

Clean Slate

No 126 Winter 2022 £2.50

**Home energy
saving tips**

COP27

**How the
arts can
inspire
climate
action**



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Cover image: John Urry

Editor: Catriona Toms.

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

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EDITORIAL

Eileen Kinsman

Reasons to be hopeful

More dire projections. A new report from the Global Carbon Project, released during COP27, made it clear to world leaders that they're currently taking a 50:50 gamble of breaching 1.5°C in nine years. According to further analysis by UK climate scientists, this could be optimistic – the actual timescale could be just six and a half years. And yet we're still not seeing the decisive global action needed.

We owe it to each other and the entire natural world not to despair. There simply isn't time. Our window of opportunity to limit the impact of climate breakdown is getting smaller. We must seize the one chance we have.

Not that we should let those in positions of power off the hook. We'll continue to campaign for national and global high-level action. But meanwhile we must get on with the job of shifting the UK onto a more sustainable path, starting where we can have a real impact – in our local communities.

At the Centre for Alternative Technology, we have 50 years' experience in giving people the knowledge, skills and the hope they need to take practical action together. With supporters like you, we can bring people from all parts of society into the climate movement and make change happen at an even bigger scale.

In your magazine, you can read some of the things you can do from your own home to make a difference, from adopting new daily habits that reduce your carbon use (and your bills) to learning more about your boiler. You can get informed on the latest climate science from the COP27 conference. And you can discover ways of supporting a more sustainable future you may not have considered, such as volunteering at CAT or leaving a gift in your will.

However you support CAT – thank you. You make our community the force for change it is and show that a better, more hopeful tomorrow is still within reach.

Interim co-Chief Executive Officer Eileen Kinsman

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



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www.cat.org.uk/news



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New research Masters launched

In October we launched a new Masters in Research (MRes) in Sustainability and Adaptation, which will allow students to spend time researching environmental issues and solutions.

Delivered by CAT's Graduate School of the Environment and validated by the University of East London, the course will be taught over two years full-time or three years part-time.

Over the first 12 months of the programme, taught modules will explore a range of topics, including: sustainability thinking and adaptation transformation planning; research philosophy, approaches and strategy; and analysis techniques and research design methods. An extended research Dissertation module will then allow students more independent research time than in traditional Masters courses.

Dr Adrian Watson, Head of the Graduate School, said:

"We have a strong history of researching environmental solutions through our pioneering Zero Carbon Britain research — and we're pleased to be expanding our course offerings at the Graduate School to meet the growing demand for researching zero-carbon solutions. The topics students explore as part of this new and exciting course have the potential to make a real difference to the climate and biodiversity emergency by building on knowledge and understanding of solutions and exploring innovative approaches."

Students can choose whether they'd like to study a taught module on-site or via distance learning – providing the opportunity to combine immersive learning through online lectures, talks, seminars and workshops, with practical sessions during on-site study visits.

Applications are now open for the first intake to the course in September 2023. For more information visit the CAT website at cat.org.uk/mres-sustainability-and-adaptation/



A new academic year for the Graduate School



CAT students taking part in a biodiversity survey in our woodlands.

In September we welcomed a further 250 new students to CAT, on-site and online, to begin their postgraduate studies in sustainability.

During their introductory modules, MSc students explored a

range of topics, including environmental change and adaptation, how we can create a zero carbon Britain, water systems, and circular building – taught through a range of lectures, workshops, seminars and hands-on practical sessions.

Students starting CAT's Masters in Sustainable Architecture course also had a busy first week getting hands-on experience with sustainable materials, sketching around the CAT site, and exploring community resilience, adaptability and sustainability.

New Sustainability in Energy Provision and Demand Management student Elliot said of his first week on-site at CAT:

"It exceeded all expectations, it was remarkable, meeting lots of like-minded friendly students, surrounded by beautiful nature. The lecturers also have plenty of knowledge and were very friendly, making CAT a fantastic environment to learn in."

We now have over 2,000 graduates making a difference in a wide range of sectors in countries around the globe.

If you'd like to find out more about studying at CAT, you can book a place on one of our upcoming open days at www.cat.org.uk/open-days or get in touch with Alis at gsmo@cat.org.uk / 01654 705953.



GALWAD – a radical hope



"The future is here because you are. Because it doesn't just happen, does it? It's created, hoped for, imagined." – Efa, GALWAD.

Kristen McTernan / Collective Cymru

A live finale broadcast on Sky Arts challenged viewers to think about the future they want, and what they can do to help make it happen

This autumn saw the culmination of an inspirational creative arts programme exploring what the next 30 years might bring and our collective agency in creating the future we want to see.

Produced by Collective Cymru, a partnership of Welsh organisations and individuals led by National Theatre Wales, GALWAD (the Welsh word for 'call') saw a story that moved across Wales and shifted between the present day and 2052. The central character, Efa, brought a message from a future world as imagined by 120 people from diverse communities across Wales and brought to life by over 400 designers, writers, musicians, filmmakers, technologists and artists.

Combining TV drama, live performance, social media and news, the drama unfolded over the course of a week, and was performed in Welsh, English and British Sign Language. It was watched by



World-building workshops at CAT and elsewhere saw 120 people from across Wales co-creating an imagined future.

Mo Hassan / Collective Cymru



The GALWAD Young Company during a residency at CAT – the group of young people, recruited through an open process, helped shape the project.

