

Clean Slate

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Centre for
Alternative Technology
Canolfon y
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50

1973 – 2023

**Celebrating CAT
at 50, together**

**Sowing the
seeds of innovation**

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Editor: Catriona Toms.

Design: Graham Preston (grahamjpreston@hotmail.com).

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EDITORIAL

Eileen Kinsman

50 years of the CAT community

Welcome to this 50th anniversary edition of *Clean Slate*. This special birthday year is a chance to celebrate the achievements so far of the whole CAT community. From our visionary founders to today's supporters like you, CAT's people have always been and continue to be its beating heart.

In five decades so many of you have been an integral part of the CAT story. Whether visiting, studying or working at CAT, everyone who has shared their valuable time and energy with us has taken something positive away and made an impact – big or small.

From the first visitors to CAT's home in Mid Wales in the 1970s to families engaging with #CATatHome during lockdown, we've been giving people hope and empowering them to act.

The people who have studied with us over the decades have spread far and wide, taking and sharing what they've learned with them. Many have gone on to start their own sustainable businesses – from architecture practices to renewable energy firms – and others have influenced traditionally conservative sectors like construction from within.

Recently, we have brought councils, local groups and businesses into our growing community through our Zero Carbon Britain innovation labs and training. Our support, built on rigorous research, is helping people to co-create ways to overcome the barriers to sustainable ways of working and change the systems we live and work within for the better.

This edition of the magazine is full of stories of the people who have made CAT so impactful over the past 50 years and continue to drive us forward towards our vision of a safer, fairer, more sustainable world.

These pages are also packed with ways to get involved and play your part. From actions you can take at home, school or work, to opportunities to volunteer and study with CAT, there's something for everyone. You can also read about how our future plans are taking shape and how you can be part of them.

Whatever you do to support CAT – thank you. Our achievements over the past 50 years have only been possible because people like you have the compassion, commitment and courage to act.

Eileen Kinsman, co-Chief Executive Officer



Keep in touch Write to us: Centre for Alternative Technology, Machynlleth, SY20 9AZ



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New guidance to embed sustainability into council services

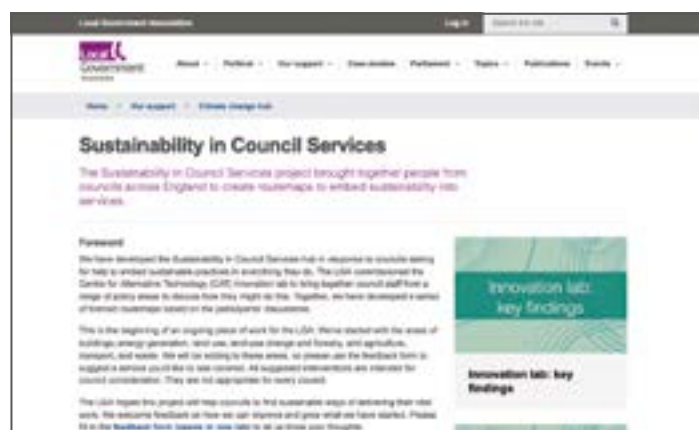
In March, the Local Government Association (LGA) launched new guidance to help embed sustainability into council services, developed in collaboration with CAT's Innovation Lab.

Although councils are only directly responsible for 2-5% of emissions in their local area, through supply chains and partnerships their influence is estimated to account for around 30%. Therefore, councils have a significant role to play in the UK reaching zero carbon, through partnerships, involving and engaging with communities, place shaping, procurement, showcasing and innovating.

The purpose of the Sustainability in Council Services project was to create guidelines to embed sustainability in services that could be used by any member of a council, from officers to managers, CEOs to leaders. The guidance includes interventions focused on five key areas: buildings; energy generation; land use, land-use change, forestry and agriculture; transport; and waste. Multiple case studies are provided to help demonstrate good practice.

The project involved representatives from councils across England, and brought together people from across different services and grades, taking a co-creative approach to explore barriers and solutions together, supported by CAT's Innovation Lab team.

At an online launch event organised by the LGA, CAT's Dr Anna Bullen and Sarah Briggs talked attendees through over six months of planning and running innovation lab workshops, analysing



data, and creating and reviewing the guidance. The launch event brought together 196 attendees from a wide range of councils, who shared their experiences and asked insightful questions.

Although this marks an end point for the initial pilot project, the LGA sees this as the start of work to bring in more voices, feedback and service areas and continue developing the guidance. And whilst this particular project only covered England, the Innovation Lab team hopes to do similar work in Wales and elsewhere in the UK in the future.

Explore the guidance at: local.gov.uk/our-support/climate-change-hub/sustainability-council-services

School holiday fun

CAT's eco centre was packed with families having a day out with a difference during the Easter school holidays. We were delighted to see so many visitors onsite after several years of pandemic-related disruption.

Both kids and parents discovered the underwater world of CAT's ponds, explored the quarry trail and built tiny gardens together. This was the perfect opportunity to get out of the house and be immersed in our beautiful woodlands and gardens at a time when signs of spring were appearing and nature was waking up after the long winter.



Then in May half-term, we welcomed more families for our 'Big Nature Count' bioblitz. Throughout the week, we sought out and recorded all manner of birds and beasts to find out who lives in the varied habitats throughout CAT's gardens, woodlands, ponds and more.



If you're looking for an inspiring and memorable day out, remember to put CAT in your calendar. We have a wide range of tours, workshops and meet-the-team sessions – many of them free with your CAT membership.

Find out what's on next at <https://cat.org.uk/visiting/days-out-events>

Celebrating soil

In May, CAT hosted a Soil Symposium as part of the Tyfu Dyfi partnership project, bringing together a range of experts and enthusiasts to explore the many ways soil helps us survive, thrive, build and sustain the world around us – and what we can do to nourish and care for this life-giving material.



The day included talks, workshops, tours, discussions and drop-in compost surgeries. Amongst the speakers were soil specialist Richard Hartnup on the fascinating world beneath our feet, the Guardian's Alys Fowler on all things compost, and researcher Clo Ward on soil care and climate friendly-agriculture.

Activities explored everything from mycelium and community composting to perennial green manures, while families had fun exploring the microbial world of soil through the lens of a microscope, getting hands-on with clay, and playing soil-themed games.

The Tyfu Dyfi project is a local partnership project that explores how communities can be involved in their local food systems, and the benefits this can bring. The project has also seen the CAT field being used as part of the Pathways to Farming scheme to train more people in growing and selling local fruit and veg, supplying fresh veg to the CAT café and other local eateries and shops.



Celebrating the Creative Nature Fellowship Programme with Arts Council Wales and Natural Resources Wales.



Imagining a better future through the arts

On Monday 30 January, the Royal Society of Arts held its RSA Wales Fellows Gathering at CAT. The 'Collective Imagination; Collective Intelligence; Collective Action' session explored the RSA's work for 2023 through the theme of 'collective futures'. This is part of the organisation's work inviting us to imagine a better future for all, which has synergies with our work here at CAT.

CAT's Innovation Lab Manager Anna Bullen ran a session on our innovation labs, which take a co-creative approach to problem solving, inspiring much thoughtful debate.

Then, on 30 March, we were joined at CAT by the Arts Council Wales, Natural Resources Wales and people from

across the arts for an event celebrating the first year of the Creative Nature Fellowship Programme, which has seen eight talented artists exploring climate emergency-related themes. CAT has been supporting the programme with residential visits and workshops, and the event was a chance to celebrate the artists' creative journeys and hear more about their projects.

The one-day event was also an opportunity to discuss the development of a Plan for Climate Justice and the Arts. CAT's Innovation Lab has been commissioned by Arts Council Wales and Natural Resources Wales to bring together people from across the arts sector and beyond to develop this plan, taking a co-creative approach to exploring barriers and solutions.

Arts and Ecology Retreat at CAT

Join us at CAT on 21-24 July for an immersive three days of nature and creativity.

We'll be exploring and connecting with our incredible world through a range of film, sound and poetry practices, using the beautiful, nature-rich CAT site as source material.

We will draw on a variety of creative practices, including direct-on-film image-making with plants and flowers, recording the sounds of objects and materials with a range of home-made contact mics and hydrophones, and responding to the environment through poetic reflection.

The course will introduce you to a range of innovative

and artistic engagements with nature that require no prior knowledge and minimal technical resources.

Find out more and book a space at <https://cat.org.uk/arts-ecology-retreat/>



RSAW Spring Conference 2023

In April, we hosted the Royal Society of Architects Wales Spring Conference 2023. This year, in a nod to CAT's unique approach to architectural education, the conference explored the theme of all things alternative.

This full-day conference welcomed RIBA-award-winning speakers from across the architectural spectrum for a day of talks and an interactive workshop designed to inform and inspire.

Delegates included some of our own Masters in Architecture students, as well as architects from across Wales, who heard from speakers including CAT's own Pat Borer, Chris Loyn (Loyn + Co Architects), Sarah Featherstone (Featherstone Young), Lucy Picardo (Haworth Tompkins) and Ben Hair (Knox Bhavan) about their different approaches to and experiences in sustainable architecture.

