



Minoro:

Accelerating the decarbonisation of buildings

August 27th 2024 | CIBSE ANZ Seminar Series | The Need for Speed

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Australia & New Zealand Sustainability Lead, Grimshaw

GRIMSHAW

Agenda

1. Introduction to Grimshaw
2. Minoro: How to use the platform
3. Benefits of Minoro
4. Integrative Design Process
5. Q&A

Introduction

Grimshaw

A global practice



8

Global studios

600+

Total global staff

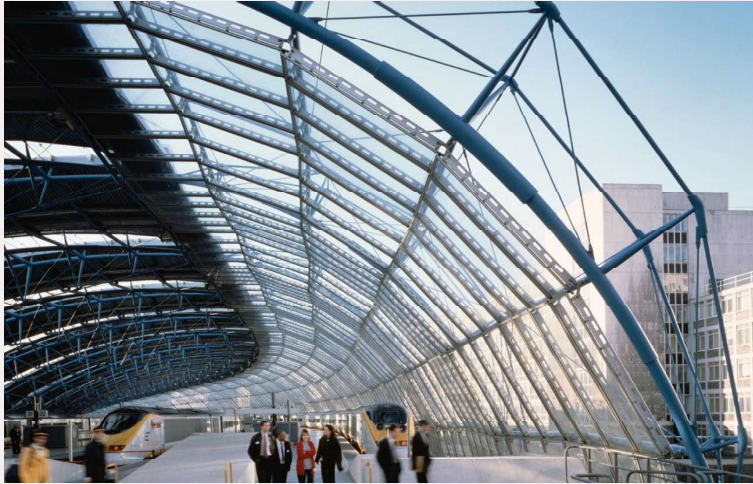
43

Years in business

250+

Awards for our work

WORLD CLASS PROJECTS



International Terminal Waterloo
London, United Kingdom



Eden Project
Cornwall, United Kingdom



Pulkovo Airport
St Petersburg, Russia



Fulton Center
New York City, NY, USA

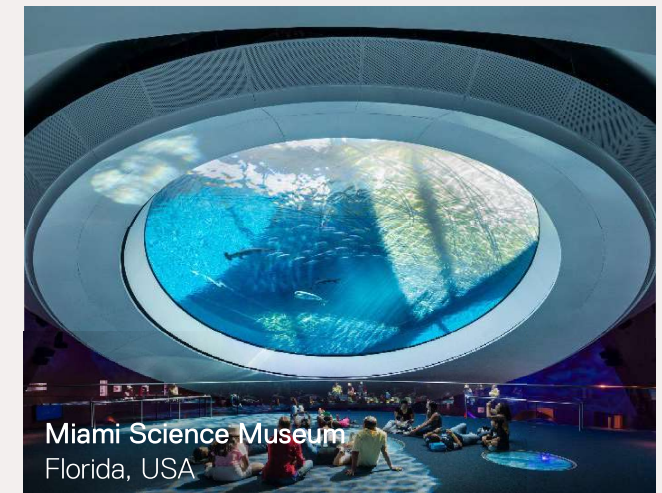
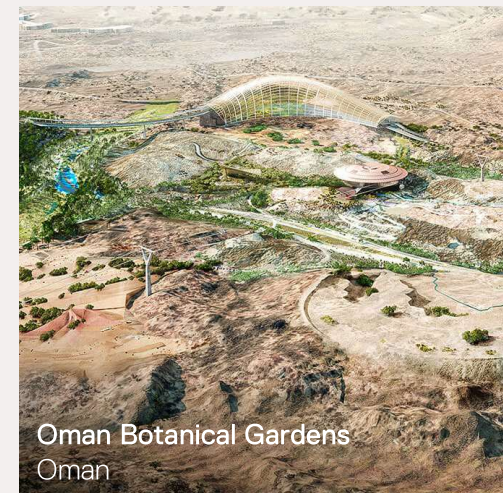
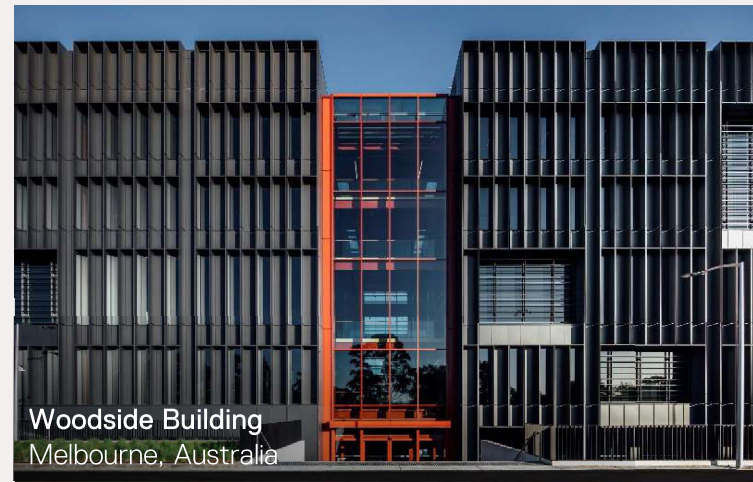