Mo Hassan / Collective Cymru

2.5 million people, and reached over 5 million people through its unique approach to storytelling, with the live finale in Blaenau Ffestiniog broadcast on Sky Arts and Freeview, followed by a one-hour TV drama.

Its central message was perhaps summed up in these lines from Efa about the power of hope: "Imaginations became action, and that action became hope. And not a sitting-on-the-sidelines kind of hope, not a watch-and-comment kind of hope... *Na, un o nerfau, o waith, o her, o weithredu oedd hwn.* (No, this is a hope of fight, of work, of challenge, of action.) A *radical* hope..."

You can find out more about the making of GALWAD and watch the full story at www.galwad.cymru.

GALWAD is one of a number of arts programmes that CAT is a partner in – take a look at pages 22-25 for an exploration of how the arts can help inspire action on climate change, and to hear more about some of the projects we are involved with.

Supporting the arts to respond to the climate emergency

CAT's Zero Carbon Britain Innovation Lab has been commissioned by Arts Council of Wales in partnership with Natural Resources Wales to support the creation of a new 'Strategy for Climate Justice and the Arts'.

Over the winter the Lab is leading online workshops with a diverse group of artists, arts organisations and environmental specialists, creating the strategy using a co-design approach. It will look at issues such as using the arts to connect people with the nature and climate emergencies, and the support that is needed for artists and arts organisations to minimise the environmental impact of creating art.

Crucially, it will provide guidance for how the arts can help Wales reach targets for net zero greenhouse gas emissions and nature restoration.

Michael Elliot, Chief Executive of Arts Council of Wales said:

"Creativity is key to tackling the enormous challenges posed by the climate and nature emergencies. The arts in Wales have a central role to play through their potential to imagine, connect, communicate, and create change. Arts Council of Wales is deeply committed to making sure that we support sustainable ways of working, and we're delighted to be working with the Centre for Alternative Technology to develop our first Strategy for Climate Justice and the Arts alongside Natural Resources Wales and partners from across the arts and environmental sectors."

Clare Pillman, Chief Executive at Natural Resources Wales said:

"The climate and nature emergencies are now a part of our everyday lives, and we need all hands-on deck to address the changes that are to come. The development of this strategy recognises the power of the arts to connect people with nature and help them find a voice in the conversation we need to have about our future. In centring itself on social justice, addressing inequality and promoting internationalism, it shows Wales to be the globally responsible nation we are all striving for."

This is one of a number of innovation labs being facilitated by the CAT team, bringing people together to explore barriers and solutions to action on climate change, and working together to co-create innovative and effective approaches. You can read more about the

approach and impact of our innovation labs at cat.org.uk/zcb-innovation-lab/

CAT turns 50!

Next year we celebrate CAT's 50th anniversary – five decades of researching and sharing environmental solutions. It's quite a milestone!

We can't wait to celebrate all that we have achieved together, with the incredible support of people like you – and to look together at the urgent work needed in the coming months and years.

We are planning a range of events and activities across the year, including a members' and supporters' weekend. You can read more in the next issue of Clean Slate – and make sure you're signed up to our enews for updates: cat.org.uk/sign-up

Engaging communities with renewable energy

CAT is working with the National Infrastructure Commission for Wales (NICW), Dulas Engineering and the Centre for Sustainable Energy (CSE) on new research into how an increase in renewable energy capacity in Wales can be delivered in a fair, just and collaborative way.

NICW is a non-statutory body that advises and makes recommendations to Welsh Government Ministers on Wales' economic and environmental infrastructure needs over the next five to eighty years.

As part of the project, CAT will be working with CSE and Dulas to look at how we can best engage with communities, with pilot exercises in Mid Wales to test an approach.

This and other research will inform a report from NICW to the Welsh Government in summer 2023.

CAT Zero Carbon Britain Innovation Lab Manager, Dr Anna Bullen said:

"In order to tackle the climate emergency at the speed and scale required, we need transformational change across every sector, including a major shift in how we produce energy. To do this successfully we need to engage people and communities, giving them time and space to look at options for their neighbourhoods, explore potential approaches and benefits, and share concerns and hopes for the future."

"At this critical time for action on climate, we are excited to be working with NICW, CSE, Dulas, and communities across Mid Wales to help inform the future of zero carbon energy planning in the region."

The project sees us collaborating with two organisations that have their roots at CAT. Dulas Engineering is a pioneering renewable energy company originally founded at CAT 40 years ago, which is now having an impact across the world, including wind, solar and hydro projects and solar-power medical fridges first invented at CAT that have saved countless lives in developing countries. The Centre for Sustainable Energy was also a CAT spin-out, founded in Bristol in 1979 and originally known as the Urban Centre for Appropriate Technology (UCAT) – CAT's city-based sister organisation. It is now an independent national charity that helps people change the way they think and act on energy.

Supporting local authority action on climate

In the last issue of *Clean Slate* we announced a new collaboration with the Local Government Association (LGA), providing Zero Carbon Britain training to local authorities and leading a new innovation lab to help embed sustainability across all local council policy and practice.

The 'Sustainability in All Policies' Innovation Lab aims to bring key stakeholders from all councils together to understand and overcome the barriers to embedding sustainability in all council policies. It will then work to co-create route maps based on key themes that cut across council services, supporting councils in their work to address the climate and biodiversity crises through systems-based approaches.

