Cities Under Pressure

The Planner's Role in a Climate-Changed World

Across the world, climate-related disasters are no longer isolated or unanticipated occurrences. Floods are overwhelming cities built along rivers and coastlines, prolonged heatwaves are testing the limits of public health and infrastructure systems, and wildfires and droughts are disrupting livelihoods at an unprecedented scale. What is striking is not just the frequency of these events, but how quickly they are becoming part of everyday reality across very different geographies. As NASA notes, a warmer planet is already fuelling *"record-breaking heat waves, drenching rains, severe floods, years-long droughts, [and] extreme wildfires…"* ***NASA Science***

While these events often dominate global headlines, their implications are felt most directly by those responsible for shaping cities on the ground. For urban planners, policymakers, developers, and communities, it has become a practical challenge that shapes everyday decisions about land use, infrastructure investment, and urban liveability.

To better understand these issues, conversations were held with planners, academicians, public agencies, and industry practitioners in Singapore. Their perspectives reveal both shared concerns and emerging opportunities as the city-state continues to integrate climate resilience into its planning system.

Asia at the Frontline of Climate Risk

Figure 1 Global weather and climate extreme events

Asia sits at the intersection of some of the world's most acute climate risks and the fastest pace of urbanisation. Many of the region's major cities are located along coastlines, river deltas, or floodplains, making them especially vulnerable to sea level rise, extreme rainfall, and storm surges. At the same time, urban liveability, infrastructure and community systems are all under increased stress due to rising temperatures and urban heat island effect.