Upcoming courses and events

17 June – Renewables for Households: Solar Hot Water

23 June – Graduate School of the Environment Open Day

1 July – Gardening for Nature Experience Day

21-24 July – Arts and Ecology Retreat

28-31 July – A Way of Building: Using Locally Sourced Materials

5 August – Making Pallet Furniture

5-6 August – Build a Small Wind Turbine

12-13 August – Cob Building

12 August – Compost Toilets

13 August – Reedbeds and Waste Water Management

21-25 August – Building with Straw Bales

9-10 September – Fixing Your Damp House

12-13 September – Zero Carbon Britain: Carbon Literacy for Local Authorities Online

25-28 September – Eco Refurbishment

This is just a selection of some of the courses and events taking place over the next few months – discover more and book your place at cat.org.uk/whats-on

Don't miss the return of the CAT conference!

This year will be a special 50th anniversary edition you won't want to miss. See page 23 of our anniversary supplement for details.



Short course spotlight – Eco Refurbishment

Transform buildings into cosy, low-impact, energy efficient homes and workspaces.

Refurbishing our homes to make them more energy efficient is one way to take effective action on climate change.

This course is ideal for builders, architects, DIYers and anyone planning to refurbish an existing building with minimal environmental impact. It will help you understand where to start and give you the skills and knowledge to choose the best methods and materials to suit your needs.

You'll learn from one of the UK's leading experts in eco-refurbishment and discover how to make your building more comfortable, cheaper to run, and better for the environment. We'll cover everything from energy efficiency, renewable energy and water re-use and conservation to what makes a building healthy and how to approach hazardous building materials.

Key information

- Duration: four days
- Next dates: 25 to 28 September 2023
- Start and finish times: starts at 10am and ends at 4pm on the last day
- Fees: waged £650; low-waged and concessions £600
- Includes: tuition, all materials, full-board shared accommodation (single accommodation is available for an additional £60)
- What to bring: as this is a practical course, safety boots are required

Topics covered include:

- Solid-wall insulation
- Insulating materials, from the commonly available to the cutting edge, including the practical issues and compromises associated with each
- U-values of materials and understanding the heat loss of buildings
- Renewable energy options and sustainable water systems taught through specialist tours of the systems in use at CAT
- Consultation and advice on your own eco refurbishment project



Getting to grips with low impact materials on a CAT short course (this image) and course tutor Nick Parsons shares his decades of expertise (above right).

Your tutor Nick Parsons has worked for over 25 years in energy-efficient and sustainable building and renewable energy. Nick carries out home energy surveys to assess potential energy efficiency improvements and renewable energy installations,

and provides consultancy and project management services to individuals, small businesses and community organisations.

For more information on this and other CAT courses, visit cat.org.uk/short-courses or contact us at courses@cat.org.uk



"Presented with gusto, tons of information, a great mix of practical and theoretical. The facilities were great, a good learning environment, everything just flows out. You feel very relaxed and comfortable."

Related courses

Fixing your damp house

Learn from an experienced conservation builder how to spot and tackle damp problems in your home.
This course will help you recognise the warning signs of damp problems, understand where past conservation efforts may have gone wrong, and explore the different techniques and methods you can use to reduce or eliminate the problem. Part of the course will be run as a 'building surgery', where you will be able to get consultation and advice on how to make your home nicer to live in, cheaper to run, and more environmentally friendly. Next on 9-10 September 2023.

Retrofit whole house approach

Our new Retrofit 'whole house approach': Demystifying the skills course is aimed at providing skills and knowledge for professionals in the building sector, supporting the wider transition to zero carbon. Taught over four days by leading experts in sustainable retrofit, the course explores the 'whole house' approach to retrofit, covering the theory and practice, with a range of hands-on practical sessions. Topics covered include moisture awareness, airtightness, exposure, internal/external wall insulation, building physics, unintended consequences, renewable energy technologies, and more. Next on 6-9 June 2023.

Find out more about these and other courses at cat.org.uk/short-courses

Celebrating fifty years of better building

The Centre for Alternative Technology have paved the way for better building, their philosophy helping shape our own ethos at Ecological Building Systems.

Together, we all play a significant part in sustainable building in the UK. Working towards a carbon negative future by supplying ecological building products that achieve these aims.

Dave Judd, of the Ecological Building Systems technical team, gained his degree with the Centre for Alternative Technology. We asked how CAT's mission of *inspire, inform and enable* has shaped his career:

How were you inspired?

I had often visited CAT and was inspired by its practical, can do, approach to solving big issues, through a mix of education and leading by example. I wanted my career to be part of the solution.

How were you informed?

The Advanced Environment & Energy Studies MSc had a solutions-based approach, aimed at both the macro policy level, but also down to the micro level of how we can build with sustainability as a core principle. My MSc has informed my working life, which has carried through to my current technical role.

How were you enabled?

The course took me on a deep dive into sustainability issues and the built environment. It showed how big issues relating to energy, resource consumption and land use arise and relate to one another, and how they manifest in the built environment.

Dave Judd

Technical Specification Advisor
BSc Hons, MSc



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Providing hope for the future for 50 years

As CAT celebrates the big 5-0, it's time to look back at five decades of inspiring practical environmental action and celebrate the impact we've made together. As ever, our focus remains on working towards a safer, fairer, more sustainable tomorrow. So this milestone birthday is also an excellent opportunity to look forward to the next chapter of our story. ►►



Then and now: today the CAT site is a lush green oasis with an incredible variety of wildlife; inset shows the disused quarry site in the early 1970s.

Sion Thomas

CAT's story is one of hope.

Not blind faith in a better tomorrow. But hope built on hard graft, lived experience and rigorous research.

Since day one, we've been putting to the test our ideas of how to live more sustainably, in harmony with the natural world we're all part of. From 1973 to 2023, our home in Mid Wales has evolved from a community of environmental pioneers with a shared vision to an established educational charity making an impact far and wide. All the while, we've been getting our hands dirty and taking practical steps to help change society for the better.

From pioneer testbed to visitor centre

"What was needed was a project to show the nature of the problem and indicate ways of going forward." CAT founder, Gerard Morgan-Grenville

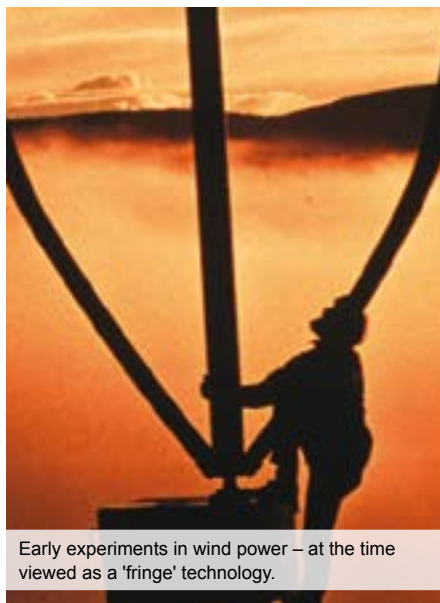
In the 1970s, awareness was growing of the negative impact humans were having on the planet. As books such as EF Schumacher's *Small is Beautiful* (1973) and the Club of Rome's *Limits to Growth* (1972) were reaching a wide audience, the urgency of the need to act was becoming more and more apparent.

Inspired by alternative communities in the USA and motivated by a growing concern about the environmental impact of fossil fuels, CAT was created. The seeds were sown by a small group of engineers, architects, builders and growers, who wanted to find a way to live simply but well, crucially while treading more lightly on the earth.

These pioneers moved into the abandoned slate quarry and set about

experimenting in everything from renewable energy generation to organic farming – 'alternative' approaches that are now considered mainstream.

As word spread about what was happening in the mountains of Mid Wales, more and more people wanted to see it for themselves. The CAT visitor centre opened in 1975 to showcase the technologies and choices behind a more sustainable society, sharing the vision of our founders with many more people.



Early experiments in wind power – at the time viewed as a 'fringe' technology.

Transforming CAT's home

After 50 years of hard work by dedicated staff and volunteers, and support from thousands of people all over the world, the CAT site is unrecognisable today.

The post-industrial wasteland we inherited is now a thriving wildlife haven, with a rich variety of gardens, woodlands and ponds. The abandoned buildings on it have been refurbished and joined by

ground-breaking new green buildings, where visitors and students discover, study and rest.

None of it came easy. From the beginning, the people living and working at CAT were making soil to grow food, restoring and constructing buildings with little or no long-term impact on the area, engineering renewable energy systems to replace the need for fossil fuels, and managing the surrounding woodlands so endangered species could share their home.

This hard work paid off, transforming the local environment and winning CAT accolades and awards along the way for its unique way of doing things differently.

Research and innovation

Asking questions has always been central to the CAT approach. What could a more sustainable future look like? How would we have to change our way of life to achieve this vision? What approaches have worked elsewhere and how could we improve on them?

Over the years, we have experimented with new ways of producing compost and treating waste, innovative low-carbon building materials and methods, various types of renewable heat, and much more. Not all our experiments have been 100% successful, but each has helped us learn and grow.

Many of those who have studied at CAT have gone on to start their own businesses, continuing to innovate and put what they have learned into practice in the wider world. From community energy projects to solar-powered vaccine fridges, the knowledge and networks born at CAT are changing and even saving lives.

Since 2007, our main research focus has been our Zero Carbon Britain project, which provides an end point vision for how the UK could reach net zero emissions using technology available today. We've engaged councils, businesses and community organisations to recognise the barriers to reaching their climate goals and co-create ways to overcome them.

By sharing what we learn together – from our 1977 'Alternative Energy Strategy for the UK' to 2019's 'Zero Carbon Britain: Rising to the Climate Emergency' report, we've shown the government and decision makers ways of reducing reliance on fossil fuels and made the case for urgent action.

