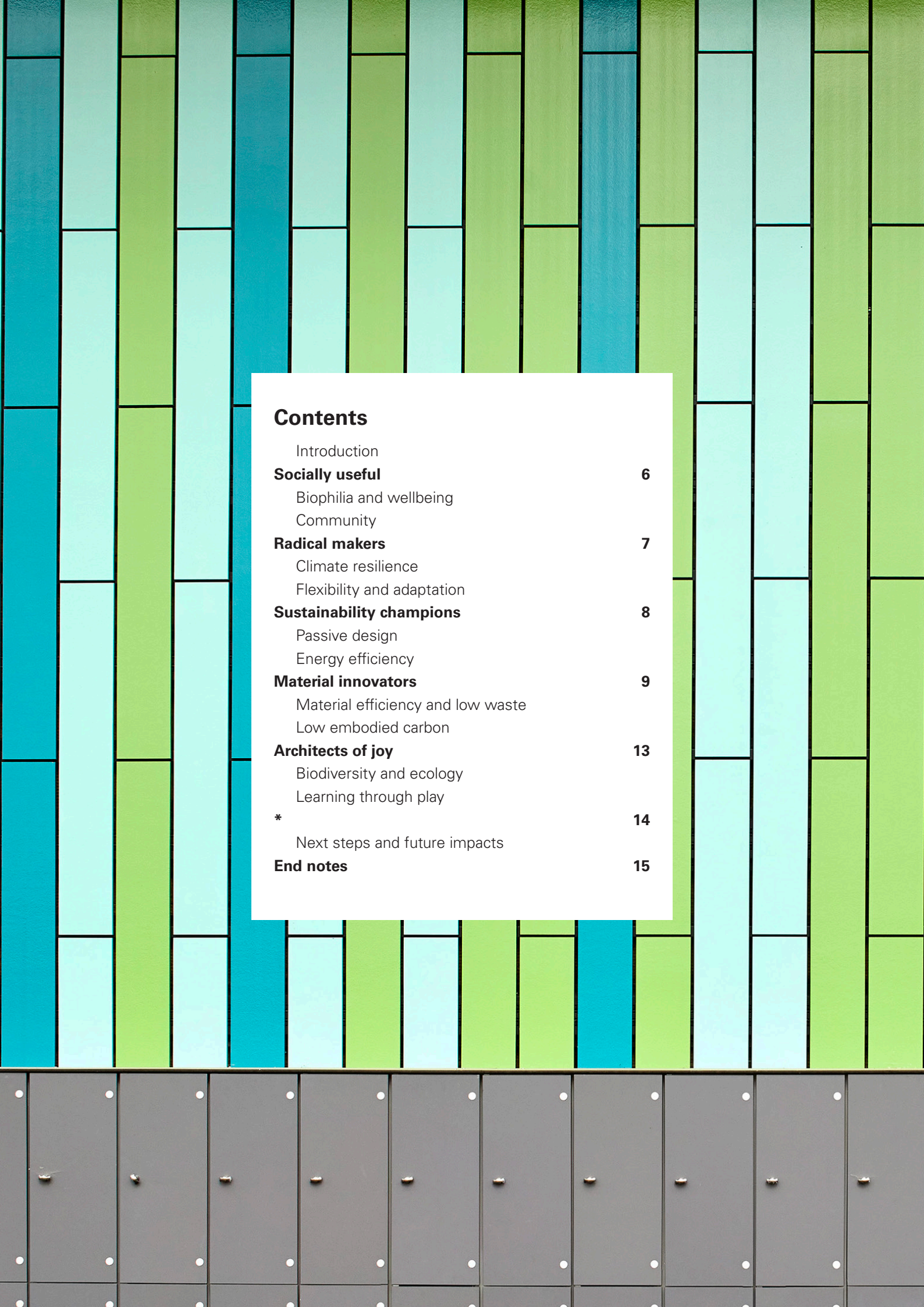
Wintringham Primary Academy

Sustainability Impact Summary



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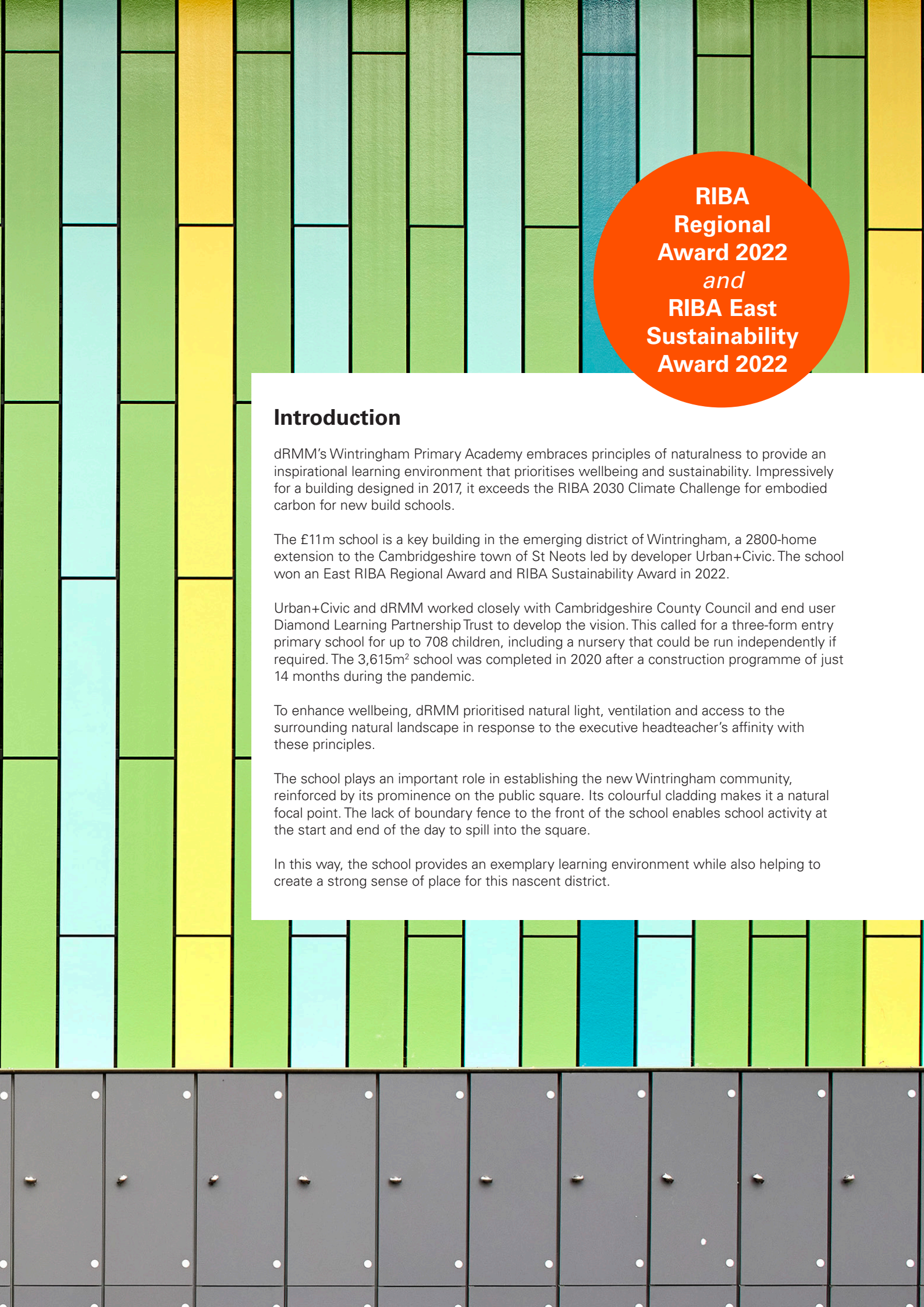


RIBA Regional Award 2022 *and* **RIBA East Sustainability Award 2022**

Introduction

dRMM's Wintringham Primary Academy embraces principles of naturalness to provide an inspirational learning environment that prioritises wellbeing and sustainability. Impressively for a building designed in 2017, it exceeds the RIBA 2030 Climate Challenge for embodied carbon for new build schools.