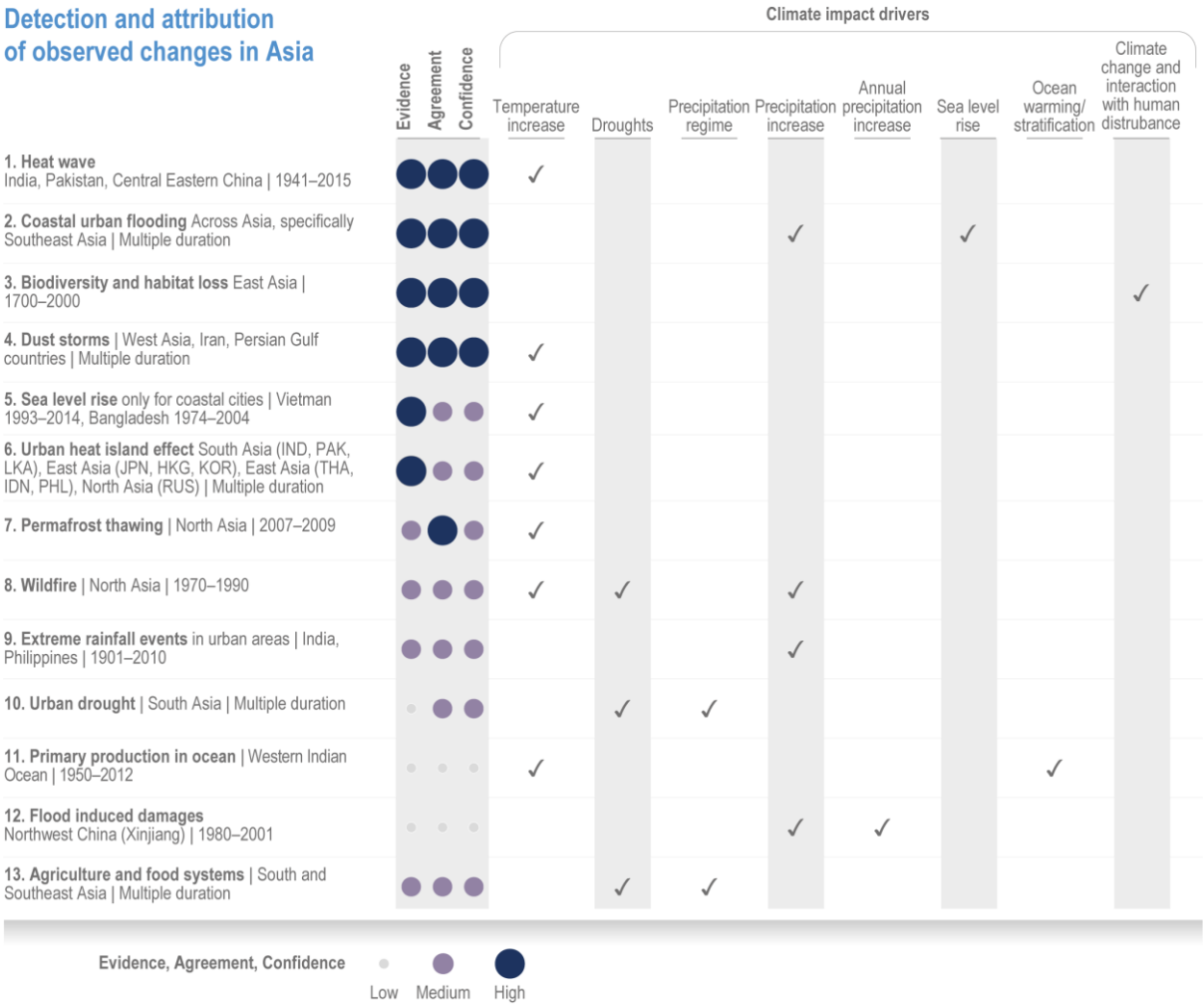

Figure 2 Observed climate impacts across Asia, including heatwaves, flooding, and biodiversity loss, show varying levels of evidence and confidence, highlighting the growing complexity of climate risk in the region.

For planners in the region, these trends introduce new layers of complexity. Climate change is now amplifying these existing stresses. Historical data, once a reliable guide for infrastructure planning is becoming less predictable as rainfall patterns shift and extreme weather events grow more intense. Urban planners & designers need to manage long-term uncertainty alongside short-term development demands. Decisions made today on land use, density, and infrastructure alignment will shape not only how cities grow, but how they respond to climate stress over decades.

Across the region, there is increasing recognition that resilience cannot be retrofitted easily or equitably. Embedding climate resilience early, before urban form and infrastructure are locked in offers one of the most effective ways to reduce future risk while supporting sustainable and inclusive urban growth.

Singapore's Climate Reality

Climate change is not an abstract risk or a far-off threat for our little red dot. As a low-lying urbanised island city with critical infrastructure tightly knitted into its urban fabric, the nation

faces direct exposure to sea level rise, more intense rainfall, and rising urban temperatures. The city's constrained geographical area, lengthy infrastructure lifespans, and dense development patterns increase these hazards and leave little opportunity for retreat or temporary solutions.

Figure 3 Heavy thundery showers across Singapore amid monsoon surge, March 2025

What distinguishes Singapore’s climate challenge is the long-time horizon over which planning decisions must remain effective. Under circumstances of growing uncertainty, public areas, land-use plans, and infrastructure are expected to function not only for present demands but also for several decades. Assets built today will need to cope with climate scenarios that extend well beyond historical experience, making adaptability and flexibility essential planning considerations.

Several stakeholders pointed out that this reality reinforces the importance of long-term thinking in Singapore’s planning approach. This is where the philosophy of Singapore’s former master planner, Dr Liu Thai Ker, becomes particularly relevant. Dr Liu has long emphasised that good planning is about caring simultaneously for people and land, and about ensuring that cities function well not just today, but decades into the future. His insistence on long-term thinking, integrated land use, and disciplined implementation has shaped Singapore’s urban form and now provides a strong foundation for climate resilience.

Singapore’s approach to climate adaptation reflects this planning-led mindset. Singapore has already taken significant steps to address climate risks through national-level strategies and investments, particularly in water management and coastal protection, and the integration of blue-green infrastructure.

