SINGAPORE INSTITUTE OF ARCHITECTS

GREEN BOOK

SUSTAINABILITY AT THE HEART OF PRACTICE

Transformation by Design

IMPLEMENTING THE NEW URBAN AGENDA

About

The Singapore Institute of Architects

The Singapore Institute of Architects (SIA) is a professional organisation established in 1963 with the objective to promote the architectural profession and the built environment in Singapore.

The Institute is the sole representative for architectural profession in Singapore.

The Institute's mission is "To champion excellence in Architecture and the Built Environment," and our vision is to see "Singapore as an Architecture Capital."

The SIA Sustainability Committee

The *Green Book* is an initiative of the SIA Sustainability Committee. The committee promotes a culture of green and integrated design for the Architects in Singapore, focusing its activities in three thrusts, namely education, professional practice and design.

SIA Sustainability Committee:

Chair	Tan Szue Hann	Member	Ein Chang
Deputy Chair	Sonny Chionh	Resource Person	Siow Zhi Xiang
Advisor	Kuan Chee Yung	Resource Person	Astee Lim
Member	Benjamin Towell	Resource Person	Chang Yen Lin

Book Production

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Relationship with the SIA Industry Transformation Map

Global and National Context	Professional level Outcome	Practice and project level Strategy
Desired Global and National Outcomes* (WHY)	SIA Industry Transformation Map (SIA ITM) and Action Plan (WHAT)	*Green Book* – The strategies to meet the outcomes (HOW)
• Leave no one behind. • Ensure sustainable and inclusive urban economies. • Ensure environmental sustainability.	Securing our profession's future as a vibrant, valued and trusted leader, with a healthy professional culture, a positive identity for the profession, with resilient practices and a built environment ecosystem that champions value and diversity.	The SIA Environmental Design Guidelines: 1. Education and Integration 2. Climate Action 3. Natural Capital 4. Resource Management 5. Urban Harmony 6. Health and Wellbeing 7. Adaptability and Longevity

* Outcomes derived from the following key drivers:

Global: The New Urban Agenda (Habitat III), United Nations Sustainable Development Goals (SDGs), Paris Agreement, Task Force on Climate-related Financial Disclosures (TCFD's) and the Draft Global Pact for the Environment.

National: The Sustainable Singapore Blueprint, Report on the Committee for the Future Economy and Singapore's Long-term Low-Emissions Development Strategy (LEDS)

Living Grid House
Architect - L Architects
Photograph - Finbarr Fallon

Foreword

Championing Sustainability by Design

Ar. Seah Chee Huang
President, 59th Council 2018/2019
Singapore Institute of Architects

The SIA Green Book is a project of great significance for the Institute.

With the built environment responsible for 40% of global carbon emissions, this project is a testament of SIA's continuous commitment towards minimising the negative environmental impacts of buildings through sustainable design. Building up from our *Attributes of Sustainable Built Environment* that was spearheaded by SIA past President Ashvinkumar Kantilal and his team in 2011, this publication marks the next major decade milestone in SIA's pursuit for positive change in our built environment.

The *Green Book* provides the Architect a valuable toolkit to embed and communicate sustainable design and management processes elevating building performance and reducing environmental impact. The book is complementary to our national green building rating system, Green Mark, now, and as it continues to evolve under the Singapore Green Building Masterplan. Strategically, the principles and outcomes advocated in the publication align the institute's endeavours to the United Nations' 17 Sustainable Development Goals, and the New Urban Agenda, towards a better future through strengthening both human and planetary health.

The intricacy and interdependence between human wellness and the environment's condition have never been more apparent. Recent conversations include Greta Thunberg's outcry at the 2019 United Nations Summit, Prime Minister Lee Hsien Loong's 2019 National Day Rally speech on our city's vulnerability to rising sea levels, and the Construction Declares led by the local architectural and engineering fraternity in Jan 2020. These serve as key reminders that our behaviour has consequences, and there are calls for us to do more for humanity in our various capacities. SIA is proud to have been represented at COP25 in Madrid last December by the head of Sustainability Committee Ar. Tan Szue Hann. There, we shared the Institute's seven Environmental Design Guidelines (EDGs) and deepened our stake in forging more sustainable and liveable designs.

If 2019 was the year of climate action, 2020 is the year of resiliency and adaptability. The launch of the *Green Book* comes at an unprecedented time for humanity. Besides its devastating effects on economies and societies, the COVID-19 pandemic also serves as a powerful reminder that our actions, or inactions, have a tremendous impact on the planet. With satellite images showing pollution and carbon emissions plummeting in cities on lockdown, the correlation between

environmental degradation and human consumption habits is clear. The SIA *Green Book* highlights our responsibilities as architects to exercise mindfulness of these interdependent ecosystems. Through the guidelines, SIA hopes to continuously push for actions that tackle an even greater crisis; any small efforts towards improvement can certainly effect a massive change.

This drive for positive action is further celebrated in SIA's Industry Transformation Map (SIA ITM). The SIA ITM strategically charts out plans to elevate the profession's relevance and resilience via purposeful innovation in design and practice enabled by technology. Through avenues such as ArchiFest and SIA Design Awards, the Institute hopes to propagate this awareness while recognising such actions by the fraternity. Moreover, SIA continues to partner other institutions and agencies in our development of applied environmental analytical platforms that utilise evidence and outcome-based design processes to deepen our green agenda.

Ultimately, the aim is to increase local stock of low carbon and zero-energy buildings, while reducing consumption and driving generative design in our urban landscape. With more responsible and responsive design, we aspire to harmonise our natural and built capital, and ultimately shape more liveable and resilient environments for communities today and tomorrow.

In closing, the SIA *Green Book* would not have been possible without the hard work of the Sustainability Committee led by Ar. Tan Szue Hann, with strong backing from Ar. Benjamin Towell in authoring the publication. On behalf of SIA, I would like to express my sincerest gratitude to the entire team's contributions and look forward to the fraternity using this publication well. Through their efforts and your actions, the SIA *Green Book* will hopefully become one of our key vehicles that propels a collective pursuit of excellence in architecture and the built environment, towards a better world for all.

Preface

The New Normal Needs a New Green Book

Ar. Tan Szue Hann
Chairman, Sustainability Committee, SIA
Council Member, SIA

The New 7 EDGs – an SIA Committee Endeavour

I'd like to start by thanking the SIA President, my fellow Council Members, and the SIA Sustainability Committee.

The pages you hold in your hand – or as it were, the pages on your screen – are a result of a two-year-long endeavour – the first, to craft the 7 EDGs (Environmental Design Guidelines) from a comprehensive 11 attributes (circa 2011), and the second, to strategically employ these attributes into the full scope of architectural practice. These were the anchor projects of the SIA Sustainability Committee, championing how sustainability can shape architectural practice, and map our growth in alignment with the larger Construction Industry Transformation Map, and the Singapore Green Building Master Plan 2020.

The above endeavours would not have been possible without the leadership of President Ar. Seah Chee Huang, who embodies vision and empathy in his stewardship of the SIA Council and Institute at large. I thank my Committee members – Ar. Kuan Chee Yung, our seasoned advisor; Ar. Sonny Chionh, deputy chair; Ar. Benjamin Towell, who authored the book; Ar. Astee Lim; Ar. Siow Zhixiang; our new addition Ar. Ein Chang, and Chang Yen Lin – for the impassioned brainstorming sessions and the crystallised document that you now see.

The New *Green Book*

This book, in a nutshell, proposes seven guidelines – the SIA Environmental Design Guidelines, adapted from the United Nations Sustainable Development Goals – on how the built environment can continue to function in tandem with environmental health. While relevant in pre-COVID-19 times when this was conceived, these guidelines could now become our lifeline for human health and planetary equity, in times of a global pandemic. Laid out in three clear sections, the book addresses climate change and our (hopeful) response, and how we as architects and stewards of the built environment can have our practice guided by the seven EDGs, being:

1 Education & Integration
2 Climate Action
3 Natural Capital

4 Resource Management
5 Urban Harmony
6 Health & Well-being
7 Adaptability & Longevity

These were presented on a global platform at COP25 (United Nations Climate Change Conference) in Madrid, December 2019, putting SIA on the stage of global climate action. That city, and the world, have seen unprecedented change in the five months since. The seven EDGs could not be any more relevant as we look to rebuild our lives, and indeed our world, in recovery from a pandemic.

The New Normal

At the time of writing, we are nearing the end of the "circuit breaker" – an imposed control on social interaction and flow of some goods and services. Homes have become de facto offices, public activity reduced to nill, and our interaction with architecture reduced to within the walls of our own homes.

Architecture and building, in these times, are both essential and non-essential all at once. The walls we build to contain and define our domesticity now prescribe our entire daily lives, yet the spaces in between buildings and in the public domain are rendered pointless at best, hazardous at worst.

The current global pandemic has brought to light the hyper-consumerist nature of our lifestyles, and the excessive production that aims to fulfil this need. This is laid bare by global lockdown scenarios that have demonstrated, even if in slight exaggeration, how the planet can recuperate in the absence of human (industrial) activity. While raising questions on how our efforts in pushing economic growth has impacted both human health and planetary health, it has also brought to fore the need for wellness, hygiene and natural ventilation in the buildings we occupy.

We hope this book will guide you through the meanders of a long-term global climate threat, and a shorter-term global health challenge. And as we all occupy a building at most points in our life, we hope this book will be as useful a guide for Architects as it is for anyone who is intent on a more sustainable, equitable built environment.

May 2020

Acknowledgements

The *Green Book* could not have been possible without the following key contributions:

The SIA Sustainability Committee who have worked well together over the last three years during the development of the book, providing professional insight, guidance, rich content and critique. Much of the work produced here is a testament to the thought leadership of the committee members and their application of this to their own practice of Architecture.

Ar. Seah Chee Huang SIA President and *Green Book* champion. He produced the Environmental Design Guidelines (EDG) graphics, which creates a wonderful identity to the EDGs in a language that resonates with the United Nations' Sustainable Development Goals (SDGs).

Ar. Catherine Loke, SIA 1st Vice President. She was a source of inspiration and determination, providing frank discussions on planetary boundaries, the market and vision in relation to professional transformation. She is also the lead author of the SIA Industry Transformation Map (SIA ITM) whose first draft in June 2017 identified the SIA's Attributes of a Sustainable Built Environment as the foundation of the SIA ITM. This became the catalyst for the review which led to the *Green Book*.

Ar. Tan Szue Hann, Chairman of the SIA Sustainability Committee Sustainability who facilitated the development of the Environmental Design Guidelines (EDGs) and a valued sounding board during the book's drafting and layout.

Ar. Kuan Chee Yung, one of the driving forces behind the SIA ITM and a champion of biophilic design. He lent a critical eye over the development of the EDGs as an evolution of the previous 11 Attributes of a Sustainable Built Environment.

Professor Louis Kotzé, an international environmental law expert and contributor to the United Nations' draft Global Pact for the Environment. His arguments and observations have greatly contributed to the wider understanding of the international context and legal frameworks, of which our profession of Architecture needs to be aware, to work within and most importantly contribute to its future development.

In addition the following people have also helped frame arguments and been a vital source of information and encouragement, Gwen Towell, Meet Kaur, Francis Tay, Ar. Darren Benger and Diane Dumashie.

Finally :- all the wonderful Architects, professionals, builders, suppliers and clients whose work is featured within these pages, bringing the book to life.

About the Author

Author - Ar. Benjamin Henry Towell
RIBA; FRICS; MSIA; CEnv; GM AAP

Benjamin is a multidisciplinary, award-winning advocate, policy-maker, Architect, Chartered Surveyor and Chartered Environmentalist. His professional experience includes bringing together policy, projects and strategy that combine technical knowledge, international environmental law, climate science and finance to accelerate our collective response to climate change within the built and natural environment.

He is an active member in the Singapore Institute of Architects, and part of the Sustainability committee since 2011, having been involved in the development of the original *Attributes of a Sustainable Built Environment* from which this book evolved. Benjamin is an advocate of the necessary transformation of the Architect, particularly in professional practice and services, environmental design and the profession's involvement in co-creating public policy.

Within the international community, Benjamin was previously the Chair of the World Green Building Council's (WorldGBC) Rating Tool Task group, where he authored the Global Quality Assurance Guide for Green Building Rating Tools. He currently sits on the Royal Institution of Chartered Surveyors (RICS) Governing Council (Global Board), holding the urbanisation and planning strategy seat, setting the profession's global strategy and providing oversight and assurance on the global body's activities, senior appointments and performance.

