



The Interior Designer's responsibility
for improving the wellbeing of students
through Biophilic Design strategies

Student: Emily Lewis

Student number: Q16035437





Figure 1.. Morning rays (Authors own image), 2023

Nature. It is something that the vast majority of us love, something that we seek for rejuvenation, restoration and relaxation. As humans we are deeply connected to the natural world, it is the home from which we all came, yet in our modern world we inhabit man-made structures that are far from what we have evolved alongside. With the rise of the technologic age and ever-growing concrete sky scrapers, our mental health and wellbeing is deteriorating rapidly. The human body, mind, and senses evolved in a bio-centric not human engineered or invented world. (S. Kellert, Callabrese, E, 2015)

Fields in Trust (n.d.) found that 6.1 million people are without a 10-minute walking access to a green space. With a mounting world population of nearly 8 billion humans exponentially increasing how can we, as interior designers, implement Biophilic Design strategies to rehabilitate our inherent connection with the natural world for our future generation's best success in the pivotal years ahead?

Throughout this essay I will explore how educational learning spaces can benefit from Biophilic Design strategies through interior design solutions, whilst investigating if they can really offer better learning and wellbeing outcomes for students, and if so, which strategies should we be putting into place to achieve a holistic result. NHS digital (2020) found that 1 in 6 young people in England aged 5-16 experienced a mental health problem in 2020, further highlighting the importance for improving the quality of lives for young people.

So, what is Biophilic Design and why is it important? It can be defined by "The process of basing decisions about the built environment on intuition or credible research – derived from either an appetency for nature or measurable biological responses, respectively – to achieve the best possible health outcomes." (Ryan.O Catherine et Browning D. William, 2020)

Biophilic Design can reduce stress, enhance creativity and clarity of thought, improve our well-being and expedite healing. This is achieved by different methodologies such as mimicking the sounds we hear in nature i.e. bird song or water to physically choosing materials that have a raw, natural edge. However, it is much more than this, Biophilic Design can provide us with places of respite which can enhance feelings of safety and rejuvenation, this can be achieved by creating bespoke booth seating or accomplished through floor plan arrangements that offer a sense of mystery and excitement, see Figure 3. (14 patterns of Biophilic Design, 2014).

Biophilia is a grouping of two words that descend from ancient Greek: 'Life (bio) and 'love' (philia); it literally means love of life.' (Barbiero, G and Berto, R 2021) Biophilia is humankind's innate biological connection with nature, coined by Edward O Wilson in 1984.



Figure 2.. Syrikova, (2020)

Through my exploration of Biophilic Design strategies, I will compare three different case studies from around the world, focusing on educational spaces whilst dissecting the techniques used, reflecting on their alignment in accordance with the 14 patterns of Biophilic Design and whether or not they have been successful in their design approaches. I will also explore the benefits of Forest School Education and how this links to Biophilic Design approaches but also how we can implement the forest school principles within interior spaces for greater student outcomes. Children with greater exposure to nature reported greater physical strength and coordination, better self-esteem and self-confidence, an enhance ability to cope with challenge and adversity and a higher critical thinking, problem solving abilities. (Kellert. S, 2018).

Our school environments are built lacking a human-centred approach. With such positive benefits at stake, one would ask what is there to lose through Biophilic Design implementation when there is so much to gain?

14 patterns of Biophilic design	14 patterns of Biophilic design	Implement in interior examples
Nature in the space	Visual connection to nature	Green walls or nature artwork
	Non-Visual Connection with Nature	Textured fabrics that mimic natural textures
	Non-Rhythmic Sensory Stimuli	Fabric that moves with the light or breeze
	Thermal & Airflo Variability	Window glazing and ventilation
	Presence of water	Constructed water fall or fountain
	Dynamic & Diffuse Light	Direct sunlight through windows or circadian colour reference ambient lighting
	Connection with Natural Systems	Natural patina of materials (leather, stone, copper, bronze, wood)
Natural analogues	Biomorphic forms & patterns	Fabrics, carpets or wallpaper design, acoustic panelling and hallway form
	Material Connection with Nature	Natural material choices such as woodwork, stone etc alongside colour pallet and furniture form
	Complexity & Order	Wall paper or carpet design or window details
Nature of the space	Prospect	Partition heights and open floor plans
	Refuge	Complete concealment i.e. booth seating or modular refuge providing small protection
	Mystery	Winding paths, form and flow
	Risk/Peril	Double height balcony's, transparent railing

Figure 3. 14 Patterns of Biophilic Design, Browning, W.D, Ryan, C.O, Clancy, J.O. (2014)



Figure 4. Biophilic forms (Authors own image), 2022



Figure 5. Biophilic forms (Authors own image), 2023



Figure 6. Pixabay, (2016)



Figure 7. The Outdoors Group, (n.d.)