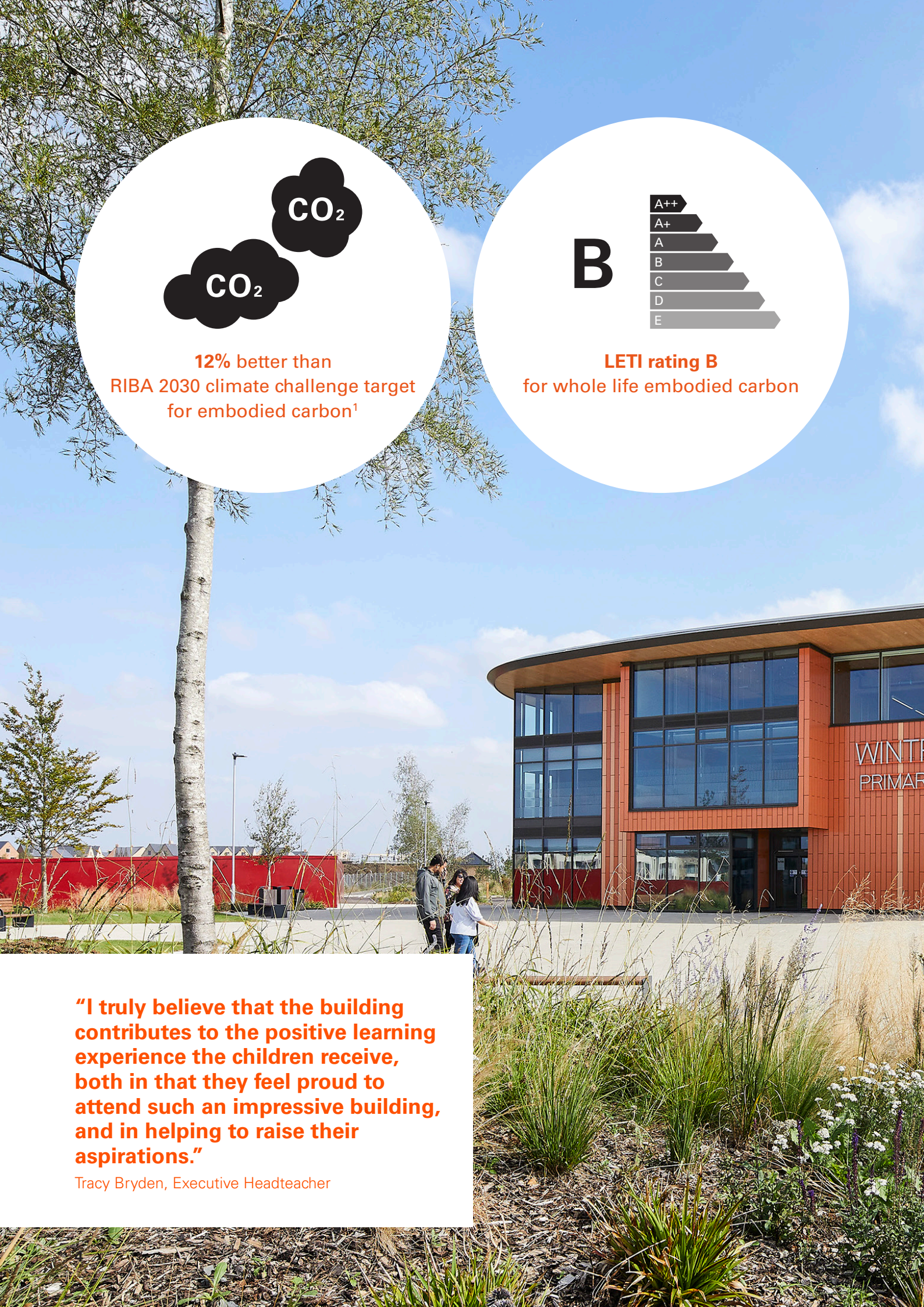
The £11m school is a key building in the emerging district of Wintringham, a 2800-home extension to the Cambridgeshire town of St Neots led by developer Urban+Civic. The school won an East RIBA Regional Award and RIBA Sustainability Award in 2022.