Southern Cross Station
Melbourne, Australia



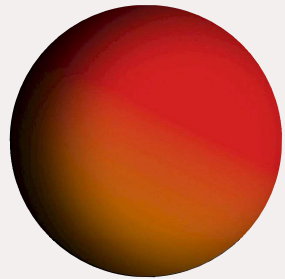
Thermae Bath Spa
Bath, United Kingdom

SUSTAINABILITY IS CENTRAL TO OUR DESIGNS



Addressing the emergency

Our commitments



Architects Declare
Climate and Biodiversity
Emergency

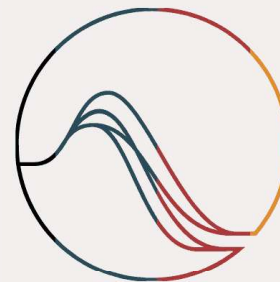


ARCHITECTS!
CLIMATE
ACTION
NETWORK

CLIMATE GROUP
CONCRETE
ZERO



ADVANCING
NET ZERO



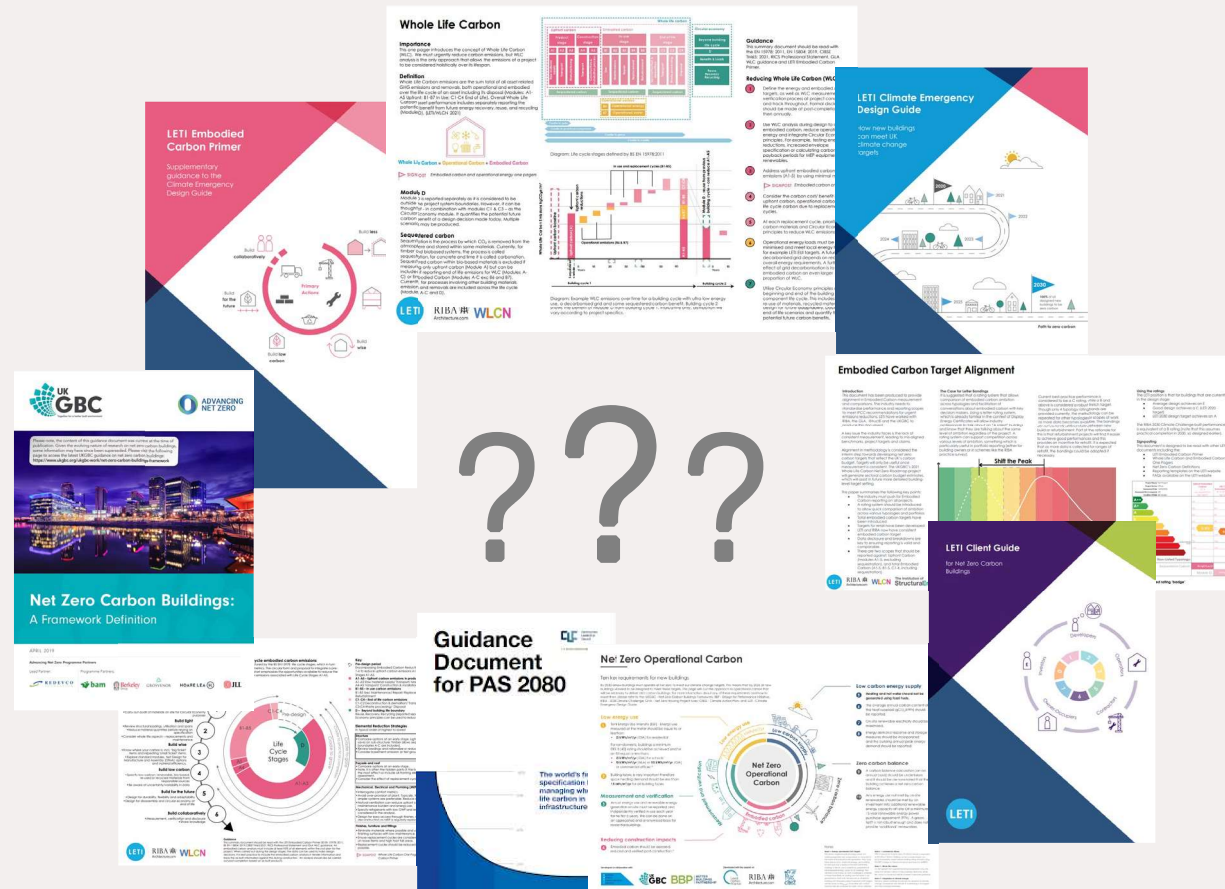
SCIENCE
BASED
TARGETS



Minoro: how to use the platform

Whole life net zero carbon

Where do you start?