Sukasantai Farmstay
Architect - Goy Architects
Photograph - Fabian Ong

Contents

INTRO-DUCTION

Introduction

This book is a cornerstone of our profession's transformation, framing a direct response to the deep socio-ecological crisis of the Anthropocene age. The book positions our profession as one that is aware and engaged with the United Nations' Sustainable Development Goals, the New Urban Agenda as well as other recent developments within the environmental sphere in the finance industry, international environmental law and associated global agreements.

The book is a professional guide that articulates how as a profession, we place sustainability at the heart of professional practice. The *Green Book* is inextricably linked to the SIA Industry Transformation Map, the SIA Scope of Service Matrix, the SIA Practice Management Framework and the SIA Conditions of Appointment and Architect's Services.

The architectural profession is at a crossroads both internationally and in Singapore. We are serving more sophisticated clients who have increasingly higher expectations, whilst working in an environment with increasing competition, including from outside the profession as others are providing services which were once exclusively in the Architect's domain.

We must be better equipped to articulate our professional value, in particular that Architects are the solution providers to address the built environment's contribution to climate change. Asia is rapidly urbanising, which in its current form is driving great socio-ecological harm. As Architects, we have an opportunity to positively intervene in this process, sharing a new form of urbanisation and managing the diverse cultural, social and environmental contexts of the region sensitively.

The book is organised into three sections. The first section identifies the professional approach through the seven Environmental Design Guidelines. Through the framework provided, we demonstrate how our practice of Architecture can drive the highest possible ambition to increase the resilience of people and ecosystems in the context of climate change, whilst integrating the United Nations' Sustainable Development Goals.

The second section summarises the present situation of climate change, and provides an outline of the international efforts to curb the rise in greenhouse gases. The purpose of this is to contextualise our professional duty and provide Architects with an up-to-date background so as to develop persuasive arguments for engaging clients and project teams to adopt an environmentally-minded approach to architecture.

The third section provides a concise critique of the book and its approach, demonstrating our awareness of the broader context and potential shortcomings to climate action being taken. It argues that we cannot maintain the status quo, and as Architects, we should be part of wider conversations and become agents of change.

The book aims to ensure that Architects actively communicate and practise with an eco-centric ethic of socio-ecological care. The Environmental Design Guidelines are a key framework to bring the profession forward in this regard, though we are aware that we need to go further in order to address the socio-ecological crisis of the Anthropocene, and we must act together, with urgency.

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Bukit Timah Fire Station (1956)
Inside the fire station tower
The site has been gazetted as a heritage site and will be regenerated through a competition requiring innovative and environmentally-sustainable urban solutions that achieve zero-energy

Photograph - Author

SECTION ONE

THE PROFESSIONAL RESPONSE

1.1 - A Call To Action

Architects must adopt a radically different paradigm for the Anthropocene age in addressing the challenges and impacts of a changing climate, and live up to our professional responsibilities by demonstrating our ability to lead the environmental charge as custodians of the built environment.

Why is this important for the Singapore Architect? The modern world is increasingly connected, economically as well as physically. One country, regardless the size, can have a substantial effect on the environment of another, not only through physical impacts such as pollution, but also through how it conducts its business, in investments, trade, policy and professional norms. Distilling this to the professional practice of Architecture means that our professional response to climate change will impact the wider professional practice of Architecture and urbanisation regionally, if not globally.

(Previous page)

Enabling Village
Architect - WOHA Architects Pte Ltd
Project transformed the previous austere institutional building into an inclusive environment for the training and employment of people with disabilities. The old car park is converted to make high-value landscape and community spaces.

National University of Singapore SDE4
Architect - Surbana Jurong in collaboration with Serie+Multiply Consultants.

1.2 - SIA Industry Transformation Map

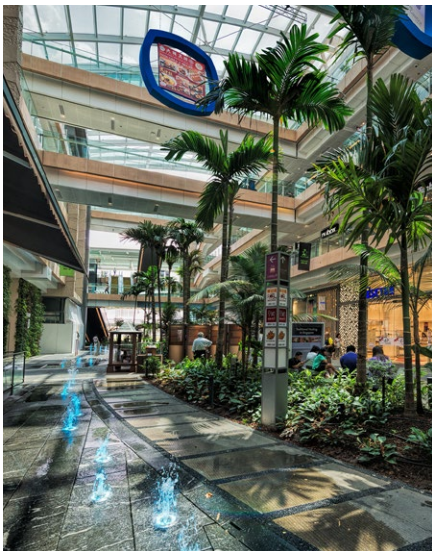
The SIA Industry Transformation Map (SIA ITM) is a critical piece in our professional transformation, our institutions' engagement in delivering a sustainable profession and our response to climate change. The SIA ITM and our associated practice level guidance, including the *Green Book*, position SIA as the leading institution and Architects as the leading profession with solutions to meeting our urban challenges nationally, regionally and globally.

The SIA ITM is a framework for our professional transformation with reference to the Committee for the Future Economy report. It explores our role within a globally leading city and identifies current global drivers and trends that will impact our profession. When developing the SIA ITM, we had fundamentally re-examined issues concerning our delivery of professional service, our clients' values, our contribution to the economy, and our relevance to and role in society.

The SIA ITM identifies the following as key drivers of change faced by the profession:

- climate change
- rapid urbanisation
- digitalisation

The SIA ITM unpacks what our professional response to these drivers has to be in order for Architects to be primed and equipped to address the challenges and opportunities in the near and medium term. Fundamental to this response is the critical examination of the world we want our children and grandchildren to inherit, human values, and how as a profession we can influence behaviour and contribute to the future economic landscape through our design and interaction with policy

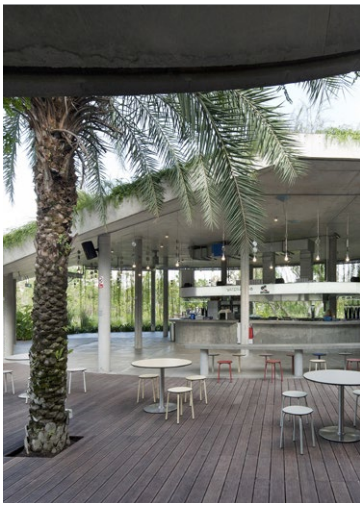


Westgate
Architect - RSP Architects Planners & Engineers

Sparkletots Preschool by PAP Foundation
Architect - LAUD Architects Pte Ltd

makers, regulators, stakeholders of the built environment and the public. This will secure our profession's future as a vibrant, valued and trusted leader, with a healthy professional culture, a positive identity for the profession, resilient practices and a built environment ecosystem that champions value and diversity.

The *Green Book* provides the strategy and detailed framework for Architects to meet one of the key outcomes in the transformation map, namely elevating sustainable and liveable design.



(left)
More than Just a Library
Architect - IX Architects

(right)
Satay By The Bay
Architect - Linghao Architects.

1.3 - Environmental Design Guidelines

The Institute's Position

As custodians of the built environment, Architects are in the best position to ensure that through their practice, projects and profession; climate change within the built environment is addressed. We have started well in working towards minimising the impact of our projects by engaging with the development of our green building rating tools and championing increasingly stringent environmental policies. However, we must act with a longer-term vision to deliver a responsive, sustainable and resilient built environment.

> *Our profession has a responsibility to adequately address the built environment's impact on the biosphere and address its contribution to climate change.*

To this end, the *Green Book* acts as the vehicle to professionalise this aspect of our work, and demonstrate our role in elevating sustainable and liveable design.

Architects must champion a holistic approach to sustainability. This takes into consideration the economic landscape as well as the entire spectrum of human values. Through design, those in the profession can then shape the way the built environment contributes to the quality of life within the planetary boundaries. Being a regulated profession with responsibilities to safeguard public and national interests, Architects are well trained to be socially responsible, and to consider the human psyche and well-being. Singapore has invested heavily in the provision of high-quality public housing, facilities, community spaces, parks, etc., to create an inclusive built environment for the enjoyment of everyone, regardless of social status or income level. Issues concerning liveability and quality of life are constantly addressed by policy-makers and city planners. Architects must fully engage in this process and be part of the collective endeavour; we have to move beyond addressing the potential and constraints of individual sites, and look towards how our projects contribute to the district, community and city.

Architects integrate creative and technical skills with a deep understanding of environmental, social, and economic impacts. As such, we are the leading profession in the built environment's response to climate change.

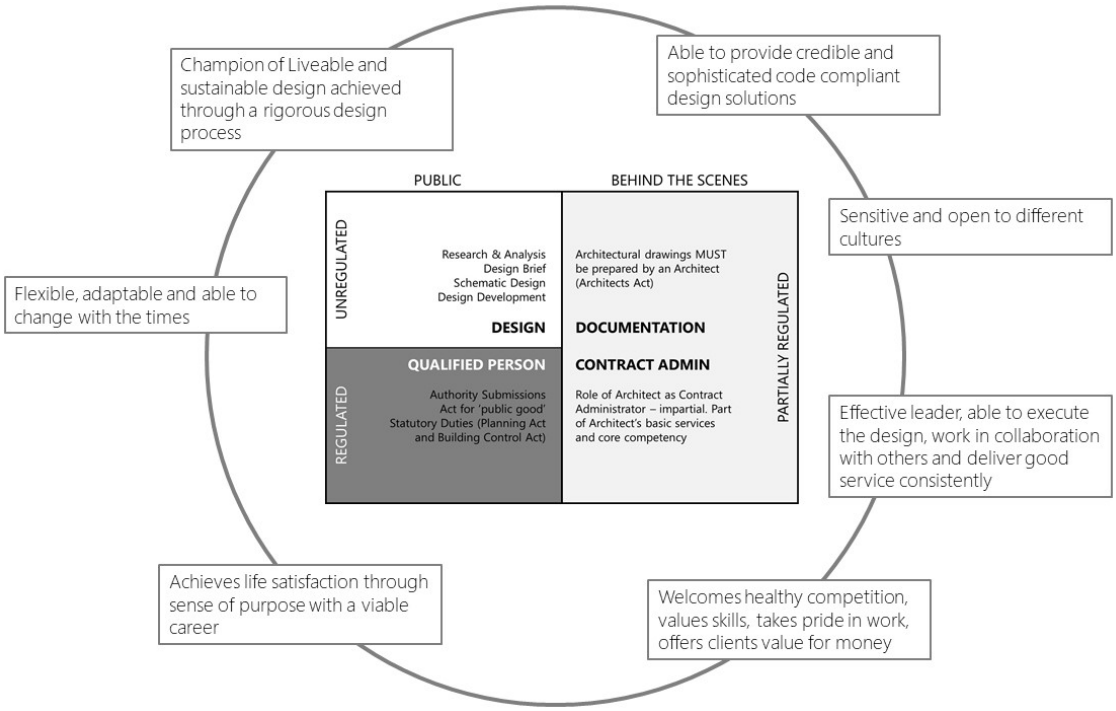


Figure 1 (Above)

The traits of the Singapore Architect – As highly trained, regulated professionals, we have a responsibility to develop and deliver climate change mitigation and adaptation solutions within the built environment.
Adapted from the SIA ITM

The conceptual basis for SIA's strategy to transform the construction industry towards sustainable practice is based on three tenets of the New Urban Agenda, namely:

Social Sustainability – Leave no one behind – how as custodians of the built environment we create places that facilitate socially positive activities and enable people to live meaningful lives;

Environmental Sustainability – how we shape our built environment to minimise the negative aspects of human settlements, encourage sustainable choices and move towards a regenerative urban form; and

Economic Sustainability – Sustainable and inclusive economies – how we can bring about a new value system which measures and rewards economic activities beyond those motivated by self-interest to include those motivated by self-transcendence and conservation.

Khoo Teck Puat Hospital
Architect - CPG Consultants Pte Ltd in collaboration with RMJM Hillier

The New Urban Agenda and the United Nations' Sustainable Development Goals

The world faces a growing number of challenges from growing inequality to the clear impact of climate change, the rapid rate of global urbanisation and natural resource depletion.

Faced with the scale of these challenges, the international community has responded with a range of global agreements aimed at tackling these issues individually and collectively. The most notable ones include the Paris Agreement which aims to keep global temperatures well below 2°C above pre-industrial levels, the New Urban Agenda (NUA) adopted at Habitat III in 2016, the 2030 Agenda for Sustainable Development, and the forthcoming UN Global Pact for the environment.