Urban+Civic and dRMM worked closely with Cambridgeshire County Council and end user Diamond Learning Partnership Trust to develop the vision. This called for a three-form entry primary school for up to 708 children, including a nursery that could be run independently if required. The 3,615m^2 school was completed in 2020 after a construction programme of just 14 months during the pandemic.

To enhance wellbeing, dRMM prioritised natural light, ventilation and access to the surrounding natural landscape in response to the executive headteacher's affinity with these principles.

The school plays an important role in establishing the new Wintringham community, reinforced by its prominence on the public square. Its colourful cladding makes it a natural focal point. The lack of boundary fence to the front of the school enables school activity at the start and end of the day to spill into the square.

In this way, the school provides an exemplary learning environment while also helping to create a strong sense of place for this nascent district.



12% better than
RIBA 2030 climate challenge target
for embodied carbon[1]

LETI rating B
for whole life embodied carbon

"I truly believe that the building contributes to the positive learning experience the children receive, both in that they feel proud to attend such an impressive building, and in helping to raise their aspirations."

Tracy Bryden, Executive Headteacher

170%
biodiversity net gain[3]

414kg CO_2/m²
sequestered carbon (A1-5), including in the CLT structure[4]

Socially useful

Biophilia and wellbeing

The school is organised ‘in the round’ with two stacked levels of classrooms arranged around a landscaped courtyard, known as The Grove. As well as providing easy navigation, this layout allows all classrooms to benefit from natural light from both the internal and external aspects.

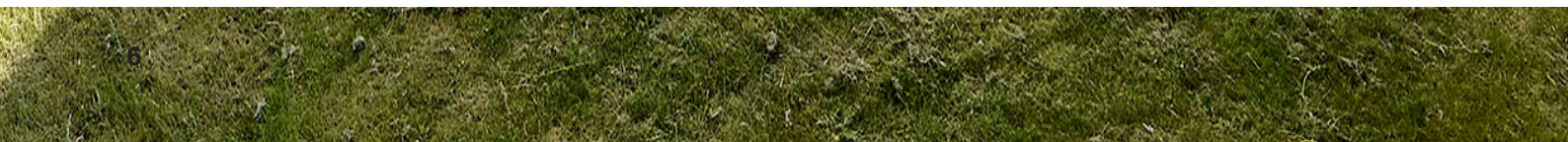
Externally, the school is clad in a colour loop of glazed ceramic panels inspired by the seasonal colour variations found in woodlands. Pupils have free flow access between the internal and external spaces, encouraging outdoor learning.

The design exploits CLT’s biophilic benefits by exposing its bare timber surface throughout the school to bring a sense of natural warmth that complements panoramic views to nature. Research shows that timber teaching spaces help reduce perceived levels of stress[5], creating a nurturing environment conducive to learning.

Community

dRMM worked closely with Wintringham’s Executive Headteacher, Tracey Bryden.

Situated at the head of the public square, the school is designed to serve as Wintringham Park’s main civic building. The school hall and playing fields are positioned for ease of community use out of school hours. The building acts as a central focal point for a masterplan-wide network of green cycle routes and walkways that promote healthy living for local people.



Radical makers

Climate resilience

Through its use of passive ventilation in classrooms and solar shading provided by the extended roof canopy, the design mitigates against the risk of overheating as a result of the climate change. These features also reduce reliance on servicing, minimising energy consumption.

In view of the area's high risk of flooding, the landscape is designed to be highly permeable, to mitigate the risk of flash flooding: while verdant planting helps to attenuate water and slow its run off.

Climate resilience is the ability for the built environment to cope with future weather events and patterns as the climate changes, while still providing comfortable places to live, work and play.

Flexibility and adaptation

To facilitate flexibility and minimise the risk of obsolescence, 'soft spots' in the CLT wall panels between classrooms allow for spatial changes to adapt to the school's future growth and evolving curriculum. Outdoor, open-plan and breakout learning spaces provide a varied learning experience. Teamed with natural ventilation, they are an important device to mitigate against the effect of climate change; a forward-thinking design decision as these requirements are being written in to the 'DfE's Employer's Requirements: School Output Specification'[6] output specification being introduced in the government's new contractors' framework for schools.

