

The Zurich-Mandala Climate Risk Index

The Impact of Climate Change on Australia's Schools

Research Report
February 2025



MANDALA



ZURICH



Foreword

Children in Australia spend more than half of each year in school classrooms.

This time is important not only for academic education, but also for critical aspects of social and behavioural development. It is widely acknowledged and appreciated that school is a key foundation for children to develop the skills and knowledge required for success in later life.

Key social infrastructure such as Australia's schools, which currently support the development of more than four million children, have repeatedly suffered the consequences of our changing climate – from damage and devastation following bushfires and floods, to extreme heatwaves resulting in reduced capacity to effectively teach and learn.

As an insurer of many Australian schools, Zurich is acutely aware of this growing physical and societal risk.

In partnership with Mandala and building on our previous analysis on other critical asset classes such as energy generation and tourism sectors, this report deep dives into the significant potential short- and long-term impacts of climate change on the nation's education sector.



The analysis draws upon more than a century of Zurich Australia's proprietary risk data insights combined with new climate forecasting technology and intelligence to paint a picture of how significantly climate change could alter Australia's education system and attainment outcomes.

The report underlines the critical importance of building the resilience of Australian schools if we are to reduce the potentially significant impacts on children's academic attainment, future employment outcomes and broader disparities in socio-educational advantage across the country.

This analysis also serves to highlight the way risk intelligence held by insurers can be used to tangibly understand and respond to the very real impacts of climate change and inform our collective action.

Justin Delaney
Chief Executive Officer
Zurich Australia & New Zealand

Foreword

When we think about climate change, our minds often turn to melting ice caps, rising seas, or the transition away from fossil fuels.

Rarely do we consider its impact on something as specific as our children's education. Yet, as this report reveals, climate change is already reshaping the learning environment for millions of Australian students.

Australia's schools are more than just buildings – they are the foundation of our future, supporting over four million students and 350,000 teaching staff. But these vital institutions now face unprecedented challenges from our changing climate. From heatwaves that impair cognitive function to bushfires that displace entire school communities, the impacts are both immediate and far-reaching.

While we have rightly focused significant attention on reducing emissions, we have paid far less attention to adapting our critical infrastructure – particularly our schools – to the climate changes already locked in.

This is why we are proud to again partner with Zurich, this time to examine the vulnerability of our education system.



The findings are concerning. Under a 2-degree warming scenario in 2060, 84% of schools face significant climate risk and academic attainment levels could be reduced by up to 7% in some parts of the country.

This impact isn't felt equally – students in the Northern Territory and Queensland are disproportionately affected, and those attending inland schools face significantly poorer future employment outcomes due to climate-related disruptions to their education.

Perhaps most troubling is how climate risks compound existing inequalities. The same schools already facing socio-educational disadvantage are often those most exposed to climate impacts, creating a double burden for vulnerable communities.

This report might make for sobering reading, but its purpose is not to alarm – it's to inform and inspire action. By understanding these risks in detail, we can better protect our schools, our teachers, and most importantly, our children's future. After all, we cannot protect what we do not measure.

Amit Singh
Managing Partner
Mandala

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Summary of Findings



Two thirds of schools in Australia face high climate risk.

This is set to increase to 84% of schools by 2060 under an intermediate climate scenario assuming 2 degrees Celsius of warming.



NSW and QLD have the highest volume of schools facing high climate risk

with 92% of schools in NSW and 91% of schools in QLD in the highest three risk categories. The ACT and NT follow closely behind.



Disadvantaged schools face higher climate risk

with over 80% of Australian schools in the lowest Socio-Educational Advantage decile facing significant climate risk, compared to around 60% of schools in the highest advantage decile.



Extreme heat could reduce academic attainment by over 7%

in parts of Australia by 2060. The NT and QLD are most severely impacted, particularly for numeracy scores.



Extreme heat could impact the lifetime earnings of students by \$73,000

due to reduction in academic attainment. This is equivalent to losing one year's average salary in Australia.

Executive Summary

Australian schools play a critical role in education and development

Australia’s primary and secondary education system supports over four million students and close to 350,000 teaching staff across nearly 10,000 schools.

Nearly half (45%) of schools are located in a regional or remote area and close to 35% of students attend a school categorised as having low ‘Socio-Educational Advantage’ (being within the lowest five deciles) compared with other schools in Australia.

The disparities evident between schools in Australia have been further exacerbated in recent years following major disruptions such as the global pandemic and climate change related weather events.

The latter, including heatwaves, bushfires and floods, can see schools closed for long periods of time, infrastructure destroyed, displacement of children and their families, reduced cognitive ability & function in students, impacts to student and teacher mental health, and reduced future employment outcomes and earning capacity.

With almost two thirds of children attending a government funded school, there is significant pressure on governments to support both mitigation and recovery efforts in the face of an increasingly volatile climate risk environment.

Two thirds of schools are at significant risk from climate change, impacting academic outcomes

The **Zurich-Mandala Climate Risk Index** has been used to analyse the risk of climate change to 9,829 primary and secondary schools across Australia. The index uses IPCC climate modelling along with proprietary climate impact assessments to understand the unique risks faced by individual sites.

The analysis finds that two thirds of Australian schools currently face significant climate risk. Under an intermediate climate scenario assuming 2 degrees Celsius of warming, this is set to rise to 84% of schools by 2060. Under a more extreme (3 degrees) scenario this will rise to 86% of schools.

The Index also finds that climate risk varies significantly by location and levels of socio-educational advantage. Schools in NSW and QLD currently face the highest climate risk, with 92% and 91% of schools in the three highest categories respectively. In terms of advantage, 83% of schools in the lowest decile face high climate risk compared with 58% in the highest (most advantaged) decile.

The Index also reveals that extreme heat has the potential to reduce academic attainment (writing, spelling, grammar & punctuation and numeracy) by over 7% in some parts of the country, with students in the NT and QLD disproportionately impacted.

As a result of reduced attainment, students attending inland schools are found to face significantly poorer future employment outcomes, with students in Katherine, NT most impacted. The analysis also found extreme heat and subsequent reduced attainment could reduce lifetime earnings by 2.2%, which in today’s terms equates to \$73,000 or one year’s average salary.

More should be done to ensure schools are resilient to climate change

In the face of climate change, governments should consider the significant impact natural perils such as extreme heat, flood and bushfire can have on both physical school infrastructure and academic performance.

In particular, governments should consider the impact of extreme heat and natural disasters on academic attainment, future employment prospects and the widening of socio-educational advantage gaps.

Commonwealth and state/territory education funding should be prioritised (in part) with specific regard to the climate risk faced by individual schools and regions.

These funds should be used as a means for achieving physical climate resilience for school infrastructure and the management of support services for school staff and students in the event of climate disasters.



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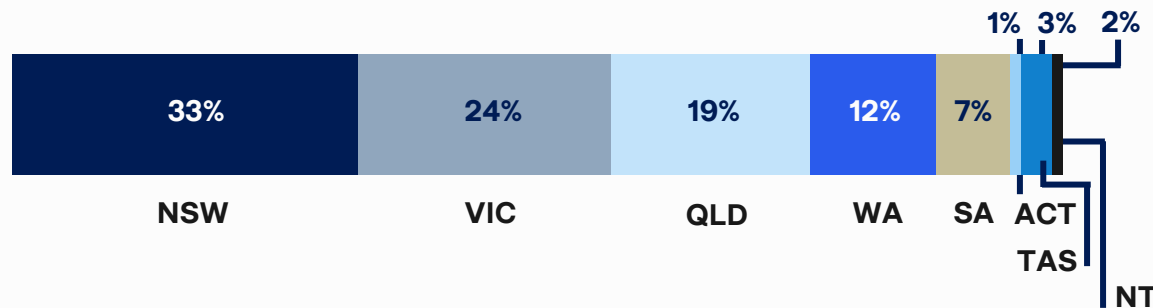
Overview of Australia’s primary and secondary education system

Australia has 9,829 primary and secondary schools (including combined and special needs schools), with a total of 4,129,209 students and 347,411 teaching staff.

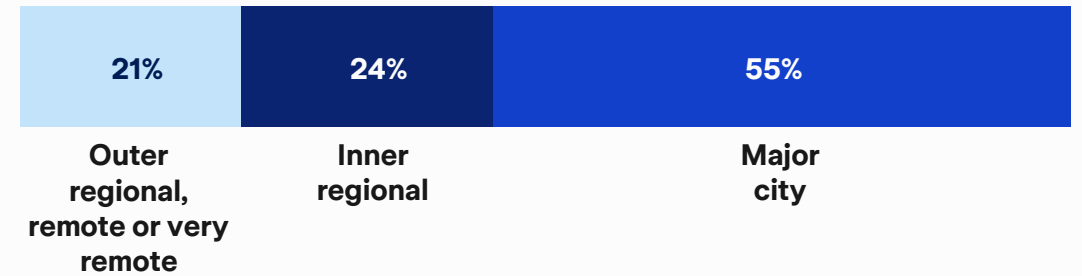
Australia’s primary and secondary education system is categorized into three key sectors: catholic, government and independent (the latter inclusive of private schools). Most of these schools are located in Australia’s eastern states in major cities, but a significant portion (more than one quarter) are located in regional or remote areas across the country

Of these students, 3% are indigenous and 6% come from a non-English speaking background.

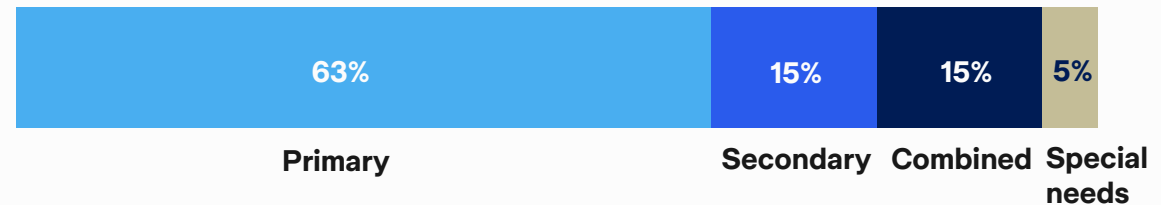
Total number of schools in Australia, split by jurisdiction



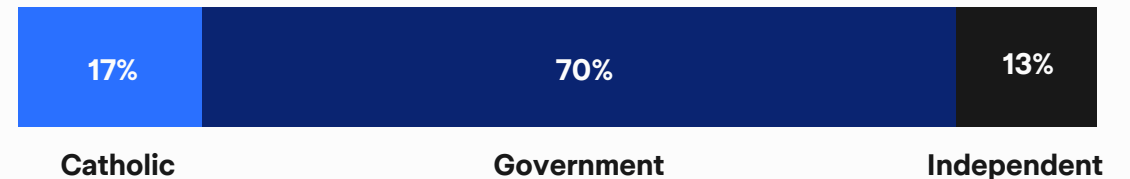
Total number of schools in Australia, split by regionality



Total number of schools in Australia, split by level



Total number of schools in Australia, split by sector

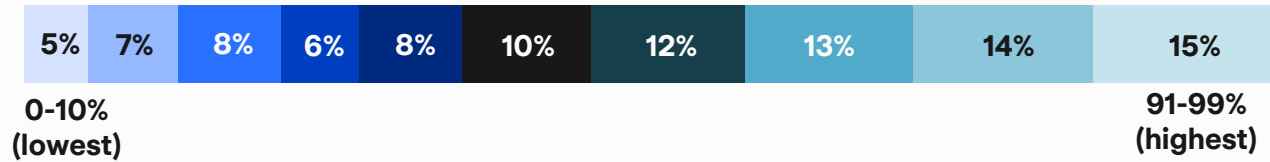


Source: Zurich and Mandala analysis

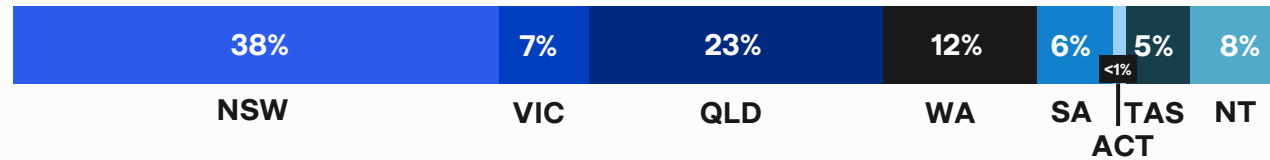
Socio-Educational Advantage in Australia

The Index of Community Socio-Educational Advantage (ICSEA) quantifies the educational advantage of a school by incorporating student factors (parental education and occupation) and school factors (location and percentage of indigenous students). Schools in lower percentiles have a lower advantage and vice versa.

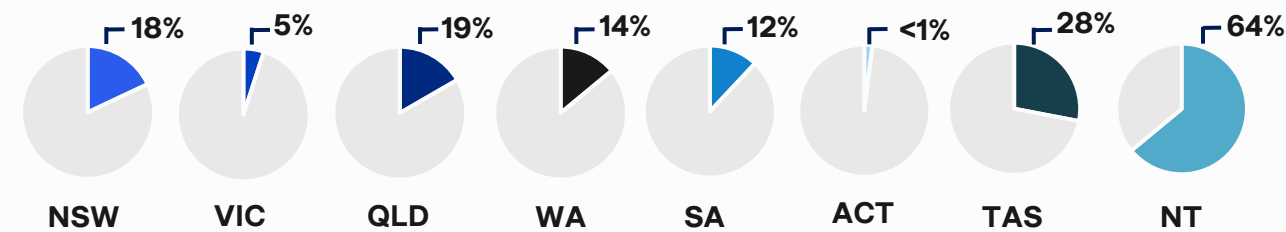
Total number of students in Australia split by school ICSEA* percentile



Total number of schools in Australia with an ICSEA percentile of 15 or less, split by jurisdiction



Total proportion of schools with an ICSEA percentile of 15 or less in each jurisdiction



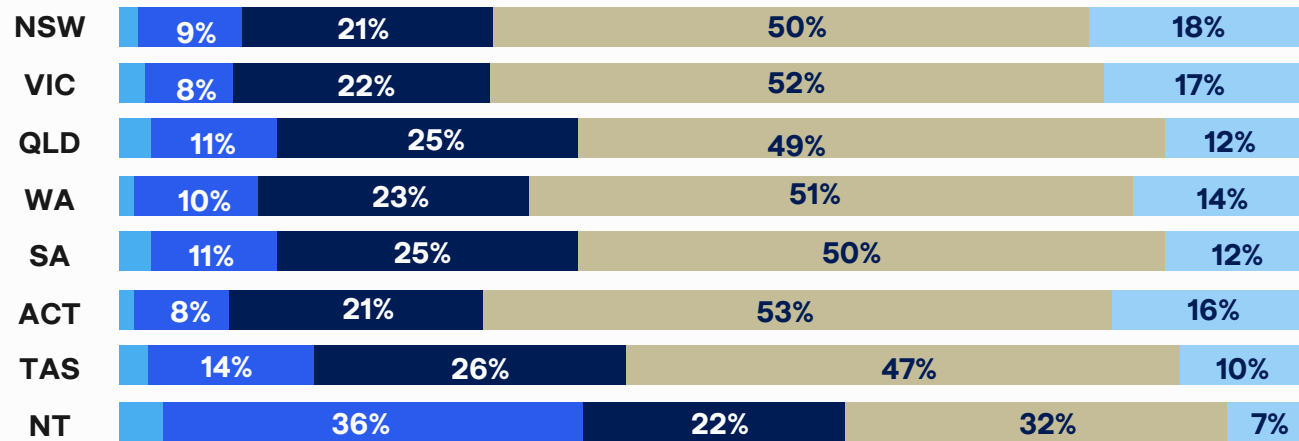
Source: Zurich and Mandala analysis. Source: Australian Curriculum Assessment and Reporting Authority ([ACARA](#))



Academic attainment in Australia

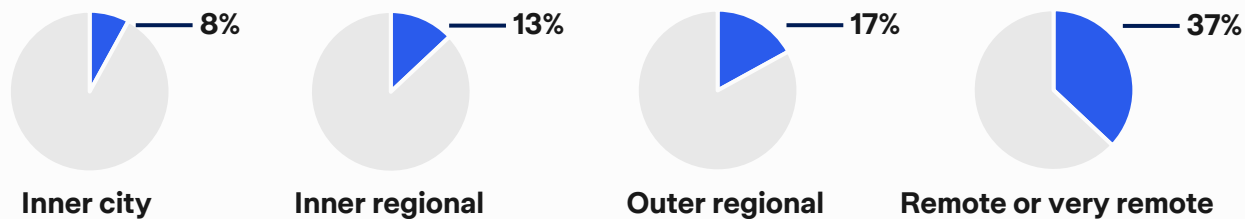
The ‘National Assessment Program – Literacy and Numeracy’ (NAPLAN) is an annual assessment for students in years 3, 5, 7 and 9 across Australia. NAPLAN tests comprise four domains: reading, writing, conventions of language (spelling, grammar and punctuation) and numeracy. The tests do not measure overall school quality.

Average 2024 NAPLAN results across all domains by jurisdiction



■ Exempt ■ Needs support ■ Developing ■ Strong ■ Exceeding

Proportion of students in ‘Needs support’ bracket in 2024, split by regionality



Source: Zurich and Mandala analysis. Source: Australian Curriculum Assessment and Reporting Authority ([ACARA](#))





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Climate change can damage school infrastructure, limit accessibility and negatively impact student & teacher health



DAMAGE TO INFRASTRUCTURE



ACCESSIBILITY



STUDENT AND TEACHER HEALTH

DESCRIPTION

Damage or destruction of school infrastructure such as classrooms, playgrounds, libraries and sporting grounds, which can create physical hazards, impact learning conditions or displace students and teachers.

Essential local infrastructure such as roads and public transport may be disrupted, impacting accessibility to schools. Teachers and/or students may also experience evacuation orders or damage to homes resulting in displacement or homelessness.

Natural disasters can cause anxiety, withdrawal and regression in children, or in severe cases, trauma or Post Traumatic Stress Disorder (PTSD). Students and teachers may also experience physical health issues for example due to reduced air quality or extreme heat.

CASE STUDY

Lismore floods, NSW, 2022

Destruction of schools saw hundreds of students and teachers moved to local sporting clubs, private properties and universities to continue learning. Several schools took years to re-open and others were permanently re-located. Many un-damaged schools were repurposed as emergency accommodation and evacuation facilities in the immediate aftermath.

Cyclone Debbie, QLD, 2017

Floods and landslips obstructed road access to several QLD schools for weeks and months at a time. In other cases, school commute times significantly increased or temporary bus routes needed to be created to reduce accessibility impacts. Many schools had to create temporary learning facilities until access to original campus locations were cleared.

Canberra bushfires, ACT, 2003

A study of students impacted by the Canberra bushfires in 2003 found 12% reported symptoms of PTSD, a further 9% reported severe psychological symptoms and 23% experienced abnormally high levels of stress. Rates were particularly high in younger children.

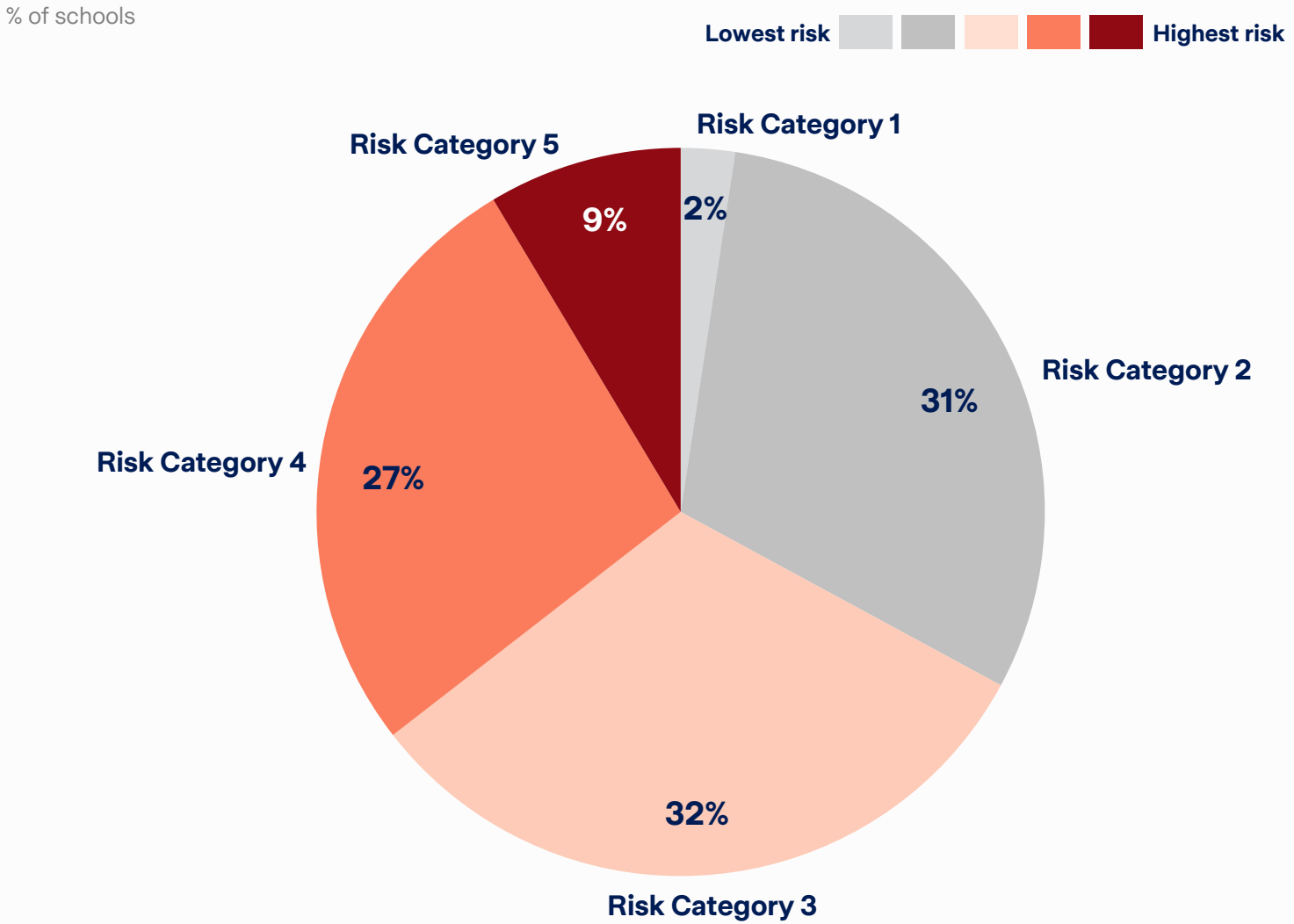
The Index finds over two thirds of Australian schools face considerable risk from the impacts of climate change

The Zurich-Mandala Climate Risk Index finds that currently, 68% of Australian schools fall within the highest three risk categories, meaning they face significant risk from climate perils (such as flood, bushfire or storms). The remainder of sites (33%) face low levels of climate risk. This report will assess schools in risk categories 3, 4, and 5.