To-date we have run five workshops bringing together councils from across England, looking at a range of issues including waste, energy, land use, agriculture, buildings and transport, discussing barriers to action and working together to explore solutions.

The work is being supported by students from CAT's Graduate School, who are gaining valuable insights into the challenges and opportunities for local authorities, and useful experience of processes aimed at co-creating solutions to the climate and biodiversity emergency.

Final guidance documents are expected to be published in spring 2023.

Currently the funding for this project is for English councils only but we hope to be able to do similar work for councils in Wales and the rest of the UK in the future.



Protecting our Planet Day for schools

On 10 November, CAT was part of an inspiring day dedicated to environmental issues and solutions, livestreamed from experts around the world to schools across the UK.

‘Protecting our Planet 22’ saw an estimated 100,000+ school pupils taking part, with livestreamed talks and activities, recorded sessions and classroom resources, all full of inspiration and activities on climate change, biodiversity loss and how we can protect our planet.

Sessions from CAT looked at the importance of forest ecosystems and how we can protect and restore forests and address climate change. CAT’s education team were joined by Professor Richard Lucas of the Living Wales project, who led live link-ups with researchers in a range of forest ecosystems around the world. From Welsh woodlands and Italian mountain forests to Australian mangroves and Malaysian tropical forests, we explored the wonders of these amazing ecosystems, the impacts of human activities, the action being taken to secure a better future, and what more needs to be done.

Protecting our Planet 22 was run by STEM Learning, an organisation that supports education in science, technology, engineering and maths, in collaboration with the UK’s Climate Change Educational Partnership. The day also included a live introduction from the captain of the RRS Sir David Attenborough polar research vessel and interviews with the team behind Frozen Planet II, as well as collaborations with Blue Peter and Autumnwatch.

Find out more about CAT’s work with schools, including school visits to our eco centre and online workshops, at cat.org.uk/school-visits/



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Looking for last minute gifts?

Give the gift of sustainability with a CAT Gift Membership – visit cat.org.uk/giftmembership or call us on 01654 705988 by 19 December and we’ll pop a pack in the post in time for Christmas. Find out more on page 10.



Stay in touch

- Send us an email: members@cat.org.uk
- Give us a call: 01654 705988
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- Write to us: CAT, Machynlleth, SY20 9AZ



Applications open for PhD: Empowering climate action through participatory filmmaking

A new PhD opportunity, in partnership between CAT, Aberystwyth University and Cardiff University, will explore how collaborative filmmaking can nurture new forms of environmental awareness and engagement.

Recent years have seen an increase in documentaries covering the climate crisis, but it is currently unclear to what extent knowledge gained from these productions leads to meaningful action and significant changes in attitude and behaviour. This interdisciplinary research project is aimed at filling some of the knowledge gaps to help understand how filmmaking can be used to create positive change.

It will explore how community involvement in the visualisation of climate issues can play a role in enhancing engagement and action on climate change, and will look at how collective storytelling can empower meaningful and lasting change, both among those people involved in its creation and for wider audiences.

The PhD is fully funded by the Arts and Humanities Research Council (AHRC) through the South, West and Wales Doctoral Training Partnership scheme, including tuition fees and a maintenance stipend. Applications are open until 16 January, and the project will begin in September 2023.

For more information, visit <https://www.sww-ahdtp.ac.uk/cda-projects-2022-2023/> or contact Dr Cathy Cole - cathy.cole@cat.org.uk



Visitor centre winter opening

The CAT eco centre has now moved to winter visiting hours, and will be open from 10am until 4pm daily.

We will be closing over the Christmas and New Year period as usual, with the centre shut from 22 December, reopening 6 January.

If you'd like to join us this winter, please take a look at our website at cat.org.uk/visit to plan your day out, and don't forget that CAT members enjoy free entry to CAT all year round!

CAT Annual Review 2021-22 out now

CAT's latest Annual Review is now available. Covering our financial year from April 2021 to March 2022, the review gives an overview of some of the key activities and impacts from throughout the year, looking how CAT is inspiring, informing and enabling people to take action on the climate and biodiversity emergency.

A few of our highlights from the year, which you can read more about in the full report, include:

- We built on our work supporting councils, communities and organisations through our Zero Carbon Britain Hub and Innovation Lab, including the launch of a free online resource hub and new courses for local authorities.
- We welcomed over 250 new students to the CAT Graduate School of the Environment, continuing to adapt delivery to suit evolving Covid-19 guidelines. We also refreshed our range of postgraduate courses.
- We developed a new Retrofit Masterclass to build knowledge and expertise within the building industry, helping to bridge the sustainable skills gap.
- We secured funding for a new partnership project providing sustainable skills training, supporting green jobs, and increasing understanding and knowledge of environmental solutions.
- Throughout the year, we ran events and courses online and at CAT to help a wide range of people build their sustainability skills.
- And, as ever, the CAT eco centre invited thousands of visitors to explore solutions.

We also began creating plans for a major step-change to allow us reach many more people with skills and knowledge to tackle the climate and biodiversity emergency.

Thank you for your support over the past year, helping CAT play its role in building the

better future we all know is possible. What we do is made possible through the generous support of people like you, enabling us to carry out our vital work.