The inclusion of these spaces allowed Wintringham Primary Academy to easily respond to ever-changing COVID requirements by enabling lessons to take place with comfortable social distancing measures and without the need to further adapt the school.

Sustainability champions

Passive design

Passive environmental principles informed the school's distinctive arrangement of teaching spaces around a central grove. Spaces receive increased natural daylight and cross ventilation from multiple aspects.

Within the masterplan the school is oriented to address the new public square and as a result the majority of classrooms benefit from a south-eastern aspect that provides natural lighting and heating. The M&E engineers conducted a thermal comfort test on the conditions within the classrooms, allowing us to ensure glazing ratios and shading devices were optimised for the learning environments. The elegant roof canopy oversails the building to provide shading and protection, reducing reliance on servicing while futureproofing the school against predicted temperature rises.

Energy efficiency is about reducing waste in energy use and limiting the amount of power needed through the use of passive environmental strategies. Doing this reduces the overall amount of energy needed to operate the built environment.

Energy efficiency

The predicted operational energy use is 34 kWh/m^2/yr. There was no design stage estimate for unregulated energy use.

At the time of writing (September 2022) Wintringham Primary Academy is currently at 15% of its full capacity, therefore conducting a post occupancy study at this stage would not be representative of the building's operations. We will return to the school to conduct post occupancy evaluation when the school has a full cohort.[7]

Material innovators

Material efficiency and low waste

All construction materials require energy for manufacture, extraction and transport to site, and many materials commonly utilised in construction are of finite origin, such as sand and gravel used in concrete mixes. Even those materials that are naturally renewable, such as timber, require energy and land to produce, so all materials regardless of their origin should be used as efficiently as possible. Renewable does not mean unlimited.

Every opportunity was taken to reduce the amount of construction material that went into the building.

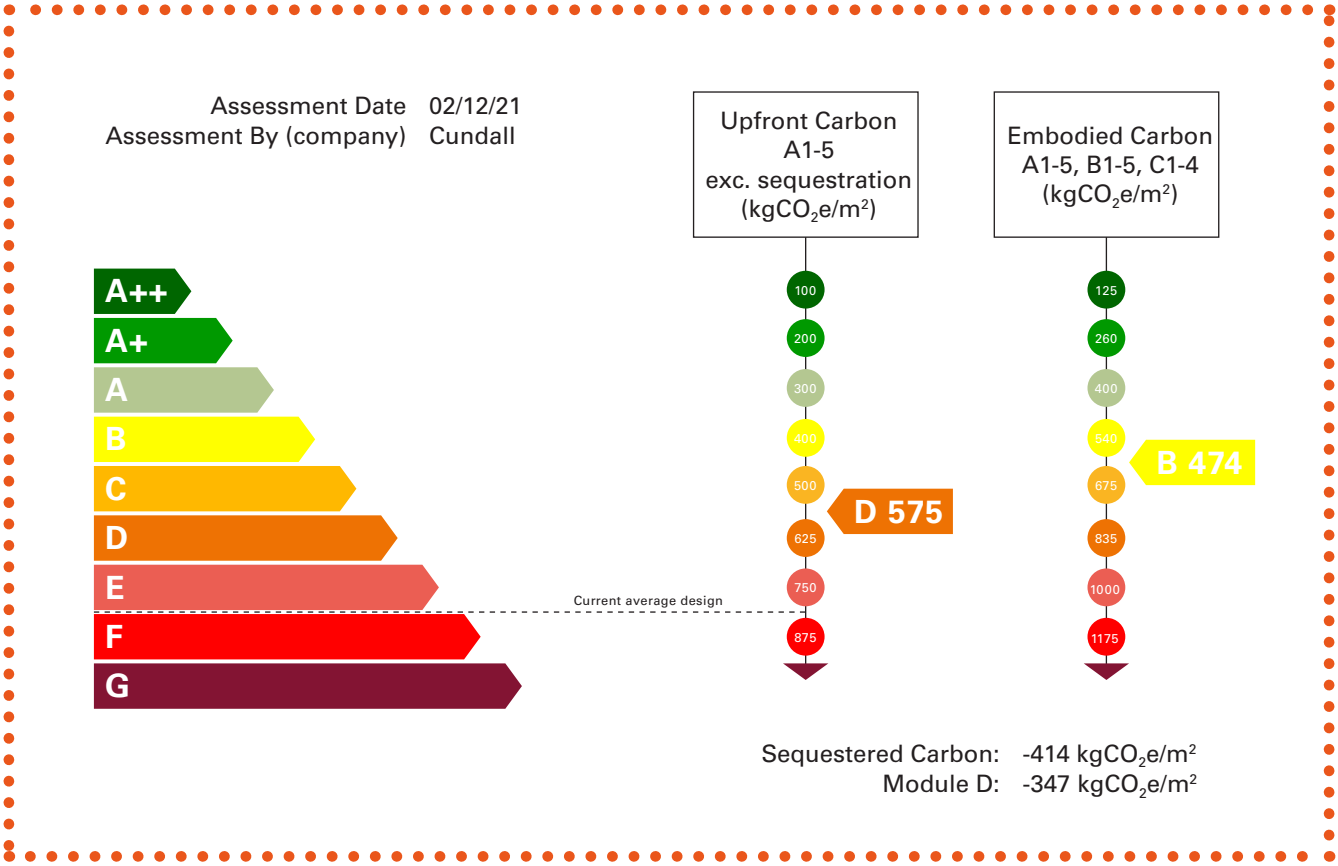
CLT, with the judicious use of a few structural steel elements, allowed a lightweight structure which helped to reduce the size of the building's sub-structure. Stacked classrooms maximise the structural efficiency of the design.