School, college, university, we've all heard of these institutions, and if we are lucky enough to have first-hand experience within one of these spaces through our early years over to young adulthood. The education system is built to support children and young adults with developing their knowledge and skills in hope that they can one day flourish in a meaningful life. Yet through my own experience most schools are outdated and uninspiring, white walls, stark overhead lighting and synthetic materials spread throughout creates a mind-numbing and lifeless space which is anything but what children and young adults are. Furthermore, the materials we choose can have a detrimental impact on our health, for instance if one is choosing a paint product, paints that have high VOCs, can cause people to experience eye irritation, breathing difficulties, kidney damage and cancer (Wikipedia, n.d.), concluding that our health can have damaging long-term impacts through contact of toxic products.

Schools are environments that rarely connect us with our natural world therefor limiting children's potential. Forest Schools on the other hand, offer children a hands-on approach to learning, focusing on human centred approaches, being student-led and play based within nature. Promoting use of all 5 human senses, deepening the students learning experience (Forest Schools, 2019). According to Forestschools.com the idea first came from Denmark in 1950 & shortly began in Sweden, during the 1990s Forest Schools were first introduced in the UK.

Its roots reach back to the open-air culture, friluftsliv, or free air life, seen as a way of life in Scandinavia where Forest School began. (Forest School Association, n.d.)

To be successful in designing schools for students, we must first understand their needs. What is it that each individual student needs in order to reach their best potential? According gov.uk, Help for Early Years Providers (n.d.), there are 6 key factors which contribute to adapting learning approaches to the specific student as seen in Figure 8.

It is clear to see that learning through physical development, expression, community and connection is imperative for the best success. What is also fascinating to reflect on is how each of the student needs, can also be applied through Biophilic Design strategies. Each of us are unique individuals with our own distinctive experiences which shape our everyday life, as such having an educational setting that is designed to support students as they grow, beyond that we can be conscious in our decisions and help people thrive in their living environment.

Communication and language	Physical development	Personal, social and emotional development	Literacy	Mathematics	Understanding the world	Expressive arts and design	Safeguarding and welfare
Interactions	Core strength and co-ordination	Emotions	Reading comprehension	Numbers	Personal experiences	Imagination and creativity	Oral health
Exploring language	Gross motor skills	Sense of self	Exploring words	Patterns and connections	Diverse world	Self-expression	Food safety
Listening and understanding	Fine motor skills	Relationships	Writing	Spatial reasoning	Widening vocabulary	Communicating through arts	Internet safety
							Mental health for early years children

Figure 8. Meeting the needs of all children, Early Years Foundation Stage (EYFS) framework, n.d.



Figure 9. The Sustainability Centre, n.d.



Figure 10. De Verwondering; n.d.



Figure 11. GEEUMPLUS, National Arboretum Children’s Forest School, n.d.

I have chosen 3 different case studies, firstly The Sustainability Centre due to being local with Forest School offerings, promoting outdoor learning. Second De Verwondering based in Netherlands due to being an award winning contemporary Biophilic Design School. Lastly the National Arboretum Children’s Forest School, based in South Korea which links Forest School education alongside Biophilic Design strategies, each have been chosen for their nature based educational ethos, some combining more Biophilic interior solutions than others and one combining both Forest School education with Biophilic interiors.

Case study 1

The Sustainability Centre Petersfield



Figure 12. The Sustainability Centre, n.d.



Figure 13. The Sustainability Centre
(Authors own image), 2024



Figure 14. The Sustainability Centre, n.d.

I will firstly explore The Sustainability Centre, a former Royal Navy Communications and Navigation School, located within Southdown's national park, spread over 55 acres of woodland and natural chalk downland. They are a charity run site which aims to educate, enable and inspire people from all walks of life to make positive changes to the way they live and work (The Sustainability Centre, n.d). They have a range of educational offerings, from Forest Schools, Home Education Groups, Comprehensive School, College & University visits & even 121 support for students on the brink of exclusion within a Comprehensive School setting.