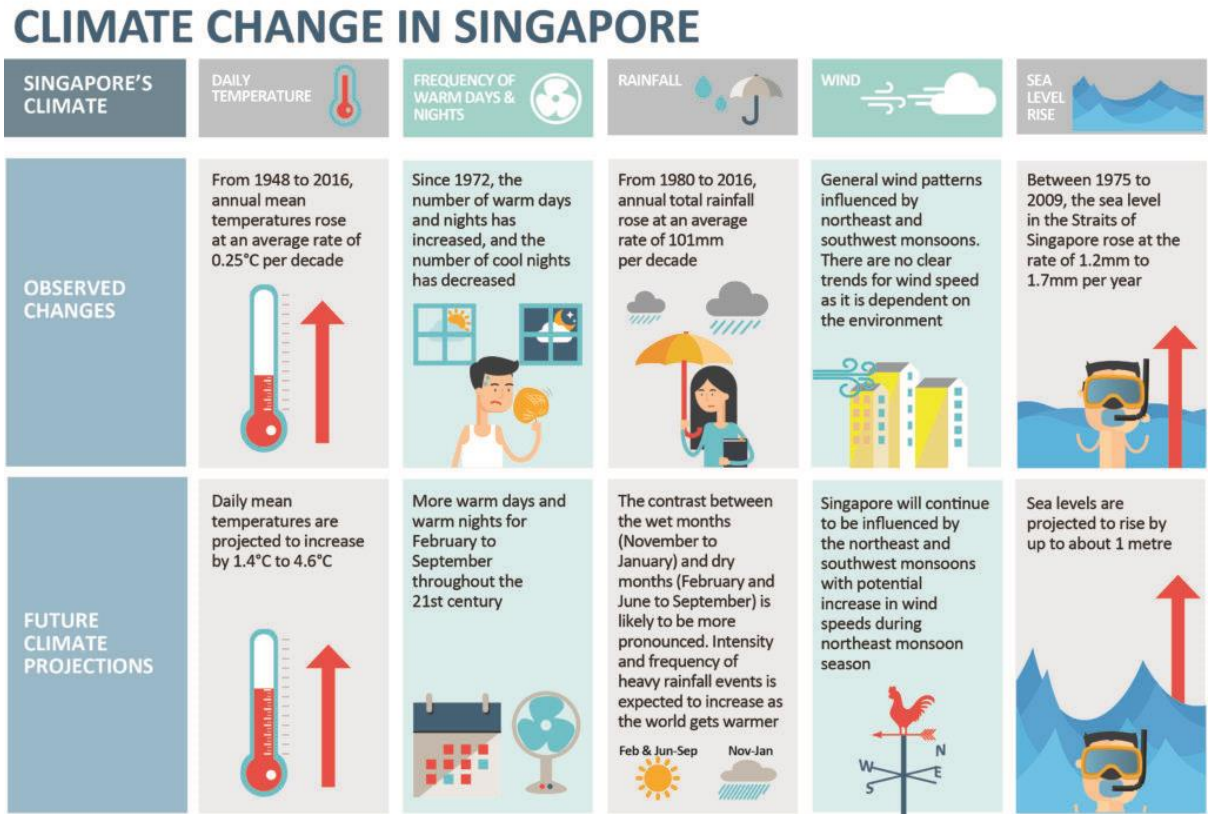

Figure 4 Source: Strategy Group Prime Minister's Office

For planners and designers, this means engaging with climate risk earlier and more explicitly using it to shape land-use choices, density distribution, infrastructure alignment, and the design of public spaces.

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Figure 5 D. Liu Thai Ker

"When you plan a city, the most important thing is that the city must function well… you have to care for the people and care for the land." - summarising Dr Liu's planning philosophy.

From Policy to Practice: Team Composition as a Tool for Climate Resilience in Singapore

In Singapore, the growing emphasis on climate resilience is increasingly visible in how public-sector projects are procured. Many government tenders now require project teams to demonstrate early integration of expertise in blue-green infrastructure, ecology, water management, and environmental planning often before the project is even awarded. This shift reflects an important recognition: climate resilience cannot be retrofitted through isolated technical inputs but must be embedded from the outset through multidisciplinary collaboration.

By requiring comprehensive teams upfront, public agencies are effectively shaping outcomes before design begins. The presence of ecological and blue-green infrastructure expertise at the early stages allows climate considerations to influence land-use strategies, public realm design, infrastructure alignment, and long-term maintenance planning. This approach moves resilience from a compliance requirement to a design driver and sets a higher baseline for what is considered standard planning practice.

However, while this model is gaining traction within the public sector, its replication in private development remains uneven.

Private-sector projects operate under different constraints. Development timelines are often tighter, risk appetites more limited, and financial models more sensitive to upfront costs. For smaller developments, assembling large multidisciplinary teams at the outset may be perceived as disproportionate to project scale. Fees, coordination effort, and longer lead times can become significant barriers, especially where climate risks are not immediately visible or regulated.

That said, the benefits of early multidisciplinary integration are increasingly evident, even for private developments. Early input from blue-green and ecological experts can reduce downstream design changes, support smoother regulatory approvals, and identify opportunities where climate-responsive strategies enhance market appeal through improved microclimate, higher-quality public spaces, and long-term asset performance. When embedded early, these considerations often lead to more efficient outcomes than retrofitting resilience measures later in the process

Emerging Themes from Stakeholder Conversations

Across discussions with planners and practitioners, several recurring themes emerged:

Balancing long-term resilience with short-term development pressures
Planners must navigate immediate urban development demands while planning for climate risks that may unfold over decades.

