



Department of **Planning,  
Lands and Heritage**  
Office of the Government Architect

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**Office of the Government Architect**

# **Response of WA Schools to Climate Change**

## **Education and Health Standing Committee Inquiry**

Thank you for the invitation to make a submission to the Committee's inquiry into the response of Western Australian schools to climate change. The role of the Office of the Government Architect (OGA) is to support the Government Architect in providing leadership and strategic advice to government to improve the design of public buildings and spaces and enhance the quality of the built environment. OGA activities span Projects, Policy, Advocacy and Design Review, including responsibility for administering the State Design Review Panel (SDRP).

The Office is part of the Department of Planning and Lands Heritage (DPLH) and as part of our remit, we work to support the delivery of good design as defined by State Planning Policy 7.0 Design of the Built Environment (SPP 7.0) ([link here](#)). Sustainability is one of the ten principles of good design.

The Government Architect and Government Architects Network Australia (GANA) nationally are currently focussed on climate change impacts and developing appropriate built environment responses. The Western Australian Climate Change Policy, launched in November 2020, includes aspirational targets to meet net zero carbon emissions by 2050. The Architects Institute of Australia (AIA) Climate Action Sustainability Taskforce (CAST) proposes commitment to the target to de-carbonise the construction industry by 2030.

### Background

We understand the inquiry extends to all Western Australian schools, however the OGA focus is on government schools. In improving their climate change adaptability and sustainability a comprehensive approach would seek to address the planning of all future school projects to facilitate improved performance from new schools, as well as upgrading existing school building stock.

A number of years ago the OGA worked with the Department of Education to develop a 'good design guide' for school projects and we understand this guidance is still used as part of the Department of Finance briefing materials for the new school projects it delivers. Sustainability measures are broadly covered through criteria such as planning for public transport, safe walking and cycling opportunities, shared community activities, operational flexibility, adaptability, passive design measures, initiatives for energy and water conservation, and reduction of waste, embodied energy and emissions. The OGA is not routinely engaged in the delivery of new school projects and instead responds to requests from either Departments of Education or Finance to assist on individual projects that may have specific design complexities. OGA advice is also sought on a case-by-case basis by planning approval authorities such as Development WA (formerly



Metropolitan Redevelopment Agency MRA and Landcorp) and the WA Planning Commission (WAPC).

There is a range of ways the OGA could assist with new school builds – project support, policy guidance, design review and advocacy on the benefits of good design in schools. As part of DPLH, OGA is supportive of optimising the site selection process for future schools to better facilitate the climate, health and wellbeing benefits of access by active transport<sup>1</sup>; and to promote landscape-led sustainable site planning<sup>2</sup>. OGA wouldn't typically be involved in maintenance and retrofit programs but would be happy to work with the Department of Education sustainability team and Department of Finance Principal Architect to produce some useful guidance, upon request.

### Detailed Response:

#### a. **The co-benefits of climate action in schools**

The OGA supports an evidence-based approach to sustainable school design, and increased transparency in demonstrating the benefits of improved environmental performance.

A PricewaterhouseCoopers study carried out in 2000 'found that capital investment in school buildings had the strongest influence on staff morale, pupil motivation and effective learning time'(Commission for Architecture and Built Environment CABE:2005,p4). Test scores in well-designed school buildings were up to 11% higher than in poorly designed classrooms (CABE 2005, p4). Another study in California found that students with the most natural day lighting in their classrooms progressed between 20 - 26% faster on tests in one year, compared to students in the darkest classrooms <sup>3</sup>, refer to Attachment A. Studies also show evidence of the positive impact of increased ventilation in the indoor classroom environment on student performance<sup>4</sup>. The Department of Education (DoE) led Solar Schools program, launched in 2020, will provide rooftop solar systems to 30 regional public schools. The \$5 million program allows a 27% saving for each school on energy costs – collectively generating \$1.7 million of savings/year while reducing carbon emissions by 2,000 tonnes per school each year, a positive step.

Recommended resources include OGA Design Standard 02 – The Design of the Education Environment ([link here](#)), which provides guidance for delivery of well-designed learning environments that respond effectively to climate change; Design Council (formerly CABE) ([link here](#)); Green Building Council of Australia (GBCA) ([link here](#)), Grattan Institute ([link here](#)), Australian Sustainable Built Environment Council (ASBEC)([link here](#)), London Energy Transformation Initiative (LETI) Schools Design Guide ([link here](#)).