Education for all ages

For decades, we have welcomed people young and not so young to our visitor centre to learn more about the climate and biodiversity crises and the role they can play to tackle it. Families, school groups and students have been educated and inspired to act on a wide array of topics related to sustainability.

In the 1980s, we added weekend and week-long courses for adults in response to a growing demand for training in renewable energy and sustainable building. This training has put specialist knowledge and skills at the heart of sectors from architecture to construction and made people catalysts for change in their workplaces and communities.

With the need to respond to the climate threat becoming more urgent, we opened our Graduate School of the Environment in 2007 to help professionals and postgraduates get the tools to speed up the transition to a more sustainable society.

To date, more than 2,000 people have studied with us, creating a ripple effect by sharing what they have learned across



Sharing solutions with policymakers - CAT's Paul Allen (third from right) presents our Zero Carbon Britain research at the UN climate talks.

their networks. Now, every year, we engage tens of thousands of visitors and learners.

The next chapter

While we're incredibly proud of our legacy so far, this is no time to rest on our laurels. The climate and biodiversity crises demand immediate action if we are to avoid the worst outcomes.

It's time to think even bigger.

We have a vision for CAT where many more people visit us, take courses, and are motivated to actively help create a safer future. Together with our supporters, we have made ambitious plans for new spaces for education in sustainable solutions, areas to deliver green skills for the future, and an immersive world-class visitor experience. Using these new facilities, we can educate and inspire people about the importance of closed-loop systems and living our lives as part of the wider natural world.

The tread lightly commitment of our founders will run through all this work. We are committed to redevelop our eco centre in a way that doesn't just work around nature but is genuinely regenerative, enhancing the diverse

wildlife habitats on our doorstep.

This new and improved CAT will be a practical and beautiful example of our values. It is a valuable opportunity to showcase the regenerative approach we promote, influencing other development projects around the globe.

The scale of the challenges we face calls for increased ambition and action. And we're ready for it.




Weekend and week-long courses help people to develop new skills in energy, buildings, woodland management, and more.

The CAT community

As a charity, our passionate and dedicated supporters are at the heart of everything we've achieved over the last 50 years and the success of our future plans.

From the monthly donations that keep us doing what we do to the legacies that help us plan for the future, the support of people like you makes everything possible. We never have, and we never will, take it for granted.

CAT is much more than what goes on at our site in Mid Wales. We are a diverse and widespread community of people from all walks of life who share a vision of a safer, more sustainable world and are motivated to make it a reality.

Thank you for your support so far and for standing with us as we continue our vital work. 



To date, more than 2,000 people have studied for a postgraduate degree with CAT (image shows last year's graduation ceremony).

Learning together for 50 years

For five decades, CAT has been helping people turn their compassion for the environment and humanity into action by giving them the knowledge and skills they need. **Amanda Smith** takes us through CAT's educational programmes, which are reaching more and more people every year.



Sharing knowledge, discussing solutions, empowering action.

To achieve a future where people and nature can thrive, everyone must take action in the transition to more sustainable systems. Change is needed throughout society and at every level, which means we all need to be able to play our part.

While awareness of the need to act on the climate and biodiversity crises has grown exponentially in the last 50 years, a green skills gap remains. To help fill this gap and empower more people to get involved in environmental solutions, education continues to be an integral part of our work.

CAT has always taken an alternative approach to education – one where people learn through doing, testing creative thinking in an immersive natural environment. Feedback from those who have visited and studied with us shows this hands-on approach leaves people inspired, energised and ready to make a difference.

Over the decades, we have developed the visitor experience, the courses we offer, and the range of educational services we provide to help more people

get empowered to act. From families to graduates to local councils, now everyone can learn to be a more effective changemaker at CAT.

Studying at CAT

“Studying at CAT is not like studying at any other university. CAT has been a home, a family and the greatest experience I have undertaken up to this moment in time.” – Tiziana Di Ronco, CAT graduate.

We launched our Graduate School of the Environment in 2007, offering Masters degrees in renewable energy and sustainable building.

Now, each year, a diverse community of more than 200 students from across the UK and overseas comes to CAT to study a much wider range of subjects, including ecology, behaviour change, food, land use and much more.

As well as learning from our expert



On-site and nearby renewable energy systems give learners the chance to get an up-close look at solutions in action.

tutors, lecturers and international guest speakers, our students share so much with us too, bringing their own unique perspectives, experiences and ideas.

While on traditional university courses, students are usually passive learners based in a classroom environment, at CAT people are active participants and immersed in nature from day one. Our home in Mid Wales is a living laboratory where students can see experiments in sustainable living in action and contribute to their development. By working together, students learn from each other and build close relationships that often continue after the course finishes, and in many cases lead to successful business partnerships.

Our Masters in Architecture (MArch) course helps the eco-architects of the future learn about sustainable materials and approaches through practical project work. Unlike many theory-based conventional architecture courses, students present their work to other students, tutors and 'live' clients and bring their designs to life in dedicated 'build weeks'. This gives them experience of navigating the challenges in sustainable building and the confidence to take their place in the professional environment.

Students from across the globe – from Ceredigion to Cambodia – now choose to study at CAT. For those unable to travel to Mid Wales, we also offer remote learning on our Master of Science (MSc) and Master of Research (MRes) courses. This has made studying with CAT accessible to a wider range of people and expanded the diversity of our student population still further.

Welcoming university and college visits

"Our students found their visit to CAT fascinating and inspiring, with several commenting on how much they enjoyed being in an atmosphere where there were so many positive and hopeful solutions." – Dr Nick Hughes, UCL, who brought 60 students on a visit to CAT in November last year.

It's not just students at our Graduate School of the Environment who learn and become inspired at CAT.

Every year, we're also joined by hundreds of students from universities and colleges across the UK and beyond. With sustainability increasingly an element of academic subjects, we host study visits and field trips from visitors exploring topics from geography, engineering and architecture to media,



Education for all ages - from pre-school to postgrad. Image shows Amanda teaching an early years wind power workshop.

psychology and design.

Over the years, word has spread that CAT is the perfect place to embed and bring to life students' learning. Our site provides people with the opportunity to get their hands dirty, digging deeper into sustainability-related topics, in a distraction-free environment where they can dedicate time and attention to their studies.

Visiting university or college groups benefit from talks from our Zero Carbon Britain team who explain systems approaches to taking climate action; tours of our site to see solutions in real life; and practical workshops to put what they've learned into practice.

School trips with a difference

"The last few visits we have done with CAT really helped to bring the learning to life. Our work with CAT has given the pupils a

sense of purpose and understanding around the importance of climate change to them and their future too." – Tomi Rowlands, Digital Lead, Ysgol Bro Hyddgen, Machynlleth

Since we opened the doors of CAT to visitors in the 1970s, many thousands of school children have had their first experience of a more sustainable way of living. We know this has had a life-changing impact for many people, who have told us coming to CAT as a child shaped both their career and their worldview.

Over the decades, we've developed the experience we offer our younger visitors. Today, our home is the site of both memorable one-day school trips and extended stays for school groups who want to learn even more.

Young people of all ages gain new knowledge and skills at CAT, from



Hands-on learning - CAT gardener Petra shares skills with our volunteers.



Building knowledge and networks - Graduate School lecturer Ruth Stevenson runs a workshop at the 2018 CAT members' conference.

pre-school to postgraduate level, including GCSE, A level and the Welsh Baccalaureate.

We run workshops on renewable energy, green building, growing and ecology, green living, and other aspects of sustainability. These cross a range of curriculum subjects, including science, geography, design and technology, personal and social education (PSE), and citizenship and can be taken in English or Welsh. All help young people develop key skills in literacy and maths, and emphasise problem solving.

Short courses and experience days

"The tutors were super knowledgeable and prioritised confidence-building as well as skills. This has been a life-changing week for me – I did stuff I never thought I could do." Suzanne Oakley, short course participant

Our short courses and experience days allow people of all ages to get a taster or develop their knowledge of areas including renewable energy, environmentally friendly building techniques, ecology, woodland management and organic gardening.

From one-day visits to more in-depth week-long courses, we provide people with opportunities to learn practical skills to make changes in their own lives or at work, or simply slow down and reconnect with nature.

Our green skills training courses range from training for people who want to find out more about making their own home more energy efficient – for example by installing solar power, heat pumps and insulation – to building professionals who need to understand more sustainable ways of working – such as how to use

natural materials or retrofit existing buildings sustainably. We also collaborate with colleges to create a bigger impact.

Our evolving approach

"Many thanks for the course, it has given me more ideas for tackling climate change and the Council's action plan will be rewritten as a result." – Carbon Literacy online course participant.

Our unique educational programmes are giving people the knowledge and skills they need to play their part in

solutions that work together to enable bigger changes than would be possible by working in isolation. This approach also helps avoid duplication of effort and unforeseen side effects as much as possible.

Most recently, our Zero Carbon Britain team has been running training and innovation labs for groups of people including councils, businesses and community groups to accelerate the systems change needed. Through these participatory workshops, on subjects such as Carbon Literacy, people are co-creating their own solutions to overcoming the barriers to achieve their climate goals (see our Zero Carbon Britain feature on page 15). We now offer online versions of many of our training and education programmes, further widening our reach.

By learning together, we can continue to build a movement for change. With our future plans in place to redevelop our visitor centre and upgrade our onsite teaching facilities as well as expanding our digital provision, we look forward to welcoming even more learners to CAT and sharing our knowledge, skills and experiences to help deliver a better future for the natural world and all of us. 