Timber is left exposed inside the building, reducing the need for additional internal finishes. The roof is designed to be entirely supported by the load-bearing CLT walls.

Despite increased energy incurred by being sourced from Europe, CLT's off-site manufacturing allowed for reduced time on site, creating a safer and cleaner working environment and allowing greater control over service coordination, ultimately reducing construction waste significantly.

Circular economy means a system where there is no waste and all resources/ assets are kept in use for as long as possible.

Cross-laminated timber (CLT) is made of bonded layers of timber that alternate in their grain direction, creating a uniform product with enhanced strength.



Low embodied carbon

Wintringham Primary Academy was designed from 2017 and constructed from 2019 onwards, so it predated the establishment of widespread understanding of embodied and whole-life carbon in the architectural profession.

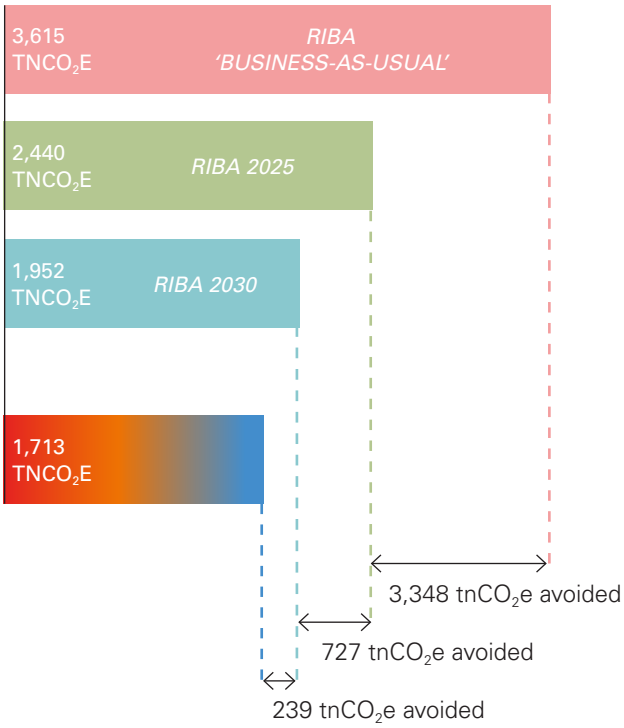
We are especially pleased, therefore, that Cundall's embodied carbon analysis found that the school is 12% less impactful than the RIBA 2030 target for schools and 32.5% less carbon than their "business as usual" benchmark.[8]

The building achieved a LETI Rating 'B' for its Embodied Carbon impact of 474kgCO_2/m^2 (A1-5, B1-5, C1-4) and a 'D' for its Upfront Carbon impact of 575kg CO_2/m^2 (A1-5 only, with sequestration excluded per standard practice). 414 kgCO_2/m^2 are sequestered in A1-5, mostly in the building's CLT structure.[9]

