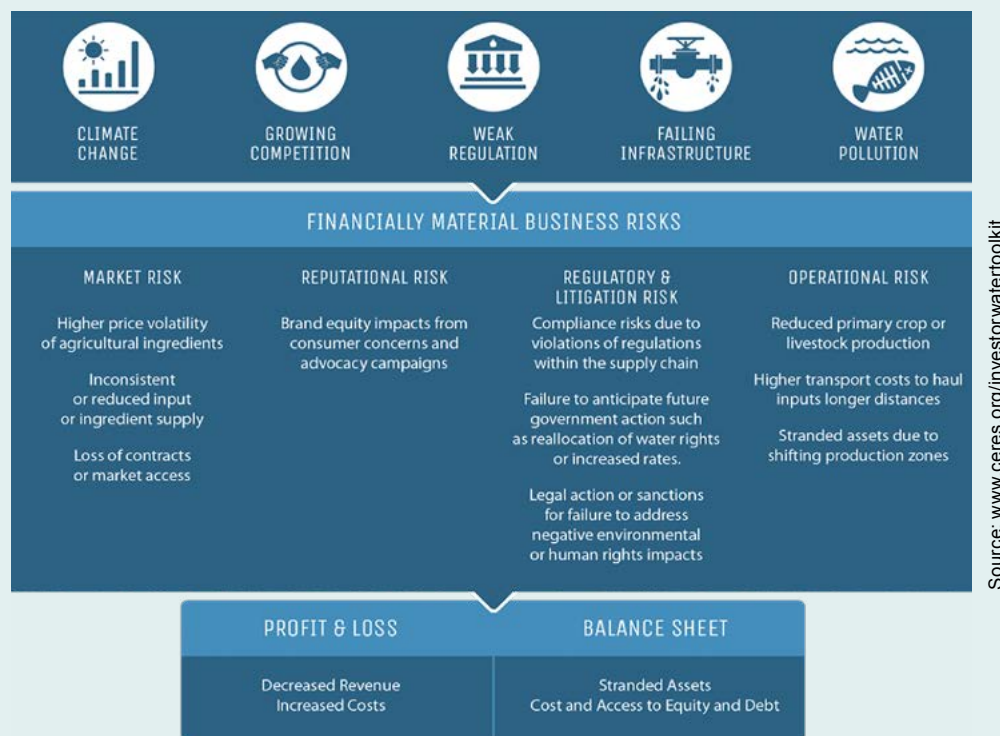


Figure 1: Business and financial impacts of key water risk drivers



Operational risks:

Water scarcity can directly affect companies with operations heavily dependent on water (e.g. farms). However, water risks can also have an indirect impact and affect companies that do not themselves have any water-intensive production processes. Particularly in countries where hydropower, coal power, or nuclear power are widely used (e.g. Brazil, India), droughts can lead to a significant drop in the amount of energy generated.

For the energy sector in particular, coal-fired and nuclear power plants also need large quantities of cooling water and are therefore often built along rivers. Droughts can reduce the volume flow of the necessary river water and heat waves can increase the cooling water temperatures. Both effects can, either alone or in combination, make it necessary to reduce the output of the power plants in question. In this way, water shortages can influence the production volumes of power plant operators and, in extreme cases, cause power grids to become unstable, which can ultimately lead to power outages and thus reduce the production of almost every company in the affected region.

Similarly, in cases where transportation logistics are water-dependent, operational risks can manifest despite not having water-intensive operations.

Depending on the characteristics of the river, dry periods can cause river levels to fall so drastically that boats travelling on inland waterways have to reduce their cargo capacities so as not to run aground. This was, for example, the case for the river Rhine in 2018. Particularly in the short term, it was not possible to prevent goods shipped by inland waterway from being adversely affected, which led to bottlenecks in the supply of raw materials to plants at Covestro and BASF, among others, and ultimately to production cutbacks at the plants.

Regulatory risks:

In addition to the above mentioned market and operational risks, companies can also be exposed to water-related regulatory risks. The production of individual plants may be adversely affected or even permanently threatened by

- Violations of existing regulations governing water use by companies in the supply chain
- Stricter laws or sanctions in the future which increase costs
- Loose water laws which result in increased reputational, operational, or market risks due to impacts from other users in the basin.

Notably, regulatory risk is particularly high in cases where companies cannot predict, and therefore financially account for, laws, policies, and regulation enforcement. Uncertainty is often the most challenging form of regulatory risk. Accordingly, stronger regulatory environments tend to be more predictable and therefore have lower risk than those with weak regulations, which in turn have greater variability of change and enforcement.

Box 1: Consequences of the drought-driven low water level of the Werra River for K+S

K+S AG is a listed German mining company, which is the world's largest potash and salt producer. Headquartered in Kassel, Germany, with about 15,000 employees, K+S is the world's largest supplier of salt products in terms of production capacity and one of the largest suppliers of potash and magnesium products.