Looking further ahead, by 2050, the world's urban population is expected to almost double from now, making urbanisation one of the twenty-first century's most transformative issues. Populations, economic activities, social and cultural interactions, as well as environmental and humanitarian impacts, are increasingly concentrated in cities, and this poses massive sustainability challenges in terms of housing, infrastructure, basic services, food security, health, education, decent jobs, safety and natural resources. Architects can, however, take advantage of the opportunities presented by urbanisation as an engine of social and cultural development, and environmental protection. Through the way cities and human settlements are planned, designed, financed, developed, governed and managed, Architects can provide many of the solutions to sustainable development; improve human health and well-being; foster resilience; and protect the environment. Much of the global growth is taking place within our region, Asia.

This places us, Singapore Architects, as the key to the implementation of the outcomes of the NUA and the implementation and professionalisation of the 2030 Agenda for Sustainable Development, to deliver the Sustainable Development Goals (SDGs) and targets, and make cities and human settlements inclusive, safe, resilient and sustainable.

The NUA provides a framework for sustainable urban development and an opportunity for the SIA and its members to engage with policy-makers, professionals and financers around a shared agenda. This is intrinsic to the SIA ITM and the way we as Architects shape Singapore's shared vision of being a city for everyone where we are able to enjoy equal rights and opportunities.

The NUA further recognises the need for implementation of new sustainable consumption and production patterns that will contribute to the responsible use of resources and address the adverse impact of climate change.

The 2030 Agenda for Sustainable Development is a plan of action for people, the planet and prosperity. Most critically, it has been accepted by all countries and is applicable to all, taking into account different national realities, capabilities and levels of development. The resultant 17 SDGs are universal and involve the entire world, balancing the social, economic and environmental dimensions of sustainable development.

Figure 2 (Above)

The Sustainable Development Goals are the blueprint to achieve a better and more sustainable future for all. They address challenges of the global community, including those related to poverty, inequality, climate, environmental degradation, prosperity, and peace and justice. The Goals are integrated and indivisible, balancing the three dimensions of sustainability.

https://www.un.org/sustainabledevelopment/sustainable-development-goals/

At the international and national level, the SDGs are translated into action, and we as Architects have a direct impact on the delivery of a number of these goals. In particular, with Goal 11, to make cities and human settlements inclusive, safe, resilient and sustainable; Goal 12, responsible production and consumption; Goal 13, climate action; and Goal 17, partnerships, provide clear opportunities for direct engagement by our fraternity.

The SIA agrees with the NUA and sees it as a call for action for Architects to be in full participation in city development, for greater levels of co-creation in delivering sustainable projects, for changing market conditions to recognise the value of design, and for greater diversity within the profession.

While we acknowledge that a large policy shift is required to achieve the targets, we recognise this is not a job for governments alone. Architects, led by

their professional institute, have a critical role to shape the policy agenda, build capability within the profession and its allied professionals, and empower members to make an effective contribution to providing solutions to global climate change and urbanisation.

The development of the SIA Environmental Design Guidelines (EDGs) forms a means of engaging and contextualising our response and actions to the global drivers, defining our role in implementing the NUA, as central agents in achieving the UN's SDGs, and ensuring we consciously place these considerations at the heart of everything we do.

The resultant guidelines relate to the design, construction, operation and disassembly of buildings, neighbourhoods and cities. Implicit in these is a multidisciplinary, multi-stakeholder, whole-life perspective, reflecting the complexities of how the built environment is managed from concept to end-of-life.

Reports from the Intergovernmental Panel on Climate Change (IPCC), civic movements and detailed measurements of the accumulation of atmospheric carbon dioxide have reinforced the critical and urgent need for climate action. At the time of writing, the planet has warmed by between 0.8°C and 1.2°C (IPCC 2019) with climate scientists warning that time is running out to limit global warming to the critical 1.5°C, the estimated tipping point for catastrophic failure of our ecological support systems.

It is critical to highlight that even at 1.5°C, the world will be a less hospitable place than the one we once knew. Heatwaves, droughts and disasters on a scale like that of the 2019/2020 Australian bushfires will be commonplace. Natural systems and biodiversity will be irreparably damaged, but we, on the upside, might save 10% of coral reefs, and limit sea level rise to only half a meter by 2100 (IPCC 2019).

The built environment is a critical sector for ambitious intervention, including rapid move to zero carbon buildings, coupled with ambitious climate mitigation and adaptation measures.

Overview of the SIA Environmental Design Guidelines

The SIA expects all its members to place sustainability at the heart of practice.

Figure 3 (Above)
The SIA Environmental Design Guidelines – Placing sustainability at the heart of professional practice

The SIA Environmental Design Guidelines (EDGs) provide practical guidance for the implementation of the NUA and the urban dimension of the UN SDGs into our professional architectural practice. The EDGs contextualise them in a way SIA members can demonstrate the Architect's role in contributing to the outcomes of sustainable development, the way Architects are actively working to meet the goals, and finally a guideline for us to measure our success at the practice and project level.

The development of these guidelines is in full support of the NUA with particular emphasis on Paragraph 13 which calls for the development of cities and human settlements to amongst other aspects:

- fulfil their social function, including the social and ecological function of land;
- be participatory, engender a sense of belonging and ownership among all their inhabitants, prioritise safe, inclusive, accessible, green and quality public spaces that are friendly for families, enhance social and intergenerational interactions, cultural expressions and foster social cohesion, inclusion and safety;
- meet the challenges and opportunities of present and future sustained,

inclusive and sustainable economic growth, leveraging urbanisation for structural transformation, high productivity, value-added activities and resource efficiency;

- promote age- and gender-responsive planning and investment for sustainable, safe and accessible urban mobility for all and resource-efficient transport systems for passengers and freight, effectively linking people, places, goods, services;

- reduce vulnerability, build resilience and responsiveness to natural and human-made hazards and foster mitigation of and adaptation to climate change;

- protect, conserve, restore ecosystems, water, natural habitats and biodiversity, minimise environmental impact and change to sustainable consumption and production patterns.

Adapted from New Urban Agenda Paragraph 13 (United Nations 2016)

Using the EDGs allows us to communicate to our clients, policy-makers, stakeholders, members of the community and our competition that we are acting as a profession to address the global challenges holistically and diligently.

Heartbeat@Bedok
Architect - Ong&Ong Pte Ltd

Target 1.1 Provide education for sustainable development.

Target 1.2 Actively encourage healthy finance, use of technology and invest in capability building.

Target 1.3 Foster a collaborative approach to practice.

Target 2.1 Integrate Climate Change measures into practice strategies and projects.

Target 2.2 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters.

Target 3.1 Protect, restore and promote sustainable use of ecosystems.

Target 3.2 Halt and reverse land/marine degradation and biodiversity loss.

Target 3.3 Prevent marine and water pollution from construction and building operation-based activities.

Target 4.1 Advance net-zero energy and low carbon developments.

Target 4.2 Implement integrated water resources management plans.

Target 4.3 Adopt a circular economic approach to buildings through material, design and construction choices.

Target 5.1 Strengthen efforts to enhance cultural and natural heritage.

Target 5.2 Actively develop and implement an urban tropical vernacular contributing to a "*city in nature*" national vision.

Target 6.1 Design and practise with well-being and comfort in mind.

Target 6.2 Incorporate a biophilic design approach to architecture.

Target 6.3 Ensure health and safety are fully considered throughout the project life including deconstruction.

Target 7.1 Design for adaptability, flexibility and reuse.

Target 7.2 Design with the future in mind, including spaces for new infrastructure, technology and future connections, as well as ease of maintenance and repair.

1 Education and Integration

More Than Just a Library
Architect - IX Architects Pte Ltd

SUMMARY:

Architects play the lead role in integrating and leading the design process including setting and managing the sustainability aspirations. Architects have a commitment to promote environmental education within the profession, and with clients and project teams, to advance understanding and generate effective responses to environmental degradation.

MEASURABLES

BIM, VDC, IDD

Design Responsibility Matrix

Early Contractor Involvement

Early Facility Manager Involvement

METRICS

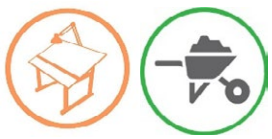
LOD (Level of Development)

BIM Level 2 to Level 3

Design Charrettes

Collaborative Appointments

PHASE



Design Construction

RELATED SDG

TARGETS	INDICATORS
Target 1.1 Provide education for sustainable development. Mainstream education for sustainable development at all levels within the organisation (i.e. architectural practice) and the project team. Incorporate mechanisms for raising capabilities for effective planning and management strategies related to climate change.	1.1A Practise level commitments to a 1.5°C world – instil a deep understanding of how every project and design decision contributes to a changing climate. Practices shall commit to providing time and resources for formal and informal education. 1.1B Use design charrettes and learning journeys with the client and project team members. Communication of design outcomes and targets shall be framed on a commitment to more sustainable development.
Target 1.2 Actively encourage healthy finance, use of technology and invest in capability building. (a) Establish healthy fee levels that represent the value that the Architect and other project team members bring. (b) Apportion practice profits (priced into fees) to be invested into research and innovation. (c) Invest and use relevant design technologies. (d) Build a capable, confident and competent practice.	1.2A Allocate fees that allow for a profitable practice, good salaries at all levels and a practice culture that fosters work-life balance. 1.2B Projects shall be given time and resources for considered, coordinated and innovative designs to be detailed sufficiently, prior to construction. 1.2C Commit a minimum percentage of practice profits to be reinvested into research and innovation projects and/or competitions. 1.2D Invest and use relevant integrated digital delivery platforms in a productive manner at all levels of organisation. 1.2E Provide a minimum time (hours per year) of structured training per member of staff across a broad spectrum of topics, including environmental performance, health and safety, ethics and professionalism, construction law, practice management, etc. Staff shall have effective monitoring, feedback, appraisal and mentoring systems.

Target 1.3 Foster a collaborative approach to practice.

Promote a collaborative industry where expertise and experience is captured, disseminated and valued.

1.3A Use a design responsibility matrix implemented across the entire project team to capture responsibilities, deliverables and level of design required.

1.3B Encourage the use of collaborative appointment and contracting frameworks for projects.

1.3C Use Integrated delivery platforms including using BIM to ISO 19650-2018 "Level 2". Project Information Models (PIM) shall be sufficiently developed and detailed for purposes of co-ordination, environmental simulations, statutory submissions, tender and construction documentation as well as forming the basis for conversion into Asset Information Models (AIM).

1.3D. Use Early Contractor Involvement (ECI) and Early Facilities Management Involvement (EFMI) within complex projects, with proper remuneration for such involvements.

1.3E Establish an effective knowledge management framework at the practice and project level to capture key learning points for future reference. Assess time spent and profitability of projects to calibrate future fees.

1.3F Conduct in-use project monitoring and feedback. Where possible, include post-occupancy evaluations and key environmental performance monitoring of complete projects for practice-based and project-team-based learning.

2 Climate Action

Sukasantai Farmstay
Architect - Goy Architects
Photograph - Fabian Ong

SUMMARY:

Architects are the custodians of the built environment, and should lead the charge for climate action within the sector. The role of Architects is of great importance in both climate change mitigation, through decarbonisation of the built environment, and climate change adaptation, ensuring our built environment's resilience to the changing climate.

MEASURABLES	METRICS
Operational Carbon	$MTCO_2e$
Life Cycle Assessment	-
Pollution	ODP, GWP, NOx, SOx, PM2.5

PHASE

Design Construction In-Use

RELATED SDG

TARGETS	INDICATORS
Target 2.1 Integrate Climate Change measures into practice strategies and projects. Integrate and communicate plans and processes to lower greenhouse gas emissions, and reduce pollution at the practice and project level.	2.1A Conduct life cycle assessment for the project to make informed material and design choices based on the life of the project. Key tools that can be adopted for assessments include: • ISO 14040:2006 • Royal Institute of Chartered Surveyors (RICS) – *Whole of life carbon assessment for the built environment (a professional statement* aligned with EN 15978) • World Green Building Council (WorldGBC) – Advancing Net Zero programme • Royal Institute of British Architects (RIBA) – *Embodied and whole life carbon assessment for architects*. 2.1B Establish pollution reduction strategies through material specification and selections, and through decisions regarding construction methods. Ensure that effective environmental management plans are required at the construction stage, covering the entire supply chain including on and off-site manufacturing. 2.1C Apply operational carbon (CO_2e) benchmarking and offset for projects and practice activities. Engage with third party certifications, identify opportunities for carbon offsets through renewable energy deployment or procurement, and procure certified carbon offsets for the practice operations, including travel.
Target 2.2 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters. Actively design climate resilience in the projects based on current climate models, including flooding, drought, heat stress and extreme weather.	2.2A Develop climate related risk assessments with adaptation (mitigation) plans. Include awareness of recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) to understand climate-related financial impacts and risk exposure of the project. 2.2B Use climatic models to build resilience into the design for future climate threats to the project, including increased rainfall, flood risk, drought, and temperature extremes.