CAT's immersive learning environment offers the chance to unplug and reconnect with nature (image shows the CAT reservoir).

tackling the climate and biodiversity crises. By continuing to develop our approach to education, we are responding to the evolving challenges we face in building a safer, fairer, more sustainable future.

It is now clear that to achieve transformative change, we need to consider systems as a whole and design

About the author

Amanda is CAT's Head of Learning – she has overseen the development of our Zero Carbon Britain training programmes, short courses and schools' education work. She has over 20 years' experience in teaching, school leadership, adult training and organisational improvement.

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CAT connections

The people from all walks of life who have studied at, worked with and been inspired by CAT over the last 50 years make up a diverse community of changemakers that spans across the UK and beyond. Together, they are creating paths towards a safer, fairer, more sustainable world.

Ecodyfi

Founded 25 years ago as a sustainable development partnership initiated primarily by Dulas, Powys County Council and CAT, ecodyfi became an independent bilingual development trust in 2002, focusing on sustainable energy, responsible tourism, community development and well-being in the Dyfi Valley and beyond. Manager Andy Rowland, who worked at CAT for 14 years before establishing ecodyfi, was named 'Environment Champion' in this year's Welsh Government St David Awards.



Dulas

Dulas has been at the forefront of the renewables industry since it was founded at CAT in 1982. Its renewable energy and off-grid solar refrigeration solutions have been used in countries from Austria to Zambia. See overleaf for more.



Energy Garden

Energy Garden is a community benefit society founded by CAT graduate Agamemnon Otero that supports communities to install and maintain gardens on railway stations across London. These are funded by revenue generated by the sale of community-owned renewable energy. See overleaf for more.

Grain Architecture

Grain Architecture is an ethical design practice producing high-quality spaces that have a positive impact on the environment. Founding Director Janna Laan Lomas is a CAT graduate passionate about using natural construction materials with low embodied energy to create efficient new homes and retrofit existing buildings.



Hawkland

Hawkland is a sustainable architecture and construction company based in Bristol. Founders and Directors Chris Hawker and David Copeland are both CAT graduates – as is their fellow Director Ben Nother. This purpose-led business focuses on low-carbon retrofit, using the latest developments in sustainable design and materials.



Waterblade

Inventor and CAT graduate Nigel Bamford created the Waterblade – a water-saving device that can fit easily to most taps. Waterblade has now been fitted in some of the UK's most recognisable buildings and many more worldwide, and has won the top innovation and water industry awards both in the UK and overseas.

NatSol

Based in Mid Wales, NatSol is a supplier of odour-free waterless and composting toilets that are used in more than 750 locations across the UK. The company was started by Andy Warren and Nick Grant, who met at CAT and combined their years of experience of designing and installing composting toilets.



ABER Instruments

Over 30 years ago, Professor Douglas Kell and Dr Robert (Bob) Todd from the University of Aberystwyth and CAT invented and patented a unique method for biomass monitoring and measurement. ABER Instruments is now a successful global company with a portfolio of systems



used in the brewing, biotech, biorenewables and biofuel industries.

Cambridge Solar

Cambridge Solar was founded by Owen Morgan, a graduate from one of CAT's early postgraduate courses in renewable energy. The company has now been providing renewable energy consultancy, design and installation services for over 13 years. See overleaf for more.



Repowering London

Repowering London was established in 2013 by CAT graduate Agamemnon Otero. His mission was to democratise the energy system and support communities to take greater control of their energy generation and use by creating an intermediary community energy development organisation. Once up and running, community energy projects continue to generate locally owned clean energy while having many further positive impacts.



Exeo Energy

Founded by CAT graduate Owen Morgan, who also set up Cambridge Solar, Exeo Energy is a renewable energy specialist with branches in Cardiff, Machynlleth and Oxford.



Centre for Sustainable Energy

The Centre for Sustainable Energy (CSE) started life in 1979 as the Urban Centre for Appropriate Technology (UCAT), a city-based offshoot of CAT. CSE is now an independent charity based in Bristol that helps people change the way they think and act on energy.



STUDIO/gather

CAT graduate Julian Mills is founding director of STUDIO/gather, an architectural studio in Cornwall specialising in deep retrofit and Passivhaus new builds. The team, which includes more CAT graduates, is committed to regenerative architecture principles and designing with a purpose, while touching the earth lightly.



Bambook Studio

Bambook Studio is an architectural studio in Indonesia specialising in sustainable design and consulting, set up by CAT graduate Paula Huerta Andrés. With a mission to help accelerate decarbonisation, the studio specialises in passive design, building physics and circularity.



Passivhaus Homes & PH15

CAT graduate and co-author of the Passivhaus Handbook Jae Cotterell co-developed the PH15 Construction Solution – a complete Passivhaus-compliant construction approach – and now delivers Passivhaus certified and net zero-ready new housing. See overleaf for more.



IndiNature

Natural-fibre insulation company IndiNature was co-founded in 2016 by CAT graduate Scott Simpson. See overleaf for more.



Adaptavate

Adaptavate is an award-winning company rethinking and redesigning the way building materials are produced, used and disposed of. The business was built on the dissertation of founder and CEO, CAT graduate Tom Robinson. See overleaf for more.



Sowing the seeds of innovation at CAT

To tackle the climate and nature emergency, transformational change is needed in all regions and across every sector. Take a closer look at some of the innovative organisations born at CAT and started by our graduates that are helping to show what's possible.



CAT spin-out company Dulas has been pioneering renewable energy for over 40 years.

Dulas

"Back in the early 1980s, a group of CAT engineers began to develop a variety of renewable energy products aimed at solving various issues around the world. In 1982, these engineers formed Dulas, and we have been pioneering products and services within the UK renewable energy and international humanitarian aid markets ever since." – Ruth Chapman, Managing Director, Dulas

Founded within CAT in 1982 before becoming an independent company in 1988, Dulas has been at the forefront of the renewables industry for four decades. And the CAT connection continues, as current Managing Director, Ruth Chapman, is also a CAT graduate.

Over 40 years, Dulas has grown with the demand for renewables, pioneering solar, hydro, wind and energy storage in the UK and globally, offering a range of consultancy services to help with the transition to clean energy.

The company also created the world's first mass-produced solar powered vaccine refrigerators, originally based on a prototype created at CAT. Now accredited by the World Health Organisation, these solar fridges are providing life-saving medical care to people in off-grid and remote locations around the globe, including areas affected by disasters, wars and disease outbreaks.

Dulas now has over 50 employees both neighbouring CAT in Machynlleth in Mid Wales and further afield in Scotland and England.

Theirs is a story of how specialist

knowledge can be used to develop real-world solutions that make an impact and create a better world for us all.

Passivhaus Homes & PH15

"I am very grateful for my time at CAT, which provided the space out of normal life to take a breath, have a think, and take a different direction." – Jae Cotterell, co-founder and Director of Passivhaus Homes and co-author of the Passivhaus Handbook.



Passivhaus Homes' first social housing scheme, due to be completed later this year.

The Passivhaus Homes team currently includes four CAT graduates: Jae Cotterell (co-founder and Director), Anna Carton (Associate & Designer), Hannah Hunt (Structural Engineer) and Phil Neve

(Energy Consultant).

The company delivers Passivhaus-certified and net-zero-ready housing, which incorporates innovative timber products to radically reduce emissions from construction. Their PH15 Construction Solution was developed to provide a complete Passivhaus-compliant construction approach that meets 2025, 2030 and 2050 climate change energy targets. In 2020, the system won the Ashden Award for scalable climate change solutions.

Projects range from one of the UK's first certified Passivhaus refurbishments to beautifully designed suburban homes; the company's first social housing scheme is due to be completed later this year.

Co-founder and Director Jae Cotterell is also co-author of the Passivhaus Handbook, a practical guide for anyone looking to build ultra-low energy homes.

Adaptavate

"We are so proud of our CAT foundations."

"So many alumni are part of Adaptavate – we have supervised theses, lectured, visited and now work in the industry with so many people that pass through this transformative quarry. Adaptavate would not be here without them." – Adaptavate

Adaptavate is an award-winning company developing low-impact, carbon negative building products including Breathaboard and Breathaplasta, offering easy-to-use drop-in alternatives to conventional materials.

Company founder and CEO Tom Robinson created the initial concept for their 'Breathaboard' alternative to plasterboard as part of his CAT Masters dissertation before going on to win a place on the Climate KIC accelerator programme, which supports innovative start-ups working on climate solutions.

In 2022, Adaptavate announced it had secured investment of £2.16 million to scale up production of Breathaboard. In the same year they were named as a 'PwC



The Cambridge Solar team installing solar PV on a London rooftop.



Net Zero Future50' company – one of 50 innovative start-ups identified by the accounting giant as having the potential to make a significant difference in tackling climate change.

April 2023 saw the launch-to-market of their new Breathaplasta range of products, which can now be found in builders merchants and DIY stores across the UK.

Energy Garden

Founded by CAT graduate Agamemnon Otero, Energy Garden supports communities to install and maintain gardens on railway stations across London. These are funded by revenue generated by the sale of community-owned renewable energy. Once a garden has been set up, Energy Garden supports communities to improve biodiversity and grow food.

This innovative organisation aims to raise awareness of environmental issues, create real examples of what solutions can look like, and support communities to cultivate resilience, cohesion, innovation and hope. Energy Garden is the largest

community energy organisation in London and the only city wide community gardening and community energy project.