You can read the Annual Review at: cat.org.uk/annual-report/





Short course spotlight:

Zero Carbon Britain: Carbon Literacy for the Housing Sector

Explore climate solutions, create an action plan for you and your work, and gain Carbon Literate certification on our online course.

Specifically developed for those working in the social housing sector, and suitable for all types of roles, this online course will cover the science of climate change, local and global impacts and how these will affect the work and duties of housing providers.

Drawing on CAT's research on how we can create a Zero Carbon Britain, the course looks at low carbon objectives in the housing sector, and helps participants create a plan for actions they can take, including how they might influence others to create change.

Using case studies and real life examples from around the UK, we'll look at practical steps to reach net zero from a social housing and community perspective.

Key information

- **Next dates:** 24 and 25 January 2023
- **Duration:** two morning sessions, 9.30am-1pm, plus up to two additional hours of independent work for Carbon Literacy accreditation
- **Location:** online
- **Fees:** £140

Across the day there will be timetabled discussion and reflection sessions, Q&As, networking and offline breaks to keep the online format refreshing and engaging.

During the course you'll commit to two carbon reducing actions – one as an individual and one that will influence a group of individuals. We encourage these to be work-based in order to support a wider shift within the housing sector.

Participants' output is evaluated by the Carbon Literacy Project, and successful completion will lead to Carbon Literate certification, enabling you to go on to train others in your area of work to share knowledge and maximise impact.

What is Carbon Literacy?

The Carbon Literacy Project describes Carbon Literacy as: 'An awareness of the carbon costs and impacts of everyday activities and the ability and motivation to reduce emissions, on an individual, community and organisational basis.'

This course is delivered by the team from CAT's Zero Carbon Britain Hub and Innovation Lab, which supports councils, communities and other organisations to act on the climate and biodiversity emergency.

This training is also offered as a bespoke course for teams or groups of people working together – please get in touch to arrange a date to suit you.

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

Related courses

Our popular '**Zero Carbon Britain: Live online**' courses cover a range of topics from renewable energy and energy efficiency to diets and land-use. Over the two days you'll take part in workshops, debates and reflection sessions with a diverse mix of attendees, looking at how we can catalyse action across all areas of society. The next course takes place online on 14-15 March.

Our new '**Zero Carbon Britain: Carbon Literacy for Communities**' online course is aimed at supporting people and organisations working within or in partnership with local communities to take action on the climate emergency. Next course runs 9-10 May.

For people working with local authorities, our '**Zero Carbon Britain: Carbon Literacy for Local Authorities**' supports elected officials, council officers and related services to look at practical steps to reach net zero, and explores the co-benefits of taking action on the climate and biodiversity emergency. Also suitable for organisations, groups and individuals that work in partnership with local authorities. Next course runs 9.30am-1pm 7 and 8 February.

Find out more at cat.org.uk/short-courses





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**CAT membership is
a gift for everyone,
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Your support gives people across the UK and beyond the knowledge and skills to build a better world.

It's a gift for everyone who will benefit from a safe, healthy and fair future in which nature thrives – including our children and future generations.

And by giving membership to your friends, family members and colleagues, they will enjoy:

- becoming part of a growing and thriving community of changemakers
- knowing that their membership supports urgent solutions to the climate and biodiversity crisis
- reading Clean Slate magazine, delivered to their door four times a year
- coming to our award-winning visitor centre for free
- unwrapping a special membership pack with an exciting extra gift on the day.



**CAT members everywhere
are putting urgent solutions
into action.**

Buy someone the gift of membership today by calling **01654 705988** or visiting

cat.org.uk/giftmembership

For more information please contact us at **members@cat.org.uk**

Talks, tours and team-building – group visits at CAT

Inspire your local group, school, college or teammates with a group visit to CAT, and start sharing solutions together.



Whether you're part of a local community organisation, an environmental action group, a teacher or school governor, or looking for something useful to do on your next team away-day, a visit to the CAT eco centre can help spark ideas and conversations and inspire action on the climate and biodiversity emergency.

In the past year, we've hosted everything from U3A groups and community organisations to groups of artists and poets, as well as playgroups, schools, colleges and universities. What they all have in common is that they're keen to learn more about environmental issues and to spend time exploring solutions together.

CAT provides the perfect setting to develop new knowledge and skills, and to take time out of the usual routine to really immerse yourself in the possibilities of a more sustainable future.

Birmingham-based community group Civic Square have returned again and again with different groups of people, and they have even incorporated a day out at CAT into their festival and event programmes.

In July, they brought 60 people, including families with young children, on the train to Machynlleth for a day

out at CAT to help fire imaginations about what might be possible in their neighbourhoods.

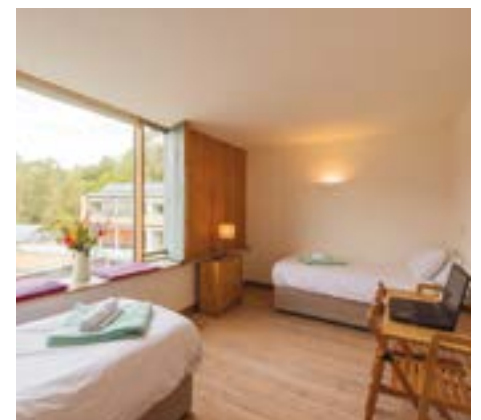
Other trips have seen groups taking part in interactive workshops on wind power, hands-on sessions using natural building materials, talks and workshops from our Zero Carbon Britain team, and a home retrofit surgery. Tours of the centre explore different aspects of sustainability and regeneration, from renewable energy to nature connection.