3 Natural Capital

Satay By The Bay
Architect - Linghao Architects

SUMMARY:

Architects must address ecological impacts of the built environment, focusing on issues of biodiversity loss, and how we can mitigate, reduce or even reverse the negative impacts of our buildings through design, construction choices and eventual operation.

MEASURABLES

Biocapacity & Diversity

Green Plot Ratio

Landscape Replacement

METRICS

Singapore Index for Biodiversity

%Landscape replacement

GnPR (Green Plot Ratio value)

Extensive/Exclusive use of native species

Ecological footprint

PHASE

RELATED SDG

TARGETS	INDICATORS
Target 3.1 Protect, restore and promote sustainable use of ecosystems. Design in a manner that promotes reforestation, through multi-layered urban greenery and richness in biodiversity that is supportive of native ecosystems. Promote rejuvenation of land or layering of land use, and infrastructure to multiply the bio-capacity of sites, while allowing complex and safe human habitation, recreation and use for production.	3.1A Plan for increased biodiversity and bio-capacity of projects through careful and complementary species selection. Identify areas for organic-based urban farming, community-led gardening and composting. 3.1B Design with high Green Plot Ratio (GnPR) and maximise landscape replacement areas, including integration of landscaped areas at various levels within the building. 3.1C Ensure the use of a wide variety of native species within the landscape plan, rather than monotypes and alien species. Include opportunities for "wild" gardens with long grasses and shrubs to provide safe habitats for wildlife. Utilise the Singapore Index as a measure for biodiversity.
Target 3.2 Halt and reverse land/marine degradation and biodiversity loss. Integrate existing, established flora and fauna within the development, communicating its established value within the development boundary and enhancing the natural systems in and around the site. A major rethinking of aesthetics, ownership versus shared spaces and valuation of natural resources shall be established.	3.2A Conduct environmental impact analysis (EIA) of sites to identify key habitats, species and areas of ecological value, to ensure these are incorporated within the design and protected during construction and building operations. 3.2B Connect to existing landscape/waterscape areas and habitats outside of the site area, including reforestation and re-wilding efforts. 3.2C Avoid the use of goods, products and services linked to environmental degradation, including deforestation, habitat destruction and pollution (including marine environments).
Target 3.3 Prevent marine and water pollution of all kinds from construction and building operation-based activities. Use materials, systems, products and construction methods that are non-invasive to freshwater and marine ecosystems. Use of toxic materials and potentially unmanageable wastes shall be avoided.	3.3A Avoid the use of chemical treatment systems (e.g., termite treatment), materials and construction methods that can leach pollutants into watercourses and damage marine habitats.

4 Resource Management

National Unviversity of Singapore SDE4
Architect - Surbana Jurong in collaboration with Serie+Multiply Consultants

SUMMARY:

Architects' design choices are critical in determining the use of resources and ability for resource management for projects. Consider resource use holistically from cradle to end-of-life and its associated environmental impacts.

MEASURABLES

Energy

Water

Materials

METRICS

% Energy Replacement with renewables

Energy Use Intensity (EUI) - kW/m^2/yr

% Water Replacement/ Recycling

Water Efficiency Index

Locally sourced, manufactured and assembled

Use of robustly certified materials

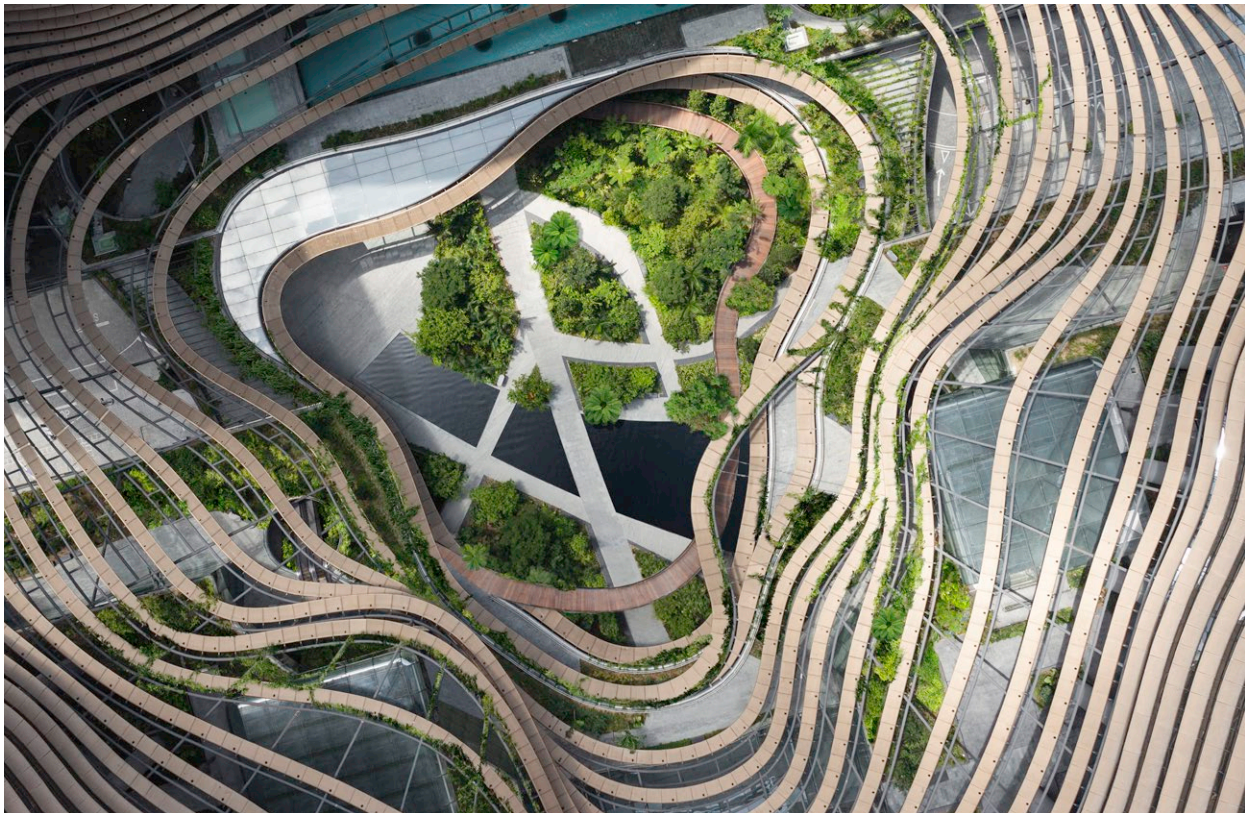
Use of rapidly renewable materials

PHASE

RELATED SDG

TARGETS	INDICATORS
Target 4.1 Advance net-zero energy and low carbon developments. Design and retrofit buildings to be of low energy consumption during operation, whilst substantially increasing the deployment of renewable energy.	4.1A Commit to designing buildings with low energy consumption (interims of EUI kWh/m^2/yr). Engage with and utilise, where appropriate, reputable third party rating tools that advance net-zero/low energy developments such as BCA Green Mark with the Super Low Energy Annex. 4.1B Identify potential for integration of renewable energy within the scheme to maximise renewable energy share in the total energy consumption of the development.
Target 4.2 Implement integrated water resources management plans. Substantially increase water use efficiency and a variety of water sources for building and building system use, to reduce potable water demand and treatment.	4.2A Benchmark the buildings designed and in-use water efficiency index (WEI). 4.2B Use and treat grey water and rainwater for non-potable water usage.
Target 4.3 Adopt a circular economic approach to buildings through material, design and construction choices. Embrace a circular approach to design, construction and end-of-life of buildings through the three principles of designing out waste and pollution, keeping products and materials in use, and regenerating natural systems.	4.3A Design out waste and pollution through well-considered dimensioning, detailing and material sections. This includes the method and programme of construction and associated activities. Buildings are designed for a combination of durability, buildability, adaptability, modularity, ease of maintenance, repair and repurposing. 4.3B Provide specification of products, systems and materials that close the material loop. Materials shall be rapidly renewable, reused/reusable, repaired/repairable, remanufactured and/or safely biodegradable.

5 Urban Harmony



Marina One
Architect - Architects 61 Pte Ltd
in collaboration with Ingenhoven
Architects

SUMMARY:

The Architect shall creatively and positively respond to the pre-existing conditions that physically define a site and describe its social-environmental and cultural context.

MEASURABLES

Connectivity

Placemaking & community

Integrative Landscape and Waterscape

Urban Heat Island Effect

METRICS

Opportunities for urban connections (cycling, walking, park and wildlife)

Macro and meso environmental studies for wind, solar insolation, reflectance and urban heat island

Massing studies and form optimisation

Character of the setting

PHASE

Design

RELATED SDG

TARGETS	INDICATORS
Target 5.1 Strengthen efforts to enhance cultural and natural heritage. Design to enhance the urban fabric with sensitivity to the project's macro, meso and micro impacts. Consider heritage assets (even if not a protected building) as part of the existing social fabric of the place.	5.1A Consider a place-making approach to the overall urban fabric and context of the site. Identifying opportunities for urban connections and enhancement of the natural and constructed amenities and infrastructure. 5.1B Conservation and enhancement of historic assets shall be undertaken with great care and attention. Ensure procurement strategies that allow for high levels of quality control and use of skilled master craftsmen within the construction.
Target 5.2 Actively develop and implement an urban tropical vernacular contributing to a "city in nature" national vision. Develop a unique approach for Singapore's urban topical context that provides solutions to 21st century tropical living within planetary boundaries.	5.2A Building form and landscaping including material sections shall be sensitive to the tropical urban context and vernacular. Reduce urban heat island around the project, and thermal stress within the project. Building form shall address potential disamenity to the surroundings. 5.2B Employ the use of an integrated landscape and waterscape within the project with gardens, sky terraces and courts, shaded outdoor areas, verandas, breezeways and inter-block shading within the project. 5.2C Promote Architects' unique skills and abilities to develop highly resolved, coordinated and climatically suited passive and active design strategies that minimise energy inputs. Demonstrate design optimisation and performance with the use of appropriate environmental simulations.

6 Health and Wellbeing

Amanemu
Architect - Kerry Hill Architects

SUMMARY:

Architects shall create places that promote physiological wellness, emotional satisfaction and safety. People spend more than 90% of our time within buildings, which is why designing for health, and wellness is critical to society. As architects, we shape our built environment, and in turn, our built environment shapes our society.

MEASURABLES

Biophilia

Comfort

Inclusiveness

Safety

METRICS

PMV, PPD

Accessibility

DA (Daylight Autonomy)

Residual risks

Satisfaction ratings

PHASE

Design Construction In-Use

RELATED SDG

TARGETS	INDICATORS
Target 6.1 Design and practise with well-being and comfort in mind. Ensure that the practice of Architecture as well as the product promotes physical and psychological well-being, activity and comfort, with equal access to all.	6.1A The practice environment shall be conducive to the physical and psychological well-being for those working within the practice. The physical workplace shall be comfortable and ergonomic. Practise working policies developed to promote physical and mental health, with proper practice management to reduce stress and burnout. 6.1B Designs and specifications shall address health and well-being of users of buildings, providing access to daylight, views, fresh air, physical activity and minimal pollution. 6.1C Designs shall consider the full range of users and their vantage point and degrees of mobility. Engaging with the *knee height city* concept to create welcoming and safe urban environments for children to play, interact, explore and move with their caregivers.
Target 6.2 Incorporate a biophilic design approach to architecture. Incorporate the positive experience of nature into the design of the built environment.	6.2A Design for and integrate diverse natural environments within, on and around the project that are accessible (to view and to experience) to benefit human health. 6.2B Designs which are inspired by the way functional challenges have been solved in biology, integrating buildings and infrastructure with natural systems.
Target 6.3 Ensure health and safety are fully considered throughout the project life, including deconstruction. Make the built environment safer for all parties through proactive practice and project management as well as practical, design-based focus on risk prevention.	6.3A Allow proper time, fees and resources to deliver construction, operation and deconstruction projects in a way that prevents injury and ill health.

7 Adaptability and Longevity

BASF Rochester Park
Architect - Forum Architects
Photograph - Fabian Ong

SUMMARY:

Architects have a crucial role in adaptive reuse, maintenance and the selection of durable materials. We shall consider the ability to combine, split or extend units and reconfigure spaces as well as the ease of upgrading, maintaining and replacing of building systems.