The gardens in the network are run by and for the communities that use the stations, and each one reflects the people who live and travel there. More than 300 people are involved on a regular basis across 26 gardens, which are enjoyed by millions of London train-users every year.

Energy Garden is one of a number of organisations co-founded by Agamemnon, with others including Repowering, which specialises in renewable energy projects led and owned by Londoners, providing direct benefits including cost savings and community investment.

Cambridge Solar and Exeo Energy

Cambridge Solar was founded by Owen Morgan, a graduate from one of CAT's early postgraduate courses in renewable energy, building on his dissertation which looked at the solar PV market.

The company has now been providing renewable energy consultancy, design and installation services for private individuals and professional organisations for over 13 years, winning various awards including the prestigious Renewable Energy Association Installer of the Year Award.

In 2013, to expand beyond Cambridge, Owen founded sister company Exeo Energy. Adding another CAT connection, in 2018 Owen was joined by Ben Robinson, a previous Dulas director, to help grow the company. The team has now grown to more than 20 full-

time members of staff and has offices in Cardiff, Machynlleth and Oxford. Later this year they will be opening their first showroom – just down the road from CAT on the Machynlleth high street!


IndiNature

"The success of IndiNature is in a large part thanks to my time at CAT. Signing up for a CAT Masters degree was the best decision I ever made – a fantastic experience full of practical and theoretical work and, most importantly, I was studying amongst some really interesting students and lecturers from a wide range of backgrounds. In the Welsh hills to boot!" – Scott Simpson, co-founder and CEO of IndiNature

Natural-fibre insulation company IndiNature was co-founded in 2016 by CAT graduate Scott Simpson, based on his Masters dissertation research. In December 2022, the team opened the UK's first dedicated natural insulation mill in the Scottish Borders, thanks to a £3m investment from the Scottish National Investment Bank (SNIB). This high-capacity factory produces IndiTherm, a flexible thermal insulation batt made from industrial hemp sourced from farms in the UK.



IndiNature co-founder Scott Simpson with one of their natural insulation products.

In early 2023, the company announced a follow-on investment of a further £2m from the SNIB to allow them to scale up production and bring to market their high-density thermal and acoustic IndiBoards and IndiBreathe, a full construction insulation system which combines IndiTherm and IndiBoards, due to be launched later this year. 



One of the 26 Energy Gardens installed in train stations across London.

CAT: 50 years of environmental innovation and education

1970s

1973: CAT is founded as the Society for Environmental Improvement and is established in Llwyngwern Quarry – a disused slate works near Machynlleth, Mid Wales.



1974: First volunteers arrive at the quarry, including engineers, architects, builders and growers. At first the site has no electricity supply, and people work by candlelight and hurricane lamp. Within a few months the first hydro turbine is installed, with excess electricity used to charge an electric truck for local transport.



1975: CAT opens to the public, with the aim of showing people alternatives to fossil fuels and how we might live in ways that reduce our environmental impact.

- A range of small wind turbines are installed on the hills above CAT.
- CAT works with Wates Construction to build the UK's most insulated house on the CAT site, testing and showcasing insulation techniques and heat recovery systems that result in a building that takes very little energy to heat.



1977: 'An Alternative Energy Strategy for the UK' is published by CAT and presented to the UK Government Energy Ministry, showing ways of reducing reliance on fossil fuels. Solar panel test monitoring is undertaken.

1980s

- CAT's education programmes expand, with more schools visits, education packs and short residential courses.
- CAT's Free Information Service is launched, providing impartial advice on a wide range of topics relating to sustainability.



- Successful businesses and projects are incubated and 'spun off' from CAT. Examples include the Urban Centre for Appropriate Technology, now known as the Centre for Sustainable Energy, an independent energy advice charity, and pioneering renewables company Dulas Ltd. Dulas's solar-powered vaccine fridges, the prototype of which was invented at CAT, help save lives in off-grid locations around the world.

1984: Polenko wind turbine installed, providing additional electricity for the site.



1988: Eco Cabins are built to create an immersive learning environment for residential schools visits.

1990s

- The CAT site expands with new teaching spaces and new exhibitions.

1991: Water-balanced cliff railway is installed. First electricity grid connection.



1996: largest PV roof in UK installed at CAT.



2000s

2000: AtEIC Environmental Information Centre opens, an award-winning building made with rammed earth, timber and lime – showing ways of building without PVC, steel and cement. The building is awarded the Gold Medal for Architecture at the 2001 National Eisteddfod.



2003: First community wind turbine in Wales installed in partnership with CAT, on the hills above the Centre, supplying the bulk of the site's electricity.

2007: First Zero Carbon Britain report published by CAT – over the next 15 years a series of reports shows scenarios for a net-zero UK, explores the barriers to action and looks at how these can be overcome.

CAT's Graduate School is launched, offering Masters degrees in renewable energy and sustainable building.

2008: Professional Diploma Part II Architecture course begins, allowing architects-in-training to specialise in sustainability.

2010s

2010: WISE Building is opened on-site at CAT – a state of the art educational facility built with low impact natural materials. It is home to CAT's postgraduate courses on renewable energy, building design and environmental sustainability.



CAT's range of short courses and degrees grows. By 2023, CAT's Graduate School has around 2000 graduates and accepts over 200 students a year.

Many CAT graduates go on to achieve incredible things, such as Scott Simpson, founder of IndiNature, who recently opened the UK's first dedicated natural insulation factory, or Owen Morgan, who founded the multi-award winning renewable energy businesses, Cambridge Solar and Exeo Energy.



2020s

2020: CAT launches the Zero Carbon Britain Hub and Innovation Lab which has helped more than 5,650 individuals, over 200 councils, and many organisations, businesses and communities to act on the climate and ecological emergency.



CAT continues to influence thousands of decision-makers and activists through its Zero Carbon Britain reports, hub, innovation labs and training programmes. Meanwhile, its courses, degrees, information service and other work reach many thousands more.

Over the decades, the visitor centre has welcomed and inspired up to 100,000 people each year.

2022: CAT announces plans for a new state of the art visitor experience and sustainable skills hub at its Mid Wales site.



1973 – 2023

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Innovating our way to zero carbon

Dr Anna Bullen and **Amanda Smith** look back on three years of designing and running CAT's Zero Carbon Britain innovation labs and training courses that are empowering organisations to act on their climate emergency declarations.



Back in February 2020, we set ourselves the aim to improve the capacity of councils, communities and organisations to take action on the climate and ecological emergency, create systemic change, and increase resilience to climate change. So how would we do this?

The innovation lab model we have designed and delivered is co-creative, based on design-thinking, experimental, sense-making, and systemic. Through this and a series of training courses, we have guided a diverse range of people and organisations to develop solutions, break barriers and seize opportunities.

“The Zero Carbon Britain programme was the catalyst. It managed to bring [everyone] together and started that first conversation about how we might be able to work together to achieve a position of carbon neutrality.” – Innovation lab participant

The first labs

We began by mapping out who was already doing what and where, then identifying where the gaps were.

We decided that the best place to start was with councils, recognising the crucial role they have to play in the UK reaching net zero. While local authorities are only directly responsible for around 2-5% of their local area's emissions, they

are estimated to have power or influence over around one-third of local emissions, for example through planning policy, transport policy and partnership work.

We ran our first lab at a Climate Emergency UK event in November 2020. With around 100 people from councils across the UK, we explored the challenges they were facing in tackling the climate and biodiversity crisis and discussed what measures would help them in their journey to zero carbon.

Building on this experience, we went on to run the Staffordshire Councils Lab in partnership with Keele University, working with the 10 Staffordshire councils to co-design interventions that would address the barriers and enable them to work better together, at a county scale.

Out of this innovation lab grew the Staffordshire and Stoke on Trent Climate Commission (<https://staffordshireclimate.com>), aimed at ‘accelerating action through collaborative cross-sector working to deliver an inclusive, just and economically secure transition to a net zero, climate resilient and nature-rich Staffordshire and Stoke-on-Trent’.

Overcoming barriers together

We have since delivered another six innovation labs, working with businesses,

charities, voluntary organisations, government bodies, community groups, academia, and the arts.

Together, we have explored a range of issues in detail and co-designed interventions. These issues have included: the role of land use; how best to engage businesses in the climate crisis; how the voluntary sector can best influence others; the arts sector's role in addressing the climate crisis; how to embed climate justice in the journey to net zero; and individuals' ability to act and influence those around them.

In recent months, we have run another lab with councils, this time commissioned by the Local Government Association to co-design guidance that will embed sustainability in all council services.

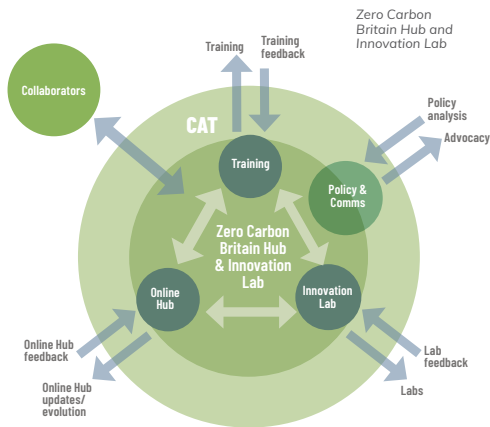
We have engaged more than 300 people from service areas from libraries to transport. A series of workshops have covered themes including energy, waste, land use, forestry and agriculture, buildings, and transport. These have resulted in online guidance on each theme (www.local.gov.uk/our-support/climate-change-hub/sustainability-council-services).