Working within land constraints
Singapore's limited land availability requires adaptation strategies that work within existing urban environments rather than relocating development.

Growing need for multidisciplinary expertise
Climate-responsive planning increasingly requires collaboration across fields such as ecology, engineering, hydrology, and digital modelling.

Skills and capacity building
Many stakeholders highlighted the importance of equipping the next generation of planners with interdisciplinary and digital skills to address climate-related challenges.

Voices from the Field

To complement these observations, conversations were conducted with practitioners working across different parts of Singapore's planning ecosystem. Their experiences provide a closer look at how climate considerations are shaping planning practice today.

Interview 1 – Perspective from Planning Practice

Goh Wee Heng
Senior Urban Planner
Henning Larson

Q1. Henning Larsen works across very different geographies. How has climate resilience started to shape the way you approach design today?
Wee Heng: Climate resilience has become a fundamental part of how we think about design, not just as a response to risk, but as an opportunity to create better places. At Henning Larsen, our work is deeply rooted in landscape architecture and nature-led design. From the outset, we focus on nature-based solutions, not only to address climate challenges like flooding, sea-level rise, and urban heat, but also to enhance liveability.

What is important is that climate resilience is not treated as a standalone layer. It is integrated into how places function socially and ecologically. We aim to go beyond basic resilience creating environments where flora, fauna, and people can coexist, and where climate strategies also contribute to everyday quality of life.

At the building scale, especially within our architecture teams globally, there's a strong focus on materials, daylight, carbon footprint, and lifecycle performance. Our headquarters in Copenhagen even sponsors PhD research in sustainability and climate-related studies. In Singapore, while our architectural footprint may be smaller, these principles still influence how we think across scales.

Q2. How does this thinking translate from buildings to urban design and landscape planning?

Wee Heng: At the urban and place-making scale, nature-based solutions are central. This ranges from stormwater management and park systems to coastal protection strategies.

For coastal areas, our approach aligns closely with what Singapore is now advocating working with nature rather than against it. Mangrove restoration is a good example. With sea-level rise, mangroves naturally migrate inland over time. Our role is to understand that process and design landscapes that allow for this ecological shift, rather than resisting it.

In projects close to sensitive natural areas, we think about long-term change, how coastlines evolve, how ecosystems adapt, and how human activity can coexist with these shifts. Climate resilience, in that sense, becomes both an environmental and spatial strategy.

Q3. Singapore has recently emphasised climate resilience in public tenders, such as Sungai Kadut and Lim Chu Kang. How do you see this shift?

Wee Heng: Sungai Kadut was a significant milestone. It was one of the first public tenders where the government explicitly required green and blue expertise ecologists, coastal engineers, landscape specialists from the outset.

For that project, we worked with arborists, mangrove specialists, coastal engineers, and water experts. This level of interdisciplinary collaboration was not just encouraged; it was essential. Compared to earlier projects, the focus had clearly shifted from vision alone to implementation-ready strategies, particularly around how green and blue systems work together as an eco-district.

This shows that government agencies are increasingly serious about addressing climate risks, not just in policy, but in how projects are structured and evaluated.

Q4. How does this differ when working with private developers?

Wee Heng: With private developers, the conversation often revolves around ESG, environmental, social, and governance commitments. Climate resilience today is closely tied to business continuity, investor confidence, and long-term asset value.

In the past, we spoke more generally about “sustainability.” Today, climate resilience is much more explicit, driven by real climate impacts and market expectations. While returns may not be immediate, developers increasingly recognise that resilience is part of long-term risk management.

So, while the motivations differ slightly between public and private sectors, both are converging toward the same reality: climate resilience is no longer optional.

Q5. Where do you see gaps between design intent and implementation?

Wee Heng: One of the biggest challenges is regulatory compliance. We can propose bold, forward-looking solutions such as advanced water reuse systems, renewable energy from organic waste, or integrated agricultural and aquaculture systems but implementation often runs up against existing guidelines.

Different agencies have different priorities. For example, one agency may view wastewater as a resource for renewable energy, while another sees it primarily as a water security issue. Both perspectives are valid, but coordination becomes critical.