MEASURABLES

Adaptability and Flexibility

Conservation and Heritage

METRICS

DfM/MiDAS

Flexibility

Mean time between failures

Building and Structural reuse

PHASE

Design In-Use

RELATED SDG

TARGETS	INDICATORS
Target 7.1 Design for adaptability, flexibility and reuse. Avoid the potential of redundancy and obsolescence. Design instead for flexibility to accommodate to changing lives and lifestyles.	7.1A Design for spatial adjustment of the project over its life through consideration of structure, services, spaces, and method of construction. • Adaptable spaces – design rooms, units, circulation routes so that units can be used in a variety of ways. • Flexible spaces and fabric – allow for physical and material changes, including spatial, aesthetic and environmental adaptations. 7.1B Look to adaptively reuse/repurpose existing buildings and structures rather than demolish and rebuild.
Target 7.2 Design with the future in mind, including spaces for new infrastructure, technology and future connections, as well as ease of maintenance and repair. Plan for future infrastructure connections, ease of upgrade for building systems, building controls, and virtual and physical connectivity, including automation systems, alternative energy systems and transportation systems.	7.2A Consider the ease of access for maintenance and repair for the project. Engage with and utilise, where appropriate, reputable third-party checklists and guidance. 7.2B Design for the future connections and technological systems of the building through considering accessibility, routing, structural, electrical and data communication readiness. 7.2C Include considerations for building automation infrastructure and diagnosis for predictive maintenance and continuous performance optimisation. This must include consideration for data protection, data ethics and occupant/user privacy.

S E C T I O N T W O

THE CONTEXT

Heng House
Architect - Goy Architects
Photograph - Fabian Ong

2.1 – Climate Change

There are a number of excellent resources for Architects on the science of climate change (or 'global warming' to give the proper title) and its implications. Given the increasing prominence of the issue, the intent is not to summarise but to take stock of and outline the situation as it stands currently, at the time of writing to contextualise why it is of great importance that we focus our collective efforts on promoting greater environmental action.

Urgent and unprecedented changes are needed to meet the goals of the Paris Agreement. Limiting the global average temperature increase to a maximum of + 1.5°C requires rapid and far-reaching transitions in energy, land, urbanisation, infrastructure (including transport and buildings), and industrial systems. From an energy transition perspective, renewables would need to supply 70% to 85% of global electricity in 2050 (United Nations Environment Programme 2018).

However, global greenhouse gas emissions today have yet to show signs of peaking. Global annual CO_2e emissions from energy and industry increased in 2017, 2018 and 2019, and are expected to do so in 2020. Total annual greenhouse gases emissions, including those from land-use change, reached 53.5 $GtCO_2e$ in 2017, an increase of 0.7 $GtCO_2e$ compared with 2016. (IPCC 2019)

> *To limit global warming to 1.5°C global carbon, emissions need to fall to 55% of 2010 levels by 2030 and continue on a steep decline to zero emissions by 2050.*
>
> (United Nations 2019)

Recent trends in emissions and the level of international ambition indicated by nationally determined contributions within the Paris Agreement would fall short of limiting warming to well below 2°C. A sense of urgency is needed for mitigation measures to be implemented in the coming years, to lead to a sharp decline in greenhouse gas emissions by 2030. The recent coordinated response to COVID-19 shows what is possible in averting and managing a global crisis. Without a similar response to climate change in the decade that follows, global warming will surpass 1.5°C and this will lead to an irreversible loss of the most fragile ecosystems, with crisis after crisis for the most vulnerable communities. It is critical to understand that even at +1.5°C, the world will be a very different, and a far more environmentally hostile place, prone to greater frequency and ferocity of natural disasters.

Estimates of the global emissions outcome of current nationally-stated mitigation ambitions as submitted under the Paris Agreement would lead to global warming of between 3°C and 4°C by 2100, with continued warming afterwards.

A world that is 3°C or 4°C hotter will be almost unrecognisable. Large areas in equatorial and sub-equatorial regions will be effectively uninhabitable. Sea levels will rise by many metres. Ecosystems around the world will collapse, causing mass extinctions on land and in the oceans. Hundreds of millions of people will die and hundreds of millions more will be displaced.

Leading finance companies have warned that a +4°C world is currently not insurable due to the climate change risks to physical assets.

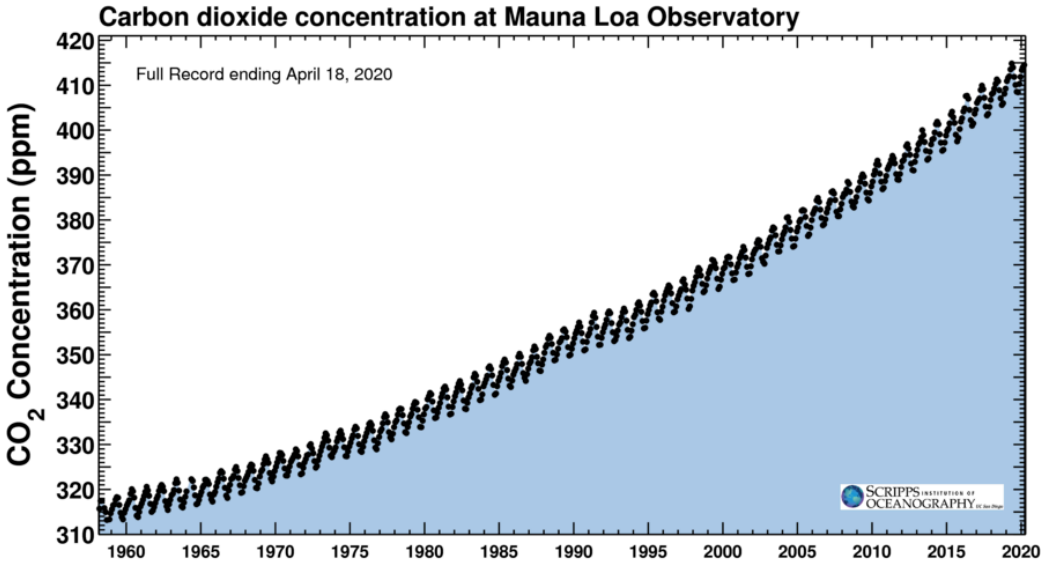


Figure 4 (Above)

Keeling Curve – a graph of the accumulation of CO_2 in the Earth's atmosphere based on continuous measurements taken at the Manua Loa Observatory on the Island of Hawaii from 1958 to the present day.

https://scripps.ucsd.edu/programs/keelingcurve/

Measurement in April 2020 recorded the atmospheric concentration of CO_2 at 417ppm.

CO_2 growth rate in the 1990s was 1.5ppm/yr. In the last decade this rate accelerated to 2.2 ppm/yr, and between May 2018 and April 2020, was >3.5ppm/yr. It is widely considered that at 450ppm, temperature rises will exceed the 2°C warming threshold, beyond which the effects of global heating are likely to be catastrophic and irreversible. Based on the annual increase of 2018, 2019, and 2020 we would cross this threshold by 2027.

Courtesy of Scripps Institution of Oceanography SIO

As shown in Figure 4, human activities are estimated to have caused approximately 1.0°C of global warming above pre-industrial levels (from 0.8°C to 1.2°C). Based on this trajectory, global warming is likely to reach 1.5°C before 2025.

The year 2019 was seen as a tipping point through a combination of the manifestation of climate change related disasters which for the first time were felt in full force by developed nations.

In the UK, a coastal town of Fairbourne will be decommissioned by 2045 as the government is unable to effectively protect it from rising sea levels and more extreme weather. This has had a huge economic and social impact on the residents, rendering properties worthless, uninsurable and non-mortgageable.

In the middle of 2019, fires spread through the Arctic, igniting not just grasslands but boreal peatlands dried out by unusually high temperatures in the region. In Brazil, fires destroyed nearly 10,000 sq km of rainforest, prompting warnings from scientists that the Amazon is now close to a tipping point, beyond which its collapse

will be unstoppable. In March Cyclone Idai left more than 1,300 people dead in Madagascar, Mozambique, Zimbabwe and Malawi.

In Australia, the worst bushfires recorded raged over the Christmas of 2019 and the New Year 2020. The sheer scale of the fires is difficult to comprehend, with an estimated 18.6 million hectares burned, an area which is 257 times larger than Singapore. The human and economic cost of the Australian bushfires is dwarfed by their ecological impact. Current estimates state that close to half a billion mammals, birds and reptiles have been killed in New South Wales alone. In many cases, burned areas will never recover. Endangered plant species confined to small areas were likely to have been wiped out; likewise, the sheer intensity of the fires would have destroyed not just the complex and highly diverse communities of organisms that populate the forest floor, but also the old-growth trees that shelter species and provide nesting sites for many birds.

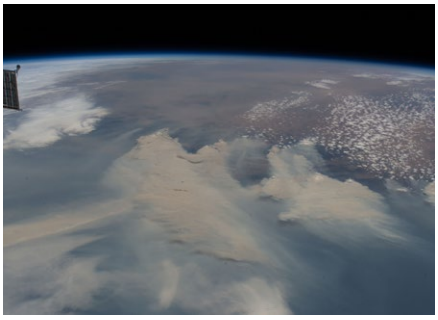
The impact of unsustainable development is driving the following:

- Two billion people live in countries experiencing high water stress today and by 2030, 700 million people could be displaced by intense water scarcity.
- Material footprint is rapidly outpacing population and economic growth, with high income countries consuming 27 metric tonnes of materials per capita, versus two metric tonnes per capita of low income countries, indicating the disparity between the haves and have-nots.
- Climate-related disasters have claimed more than 1.3 million lives between 1998 and 2017.
- Climate change is now causing an average of one disaster a week.
- Atmospheric CO_2 is 146 per cent above pre-industrial levels and it is continuing to rise.
- Ocean acidity has increased by 26 per cent since pre-industrial times and it is expected to rise rapidly.
- Land degradation is affecting one fifth of the Earth's land area and the lives of one billion people.
- The risk of species extinction has worsened by 10 per cent over the last 25 years.

(United Nations 2019)

Bushfire at Captains Creek https://commons.wikimedia.org/wiki/File:Bush_fire_at_Captain_Creek_central_Queensland_Australia..JPG 80 trading 24 - CC-BY-SA-3.0

California Forest Fire 2018
NASA, Joshua Stevens - https://earthobservatory.nasa.gov/images/144225/camp-fire-rages-in-california

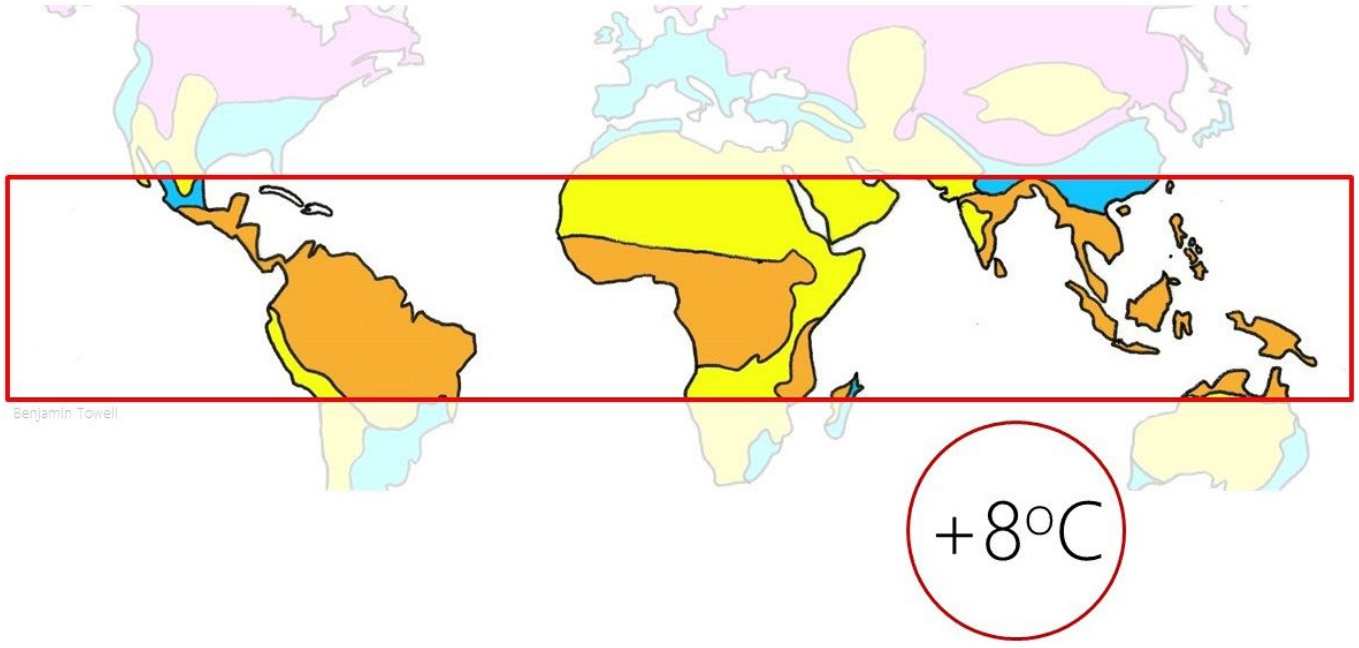


Australian Bushfires as Viewed from ISS
NASA - https://www.nasa.gov/sites/default/files/thumbnails/image/iss061e120235.jpg

This was compounded with the pandemic of COVID-19 in early 2020 which highlighted both the speed at which our environment can heal from pollution, but also the great inequalities within our societies, and the dangers of unplanned, unequal urbanisation for pandemic management.