The Staffordshire Councils Lab has helped accelerate climate action. Image shows the written report produced through the lab.

Training

Alongside the innovation labs, we have developed and run a series of training courses to enable organisations to overcome barriers to climate action. Each training event has been designed as part



of an ongoing learning journey.

On the two-day Zero Carbon Britain course, participants have looked at the causes of the climate and biodiversity emergency and the tools we can use to reach zero carbon. External speakers have brought fresh perspectives and specialist knowledge for people to reflect on and apply in their work.

A one-day Local Energy Solutions course was designed with input from members of District Heating Divas, a network of women from across the UK's heat network sector, to look at heat, energy and demand reduction. This training looked at local energy project case studies, stakeholder engagement, and legal considerations. We were later commissioned by Lancashire County Council's NW Regional Energy Hub to run this course, first online and later in person.

We worked with the Carbon Literacy Project (CLP) to develop training accredited by them. Our first CLP course, Zero Carbon Britain: Carbon Literacy for Local Authorities, ran in September 2021. We went on to secure contracts from the Local Government Association to deliver CLP-accredited training on its behalf, developing programmes for elected members and senior officers. We created a 'train the trainer' session to make the training more impactful. We also worked with Poplar HARCA, a housing association, to develop bespoke training for them and added Carbon Literacy for the Housing Sector to our programme. Our most recent addition is Carbon Literacy for Communities.

"I think that the overall impact of the training is immense... If I hadn't participated in the training, I would not be rolling out Carbon Literacy training within the council." – Carbon Literacy training participant

Engagement in our training programmes resulted in requests for bespoke training and commissions. These have included two days of training for the Church of England and bespoke Carbon Literacy training for councils including Medway, Wrexham, the Royal Borough of Kensington and Chelsea, and others. A new Carbon Literacy 'lite' two-hour awareness training has just been developed for Public Health Wales.

Although the move to online training in 2020 presented a significant challenge, it actually enabled greater engagement, bringing participants from a wider geographical spread and from those who could not have travelled to CAT for various reasons. We were delighted to further widen access to our courses with the offer of more than 40 bursary places.

Real results

Three years since the start of the Hub and Lab, we have delivered eight innovation labs engaging nearly 1,000 people; trained nearly 6,000 people through 175 events; and worked with over half the local authorities in the UK. The potential impact of this support and shared knowledge is huge.

Those involved in the labs and training have consistently been positive about their experience, developing their understanding and skills, and, equally important, gaining the motivation and confidence to act on the climate crisis.

Ninety-two per cent of participants



Amanda shares our Zero Carbon Britain research with a community group at CAT.

have said that at the end of the training they know what is needed to achieve net zero and why it is important that we do. They have also reported that they understand the role of individuals and organisations in developing a net zero strategy (compared with 38% at the beginning). Surveys after six months show that almost all participants report an increase in their confidence to take action.

"Just keep doing what you're doing. I don't think anyone could walk away from this training course without thinking seriously about the changes they can make both as an individual and by empowering others." – Bespoke training participant



Online courses have allowed us to reach a much wider audience.

Thank you

We could not have achieved what we have over the last three years without a huge amount of support. Thank you to: the Moondance Foundation, for a generous donation that made the project possible; our staff and volunteers who have delivered the workshops and training, testing innovations along the way; a whole host of likeminded organisations that have shared their expertise and experience; and our valued members and supporters, without whom none of this would be possible. [CS](#)

About the authors

Anna is CAT's Zero Carbon Britain Innovation Lab Manager. She is a qualified facilitator and project manager, with 25 years' experience in the sustainability sector. She has a PhD in Sustainable Citizenship and is a firm believer in the use of co-creation to design effective and meaningful solutions to issues such as climate change.

Amanda is CAT's Head of Learning – she has overseen the development of our Zero Carbon Britain training programmes, short courses and schools education work. She has over 20 years' experience in teaching, school leadership, adult training and organisational improvement.



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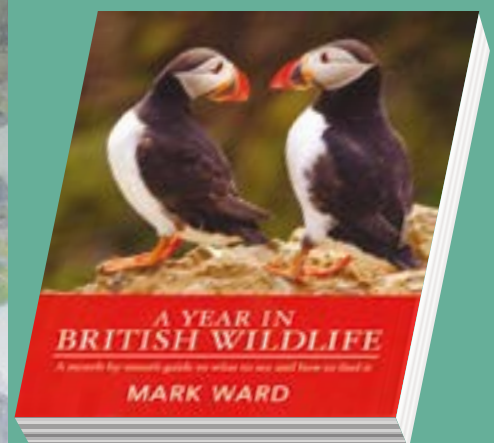
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Making a difference for people and planet

Founded in 1982 within the Centre for Alternative Technology,

Dulas has been at the forefront of the renewables industry, developing innovations that are still in use around the world today.



One of the many innovative products developed by Dulas is the **solar powered vaccine refrigerator**. Our cold chain products support vital immunisation programmes and exceed the World Health Organisation PQS standards.



Dulas has comprehensive experience of **working with major wind farm developers** in the UK and internationally. We offer a variety of services including wind monitoring, data collection, feasibility studies, repowering and extension advice, helping to ensure that every wind scheme is successful and profitable.



Dulas is an **experienced solar PV consultant**, designer and engineering company. We apply decades of pioneering experience to ensure solar success. Our customers range from large scale electricity utilities and developers, to M&E contractors, landowners, facilities managers, NHS Trusts, housing associations, and many more.



Dulas delivers a complete range of services for **small to medium sized hydro schemes**. Our two decades of experience gives us the confidence and knowledge to ensure that every aspect of a Dulas hydro scheme is robust, effective and efficient, and deliver excellent return on investment.


Find out more at
dulas.org.uk

Carry forward your commitment to CAT

The impact CAT supporters have made over the past 50 years will go on and on, for years, decades and beyond. While the predictions for the future can look bleak, we have in our hands the power to make positive change happen.

By choosing to leave CAT a gift in your Will, you can act now to give hope for future generations. With you by our side, we will continue our vital work to educate and inspire people from all walks of life and do everything we can towards our vision of a safer, fairer, more sustainable world.

Leaving a gift in your Will is a deeply personal decision. It can seem daunting, complex and emotional. We are here to listen and answer any questions you have about supporting CAT in this important way. Contact Freya by email: freya.randall@cat.org.uk or phone: 01654 523015, or write to us.

Every gift left to CAT in someone's Will is incredibly special for us too. At our visitor centre, you may have seen memorials where some people have chosen to leave memories behind for loved ones. This is a testament to the deep connection people feel to CAT and our shared compassion for the natural world and everyone in it. 



Here is the story of Liz and John, who have pledged to leave a gift to CAT in their Wills. We are eternally grateful.



"We first heard about CAT more than 30 years ago.

We remember visiting for the first time when our boys were young teenagers, on a Welsh holiday. We were already aware of Schumacher's Small is Beautiful and the need for a more sustainable way of living. CAT was clearly doing things differently. We were all fascinated by the practical ideas we saw on our visit, including alternative energy sources and building materials. We have been supporters of CAT ever since, choosing to offer annual monetary contributions.

We were and still are incredibly impressed by CAT's work, researching and communicating alternative technologies. The work you do to involve and support local councils in their efforts to address sustainability; the dissemination of practical solutions for a zero carbon future; your focus and expertise in education and research – we knew we wanted to help secure this work in the future.

So when we reviewed our Wills in 2012, we decided that we wanted to name our two favourite charities as beneficiaries, one of which we're proud to say is CAT. We have chosen to leave small percentages of our estates to CAT as the simplest way of ensuring our legacies retain their value.

Our legacy gifts carry forward our commitment to the work you do, particularly the educational aspect that helps secure ongoing development towards sustainable living for future generations.

We love reading Clean Slate when it arrives and take the opportunity to attend webinars and visit CAT when we are in the area. Sadly, we live too far away for visits to be more than occasional. CAT is at the forefront of research and education to ensure future generations will benefit from a better understanding of sustainable living and the practical solutions needed to achieve this. And we are so grateful for the work you do."



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Writing CAT's next chapter – with your support



An artist's impression of how we might develop the Centre in ways that further enhance biodiversity.

Thanks to the generous support of people like you, the next phase of work on the redevelopment of our eco centre is underway!

If we hit our fundraising targets, we're confident we will be able to hire specialist ecologists to carry out detailed surveys of the many species and habitats at CAT this summer. These will inform our plans to improve and update our home in a genuinely regenerative way, accommodating and enhancing the ecological diversity that makes our home in Mid Wales so rich.

Our commitment to sustainability will underpin the whole project, including the re-use and refurbishment of existing buildings, re-use of materials, the use of low-impact materials and local sourcing, additional renewable energy capacity, and protecting and enhancing the site's biodiversity.

When complete, our new and upgraded facilities will enable many more people to visit us, take courses, and be motivated to help take action on the climate and biodiversity crises.

Education and skills

World-class education facilities will help us provide environmental education and skills training to many more people, helping bridge the green skills gap – one of the main barriers to tackling climate change at the scale and speed required. We'll be developing our train-the-trainer programmes, professional skills courses, and bespoke study visits for schools, colleges and universities, whilst continuing to grow our range of

postgraduate programmes.

A new sustainable skills hub, new and refurbished classroom spaces, workshops, labs, and indoor and outdoor demonstration areas will all provide innovative spaces for activities including sustainable building, retrofit, renewable energy demonstrations and more.