Risk categories were determined based on a threshold value for the index calculated for each site.

- **Category 1 (Index value between 0 and 25):** one moderate risk, or multiple minor risks with a low level of impact
- **Category 2 (Index value between 26 and 31):** multiple moderate risks with a high level of impact or multiple moderate or high risks with a low level of impact
- **Category 3 (Index value between 32 and 34):** one very high risk with a very high impact or multiple moderate risks with moderate or high impact
- **Category 4 (Index value between 35 and 40):** multiple high risks with high to very high levels of impact
- **Category 5 (Index value 41 and above):** multiple very high risks with high to very high levels of impact

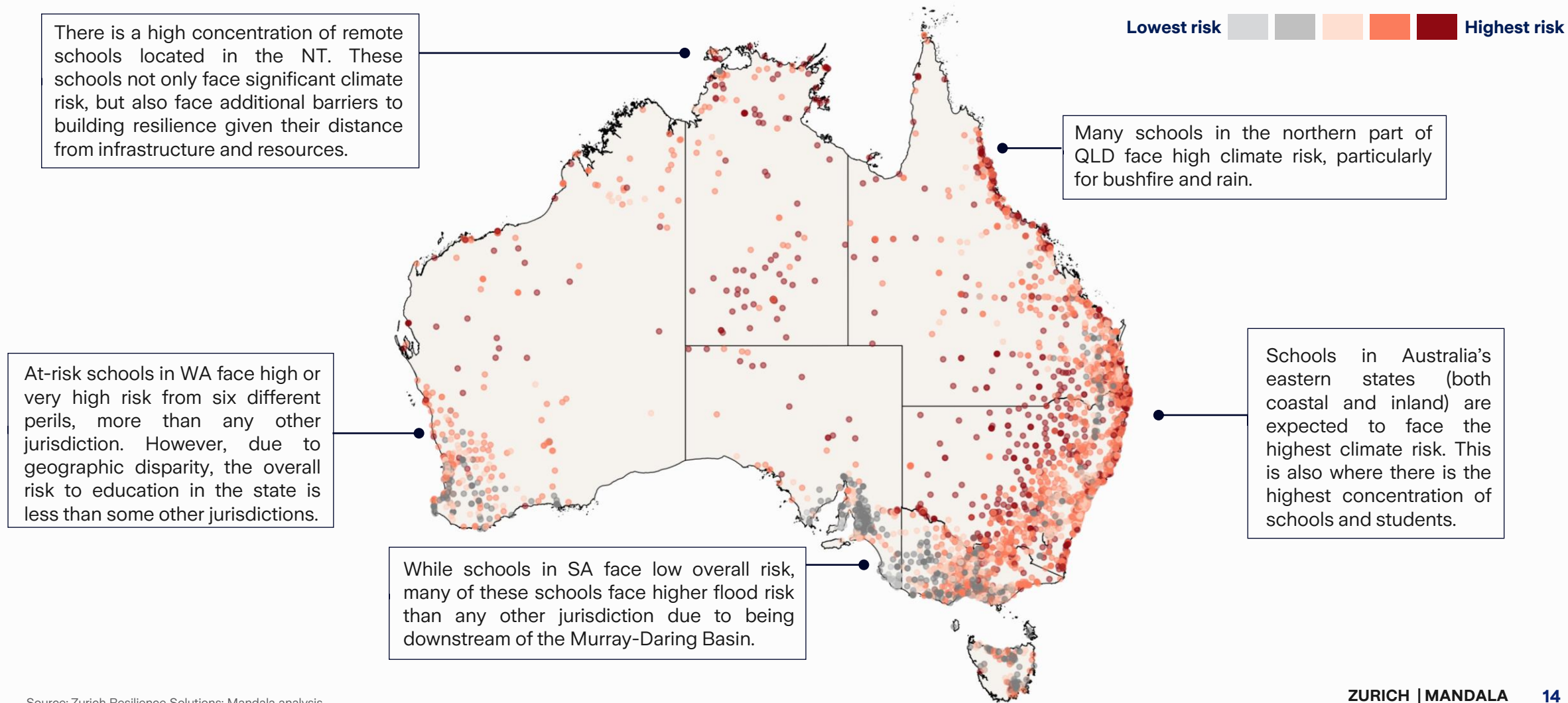
Proportion of schools in each risk category



Note: Numbers might not sum up to a 100% due to rounding. Source: Zurich Resilience Solutions; Mandala analysis.

Climate risk varies significantly for schools across Australia based on location

Schools mapped across Australia with climate risk categories



Bushfire and hail pose the greatest climate risk to Australia’s schools, but each region must adapt to different challenges to improve resilience

Contribution of climate peril to the risk index by region

% of total climate score for each jurisdiction

Lower risk Higher risk

	Flood	Rain	Wind	Storm	Hail	Heat	Drought	Bushfire	Explanation
AUS	13%	16%	4%	10%	16%	12%	8%	20%	Across Australia as a whole, bushfire, hail and rain create the most significant volume of risk, followed by heat and flood.
NSW	12%	20%	4%	10%	17%	11%	8%	18%	Schools in NSW have high rain risk because of the density in coastal locations. Dry vegetation also makes some schools susceptible to bushfires.
VIC	14%	9%	5%	10%	20%	11%	11%	20%	Parts of VIC exist in the ‘hail belt’ and the state’s heat, dry vegetation and strong winds make many schools in the state susceptible to bushfires.
QLD	13%	21%	4%	10%	15%	11%	7%	20%	QLD schools are prone to higher instances of rain due to the tropical climate, and bushfires due to the state’s high temperatures.
WA	13%	12%	4%	11%	12%	18%	7%	23%	WA’s high temperatures and large bushland areas make schools in this region most at risk of bushfire and heat.
SA	15%	9%	4%	12%	14%	14%	10%	22%	Many SA schools are at risk of flooding due to the state being downstream of the Murray-Darling basin, Australia’s largest river system.
TAS	13%	13%	6%	11%	13%	10%	8%	26%	Approximately 98% of TAS is bushfire prone despite its cooler temperatures compared to mainland Australia. For this reason, schools in the state face very high fire risk.
ACT	12%	12%	3%	9%	22%	9%	9%	23%	The ACT’s lengthy summers and location in the ‘hail belt’ make many of its schools susceptible to bushfires and hail.
NT	12%	17%	4%	9%	10%	17%	6%	26%	The NT is more at risk to bushfire and heat due to its geographic position and rain due to its wet seasons.

Source: Zurich Resilience Solutions; Mandala analysis. Tasmania Fire Service, [2024](#).

New South Wales and Queensland have the highest volume of schools facing climate risk

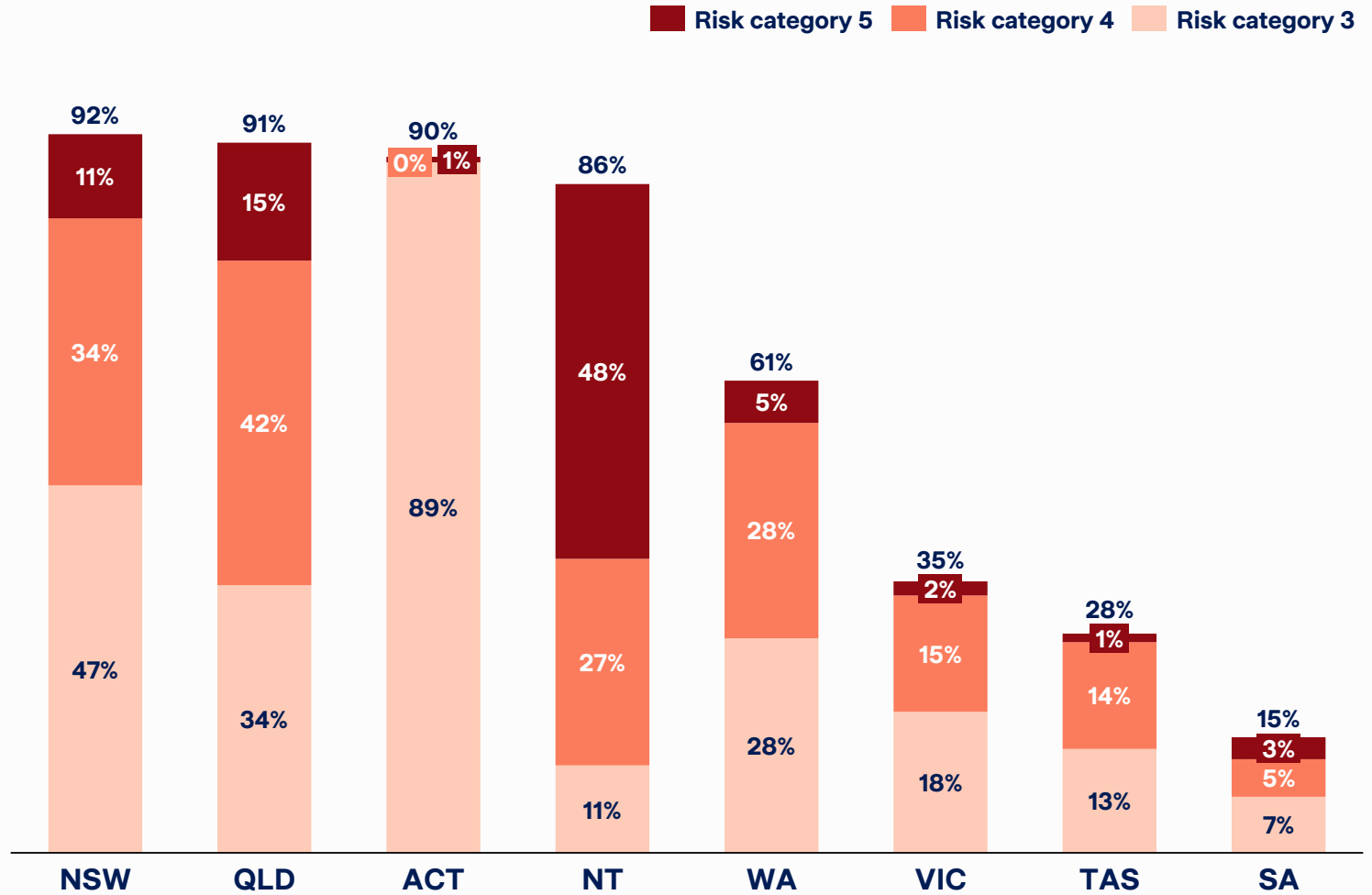
92% of schools in NSW and 91% of schools in QLD are in Risk Category 3 or above. Both jurisdictions experience risk from similar perils (rain, hail and high temperatures). The climate risk for schools in QLD is more severe, however, with 42% of schools in Risk Category 4 and 15% of schools in Risk Category 5.

The ACT and the NT also have a high volume of schools in the three highest categories, at 90% and 86% respectively. However, almost all at-risk schools in the ACT are in risk category 3, whereas nearly half of all schools in the NT are in risk category 5. This level of risk in the NT can be attributed to its high temperatures in the summer months.

Schools in Australia’s southern states, including VIC, TAS and SA face more moderate risk levels compared to other jurisdictions.

Climate risk to school by state or territory

% of schools in risk category 3 to 5; risk category 1 and 2 not displayed.



Source: Zurich Resilience Solutions; Mandala analysis.

Government primary schools face the highest climate risk, while Catholic primary schools face the lowest

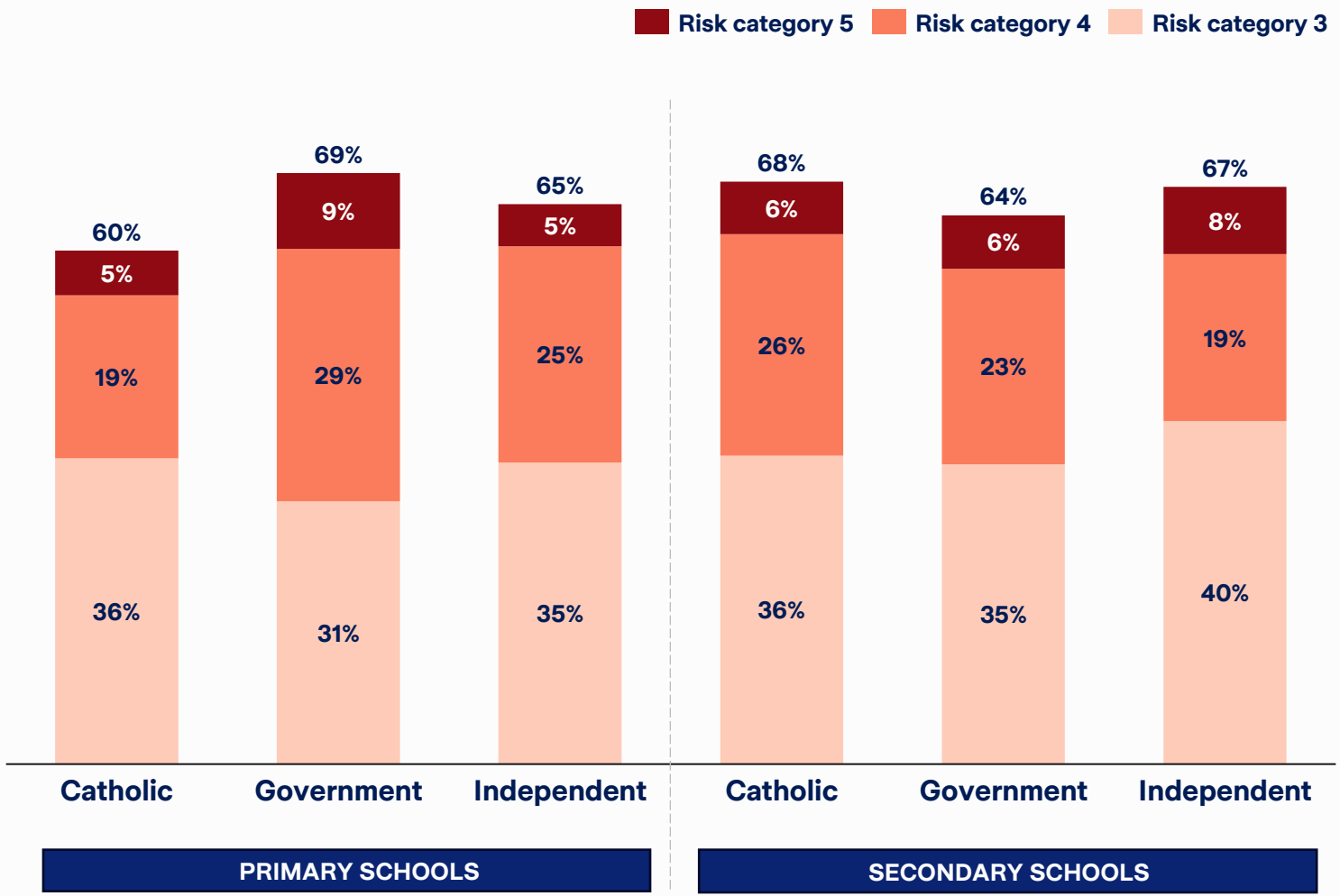
69% of government primary schools fall into Risk Category 3 or above. Of these schools, 38% are in Risk Category 4 and 5. This is particularly significant given government primary schools are often used as community safety, evacuation and shelter locations during climate crisis events such as bushfires and floods.

Conversely, 60% of Catholic primary schools are in Risk Category 3 or above, the smallest proportion out of all school sectors.

For secondary schools, Catholic schools are most at risk, with 68% in the highest three categories. This is followed by independent schools at 67%.

Climate risk by school sector

% of schools in risk category 3 to 5; risk category 1 and 2 not displayed



Source: Zurich Resilience Solutions; Mandala analysis.

Schools with lower Socio-Educational Advantage face greater climate risk

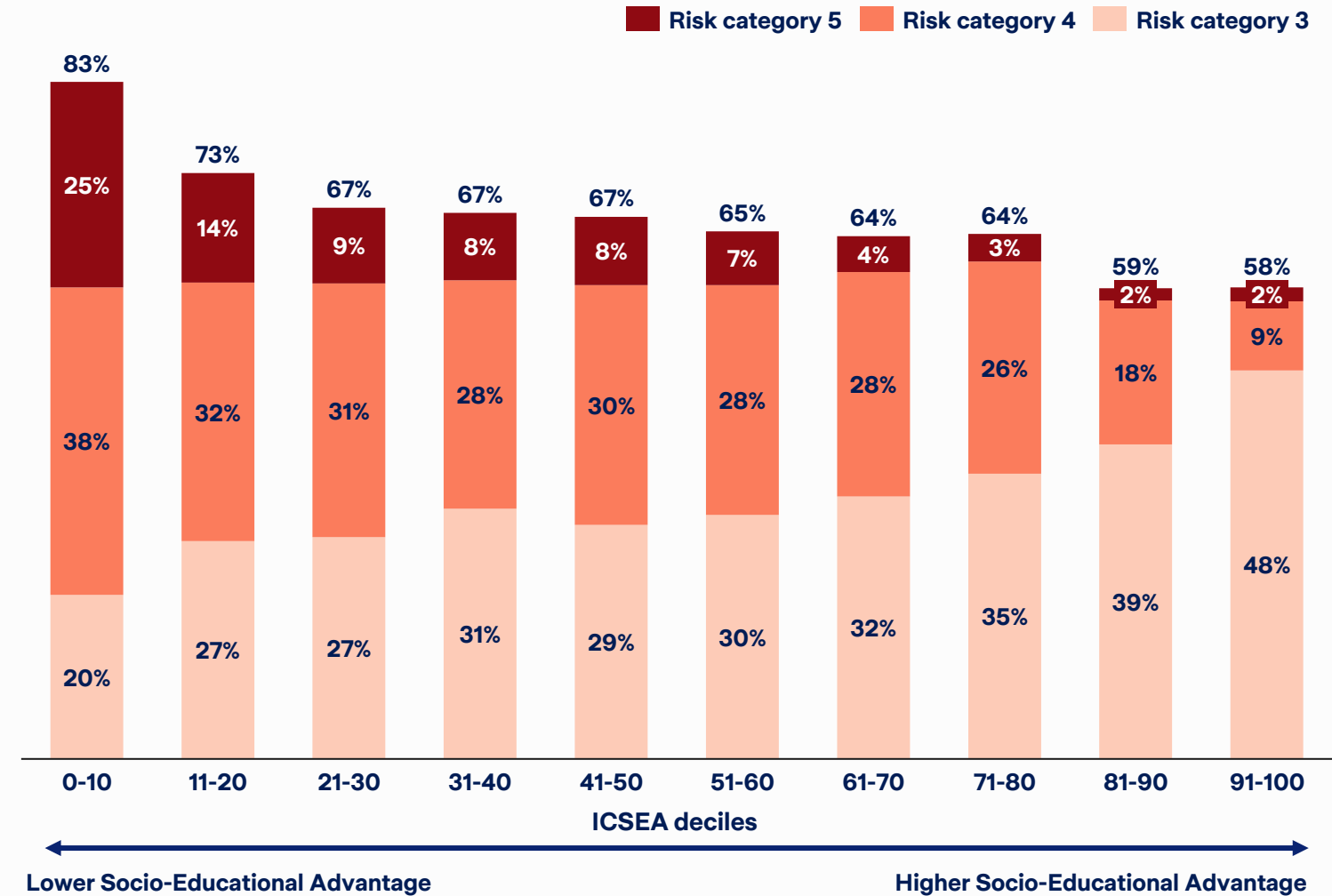
The Index of Community Socio-Educational Advantage (ICSEA) ranks schools across Australia comparatively by percentiles. ICSEA is a standardised metric used to measure the socio-educational backgrounds of a school's students, with percentiles indicating the school's relative advantage or disadvantage on a national scale. Schools with lower ICSEA percentiles are more disadvantaged than schools with higher percentiles.

According to the Index, schools with lower ICSEA percentiles face far higher climate risk. For example, 83% of schools with ICSEA percentiles between 0 and 10 are in the highest three categories (with 25% in the highest category), compared to 58% of schools with ICSEA percentiles of 91-100 (with only 2% in the highest category).

Given the significantly negative impact that extreme weather can have on educational attainment (particularly extreme heat and natural catastrophe events), climate change may further exacerbate the existing educational divide.

Climate risk by ICSEA deciles

% of schools in risk category 3 to 5; risk category 1 and 2 not displayed.



Source: Zurich Resilience Solutions; Mandala analysis.