I visited The Sustainability Centre for a guided tour and asked if they had received any feedback from students who attended the facility regularly, their responses were staggering, stating that many students had changed their entire trajectory in life, in particular those who were struggling within a Comprehensive School setting.

One of my tour guides was called Liz, a former Comprehensive School teacher, stated that working at The Sustainability Centre has completely changed her perspective on her former experience as a teacher, she now firmly believes that there is a growing need for big changes which would align in favour of the Forest School approach

The centre had ambitions to fully refurbish, however they would have needed to raise £3.5 million to achieve this, as such they decided to stay in keeping with the sustainable ethos; renovate little and often whilst being locally resourceful.



Figure 15. The Sustainability Centre, Workshop room
(Authors own image), 2024

I was advised that the site rarely has students within the interior space itself, even when it is raining as the centre is all about harnessing our innate connection with nature, as such it is challenging to compare the space with my other case studies. I was directed to a room within the centre which functioned as a workshop room if the weather is too poor to be outside.

The space was dated yet, they have tried their best efforts to create a calming environment for the visitors. In terms of Biophilic Design practises, there were light bright windows which were south facing, providing ample light, the main colours of the carpet and paint were green, creating a calming yet outdated interior space. There were use of plants and table clothes featuring natural elements such as plants and bees, however I felt this was too literal and childlike, improvements could be made by choosing natural materials such as linen that offers more texture.

In my opinion more sense stimulating interior choices could be made, such as curved wooden tables and chairs as shown in Figure 15. In addition, wooden cladding within the interior space could have echoed the outdoor further whilst providing wellbeing benefits.



Figure 16. The Sustainability Centre, Outdoor circle
(Authors own image), 2024



Figure 17. The Sustainability Centre,
Educational fire circle (Authors own image),
2024



Figure 18. The Sustainability Centre, Forest
school area (Authors own image), 2024

Case study 2

De Verwondering

Almere, Netherlands



Figure 19. Orga Architects, De Verwondering, (2023)



Figure 20. Orga Architects, De Verwondering, (2023)

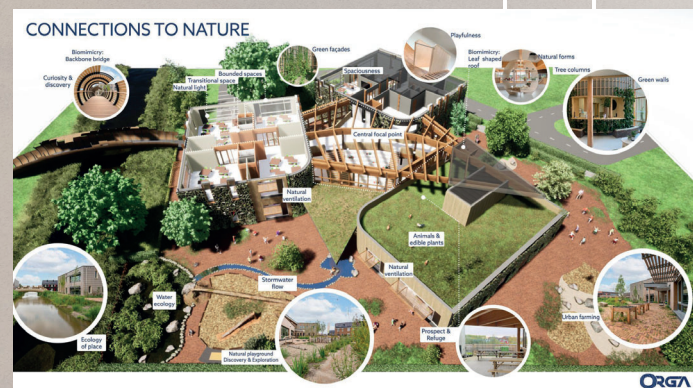


Figure 21. Orga Architects, De Verwondering, (2023)

De Verwondering is a school located in the city of Almere, the Netherlands. It was designed by Orga Architects with Biophilic Design at the heart of their endeavours. De Verwondering won the international Stephen Kellert Biophilic Design Award which is a truly remarkable achievement. The primary school aims for a holistic approach to their learning offerings but also through their physical environment which includes the interior space and exterior of the school building with their design inspiration inspired by natural habitats where animals' species coexist and thrive (Orga Architects, n.d.).

Teachers from De Verwondering have stated that students now feel a sense of self and ease when they attend classes, it is clear to see through the first-hand experience of teachers the undeniable wellbeing impact of Biophilic Design (Orga Architects, 2023).

There are many inspiring elements to this case study which really reflect the biomorphic values. Within in the interior space there are large windows which allow for greater circadian rhythmic flows, these also offer views to the abundance green gardens. Some key features that really stand out to me are the natural flows and circulations of the space, there is no set linear pathways but allows for freedom of movement an exploration which I believe is very important particularly for younger students. The large proportion of the interior materials are natural wood including wooden logs adding additional texture, living plant walls in trellis which will grow over time add a unique feature. Cork features throughout, which has significant sustainability credentials alongside acoustic benefits. In addition, circular grass mats are used, usually I would not be fond of such mats but due to their minimal quantity and quality of product I feel these suit the interior space well.