The production sites for potash, magnesium, and salt products are spread across Europe and North and South America. The production, further processing, and disposal of these products requires a high volume of water (2017: 397.9 million m³) and wastewater disposal (2017: 17.5 million m³). K+S's business activities thus heavily rely on water as a resource. This has been particularly evident in recent years at the Werra plant, which represents about 50% of the annual German production capacity for potash and magnesium products. The water risk in this case is expressed mainly in terms of wastewater disposal, which results from production and residues stored on tailings piles. K+S' main disposal route is the discharge of saline wastewater into the Werra River and its injection underground. For discharge into the Werra River, K+S is highly reliant on the river's water level.

Water-related regulatory risks have already proved to be material for K+S in this context in the past. An annual injection volume of 1.5 million m³ per year, limited to 5,000 m³ per day when the water level of the Werra is sufficiently high, is legally permitted until 2021; K+S applied for 2 million m³ per year. Besides the legal risks, there are operating risks, which had a financial impact on K+S in 2018. During the 2018 drought, water levels in the Werra fell so low that K+S was legally prohibited from discharging wastewater into the river. Due to the ongoing drought, K+S had to largely suspend production at the Werra plant for 64 days, resulting in a €1.5 million daily loss. This loss was exacerbated by higher transport costs due to saline wastewater having to be removed by truck and train to inoperative mines as an alternative disposal route.

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Net debt/EBITDA | 0.5 | 0.8 | 1.1 | 1.8 | 2.3 | 6.9 | 7.2 | 7.3 |
| Share price [€] | 34.92 | 35.00 | 22.38 | 22.92 | 23.62 | 22.69 | 20.76 | 15.77 |

Figure 2: Development of K+S share price and debt ratio

The water-related legal and operational risks have thus become material for K+S. With demand for salt and potash continuing to increase in general terms, the net debt ratio of K+S has risen steadily since 2016 (see Figure 2). The reasons for this, in addition to the commissioning of a mine in Canada, included production stoppages because of the Werra River's persistently low water level and saline wastewater injection has been prohibited. Water-related risks also significantly affected the share price, which in 2018 reached its lowest level in more than 10 years. In addition, the rating agency Standard and Poor's lowered its outlook for K+S' credit rating from stable to negative and the rating agency Moody's downgraded its rating from "Ba1" to "Ba2".

Reputational risks:

The use of water as a resource can also lead to reputational risks. Particularly in regions with high water stress or pollution, companies compete in some cases with other businesses and local communities for the resource. In these cases, public campaigns and boycotts can harm revenues or damage brand value. Coca Cola and PepsiCo, for example, experienced a case like this in 2017 in the Indian province of Tamil Nadu. While a severe drought hit the farmers in the region, soft drinks continued to be produced there. Retailers and consumers in the region then boycotted the soft drink manufacturers because it was assumed they were partly responsible for the falling groundwater level. This triggered a decline in the quantities purchased in the region. The Indian financial sector is also regularly affected by water risks (see Annex A for a more detailed explanation). As explained above, water risks can affect a company's business activities as a result of various interdependencies. They can lead to operational and market risks and also cause regulatory and reputational risks (Figure 3).

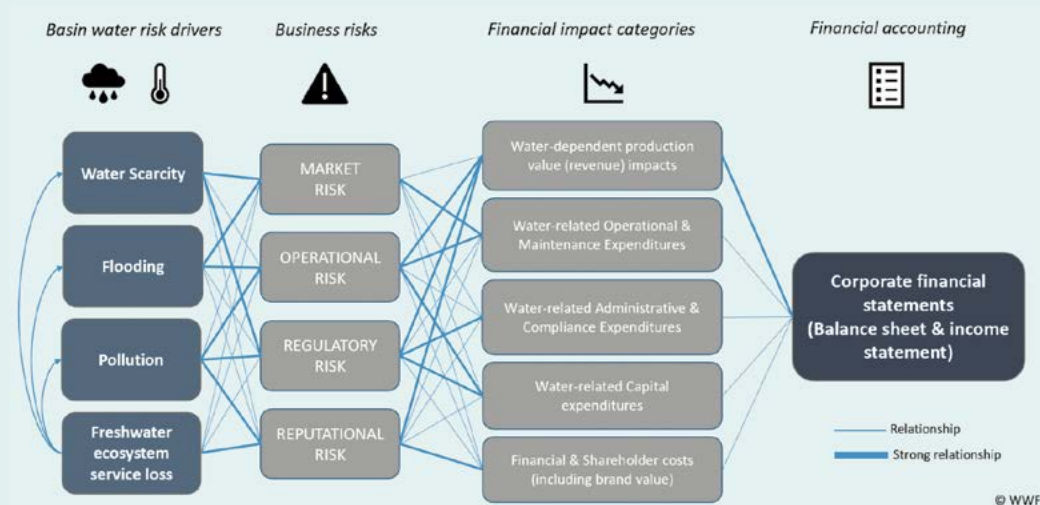


Figure 3: Impact of water risks on companies

While the links illustrated in Figure 3 have been proposed for some time now, what is shifting is the growing body of evidence being generated through disclosure data. Many companies are already feeling the effects of water risks on their value chains. CDP's annual reports have seen the costs of water risk rising from US\$2.5 billion in 2015 to US\$14 billion in 2016, to US\$38.5 billion in 2018. CDP's data is beginning to enable a deeper understanding of the linkages between water risk event exposure, financial impacts, and responses (see Figure 4).