Of the ten most at-risk schools in Australia, most are government schools with low Socio-Educational Advantage facing high bushfire and flood risk

Top 10 schools in Australia by climate risk impact score

Rank	School	Total score	State	ICSEA percentile	School level	Category	Climate Risk Impact Score							
							Flood	Rain	Wind	Storm	Hail	Heat	Drought	Bushfire
1	St Therese's Community Parish School, Wilcannia	63	NSW	3	Primary	Catholic	16	4	1	6	4	12	4	16
2	St Francis Xavier Catholic School, Daly River	57	NT	1	Combined	Catholic	16	8	2	3	4	6	2	16
3	Areyonga School, Areyonga	57	NT	0	Combined	Government	16	6	1	3	4	12	3	12
4	Towamba Public School, Towamba	56	NSW	11	Primary	Government	16	8	2	3	8	3	4	12
5	Wyong Christian Community School, Wyong	56	NSW	74	Combined	Independent	16	8	2	6	6	3	3	12
6	Thargomindah State School, Thargomindah	56	QLD	3	Primary	Government	8	6	1	6	4	12	3	16
7	Katherine South Primary School, Katherine	56	NT	11	Primary	Government	12	6	1	3	4	12	2	16
8	Orama Public School, Thora	55	NSW	37	Primary	Government	16	8	1	3	6	3	2	16
9	Wonga Beach State School, Wonga Beach	55	QLD	18	Primary	Government	8	8	3	12	4	6	2	12
10	Robinson River School, Robinson River	55	NT	1	Combined	Government	12	8	1	6	4	6	2	16

Lower risk Higher risk

Source: Zurich Resilience Solutions; Mandala analysis.

The risk-profile of Australian schools is set to worsen over time

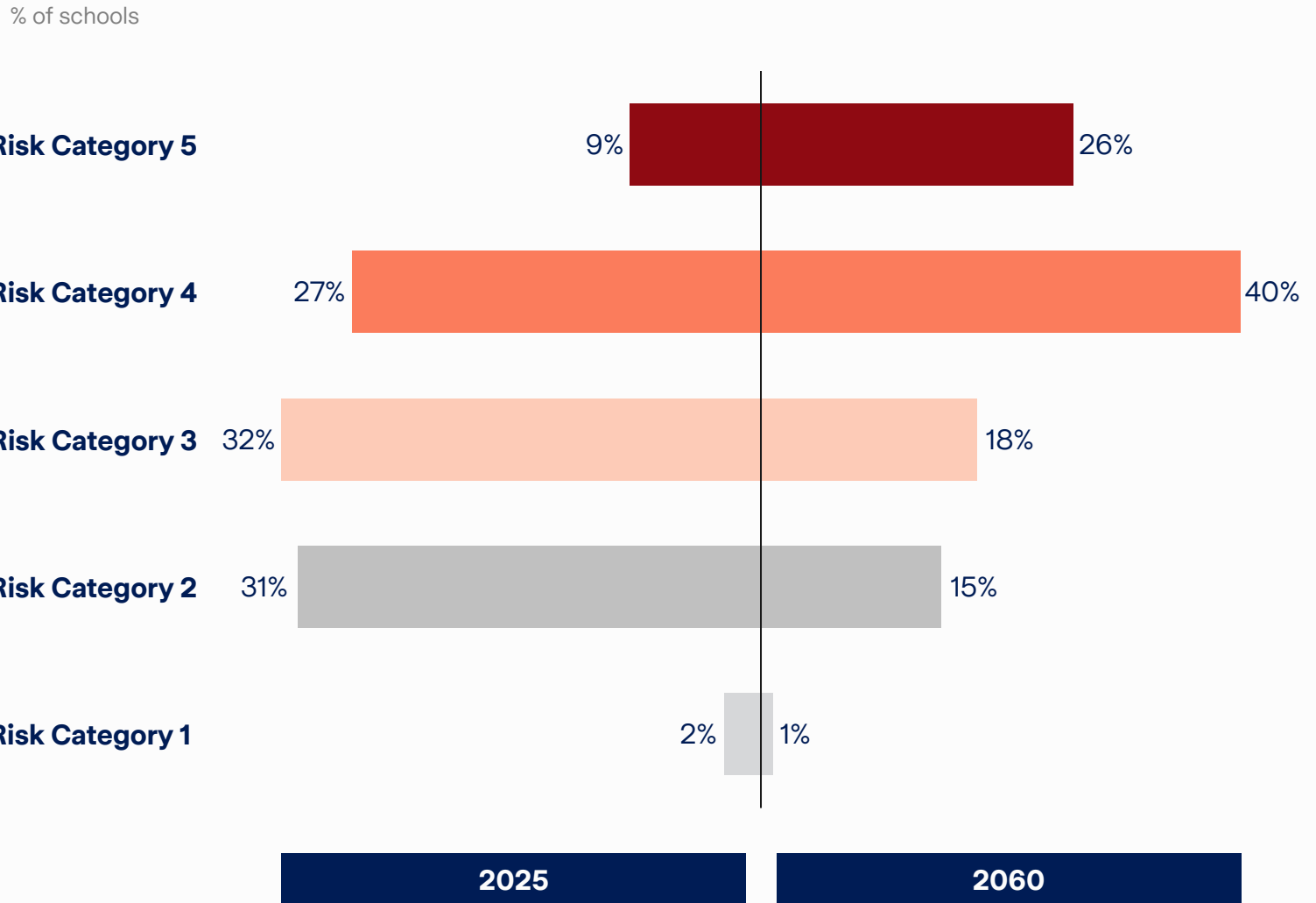
Under the Intergovernmental Panel on Climate Change (IPCC) SSP2-4.5 climate scenario, Australian schools will face greater climate risk over time.

SSP2-4.5 is an intermediate scenario for climate risk that assumes 2 degrees Celsius of warming by 2041-2060. It is considered the most likely climate scenario over the near/mid-term given current and committed climate actions.

In the 35 years from 2025 to 2060, the proportion of Australian schools in the three highest climate risk categories will rise from 68% to 84%. Sites in the highest three risk categories are likely to face significant risk from multiple perils with a high impact on student outcomes.

Under the more severe SSP5-8.5 climate scenario, which assumes little or no climate action and up to three degrees of warming by 2041-2060, 13% of schools will see an increase in risk between 2025 and 2060. Under this scenario, 86% of all schools will be in Risk Category 3 or above by 2060.

Exhibit 11: Proportion of schools in each risk category over time under SSP2-4.5



Note: Numbers might not sum up to a 100% due to rounding.
Source: Zurich Resilience Solutions; Mandala analysis.

There are several resilience solutions that can reduce climate risk for schools

Extreme heat

Using a combination of ventilation and air conditioning is most effective in combatting extreme heat in classrooms. However, grid instability during heatwaves or extreme weather conditions may compromise the reliability of energy supply. This makes the use of additional cooling methods important. Green spaces, trees and installation of shading on school grounds can significantly reduce ambient temperatures. Misting stations are another effective cooling method for outdoor spaces. Use of light colours (on walls and playground surfaces, for example) can also be effective. Providing students with adequate access to water, and on particularly hot days, providing breaks from learning and reducing outdoor activity, can also assist in reducing negative impacts on learning.

Bushfire

Ensure the school has robust fire management and evacuation plans, including early fire brigade notifications, building evacuation plans and up-to-date contact details for students' next of kins. Ensure gutters in school buildings are regularly cleared. Reduce density and proximity of bushland near school buildings, including trimming trees and shrubs, keeping lawns well maintained and removing any debris. Schools can also install fire protection mechanisms, including mesh screens and seals on windows and doors. Any combustible infrastructure should be covered or replaced. In the aftermath of a bushfire, schools should consider ongoing support for students beyond the initial response to reduce mental health impacts.

Source: Zurich Resilience Solutions





There are several resilience solutions that can reduce climate risk for schools

Heavy precipitation or flood

Effective flood risk management plans (including evacuation route mapping) and use of flood resistant materials in construction of schools can reduce impact in the event of a flood and help with recovery. Raising critical facilities off the ground and out of basement levels to improve ventilation for excess moisture during high rain or flood events. Installing adequate drainage, particularly for fields, ovals and playgrounds, backflow prevention devices for drainage systems and checking maintenance of roofing and windows for watertightness. During significant flooding events, offering support to students beyond the initial response phase (such as wellbeing and educational assistance) can be critical for reducing mental health impacts.

Storm, wind or cyclone

Effective mitigation of storm, wind and hail risk can be achieved through maintenance and construction, such as securing roof fixtures, updating lighting and signage, trimming overhanging trees and clearing blocked drains. Air conditioning systems, electrical equipment and fire protection systems should also receive annual maintenance.

During a major event or cyclone, a school may experience severe flooding in addition to winds. As with bushfires and floods, it is important to recognise the potential mental health impact on students, teachers and families and provide adequate support.



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Climate change can significantly impact academic attainment

Natural disasters

During a natural disaster, children can experience significant reduction in memory and concentration or in cases of trauma or PTSD, changes to attention, memory, processing, and executive skills.

Damage to school and/or local infrastructure can result in lost learning days or reduced learning effectiveness. Students facing temporary displacement or homelessness may also experience impacts to attendance and learning capacity.

Following the Black Saturday Bushfires (VIC, 2009), a study was conducted to measure the academic impact of the event on 24,000 primary students in the years following. The study found that expected academic gains across reading and numeracy were reduced between year 3 and year 5 exams when students faced higher levels of bushfire impact.

Extreme heat

High classroom temperatures can slow children's cognitive ability and cognitive function, impairing the way students make decisions and process and retain information.

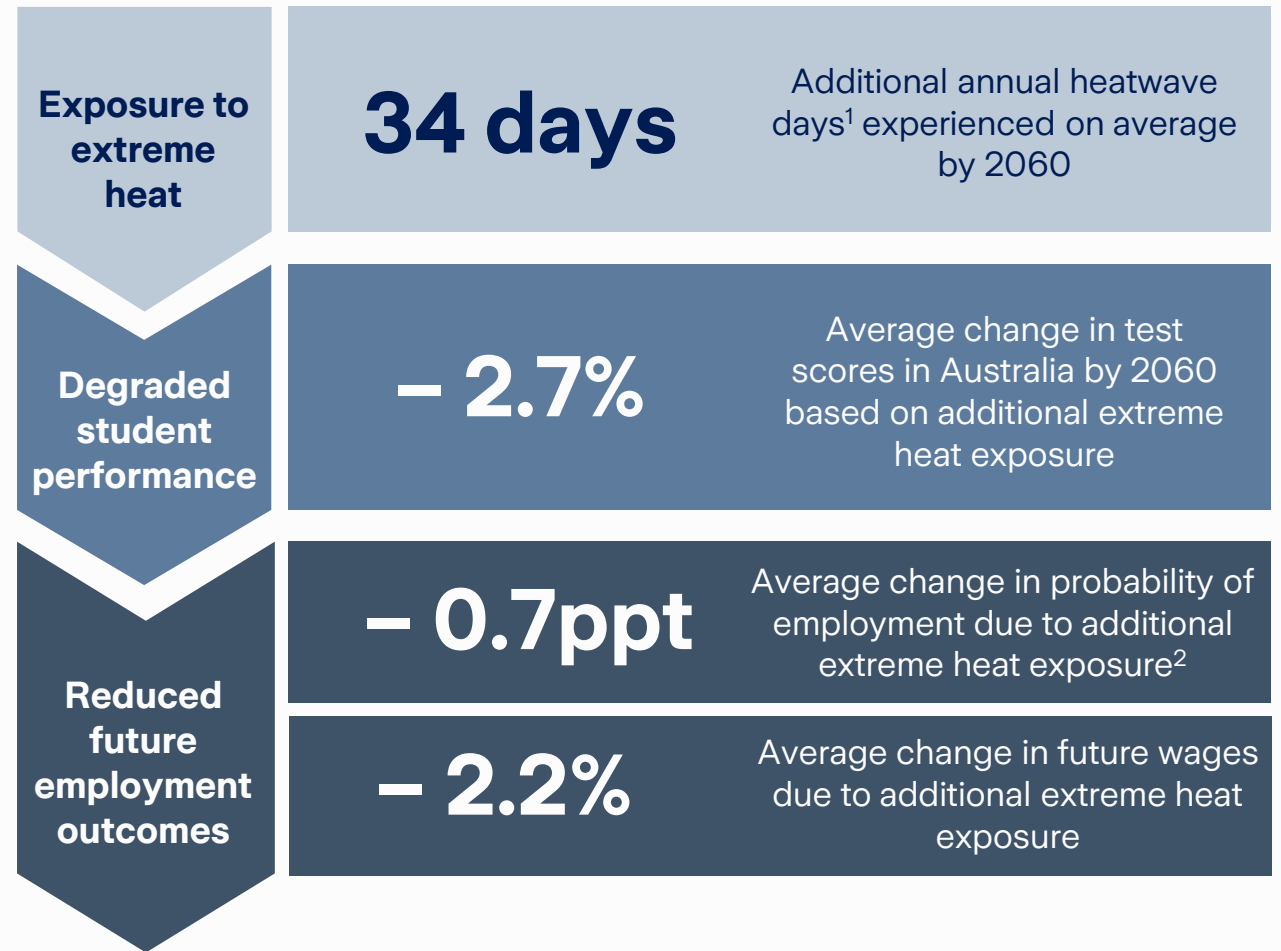
A comprehensive study of more than 10 million American students found that for the average student, a sustained increase in temperature of 2 degrees Celsius lowers achievement gains by approximately 7% of an average year's worth of learning.

Extreme heat can also reduce the amount of time children spend outdoors for recess, lunch and sport – activities which promote physical and mental health and stimulate the development of cognitive and social abilities. See further break down on heat in next slide.





Understanding the impact of extreme heat on Australian student outcomes by 2060



¹ Defined as a day with a maximum temperature of at least 34°C. We assume that the maximum temperature is at least 34°C on heatwave days. ² Productivity Commission (2014) *Literacy and numeracy skills and labour market outcomes in Australia*. Source: Cho, H. (2017) *The effects of summer heat on academic achievement: A cohort analysis*; Mandala analysis.

Exposure to extreme heat could reduce academic attainment by over 7% in some parts of Australia by 2060

The impact of exposure to extreme heat on student academic attainment by jurisdiction in Australia

% average change in NAPLAN scores by 2060

Lower impact    Higher impact

Subject	Australia	NSW	VIC	QLD	WA	SA	ACT	TAS	NT
Writing	-2.4%	-2.3%	-1.7%	-3.3%	-2.6%	-2.0%	-2.2%	-1.8%	-5.0%
Spelling	-2.3%	-2.2%	-1.7%	-3.2%	-2.5%	-1.9%	-2.2%	-1.8%	-4.9%
Grammar and punctuation	-2.7%	-2.6%	-1.9%	-3.7%	-2.9%	-2.3%	-2.5%	-2.1%	-5.8%
Numeracy	-3.5%	-3.4%	-2.6%	-4.8%	-3.8%	-3.0%	-3.2%	-2.7%	-7.2%
Average across all subjects	-2.7%	-2.6%	-2.0%	-3.9%	-3.0%	-2.3%	-2.5%	-2.1%	-5.7%

Note: Cho, H. (2017) does not find a statistically significant impact of exposure to extreme heat on reading test scores.
 Source: Cho, H. (2017) *The effects of summer heat on academic achievement: A cohort analysis.*

Students attending inland Australian schools are at greater risk of reduced future employment outcomes due to extreme heat

The risk of poorer future employment outcomes for students due to exposure to extreme heat varies significantly by Local Government Area (LGA).

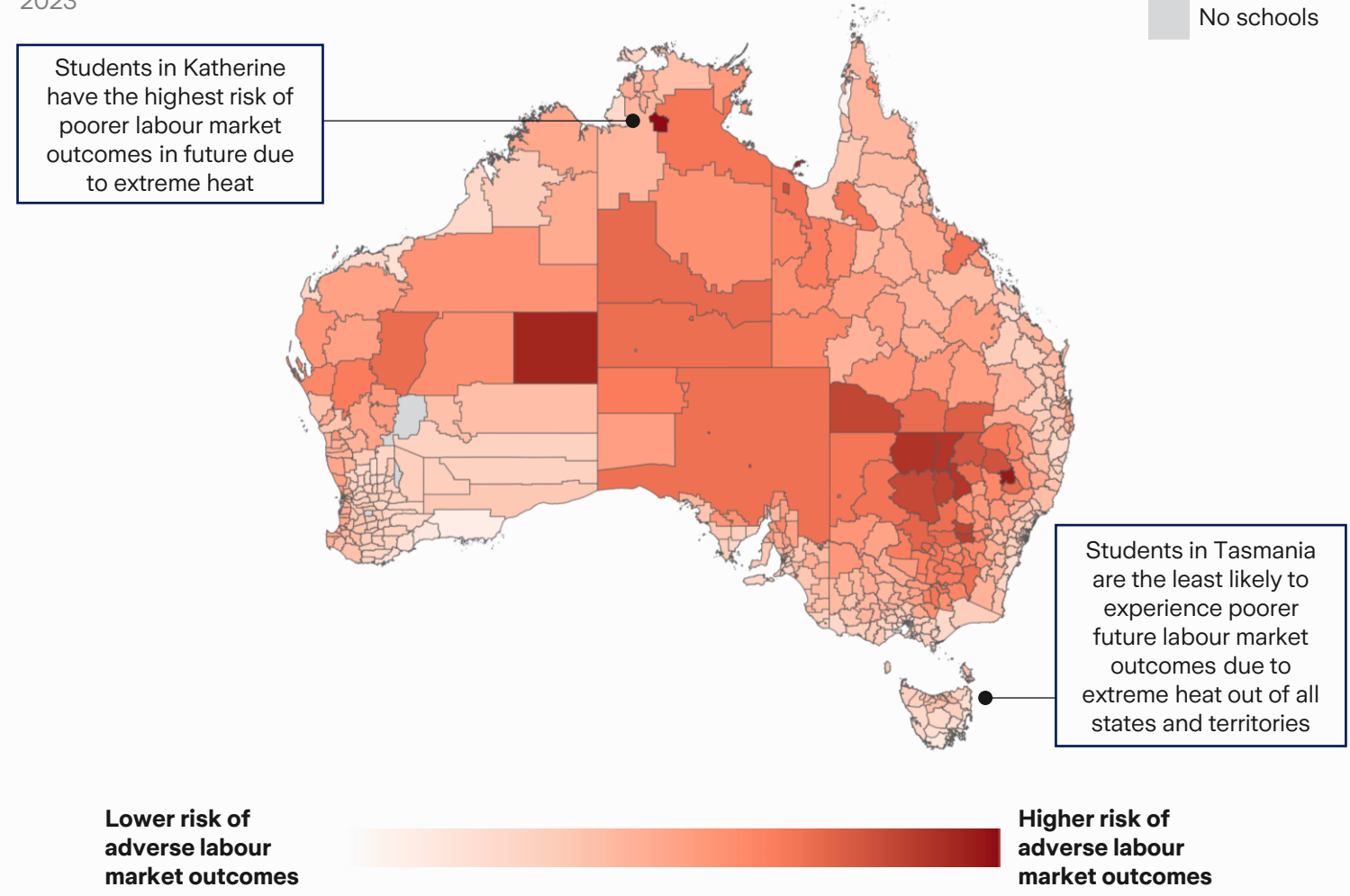
Students attending school in inland LGAs are significantly more likely to experience adverse labour market outcomes in the future as a result of extreme heat, with students in Katherine in the NT facing the highest risk in the country.

Conversely, the length and severity of heatwaves tend to be shorter in southern LGA's, meaning students in these areas are less likely to have reduced labour market outcomes in the future.

Across states and territories, Tasmanian students have the lowest risk of poorer future labour market outcomes due to their low exposure to extreme heat. Conversely, students in the Northern Territory have the highest risk.

Risk of lower employment outcomes due to extreme heat by LGA

2023



Source: Zurich Resilience Solutions; Mandala analysis.

Extreme heat could reduce the lifetime earnings of a student by \$73,000, equivalent to one year’s average salary

Extreme heat exposure reduces student learning capacity, impacting future productivity and wages over the individual’s working life.

Based on the intermediate IPCC SSP2-4.5 scenario, which assumes 2 degrees Celsius of warming by 2041-2060, the average Australian student could experience an additional 34 days of exposure to extreme heat per year by 2060.

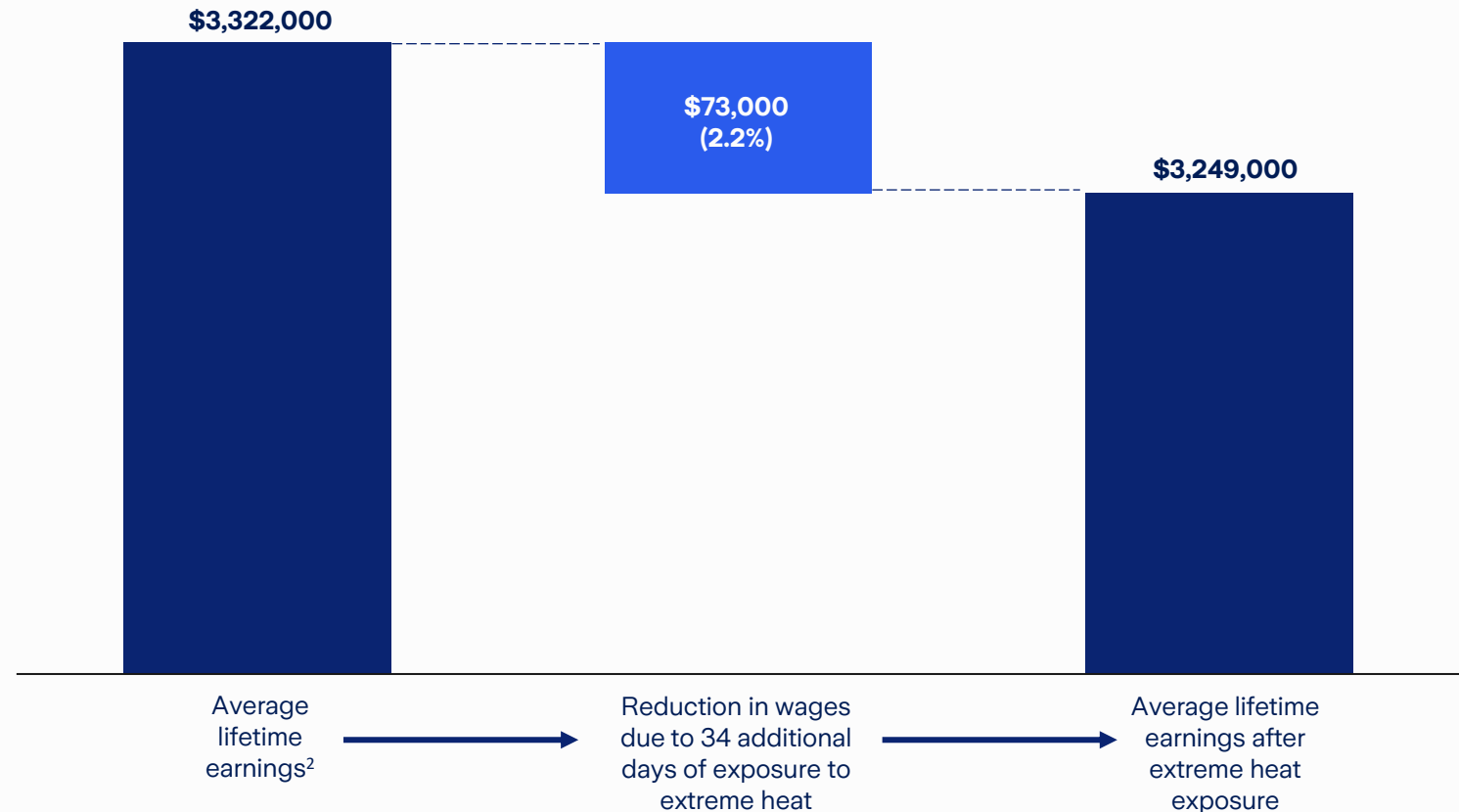
This additional exposure could reduce future lifetime earnings by 2.2% compared to the average student today.