Figure 22. Orga Architects, De Verwondering, (2023)



Figure 23. Orga Architects, De Verwondering, (2023)



Figure 24. Orga Architects, De Verwondering, (2023)



Figure 25. Orga Architects, De Verwondering, (2023)



Figure 26. Orga Architects, De Verwondering, (2023)



Figure 27. Orga Architects, De Verwondering, (2023)

Throughout the space there are also timber frame stools and tables which offer a community feel to learning, in contrary to this there are modular and circular seating offerings finished in a muted green. There is limited use of colour within the space featuring mainly warm wooden tones alongside shades of greens and predominantly warm whites which one may feel does not add much depth or excitement, for a school however I would say that this minimal use of colours creates a very calming environment. I really love the bespoke oval plant stand made from birch again mimicking an organic form which functions as seating and a plant stand.

The classrooms feature a view to flowing water with large windows which adds additional sounds and views to a changing seasonal environment. The school also offers a great source of ventilation therefor greatly benefiting the air quality for the students and teachers. The flooring is a biobased floor finish which really echoes the school's philosophy of holistic approaches.

The space could benefit from some more playful elements to really enhance the children's experience and engaging natural elements such as interactive nature tables. This could also be achieved by have more interesting chairs which could mimic toadstools or images of animals that could further their connection to nature. Perhaps even adding some sheer curtains or blinds that could offer the freedom of movement that nature offers.

In comparison to The Sustainability Centre there are a few stand out points, De Verwondering offers not just exterior benefits of gardens and connection to a physical nature but also an interior that reflects their ethos, it successfully breathes sustainable Biophilic Design within interior application and exterior which is a triumph.

Case study 3

National Arboretum Children's Forest School

Korea

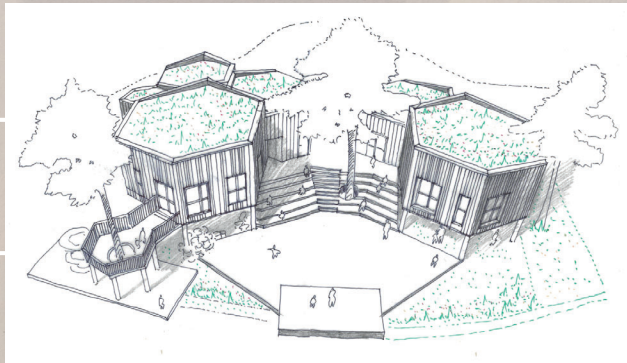


Figure 28. GEEUMPLUS, National Arboretum Children's Forest School, (2021)



Figure 29. GEEUMPLUS, National Arboretum Children's Forest School, (2021)



Figure 30. GEEUMPLUS, National Arboretum Children's Forest School, (2021)

Lastly the third case study I will be reviewing is Korea National Arboretum Childrens Forest School which is used as an educational and exhibition space to inform children about the importance of forests and the environment in a fun and easy way through the building and the exhibition of outdoor spaces (Archdaily, 2021). The site reminds me somewhat of The Sustainability Centre; yet with similar ethos to De Verwondering.

The floor plan was inspired by the honeycomb which reflects the architects' messages for the importance of bees within our ecosystem. Each building has been set at a height, mimicking tree houses which creates a sense of curiosity and excitement for the children.

The interiors feature curved seating arrangements made from warm wood veneers which add texture and patterns of natural forms. There is a selection of windows within the space, offering views to nature. This is the first project within the essay that features more colour within the palette, although the colours are not bold and vivid they add a calmness to the space and reflect that of nature whilst also being appropriate for the age range.



Figure 31. GEEUMPLUS, National Arboretum Children's Forest School, (2021)



Figure 32. GEEUMPLUS, National Arboretum Children's Forest School, (2021)



Figure 33. GEEUMPLUS, National Arboretum Children's Forest School, (2021)

The honeycomb forms have been used throughout the interior space as well in the form of shelving and seating which I think is a playful touch. There are also bespoke shelving and tree trunk tables which are used within the space which further lean into the Biophilic Design approach without offering a tackiness or over the top emphasis on literal nature. There is tree bench seating to encourage reading underneath the tree, this is a fun element yet larger scale of the top could have been more encapsulating.