Drawing from CDP and work previously done with IFC, WWF has sought to create a harmonized framework that can account for the financial impacts of water risk drivers (Figure 5). By organizing the financial impacts of water risk around these groupings, it allows both companies and financial institutions to integrate impacts into more traditional financial analysis, such as discounted cash flow analyses, and accordingly, better account for water risks.




| | Financial impacts reported | Most common impacts | Most common responses |
|---|----------------------------|---|--|
| Mineral Extraction  | USD 20.5 billion | Increased operating costs | Adopt water efficiency, water re-use, recycling and conservation practices |
| | | Reduction/disruption in production capacity | Pollution abatement and control measures |
| | | Fines, penalties or enforcement orders | Engage with regulators/policymakers |
| Power Generation  | USD 9.6 billion | Increased operating costs | Engage with regulators/policymakers |
| | | Impact on company assets | Infrastructure maintenance |
| | | Increased compliance costs | Increased capital expenditure |
| Biotech, Health Care and Pharma  | USD 3.5 billion | Reduction/disruption in production capacity | Adopt water efficiency, water re-use, recycling and conservation practices |
| | | Constraint to growth | Amend the Business Continuity Plan |
| | | Increased operating costs | Secure alternative water supply |

Figure 4: Sectors with the largest financial impact

DIRECT: Operational and Maintenance Expenditures

- Increased operating costs –energy costs (from water)
- Increased operating costs – water procurement costs
- Increased operating costs – water treatment costs (if distinct from procurement)
- Increased operating costs – other water-dependent good costs (agricultural commodities, chemicals, etc.)
- Upfront costs to adopt/deploy new practices and processes

DIRECT: Capital Expenditures

- Increased capital costs (including need for new water infrastructure)
- Impaired assets (including asset repairs)
- Write-offs and early retirement of existing assets / closure of operation

INDIRECT: Administrative and Compliance Expenditures

- Other water-related permitting and compliance costs
- Water-related staffing costs
- Water-related fines and penalties
- Water-related litigation costs

INDIRECT: Financial and Shareholder costs

- Brand damage
- Water-related insurance costs and increased insurance premiums
- Increased financing costs (reduction in capital availability)

DIRECT: Revenue Impacts

- Site disruption leading to impact on production/output (including loss of license to operate)
- Delays in permitting (including loss of license to establish)
- Constraint to growth (including loss of license to grow)

Figure 5: A classification of financial impacts to account for water risk. Developed by WWF and Water Foundry (informed by CDP Water Security)

2.2 Water risks in the financial sector

Water risks are not only important for the real economy, but they can also have an impact on the financial sector (see Figure 6). The challenge is to understand the materiality and timing of the water risks' impact on specific asset classes and industries. Revenues and costs can be directly and most significantly affected by water risks. For example, production volumes may be reduced due to drought, or operations may be shut down during a flood, resulting in lower income. Revenues are particularly important for investors in the short term. Long-term impacts on operating costs, such as increases in water and energy prices, are

less critical, but may have a longer-term impact on companies' financial performance, particularly in the case of low-margin products and intense international competition. Production costs can rise in the short term as a result of water risks, for example due to higher prices for raw materials, or costly countermeasures can be implemented to prevent water-related production stoppages. Ultimately, both revenue losses and cost increases negatively impact business earnings.

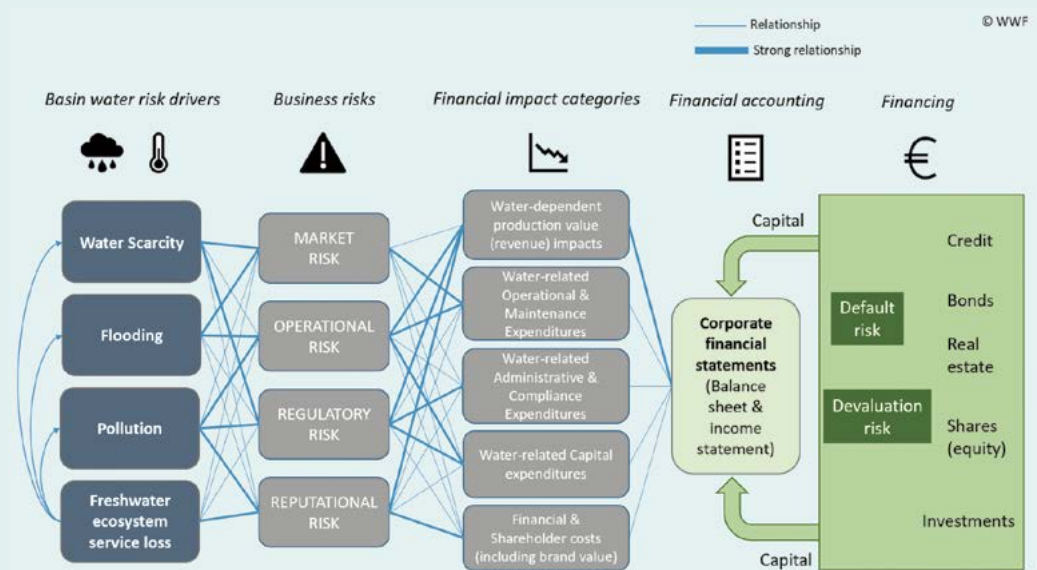


Figure 6: Impact of water risks on the financial sector

However, water risks are location-dependent. While efforts to curb greenhouse gas emissions may lead to shocks on the global financial market (e.g., sudden changes in carbon regulation), water as a local risk is more likely to affect individual investors and/or lenders or specific portfolios, but not the entire global financial market. They have a much stronger impact on locally operating or less diversified companies in particularly exposed sectors and can act as a cluster risk, especially for financial market players that focus on precisely those regions and sectors. The actors affected include lenders as well as shareholders.