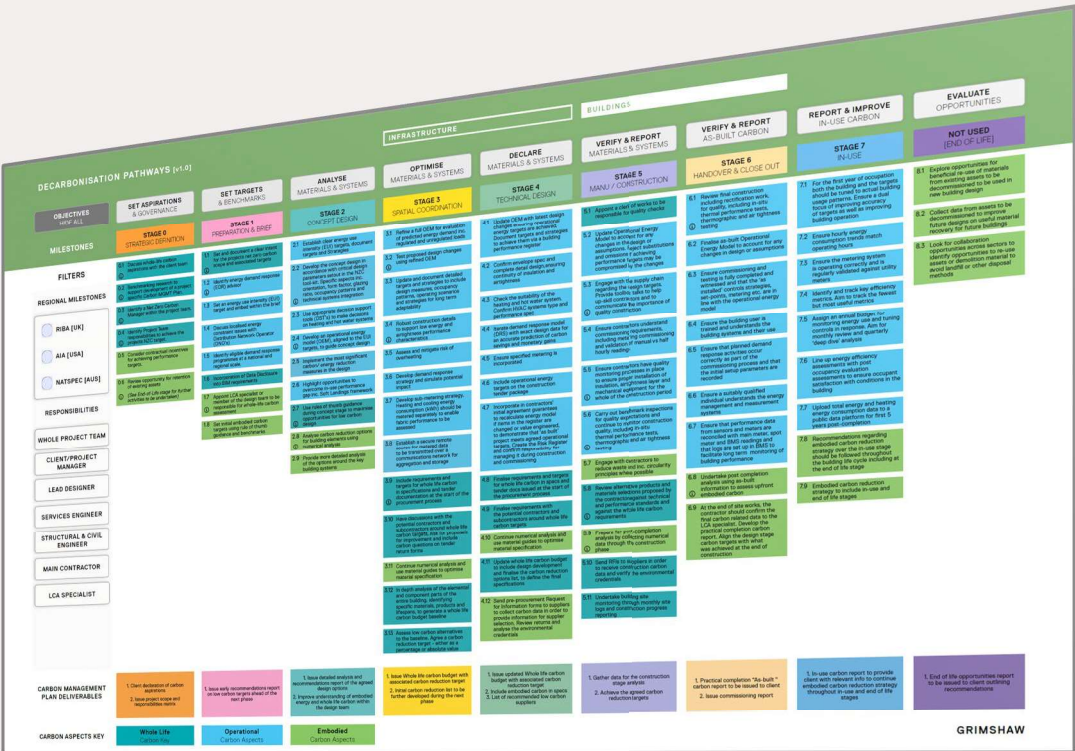
Whole life net zero carbon

Decarbonization pathways

	OBJECTIVES HIDE ALL	SET ASPIRATIONS & GOVERNANCE	SET TARGETS & BENCHMARKS	ANALYSE MATERIALS & SYSTEMS	OPTIMISE MATERIALS & SYSTEMS	DECLARE MATERIALS & SYSTEMS	VERIFY & REPORT MATERIALS & SYSTEMS	VERIFY & REPORT AS-BUILT CARBON	REPORT & IMPROVE IN-USE CARBON	EVALUATE OPPORTUNITIES
	MILESTONES	STAGE 0 STRATEGIC DEFINITION	STAGE 1 PREPARATION & BRIEF	STAGE 2 CONCEPT DESIGN	STAGE 3 SPATIAL COORDINATION	STAGE 4 TECHNICAL DESIGN	STAGE 5 MANU / CONSTRUCTION	STAGE 6 HANDOVER & CLOSE OUT	STAGE 7 IN-USE	NOT USED [END OF LIFE]
FILTERS										
REGIONAL MILESTONES										
<div><div></div>RIBA [UK]</div> <div><div></div>AIA [USA]</div> <div><div></div>NATSPEC [AUS]</div>										
RESPONSIBILITIES										
WHOLE PROJECT TEAM										
CLIENT/PROJECT MANAGER										
LEAD DESIGNER										
SERVICES ENGINEER										
STRUCTURAL & CIVIL ENGINEER										
MAIN CONTRACTOR										
LCA SPECIALIST										
	0.1 Discuss whole-life carbon aspirations with the client team ①	1.1 Set and document a clear intent for the projects net zero carbon scope and associated targets ①	2.1 Establish clear energy use intensity (EUI) targets, document targets and Strategies	3.1 Refine a full OEM for evaluation of predicted energy demand inc. regulated and unregulated loads	4.1 Update OEM with latest design changes ensuring operational energy targets are achieved. Document targets and strategies to achieve them via a building performance register	5.1 Appoint a clerk of works to be responsible for quality checks	6.1 Review final construction including rectification work, for quality, including in-situ thermal performance tests, thermographic and air tightness testing	7.1 For the first year of occupation both the building and the targets should be tuned to actual building usage patterns. Ensure a dual focus of improving accuracy of targets as well as improving building operation	8.1 Explore opportunities for beneficial re-use of materials from existing assets to be decommissioned to be used in new building design	
	0.2 Benchmarking research to support development of a project specific Carbon MGMT Plan ①	1.2 Identify energy demand response (EDR) advisor ①	2.2 Develop the concept design in accordance with critical design parameters setout in the NZC tool-kit. Specific aspects inc. orientation, form factor, glazing ratio, occupancy patterns and technical systems integration	3.2 Test proposed design changes using refined OEM ①	4.2 Confirm envelope spec and complete derral design ensuring continuity of insulation and airtightness	5.2 Update Operational Energy Model to account for any changes in the design or assumptions. Reject substitutions and omissions if achieving performance targets may be compromised by the changes	6.2 Finalise as-built Operational Energy Model to account for any changes in design or assumptions	7.2 Ensure hourly energy consumption trends match operating hours	8.2 Collect data from assets to be decommissioned to improve future designs on useful material recovery for future buildings	
	0.3 Identify a Net Zero Carbon Manager within the project team. ①	1.3 Set an energy use intensity (EUI) target and embed within the brief	2.3 Use appropriate decision support tools (DST's) to make decisions on heating and hot water systems	3.3 Update and document detailed targets and strategies to include design measures, occupancy patterns, operating scenarios and strategies for long term adaptability	4.3 Check the suitability of the heating and hot water system. Confirm HVAC systems type and performance spec	5.3 Engage with the supply chain regarding the design targets. Provide toolbox talks to help up-skill contractors and to communicate the importance of quality construction	6.3 Ensure commissioning and testing is fully completed and witnessed and that the 'as installed' controls strategies, set-points, metering etc. are in line with the operational energy model	7.3 Ensure the metering system is operating correctly and is regularly validated against utility meters	8.3 Look for collaboration opportunities across sectors to identify opportunities to re-use assets or demolition material to avoid landfill or other disposal methods	
	0.4 Identify Project Team responsibilities to achieve the projects NZC target. ①	1.4 Discuss localised energy constraint issues with Distribution Network Operator (DNO's)	2.4 Develop an operational energy model (OEM), aligned to the EUI targets, to guide concept design	3.4 Robust construction details to support low energy and airtightness performance characteristics	4.4 Iterate demand response model (DRS) with exact design data for an accurate prediction of carbon savings and monetary gains	5.4 Ensure contractors understand commissioning requirements, including metering commissioning and validation of manual vs half hourly readings	6.4 Ensure the building user is trained and understands the building systems and their use	7.4 Identify and track key efficiency metrics. Aim to track the fewest but most useful metrics		