In today’s terms (based on average lifetime earnings in 2023), this could equate to a \$73,000 reduction in lifetime earnings, the equivalent of foregoing one year of employment.¹

¹ ABS (2024) *Personal Income in Australia*.

Impact of extreme heat on lifetime earnings of students

\$ impact, 2023 terms



² Average of the lifetime earning between men and women based on research from The Centre for Future Work at the Australia Institute ([March 2023](#))
Source: Mandala analysis



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Appendix

State-by-state analysis

NEW SOUTH WALES

VICTORIA

QUEENSLAND

WESTERN AUSTRALIA

SOUTH AUSTRALIA

TASMANIA

AUSTRALIAN CAPITAL TERRITORY

NORTHERN TERRITORY





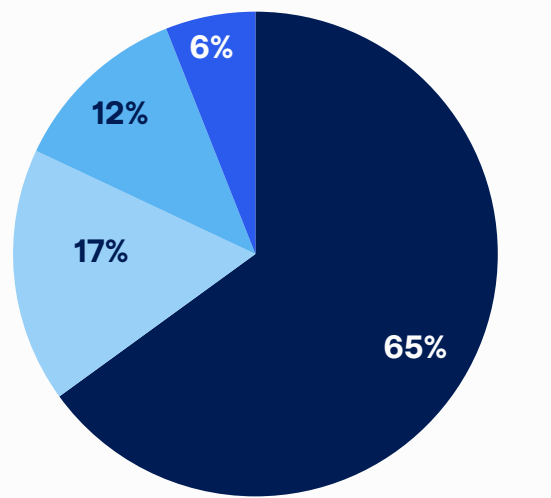
NSW has 3,219 schools, with the majority being government primary schools in major cities

Number of schools in NSW by school level, education sector, and regionality

Count of schools (2023)

School level

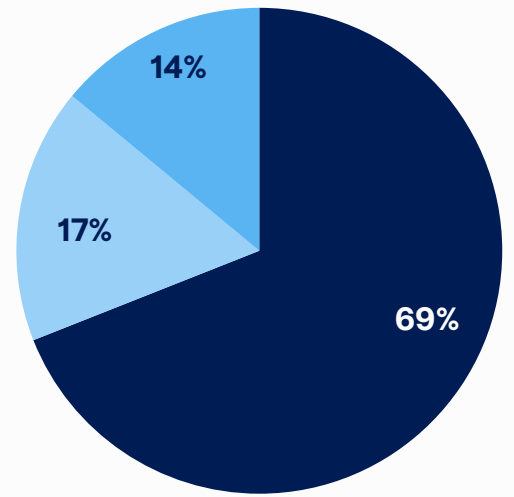
The majority of schools in NSW are primary schools, followed by secondary and combined schools.



- Primary
- Secondary
- Combined
- Special needs

Education sector

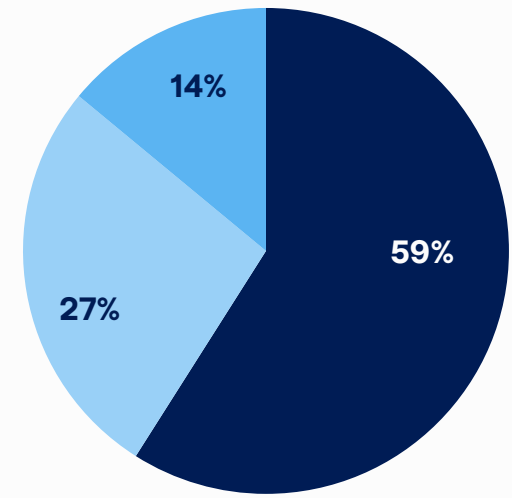
The composition of schools in NSW is relatively similar to the national average.



- Government
- Catholic
- Independent

Regionality

Nearly 60% of schools in NSW are in major cities, with the remainder attending school in regional, remote or very remote locations.



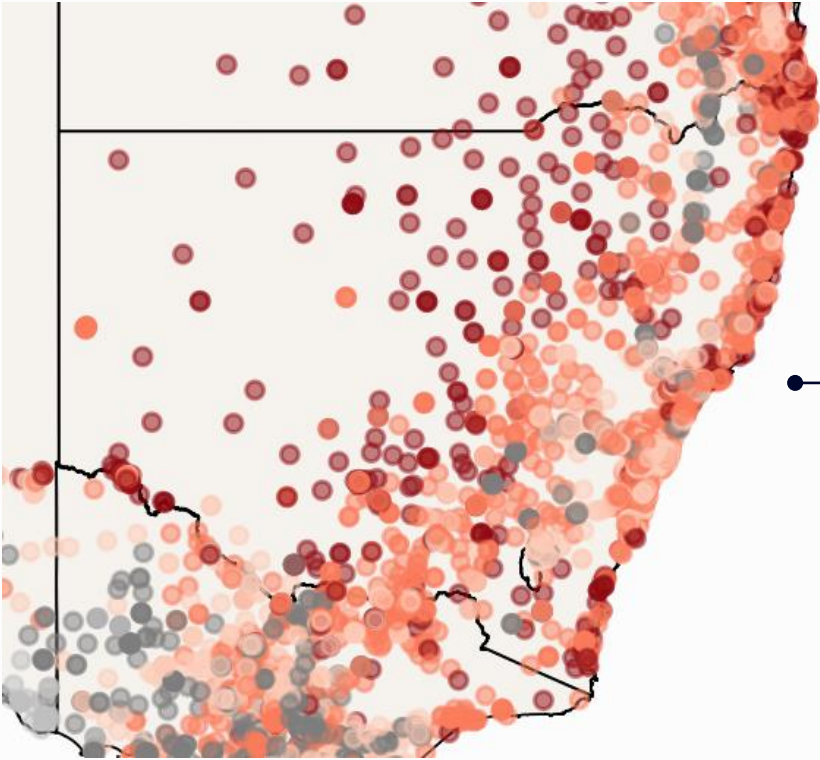
- Major cities
- Outer regional, remote, very remote
- Inner regional

Source: ACARA, 2023.

92% of schools in New South Wales face significant climate risk, with bushfire, rain and hail the most material perils

Schools mapped across NSW with climate risk categories

Lowest risk  Highest risk



NSW has the highest volume of schools facing significant climate risk in the country, with 92% in the highest three risk categories including 45% in the highest two categories.

Rain poses the greatest risk (impacting 20% of schools) due to the density of schools located in coastal areas. Bushfire is also a significant risk due to the number of schools in regional areas where there is a high degree of dry vegetation.

Source: Zurich Resilience Solutions; Mandala analysis.

Schools most at-risk from climate perils in NSW

Top 10 schools in NSW by climate risk impact score

														Lower risk			Higher risk
Rank	School	Total score	ICSEA percentile	School level	Category	Flood	Rain	Wind	Storm	Hail	Heat	Drought	Bushfire				
1	St Therese's Community Parish School, Wilcannia	63	3	Primary	Catholic	16	4	1	6	4	12	4	16				
2	Towamba Public School, Towomba	56	11	Primary	Government	16	8	2	3	8	3	4	12				
3	Wyong Christian Community School, Wyong	56	74	Combined	Independent	16	8	2	6	6	3	3	12				
4	Orama Public School, Thora	55	37	Primary	Government	16	8	1	3	6	3	2	16				
5	Condong Public School, Condong	53	23	Primary	Government	12	8	1	9	6	3	2	12				
6	Menindee Central School, Menindee	53	2	Combined	Government	12	4	1	3	4	9	4	16				
7	Coffs Harbour Senior College, Coffs Harbour	52	62	Secondary	Government	8	8	1	6	8	3	2	16				
8	Wyong Creek Public School, Wyong Creek	52	45	Primary	Government	16	8	1	3	6	3	3	12				
9	Repton Public School, Repton	52	38	Primary	Government	12	8	1	6	8	3	2	12				
10	Tea Gardens Public School, Tea Gardens	52	15	Primary	Government	4	8	1	12	6	3	2	16				

Source: Zurich Resilience Solutions; Mandala analysis.

Exposure to extreme heat could reduce academic attainment by close to 6% in parts of NSW by 2060

The impact of exposure to extreme heat on student academic attainment by regionality in NSW

% average change in NAPLAN scores by 2060

Lower impact Higher impact

Subject	NSW	Major cities	Inner regional	Outer regional	Remote	Very remote
Writing	-2.3%	-2.0%	-2.4%	-2.8%	-3.7%	-3.8%
Spelling	-2.2%	-2.0%	-2.4%	-2.7%	-3.4%	-4.0%
Grammar and punctuation	-2.6%	-2.3%	-2.7%	-3.2%	-4.1%	-4.4%
Numeracy	-3.4%	-3.0%	-3.6%	-4.2%	-5.4%	-5.9%
Average across all subjects	-2.6%	-2.3%	-2.8%	-3.2%	-4.2%	-4.5%

Note: Cho, H. (2017) does not find a statistically significant impact of exposure to extreme heat on reading test scores.
 Source: Cho, H. (2017) *The effects of summer heat on academic achievement: A cohort analysis*; Zurich Resilience Solutions; Mandala analysis.

Case studies: The impact of extreme heat on academic attainment in NSW

The impact of exposure to extreme heat on student academic attainment by regionality in NSW

% average change in NAPLAN scores by 2060

Lower impact    Higher impact

The King's School, North Paramatta

Number of students: 2,137
Number of teachers: 218
Sector: Independent
Regionality: Major city
ICSEA percentile: 97

Subject	Attainment change
Writing	-1.9%
Spelling	-1.9%
Grammar & punctuation	-2.1%
Numeracy	-2.7%

James Ruse Agricultural High School, Carlingford

Number of students: 849
Number of teachers: 55
Sector: Government
Regionality: Major city
ICSEA percentile: 99

Subject	Attainment change
Writing	-1.7%
Spelling	-1.3%
Grammar & punctuation	-1.5%
Numeracy	-2%

St Therese's Community Parish School, Wilcannia

Number of students: 74
Number of teachers: 5
Sector: Catholic
Regionality: Very remote
ICSEA percentile: 3

Subject	Attainment change
Writing	-3%
Spelling	-4.5%
Grammar & punctuation	-6.4%
Numeracy	-5.4%

State-by-state analysis

NEW SOUTH WALES

VICTORIA

QUEENSLAND

WESTERN AUSTRALIA

SOUTH AUSTRALIA

TASMANIA

AUSTRALIAN CAPITAL TERRITORY

NORTHERN TERRITORY



VIC has 2,322 schools, with the majority being government primary schools in major cities

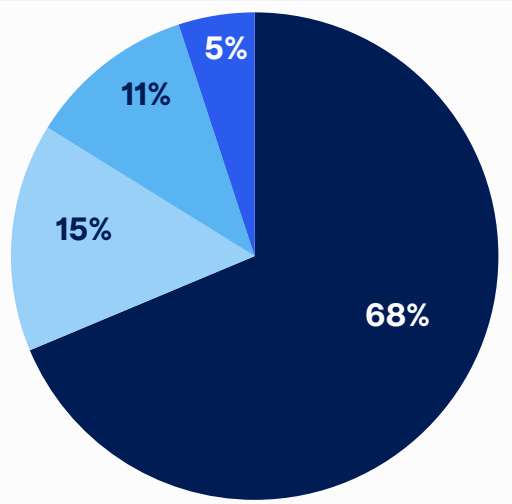


Number of schools in VIC schools by school level, education sector, and regionality

Count of schools (2023)

School level

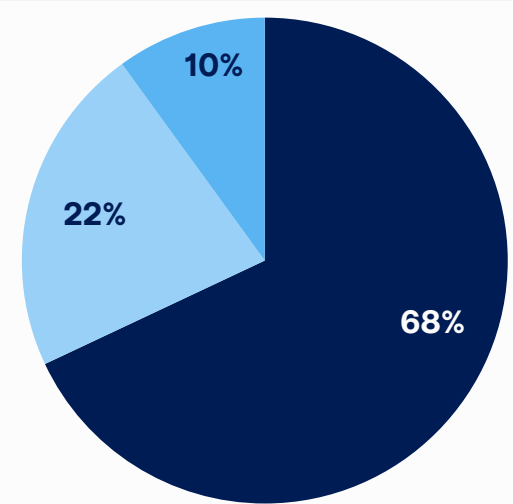
Like other large states, most schools in VIC are primary schools. This is followed by secondary schools at 15% and combined at 11%.



- Primary
- Secondary
- Combined
- Special needs

Education sector

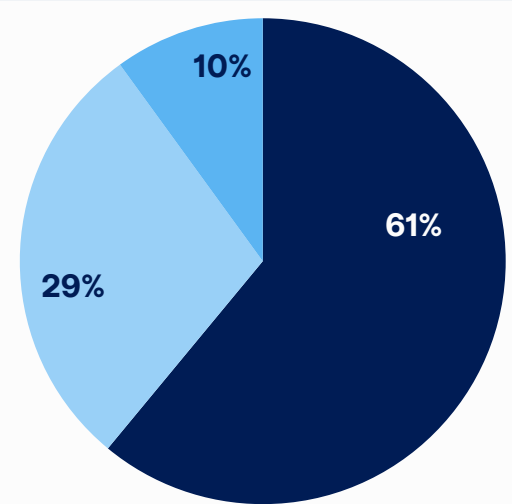
More than two thirds of schools in VIC are government schools, marginally lower than the Australian average (70%). The remainder of schools are Catholic (22%) or independent (10%) schools.



- Government
- Catholic
- Independent

Regionality

Over 60% of schools in VIC are in major cities.

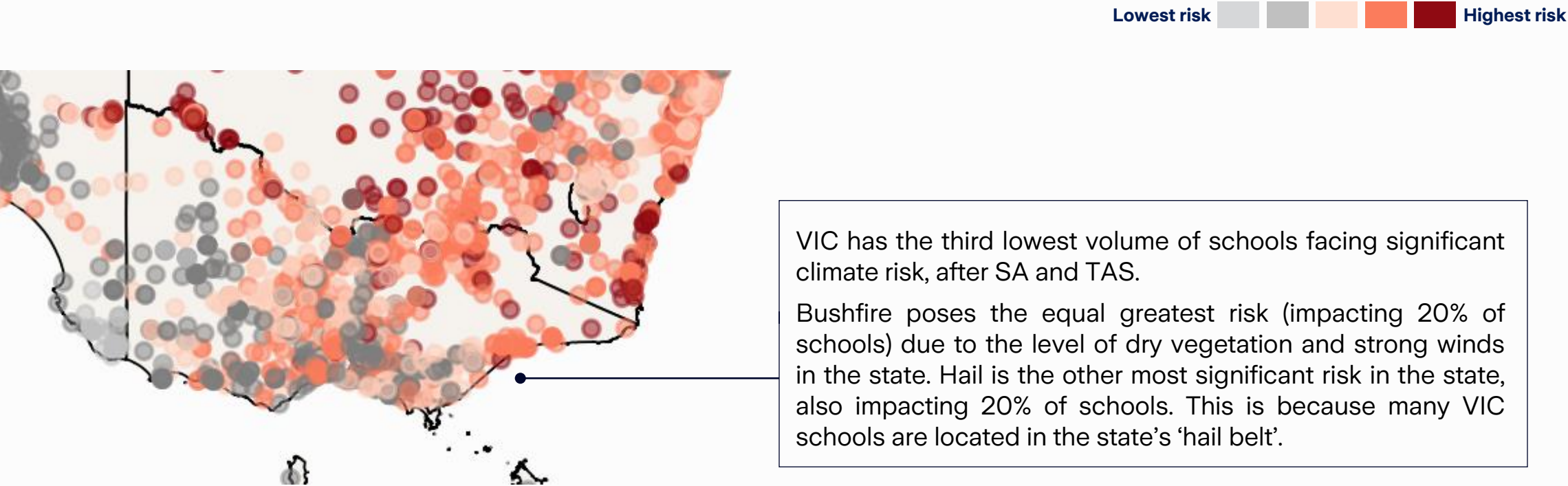


- Major cities
- Outer regional, remote, very remote
- Inner regional

Source: ACARA, 2023.

More than one third of schools in Victoria face significant climate risk, with bushfire and hail the most material perils

Schools mapped across VIC with climate risk categories



Source: Zurich Resilience Solutions; Mandala analysis.

Schools most at-risk from climate perils in VIC

Top 10 schools in VIC by climate risk impact score

Rank	School	Total score	ICSEA percentile	School level	Category	Climate perils							
						Flood	Rain	Wind	Storm	Hail	Heat	Drought	Bushfire
1	Noojee Primary School, Noojee	53	N/A	Primary	Government	16	4	2	3	6	3	3	16
2	Nangiloc Colignan and District Primary School, Nangiloc	49	29	Primary	Government	8	4	1	3	4	9	4	16
3	St Anne's College, Kialla	48	58	Combined	Catholic	12	4	1	3	6	6	4	12
4	Swifts Creek P-12 School, Swifts Creek	47	33	Combined	Government	16	4	1	3	8	3	4	8
5	Darraweit Guim Primary School, Darraweit Guim	46	28	Primary	Government	16	4	2	3	6	3	4	8
6	Cornish College, Bangholme	46	89	Combined	Independent	12	2	2	6	6	3	3	12
7	St Mary's School, Robinvale	46	30	Combined	Catholic	12	4	1	3	4	6	4	12
8	Epsom Primary School, Epsom	45	26	Primary	Government	12	4	1	3	6	3	4	12
9	Koorlong Primary School, Koorlong	45	28	Primary	Government	4	4	1	3	4	9	4	16
10	Ranfurly Primary School, Mildura	45	9	Primary	Government	12	4	1	3	4	9	4	8

Lower risk ■ ■ ■ Higher risk

Exposure to extreme heat could reduce academic attainment by over 3% in parts of VIC by 2060

The impact of exposure to extreme heat on student academic attainment by regionality in VIC

% average change in NAPLAN scores by 2060

Lower impact Higher impact

Subject	VIC	Major cities	Inner regional	Outer regional	Remote
Writing	-1.7%	-1.6%	-2.0%	-2.1%	-2.5%
Spelling	-1.7%	-1.6%	-2.0%	-2.1%	-1.6%
Grammar and punctuation	-1.9%	-1.8%	-2.2%	-2.4%	-2.4%
Numeracy	-2.6%	-2.3%	-2.9%	-3.1%	-3.1%
Average across all subjects	-2.0%	-1.8%	-2.3%	-2.4%	-2.4%

Note: Cho, H. (2017) does not find a statistically significant impact of exposure to extreme heat on reading test scores.
 Source: Cho, H. (2017) *The effects of summer heat on academic achievement: A cohort analysis*; Zurich Resilience Solutions; Mandala analysis.