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<sup>1</sup> (Planning Institute Australia, 2021)

<sup>2</sup> (Whole Building Design Guide, National Institute of Building Sciences US, 2021)

<sup>3</sup> (Commission for Architecture and the Built Environment, 2005)

<sup>4</sup> (Building Research Technical Report 20/2005, 2006)



**b. Climate change mitigation and adaptation actions currently being undertaken in schools, and the benefits they are achieving**

OGA is not currently engaged in monitoring the operations of WA schools but could work with the Department of Education asset and sustainability teams to test suitability of some potential actions for trial here. For example, the Victorian Schools Building Authority has launched “Building Quality Standards Handbook”<sup>5</sup> which contains a section on Sustainable Operations. In this detailed brief for architects and designers, initiatives for sustainable operation of the school on handover are listed. One such action is that SMART (specific, measurable, achievable, relevant and timebound) goals should be handed over by the consultants, to assist the school to optimise performance of the building. The Victorian government has also established the Greener Government School Buildings program to improve the energy efficiency of schools and reduce operating costs and greenhouse gases. The Water Efficiency Program provides data loggers to all Victorian schools. ResourceSmart Schools provides practical support to help embed sustainability in schools.

Further opportunities include:

- Build transparency about the embodied carbon and operational carbon in schools. This includes ensuring schools have low energy use, that school energy sources are decarbonised, and schools have low water use.
- Ensure life cycle assessment is undertaken for all new and retrofitted education projects.
- Ensure education construction projects support Net Zero carbon goals, with transition towards Net Zero in the interim. School Board members should be educated on the benefits of Net Zero.
- Ensure building practitioners, policy makers and the school community make use of sustainability ratings tools to drive a suitably scaled, evidence-based responses to climate change.
- Preference use of materials with Environmental Product Declarations (EPD’s) as demand for third party EPD verification drives innovation in the construction supply chain. Refer to [Vic Schools Building Quality Handbook](#) page30-31, and Green Building Council of Australia GBCA (link [here](#)).
- Ensure targets are set to reduce the embodied carbon emissions of all built environment projects.<sup>6</sup> Refer Attachment C (link [here](#) )
- Ensure efficiency targets are set to reduce the operational carbon emissions of a school, are transparent, and monitored. Data loggers can be retrofitted as both a learning and monitoring tool.

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<sup>5</sup> (Department of Education and Training, 2021)

<sup>6</sup> (London Energy Transformation Initiative, 2020)



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- Ensure built environment professionals, school asset delivery and management teams, and school communities are well informed, better skilled and equipped to implement adaptation strategies, and can drive the above programs for change.
- Work with the sustainable development unit in the Department of Education to promote sustainable development, reduce carbon emissions and energy costs, and run advocacy training programs for sustainability school committees.
- Establish a risk management program for built environment resilience to shock from extreme weather– heat wave, bushfire, coastal erosion, inundation, flooding.
- Encourage schools to mitigate the heat island effect with awareness of landscape microclimates. An example of a community led urban greening case study: Miyawki forest is a fast-growing forest technique being trialled at South Padbury Primary School; this project offers a ‘bite size environmental action’ to mitigate against heatwave and loss of biodiversity. (Link [here](#))
- Encourage scalable revegetation rehabilitation projects such as creating native vegetation gardens and habitat restoration. Possibilities include the corners or left-over space at the edges of school ovals.
- Encourage existing schools to transition to a higher level of renewable energy capacity. The WA Climate Policy refers to the Solar Schools Program, an action led by the Department of Education, which promotes installation of solar panels on school rooftops. School Virtual Power Plants (VPP), a project which transforms selected schools into smart green VPPs integrating rooftop solar and batteries, is led by Synergy.
- Promote local innovation. For example, demonstrate direct air capture with new locally made technology. Southern Green Gas and Sydney University have developed small scale solar powered direct air capture units capable of capturing 1-2 tonnes of carbon dioxide each year. (Link [here](#)).
- Ensure meaningful engagement with local Aboriginal advisors. Aboriginal understanding of land, sustainability and traditional bushfire management knowledge should be shared with school children.
- Ensure schools contribute to community resilience. For example, schools can share space when short term events occur such as heat wave, flood, bushfire, cyclone.

Through collaboration with other lead government agencies, OGA could assist in testing suitability of possible actions to prepare our school environments for:

Climate change resilience – so a school can respond to short term shocks, including direct and indirect weather impacts.

Operations resilience – to enable the school to respond to acute and chronic stresses that affect its operations.

Community resilience – the school contributes to community resilience.

Heat resilience- the school reduces impacts of heat island effects.