Climate Change Impact on Asia

The Asian region is exceptionally exposed to the impact of climate change. The region has limited resources to adapt to the increasing threat of extreme weather events. Its countries top the list of those most affected by extreme weather events causing high numbers of fatalities and economic losses. Six of the world's top ten countries impacted by climate change are in Asia, namely Myanmar, Philippines, Bangladesh, Vietnam, Pakistan and Thailand (Asian Development Bank 2017). Numerous countries in the region regularly experience annual losses associated with extreme weather events equivalent to 1 per cent of GDP. Unless urgent action is taken to strengthen resilience and avoid global warming beyond 2°C, such losses will be multiplied.



The Tropics
The Tropical region likley to warm by 8°C, and Singapore could have regular highs of 40°C Sketch by Author

Large areas of Asia will suffer from summertime warming of 8°C, causing large disruption to land and marine ecosystems, including the total loss of the region's coral reefs. South East Asia is projected to be most affected by heat extremes, Singapore included. From an agricultural perspective, such a change in climate would compromise Asia's ability to supply enough food for its growing population with food yields in Indonesia, Thailand and Vietnam estimated to drop by 50% by 2100 from 1990 levels (Asian Development Bank 2017).

Asia's vulnerability to sea level rise is particularly concerning given the share of its populations and urban centres located on low-lying coastlines. Out of 25 cities most exposed to a one-metre sea level increase, 19 are located in Asia, and an estimated 130 million people reside in low elevation coastal zones are at risk of permanent displacement by sea level rise.

Despite the well-known risks, Asia's emissions are still rising and not expected to peak by 2030. The way in which land is managed, energy produced, and waste processed is having immediate impact on the region's population in the form of hazardous levels of air pollution. In Asia, there are 3.3 million deaths a year attributed to outdoor air pollution. These issues of pollution are transnational, for example, the Indonesian fires in 2015 caused widespread suffering to neighbouring countries causing health concerns, school and business shutdowns in Singapore. Furthermore, the fires in 2015 emitted 860 million tonnes of CO_2. By contrast Singapore's total annual emissions for 2014 was 50.9 million CO_2e (16 times lower than the Indonesian land clearance fires).

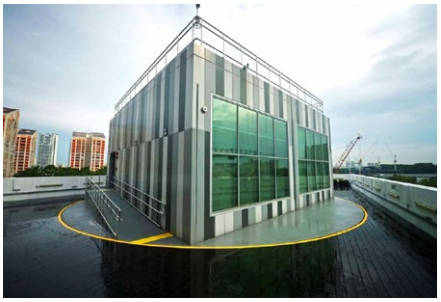
The growth of Asia is alarming. Asia's urban population has increased significantly from 20 per cent of the population being urbanised in 1950 to 50 per cent in 2016. This number is expected to reach 64 per cent in 2050. In absolute terms, the urban population in Asia is projected to increase from approximately 1.7 billion people today to 2.26 billion in 2030, and 2.75 billion in 2050. That means one billion more people of the region are expected to live in cities.

Asia is thus the key region in achieving global development and human progress within planetary boundaries. It will be transformed by imposed driving forces of climate change exacerbating rural-urban migration famine, disease, poverty, and civil conflict, or it could shape sustainability transformation regionally and globally. The Singapore Architect is well poised to deliver positive urban solutions that can deliver the transformative change in the region critical for climate change objectives to be met.

2.2 – The Built Environment

Our Tampines Hub
Architect - DP Architects Pte Ltd

Holiday Inn Express
Architect - RSP Architects Planners & Engineers



BCA SkyLab
Architect - Surbana Jurong

Urban Challenges faced globally today include:

- Half of urban residents have convenient access to public transport
- Nine out of 10 urban residents breathe polluted air
- One out of four urban residents live in slum-like conditions
- Two billion people do not have access to waste collection services

(United Nations 2019)

Cities occupy 2% of the land however account for:

- 70% GDP;
- over 60% of global energy consumption;
- 70% greenhouse gas emissions;
- 70% global waste. (United Nations 2016)

The built environment sector has a vital role to play in responding to the climate emergency. With buildings currently responsible for 39% of global carbon emissions, decarbonising the sector is one of the most cost effective ways to mitigate the worst effects of climate breakdown. (World Green Building Council 2019)

Furthermore, the global population is expected to grow to more than ten billion, with a greater proportion being lifted out of poverty, a burgeoning growth of the middle class, the global constructed floor area is estimated to double by 2060. This growth will consume vast amounts of finite natural resources, contributing to an expected doubling of the total global consumption of raw materials, significantly increasing the sector's emissions and climate impact. Here are a few global facts:

- 90% of human activity happens indoors (US Environmental Protection Agency 1989).

- Buildings are responsible for 39% of global carbon emissions (World Green Building Council 2019).

- Construction materials and activities are responsible for 11% of global carbon emissions (World Green Building Council 2019).

COVID-19 brought to light the critical importance of having a good home – with access to natural light, ventilation, space to work, exercise, school and to carry out mundane tasks such as drying clothes whilst all of these activities were taking place. Through the experience of many countries with social distancing restrictions it raised the question of the need for large swathes of our city's commercial areas, the distribution of space, and most notably the need of the physical office. There is an

argument for a paradigm shift for a great urban repurposing, and how this can give large parts of our urban areas back to nature and back to society.

The Singapore Context:

Singapore is planning for a long-term low-emissions development strategy (LEDS) outlining the planned transition to a low-carbon, sustainable and climate resilient future. The strategy principally revolves around peaking emissions in 2030, halving that peak by 2050 and rapidly progressing to net-zero emissions soon after.

This will involve transformations in industry, the economy and society at large, which provides Architects with a large role to play as our profession cuts across all 3 areas.

The Built environment sector in particular has been identified as a key sector for transformation in achieving the national commitment to climate change, along with power generation sector, industrial sector, and transport sector.

- End-use electricity directly attributable to our buildings (household and commercial/service related) is 51% (25,100 GWh) in 2017 (EMA 2019).

- Our built environment contributes to approximately 25% of our national carbon emissions.

- Singapore Green Building Masterplans – greater push towards Zero Energy Buildings (Super Low Energy Programme).

- Regulatory shifts towards mandatory energy disclosure, raising the minimum standards for new and existing buildings to the equivalent of the Green Mark 2015 Platinum energy standards, as well as raising performance requirement for Government Land Sales sites, and Public Sector funded projects.

Whilst these shifts are taking place at the building level, the ideas around complexity science are being explored – looking at how individual buildings have a direct relationship with the wider district and at the city level. How policy can be further shaped to maximise buildings performance, in key areas, and when this is scaled up to see the aggregated benefits to the entire city. This includes, for example, the reduction of costly municiple infrastructure and frees up space for nature or public amenities. The Architects role for Singapore to achieve the outcomes within its long-term low-emissions development strategy cannot be understated.

2.3 – Global Response

International Environmental Law

The Paris Agreement - COP 21

The Paris Agreement was adopted on 12 December 2015 at the 21st Session of the Conference of the Parties (COP 21) to the United Nations Framework Convention on Climate Change (UNFCCC) held in Paris from 30 November to 12 December 2015.

The aim of the agreement is to decrease global warming described in Article 2, "*enhancing the implementation*" of the UNFCCC through:

- Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change;

- Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production;

- Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.

(United Nations 2015)

Within the agreement, nations are to provide the positive action such as the "*peaking of greenhouse gas emissions as soon as possible*", to "*undertake rapid reductions thereafter in accordance with best available science*", and to "*achieve a net balance between anthropogenic emissions by sources and removals by sinks for greenhouse gasses*" (Article 4). In addition, there is a requirement for the development of adaptation actions around climate change impacts, taking into account vulnerable people, places and ecosystems, to build the resilience of socioeconomic and ecological systems, including through economic diversification and sustainable management of natural resources (Article 7).

The Paris deal is the world's first comprehensive climate agreement, and it has started a concerted effort to internationally frame and report on climate action (Article 13), whilst giving the ability to legally address losses and damages associated with the adverse effects of climate change through an internationally agreed mechanism (Article 8).

UN Global Pact for the Environment

The Global Pact for the Environment is an initiative to develop a legally binding international instrument under the United Nations, combining the principles outlined in the Stockholm Declaration, the World Charter for Nature, the Rio Declaration, and many other important international agreements. The aim is to solidify international environmental law as an instrument (a "stick") to achieve the 2030 Agenda for Sustainable Development and accelerate achieving the 17 SDGs.

The draft pact has three main objectives:

- Establish the universal right to an ecologically sound environment as a human right at the international level, with the ability to be invoked in international, regional and national courts of law.

- Unify the guiding principles of international environmental law in one internally coherent legal document, thereby clarifying points of tension in international environmental law that have arisen given the existing sectoral approach to governance.

- Empower citizens to hold home and neighbour governments accountable for their environmental policies.

(United Nations General Assembly 2018)

The pact includes references to long-standing principles such as prevention, precaution and sustainable development as well as newer principles such as resilience, non-regression and the role of non-state actors in environmental governance, including professionals.

The aim of the Pact is to have a globally binding international environmental law instrument that entrenches all the major principles of international environmental law in one document, whilst developing the law progressively to provide a globally recognised right to live in an ecologically sound environment (Le Club des Juristes 2017). The turn to "rights" is critical: The Pact states that "*every person has the right to live in an ecologically sound environment adequate for their health, well-being, dignity, culture and fulfilment*" (draft Article 1). This will be the first global treaty to recognise such a right. It will have a profound impact on international development, people's duty of care to the environment, and the development of the legal mechanisms to address environmental damages.

It is important for us, professionals that are the custodians of the built environment, to recognise this and know that our work directly affects the rights of people.

HDB Tampines Green Ridges
Architect - LAUD Architects Pte Ltd in collaboration with G8A Architecture & Urban Planning

Solaris
Architect - CPG Consultants Pte Ltd in collaboration with TR Hamzah & Yeang Sdn Bhd

Frame House
Architect - Red Bean Architects

International Environmental Law Developments

International environmental law encompasses not just the traditional sources such as treaties and pacts, but also newer sources of environmental norms, including declarations, codes of conduct, guidelines, action plans and the like, together with international institutions that help develop, implement and enforce these norms.

Global agreements have led to significant case law developments in the issue of due diligence as a way of holding states and private actors to account. For instance, with Pulp Mills on the River Uruguay, Argentina v Uruguay, ICGJ 425 (ICJ 2010), the International Court of Justice stated that there is an "*obligation to act with due diligence in respect to all activities which take place under the jurisdiction and control of each party." And "where there is a risk of serious or irreversible [environmental] damage, lack of scientific certainty shall not be used as a reason for postponing the adoption of effective and proportionate measures to prevent from environmental degradation*." In the 2018 ICJ judgement in the case of Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica v. Nicaragua), ICJ 150 (ICJ 2018), the International Court of Justice judgement stated that "*damage to the environment, and the consequent impairment or loss of the ability of the environment to provide goods and services, is compensable under international law*" and "*the necessary measures shall be taken to ensure an adequate remediation of environmental damages*."

Issues of environmental damages and impacts to neighbouring states can be brought before international courts and issues of duty of care clearly established to protect the environment from damage. This is something to which Architects can relate, with our Code of Professional Conduct and Ethics, our role to protect public interest as well as our legally-defined duty of care within the Architects Act. Today, the interpretation of "public interest" and "duty of care" may extend to include the environment as a whole.