Case studies: The impact of extreme heat on academic attainment in VIC

The impact of exposure to extreme heat on student academic attainment by regionality in VIC

% average change in NAPLAN scores by 2060

Lower impact Higher impact

Geelong Grammar School, Corio

Number of students: 1,372
Number of teachers: 193
Sector: Independent
Regionality: Major city
ICSEA percentile: 94

Subject	Attainment change
Writing	-1%
Spelling	-1%
Grammar & punctuation	-1.1%
Numeracy	-1.4%

St Joseph's College Mildura, Mildura

Number of students: 833
Number of teachers: 78
Sector: Catholic
Regionality: Outer regional
ICSEA percentile: 59

Subject	Attainment change
Writing	-2.4%
Spelling	-1.8%
Grammar & punctuation	-2.4%
Numeracy	-3.3%

Merbein P-10 College, Merbein

Number of students: 650
Number of teachers: 62
Sector: Government
Regionality: Outer regional
ICSEA percentile: 23

Subject	Attainment change
Writing	-2.4%
Spelling	-2.5%
Grammar & punctuation	-2.8%
Numeracy	-3.6%

State-by-state analysis

NEW SOUTH WALES

VICTORIA

QUEENSLAND

WESTERN AUSTRALIA

SOUTH AUSTRALIA

TASMANIA

AUSTRALIAN CAPITAL TERRITORY

NORTHERN TERRITORY



QLD has 1,827 schools, with the majority being government primary schools in regional and remote areas

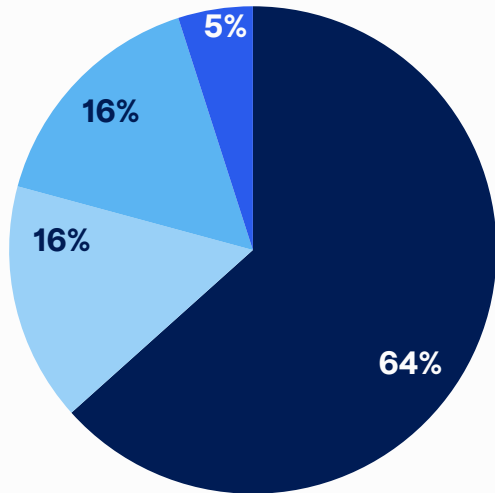


Number of schools in QLD by school level, education sector, and regionality

Count of schools (2023)

School level

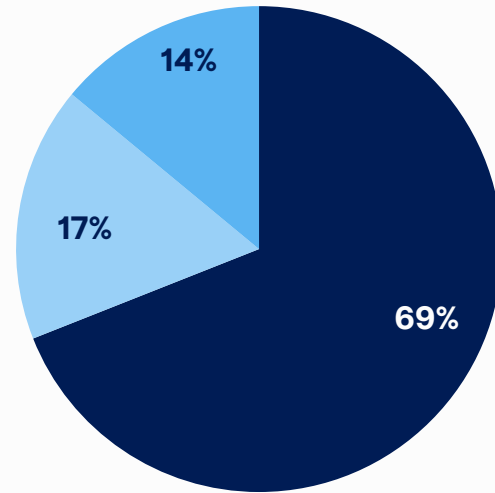
Like other large states, a large portion of schools in QLD are primary schools. The remaining schools are equally split between secondary or combined schools.



- Primary
- Secondary
- Combined
- Special needs

Education sector

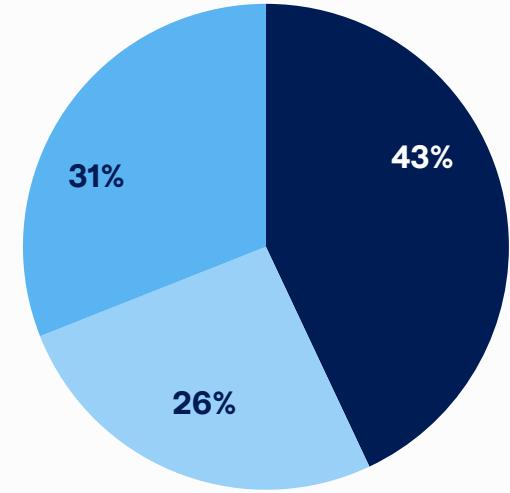
Nearly 70% of schools in QLD are government schools.



- Government
- Catholic
- Independent

Regionality

As the most decentralised population in Australia, less than half of schools in QLD are in a major city. The remainder are in regional, remote or very remote locations.

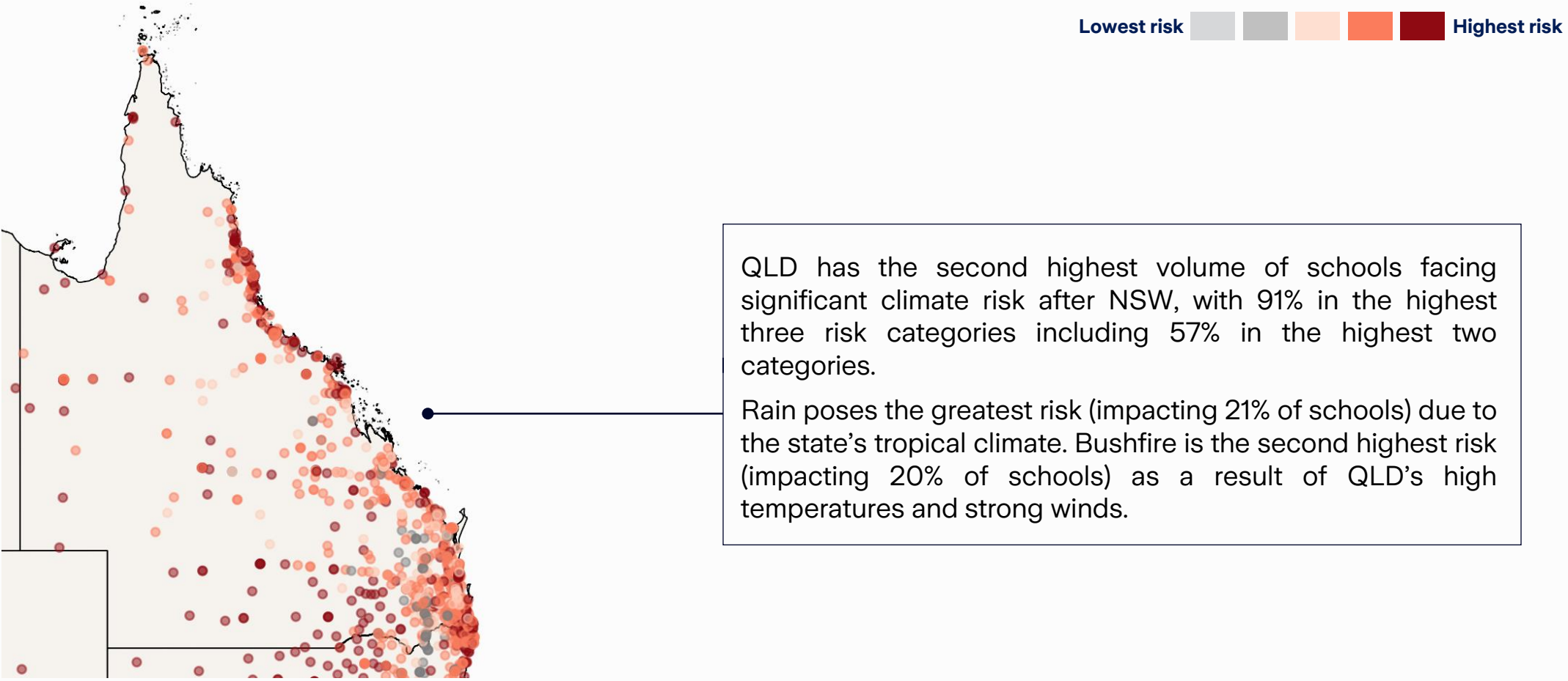


- Major cities
- Inner regional
- Outer regional, remote, very remote

Source: ACARA, 2023.

91% of schools in Queensland face significant climate risk, with rain and bushfire the most material perils

Schools mapped across QLD with climate risk categories



Source: Zurich Resilience Solutions; Mandala analysis.

Schools most at-risk from climate perils in QLD

Top 10 schools in QLD by climate risk impact score

Rank	School	Total score	ICSEA percentile	School level	Category	Climate perils							
						Flood	Rain	Wind	Storm	Hail	Heat	Drought	Bushfire
1	Thargomindah State School, Thargomindah	56	3	Primary	Government	8	6	1	6	4	12	3	16
2	Wonga Beach State School, Wonga Beach	55	18	Primary	Government	8	8	3	12	4	6	2	12
3	Rossville State School, Rossville	53	11	Primary	Government	12	8	2	3	4	6	2	16
4	Brisbane Independent School, Pullenvale	52	95	Primary	Independent	16	8	1	3	6	3	3	12
5	Tropical North Steiner School, Mossman	52	N/A	Primary	Independent	12	8	2	6	4	6	2	12
6	Two Mile State School, Two Mile	51	15	Primary	Government	16	8	1	3	6	3	2	12
7	Widgee State School, Widgee	51	31	Primary	Government	16	8	1	3	6	3	2	12
8	Bollon State School, Bollon	51	20	Primary	Government	8	4	1	3	4	12	3	16
9	Dunkeld State School, Dunkeld	51	47	Primary	Government	12	4	1	3	4	9	2	16
10	Chelona State School, Chelona	50	35	Primary	Government	12	8	3	6	4	3	2	12

Lower risk ■ ■ ■ Higher risk

Exposure to extreme heat could reduce academic attainment by up to 6.5% in parts of QLD by 2060

The impact of exposure to extreme heat on student academic attainment by regionality in QLD

% average change in NAPLAN scores by 2060

Lower impact Higher impact

Subject	QLD	Major cities	Inner regional	Outer regional	Remote	Very remote
Writing	-3.3%	-2.8%	-3.2%	-4.3%	-4.4%	-4.5%
Spelling	-3.2%	-2.8%	-3.1%	-4.2%	-4.2%	-4.3%
Grammar and punctuation	-3.7%	-3.1%	-3.5%	-4.9%	-5.0%	-5.2%
Numeracy	-4.8%	-4.1%	-4.6%	-6.4%	-6.4%	-6.5%
Average across all subjects	-3.8%	-3.2%	-3.6%	-5.0%	-5.0%	-5.13%

Note: Cho, H. (2017) does not find a statistically significant impact of exposure to extreme heat on reading test scores.
 Source: Cho, H. (2017) *The effects of summer heat on academic achievement: A cohort analysis*; Zurich Resilience Solutions; Mandala analysis.

Case studies: The impact of extreme heat on academic attainment in QLD

The impact of exposure to extreme heat on student academic attainment by regionality in QLD

% average change in NAPLAN scores by 2060

Lower impact Higher impact

Ormiston College, Ormiston

Number of students: 1,486
Number of teachers: 103
Sector: Independent
Regionality: Major city
ICSEA percentile: 93

Subject	Attainment change
Writing	-2.7%
Spelling	-2.7%
Grammar & punctuation	-3%
Numeracy	-4%

Holy Cross School, Trinity Park

Number of students: 570
Number of teachers: 28
Sector: Catholic
Regionality: Outer regional
ICSEA percentile: 69

Subject	Attainment change
Writing	-8%
Spelling	-9.6%
Grammar & punctuation	-9.7%
Numeracy	-12.7%

Tagai State College, Thursday Island

Number of students: 1,237
Number of teachers: 160
Sector: Government
Regionality: Very remote
ICSEA percentile: 2

Subject	Attainment change
Writing	-9.3%
Spelling	-8.6%
Grammar & punctuation	-11.1%
Numeracy	-13.9%

State-by-state analysis

NEW SOUTH WALES

VICTORIA

QUEENSLAND

WESTERN AUSTRALIA

SOUTH AUSTRALIA

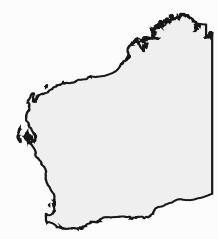
TASMANIA

AUSTRALIAN CAPITAL TERRITORY

NORTHERN TERRITORY



WA has 1,137 schools, with the majority attending government primary schools in major cities

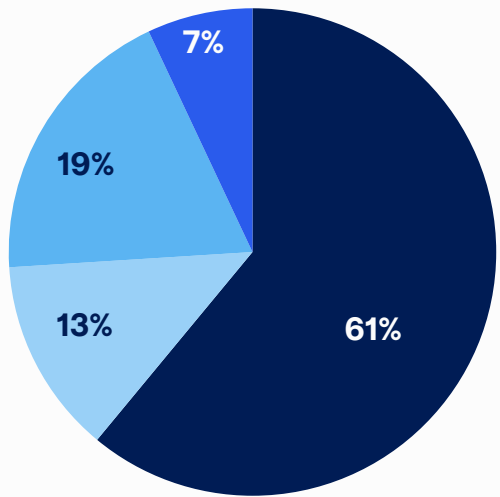


Number of schools in WA schools, by school level, education sector, and regionality

Count of schools (2023)

School level

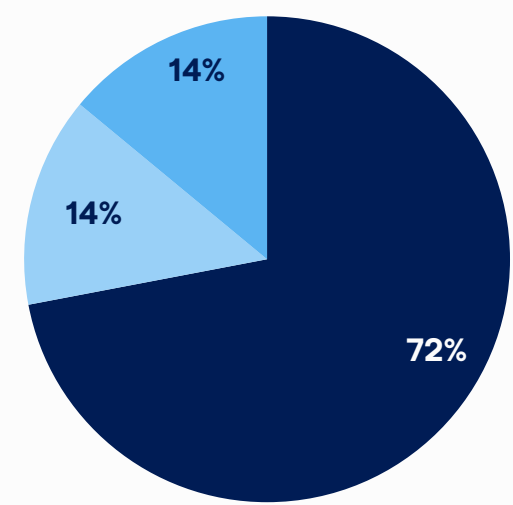
Over 60% of schools in WA are primary schools. This is followed by combined (19%) and secondary (13%).



■ Primary ■ Combined
■ Secondary ■ Special needs

Education sector

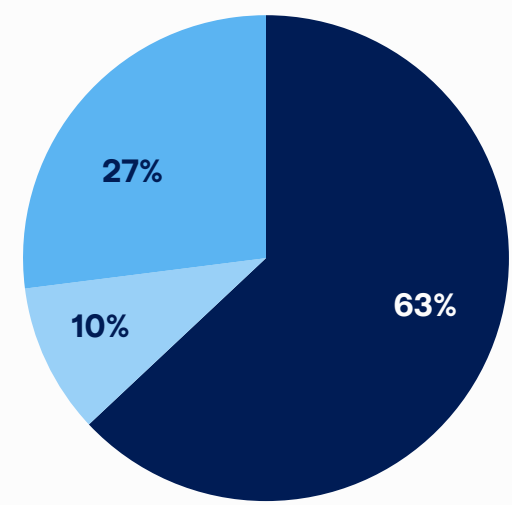
Over 70% of schools in WA are government schools, with an equal split of remaining schools being either independent or Catholic schools.



■ Government ■ Independent
■ Catholic

Regionality

The majority of schools in WA are located in a major city. Unlike other states, there are more schools located in outer regional or remote areas, than those in regional centres.



■ Major cities ■ Inner regional
■ Outer regional, remote, very remote

Source: ACARA, 2023.

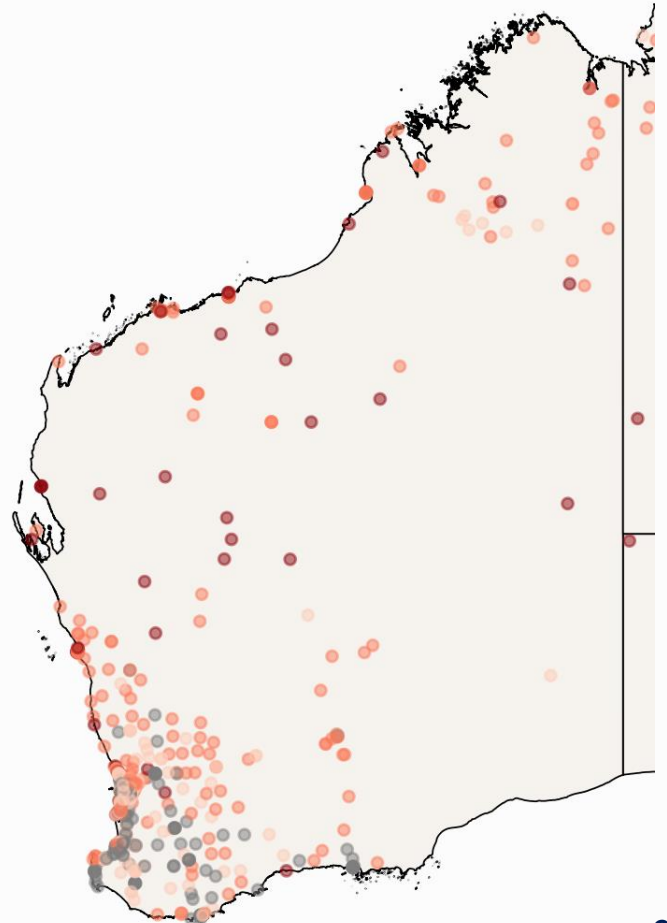
Close to two thirds of schools in Western Australia face significant climate risk, with bushfire and heat the most material perils

Schools mapped across WA with climate risk categories

Lowest risk  Highest risk

Close to two thirds of schools in WA face significant climate risk, with one third of these schools in the highest two risk categories.

Bushfire poses the greatest risk (impacting 23% of schools) due to the state's dry vegetation and high temperatures. Heat is the second most significant risk (impacting 18%).



Source: Zurich Resilience Solutions; Mandala analysis.

Schools most at-risk from climate perils in WA

Top 10 schools in WA by climate risk impact score

Rank	School	Total score	ICSEA percentile	School level	Category	Lower risk   Higher risk 							
						Flood	Rain	Wind	Storm	Hail	Heat	Drought	Bushfire
1	Sacred Heart School, Broome	54	1	Combined	Catholic	12	8	4	6	4	6	2	12
2	Karalundi College, Via Meekatharra	54	0	Secondary	Independent	12	4	1	3	4	12	2	16
3	Carnarvon Community College, East Carnarvon	53	2	Combined	Government	4	6	3	9	4	9	2	16
4	Burringurrah Remote Community School, Mount James	51	1	Combined	Government	4	4	2	9	4	9	3	16
5	Carnarvon School Of The Air, Carnarvon	50	42	Primary	Government	8	6	3	6	4	9	2	12
6	Yandeyarra Remote Community School, Yandeyarra Community	50	0	Combined	Government	12	6	4	3	4	6	3	12
7	Meekatharra School Of The Air, Bluff Point	47	73	Primary	Government	4	4	2	9	4	6	2	16
8	Sheoak Grove Primary School, Baldivis	47	41	Primary	Government	12	4	1	6	4	6	2	12
9	Nullagine Primary School, Nullagine	47	0	Combined	Government	12	8	4	3	4	6	2	8
10	Geraldton Senior High School, Geraldton	46	9	Secondary	Government	4	4	2	12	4	6	2	12

Exposure to extreme heat could reduce academic attainment by up to 6% in parts of WA by 2060

The impact of exposure to extreme heat on student academic attainment by regionality in WA

% average change in NAPLAN scores by 2060

Lower impact Higher impact

Subject	WA	Major cities	Inner regional	Outer regional	Remote	Very remote
Writing	-2.6%	-2.7%	-2.3%	-1.7%	-1.9%	-4.2%
Spelling	-2.5%	-2.7%	-2.3%	-1.7%	-1.9%	-4.0%
Grammar and punctuation	-2.9%	-3.1%	-2.7%	-2.0%	-2.2%	-4.8%
Numeracy	-3.8%	-4.0%	-3.4%	-2.5%	-2.8%	-6.0%
Average across all subjects	-3.0%	-3.1%	-2.68%	-2.0%	-2.2%	-4.8%

Note: Cho, H. (2017) does not find a statistically significant impact of exposure to extreme heat on reading test scores.
 Source: Cho, H. (2017) *The effects of summer heat on academic achievement: A cohort analysis*; Zurich Resilience Solutions; Mandala analysis.

Case studies: The impact of extreme heat on academic attainment in WA

The impact of exposure to extreme heat on student academic attainment by regionality in WA

% average change in NAPLAN scores by 2060

Lower impact     Higher impact

St Hilda's Anglican School for Girls, Mosman Park

Number of students: 1,087
Number of teachers: 137
Sector: Independent
Regionality: Major city
ICSEA percentile: 98

St Mary Star of the Sea Catholic School, Carnarvon

Number of students: 280
Number of teachers: 22
Sector: Catholic
Regionality: Very remote
ICSEA percentile: 26

North Cottesloe Primary School, Cottesloe

Number of students: 334
Number of teachers: 23
Sector: Government
Regionality: Major city
ICSEA percentile: 99

Subject	Attainment change
Writing	-2.9%
Spelling	-2.9%
Grammar & punctuation	-3.3%
Numeracy	-4.4%

Subject	Attainment change
Writing	-3.9%
Spelling	-3.8%
Grammar & punctuation	-4.4%
Numeracy	-5.6%

Subject	Attainment change
Writing	-3%
Spelling	-3.6%
Grammar & punctuation	-3.5%
Numeracy	-4.5%

State-by-state analysis

NEW SOUTH WALES

VICTORIA

QUEENSLAND

WESTERN AUSTRALIA

SOUTH AUSTRALIA

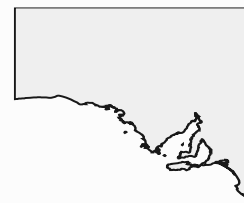
TASMANIA

AUSTRALIAN CAPITAL TERRITORY

NORTHERN TERRITORY



SA has 726 schools, with the majority in government primary schools in major cities

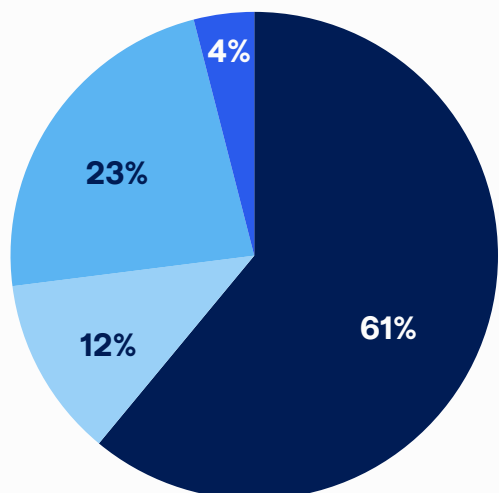


Number of schools in SA by school level, education sector, and regionality

Count of schools (2023)

School level

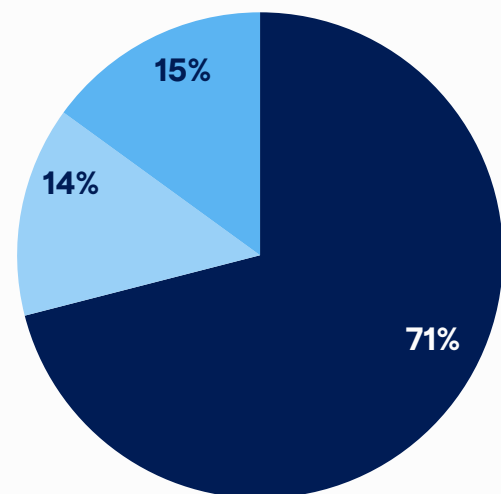
Over 60% of schools in SA are primary schools. This is followed by combined (23%) and secondary (12%).