	0.5 Consider contractual incentives for achieving performance targets.	1.5 Identify eligible demand response programmes at a national and regional scale.	2.5 Implement the most significant carbon/ energy reduction measures in the design	3.5 Assess and mitigate risk of overheating	4.5 Ensure specified metering is incorporated	5.5 Ensure contractors have quality monitoring processes in place to ensure proper installation of insulation, airtightness layer and mechanical equipment for the whole of the construction period	6.5 Ensure the building user is trained and understands the building systems and their use	7.5 Assign an annual budget for monitoring energy use and tuning controls in response. Aim for monthly review and quarterly 'deep dive' analysis		
	0.6 Review opportunity for retention of existing assets ① (See End-of-Life stage for further activities to be undertaken)	1.6 Incorporation of Data Disclosure into BIM requirements	2.6 Highlight opportunities to overcome in-use performance gap inc. Soft Landings framework	3.6 Develop demand response strategy and simulate potential impact	4.6 Include operational energy targets on the construction tender package	5.6 Carry out benchmark inspections for quality expectations and continue to monitor construction quality, including in-situ thermal performance tests, thermographic and air tightness testing	6.6 Ensure that planned demand response activities occur correctly as part of the commissioning process and that the initial setup parameters are recorded	7.6 Line up energy efficiency assessments with post occupancy evaluation assessments to ensure occupant satisfaction with conditions in the building		
		1.7 Appoint LCA specialist or member of the design team to be responsible for whole-life carbon assessment ①	2.7 Use rules of thumb guidance during concept stage to maximise opportunities for low carbon design	3.7 Develop sub-metering strategy. Heating and cooling energy consumption (kWh) should be metered separately to enable fabric performance to be assessed	4.7 Incorporate in contractors' initial agreement guarantees to recalculate energy model if tens in the register are changed or value engineered, to demonstrate that 'as built' project meets agreed operational targets. Create the Risk Register and confirm responsibility for managing it during construction and commissioning	5.7 Engage with contractors to reduce waste and inc. circularity principles where possible	6.7 Ensure a suitably qualified individual understands the energy management and measurement systems	7.7 Upload total energy and heating energy consumption data to a public data platform for first 5 years post-completion		
		1.8 Set initial embodied carbon targets using rule of thumb guidance and benchmarks	2.8 Analyse carbon reduction options for building elements using numerical analysis	3.8 Establish a secure remote source for metered data to be transmitted over a communications network for aggregation and storage	4.8 Finalise requirements and targets for whole life carbon in specs and tender docs issued at the start of the procurement process	5.8 Review alternative products and materials selections proposed by the contractor against technical and performance standards and against the whole life carbon requirements	6.8 Undertake post completion analysis using as-built information to assess upfront embodied carbon	7.8 Recommendations regarding embodied carbon reduction strategy over the in-use stage should be followed throughout the building life cycle including at the end of life stage		
			2.9 Provide more detailed analysis of the options around the key building systems	3.9 Include requirements and targets for whole life carbon in specifications and tender documentation at the start of the procurement process	4.9 Finalise requirements with the potential contractors and subcontractors around whole life carbon targets	5.9 Engage with contractors to reduce waste and inc. circularity principles where possible	6.9 At the end of site works, the contractor should confirm the final carbon related data to the LCA specialist. Develop the practical completion carbon report. Align the design stage carbon targets with what was achieved at the end of construction			
				3.10 Have discussions with the potential contractors and subcontractors around whole life carbon targets. Ask for proposals for improvement and include carbon questions on tender return forms	4.10 Continue numerical analysis and use material guides to optimise material specification	5.10 Prepare for post-completion analysis by collecting numerical data through the construction phase				
				3.11 Continue numerical analysis and use material guides to optimise material specification	4.11 Update whole life carbon budget to include design development and finalise the carbon reduction options list, to define the final specifications	5.11 Send RFIs to suppliers in order to receive construction carbon data and verify the environmental credentials				
				3.12 In depth analysis of the elemental and component parts of the entire building, identifying specific materials, products and lifespans, to generate a whole life carbon budget baseline	4.12 Send pre-procurement Request for Information forms to suppliers to collect carbon data in order to provide information for supplier selection. Review returns and analyse the environmental credentials	5.12 Undertake building site monitoring through monthly site logs and construction progress reporting				
				3.13 Assess low carbon alternatives to the baseline. Agree a carbon reduction target - either as a percentage or absolute value						