The floor offers a beautiful free flowing space which I can imagine children engaging with. I do feel that there could have been better seating offerings for more community engagement with one another which I feel De Verwondering achieves very well however this school is offered to a younger age bracket therefore designed in consideration. It is a shame that some of the windows have been covered by the bespoke library shelving where window seats could have been offered for a more hidden place of respite for the children which also offers the great view out to the natural landscape.
































14 patterns of Biophilic design	14 patterns of Biophilic design	Implement in interior examples	The Sustainability Centre	De Verwondering	Korea national arboretum children's forest school
Nature in the space	Visual connection to nature	Green walls or nature artwork			
	Non-Visual Connection with Nature	Textured fabrics that mimic natural textures			
	Non-Rhythmic Sensory Stimuli	Fabric that moves with the light or breeze			
	Thermal & Airflow Variability	Window glazing and ventilation			
	Presence of water	Constructed water fall or fountain			
	Dynamic & Diffuse Light	Direct sunlight through windows or circadian colour reference ambient lighting			
	Connection with Natural Systems	Natural patina of materials (leather, stone, copper, bronze, wood)			
Natural analogues	Biomorphic forms & patterns	Fabrics, carpets or wallpaper design, acoustic panelling and hallway form			
	Material Connection with Nature	Natural material choices such as woodwork, stone etc alongside colour pallet and furniture form			
	Complexity & Order	Wall paper or carpet design or window details			
Nature of the space	Prospect	Partition heights and open floor plans			
	Refuge	Complete concealment i.e. booth seating or modular refuge providing small protection			
	Mystery	Winding paths, form and flow			
	Risk/Peril	Double height balcony's, transparent railing			
Out of 14			7	13	10

Figure 34. 14 Patterns of Biophilic Design, Browning, W.D., Ryan, C.O., Clancy, J.O. (2014)

In summary of the three case studies, The Sustainability Centre achieves 7 Biophilic elements, they could benefit from implementing better interior design solutions such as improved choices of materials like wood. The National Arboretum Children's Forest School achieves 10 of the 14 patterns requirements and could benefit by improving the quality of nature of the space, offering places of refuge & prospect.

The most successful in achieving the 14 patterns of Biophilic Design is De Verwondering. It is a very well-considered design offering a Forest School approach to learning yet does not forget the interior, humans after all do like to live within shelters that can provide us a feeling of safety and security emphasising our need for well-designed interiors. As such I conclude that the Biophilic Design strategy is of utmost importance for Interior Designers to implement when designing spaces that can be long lasting whilst designing empathetically for the users, planting seeds of hope and excitement for the future whilst preserving our innate love for nature.

Figure reference list

Figure 1. Morning rays (Authors own image), 2021

Figure 2. Syrikova, T (2020), *Back View of a Person Carrying a Baby near the Placid Lake Scener* [photograph] Available from: <https://www.pexels.com/photo/back-view-of-a-person-carrying-a-baby-near-the-placid-lake-scenery-3933989/>

Figure 3. 14 Patterns of Biophilic Design, Browning, W.D, Ryan, C.O, Clancy, J.O (2014) *14 Patterns of Biophilic Design*. [graph]

Figure 4. Biophilic forms (Authors own image), 2022

Figure 5. Biophilic forms (Authors own image), 2023

Figure 6. Pixabay (2016) *White Wooden Rectangular Table* [photograph] Available from: <https://www.pexels.com/photo/white-wooden-rectangular-table-159213/>

Figure 7. The Outdoors Group (n.d.) [photograph] Available from: <https://www.outdoorsgroup.co.uk/what-is-forest-school/>

Figure 8. Meeting the needs of all children, Early Years Foundation Stage (EYFS) framework, n.d. [graph]

Figure 9. The Sustainability Centre, n.d. Available from: <https://www.sustainability-centre.org/all-about-us.html>

Figure 10. De Verwondering, n.d. Available from: <https://verwondering-almere.nl/>

Figure 11. GEEUMPLUS, National Arboretum Children's Forest School, n.d. Available from: https://www.archdaily.com/965761/korea-national-arboretum-childrens-forest-school-geeumplus?ad__medium=gallery

Figure 12. The Sustainability Centre, n.d. Available from: <https://www.sustainability-centre.org/all-about-us.html>

Figure 13. *The Sustainability Centre* (Authors own image), 2024

Figure 14. The Sustainability Centre, n.d. Available from: <https://www.sustainability-centre.org/all-about-us.html>