Primary
 Combined
 Secondary
 Special needs

Education sector

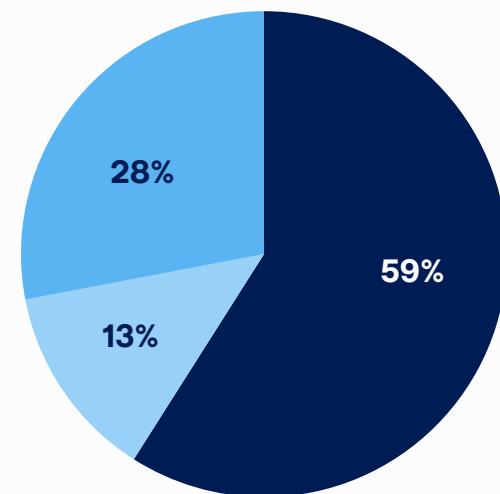
Over 70% of schools in SA are government schools. The remaining schools are split almost equally between independent and Catholic.



Government
 Independent
 Catholic

Regionality

The majority of schools in SA are located in a major city.

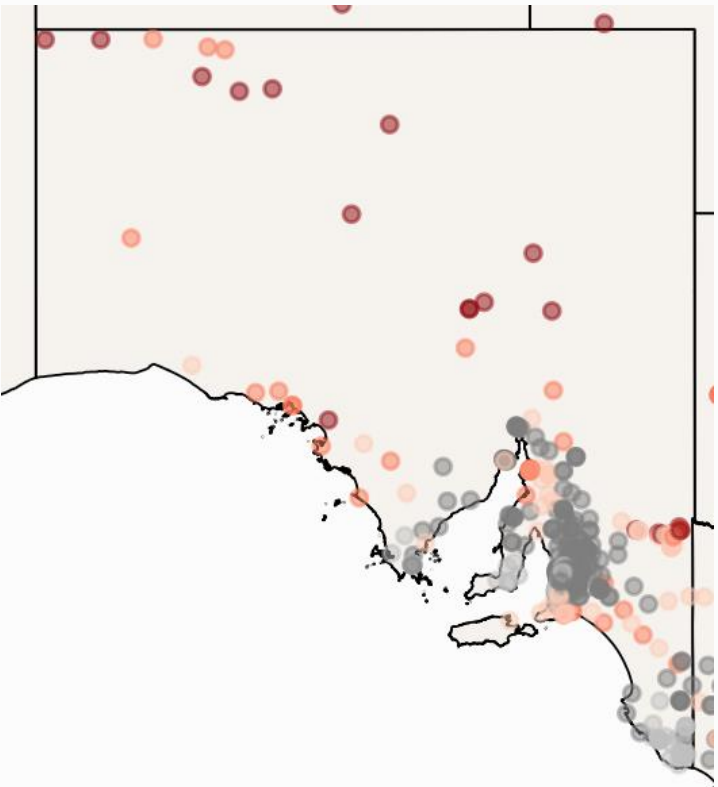


Major cities
 Inner regional
 Outer regional, remote, very remote

Source: ACARA, 2023.

15% of schools in South Australia face significant climate risk, with bushfire and flood the most material perils

Schools mapped across SA with climate risk categories



SA has the lowest volume of schools facing significant climate risk in Australia, with 15% in the highest three risk categories including 8% in the highest two categories.

Bushfire poses the greatest risk (impacting 22% of schools) followed by flood (impacting 15%). Many SA schools are at risk of flooding due to the state being downstream of the Murray-Darling basin, Australia's largest river system.

Source: Zurich Resilience Solutions; Mandala analysis.

Schools most at-risk from climate perils in SA

Top 10 schools in SA by climate risk impact score

						Lower risk Higher risk							
Rank	School	Total score	ICSEA percentile	School level	Category	Flood	Rain	Wind	Storm	Hail	Heat	Drought	Bushfire
1	Fregon Anangu School, Fregon	47	N/A	Combined	Government	8	6	1	6	4	12	2	8
2	Pipalyatjara Anangu School, Pipalyatjara	46	N/A	Combined	Government	4	6	1	3	4	9	3	16
3	Kingston-on-Murray Primary School, Kingston On Murray	44	20	Primary	Government	16	2	1	3	4	6	4	8
4	Ramco Primary School, Ramco	44	36	Primary	Government	16	2	1	3	4	6	4	8
5	Renmark Primary School, Renmark	44	13	Primary	Government	16	2	1	3	4	6	4	8
6	Cobdogla Primary School, Cobdogla	44	33	Primary	Government	16	2	1	3	4	6	4	8
7	Renmark High School, Renmark	44	20	Secondary	Government	16	2	1	3	4	6	4	8
8	St Francis of Assisi College, Renmark	44	51	Secondary	Catholic	16	2	1	3	4	6	4	8
9	Renmark North School, Renmark North	43	20	Primary	Government	12	2	1	3	4	9	4	8
10	Leigh Creek Area School, Leigh Creek	43	1	Combined	Government	4	4	1	6	4	12	4	8

Source: Zurich Resilience Solutions; Mandala analysis.

Exposure to extreme heat could reduce academic attainment by over 5% in parts of SA by 2060

The impact of exposure to extreme heat on student academic attainment by regionality in SA

% average change in NAPLAN scores by 2060

Lower impact Higher impact




Subject	SA	Major cities	Inner regional	Outer regional	Remote	Very remote
Writing	-2.0%	-1.9%	-2.0%	-2.2%	-1.8%	-3.5%
Spelling	-1.9%	-1.9%	-2.0%	-2.1%	-1.7%	-3.4%
Grammar and punctuation	-2.3%	-2.2%	-2.3%	-2.5%	-2.0%	-4.1%
Numeracy	-3.0%	-2.9%	-3.0%	-3.2%	-2.6%	-5.2%
Average across all subjects	-2.3%	-2.2%	-2.3%	-2.5%	-2.0%	-4.1%

Note: Cho, H. (2017) does not find a statistically significant impact of exposure to extreme heat on reading test scores.
 Source: Cho, H. (2017) *The effects of summer heat on academic achievement: A cohort analysis*; Zurich Resilience Solutions; Mandala analysis.

Case studies: The impact of extreme heat on academic attainment in SA

The impact of exposure to extreme heat on student academic attainment by regionality in SA

% average change in NAPLAN scores by 2060

Lower impact    Higher impact

Pembroke School, Kensington Park

Number of students: 1696
Number of teachers: 182
Sector: Independent
Regionality: Major city
ICSEA percentile: 98

Subject	Attainment change
Writing	-1.6%
Spelling	-1.5%
Grammar & punctuation	-1.7%
Numeracy	-2.3%

St Barbara's Parish School, Roxby Downs

Number of students: 178
Number of teachers: 16
Sector: Catholic
Regionality: Remote
ICSEA percentile: 29

Subject	Attainment change
Writing	-4.2%
Spelling	-4.5%
Grammar & punctuation	-4.8%
Numeracy	-6.6%

Coober Pedy Area School, Coober Pedy

Number of students: 212
Number of teachers: 26
Sector: Government
Regionality: Very remote
ICSEA percentile: 2

Subject	Attainment change
Writing	-5.2%
Spelling	-4.6%
Grammar & punctuation	-5.5%
Numeracy	-7.1%

State-by-state analysis

NEW SOUTH WALES

VICTORIA

QUEENSLAND

WESTERN AUSTRALIA

SOUTH AUSTRALIA

TASMANIA

AUSTRALIAN CAPITAL TERRITORY

NORTHERN TERRITORY





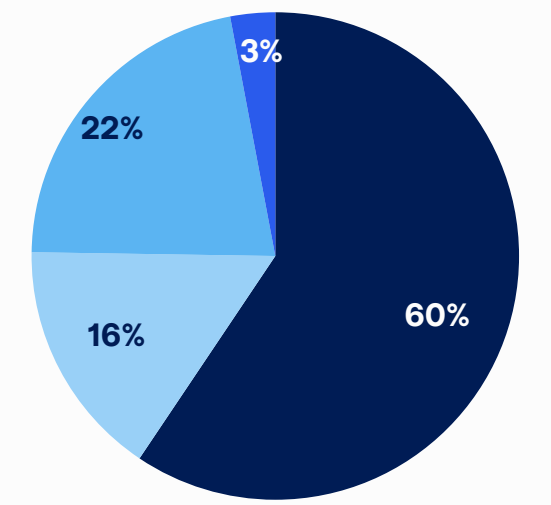
TAS has 263 schools, with the majority in government primary schools in regional locations

Number of schools in TAS by school level, education sector, and regionality

Count of schools (2023)

School level

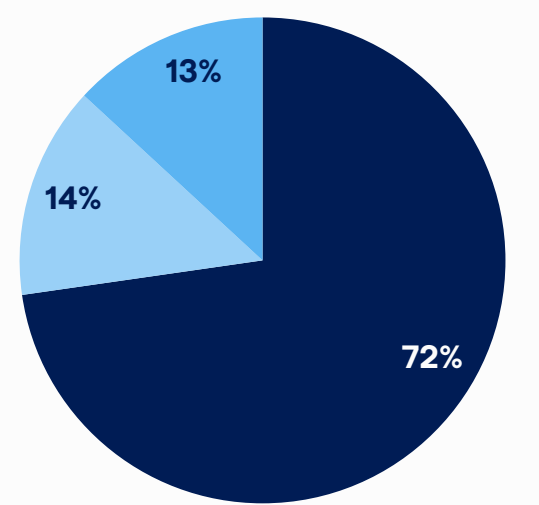
The majority of schools in TAS are primary schools. There are slightly more combined schools than secondary schools.



■ Primary ■ Combined
■ Secondary ■ Special needs

Education sector

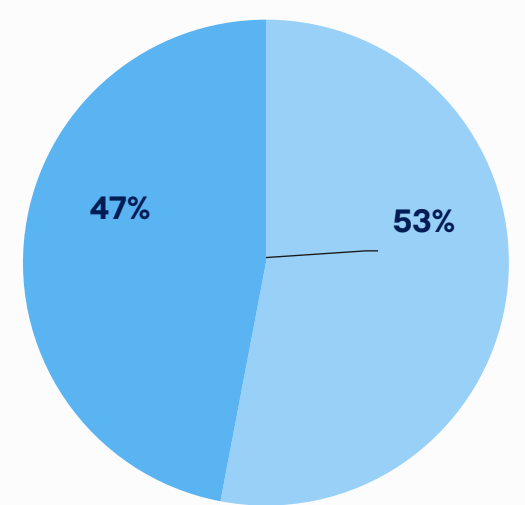
Over 70% of students in TAS attend a government school, with the remainder at Catholic (14%) and independent (13%) schools.



■ Government ■ Independent
■ Catholic

Regionality

Over half of schools in TAS are located in inner regional areas. The remainder are in outer regional, remote or very remote areas.

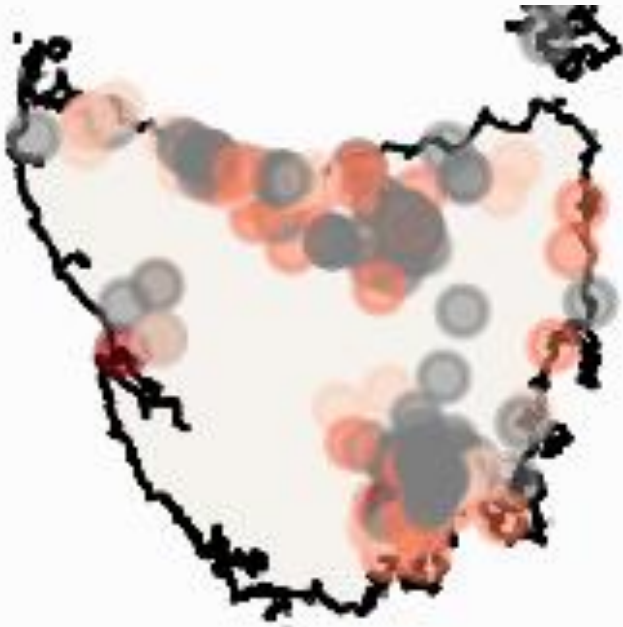


■ Major cities ■ Inner regional
■ Outer regional, remote, very remote

Source: ACARA, 2023.

Close to one third of schools in Tasmania face significant climate risk, with bushfire the most material peril

Schools mapped across TAS with climate risk categories



TAS has the second lowest volume of schools facing significant climate risk in Australia following SA. 28% of schools in the state fall into one of the three highest risk categories, including 15% in the highest two categories.

It does, however, face the equal highest bushfire risk in Australia (alongside the NT) with 26% of schools impacted. This is because TAS has particularly dry summer and autumn seasons and a high degree of combustible vegetation due to soil fertility.

Schools most at-risk from climate perils in TAS

Top 10 schools in TAS by climate risk impact score

Rank	School	Total score	ICSEA percentile	School level	Category	Lower risk ■ ■ ■ Higher risk							
						Flood	Rain	Wind	Storm	Hail	Heat	Drought	Bushfire
1	Strahan Primary School, Strahan	42	28	Primary	Government	8	4	2	3	4	3	2	16
2	Huonville High School, Huonville	41	8	Secondary	Government	8	4	2	6	4	3	2	12
3	Huonville Primary School, Huonville	41	16	Primary	Government	8	4	2	6	4	3	2	12
4	Ravenswood Heights Primary School, Ravenswood	39	4	Primary	Government	12	4	2	3	4	3	3	8
5	St Helens District High School, St Helens	39	27	Combined	Government	4	6	2	6	4	3	2	12
6	Tasman District School, Nubeena	39	14	Combined	Government	4	4	2	3	4	3	3	16
7	Sacred Heart Catholic School, Geeveston	38	24	Primary	Catholic	4	4	2	3	4	3	2	16
8	Smithton High School, Smithton	38	7	Secondary	Government	4	4	2	6	4	3	3	12
9	Glen Huon Primary School, Glen Huon	38	43	Primary	Government	4	4	2	3	4	3	2	16
10	Bruny Island District School, Alonnah	38	55	Primary	Government	4	4	2	3	4	3	2	16

Exposure to extreme heat could reduce academic attainment by over 3% in parts of TAS by 2060

The impact of exposure to extreme heat on student academic attainment by regionality in TAS

% average change in NAPLAN scores by 2060

Lower impact Higher impact

Subject	TAS	Inner regional	Outer regional	Remote
Writing	-1.8%	-1.6%	-2.1%	-1.6%
Spelling	-1.8%	-1.6%	-2.1%	-1.7%
Grammar and punctuation	-2.1%	-1.8%	-2.4%	-2.0%
Numeracy	-2.7%	-2.4%	-3.1%	-2.4%
Average across all subjects	-2.1%	-1.9%	-2.4%	-1.9%

Note: Cho, H. (2017) does not find a statistically significant impact of exposure to extreme heat on reading test scores.
 Source: Cho, H. (2017) *The effects of summer heat on academic achievement: A cohort analysis*; Source: Zurich Resilience Solutions; Mandala analysis.

Case studies: The impact of extreme heat on academic attainment in TAS

The impact of exposure to extreme heat on student academic attainment by regionality in the TAS

% average change in NAPLAN scores by 2060

Lower impact    Higher impact

The Friends' School, North Hobart

Number of students: 1,257
Number of teachers: 140
Sector: Independent
Regionality: Inner regional
ICSEA percentile: 96

St Peter Chanel Catholic School, Smithton

Number of students: 123
Number of teachers: 15
Sector: Catholic
Regionality: Outer regional
ICSEA percentile: 8

King Island District High School, Currie

Number of students: 178
Number of teachers: 21
Sector: Government
Regionality: Very remote
ICSEA percentile: 24

Subject	Attainment change
Writing	-1.1%
Spelling	-1.2%
Grammar & punctuation	-1.3%
Numeracy	-1.7%

Subject	Attainment change
Writing	-2.1%
Spelling	-2.7%
Grammar & punctuation	-2.8%
Numeracy	-3.3%

Subject	Attainment change
Writing	-2.4%
Spelling	-2.4%
Grammar & punctuation	-2.9%
Numeracy	-3.7%

State-by-state analysis

NEW SOUTH WALES

VICTORIA

QUEENSLAND

WESTERN AUSTRALIA

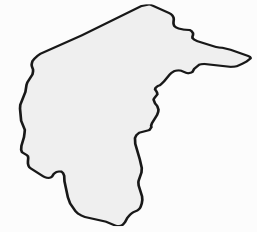
SOUTH AUSTRALIA

TASMANIA

AUSTRALIAN CAPITAL TERRITORY

NORTHERN TERRITORY





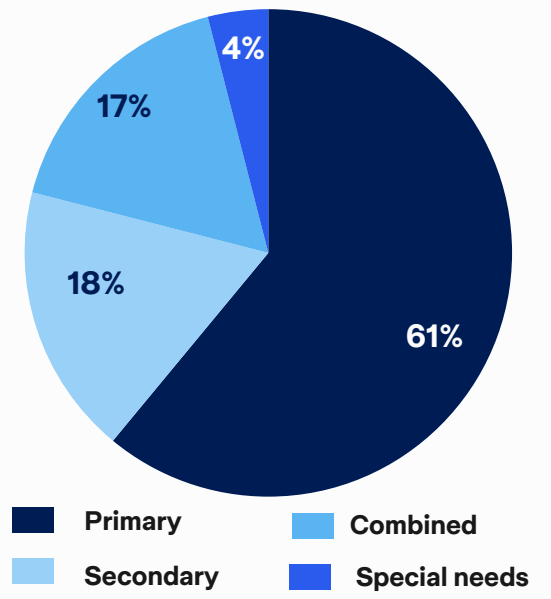
The ACT has 139 schools, with the majority in government primary schools in major cities

Number of schools in the ACT by school level, education sector, and regionality

Count of schools (2023)

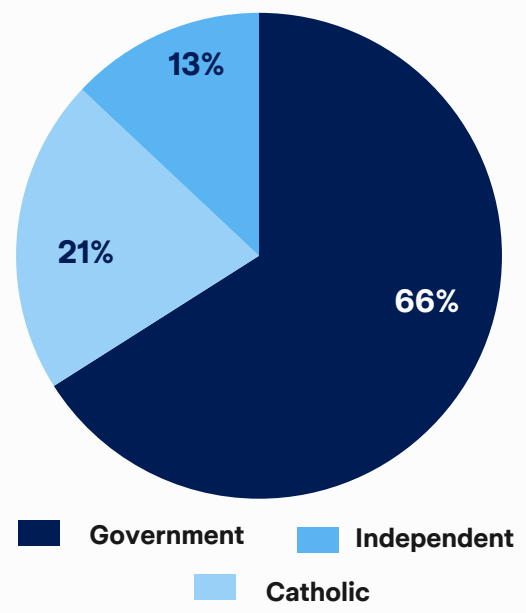
School level

Primary schools make up the largest portion of schools in the ACT (61%), with the remainder split almost equally between combined and secondary schools.



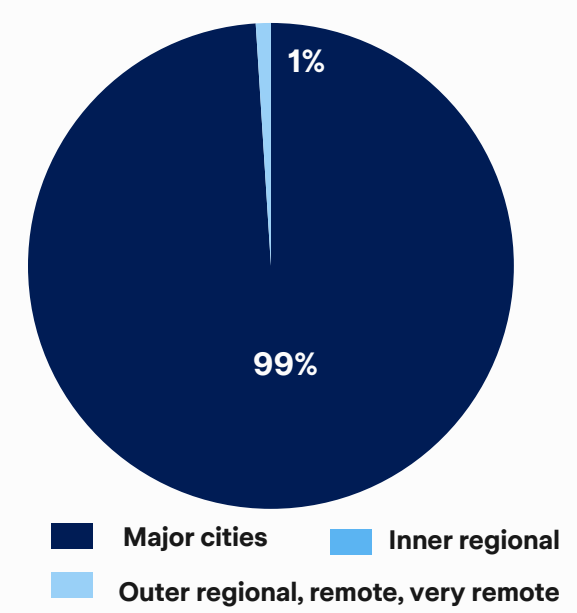
Education sector

The ACT has the lowest proportion of government schools than any other jurisdiction in Australia.



Regionality

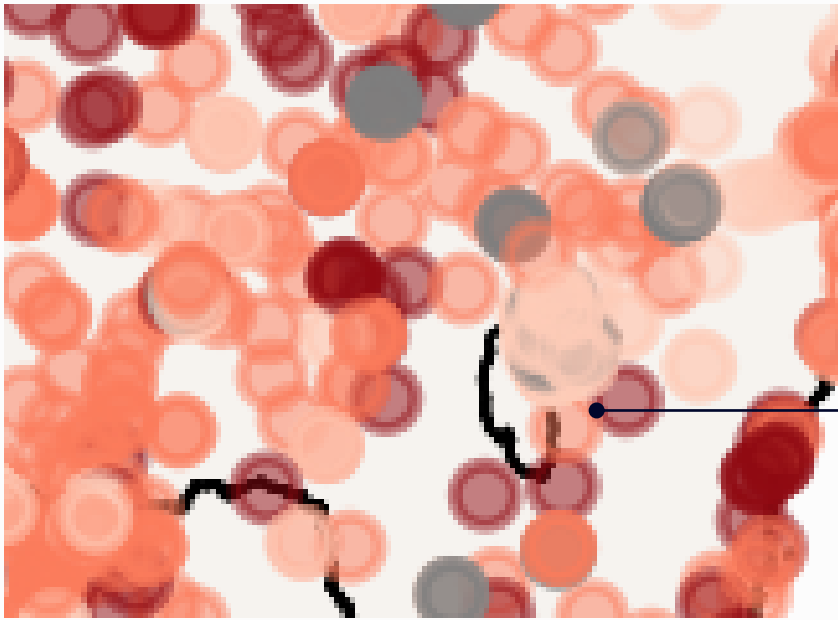
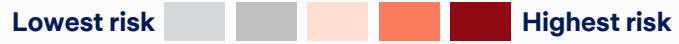
Almost all schools in the ACT are located in a major city (Canberra or surrounds).