The gap is not a lack of ideas or ability, it is the need for guidelines to evolve, and for agencies to collaborate more closely so that innovative solutions can move from concept to reality.

Q6. Do you see capacity gaps in the profession, especially among younger planners and designers?

Wee Heng: Young planners and designers today are very capable. They have strong technical and design skills, and they understand place-making and liveability well.

However, climate resilience requires another layer of thinking. It goes beyond creating pleasant spaces. It involves understanding materials, carbon emissions, construction processes, surface treatments, and long-term environmental impacts.

These are things that often come with experience. Universities lay a solid foundation, but much of this knowledge is developed through practice, interdisciplinary collaboration, and exposure to complex projects.

As planners, we also play a mediating role balancing engineering, environmental, social, and economic considerations. That ability to synthesise and negotiate across disciplines is a skill that develops over time.

Q7. Henning Larsen uses in-house tools to evaluate masterplans. How important is this shift toward quantification?

Wee Heng: It is particularly important. Design is often seen as subjective, and clients sometimes struggle to understand why one option is better than another. Our in-house tools help evaluate carbon emissions, microclimate performance, and environmental impact across different masterplan scenarios. They do not dictate design decisions, but they provide a framework for more informed, transparent discussions.

This is especially useful when working with different client types; public agencies, private developers, or investors, each with different priorities. Quantification helps bridge the gap between design intent and decision-making.

Q8. What role do planners and professional bodies like SIP play in advancing climate resilience?

Wee Heng: Planners are uniquely positioned because we work at the intersection of disciplines. We do not work in isolation, we consider regional impacts, long-term consequences, and multiple stakeholder interests.

Professional bodies like the Singapore Institute of Planners (SIP) can play a stronger role by bridging public agencies and private practice. Public agencies have deep local expertise, but private practitioners bring international experience and exposure to innovative models.

There is a real opportunity for SIP to act as a platform for collaboration, dialogue, and knowledge exchange not just networking, but shaping how climate resilience is embedded into planning practice in Singapore.

Q9. On a personal note, what drives your commitment to this work?

Wee Heng: For me, planning is always about the future. Much of what we design today will not be fully enjoyed by our own generation, it is for the next.

I often think about my son. He is the one who will live in and experience the environments we are shaping now. That perspective changes how you approach your work. It is no longer about delivering a project; it is about responsibility.

That is why climate resilience matters. Without it, our plans simply will not last. And if they do not last, they fail the very people they are meant to serve.

Interview 2 – Perspective from Planning Practice

Anuj Jain

Director and Principal Ecologist
Biosea

Q1. What are some of the real challenges when trying to integrate nature, such as mangroves into infrastructure or industrial development projects?

Anuj: One challenge is that while we understand mangroves well at a biological or species level, integrating them into engineering and planning systems is much more complex.

For example, we worked on a project in western Singapore where an industrial estate borders several important mangrove ecosystems. The coastline includes a naturalised river system that also supports mangroves. The challenge was to design the industrial estate so that these mangroves could be protected.

Drainage systems for the development needed to respect the ecological boundary conditions. With climate change, rainfall patterns may intensify, which means more stormwater could flow into the mangrove areas. We therefore need to ensure that the hydrology of the site does not damage the ecosystem.

This leads to additional questions:

- If mangroves remain intact, do we still need the same level of land elevation or coastal protection?
- Should there be special edge treatments where the mangroves interface with the development?

Engineering systems are usually designed based on peak flow events, such as a one-in-ten or one-in-hundred-year storm. But ecological responses are harder to quantify. While studies show how mangroves respond to certain stresses, it is difficult to directly predict how a specific site will behave without detailed modelling.

So the science exists, but it is complex. Nature-based solutions are not always as simple as mixing together ready-made strategies. Each site requires deeper analysis.

Q2. From your experience, is there a gap between planners, designers and ecological experts when implementing nature-based solutions?

Anuj: Yes, there is definitely a gap, both in terms of numbers and timing. Often ecological experts are brought into projects too late. By that time, major planning decisions may already have been made. For example, a seawall may already be planned and then an ecologist is asked to help make that seawall "nature based."

But ideally, ecologists should be involved much earlier so they can influence fundamental decisions such as whether that seawall should even be placed there, or whether a different system-wide approach might work better.

So the issue is not just having more experts but also integrating them earlier in the planning process.

Q3. Do you see capability gaps in the industry in terms of skills, tools or market readiness for nature-based solutions?