Lenders:

Falling revenues and rising production costs can reduce a company's operating cash flows and thus also its disposable cash flows, which are ultimately available for capital services (interest and repayment of loans).

The declining liquidity poses a threat through:

- Impacts on the credit rating and resulting refinancing costs; and
- Defaults or delays in payment.

In the case of long-term water risks, the profitability of a company or plant can also be permanently impaired. This can result in depreciation, which can also affect the lending value of an asset.

Shareholders:

Declining disposable cash flows can also impact a company's dividend policy. However, falling profits are likely to have a more serious impact on the share price of companies listed on the stock exchange. Even short-term production losses can have a considerable impact on quarterly results, as the example of K+S shows (see Box 1). Especially among investors with a short investment horizon, even effects that lower profit temporarily lead to significant sell-offs. Meaning that even temporary influences on companies' financial performance increase the volatility of the associated share prices at a minimum. From the perspective of financial market players, companies' exposure to water risks, also in the context of acquisitions, is extremely important. Due to the high level of the investment company's exposure to individual investments compared to diversified equity portfolios, water risks of affected assets also have a greater impact on the investment company.

As a result of the interdependencies mentioned above, water risk assessments need to be integrated into lending, acquisition, and investment decisions. In order to achieve far-reaching transparency, water risk analyses must be performed regularly both before the (purchase) decision and during the investment period so that changing overall conditions can be incorporated into further decisions and into the timely planning of suitable countermeasures to prevent losses. Countermeasures, or controls, can include both responses by the company exposed to the water risk, as well as the use of financial products. In the case of the former, ensuring companies are responding both contextually (matching controls to the type of risk exposure), and focusing on risks that are likely to link to material financial impacts is critical. In short, shareholders ought to be asking much more nuanced questions around how water risks are being mitigated across the value chain.

To ask better questions about water risk, investors require a clear understanding of a company's different sites, the basin and operational water risk exposure (see Part II of the report), as well as an understanding of a company's contextual response (see WWF's Water Risk Filter for more details).

2.3 Opportunities in the financial sector

Challenges related to the changing water cycles do not just give rise to risks for financial market players. Water issues also offer banks and investors opportunities to invest in technologies and companies that contribute to improving the sustainable management of water resources while generating attractive financial returns at the same time. It is estimated that by 2050, US\$22.6 trillion will have to be invested in water infrastructure worldwide. Moreover, RobecoSAM estimates that market opportunities related to the water sector are expected to reach US\$1 trillion by 2025. Potential opportunities include:

Water issues offer banks and investors investment opportunities.

- Development of nature-based solutions;
- Expansion of conservation measures or water supply networks;
- Construction of water treatment, filtration, and desalination plants; and
- Construction of drought and flood mitigation solutions.

The required investments in water are higher than the required investments in telecommunications (US\$9.5 trillion) and comparable to the required investments in energy supply (US\$12.2 trillion) (see Figure 7).

Furthermore, innovation in the water technology space offers considerable opportunities for profitable investments. Given the growing state of water challenges – from quantity to quality – new solutions have significant growth potential for investors.

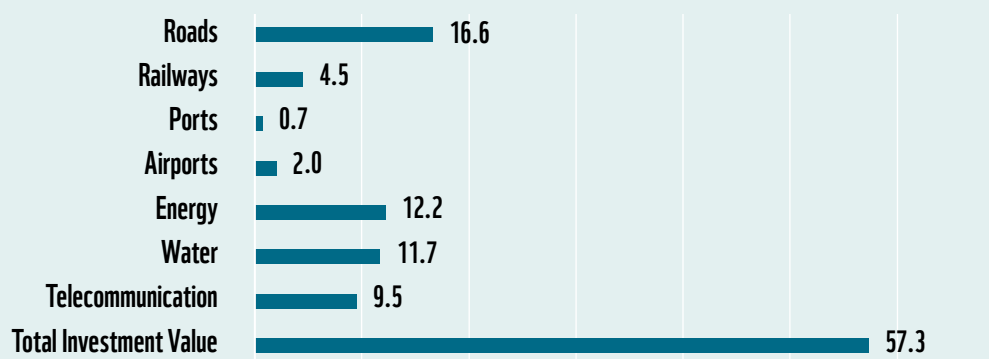


Figure 7: Global investments needed in infrastructure (2013–2030)

2.4 Pathways for better accounting

Perhaps one of the greatest challenges facing investors is how to better account for not only the basin water risk drivers, but the respective business risks and financial impacts that stem from those drivers.