Why is this important?

Global agreements are increasingly raising the issues of global socio-ecological decline, whilst seeking broader consensus that action needs to be taken, and taken soon. The context is shifting with transboundary developments in international environmental law. It has been suggested that with the drafting of the UN's Global Pact for the Environment, we are on the cusp of a defining global environmental constitutional moment, one that has the potential to reshape the world and our professional responsibilities. It is conceivable that such a shift would see a global transformation not seen since the mid-20th Century, which saw the establishment of the UN and the World Trade Organization, defining international legal norms on human rights, economic cooperation, and trade.

This potential for environmental law has far-reaching implications to our professional practice and our explicit duty of care.

The recent IPCC and UN environmental programme reports underscore the fact that current international commitments under the Paris Agreement are not sufficiently ambitious, and will not lead to the realisation of the global temperature goal. It is clear that the built environment has a large share of responsibility and there is a need for Architects to set new practice and cultural norms to essentially restrict carbon-intensive economic activities to address climate change.

It is important that we keep abreast of climate science and developments in environmental law to ensure our profession is agile in our response to a changing international context. Further, we should be actively involved in shaping discussions on the built environment's contribution to climate change mitigation.

Kampung Admiralty
Architect - WOHA Architects Pte Ltd

Global Frameworks

Euonia Junior College
Architect - CPG Consultants Pte Ltd

Riding for the Disabled Association Equestrian Centre
Architect - Ian Lander Architect

Living Grid House
Architect - L Architects
Photograph by Finbarr Fallon

UN 2030 Agenda for Sustainable Development and the Sustainable Development Goals

The 2030 Agenda for Sustainable Development is a plan of action for people, planet and prosperity being delivered through the 17 SDGs.

The agenda is based on the following:

People – to end poverty and hunger, and to ensure that all human beings can fulfil their potential in dignity and equality and in a healthy environment.

Planet – to protect the planet from degradation, including through sustainable consumption and production, sustainably managing its natural resources and taking urgent action on climate change, so that it can support the needs of the present and future generations.

Prosperity – to ensure that all human beings can enjoy prosperous and fulfilling lives and that economic, social and technological progress occurs in harmony with nature.

Peace – to foster peaceful, just and inclusive societies which are free from fear and violence. There can be no sustainable development without peace and no peace without sustainable development.

Partnership – to mobilise the means required to implement the Agenda through a revitalised Global Partnership for Sustainable Development, based on a spirit of strengthened global solidarity, focused in particular on the needs of the poorest and most vulnerable and with the participation of all countries, all stakeholders and all people.

The interlinkages and integrated nature of the SDGs are of crucial importance in ensuring that the purpose of the new Agenda is realised.

The SDGs aim to address the global challenges we face, including those related to poverty, inequality, global warming, environmental degradation, conflict and injustice. They recognise that ending poverty should go hand-in-hand with strategies that build economic growth and address a range of social needs including education, health, social protection, and employment opportunities, while tackling climate change and environmental protection.

New Urban Agenda

The New Urban Agenda represents a shared vision for a better and more sustainable future. It acknowledges that a well-planned and well-managed form of urbanisation can be a powerful tool for sustainable development and to achieving some of the outcomes of the 2030 Agenda for sustainable development. It provides the global principles, policies and standards required to achieve sustainable urban development, and to transform the way cities are constructed, managed, operated and lived in.

The New Urban Agenda takes into account the synergies that exist with other global agreements, namely the SDGs and the global climate agreement reached at COP21 in Paris.

The key principles can be summarised as follows:

Guiding Principle	Actions
Leave no one behind, ensure urban equality and eradicate poverty.	Provide equitable access for all to physical and social infrastructure: • Adequate housing and shelter • Public spaces as an enabler of socio-economic function of the city Recognise and leverage culture, diversity and safety in cities. Enable and strengthen participation and enhance liveability and quality of life.
Achieve sustainable and inclusive urban prosperity and opportunities for all.	Enhance benefits of urbanisation and avoid land speculation. Create fair and equitable employment, productivity and diversity. Innovate through sustainable economic development.
Foster ecological and resilient cities and human settlements.	Drive sustainable patterns of production and consumption. Protect and value ecosystems and biodiversity. Adapt to and mitigate the impact of climate change, whilst increasing urban systems resilience to physical, economic and social shocks and stresses.

The strategic direction for the successful transformation of cities are based on the following implementation:

- Urban Rules and Regulations. The outcomes in terms of quality of an urban settlement is dependent on the set of rules and regulations and their implementation. Proper urbanisation requires the rule of law.

- Urban Planning and Design. Adequate provision of common goods, including streets, open spaces and an efficient pattern of buildable plots, shall be established.

- Municipal Finance. For a good management and maintenance of the city, local fiscal systems shall redistribute parts of the urban value generated.

- National Urban Policies. These establish a connection between the dynamics of urbanisation and the overall process of national development.

Singapore Architects are well versed with all aspects of the above and can make a great contribution to the delivery of this agenda within Asia, and globally.

Task Force on Climate-related Financial Disclosures

In June 2017, The Task Force on Climate-related Financial Disclosures (TCFD) released its final recommendations, which provide a framework for companies and other organisations to develop more effective climate-related financial disclosures through their existing reporting processes. The Task Force emphasised the importance of transparency in pricing risks related to climate change to support informed, efficient capital-allocation decisions.

The recommendations are structured around thematic areas that represent core elements of how companies operate, namely governance, strategy, risk management, and metrics and targets. The four overarching recommendations are supported by 11 recommended disclosures that build out the framework with information that will help investors and others understand how reporting companies assess climate-related risks and opportunities. (For more information on the reporting disclosure mechanisms, see 'Final Report: Recommendations of the Task Force on Climate-related Financial Disclosures (June 2017).)

The 2019 TCFD Status Report articulates that it is critical for companies to consider the impact of climate change and associated mitigation and adaptation efforts on their strategies and operations, as well as disclose related material information. Companies investing in activities unlikely to be viable in the longer

term may be less resilient to risks related to climate change; and their investors may experience lower financial returns. This has been echoed recently by the Bank of England's Governor who bluntly stated that companies ignoring the climate emergency will go bankrupt, highlighting that currently USD 20 trillion of assets could be wiped out if the climate emergency is not addressed effectively. (reported in The Guardian, 13 October 2019). We are witnessing the economic damage of a relatively light global pandemic (COVID-19). With climate change the impact would be more far-reaching and longer lasting.

Within the 2019 Status report, TCFD has more than 785 supporters; the companies involved represent a broad range of sectors with a combined market capitalisation of over USD 9.2 trillion. In addition, this includes over 374 financial firms, responsible for assets of USD 118 trillion. The TCFD has also received support from governments :- Belgium, Canada, France, Sweden, and the United Kingdom - as well as financial regulators around the world, including in Australia, Belgium, France, Hong Kong, Japan, the Netherlands, Singapore, South Africa, Sweden, and the United Kingdom (TCFD 2019).

Through widespread adoption, climate-related risks and opportunities will become a natural part of companies' risk management and strategic planning processes. As this occurs, companies' and investors' understanding of the financial implications associated with climate change will grow, information will become more useful for decision-making, and risks and opportunities will be more accurately priced, allowing for the more efficient allocation of capital and contributing to a more orderly transition to a low-carbon economy.

In relation to the built environment, this will impact how buildings and assets are valued based on their perceived climate risk, the cost of financing for buildings, and the potential cost of insurance (or ability to gain insurance). Given TCFDs are being adopted by financial regulators in Singapore, we must grasp how the changing financial response to climate risk will create opportunities for our practices to demonstrate value in delivering more ecologically sound projects, a method of reducing risk exposure in a changing climate.

Secret Garden
Architect - Wallflower Pte Ltd

SPCA Animal Welfare Centre
Architect - Richard Ho Architects

Saint Andrews School (PERI Upgrading)
Architect - Vivata Pte Ltd

2.4 – Response to a Pandemic

This addition to Section 2 which is being penned in the midst of the COVID-19 pandemic. As such it sits awkwardly with the flow of the book. It is however, too big an issue not to include. The aim is not to interrogate the current and crowded COVID-19 discourse, but more to bring to light some key observations that has shown us how damaging our current economic activities are to the environment.

With millions of people across the world in various levels of "lockdowns", "circuit breakers" or continued "social distancing" measures, skies have turned blue. With factories and offices closed, vehicular traffic have been reduced to levels of the 1950s and air traffic decreased by more than 50%, resulting in a global pollution reduction that was visible from space. Key examples cited in a number of reports include falls in nitrogen dioxide levels in Europe by as much as 40%; in China carbon emissions were down by 250 million tonnes; Europe is forecast to see a reduction of a further 390 million tonnes. This drop of emissions is unprecedented, though it has come at such a great human cost, and thus is not to be celebrated.

The reduction in human movements and our retreat due to various social distancing measures have given wildlife in developed areas a much-needed break; with fewer cars on the roads, there has been a marked decrease in roadkill, allowing greater wildlife movement.

Whilst this can be looked at positively in cities, it is a tale of two worlds. In the Amazon, stories are emerging of lessened of environmental monitoring and protection operations. The same issues are present in the Serengeti and other key nature reserves. Here without tourists, the funding for park rangers is reduced and there is a fear that this could lead to an increase in poaching, logging and other nefarious activities that damage already fragile ecosystems.

There are questions on how we work, live and play. Social distancing measures have impacted our social lives in many ways, from a working perspective it has given a glimpse that much of what we do does not need a physical office or frequent business travel. Our built environment can be seen differently, questions on the possibility to reduce office spaces, giving these buildings over to other activities, the potential to reduce the quantum we need to build. To take advantage of increased working flexibilities we can look instead at how we retrofit in meeting rooms and business facilities within our residential estates, allowing physical formal meetings closer to our homes.

Lockdowns have highlighted the great inequality between people and their accommodation, whilst many of us have potentially enjoyed the time at home balancing childcare and work, others have been living in overcrowded unhealthy conditions with limited access to the outside.

This is something that as Architects we need to address and lead the discourse. The EDGs can help frame our response to an improved urban model that provides the solutions that promote healthy environments, social values as well as living within our planetary boundaries.

Prior to COVID-19 it was inconceivable due to the pressures of globalisation and capital growth, to have the political will to slow the economy down, lower the rate of consumption in a coordinated move, to take big actions to focus on collective wellbeing. It would not have been imaginable prior to this, for example to ground the majority of passenger flights worldwide.

This has shown that the issues of climate change can be addressed where experts are listened to, and positive action is taken collectively. The worry is that we will return or try to catch up on lost growth. We have, from this experience, a great opportunity to re-evaluate how we do things, to reform the growth perspective from individual consumption, to a more holistic model that cares about climate, health, jobs, housing, and communities. In short this provides the impetus for us to change our economic system to enable the meeting of the core needs of all, within the means of the planet. Architects can, through our design and interactions with policy makers, regulators, built environment stakeholders and the public, bring about behavioural and economic transformation. That is what will make our profession relevant and valuable to society.

Amanyyangyun
Architect - Kerry Hill Architects

SECTION THREE

CRITICAL REFLECTION

Parkroyal at Pickering
Architect - WOHA Architects Pte Ltd

3.1 – Critique of the *Green Book*

Daily news, social media, and academic literature are full of references and detailed accounts relating to the massive socio-ecological harms and injustices that are being committed in the name of selective, globally uneven human progress and development.

Unfortunately, much of our work as Architects is entangled with sustaining multiple drivers of earth system destruction and socio-ecological injustices, and even structurally complicit in them. Professional practice has not been sufficiently ambitious to deal with the increasingly assertive and destructive modes of urbanisation and economic growth. Global environmental governance is under increasing scrutiny amidst growing public resistance to the business-as-usual approach.

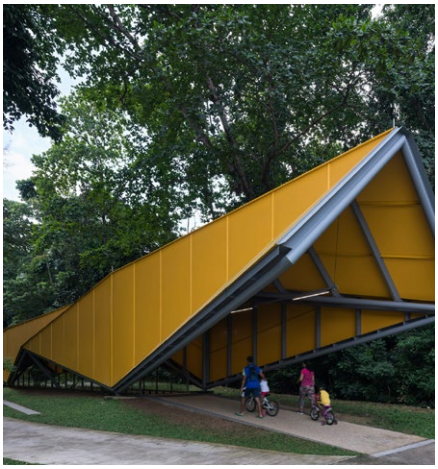
Architects have achieved wonderful feats, created awe-inspiring places and solved many of humanity's pressing issues in Singapore, including addressing poverty and public health issues, placemaking and community building. However, for all our successes, the profession at large has not been able to confront, head-on, the ever-deepening socio-ecological crisis that is engulfing the living order and transcending national boundaries. The built environment sector often has a fragmented, problem-shifting adversarial approach, which does not always allow climate change issues to be given the due consideration they require.