Joe Baker of Civic Square said: "At Civic Square we believe there is a role for everyone in creating socially just, ecologically sustainable neighbourhoods. Our several visits to CAT with diverse, intergenerational groups from our neighbourhood has provided us with knowledge, skills and inspiration to take back to Birmingham and begin to put into practice together."

We also regularly host team away-days, combining professional meeting spaces (including the Sheppard Lecture Theatre, which can seat up to 150 people, as well as smaller meeting rooms) with unique and memorable team-building activities that are as fun and challenging as they are inspiring and educational.

Some groups choose to stay overnight in our four-star twin-room group

accommodation, allowing them to experience the starry skies and misty mountains of Mid Wales. It's a truly immersive experience, sleeping in buildings made with earth, timber, hemp and lime, and enjoying delicious vegetarian and vegan meals from the CAT café.



If you are part of any type of group that would like to spend time together in beautiful surroundings exploring environmental solutions, please get in touch and we'll work together on a programme that suits your needs. Contact our group visits team at education@cat.org.uk or call us on 01654 705950 to find out more and start making plans. 

Our foot is still on the accelerator – overview of key outcomes from COP27

COP27 has delivered an important agreement on funding for loss and damage, but fallen woefully short on what's needed to stop catastrophic climate change. **Paul Allen** reports.



A clear message from negotiators from the Maldives at the UN talks.

COP27 opened with a very clear warning from UN Secretary-General António Guterres, who told world leaders that: "We are on a highway to climate hell with our foot still on the accelerator."

He said the world faced a stark choice over the fortnight of talks: either countries work together to make a "historic pact" that would reduce greenhouse gas emissions and set the world on a low-carbon path – or failure, which would bring climate breakdown and catastrophe.

As the two weeks of talks drew to a close, exhausted negotiators finally agreed a climate deal that paves the way to a fund to support the most climate vulnerable countries to rebuild after climate impacts, but falls woefully short on reducing the emissions that cause the problem in the first place.

Historic win on loss and damage

The final agreement included commitment to set in train a process to support poorer countries on the front lines of the climate emergency to address 'loss and damage'.

This is a historic achievement after a decades-long fight by the most climate vulnerable countries, who have long argued that they are bearing the brunt of climate impacts despite having contributed very little to global greenhouse gas emissions compared to developed countries.

However, there was no action plan for immediate delivery, and no agreement yet on how the finance should be provided and who should contribute – details that will be worked out in the coming months. The UN has suggested that loss and damage funds should come from the massive profits made by global fossil fuel companies.

Lack of progress on 1.5°C

If immediate actions are not taken to keep average global temperature rise within 1.5°C, millions more people will be exposed to devastating impacts, and the need for loss and damage funding will drastically increase. We've known since the publication of the Stern Review in 2006 that the benefits of early action on climate change mitigation far outweigh the economic costs of not acting.

It's on progress on reducing global greenhouse gas emissions that COP27 really failed to deliver.

The 1.5°C target remains in the final COP27 text, but there was woefully little progress on the 'how'. Many now fear that this goal is slipping away, with devastating consequences.

Released during COP27, a new report from the Global Carbon Project found that if emissions remain at current levels the world faces a 50% risk of breaching 1.5°C in nine years. Further analysis of the numbers by scientists from the University of Leeds and Imperial College London suggests that things may be even tighter, with a timescale of just 6.5 years at current rates.

At the end of the Glasgow climate talks, countries agreed to revisit and strengthen their emissions reductions plans, known as Nationally Determined Contributions (NDCs), during 2022, but as COP27 came to a close only 29 new or updated plans had been submitted from a total of 194.

A UN report released just before COP27 looked at the combined NDCs, including those updated this year, and



A historic agreement on loss and damage will see support for developing countries to rebuild following climate impacts. Image shows women in floods in Bangladesh in 2019.

found that current plans and pledges from the world's governments have us on track for 2.5°C of warming by the end of the century – and will increase emissions by more than 10% by 2030 compared to 2010 levels.

When the Paris Agreement was signed in 2015, humanity was on track for around 3.6°C of warming, so some progress has been made, but at nowhere near that rate demanded by the climate emergency.

Fossil fuels and renewables

Last year in Glasgow, countries committed to “phase down” the use of “unabated” coal. Whilst this was not as strong as the “phase out” that many countries wanted, it was – astonishingly – the first time a resolution on fossil fuels was included in the final text of a COP agreement.

At COP27, some countries argued for a commitment to phase down all fossil fuels, including oil and gas, but this failed and in the end the resolution was the same as that agreed in Glasgow.

Countries did commit to “enhancing a clean energy mix, including low-emission and renewable energy,” but the inclusion of the phrase “low-emission energy” has caused real concern, as it is open to interpretation and could leave the door open for further gas production, for example.

“Still in the emergency room”

The current rise of 1.1°C has already caused major climate disasters. Research from World Weather Attribution, for example, reveals that the devastating floods in Nigeria were 80 times more likely because of the climate crisis.