Tools have started to emerge over the past few years, which offer some promise for improved pathways. These are the focus in Part II of this report.

The financial industry, as investors in companies, is exposed to the water-related risks that companies themselves face (Figure 5). Water risks can manifest themselves in financial institutions through devaluation and default risks (Figure 6). The reputation of financial institutions is also affected by a risk that may result from unethical, unfair, or manipulative customer practices. But the risks are also accompanied by opportunities to create financial value. In order to seize opportunities or mitigate water-related portfolio risks, financial institutions can undertake a number of measures as illustrated below. For more details on how institutional investors can integrate water risk and stewardship into their operations, see Annex B.

Ensuring integration of water risk and response into decision-making processes

It is important to ensure financial institutions are appropriately integrating water-related considerations into their:

- **Strategy and business development to ensure that both water risks and opportunities are being accounted for in services and product offerings; and**
- **Governance structures to ensure that water risks are being taken into consideration at senior levels in the institution; and**
- **Guidelines and policies to help guide lending and investment decisions; and**
- **Standards and other safe-guard processes to ensure that the financial institution is protected from indirect water risk exposure.**

All of these aspects enable financial institutions to have better internal decision-making processes that will help to better account for water risks and opportunities.

Strengthening water risk capabilities in the financial industry

For better management of opportunities and risks, it is necessary to identify water opportunities and risks to derive possible responses. This assumes that the following is established and developed over time not only in the individual company but within the sector as a whole:

- A common understanding of Environmental and Social Governance (ESG);
- Clarity about the exposure of companies and value chains (through asset level data, operational risk exposure, and multiple forms of basin water risk exposure beyond simply scarcity);
- Greater clarity about the response of companies and their inclusion of water within business growth strategies;
- Knowledge of existing data requirements and know-how regarding water-related future scenarios;
- Knowledge of water risk modelling and its links to financial impacts.

It is
necessary
to identify
water
opportunities
and risks
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responses.

In particular, it is worth noting that only recently has work begun to emerge that systematically tracks the links between water risks and financial impacts. Too much of what has been done to date has been highly anecdotal in nature, which has resulted in a poor understanding of these relationships and the materiality of the issues in play. This poor understanding of relationships, combined with insufficient data and tools, has left financial analysts with a complicated path-way for integrating water risks into financial decision making.

Without robust approaches, the ESG community has offered additional data sets to support water risk integration in the interim. However, there is a strong need to revisit how water is handled by ESG data providers who typically look only at one basin water risk driver (scarcity) and a limited subset of risk responses (e.g., environmental policy and water use efficiency). Furthermore, asset-level data, which is critical to understanding the local nature of basin water risk exposure tied to operational business risk, has also been difficult to obtain. These combined factors have created a thin level of supplementary water risk data for ESG analysts to work with. However, there is a growing recognition that the status quo is insufficient, and with growing data availability, new approaches that better account for water risk are on the way.

Driving disclosure of water risks and greater transparency of water data:

Lack of transparency of water risk exposure is one of the biggest challenges financial institutions need to address in order to better understand their portfolio's water risk. They can exert their influence on portfolio companies to increase transparency. However, it is equally important that financial institutions themselves provide a comprehensive and public account of their water risk exposure and mitigation measures.

Furthermore, there is also the need for additional efforts around standardization and quality control to improve comparability. Recently, an array of organizations including CDP (Carbon Disclosure Project), GRI (Global Reporting Initiative), SASB (Sustainability Accounting Standards Board), and others have come together in an effort to further improve standardization of reporting and disclosure. Similarly, greater accessibility of basin water risk data is necessary – at better spatial resolutions – in order to further enhance an understanding of water risk drivers.

Demonstrating a willingness to act:

The analysis of water-related opportunities and risks results in immediate implications for action. These include, among others:

- Supporting companies and technologies that aim to reduce water-related risks
- Developing water-related financial products and services (e.g., water funds, water bonds for nature-based solutions, interest rate adjustments for companies exposed to water risks)
- Penalizing companies and technologies that exacerbate water risks or demonstrate poor risk response strategies

Several institutions have begun down this pathway, including ING who have explored differential discount rates based upon water issues. The implementation of these implications requires the involvement of various departments as well as stronger ESG approaches (per above). As a result, a company's sustainability department needs to position the topic internally in order to ensure the willingness and ability to act.

3 Conclusions and recommendations

Freshwater is a scarce resource and the competition for it will intensify in the coming decades, not least of all due to the rapid growth in population. At the same time, climate change is affecting freshwater resources. Projections suggest that in some regions, droughts and floods will become more frequent and more extreme in the future. It will become increasingly important to manage finite resources efficiently and keep them clean. Furthermore, protection against extreme weather events will become more important. A company's production processes can be affected by water risks in different ways. How water is managed can give rise to market and operational risks for the companies affected, as well as regulatory and reputational risks. In this way, water is already having an impact on the financial performance of various companies today – with this impact set to intensify in the future.

Investor and financiers can play an important role in the transition to sustainable water management.