Grid resilience- the school contributes to the functioning of the grid as it transitions to a higher level of renewable energy capacity. <sup>7</sup>

**c. Barriers that schools encounter in undertaking climate action and how these can be addressed**

New schools are procured through the Department of Finance (DoF) to perform as well as possible environmentally within capital works expenditure constraints. Performance requirements are set out in the standard primary and secondary school design briefs (managed by DoF but actively owned and directed by the Department of Education). Transitioning schools to net zero carbon will require funding. The current situation may present difficulties in meeting net zero goals, and current approaches premised on capital cost minimisation for new schools may be ineffective long term because of increasing operational costs and broader public health impacts<sup>8</sup>. With a view to whole-of-life value for money, appropriate construction rates per square metre should be developed with Treasury, to enable delivery of high performing new schools and sustainability improvements to existing stock. Such an approach would deliver healthy buildings with cost savings in the long term, as well as social and environmental benefits for students, teachers and the community.

School Briefs should be reviewed to ensure inclusion of good design requirements that assist with responding to climate change. The OGA can work with the Departments of Education and Finance to prepare sustainability updates to school briefs and include best practice requirements regarding climate responsive design.

**d. What more can be done to support schools to respond to climate change**

Upon request the OGA can advise on and assist with procurement approaches to ensure well credentialled designers with expertise in sustainability are appointed for school projects.

As noted above, the OGA has developed a suite of Design Standards for new public building projects to set objective provisions for design quality, including Design Standard 02 – The Design of Education Environments (as attached). Strategies that support climate change response are highlighted in the document. OGA will be updating DS02 in the near future.

The OGA also offers inter-agency design review. The State Design Review Panel (SDRP) is a multi-disciplinary panel of highly experienced built environment professionals that provides independent advice on the design quality of major development proposals. Advice on sustainability measures are provided as part of this process. For more information on design review, refer to link

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<sup>7</sup> (AECOM Australia Pty Ltd , 2021)

<sup>8</sup> (Priska Ammann, 2021)



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[here](#). State Planning Policy 7.0 Design of the Built Environment includes performance-based design principles, which provide the means of evaluating the merit of proposed solutions by professionals with appropriate design expertise. The Department of Education is welcome to refer new school projects to SDRP.

The OGA welcomes collaboration the Education Department and can provide advice on school project briefing and multi-disciplinary consultant engagement for major school projects upon request. We encourage engagement at early concept design stages of major education projects.

### **Attachments**

Attachment A- The Value of Good Design: CABE. ([link here](#))

Attachment B- OGA Design Standard 02 for secondary schools ([link here](#)),

Attachment C- LETI Climate Emergency Schools Design ([link here](#)).

### **Resources**

Victorian Government Architect: Building Quality Standards Handbook 2021

[vsba-building-quality-handbook.pdf \(education.vic.gov.au\)](#)

Victorian Government Architect: The following are links to the policy, guidance and resources for sustainability in schools in Victoria.

<https://www2.education.vic.gov.au/pal/sustainable-facilities/policy>; [Sustainable Facilities: Resources | education.vic.gov.au](#)

South Australian Government Architect: Sustainable new school exemplars:

- Botanic High School (opened in 2019) COX Architecture and DesignInc  
[Adelaide Botanic High School — COX \(coxarchitecture.com.au\)](#)  
[Adelaide Botanic High School | DesignInc](#)
- Whyalla Secondary School (under construction) COX Architecture and Thomson Rossi  
[Construction Underway for the New Whyalla Secondary College — COX \(coxarchitecture.com.au\)](#)  
[Whyalla Secondary College \(education.sa.gov.au\)](#)
- <https://www.education.vic.gov.au/about/awards/Pages/designawards.aspx> 4 star greenstar 'equivalent'.



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*Global Risks 2021: Fractured Future*. (2021, October 14). Retrieved from World Economic Forum: <https://reports.weforum.org/global-risks-report-2021/global-risks-2021-fractured-future/>

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Planning Institute Australia. (2021, October 27). *Policy 2021 PIA CLimate Series*. Retrieved from PIA: <https://www.planning.org.au/policy/2021-climate-series>

Priska Ammann, D. D. (2021, August). Health impact assessment and climate change: A scoping review. *The Journal of Climate Change and Health*, p. Vol 3.