Yet, after another year of global climate

talks, commitments from world leaders still have us on a path to temperature rises of well over 2°C, with the risk of climate tipping points pushing us into even more dangerous territory.

As COP27 came to a close, UN Secretary General António Guterres said: *“Our planet is still in the emergency room. We need to drastically reduce emissions now and this is an issue this COP did not address... A fund for loss and damage is essential – but it's not an answer if the climate crisis washes a small island state off the map – or turns an entire African country to desert. The world still needs a giant leap on climate ambition. The red line we must not cross is the line that takes our planet over the 1.5°C temperature limit.”*

In other words, we are still very much on the ‘highway to hell, with our foot on the accelerator.’

Action at all levels

It is clear that the time is long past for incremental changes, we need nothing short of transformational change across every sector.

Whilst global agreements and government action are essential – and governments must now urgently look at their NDCs and work towards a viable pathway for 1.5°C – outcomes from COP27 serve as an urgent reminder that we can't rely on global negotiations to deliver change at the necessary pace.

Fortunately, new leadership is emerging at local level. By getting the skills and knowledge we need, communities, councils, organisations and individuals are getting on with creating change. By sharing this work with others, and highlighting the many co-benefits of action on the climate

COP jargon buster

COP

COP stands for ‘Conference of the Parties to the United Nations Framework Convention on Climate Change’. The number following, e.g. COP27, represents the number of COPs that have taken place since the convention was signed at the Earth Summit in Rio in 1992, while ‘parties’ are the countries participating in the conference.

NDCs

To achieve the goal of limiting warming, countries have to submit plans that set out their emissions reduction targets and some details on how they will be achieved – these plans are known as ‘Nationally Determined Contributions’ (NDCs).


Loss and Damage

Climate change can result in economic losses and damage to infrastructure and ecosystems, both through short-term extreme weather events and longer-term slower impacts such as sea-level rise. Countries that are dealing with loss and damage have long argued for financial compensation from wealthier nations, recognising that many of the most climate-vulnerable countries have contributed least to global emissions.

The Paris Agreement

This groundbreaking treaty was the first legally-binding global agreement to act to tackle climate change and work to limit its impacts.

A commitment to limit warming to “well below” 2°C whilst “pursuing efforts” to not exceed 1.5°C above pre-industrial levels was agreed. At COP26 in Glasgow in November 2021, “keeping 1.5°C alive” was a focus of the conference to avoid the catastrophic climate impacts forecast by the Intergovernmental Panel on Climate Change (IPCC).

emergency, we are demonstrating what can be achieved on the ground to take our foot off the accelerator and explore new ways ahead. 

References available on request.

About the author

Paul is CAT's Zero Carbon Britain Knowledge and Outreach Coordinator. He has been involved with our research into zero carbon scenarios since the beginning, coordinating the development of research reports and liaising directly with government, industry, NGOs and the arts to share findings.

Addressing the climate emergency together

Whilst the agreement on loss and damage is rightly celebrated, COP27 failed to deliver the increased ambition that is needed to keep within 1.5°C of global temperature rise and avert catastrophic climate breakdown.

We need to keep up the pressure on governments to invest in the big changes we all know are needed, but we can't afford to wait, and we can't rely on governments alone – this is the fight for all our lives, and we need urgent action at all levels.

At CAT, we explore joined-up solutions that address climate change whilst also helping reduce fuel poverty, create green jobs, address energy security, and improve health and wellbeing whilst supporting the protection and restoration of nature.

From working with councils and communities to providing education for everyone from school students to postgrads, we provide people with skills, knowledge and networks to help them play an effective part in the urgent transition in their communities, workplaces, and in their own lives.

Here are just a few of examples of how CAT is helping to address the climate and biodiversity crisis – with your support.

Over 200 councils across the UK have now completed our Zero Carbon Britain Carbon Literacy training, helping councils to develop a clearer understanding of how they can take action on climate change. This programme has received exceptional feedback and has been so popular that we have had to expand the team to meet demand.

Our Sustainability in all Policies Innovation Lab is supporting the Local Government Association (LGA), which works with 331 of the 333 councils in England, to create



CAT graduate Scott Simpson with IndiNature's hemp-based insulation. Inset: Adaptavate's Breathaboard – a drop-in replacement for plasterboard.

guidance documentation to be used by councils across England to help embed sustainability within all council policies and across all service areas. Whilst the funding for this project only covers England, we hope to be able to do similar work for councils in Wales and the rest of the UK in the future.

In addition to these projects, our Masters programmes have provided our graduates with the skillset and knowledge needed to innovate, develop and implement climate change solutions.

For example, this year saw the building of the UK's first natural insulation factory, thanks to the inspirational work of IndiNature. IndiNature was co-founded by CAT graduate Scott Simpson, building on research completed as part of his Masters dissertation. IndiNature uses UK-grown hemp fibres to create carbon-negative, reusable and biodegradable insulation products, helping tackle the construction industry's significant contribution to climate change.

This year also marked a step-change for another company founded by a CAT graduate, with Adaptavate securing investment of over £2 million to scale up production of their carbon-absorbing plasterboard, Breathaboard. Company founder and Managing Director, Tom

Robinson developed and tested Breathaboard during his studies at CAT, using his dissertation as an opportunity to research innovative building materials.