Whole life net zero carbon

Decarbonization pathways



For each action outlined in the pathway guidance is provided on:

1. What needs to be done
2. Who is responsible
3. How to go about it

Decarbonization pathways: carbon management activities



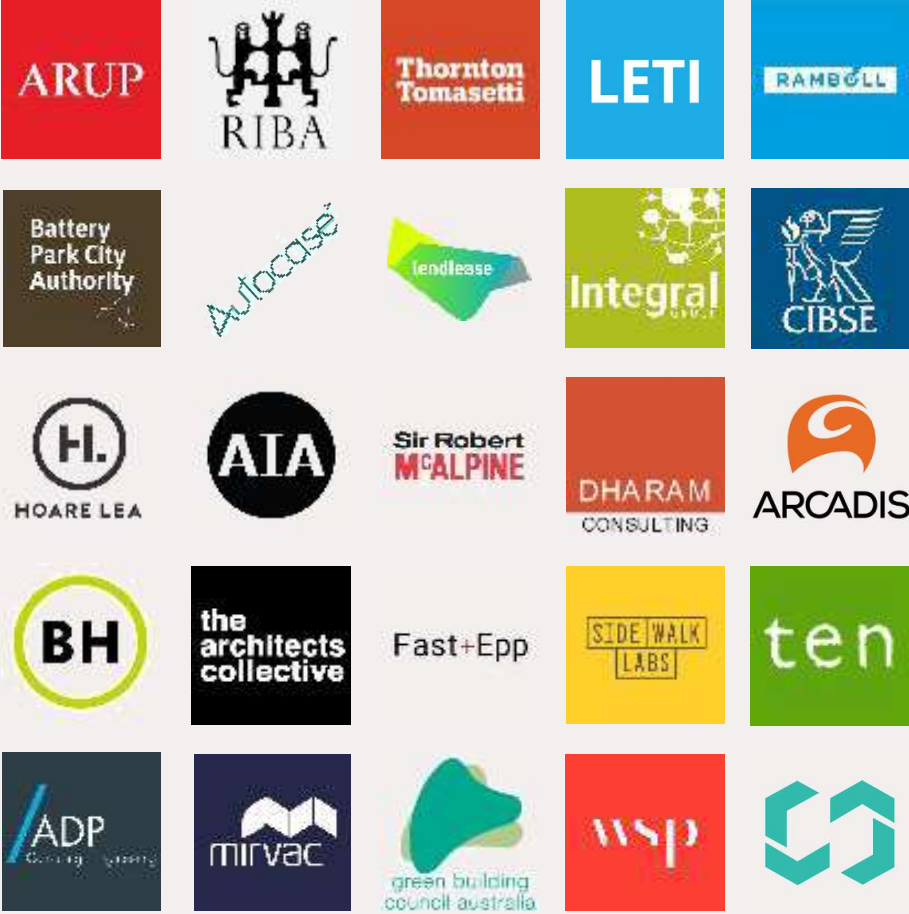
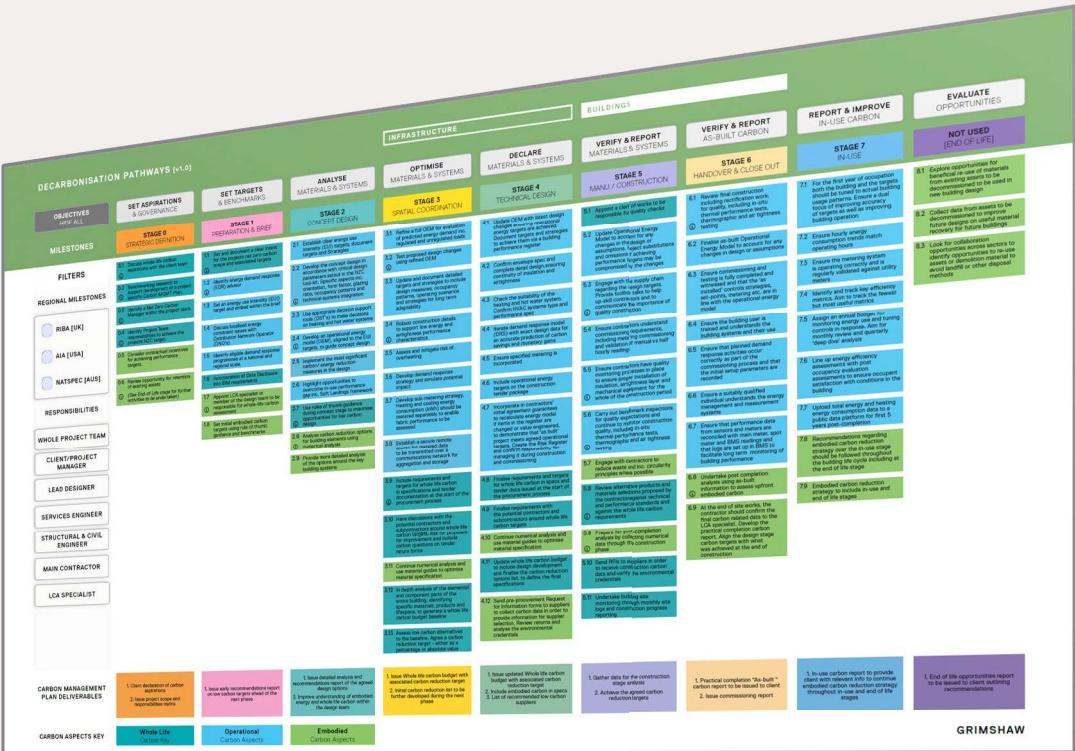
5. Assessment & reporting

4. Embodied carbon optimisation

6. Commissioning & validation

Whole life net zero carbon

Decarbonization pathways



Introduction to Minoro

Minoro

Registration

Register Minoro to keep informed of the latest updates and improvements.

Name

Company

Email *

☐ I would like to contribute data to the new database to future Minoro updates.

Submit

* By providing your information you agree to Minoro contacting you to inform you of the latest updates to the platform.

* Your information will not be passed on to any other third party and will only be used for Minoro related communications.

* The information you supply will be managed in accordance with international data protection laws – Refer to Minoro's [privacy policy](#) for more information.

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Terms & Conditions

Accessibility

Minoro

Region: Global - APM

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Stage 0 [Pre-Design]	Stage 1 [Pre-Design]	Stage 2 [Design]	Stage 3 [Design]	Stage 4 [Design]	Stage 5 [Construct]	Stage 6 [Handover]	Stage 7 [In Use]	Stage 8 [End of life]
0-01 Establish carbon management scope	1-01 Adapt measurement standards	2-01 Confirm energy use intensity targets	3-01 Review carbon reduction targets	4-01 Review contractor scope & responsibilities	5-01 Engage with specialist sub-contractors	6-01 Undertake commissioning handover audit	7-01 Calibrate energy supply & demand	8-01 Explore life extension opportunities [C-D]
0-02 Challenge the project premise / need	1-02 Identify specialist appointments	2-02 Update environmental strategies & systems	3-02 Refine environmental strategies & systems	4-02 Review monitoring, reporting procedures	5-02 Review specialist sub-contractor proposals	6-02 Finalise operational energy model [Bd]	7-02 Identify further reduction opportunities [B1-7]	
0-03 Establish governance & reporting	1-03 Establish energy use intensity targets	2-03 Commission energy demand response study	3-03 Mitigate impacts of extreme weather	4-03 Finalise testing & commissioning procedures	5-03 Undertake benchmark testing	6-03 Finalise embodied carbon model [A1-A5]	7-03 Measurement & verification	
0-04 Establish policy & legislative drivers	1-04 Establish embodied carbon targets	2-04 Set up an operational energy model [LCa module Bb]	3-04 Update operational energy model [Bb]	4-04 Review carbon reduction targets	5-04 Undertake commissioning	6-04 Finalise whole-life carbon assessment [A-C]	7-04 Update carbon management plan	
0-05 Explore sustainable finance options	1-05 Identify reduction opportunities	2-05 Identify energy use hotspots	3-05 Update energy use hotspots	4-05 Review environmental strategies & systems	5-05 Update operational energy model [Bd]	6-05 Update reduction opportunities		
0-06 Explore carbon targets	1-06 Update carbon management plan	2-06 Establish commissioning framework	3-06 Refine systems, components & materials	4-06 Update operational energy model [Bb]	5-06 Update embodied carbon model [A1-A5]	6-06 Update carbon management plan		
0-07 Create carbon management plan		2-07 Confirm embodied carbon targets	3-07 Update embodied carbon model [A1-A5]	4-07 Refine systems, components & material	5-07 Update whole-life carbon assessment [A-C]			
		2-08 Evaluate systems, components & materials	3-08 Update embodied carbon hotspots	4-08 Update embodied carbon model [A1-A5]	5-08 Update reduction opportunities			
		2-09 Set up embodied carbon model [A1-A5]	3-09 Update whole-life carbon assessment [A-C]	4-09 Update whole-life carbon assessment [A-C]	5-09 Update carbon management plan			
		2-10 Identify embodied carbon hotspots	3-10 Update reduction opportunities	4-10 Update reduction opportunities				
		2-11 Set up whole life carbon assessment [LCa module A-C]	3-11 Update carbon management plan	4-11 Update carbon management plan				
		2-12 Update reduction opportunities	3-12 Engage potential contractors					
		2-13 Engage supply-chain	3-13					
		2-14 Update carbon management plan	3-14 Finalise tender documentation					