Comparing the school to equivalent carbon total impacts based on the RIBA 2030 Climate Challenge targets showcase the real significance of carbon avoided – some 1,902 tonnes CO_2e are avoided as compared to a theoretical RIBA Business-as-Usual school of the same area. This is the same amount of carbon as avoiding 1,929 return flights from London Heathrow to New York JFK airport.[10]

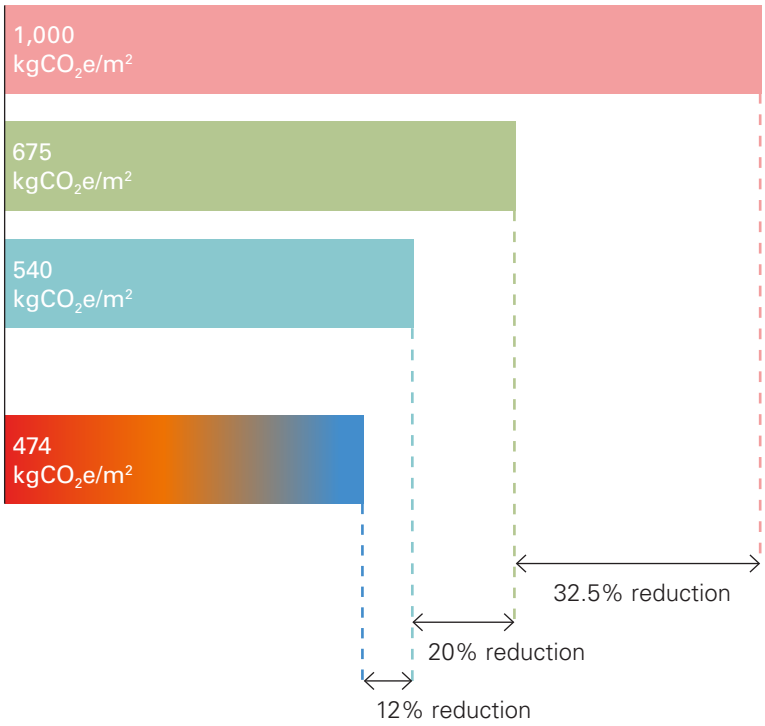
The total impact of Wintringham Primary Academy is still some 1,713 tonnes CO_2e (including sequestration). This is a powerful reminder of how impactful the design of buildings can be, and how much agency we have as designers to reduce carbon.[11]

Embodied carbon is the quantity of carbon dioxide equivalents (CO_2eq) that arise from an asset's materials and construction/ manufacturing processes from cradle-to-grave.



RIBA
embodied carbon targets
in total for an equivalent
sized school (3,615m²)

Actual embodied
carbon total for
Wintringham Primary Academy
2022



RIBA
2030 embodied carbon targets
(Climate Challenge V02)

Embodied carbon for
Wintringham Primary Academy
2022


Mr. Men and Little Miss
Characteristics of Effective Learning
How tall are you?
taller
tall
smaller
tallest
smallest
Pink
I can...
choose what I want to use
mirrors
laces
threading

Architects of joy

Biodiversity and ecology

The school scored 170% in the BREEAM ecology calculation.[12] Previously wheatfields, the site was considered of low/medium ecological value due to its history of intensive farming practices. The project was designed to enhance the biodiversity and ecological value of the site through the planned creation of native species hedges, woodland, shrubs, wildflower meadow and amenity shrub and tree planting. Additional roosting opportunities for bats and UK priority bird species have been provided through bat and bird boxes. As with the well-known potential for an operational energy performance gap, established natural landscapes may also experience their own version of a performance gap. The weather, maintenance and fauna are all factors that may affect how a landscape behaves in real life, in comparison to the design expectation. This is an area that dRMM would love to explore in any post-occupancy study of the project in the future.

Biodiversity net gain is the aim to leave the wider natural environment in an improved state, and to quantify this through a consistent measurement methodology. 'Net gain' can be achieved wholly on-site or through off-site schemes.