Whole Building Design Guide Sustainable Committee. (2021, October 27). *Optimize Site Potential*. Retrieved from WBDG : <https://www.wbdg.org/design-objectives/sustainable/optimize-site-potential>

## Useful links:

[About Embodied Carbon - building-transparency.org \(buildingtransparency.org\)](https://www.buildingtransparency.org)

[www.Carbonleadershipforum.Org](https://www.carbonleadershipforum.org)

[Life Cycle Assessment \(LCA\) and Environmental Product Declarations \(EPD\) | Green Building Council of Australia \(gbca.org.au\)](https://www.gbca.org.au)

[The Net Zero Carbon Buildings Commitment | World Green Building Council \(worldgbc.org\)](https://www.worldgbc.org)

[Optimize Site Potential | WBDG - Whole Building Design Guide](https://www.wbdg.org)

[Infographic-CCC06-Infographic-Linking-climate-change-and-health-impacts-26-Nov-2020.pdf \(sustainability.vic.gov.au\)](https://www.sustainability.vic.gov.au)

# Schools

## Operational energy

Implement the following indicative design measures:

### Fabric U-values (W/m<sup>2</sup>.K)

Walls	0.13 - 0.15
Floor	0.09 - 0.12
Roof	0.10 - 0.12
Windows	1.0 (triple glazing)
Doors	1.2

### Fabric efficiency measures

Air tightness	<1 (m <sup>3</sup> /h. m <sup>2</sup> @50Pa)
Thermal bridging	0.04 (γ-value)
G-value of glass	0.5 - 0.4

### Power efficiency measures

Lighting power density	4.5 (W/m <sup>2</sup> peak NIA)
Lighting out of hours	0.5 (W/m <sup>2</sup> peak NIA)
Small power out of hours	2 (W/m <sup>2</sup> peak NIA)

### System efficiency measures

MVHR	90% (efficiency)
Heat pump SCoP	≥ 2.8
Central AHU SFP	1.5 - 1.2 W/l.s

 Maximise renewables so that 70% of the roof is covered

### Window areas guide (% of wall area)

North	15-25%
East	15-25%
South	15-25%
West	15-25%



Balance daylight and overheating



Include external shading



Include openable windows and cross ventilation



Form factor of 1 - 3

Reduce energy consumption to:



Energy Use Intensity (EUI) in GIA, excluding renewable energy contribution

Reduce space heating demand to:



## Heating and hot water

Implement the following measures:



**Fuel**  
Ensure heating and hot water generation is fossil fuel free



**Heat**  
The average carbon content of heat supplied (gCO<sub>2</sub>/kWh.yr) should be reported in-use



**Heating**  
Maximum 10 W/m<sup>2</sup> peak heat loss (including ventilation)



**Hot water**  
Maximum dead leg of 1 litre for hot water pipework  
'Green' Euro Water Label should be used for hot water outlets (e.g.: certified 6 L/min shower head – not using flow restrictors).

## Demand response

Implement the following measures to smooth energy demand and consumption:



### Peak reduction

Reduce heating and hot water peak energy demand



### Active demand response measures

Install heating and cooling set point control  
Reduce lighting, ventilation and small power energy consumption



### Electricity generation and storage

Consider battery storage



### Electric vehicle (EV) charging

Electric vehicle turn down  
Reverse charging EV technology



### Behaviour change

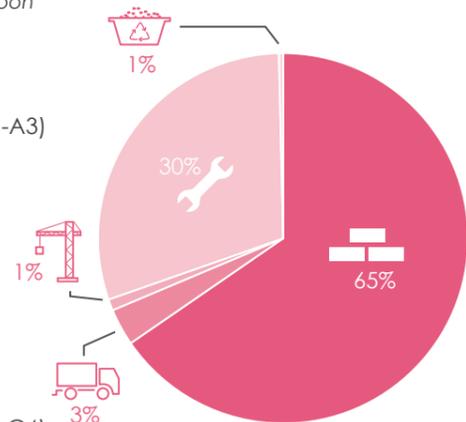
Incentives to reduce power consumption and peak grid constraints  
Encourage responsible occupancy.



## Embodied carbon

Focus on reducing embodied carbon for the largest uses:

-  Products/materials (A1-A3)
-  Transport (A4)
-  Construction (A5)
-  Maintenance and replacements (B1-B5)
-  End of life disposal (C1-C4)



### Average split of embodied carbon per building element:

- 30% - Superstructure
- 21% - Internal finishes
- 16% - Substructure
- 16% - Façade
- 13% - MEP

Reduce embodied carbon by 40% or to:



Area in GIA

## Data disclosure

Meter and disclose energy consumption as follows:



### Metering

(Metering strategy following BBP Better Metering Toolkit guidance)

- Record meter data at half hourly intervals
- Clearly label meters with serial number and end use
- Submeter renewable energy generation
- Use a central repository for data that has a minimum of 18 months data storage
- Provide thorough set of meter schematics and information on maintenance and use of meters
- Ensure metering commissioning includes validation of manual compared to half hourly readings.



### Disclosure

- Carry out an annual Display Energy Certificate (DEC) and include as part of annual reporting
- Report energy consumption by fuel type and respective benchmarks from the DEC technical table
- Upload five years of data to a publicly accessible database such as GLA and/or CarbonBuzz. Include information about the building (do not anonymise).