Source: ACARA, 2023.

90% of schools in the Australian Capital Territory face significant climate risk, with bushfire and hail the most material perils

Schools mapped across ACT with climate risk categories



The ACT has the third highest volume of schools facing significant climate risk in Australia at 90%, however 89% of these schools are in Risk Category 3 (the third highest category) and only 1% are in the highest risk category.

Bushfire poses the greatest risk (impacting 23% of schools) due to the ACT's lengthy summers. Hail poses the next greatest risk (impacting 22%) due to the ACT's location in the 'hail belt'.

Schools most at-risk from climate perils in the ACT

Top 10 schools in the ACT by climate risk impact score

														Lower risk				Higher risk
Rank	School	Total score	ICSEA percentile	School level	Category	Flood	Rain	Wind	Storm	Hail	Heat	Drought	Bushfire					
1	Jervis Bay School, Jervis Bay	41	2	Primary	Government	4	8	2	3	6	3	3	12					
2	Hawker College, Hawker	34	77	Secondary	Government	4	4	1	3	8	3	3	8					
3	Caroline Chisholm School, Chisholm	34	46	Combined	Government	4	4	1	3	8	3	3	8					
4	Belconnen High School, Hawker	34	77	Secondary	Government	4	4	1	3	8	3	3	8					
5	Hawker Primary School, Hawker	34	90	Primary	Government	4	4	1	3	8	3	3	8					
6	Latham Primary School, Latham	34	62	Primary	Government	4	4	1	3	8	3	3	8					
7	Macgregor Primary School, Macgregor	34	64	Primary	Government	4	4	1	3	8	3	3	8					
8	Macquarie Primary School, Macquarie	34	78	Primary	Government	4	4	1	3	8	3	3	8					
9	Weetangera Primary School, Weetangera	34	89	Primary	Government	4	4	1	3	8	3	3	8					
10	Cranleigh School, Holt	34	65	Special	Government	4	4	1	3	8	3	3	8					

Source: Zurich Resilience Solutions; Mandala analysis.

Exposure to extreme heat could reduce academic attainment by over 3% in the ACT by 2060

The impact of exposure to extreme heat on student academic attainment by regionality in the ACT

% average change in NAPLAN scores by 2060

Lower impact Higher impact

Subject	ACT	Major cities
Writing	-2.2%	-2.2%
Spelling	-2.2%	-2.2%
Grammar and punctuation	-2.5%	-2.5%
Numeracy	-3.2%	-3.2%
Average across all subjects	-2.5%	-2.5%

Note: Cho, H. (2017) does not find a statistically significant impact of exposure to extreme heat on reading test scores.
 Source: Cho, H. (2017) *The effects of summer heat on academic achievement: A cohort analysis*; Zurich Resilience Solutions; Mandala analysis.

Case studies: The impact of extreme heat on academic attainment in the ACT

The impact of exposure to extreme heat on student academic attainment by regionality in the ACT

% average change in NAPLAN scores by 2060

Lower impact Higher impact

Canberra Grammar School, Red Hill

Number of students: 2,118
Number of teachers: 187
Sector: Independent
Regionality: Major city
ICSEA percentile: 99

Subject	Attainment change
Writing	-2.1%
Spelling	-2.1%
Grammar & punctuation	-2.3%
Numeracy	-3.1%

Good Shepherd Primary School, Amaroo

Number of students: 763
Number of teachers: 43
Sector: Catholic
Regionality: Major city
ICSEA percentile: 85

Subject	Attainment change
Writing	-2.1%
Spelling	-2.5%
Grammar & punctuation	-2.6%
Numeracy	-3.4%

Jervis Bay School, Jervis Bay

Number of students: 40
Number of teachers: 12
Sector: Government
Regionality: Inner regional
ICSEA percentile: 2

Subject	Attainment change
Writing	-2.4%
Spelling	-3.6%
Grammar & punctuation	-3.7%
Numeracy	-4.4%

State-by-state analysis

NEW SOUTH WALES

VICTORIA

QUEENSLAND

WESTERN AUSTRALIA

SOUTH AUSTRALIA

TASMANIA

AUSTRALIAN CAPITAL TERRITORY

NORTHERN TERRITORY





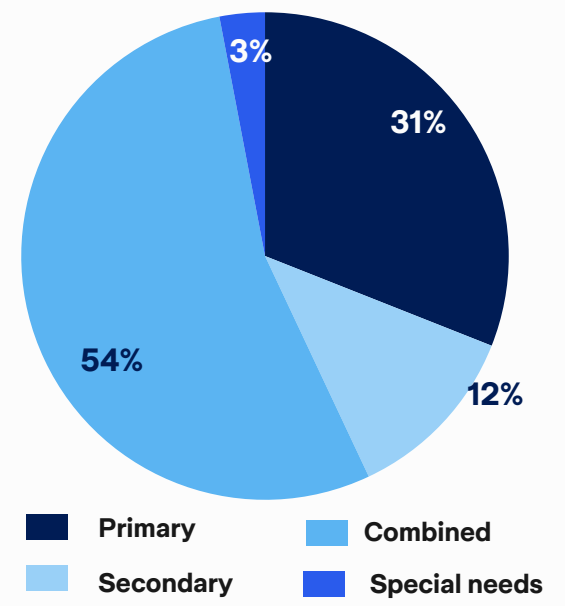
The NT has 196 schools, with the majority in government combined schools in outer regional, remote and very remote locations

Number of schools in the NT by school level, education sector, and regionality

Count of schools (2023)

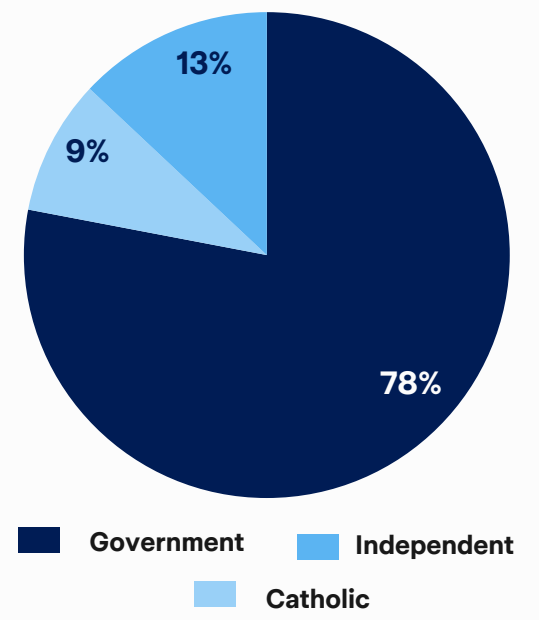
School level

The majority of schools in the NT are combined schools (54%), the highest of all Australian jurisdictions. This is followed by primary (31%) and secondary (12%) schools.



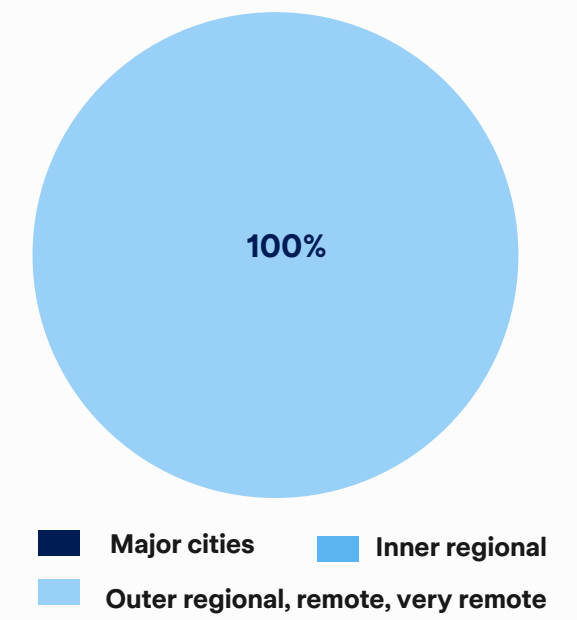
Education sector

NT has the largest share of government schools than any other jurisdiction in Australia (78%).



Regionality

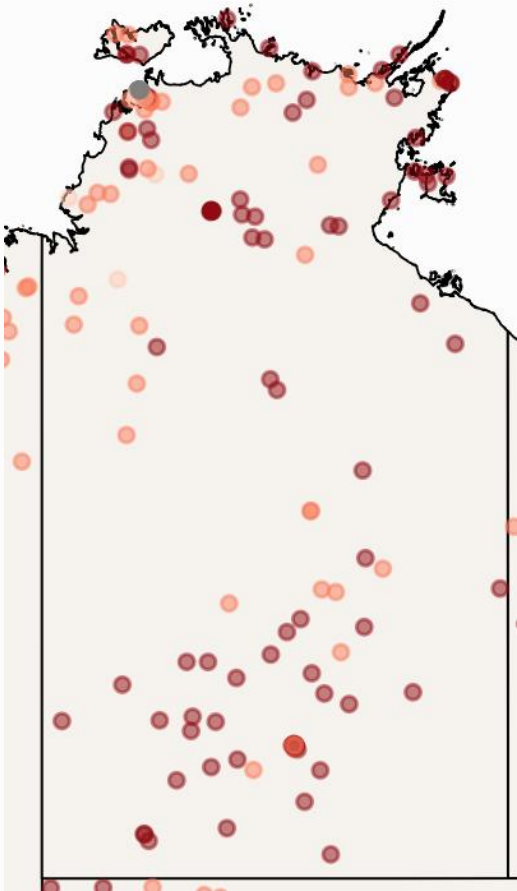
All NT schools are located in an outer regional, remote or very remote location.



Source: ACARA, 2023.

86% of schools in the Northern Territory face significant climate risk, with bushfire, heat and rain the most material perils

Schools mapped across the NT with climate risk categories



Lowest risk Highest risk

The NT has the fourth highest volume of schools facing significant climate risk in Australia, but the highest portion in the most severe risk categories. Of the 86% of schools impacted, nearly half are in the highest risk category and a further 27% are in the second highest.

The NT faces the equal highest bushfire risk in the country (alongside TAS) with 26% of schools at risk due to its dry and hot conditions. Rain also poses a considerable risk (impacting 17% of schools) due to the NT's wet seasons.

Source: Zurich Resilience Solutions; Mandala analysis.

Schools most at-risk from climate perils in NT

Top 10 schools in NT by climate risk impact score

													Lower risk		Higher risk	
Rank	School	Total score	ICSEA percentile	School level	Category	Flood	Rain	Wind	Storm	Hail	Heat	Drought	Bushfire			
1	St Francis Xavier Catholic School, Daly River	57	1	Combined	Catholic	16	8	2	3	4	6	2	16			
2	Areyonga School, Areyonga	57	0	Combined	Government	16	6	1	3	4	12	3	12			
3	Katherine South Primary School, Katherine South	56	11	Primary	Government	12	6	1	3	4	12	2	16			
4	Robinson River School, Robinson River	55	1	Combined	Government	12	8	1	6	4	6	2	16			
5	Titjikala School, Titjikala	55	0	Combined	Government	16	4	1	6	4	9	3	12			
6	Nyirripi School, Nyirripi	54	0	Combined	Government	12	6	1	3	4	9	3	16			
7	Katherine School Of The Air, Katherine	52	37	Combined	Government	8	6	1	3	4	12	2	16			
8	Katherine High School, Katherine East	52	3	Secondary	Government	8	6	1	3	4	12	2	16			
9	Ntaria School, Hermannsburg	52	1	Combined	Government	16	4	1	3	4	9	3	12			
10	Sadadeen Primary School, Alice Springs	51	2	Primary	Government	12	6	1	3	4	9	4	12			

Source: Zurich Resilience Solutions; Mandala analysis.

Exposure to extreme heat could reduce academic attainment by over 11% in parts of the NT by 2060

The impact of exposure to extreme heat on student academic attainment by regionality in the NT

% average change in NAPLAN scores by 2060

Lower impact    Higher impact

Subject	NT	Outer regional	Remote	Very remote
Writing	-5.0%	-2.9%	-5.9%	-8.8%
Spelling	-4.9%	-2.8%	-5.8%	-8.6%
Grammar and punctuation	-5.8%	-3.3%	-6.9%	-10.2%
Numeracy	-7.2%	-4.3%	-8.5%	-11.3%
Average across all subjects	-5.7%	-3.3%	-6.8%	-9.7%

Note: Cho, H. (2017) does not find a statistically significant impact of exposure to extreme heat on reading test scores.
 Source: Cho, H. (2017) *The effects of summer heat on academic achievement: A cohort analysis*; Zurich Resilience Solutions; Mandala analysis.

Case studies: The impact of extreme heat on academic attainment in the NT

The impact of exposure to extreme heat on student academic attainment by regionality in the NT

% average change in NAPLAN scores by 2060

Lower impact Higher impact

Haileybury Rendall School, Berrimah

Number of students: 877
Number of teachers: 94
Sector: Outer regional
Regionality: Independent
ICSEA percentile: 79

St Joseph's Catholic College, Katherine

Number of students: 258
Number of teachers: 27
Sector: Catholic
Regionality: Remote
ICSEA percentile: 26

Mamaruni School, Minjilang

Number of students: 53
Number of teachers: 4
Sector: Government
Regionality: Very remote
ICSEA percentile: 0

Subject	Attainment change
Writing	-2.2%
Spelling	-2.2%
Grammar & punctuation	-2.4%
Numeracy	-3.2%

Subject	Attainment change
Writing	-8.6%
Spelling	-9%
Grammar & punctuation	-10.4%
Numeracy	-13.5%

Subject	Attainment change
Writing	N/A
Spelling	-31.3%
Grammar & punctuation	-114.9%
Numeracy	-36.0%



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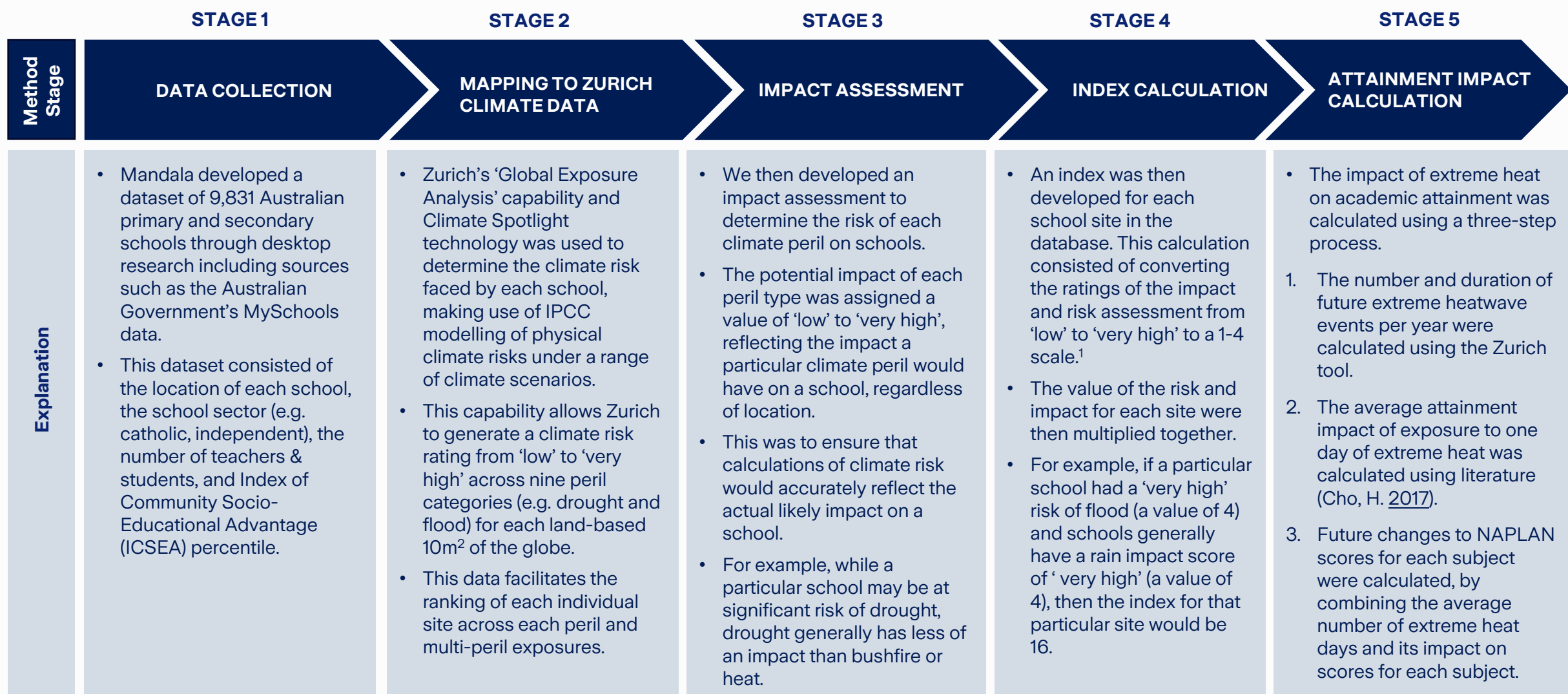
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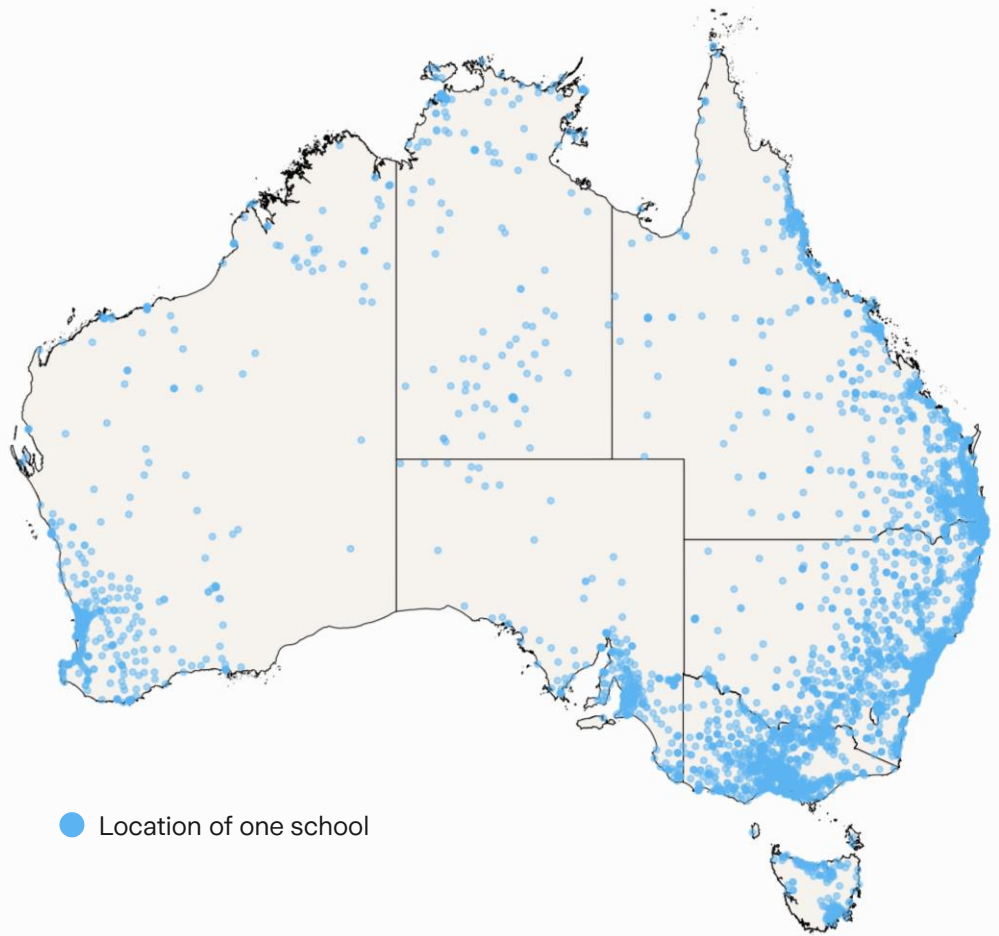
Methodology: Zurich’s geospatial climate risk data was used to assess the climate risk to Australia’s schools



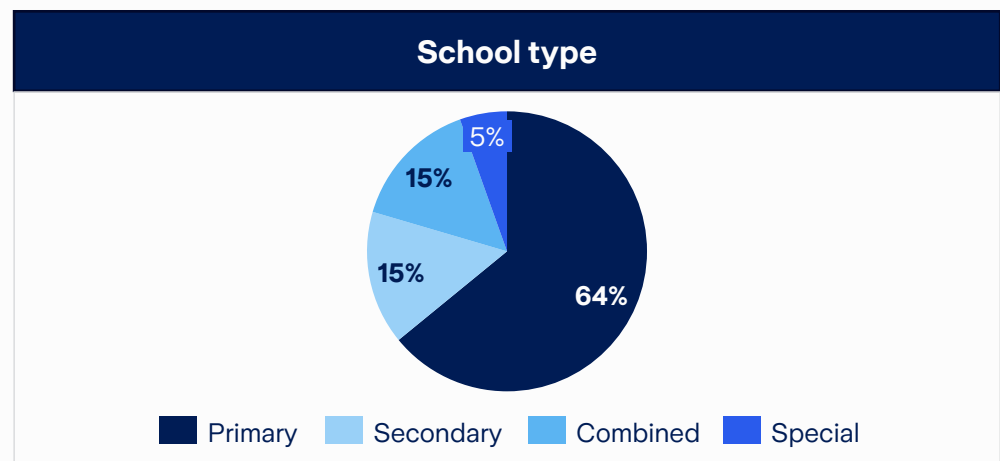
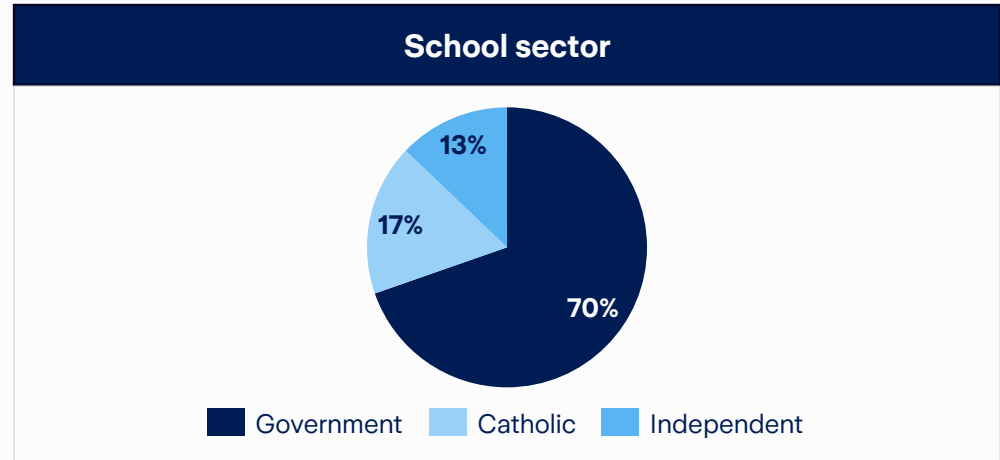
¹ For geographic coordinates (latitude and longitudes) of schools where a climate risk rating was unavailable for a peril category, the closest location with a risk rating was used instead.