Falling revenues, rising production costs and a lack of growth can make access to equity and debt capital more difficult. For financial market players, the water risks faced by real economy companies result in increased default and devaluation risks. Particular risks exist above all in the case of smaller companies that have little geographical diversification and operate in sectors that are particularly exposed to water risks. Cluster risks can arise for banks and investors that focus on exposed regions and industries, but also for larger acquisitions.

A more indepth assessment of water risks is therefore needed in the cases mentioned. Combining emergent forms of basin water risk and disclosure data, research into the links between water risk and financial impacts, stronger ESG approaches, and using this to guide next generation tools can help. In particular, we believe that providing the financial sector with strengthened tools can help to mainstream these concepts and accordingly, this is where we turn our focus in Part II of this report series.

While the discussion about water-related opportunities and risks is still in a very early phase in the financial industry, investors and financiers can, and must, play an important role in the transition to sustainable water management. As climate change manifests itself in the coming years through the medium of water, the financial industry must respond not only for the planet, but for its own self-interest.

Annex A: Water risks in India

In India, which is home to 17% of the world's population, the impact that water risks can have on the population, the manufacturing industry, and the financial sector is evident. A study conducted by NITI Aayog – a think-tank of the Indian government – reveals that about 600 million Indians suffer from water shortages. By 2021, another 21 major cities are expected to have no access to groundwater, resulting in an additional 100 million Indians lacking adequate access to water. Taking into account the growing population, it is expected that the demand for fresh water will exceed the supply by about double in 2030. The water shortage is expected to negatively impact the country's GDP by about 6%. The effect will tend to be more pronounced in water-dependent sectors. It is projected that more than 39% of Indian banks' total gross credit risk is in sectors such as agriculture, energy, and metal/basic products where water risks are significant. The indications of financial risks resulting from water scarcity are becoming increasingly concentrated:

- The WRI (World Resources Institute) determined that 14 of India's 20 largest heat suppliers had to shut down plants at least once between 2013 and 2016 due to water shortages. The financial loss amounted to approximately US\$1.4 billion.
- The Indian Ministry of Energy estimated that in 2017, investments of approximately US\$52 billion were made to expand the energy supply and that water-related risks are a major risk driver for these investments.
- Agriculture is responsible for over 90% of freshwater abstraction. The broad loss of agricultural assets has so far failed to materialise mainly because government intervention protected the financial sector. In 2016 and 2017, six governments, among others, waived agricultural loans amounting to almost US\$13 billion.

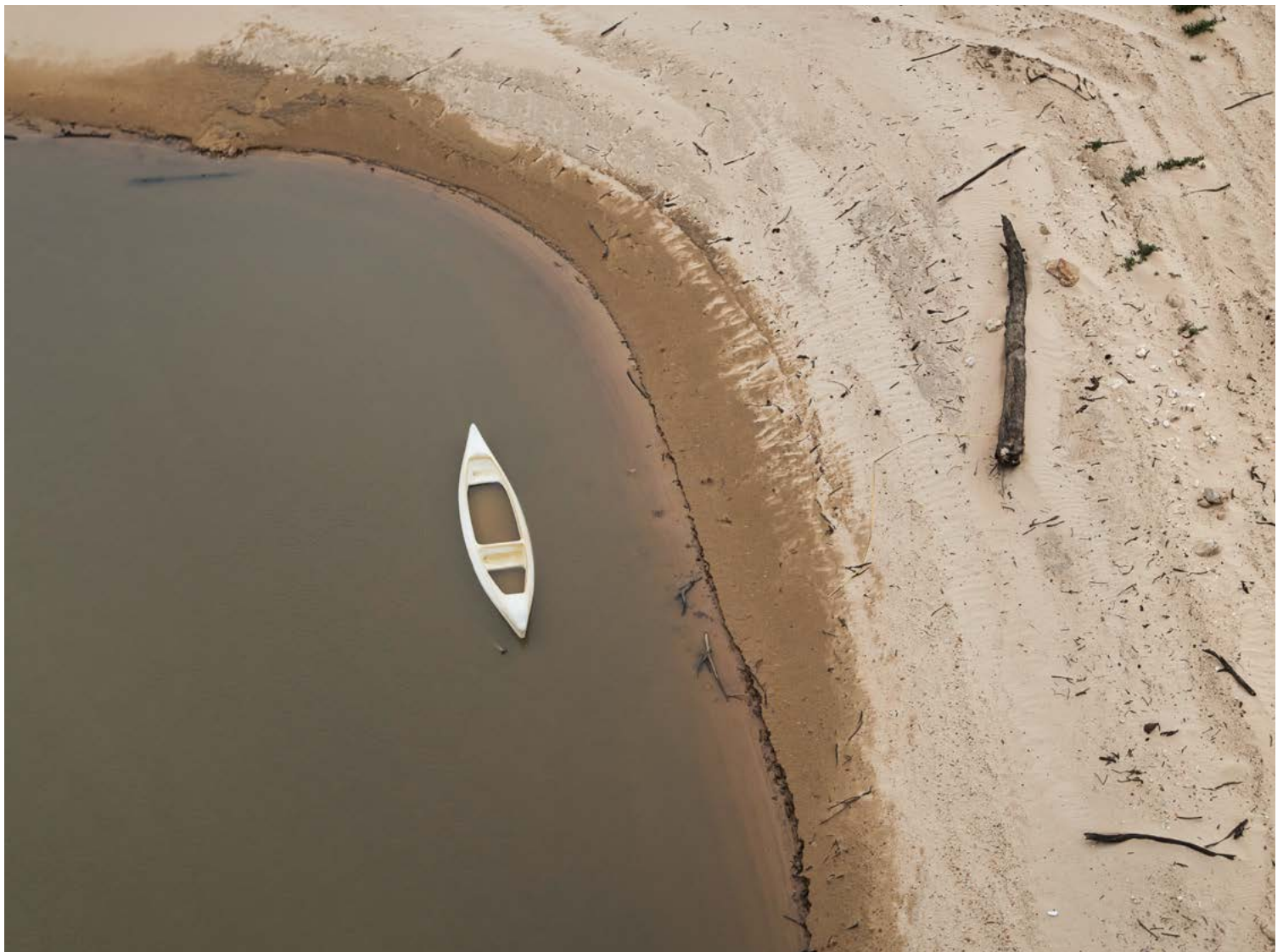
The consideration of water-related risks is therefore of great importance for Indian banks.