Figure 15. The Sustainability Centre, Workshop room (Authors own image), 2024

Figure 16. The Sustainability Centre, Outdoor circle (Authors own image), 2024

Figure 17. The Sustainability Centre, Educational fire circle (Authors own image), 2024

Figure 18. The Sustainability Centre, Forest school area (Authors own image), 2024

Figure 19 - Figure 27. Orga Architects, De Verwondering, 2023 Available from: <https://www.orga-architect.nl/projecten/biophilic-school-de-verwondering/>

Figure 28 - Figure 33. GEEUMPLUS, National Arboretum Children's Forest School, 2021 Available from: https://www.archdaily.com/965761/korea-national-arboretum-childrens-forest-school-geeumplus?ad__medium=gallery

Figure 34. *14 Patterns of Biophilic Design*, Browning, W.D, Ryan, C.O, Clancy, J.O. (2014) [graph]

References List

AHR, n.d. Biophilic design [viewed 28 April 2024] Available from: <https://www.ahr.co.uk/biophilic-design>

Arch daily, 2021 *Korea National Arboretum Children's Forest School/ GEEUMPLUS* [viewed 28 April 2024] Available from: https://www.archdaily.com/965761/korea-national-arboretum-childrens-forest-school-geeum-plus?ad__medium=gallery

Barbiero, G., Berto, R. (2021). *Biophilia as Evolutionary Adaptation: An Onto- and Phylogenetic Framework for Biophilic Design*. Front. Psychol. 12:700709.doi: 10.3389/fpsyg.2021.700709

Browning, W.D., Ryan, C.O., Clancy, J.O. (2014). *14 Patterns of Biophilic Design*. New York: Terrapin Bright Green llc.

Forest School Association, n.d. *What is a Forest School?* [viewed 28 April 2024] Available from: <https://forest-schoolassociation.org/what-is-forest-school/>

Forest Schools, 2019 *What is Forest Schools and how did it change my life* [viewed 28 April 2024] Available from: <https://www.forestschoools.com/blogs/forest-school-blog/what-is-forest-schools-and-how-did-it-change-my-life>

FIELDS IN TRUST, n.d. *Green Space Index*, England and Wales [viewed 28 April 2024] Available from: <https://fieldsintrust.org/insights/green-space-index>

Gov.uk, n.d. *Meeting the needs of all children* [viewed on 28 April 2024] Available from: <https://help-for-early-years-providers.education.gov.uk/get-help-to-improve-your-practice/meeting-the-needs-of-all-children>

Kellert, S. and Calabrese, E. 2015. *The Practice of Biophilic Design* [viewed 28 April 2024] Available from: www.biophilic-design.com

Kellert, S. 2018 *Nature by Design: The practise of Biophilic Design*. United States: Yale University Press.
Newlove-Delgado T, Marcheselli F, Williams T, Mandalia D, Davis J, McManus S, Savic M, Treloar W, Ford T.

NHS Digital, 2022, *Mental Health of Children and Young People in England*, Leeds. [viewed 28 April 2024] Available from: <https://digital.nhs.uk/data-and-information/publications/statistical/mental-health-of-children-and-young-people-in-england/2022-follow-up-to-the-2017-survey>

Orga Architect, 2023, *Winnende inzending Stephen Kellert Biophilic Design award EU 2023* [viewed 28 April 2024] Available from: <https://www.youtube.com/watch?v=HNatRilbg34>

Orga Architect, n.d. *Biophilic School De Verwondering* [viewed 28 April 2024] Available from: <https://www.orga-architect.nl/projecten/biophilic-school-de-verwondering/>

Ryan, C.O., Browning, W.D. (2020). *Biophilic Design*. In: Loftness, V. (eds) *Sustainable Built Environments. Encyclopaedia of Sustainability Science and Technology Series*. Springer, New York, NY. [viewed 28 April 2024] Available from: https://doi.org/10.1007/978-1-0716-0684-1_1034

The Sustainability Centre, n.d. *All about us* [viewed 28 April 2024] Available from: <https://www.sustainability-centre.org/all-about-us.html>

Wikipedia, n.d. *Volatile organic compound* [viewed 28 April 2024] Available from: https://en.wikipedia.org/wiki/Volatile_organic_compound#cite_note-52