1 Leadership & Governance

2 Target Setting & Baselines

3 Optimise In-use Energy

4 Optimise Embodied Carbon

5 Procurement

6 Measure & Manage

7 Monitor, Report & Verify

8 Client / Owner

9 Project Manager

10 Cost Manager

11 Carbon Manager

12 Architect / Lead Designer

13 Structural Engineer

14 Services Engineer

15 Energy Modelling Specialist

16 LCA Specialist

17

14

Introduction to Minoro (www.minoro.org)

Minoro

Region: Global - APM

Toolkit
User Guide
Terms & Conditions

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0-02 Challenge the project premise / need	1-02 Identify specialist appointments	2-02 Evaluate environmental strategies & systems	3-02 Refine environmental strategies & systems	4-02 Finalise monitoring, reporting procedures	5-02 Finalise specialist sub-contractor proposals	6-02 Finalise operational energy model [B6]	7-02 Identify further reduction opportunities [B1-7]	
0-03 Establish governance & reporting	1-03 Establish energy use intensity targets	2-03 Commission energy demand response study	3-03 Mitigate impacts of extreme weather	4-03 Finalise testing & commissioning procedures	5-03 Undertake benchmark testing	6-03 Finalise embodied carbon model [A1-AS]	7-03 Measurement & verification	
0-04 Establish policy & legislative drivers	1-04 Establish embodied carbon targets	2-04 Set up an operational energy model [LCA module B6]	3-04 Update operational energy model [B6]	4-04 Review carbon reduction targets	5-04 Undertake commissioning	6-04 Finalise whole-life carbon assessment [A-C]	7-04 Update carbon management plan	
0-05 Explore sustainable finance options	1-05 Identify reduction opportunities	2-05 Identify energy use hotspots	3-05 Update energy use hotspots	4-05 Finalise environmental strategies & systems	5-05 Update operational energy model [B6]	6-05 Update reduction opportunities		
0-06 Explore carbon targets	1-06 Update carbon management plan	2-06 Establish commissioning framework	3-06 Refine systems, components & materials	4-06 Update operational energy model [B6]	5-06 Update embodied carbon model [A1-AS]	6-06 Update carbon management plan		
0-07 Create carbon management plan		2-07 Confirm embodied carbon targets	3-07 Update embodied carbon model [A1-5]	4-07 Finalise systems, components & material	5-07 Update whole-life carbon assessment [A-C]			
		2-08 Evaluate systems, components & materials	3-08 Update embodied carbon hotspots	4-08 Update embodied carbon model [A1-5]	5-08 Update reduction opportunities			
		2-09 Set up embodied carbon model [A1-5]	3-09 Update whole-life carbon assessment [A-C]	4-09 Update whole-life carbon assessment [A-C]	5-09 Update carbon management plan			
		2-10 Identify embodied carbon hotspots	3-10 Update reduction opportunities	4-10 Update reduction opportunities				
		2-11 Set up whole life carbon assessment [LCA module A-C]	3-11 Update carbon management plan	4-11 Update carbon management plan				
		2-12 Update reduction opportunities	3-12 Engage potential contractors					
		2-13 Update carbon management plan	3-13 Engage supply-chain					
			3-14 Finalise tender documentation					

1. Leadership & Governance

2. Target Setting & Baselines

3. Optimise In-use Energy

4. Optimise Embodied Carbon

5. Procurement

6. Measure & Manage

7. Monitor, Report & Verify

8. Client / Owner

9. Project Manager

10. Cost Manager

11. Carbon Manager

12. Architect / Lead Designer

13. Structural Engineer

14. Services Engineer

15. Energy Modelling Specialist

16. LCA Specialist

Benefits of Minoro

Benefits of Minoro

- Grimshaw and their design teams have gone through the '*learning by doing*' phase - this saves time and costs.
- Minoro has been peer reviewed and improved by 90+ organisations and industry experts.
- Actions found in Minoro come from practical knowledge through the concept and design stages
- Minoro outlines the process with guidance and actions for carbon management