CAT graduates are having an impact across many other sectors – from community energy projects and sustainable architecture to adaptation planning and natural resource management.

We are extremely proud of and grateful to our hard-working graduates who are putting what they have learnt at CAT into practice in the real world, helping address the climate and biodiversity emergency.

If you would like to deepen your knowledge of environmental issues and solutions, we have a variety of postgraduate courses available, including our new MRes Sustainability and Adaptation. To find out more, visit: cat.org.uk/gse

Alternatively, check out our free information service, supporting everyone to make changes in their own homes and lives – cat.org.uk/info

Thank you

Thank you so much for supporting CAT to deliver this vital work. 



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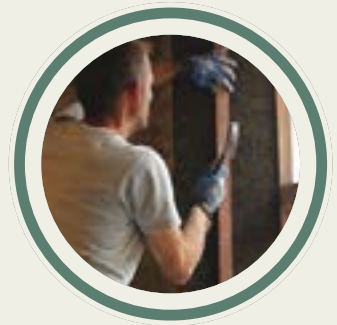
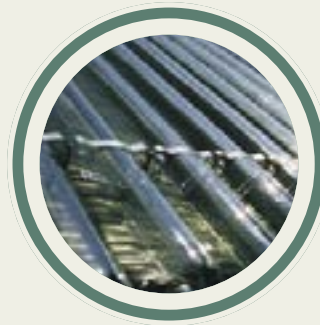
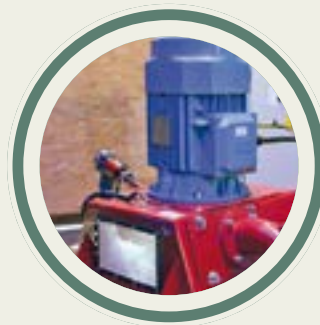
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Getting the best from a boiler

As energy bills soar and the need for climate action becomes ever more urgent, **Joel Rawson** looks at how you can maximise the efficiency of an existing gas boiler whilst helping ready your home for a heat pump.



We can't all switch away from a gas or oil boiler right now, but many householders – including renters – could reduce running costs and carbon emissions with some simple changes.

Because the UK electricity supply now includes lots of wind and solar power, average carbon emissions from electricity generation are far lower than from fossil fuel boilers. This means that if you pay about half your bill for gas and half for electricity, about 80-85% of the associated carbon emissions are from the gas use and only 15-20% from electricity use. Reducing heating needs therefore gives the biggest carbon saving, in addition to clawing back some of the spiralling rise in energy prices.

In the last year there has been much more coverage of the financial benefit of lowering the flow temperature from a condensing boiler that's not already optimised. This is usually aimed at 'combi' boilers (that heat water on demand) as the approach is easier. It should also be possible to improve the efficiency of a 'system' boiler (that heats a hot water cylinder), but expert help may be needed.

Flow and return

A central heating system will send out a 'flow temperature' from the boiler (or heat pump) to the radiators. Heat is given off to the rooms and a lower 'return temperature' goes back to the boiler. Before condensing boilers, these temperatures were high as old boilers had to run hot. There's been no need for that for many years, yet high flow and return temperatures have remained common. With a flow of 70-80°C and return of 60°C, a condensing boiler runs about 10-15% less efficiently than it should. The return temperature is too high for it to run in condensing mode – when it extracts heat by condensing hot flue gases.

If the return temperature is about 50°C, the boiler should condense much more and get closer to 90% efficiency. For the highest efficiency, return should be at 45°C or below. The best way to get lower flow and return temperatures is with modulation control. The flow could be 55°C in very cold weather (below zero) but reduced below this most of the time, when it's milder. Unfortunately, many boilers are either not set up well or lack the controls to modulate flow temperature.

Heat pumps are also most efficient when supplying the lowest possible flow temperatures. Measures to make sure you're getting the best from an existing boiler therefore also take you several steps along the path to a heat pump ready home. They help to identify if bigger or additional radiators will be needed, or if what you have is already suitable.

Combi boilers

The UK innovation agency Nesta recently evaluated the effect of reducing flow temperatures from a gas combi boiler. Their test house was a solid walled end terrace rated at EPC Band D (about average) with a standard type of boiler. They found that reducing the flow from 80°C to 60°C cut gas use by 12% and only made the warm-up time about 10 minutes longer. The saving was mainly from better boiler efficiency, with only a very minor impact on room temperatures. At current prices, that one change would reduce an average energy bill by over £100 a year. For a house with better insulation and with good modulation controls, it should be possible to further reduce flow temperatures and make the boiler even more efficient.

You can also change settings to improve the efficiency of hot water delivery. For a combi this is usually a matter of turning down the relevant temperature dial, and (where possible) turning off the pre-heat function. Most households won't use the hot taps enough to justify a regular pre-heat firing, so it will waste much more energy than it saves.

System boilers

For condensing system boilers (that heat a hot water cylinder) it may be possible to add new controls that will enable different flow temperatures at different times. Then it can be run at a lower temperature to radiators but can also occasionally supply a flow of 60°C to the cylinder – to prevent the risk of legionella bacteria growth.

It's usually possible to do this with a boiler that has 'Opentherm' technology, making it compatible with a range of third-party controls, or manufacturers

may supply their own controls. It is quite technical, and most people are going to need advice from a well-qualified heating engineer. Alongside this, it's worth having a check that the hot water cylinder thermostat is still accurate – as sometimes the cylinder is much hotter than the setting.