Anuj: Yes, absolutely. One positive development is that some government project briefs now require environmental specialists or ecologists to be included in multidisciplinary teams from the beginning. That is very encouraging.

However, this is still not the norm. Many projects still engage ecological expertise only on an ad-hoc or downstream basis.

Outside Singapore, the gap is even larger. In many Southeast Asian and South Asian countries, environmental impact assessments (EIAs) are conducted mainly to address regulatory requirements. These assessments often focus on impacts to air, water, and soil, rather than detailed ecological assessments of flora and fauna.

As a result, developers may not even know which areas of their site have high ecological value or where natural assets could be integrated into the design.

A more holistic approach is needed to assess benefits such as carbon sequestration, cooling effects, biodiversity and ecosystem services.

Q4. Do you think professional organisations such as the Singapore Institute of Planners could help bridge the gaps between planners, ecologists and developers when it comes to nature-based solutions?

Anuj: Yes, I believe professional bodies can play a very important role, especially by creating a common language around valuing ecosystem services.

In the building industry, we already have frameworks like Green Mark. In the landscape sector, there are systems such as LEAF (Landscape Excellence Assessment Framework) which incorporate biodiversity considerations.

There are also emerging tools such as biodiversity accounting metrics that allow planners to quantify the ecological value of a site. These tools assign habitat scores to a piece of land and establish a baseline biodiversity value.

In the UK, for example, developments are now required to achieve at least a 10% net gain in biodiversity units before receiving approval. Singapore does not yet have such regulatory requirements. Without regulatory frameworks, these approaches remain voluntary and are implemented only on a project-by-project basis.

This is where professional organisations like the Singapore Institute of Planners can play an important role bringing planners, designers and ecological experts together, encouraging shared standards, and fostering conversations that integrate nature-based solutions more systematically into the planning process.

Q5. Are there projects that you feel demonstrate successful nature-based solutions?

Anuj: Before answering that, it's important to define what we mean by nature-based solutions.

For me, it’s not simply adding greenery. A good nature-based solution responds to the site’s original ecological context and enhances it. Two projects that demonstrate this well are:

Rifle Range Nature Park: This project serves as a buffer to Bukit Timah Nature Reserve.

The site was previously a quarry that had formed a degraded wetland. The design restored and enhanced the wetland ecosystem by introducing riparian vegetation and improving ecological conditions. At the same time, the park created new public spaces such as boardwalks and viewing decks.

Over time, biodiversity has increased while also providing recreational opportunities for visitors.

Jurong Lake Gardens: This site originally contained swamp vegetation along the Jurong River. The design aims to restore swamp forest ecosystems by adjusting the hydrology of the landscape.

The project is not only about climate resilience, but also about restoring lost biodiversity while creating meaningful public space.

Kampung Admiralty: This project integrates housing, healthcare, retail and community spaces within a vertical village. What makes it interesting from a nature-based perspective is that it incorporates layered greenery that supports biodiversity while also providing climatic benefits. Studies have shown measurable cooling effects in the area.

The social benefits are also significant. In surveys conducted on site, about 42% of residents reported meeting new acquaintances in the green spaces, which shows how ecological design can also support social interaction and placemaking.

Q6. What are some additional challenges when scaling up nature-based solutions?

Anuj: Several challenges exist;

1. Boundary limitations
Nature does not follow site boundaries. Sometimes the most effective ecological solution may lie outside a development site, but developers cannot influence land beyond their control.

2. Time
Nature takes time to mature. Restoring ecosystems such as mangroves may take 10–20 years before they deliver full benefits. During that time, infrastructure still needs to remain resilient.

This often means engineering systems are designed to handle worst-case scenarios, which increases cost and carbon emissions.

3. Manufacturing and technology availability
Certain coastal protection solutions such as ecological seawall blocks that allow marine life to establish are not always available at the necessary scale.

4. Testing and experimentation
Many nature-based technologies are still being tested. More real-world field testing is needed, especially in tropical climates like Singapore where environmental conditions differ from temperate regions.

Q7. What needs to happen next for the industry to move forward?
Anuj: We need stronger integration between planning, engineering and ecological expertise.

Capacity building is important, but so is experimentation and scaling up pilot projects. More field testing and research should happen in real environments rather than only in laboratories. As climate pressures increase, these interdisciplinary approaches will become increasingly necessary.