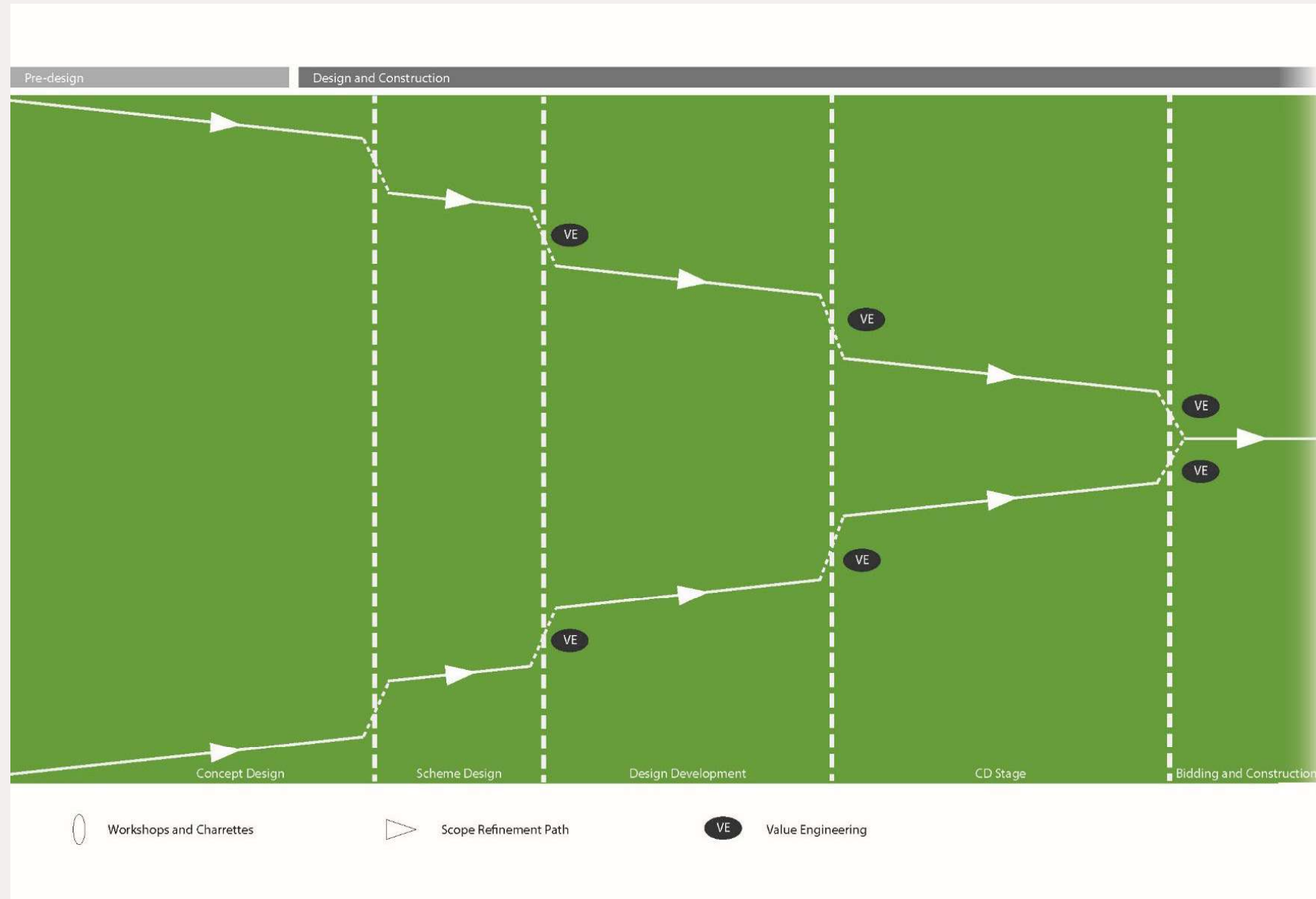
Benefits of Minoro



- **Create a plan for carbon management**
Meet project aspirations and maximise value from the outset by implementing a comprehensive plan to manage whole life carbon.
- **Develop credible, informed carbon reduction targets**
Understand how to set realistic targets that are backed by science in order to achieve a successful project outcome.
- **Make the connection between policy and fiscal incentives**
Drive out carbon across a project's value chain by leveraging available policies and fiscal incentives.
- **Seek opportunities at all project stages**
Identify and maintain a register of carbon reduction opportunities throughout a project's life including design, construction and maintenance.