An expanded digital outreach programme also features in our plans.

The visitor experience

The new visitor experience will provide individuals with the motivation, knowledge and support to create change at home and work and within wider communities.

A new welcome and orientation hub and new and refurbished exhibition spaces will increase understanding of the issues and help bring climate solutions to life. A 'green living' resource centre will also provide additional information and support about buildings and energy for householders and small businesses.

New nature trails around the Centre will offer a rich nature-based experience for families, as well as providing accessible routes into CAT's woodlands and Quarry Trail – a real-life example of what we can do to help protect and restore wild spaces and species.

The project will also see the development of additional accommodation and an expanded café with increased indoor and outdoor seating, to help provide for an increased number of visitors and learners.

The wider community

As well as attracting many more learners and visitors to the Centre, we hope to create an additional 48 jobs, benefiting the local economy for many years to come.

This will be a multi-year project, with a phased approach to minimise disruption and allow the Centre to remain open to students and visitors throughout its transformation. This should also create more opportunities for smaller local firms and specialists in sustainable build and design to get involved.

Next steps

With your support, we hope to raise the funds we need to complete the ecological surveys this summer. We have also now issued a tender to appoint specialists in structural design so that we are ready to move into the next phase of development when funding allows.



CAT is home to a number of rare species, including this beautiful pine marten, a regular visitor to our woodlands.

We will share more details as plans progress, with opportunities to provide feedback and further contribute to the project's development.

Progress in this next chapter of CAT's story has been made possible by donations from CAT supporters, old and new. We're so happy to have received such overwhelming support from the CAT community and look forward to returning this support from our new and improved home.

To donate, please visit our website. [CAT](https://www.cat.org.uk)

A Complete System Approach



Congratulations to CAT for 50 years of sowing the seeds for sustainable innovation. Thank you for inspiring so many like us to start environmental businesses, contributing towards better ways of living.



Designed by Passivhaus experts, the PH15 system includes all the technical elements, training and key components to enable you to build in a cost-optimized and low-carbon way.

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Celebrating CAT at 50, together

In this big birthday year for CAT, we're busy planning two opportunities for you to join us in celebration. Together, we'll look back at the last five decades of inspiring change, and ahead to what the next chapter holds. We hope you can join us!



For members:

CAT Conference – 50th anniversary edition

Our CAT conferences have always been a special opportunity to bring our members together. Over the years, we've recognised the vital work your support has made possible, shared new ideas, and made fruitful connections.

It's been three years since our last conference, so we're particularly excited to invite you back on site once again, marking our 50th year.

Taking place from 10 to 12 November, this anniversary edition of the conference will look back on our shared journey to date, our challenges and achievements, and the opportunities ahead. You'll be able to swap CAT stories with others and give us your views on what comes next.

Framed around the theme of exploring the future we want to create, through talks and workshops we'll explore the barriers and solutions to a more sustainable world – not just technical but social, economic and political.

You'll have an exclusive insight into our plans for CAT, and how together we can leave a legacy of change for future generations.

All of this will take place at CAT, immersed in nature and our beautiful surroundings, with guests staying in our low-impact accommodation.

We hope you'll be inspired to join us and share your unique story, experiences and expertise.

Save the date: 10 to 12 November.

Tickets start at £200, depending on circumstances.

Sign up to news by email to be first to know when they are available to book.



For everyone:

CAT's 50th Summer Celebration

This free event on Saturday 19 August will be a chance for all friends of CAT, old and new, young and old, to explore CAT's history, current work and future plans.

If you're new to CAT, we'll give you an introduction to our work and why action on the climate and biodiversity crises is so important. And if you're already familiar with what we do, you'll have the opportunity to dig deeper into topics such as renewable energy, green building and sustainable food production.

We'll keep the kids entertained all day with fun activities and adventure trails, and everyone can enjoy delicious vegetarian and vegan food from the CAT café.

Booking is not essential. But if you're travelling to CAT, we advise booking your free ticket in advance to avoid missing out.

Find out more and book online:
cat.org.uk/50th-summer-celebration

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Why do we teach... ecological assessment?

Next in our series looking at themes and topics explored by students on CAT Masters degrees, **Jane Fisher** introduces ecological assessment and some of the main teaching methods used on our courses.



Ecological assessment is the measurement of the structure, quality and function of an ecosystem or, on a small scale, a habitat. It can involve: measuring biodiversity (structure); a chemical variable, such as the concentration of a nutrient available in soil or water, or a metal contaminant (quality); or whether an ecosystem is effective in storing carbon or water to prevent flooding (function). Understanding these aspects is a key part of our MSc Sustainability and Ecology programme and also useful for students studying MSc Sustainable Food and Natural Resources.

Why is the topic important?

Ecological assessment is used in many aspects of natural resource management and to measure environmental change. It can establish academic information

about an ecosystem, check adherence to policy and legislation relating to land management, and investigate whether management has had a desired impact on an ecosystem's functioning or species diversity. For instance, when seeking to restore an ecosystem, how can we know if or when the work has been successful? What does a successful ecological restoration look like?

A current and growing practice is to pay a landowner to protect land. For example, a farmer might be paid to farm in environmentally sensitive ways. For payments to be linked to success, methods are needed to measure changing ecosystem variables. In the future, these measurements may be a defining aspect of how ecosystem protection is funded. This approach is called 'payments for ecosystem services' or PES. Underlying it is a need to be able to measure ecological

health, and especially the ability of an ecosystem to provide services such as clean air, water, habitat for pollinators, or sequestering carbon.

An ecosystem that is intact and healthy provides value to the people who use or visit it, to people who value biodiversity itself, and to global-scale ecological health. We therefore need to be able to compare a healthy ecosystem with a degraded ecosystem on the same or a similar site. Ecological assessment is important for conservation and likely to lie at the heart of ecosystem protection approaches globally.

What are the main aspects to consider?

Ecosystems are complex interconnected webs of many organisms interacting via biogeochemical pathways. There are, therefore, a myriad of different ways an ecosystem can be assessed. Is the interest in biodiversity focused on the level of species, for instance asking how many different species there are? If so, are we interested in animal species? Insects? Microbes? Does identifying species even matter? Perhaps what the species 'do' matters more? Looking at the abundance of woody species, top predators, ecological engineers or microbial nitrogen-fixers, for example, could tell us more about the ecosystem and what is happening than merely making a list of species. Or, if looking at physico-chemical variables, there are literally thousands to choose from, and as many different ways to measure them. Measuring how well an ecosystem functions to provide services is similarly complex. How can we measure whether an ecosystem cleans water, or is resilient to climate change, or makes people happy, for example?

One of the main challenges in ecological assessment methods is to know what we are aiming for and then to select methods that help us achieve that aim. These generally need to be simple, affordable and useable by ecologists all over the world with varied access to resources. But they also need to be reliable, so that they give answers about the ecosystem's structure, function and health overall. This is the holy grail of finding 'ecological indicators'.



What are the main teaching methods?

We begin by envisaging what a healthy ecosystem looks like, and what a damaged and degraded ecosystem might look like in comparison. We draw on academic research to support our discussions. We then focus on some commonly used and often globally relevant ecological assessment methods and get our hands dirty trying them out in the field. We sample invertebrates in the Dulas river at the bottom of the CAT site, carry out bird surveys in CAT's woodland, Coed Gwern, and map habitat around the visitor centre.

While looking at the temperate aquatic and terrestrial ecosystems around CAT, we trial and critique methods that would be applicable to equivalent environments in tropical, dry Mediterranean or colder alpine environments. Our students joining us at distance, often from all over the globe, can also try these methods out and report back on their findings when we meet online.

Through this experiential learning, we can see which methods will require the ecologist to have specialist species identification skills or expensive scientific kit and which rely on a few easy-to-recognise species or physico-chemical characteristics. We also investigate which methods are multimetric, drawing on a range of species, chemical and physical information, and which are drawn from the understanding of local people and traditional ecological knowledge.

We then look to place our learning in wider contexts. At CAT, we like to ask the big questions to which there is no single answer. Is an ecosystem that appears healthy one that can withstand the pressures of climate change? How do we recognise, and value, an ecosystem that is resilient to disease? How do the results from local ecological assessment methods fit into global remote sensing

and satellite image data on ecosystems? How do we incorporate the indigenous knowledge that local people have to enable a more holistic understanding? And what can we do with all this information?

After the module teaching period, the students work on their assignments. One of these is a consultancy-style report in which they assess a habitat of their choice, critique the ecological assessment methods they have chosen to use, and outline management recommendations for that site.

How do students use this learning?

Recent students have used the skills gained in this module when studying for their MSc dissertations, carrying out research into topics such as insect diversity in green roofs, bird communities related to the form of

urban parks, and evaluating the probable success of seaweed bed restorations. Students have gone on to become advisers for Natural England, work with the National Trust, or become land managers for the Wildlife Trusts, as well as working for councils and environmental education providers. Others have gone on to further research towards a PhD, and have found that this hands-on experience, coupled with looking at the big picture, stands them in good stead for deeper study.