Learning through play

The school's natural and passive credentials provide an education tool for staff to bring sustainability to life in their teaching, whilst the central grove serves as a constant reminder of how important the natural world is to the way we live.

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Next steps and future impacts

This sustainability impact summary is based on the data available to dRMM at the time of writing, compiled from a variety of sources including design documentation and analysis undertaken since the building's completion by third-party assessors. It is also based on the present understanding of the key concepts that the document covers, which are evolving and emerging in their nature as our industry develops its understanding of each aspect of sustainable, regenerative design. With this summary we seek to be transparent and open about the successes and limitations of this project, so that others can learn from our findings for the benefit of future projects.

It is important to note that buildings can perform differently in use than expected during design stages, and Wintringham Primary Academy is just at the beginning of its expected design life. There will be more to learn in years to come. The wider masterplan by Urban & Civic is still under development and much will change around the building's site; from the construction of surrounding developments to the biodiversity corridors and links that will evolve. The school population will grow in parallel with the growth if the Wintringham Park neighbourhood. Trees and plants will mature, filling out the grove and other biodiverse areas in the scheme, offering increased shading and cooling benefits.

As a studio we find learning about the reality of in-use operation of buildings fascinating and often surprising. Once a building is complete it is handed over to its owner occupiers and used as they see fit, whether as we had expected it to be or not. We hope to revisit the school in the future to evaluate how it is performing when it is in full occupancy and update this document as and when more data is made available to us. We would like to be able to learn from the building's operations in order to develop a fuller whole-life carbon study based on in-use energy data. And to hear from students and staff about how it is performing in their eyes.

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It is important that we are clear with the sources of data for claims around sustainability performance. At dRMM the asterisk represents this importance, signalling our passion for rigour and clarity in data disclosure.

End notes

1. Based on RIBA 2030 new-build schools target of <750 $kgCO_2e/m^2$ (A1-A5, B1-B-5, C1-C4 incl sequestration) in the document 'RIBA 2030 Climate Challenge version 2' as compared to the embodied carbon study conducted by Cundall for dRMM on Wintringham using the Sturgis carbon calculator.

2. As calculated by Cundall for dRMM, using the Sturgis carbon calculator, for stages A1-5, B1-5, and C1-4. Full LETI reporting can be access from https://drmmstudio.com/wintringham-primary-academy-benchmarked-embodied-carbon-data/.

3. 170% change in biodiversity units calculated by HRS Services Limited using the methodology as set out in BREEAM, 2018 GN36 BREEAM, CEEQUAL and HQM Ecology Methodology – Route 2. The true biodiversity net gain should be monitored long term to verify that the design aspiration has been met. Factors such as the weather, maintenance regimes and fauna can all affect the actual maturing of plants and may result in a 'biodiversity performance gap'.

4. As calculated by Cundall for dRMM using the Sturgis carbon calculator.

5. Studies on this subject include; Moser, M., Kelz, C., Grote, V. (2011) 'Interior wood use in classrooms reduces pupils' stress levels', Conference Paper from 9th Biennial Conference on Environmental Psychology at Eindhoven, The Netherlands.

6. Reference: DfE Employer's Requirements Part B School Output Specification Generic Design Brief (May 2022)

7. BS 40101 (2022) 'Building performance evaluation of occupied and operational buildings' recommends building performance evaluations should be conducted when there is a minimum of 75% of expected occupancy.

8. As set out for new-build schools in the document 'RIBA 2030 Climate Challenge version 2' as compared to the embodied carbon study conducted by Cundall for dRMM on Wintringham using the Sturgis carbon calculator.

9. As calculated by Cundall for dRMM using the Sturgis carbon calculator. Full LETI reporting can be access from https://drmmstudio.com/wintringham-primary-academy-benchmarked-embodied-carbon-data/.

10. According to the Guardian Carbon Calculator a flight from LHR to NY JFK is 0.986 tonnes CO_2. https://www.theguardian.com/travel/2019/jul/31/carbon-calculator-find-out-how-much-co2-your-flight-will-emit

This report summarises the sustainability strategies in place in dRMM's Wintringham Primary Academy design and demonstrates dRMM's approach to design as radical makers of socially useful architecture.

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