Stage 1: School data collection

Geospatial data was collected for each school across Australia along with information on its characteristics (including type, sector and ICSEA scores).



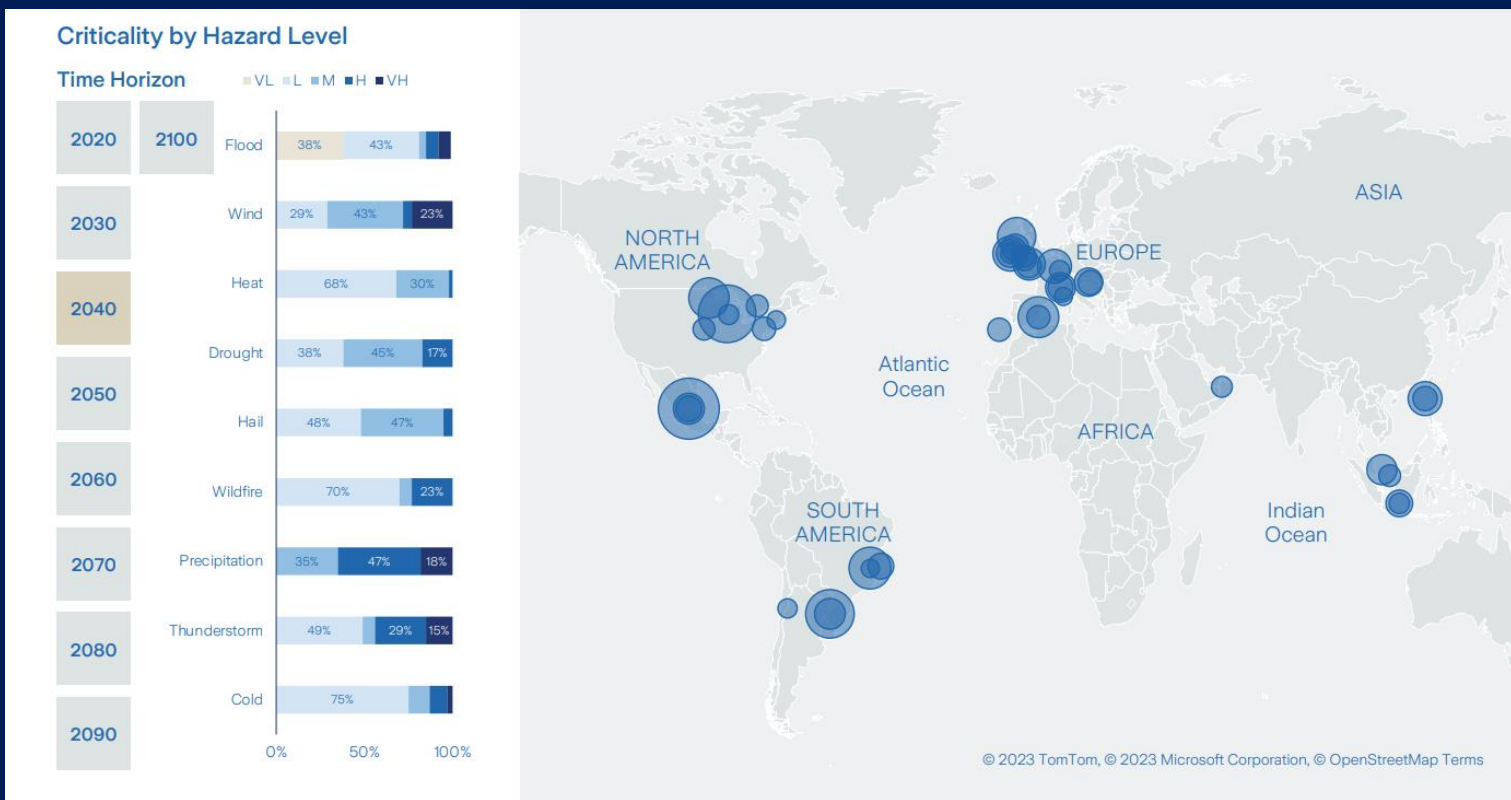
● Location of one school



Source: Zurich and Mandala analysis

Stage 2: Zurich Resilience Solutions (ZRS) climate modelling

ZRS provides specialised insights and tools to support more informed decisions to build resilience against traditional and evolving risks, such as climate and cyber.

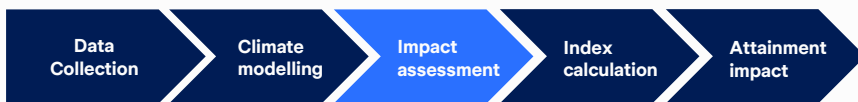


ZRS Global Exposure Analysis

ZRS climate scientists transform business data, including land-based location or asset data into deep climate risk insights.

ZRS Global Exposure Analysis and ‘Climate Spotlight’ technology allows government and business to understand the probability that climate risks – such as drought, flood or fire – may impact a specific asset or portfolio of locations over time based on three IPCC-based climate scenarios.

These insights quantify and contextualise climate exposure to ensure risk can be understood, tracked and shared in order to appropriately prioritise actions and investments.



Stage 3: Assessing how each climate peril would typically impact a school

The third stage required the creation of an impact risk assessment scoring the likely severity each natural peril could pose on a school, regardless of its location. Zurich Resilience Solutions used its internal capability to assess how severely perils would impact schools.

The assessment identified flood, heat, bushfire and storm as the most impactful perils due to their significant potential impact, including:

- Damage to school infrastructure, particularly old or temporary buildings;
- Disruption to accessing schools, sometimes for long periods, due to local infrastructure damage such as road blockages; and
- The significant potential for disruption to learning due to slowed cognition, psychological impacts and reduced access to school.

Impact risk assessment

Very high impact High impact Medium impact Low/no impact

Flood Very high impact	Bushfire Very high impact
Has the potential to significantly damage a school and restrict access for long periods. Flooding can also displace students and teachers and in severe cases have psychological impacts on children, which can impact learning.	Like flood, bushfire events can damage or destroy a school and cut off access. It may also lead to student or teacher displacement and smoke inhalation and thermal heat may have significant health effects.
Heat High impact	Storm High impact
Extreme heat may damage infrastructure around a school and have significant impacts on school employees and students, particularly where there is a lack of suitable natural shading, air cooling, breaks and hydration areas. Children are particularly susceptible to heat and their learning can be severely impacted.	Severe storms can damage or destroy a school property, requiring significant time and funding to repair. Major storms can reduce access to schools if roads are damaged, local rivers flood or powerlines are down.
Rain Medium impact	Hail Medium impact
Excess rain, particularly in schools with poor drainage and maintenance, may result in some surface flooding or ingress of water from ceilings.	Severe hail events may lead to structural damage, particularly in older school buildings.
Wind Low impact	Drought Low impact
In very high winds, structural damage may impact older or temporary school buildings. Fallen trees may also impact schools and access routes.	Severe drought may impact availability of water supply for hydration and sanitary use. Drought conditions may also increase bushfire risk.

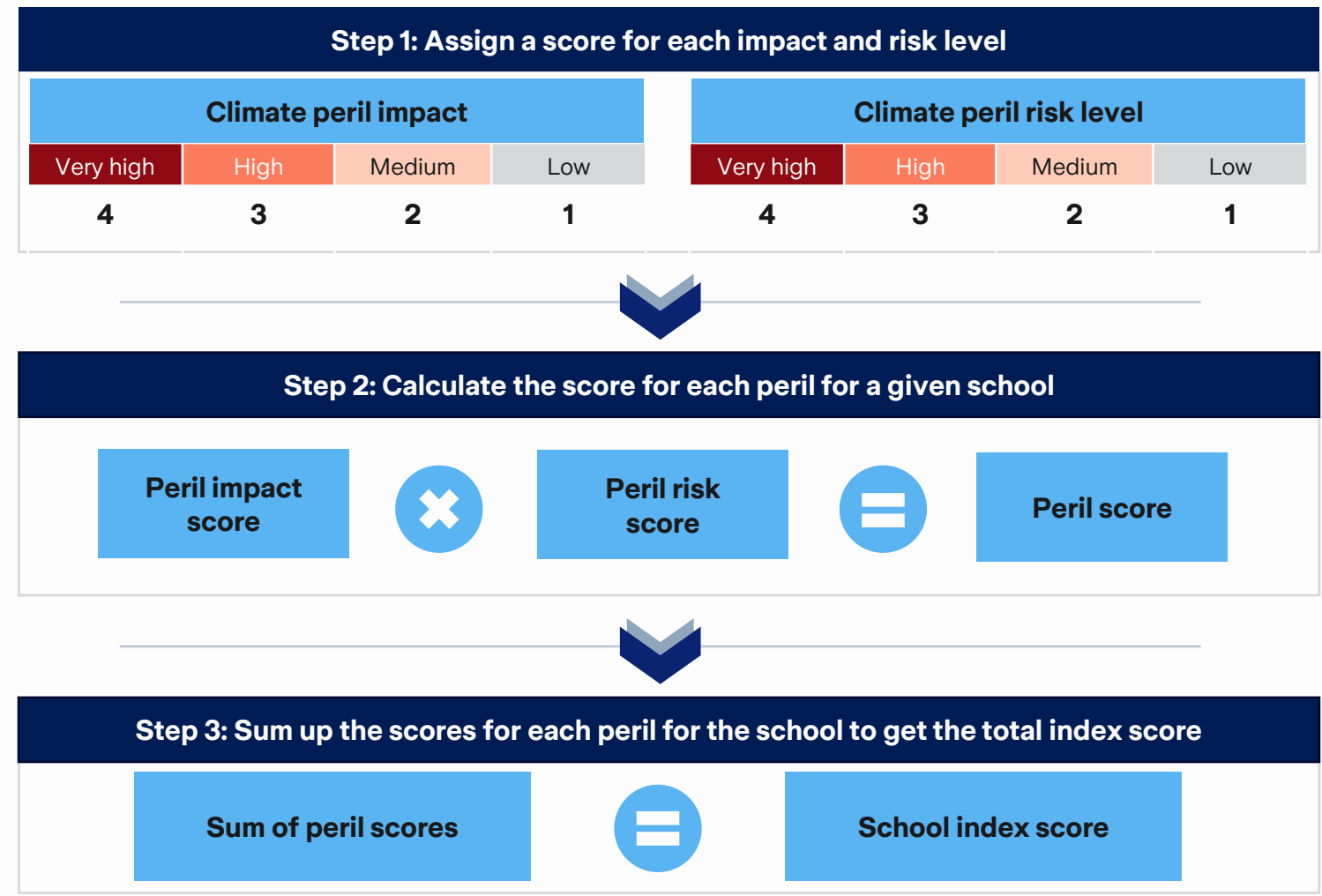
Source: Zurich Resilience Solutions analysis

Stage 4: Calculating the climate risk index score for each school

The fourth methodology stage involved generating a climate risk index score for each school that enables the comparison of climate risks. This involved a three-step process:

1. Converting the ratings within the Zurich climate tool and impact risk assessment from 'low' to 'very high' to a 1-4 scale
2. Calculating the score for each school by multiplying the school's impact score for every peril (from the Zurich tool) by the peril risk score (from the impact assessment)
3. Summing the scores for each peril to calculate the school's total climate risk index score

Calculation of climate risk index score for each school

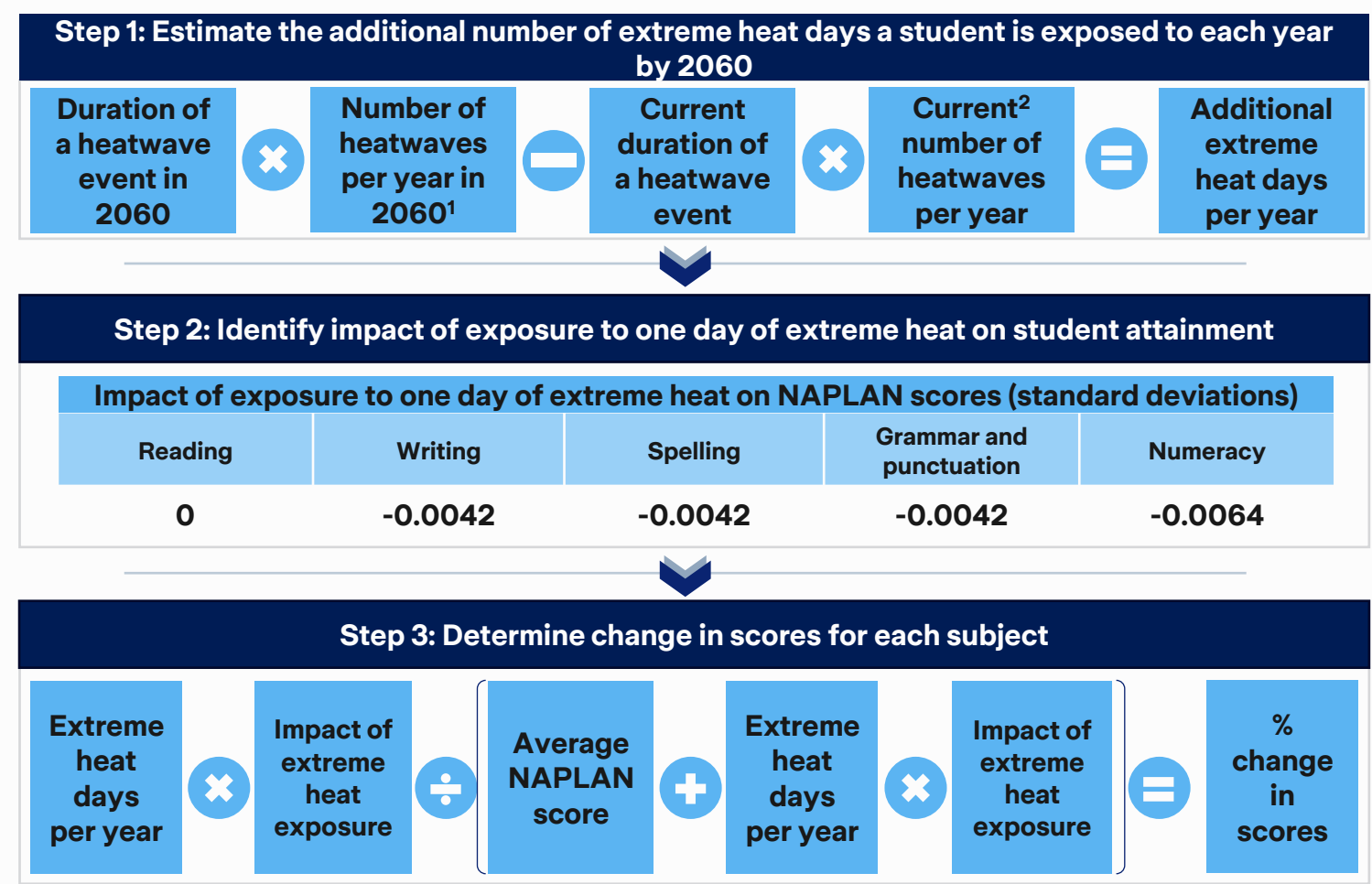


Stage 5: Calculating the impact of extreme heat on academic attainment

The fifth methodology stage involved estimating the impact of climate events on academic attainment through using extreme heat as a case study. This involved a three-step process:

1. Estimating the additional average number of extreme heat days per year using data on the average duration of a heatwave event within the Zurich climate tool
2. Identifying the average impact of exposure to one day of extreme heat on student attainment using Cho, H. (2017).
3. Calculating the change in NAPLAN scores for each subject based on average additional number of extreme heat days and its impact on scores for each subject.

Calculation of the impact of extreme heat on student attainment



¹ Assumed there is an additional 2.5 heatwaves per year using the lower bound of the increase in heatwave event frequency per year in AdaptNSW (2015). ² Based on the average of the number of heatwaves from AdaptNSW (2015) and Queensland Government (2020).
 Source: Cho, H. (2017) *The effects of summer heat on academic achievement: A cohort analysis*; Zurich and Mandala analysis



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Appendix

This report analyses 9,829 primary and secondary schools (including combined and special needs schools) across all Australian jurisdictions.

The appendix includes the name, location, sector and level of each school analysed. It can be found using the link below.

[Access appendix](#)

School Name	Suburb	State	School Sector	School Type
Jervis Bay School	Jervis Bay	ACT	Government	Primary
Macgregor Primary School	Macgregor	ACT	Government	Primary
Latham Primary School	Latham	ACT	Government	Primary
Cranleigh School	Holt	ACT	Government	Special
St John the Apostle Primary School	Florey	ACT	Catholic	Primary
Kingsford Smith School	Holt	ACT	Government	Combined
St Matthew's Primary School	Page	ACT	Catholic	Primary
Hawker College	Hawker	ACT	Government	Secondary
Belconnen High School	Hawker	ACT	Government	Secondary
Macquarie Primary School	Macquarie	ACT	Government	Primary
Hawker Primary School	Hawker	ACT	Government	Primary
Weetangera Primary School	Weetangera	ACT	Government	Primary
Evelyn Scott School	Denman Prospect	ACT	Government	Combined
Yarralumla Primary School	Yarralumla	ACT	Government	Primary
Telopea Park School	Barton	ACT	Government	Combined
Forrest Primary School	Forrest	ACT	Government	Primary
Canberra Girls Grammar School	Deakin	ACT	Independent	Combined
Charles Weston School	Coombs	ACT	Government	Primary
Alfred Deakin High School	Deakin	ACT	Government	Secondary
The Woden School	Deakin	ACT	Government	Special
Orana Steiner School	Weston	ACT	Independent	Combined
Holy Trinity Primary School	Curtin	ACT	Catholic	Primary
Canberra Grammar School	Red Hill	ACT	Independent	Combined
Islamic School of Canberra	Weston	ACT	Independent	Combined
Curtin Primary School	Curtin	ACT	Government	Primary
Canberra Montessori School	Holder	ACT	Independent	Primary
Hughes Primary School	Hughes	ACT	Government	Primary
St Jude's Primary School	Holder	ACT	Catholic	Primary
Duffy Primary School	Duffy	ACT	Government	Primary
St Benedict's Primary School	Narrabundah	ACT	Catholic	Primary
Malkara School	Garran	ACT	Government	Special
St Bede's Primary School	Red Hill	ACT	Catholic	Primary
Sts Peter and Paul Primary School	Garran	ACT	Catholic	Primary
Red Hill Primary School	Red Hill	ACT	Government	Primary
Garran Primary School	Garran	ACT	Government	Primary
St John Vianney's Primary School	Waramanga	ACT	Catholic	Primary
Mount Stromlo High School	Waramanga	ACT	Government	Secondary
Arawang Primary School	Waramanga	ACT	Government	Primary
Canberra Christian School	Mawson	ACT	Independent	Primary
Chapman Primary School	Chapman	ACT	Government	Primary
Mawson Primary School	Mawson	ACT	Government	Primary
Melrose High School	Pearce	ACT	Government	Secondary
Sacred Heart Primary School	Pearce	ACT	Catholic	Primary
Torrens Primary School	Torrens	ACT	Government	Primary
Taylor Primary School	Kambah	ACT	Government	Primary
Farrer Primary School	Farrer	ACT	Government	Primary
St Thomas the Apostle Primary School	Kambah	ACT	Catholic	Primary
Communities@Work Galilee School	Kambah	ACT	Independent	Special
Wanniassa Hills Primary School	Wanniassa	ACT	Government	Primary
St Anthony's Parish Primary School	Wanniassa	ACT	Catholic	Primary
Wanniassa School	Wanniassa	ACT	Government	Combined
Fadden Primary School	Fadden	ACT	Government	Primary
Trinity Christian School	Wanniassa	ACT	Independent	Combined
Holy Family Primary School	Gowrie	ACT	Catholic	Primary
Gowrie Primary School	Gowrie	ACT	Government	Primary
Lake Tuggeranong College	Greenway	ACT	Government	Secondary



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Zurich Resilience Solutions (ZRS) provides specialised insights and tools to support customers with building resilience to traditional and evolving risks. ZRS helps governments and businesses to understand how climate change could impact their operations and how best to mitigate these risks. Operating in 40 countries, ZRS has a network of more than 850 Risk Engineers who conduct over 60,000 risk assessments annually. In Australia, ZRS completes more than 3,600 underwriting assessments and risk improvement actions per year across motor fleet, property, marine and construction.

Mandala is a research firm with offices in Melbourne, Canberra, Sydney and Brisbane. Mandala specialises in combining cutting-edge data and advanced analytical techniques to generate new insights and fresh perspectives on the challenges facing businesses and government.

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Note: All dollar figures are Australian dollars unless indicated otherwise.