On the other hand, the current emergency in water supply also creates opportunities. Substantial investments are needed to adapt the water infrastructure to meet future requirements. By 2030, some USD 11.7 trillion will have to flow into water infrastructure around the world to keep pace with current levels of GDP growth. Taking into account population and economic growth, massive investment will also be needed in India. There are opportunities for development banks, for example in the area of blended finance. As early as 2013, for example, KfW implemented a project together with an Indian asset manager that enabled many municipal projects to strengthen the water infrastructure through a KfW loan of EUR 10 million.

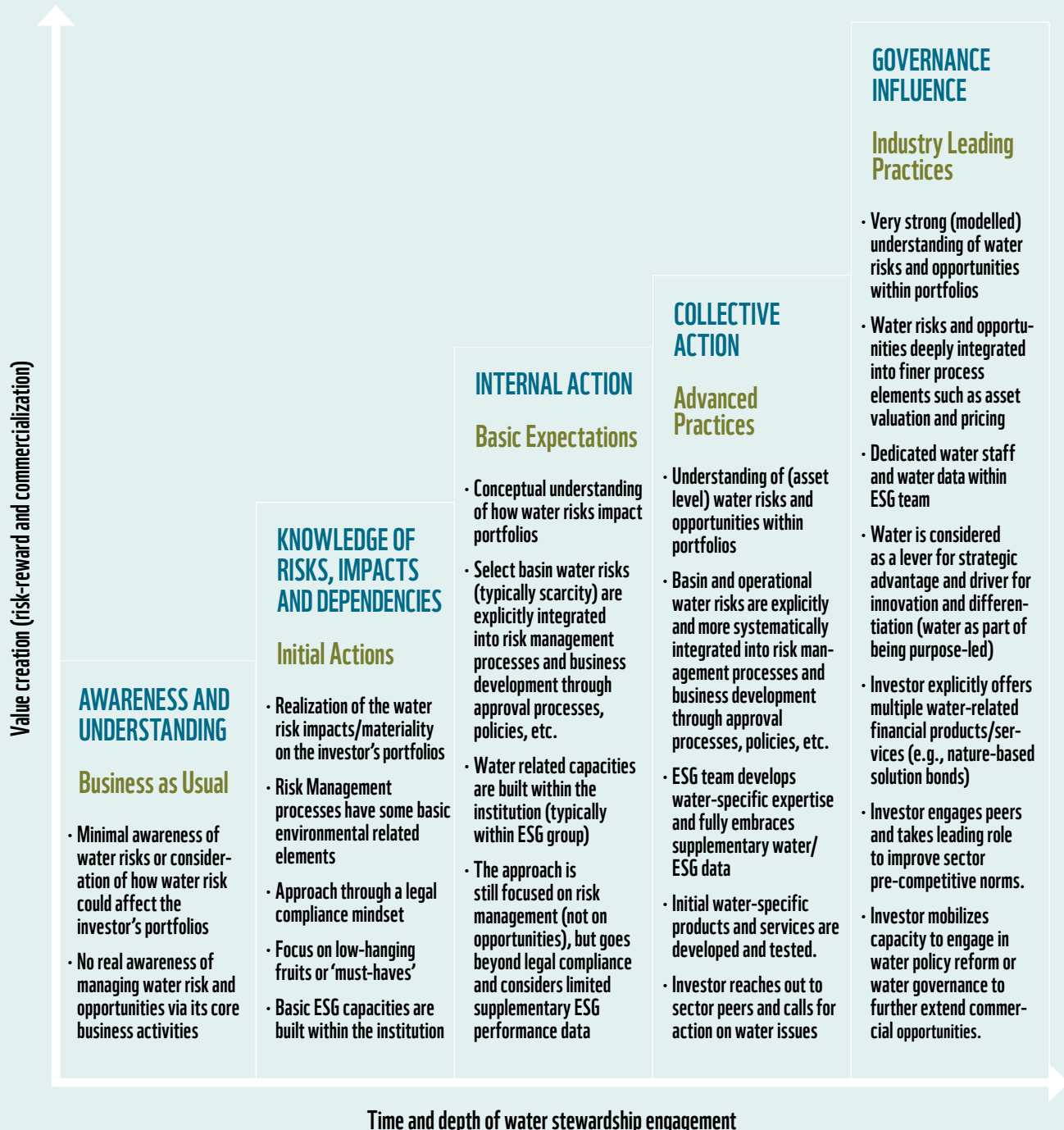
New opportunities are also opening up in the area of bonds. In 2018, for example, the Seychelles launched the first Blue Bond – a bond explicitly designed to finance water-related projects.