Interview 3 – Perspective from Planning Practice

Ratna Delia Octaviana
Associate Director
Ramboll

Q1. How are climate risks (flooding, heat, sea level rise) influencing your projects or operations?
Ratna: As I'm sitting within Ramboll Singapore's Water Infrastructure and Climate Adaptation team, climate risk is not something we occasionally consider, it sits at the core of almost everything we do. One way or another, every project engages with climate risk, whether through flooding, heat, or sea level rise. What has shifted most is our approach. Climate risk is no longer a scenario tested at the end of a study; it shapes decisions from day one. It influences how we structure land use, phase development, design public spaces, and ultimately determine what is truly feasible over time. Today, we no longer ask, "Can this be built?" but rather, "Can this continue to perform, adapt, and remain safe 30 to 50 years

from now?" That mindset shift fundamentally changes how we plan cities, infrastructure, and long-term investments.

Q2. What measures are you currently adopting in response to these risks?
Ratna: We're moving toward anticipatory planning, not reactive fixes. This includes embedding blue-green infrastructure early, nature-based solution, planning with exceedance pathways rather than absolute protection, designing for heat comfort at the human scale, and aligning land use with long-term flood and coastal strategies. Equally important is governance with clear decision gates, scenario testing, and staged investments so resilience is built progressively rather than treated as a one-off capital cost.

Q3. What are the biggest barriers you face when implementing resilience measures?
Ratna: The biggest barrier is rarely technical but it's more on alignment. Regulations often lag behind emerging risks, financial models still prioritise short-term returns, and resilience benefits are not always captured in conventional cost–benefit frameworks. There's also a tendency to treat resilience as an "add-on," when in reality it requires reframing

Q4. From your experience, where do you see capacity gaps?
Ratna: I see gaps in three areas.
First, skills. especially the ability to translate climate data into spatial and financial decisions.
Second, tools. we have strong models, but they're not always integrated or accessible across disciplines.
Third, market readiness. many stakeholders are willing in principle, but unsure how to move from ambition to delivery at scale.

Q5**. What opportunities do you see for innovation or business growth in climate-resilient solutions?**
Ratna: There's huge opportunity at the intersection of planning, infrastructure, and finance. Not just new technologies, but new ways of packaging resilience as investable, phased, and value-creating.
Solutions that combine risk reduction with everyday urban benefits such as cooler streets, healthier public spaces, more adaptable infrastructure. It's where resilience stops being a cost and starts becoming a competitive advantage.

Q6. Are there examples you believe could be adapted successfully in Singapore?
Ratna: Yes, but adaptation matters more than replication. Cities like Copenhagen and Rotterdam show how water can be treated as an asset, not a liability. What's relevant for Singapore is not copying their forms, but adopting their systems thinking by integrating governance, design, engineering, and community use into one coherent approach. Singapore's strength is its ability to pilot, learn, and scale quickly and that's where these ideas can truly take root.

Q7. How can institutes like SIP and professional bodies help bridge the gap?
Ratna: Professional bodies play a critical convening role. They can translate research into practice, create safe spaces for cross-sector dialogue, and help shape shared language between regulators, consultants, and industry. Just as importantly, they can invest in people building confidence, capability, and leadership in the next generation to carry resilience thinking forward. For example SIP can support capability building by embedding climate resilience into CPD not as abstract theory, but through applied training: how to read flood models, how to assess trade-offs, how to integrate resilience into land-use and phasing decisions.

8. What role should cross-disciplinary collaboration play in building resilience?
Ratna: Resilience cannot sit within one discipline. Planners bring spatial logic and people-centred thinking; engineers ensure performance and safety; financiers enable delivery;

technologists accelerate insight and monitoring. When these perspectives come together early, we get solutions that are not only robust, but also implementable and meaningful. In my experience, resilience succeeds when collaboration is treated as core infrastructure, not coordination overhead.

Looking Ahead

The perspectives shared through these conversations highlight that climate resilience is not simply a technical problem to solve. It is a planning challenge that cuts across institutions, disciplines, and communities.

For Singapore, the task ahead will involve continuing to strengthen collaboration between public agencies, private developers, planners, and communities while building the capacity needed to navigate an increasingly uncertain climate future.

In many ways, the principles guiding this effort; long-term thinking, careful stewardship of land, and integrated planning have long been central to Singapore’s planning philosophy. As climate pressures intensify, these principles may prove more important than ever.