As a profession, we need to move to instil ambitious practice norms that address profound patterns of global unevenness, differently distributed human and non-human vulnerabilities; and norms that will restrict those that drive economic development at the cost of earth system integrity. We need to professionally counter the dominant neoliberal growth-without-limits paradigm in which we operate to address the deep-rooted environmental issues entrenched in our practice.

The *Green Book* has been written to ensure our practice becomes responsive to the Anthropocene's socio-ecological challenges, whilst cautioning against the pitfalls of a business-as-usual approach, but does it go far enough?

Whilst it is easier to address negative externalities or symptoms of the existing business practice, such as pollution, it is much more challenging to drive the type of structural changes necessary to avoid these externalities in the first place. To do so requires us to work en-masse with other professionals and civil society, to demonstrate our professional expertise and apply this beyond our field to take a leading role in the development of global responses that effect a real change.

Architects must rise above the current market's fragmented, adverse and short-term considerations and instead, adopt an integrated, long-term earth system perspective that offers a different paradigm for the Anthropocene age.



Bayshore Park Underpass
Architect - GreenhilLi Pte Ltd

Beyond the *Green Book*, and in line with the SIA ITM, we as a profession will be pushing for greater involvement in the development of our regulatory systems, economic policies and legal boundaries to instil the concept of planetary boundaries, and translate the physical reality of our finite world into policy and thus, environmental law.

Singapore Management University
Prinsep Street Residences
Architect - MKPL Architects Pte Ltd

3.2 – Critique of the Guidelines

Although the Environmental Design Guidelines are not perfect, they provide our profession a significant symbolic expression of hope to achieve a more harmonious and sustainable relationship between humanity and the rest of life on earth, in all its richness and diversity. It sets the context within which operational strategies and programmes within practices and the wider profession are developed.

It is, however, important we understand the shortcomings of our approach today, so that we can build upon this for tomorrow. This includes stepping outside of our profession, engaging with international and national policy-making, law-making, and non-government entities and ensuring our profession's expertise has a seat at the tables at all levels when tackling global, regional, national and local climate change issues, offering our insights and professional solutions.

Terminology - Use of "Environmental"

Environment *"is a term that everyone understands, but no-one is able to define."* (Caldwell 1990)

For the purposes of the Green Book we take the definition – "*the relationship of human beings with water, air, land and all biological forms.*" (European Community 1979)

The *Green Book* builds upon the SIA ITM, with an emphasis on the relationship between humans and their environment as well as socio-economic factors; although there is still a "human-centricity" to this. This is something we are acutely aware of and something that will need to be considered as our professional response continues to mature in addressing the socio-ecological complexities of the Anthropocene.

Much debate took place. Should we use the term "environmental" or "sustainable" for the design guidelines, or do both terms have baggage and negative connotations due to their overuse and their subsequent association with inaction and greenwashing. Should we shift towards the principle of ecological sustainability instead, framing this with the associated rights of nature?

We settled on the term "environmental" to align the response with the allied fields of environmental law, environmental rights and international movements. In these fields, the term "environmental" subsumes the principles of "sustainable development".

Environmental protection has traditionally included, yet separated, distinctive aspects such as wildlife conservation, pollution control and waste management in a way that ignores ecological complexity and social (human) relations and their interactions. The *Green Book* through its Environmental Design Guidelines begins

to address the integrated complexities of ecological systems, but retains some of the approach of separation of environmental aspects to ensure the goals are manageable in practice. As such the *Green Book* can be seen to be focused on addressing primarily human-centric activity.

Do The Guidelines Go Far Enough?

The Environmental Design Guidelines run the risk of not going far enough to ensure the practising Architect delivers the professional response required for substantive and necessary structural changes to the way we deliver projects.

Whilst the EDGs do include concepts of planetary boundaries and circularity of the economy, they focus on the softer, more accepted vernacular of human-centric activities that minimise harm to the environment rather than explicitly acknowledging the severity of the climate crisis we are facing and thus the radical actions required. The EDGs are still professionally progressive in their response to the practical realities in which we practise Architecture and allow us to fully engage with the New Urban Agenda and the implementation of the Sustainable Development Goals. This places our practices as highly relevant in solving the urban socio-ecological issues at the core of the climate crisis.

However, with the advancement of international environmental law, newer and bolder global agreements in the wake of the forthcoming IPCC reports due early in the 2020s, and the wake of the devastation of recent climate change related disasters, there will be profound changes to the context in which we practise Architecture. We must directly engage in the development of such agreements representing the built environment's potential for mitigating climate change and our role in bringing this about. The EDG's are a key step for us to demonstrate this.

Are The SDGs And NUA The Right Frameworks In Which To Engage?

The SDGs and EDGs highlight the urgency to tackle climate change and unprecedented biodiversity loss, to ensure that our ecosystems are resilient, but these are still focused through the lens of contribution to human well-being and human services. The *Green Book* was developed as a way for Architects to demonstrate their ability to deliver the SDGs within our general practice and further the built environment's necessary orientation towards climate action.

Whilst this is one of the key outcomes, it should be understood that the UN's SDGs are based on the premise of sustainable human development, aligned with the anthropocentric three-pillared approach to sustainable development. This approach has been criticised as legitimising "*the type of unbridled development that pushes ecological interests to the periphery of regulatory concerns, whilst prioritising social and economic development at the expense of both global earth system integrity and meaningful solidarity between peoples*." (Kotze and French 2018)

In other words, although a positive intervention building on the Millennium Goals, the SGDs continue to perpetuate that it is possible to achieve ongoing and expanded economic growth within a limited earth system based upon consumption.

As such, the SDGs do not offer a radically different alternative for steering human actions on a path towards greater earth system integrity.

However, we believe it is necessary that our profession engages with the SDGs and NUA urgently since we operate in the realities of the current global economic system. This engagement will give us greater traction within to structure and offer the necessary changes to policies that can operate in accordance with planetary boundaries and earth system integrity

CONCLUSION

Sparkletots Preschool by PAP Foundation
Architect - LAUD Architects Pte Ltd

Conclusion

The *Green Book* with the EDGs forms a highly relevant, practical guide for practising Architects to utilise in order to ensure that we are placing sustainability at the heart of our practice.

These environmental principles form the foundation of SIA's ITM as its embodied values and offer Architects a means to develop a rigorous framework and practical measures for good design to occur. This is whilst providing an opportunity for further development to address quality of life through application of biophiia, with liveable and socially positive design principles.

At the centre of it is our acknowledgement that as Architects we are the custodians of the built environment. We have professional duties, responsibilities and protection enshrined in law. Let us come together as a profession and be bold in transforming our architecture for the good of our people, our planet and our practices.

What we cannot do is to preserve the status quo. If we do, we as a profession will need to be comfortable with the fact (and accept responsibilities that will come with such a decision) that we are preserving the root causes of the socio-ecological crisis in which we find ourselves today.

Whilst words alone cannot change behaviour, better words can prompt better behaviour. Scientific and ethical realities are increasingly coalescing around the viewpoint that the present practice of Architecture is insufficient in addressing the climate crisis. This book, with the Environmental Design Guidelines, read together with the SIA ITM pushes for a more ambitious framework and a means for our practice to address the systemic challenges ahead of us and be the solution providers for a more ecologically sound, socially just and healthy world.

New Wing at the Asian Civilisation Museeum
Architect - GreenhilLi Pte Ltd

Deck
Architect - LAUD Architects Pte Ltd

REFERENCES

Asian Development Bank. 2017. *A Region at Risk: The Human Dimensions of Climate Change in Asia and the Pacific.* Manila: ADB.

Bodansky, Daniel. 2009. "What is International Environmental Law?" In *The Art and Craft of International Environmental Law*, 1-28. Cambridge MA: Harvard University Press.

Caldwell, Lynton. 1990. *International Environmental Policy: Emergence and Dimensions.* Durham NC: Duke University Press.

EMA. 2019. *Singapore Energy Statistics 2018.* Singapore: Energy Market Authority.

European Community. 1979. *Council Directive 79/117 Article 2(10).* EC.

French, Duncan, and Louis Kotze. 2019. "Towards a Global Pact for the Environment: International environmental law's factual, technical and (unmentionable) normative gaps." *Review of European Compartive and International Environmental Law.* 1-8.

IPCC. 2019. *Global Warming of 1.5C. An IPCC Special Report on the impacts of global warming of 1.5C above pre-industrial levels and related greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change.* Intergovernmental Panel on Climate Change.

Kotze, Louis. 2016. "International Environmental Law's Lack of Normative Ambition: an Opportunity for the Global Pact for the Environment?" *Journal for European Environmental & Planning Law* 16: 213-236.

Kotze, Louis, and Duncan French. 2018. "A Critique of the Global Pact for the environment: a stillborn initiative of the foundation for Lex Anthropocenae." *International Environmental Agreements: Politics, Law and Economics* 18 (6): 811-838.

Le Club des Juristes. 2017. *White Paper: Toward a Global Pact for the Environment.* Paris.

TCFD. 2019. "Task Force on Climate-related Financial Disclosures: 2019 Status Report."

United Nations Environment Programme. 2018. *Emissions Gap Report 2018.* Nairobi: United Nations.

United Nations General Assembly. 2018. *Towards a Global Pact for the Environment* . Resolution, New York: United Nations.

United Nations. 2015. "Paris Agreement." *21st Conference of the Parties to the United Nations Framework Convention on Climate Change (COP21).* Paris: United Nations.

United Nations. 2019. *Sustainable Development Goals Report 2019.* Progress report, New York: United Nations.

United Nations. 2016. *The New Urban Agenda.* Habitat III - The UN conference on Housing and Sustainable Urban Development, Quito: United Nations.

United States Environmental Protection Agency. 1989. *Report to Congress on Indoor Air Quality: Volume 2.* EPA/400/1-89/001C, Washington DC: EPA.

World Green Building Council. 2019. *Bringing embodied carbon upfront. Coordinated action for the building and construction sector to tackle embodied carbon.* London: WorldGBC.

Singapore Architects Declare a Climate and Biodiversity Emergency

APPENDIX

Architects Declare

*(**Previous Page**)*
Construction Declares a Climate and Biodiversity Emergency image.
www.constructiondeclares.com
https://sg.architectsdeclare.com/

Construction Declares is a global petition uniting all strands of construction and the built environment. It is both a public declaration of our planet's environmental crises and a commitment to take positive action in response to climate breakdown and biodiversity collapse. It was set up in May 2019 in the UK and has expanded to be a global movement for professional action.

The movement states that the twin crises of climate breakdown and biodiversity loss are the most serious issue of our time.

For everyone working in the construction industry, meeting the needs of our society without breaching the earth's ecological boundaries will demand a paradigm shift in our behaviour. Together with our clients, we will need to commission and design buildings, cities and infrastructure as indivisible components of a larger, constantly regenerating and self-sustaining system.

The research and technology exist for us to begin that transformation now, but what has been lacking is collective will. Recognising this, we are committing to strengthen our working practices to create architecture and urbanism that has a more positive impact on the world around us.

The SIA EDGs are a way for practices that have committed to the movement to translate their declaration into practice.

Architects Declare signatories will seek to do the following:	SIA EDG(s) to demonstrate the commitment in practice
Raise awareness of the climate and biodiversity emergencies and the urgent need for action amongst our clients and supply chains.	
Advocate for faster change in our industry towards regenerative design practices and a higher funding priority to support this.	
Establish climate and biodiversity mitigation principles as a key measure of our industry's success.	 

Share knowledge and research to that end on an open source basis.	
Evaluate all new projects against the aspiration to contribute positively to mitigating climate breakdown and encourage our clients to adopt this approach.	 
Upgrade existing buildings for extended use as a more carbon-efficient alternative to demolition and new build whenever there is a viable choice.	 
Promote life cycle studies, carbon footprint assessment and post occupancy evaluation, to reduce both embodied and operational resource use.	
Adopt more regenerative design principles in our studios, with the aim of designing architecture and urbanism that goes beyond the standard of net zero carbon in use.	
Collaborate with engineers, contractors and clients to further reduce construction waste.	 
Accelerate the shift to low embodied carbon materials in all our work.	
Minimise wasteful use of resources in architecture and urban planning, both in quantum and in detail.	

Transformation by Design

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