The issues covered in this module reflect a growing area of ecological assessment vital for the current EU Biodiversity Strategy for 2030 and for UK policy such as the UK government's Biodiversity Net Gain Initiative and new farm payments which may, or may not, come about through the new Environmental Land Management schemes (ELMs). Preventing and mitigating the current global ecological collapse is going to take more students with hands-on ecological assessment skills, alongside big picture thinking and real-world problem solving. 🌱

About the author

Jane is Programme Leader for MSc Sustainability and Ecology and Sustainability and Behaviour Change, and developed the MSc Sustainable Food and Natural Resources programme. She has professional experience in developing ecological assessment methods to evaluate freshwater and wetland environments, a PhD in freshwater ecology, and has taught environmental science, biogeography and ecology at universities for over 15 years.



Study with us

Find out more about CAT Masters degrees, join an on-site or virtual open day, and explore what funding might be available to you – visit cat.org.uk/gse or contact Alis at study@cat.org.uk or on +44 (0)1654 705953.

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DOMESTIC WIND POWER

Joel Rawson explains what you should consider before installing a turbine at home and suggests ways to support wind power as part of a community, which could be better for the planet and your pocket.

Khanthachai C/Shutterstock



As more households put in domestic batteries, interest is growing in small wind turbines. The thinking is to charge batteries during the winter, when solar PV contributes little. But before placing an order, there are some important things to think about.

Wind speed

The main question to ask is whether you have a windy enough location.

The power in a flow of wind is

calculated from the wind speed raised to the power of three. This means that the power available in the wind rises exponentially as the wind speed increases.

To experience the higher wind speeds that will give a reasonable power output, a turbine must be high up and well away from obstacles such as buildings or trees. You generally need an average of more than 5m/s (metres per second). At CAT we only get that on the hills well above

the site.

There are online tools that give a rough estimate of local wind speeds, but they need to be used carefully.

For example, the Rensmart website (www.rensmart.com/Maps) hosts a map using the NOABL database of estimated wind speeds at heights of 10m or more. Speeds were modelled for flat terrain and give an average for a kilometre square. Therefore, although they can be an initial guide if a potential site is open and away from buildings, winds will be much reduced once you're close to buildings or other obstacles, or nearer the ground.

Turbine size

Because the area of a circle is calculated using the square of the radius ($A = \pi r^2$), increasing the length of rotor blades from 1m to 2m increases the area of wind being captured (and therefore also the power) to four times as much. A turbine with blades that are 10 times as long can capture 100 times as much wind. This shows the big economies of scale with wind power.

Smaller wind turbines (less than 1m rotor diameter) are not really designed for grid connected houses. The UK companies Marlec and Leading Edge make small turbines that can generate a few hundred watts of power in a strong wind. These are great for complementing solar panels in an off-grid setup, like on a boat or remote cottage.

There's then a jump up to larger turbines that can generate a few kilowatts of power, similar to the peak output of a solar PV array, such as those from SD Turbines and Britwind. These can be grid connected and could make several thousand units of electricity per year. They are large machines though, with a rotor several metres in diameter, mounted on a high tower.

The suppliers will be able to provide information, including a power curve and the energy yield for different average wind speeds, to help you decide if the turbine is right for your site.

Buildings and roofs

Close to buildings, trees or other obstacles, the wind becomes turbulent and relatively weak. That means there is very little energy to harness in the first

place, whatever the design of turbine.

Even if a building-mounted turbine does occasionally receive some strong winds, the resulting vibrations can damage the structure. Designers often claim a vertical axis rotor (a bit like a large whisk) can capture turbulent winds – but even if this can be done it would put more wear and tear on components.

The Warwick Wind Trials found that sites on roofs and in urban areas performed badly – some turbines even consumed more energy than they produced. In comparison, by putting a turbine on a good site (in an open area, on a high tower) it would generate 20 to 30 times as much electricity.

Unhelpfully, some companies still make dubious claims about roof-mounted wind turbines – often linked to unusual designs they say will capture turbulent winds, and giving very little data about actual real world performance. The UK manufacturers mentioned above mainly sell horizontal axis (rotor type) machines, shown over time to perform well when properly sited. For some other turbines sold online, build quality and performance claims can be suspect, besides lacking ongoing maintenance support within the UK.

Getting connected

Aside from wind speed, sizing and siting considerations, it is important to note that connecting a wind turbine to most homes is not as simple as with solar PV. The management systems for lithium batteries sold for household use weren't designed with small wind turbines in mind, so they won't work properly together.

Connecting a turbine to an existing battery using a bespoke arrangement carries the expensive risk of invalidating warranties for the battery, inverter and possibly the wind turbine too. It can be possible to get a valid grid-connected setup, especially if starting from scratch, but the equipment needed won't be cheap.

Beyond domestic wind – power in the community

When a small wind turbine is not feasible, there are other ways of purchasing or investing in wind power. Economies of scale mean that wind power is usually much more effective at a community level.

In 2003, CAT was involved with the installation of a community-owned wind turbine up on the hill above our site. A few years later, an older turbine operated by CAT was replaced with a

second community-owned turbine. Because large scale wind power was rapidly becoming a mainstream technology, community ownership made much more sense than CAT operating a new turbine. We now use the electricity from these turbines indirectly via the local grid.

CAT's Information Service offers links to community-scale options, including the organisations Community Energy England, Scotland, and Wales, who have more advice on setting up a project. There's also the Energy Local (www.energylocal.org.uk) model, where people effectively buy energy directly from local generators, and Ripple Energy (www.rippleenergy.com), which combines a share offer with your energy tariff to give you a discount on bills.

For more on these options and others, email info@cat.org.uk or call 01654 705989. 

About the author

Joel Rawson is CAT's Information Officer, providing free and impartial advice on a wide range of topics related to sustainability. He first came to CAT to volunteer in 2001 and graduated with a CAT Postgraduate Diploma in 2013.

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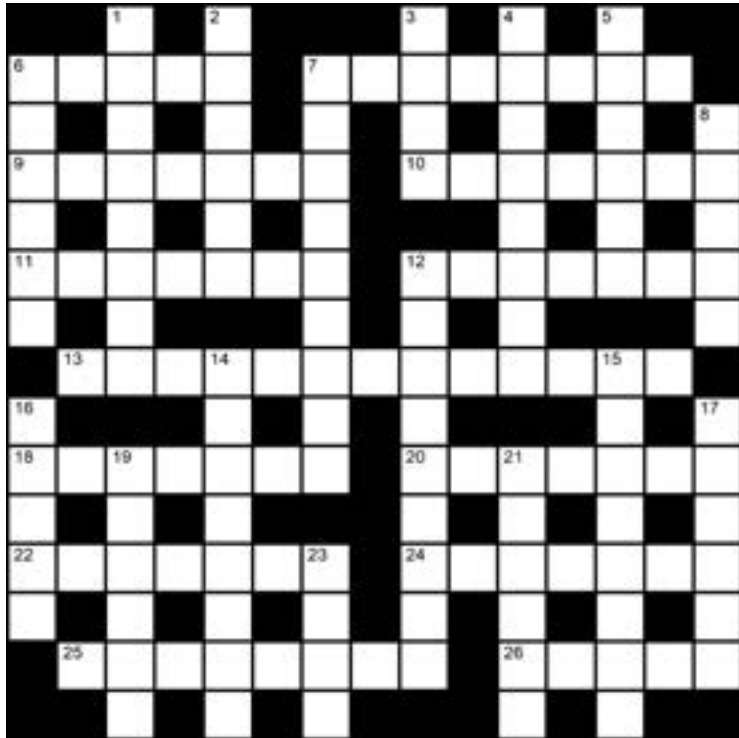
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Cryptic crossword by Brominicks

<http://www.brominicks.wordpress.com>



Across

- 6 Delight in case of Chablis, say (5)
- 7 Vegetable better pickled with a couple of eggs? (8)
- 9 Bitter, one recommended initially by writer (7)
- 10 Doctor related "it will require foot operation" (7)
- 11 Poor part of town where you'll find slippers? (4,3)
- 12 Single sound made by cat going back behind church – tweet! (7)
- 13 Where you'll find monsters and ogres had been running amok, either side of river (4,2,7)
- 18 Joker grabs teaspoon where it's scorching (3,4)
- 20 Biscuit about to be submerged into fresh tea, OK? (7)
- 22 Run through Scottish dance competition? (4,3)
- 24 Try and combat temptation, just a little bit (7)
- 25 Ground teenager that gets drunk (5,3)
- 26 Supporter of the arts? (5)

- 5 Unknown drone circling over there (6)
- 6 Cook a little bemused by increase in salary (9)
- 7 Plant only covering 100kwh, each (9)
- 8 Procedure followed by police force used up time (5)
- 12 In essence, ZCB charts way to produce food (9)
- 14 Constructor conjured up scheme to take on mid-week worker (8)
- 15 Close to girl – narrowly avoided bump (4,4)
- 16 Leaves African country without resistance (5)
- 17 Pulse irregular – ill, rings hospital department (6)
- 19 Article on antelope mostly speculation (6)
- 21 First of team there, finally at the top, securing lead (6)
- 23 Hamper said to contain cheese (4)

To enter:

Name: _____

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The first correct entry pulled from a hat wins a £20 voucher for the CAT EcoStore – store.cat.org.uk.

Please send your completed crossword entry by 31 July 2023 to *Clean Slate* Crossword, Centre for Alternative Technology, Machynlleth, Powys, SY20 9AZ.

Solution will be published in the next issue of *Clean Slate*.

Down

- 1 18 hosting Formula One, live! (8)
- 2 Line on map, one very close to pole (6)
- 3 Experienced enough to make cloth? (4)
- 4 Sign of aging hidden by elder? (4,4)

Clean Slate 127 Solution



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