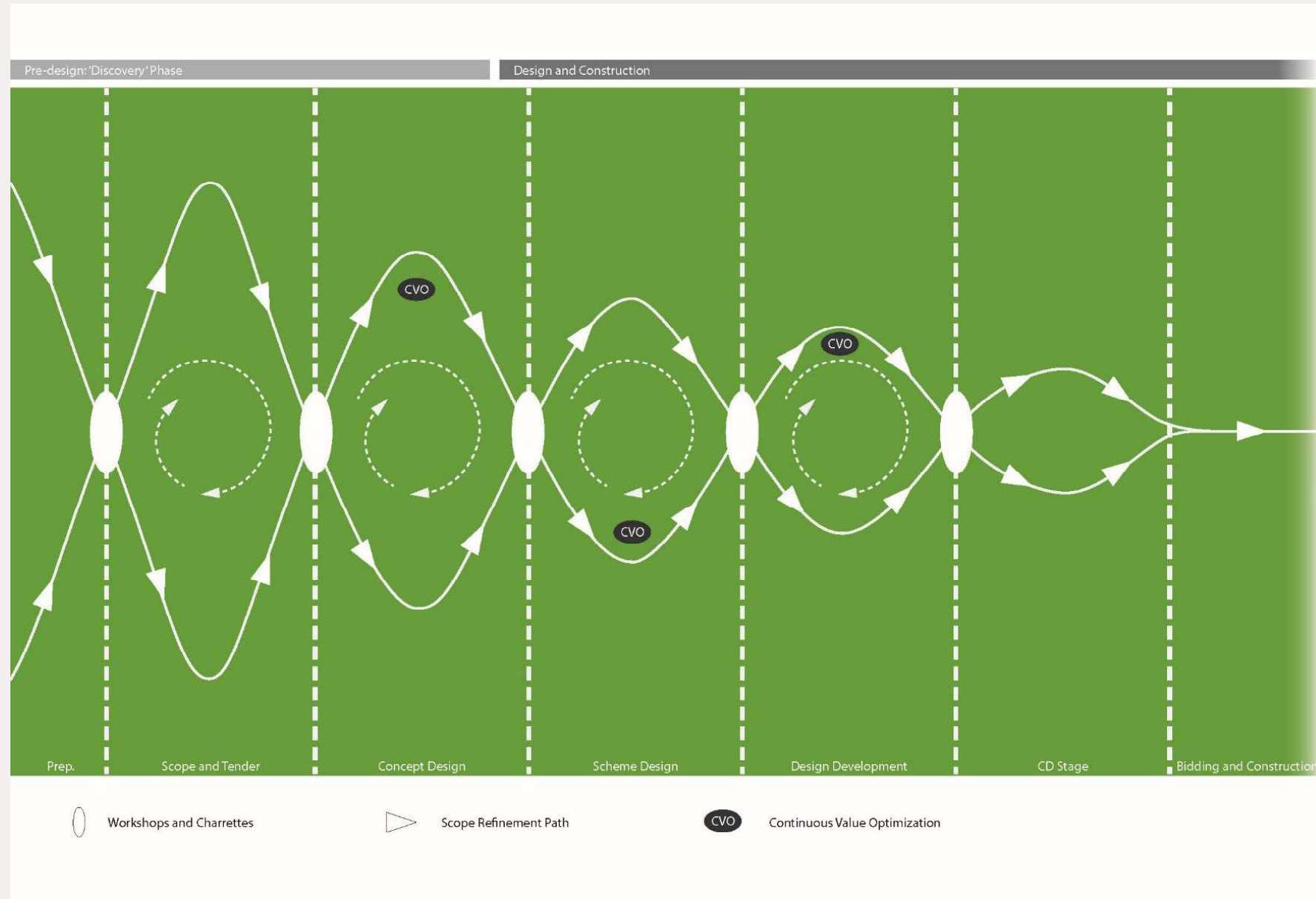
Integrative design approach

Business-As-Usual



*Image credit: Atelier Ten
Based on the work of 7 Group and Bill Reed,
The Integrative Design Guide to Green Building*

An Integrative Design Process



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An Integrative Design Process

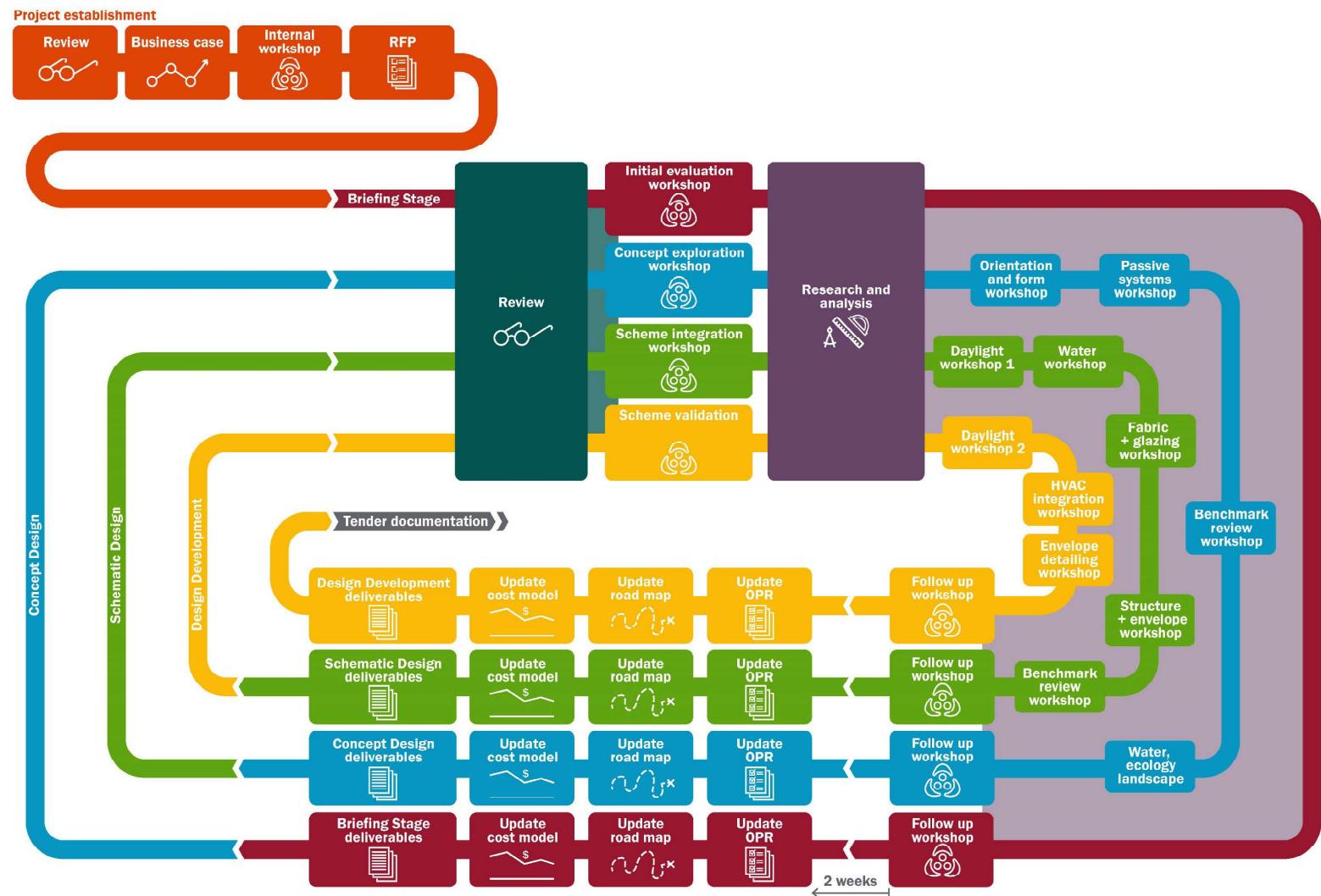


Image credit: Atelier Ten

Minoro

Q&A

Stage 0 [Pre-Design]

Stage 1 [Pre-Design]
outcomes: 100%

100%

Adaptation

100%

Adaptation

carbon management