It is also to be expected that the regulatory framework for water-related investments will gradually improve as water scarcity intensifies.

While these challenges and opportunities are obviously important for the Indian banking sector, water-related risks can also affect companies in other countries through the supply chain. Germany was the third largest importer in the world in 2017, and German companies are heavily dependent on goods and services from abroad. In 2018, 20.9% of German imports came from Asia, Australia and Oceania – partly from regions with poor water availability and management along supply chains. This gives rise to risks for German companies that could jeopardise both production and reputation. Domestic banks and investors are also exposed to these risks.



Annex B: Water Stewardship Ladder for Institutional Investors



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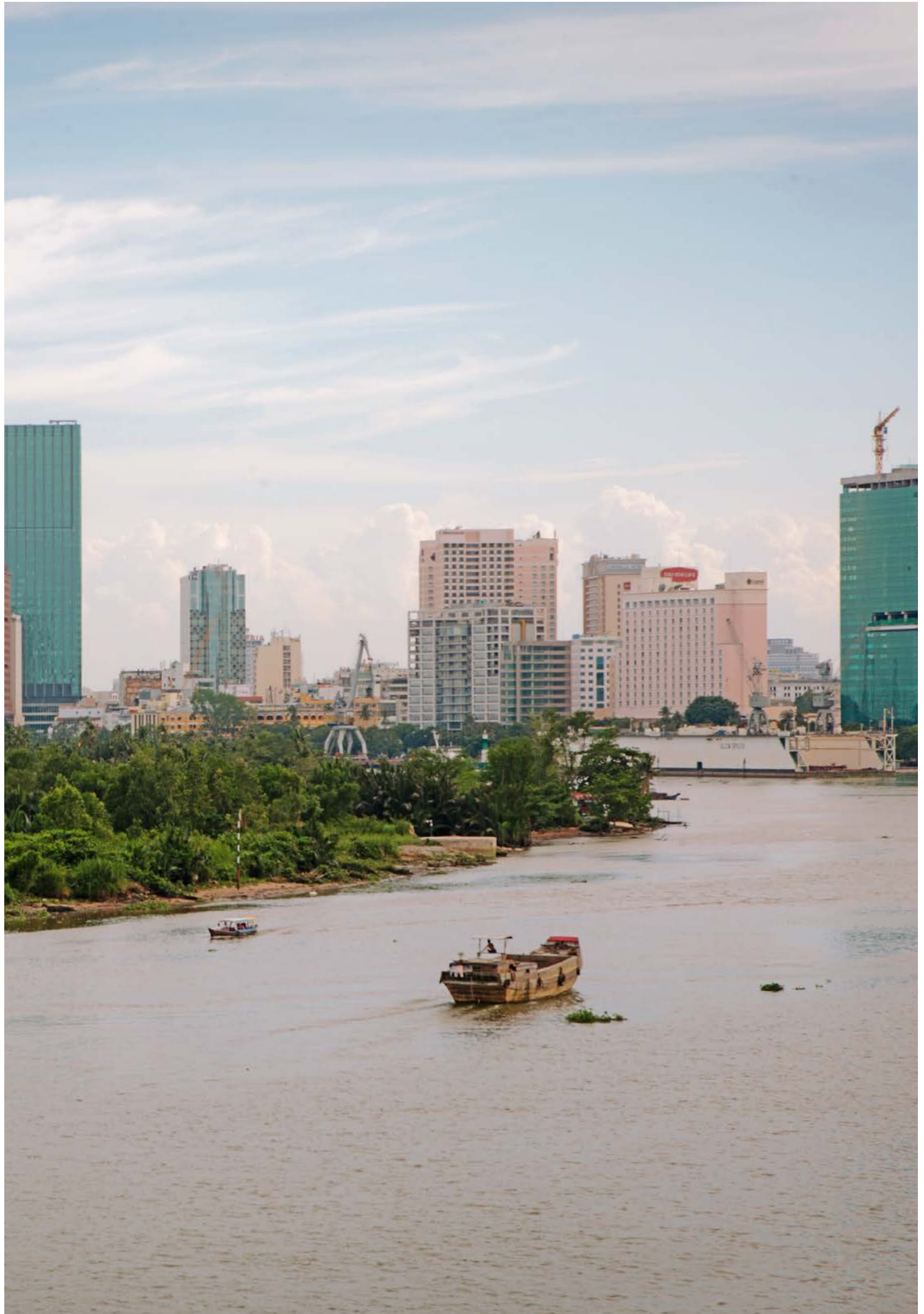
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