Other settings

The best performance will come from controls to modulate the temperature flow depending on circumstances. A thermostat with 'load compensation' modulates the boiler to deliver just the right level of heat – rather than just turning a high temperature flow on and off several times as the temperature bounces up against a more basic thermostat setting. 'Weather compensation' does a similar thing but also takes into account the outside temperature (as this affects home heat loss). These can improve boiler efficiency by 10-15%.

For the best savings, especially if adding modulation, the radiator balancing may need to be checked. This is the process of regulating the flow rate to ensure each radiator gives the right temperature, and you'll most likely need a heating engineer to do it. One option is to have 'auto-balancing' thermostatic radiator valves (TRVs). A difference of 20°C between flow and return is sometimes used as a guide, but for lower temperature flows from modulating systems a better guide is a 30% drop - for example 50°C flow and 35°C return.

Smart controls can allow you to adjust settings remotely – for example if arriving home late. However, these can be more just 'remote control' than truly 'smart' because they're often still just a basic on or off, and you'd need other controls to get the boiler modulating. So check if they include the compensation control mentioned above, and that it's compatible with your boiler.

It can be more difficult to improve an existing boiler if it was originally oversized. If so, when it fires up it can send out more heat than your home needs, making the return temperature too high for the boiler to condense. It can be possible to constrain the maximum output, reducing the typical power output and the return temperature. However, if the minimum power output is still too high for a mild day it will stop you getting the best efficiency from a boiler. This is why the correct sizing (avoiding oversizing) of central heating systems is important.

What about an electric heater instead of the boiler?

In some cases, if there are barriers to getting the best efficiency from an existing boiler, and upgrading (such as to a heat pump) is not yet feasible, a form of plug-in electric heating may be cheaper than running central heating all day. However, while most electric heaters are cheap to buy, the running costs can stack up because electricity is more than three times more expensive than gas per unit of energy.

To make sense financially, an electric heater needs to be very targeted to the person. The best example of this is sitting in an electric blanket when the central heating is off. A blanket only consumes about 100 watts, and a trial by Octopus Energy showed an average saving of a few hundred pounds per year.

Electric heaters for a room will generally use much more power – hundreds or even thousands of watts. Energy consumption over time is therefore much more, and central heating will usually work out cheaper for keeping the main room warm in small to medium size homes or flats (with TRVs turned low in other rooms).

If you're working in one small room in a large and poorly insulated house, then an electric oil-filled radiator could be cheaper than having the gas boiler on. This is because when you can't fit good controls it's difficult to constrain a large boiler to run efficiently at a very low output. Oil-filled radiators give a more gentle, even heat than other electric heaters, so may work best for that sort of home office arrangement. A well placed fan heater can give a brief blast of heat if you're only using a space for a few minutes (e.g. nipping into the loo), but it's not as good for longer periods.

Whether a small electric heater will actually work out cheaper for your particular situation will depend on the size, layout and heat loss of your house, and on the type of thermal comfort you need. So there's no easy answer. By checking smart meter readings you can compare each option to be sure – perhaps by borrowing an oil-filled radiator from a friend, and trying out that vs the minimum possible central heating, on days with similar weather.

Spread the warmth

Other energy saving measures will help to keep a house warm as you lower the boiler flow temperature. And there are plenty of other ways to cut back bills while staying healthy and comfortable – you'll find a few quick tips overleaf. A lot of CAT members and supporters will be

Further information on boiler settings

Following their trial, Nesta launched the 'Money Saving Boiler Challenge' website, giving straightforward advice about turning down the temperature on a combi boiler: <http://www.moneysavingboilerchallenge.com/>

A similar approach was promoted in the Carbon Coop's 'heat pump challenge': <https://hpc.carbon.coop/>

For more advice on maximising the efficiency of existing gas boilers, including details of how to adjust settings for particular brands, see the Home Heating Hub:


<https://www.theheatinghub.co.uk/>

Heat Geek have a consumer advice section on their website, giving lots of detailed information about boiler and control settings: <https://www.heatgeek.com>

Both Heat Geek and the Home Heating Hub also link to networks of installers trained to high standards, who can advise on getting an existing boiler operating at its best.

In a recent episode of the BetaTalk podcast (<https://betatalk.buzzsprout.com>), Richard Burrows from Mid Wales Plumbing and Heating Supplies spoke about what's needed to get a system boiler running efficiently, plus modulation with load compensation and weather compensation.

You can also of course contact me on info@cat.org.uk or 01654 705989 with further questions.


aware of many of these measures, but if you've already done what you can then you could promote this sort of simple advice (including boiler settings) to other people through a local voluntary group. This could be through events, open houses, informal advice, or a more formal funded scheme. 

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.


Home energy saving tips


Reduce your heating needs


 If you have a combi boiler, reduce the flow and hot water temperatures and turn off hot water pre-heat


A quick guide to lower cost ways of cutting carbon and bills.


Lower your electricity use

 Turn off lights when you leave a room.


 Replace old bulbs with LEDs and get the right design and placement of fittings.


 Only boil what you need in the kettle.

 Wash clothes at 30°C and whenever possible dry them outdoors to minimise tumble dryer use.

 Fill the dishwasher before running it.

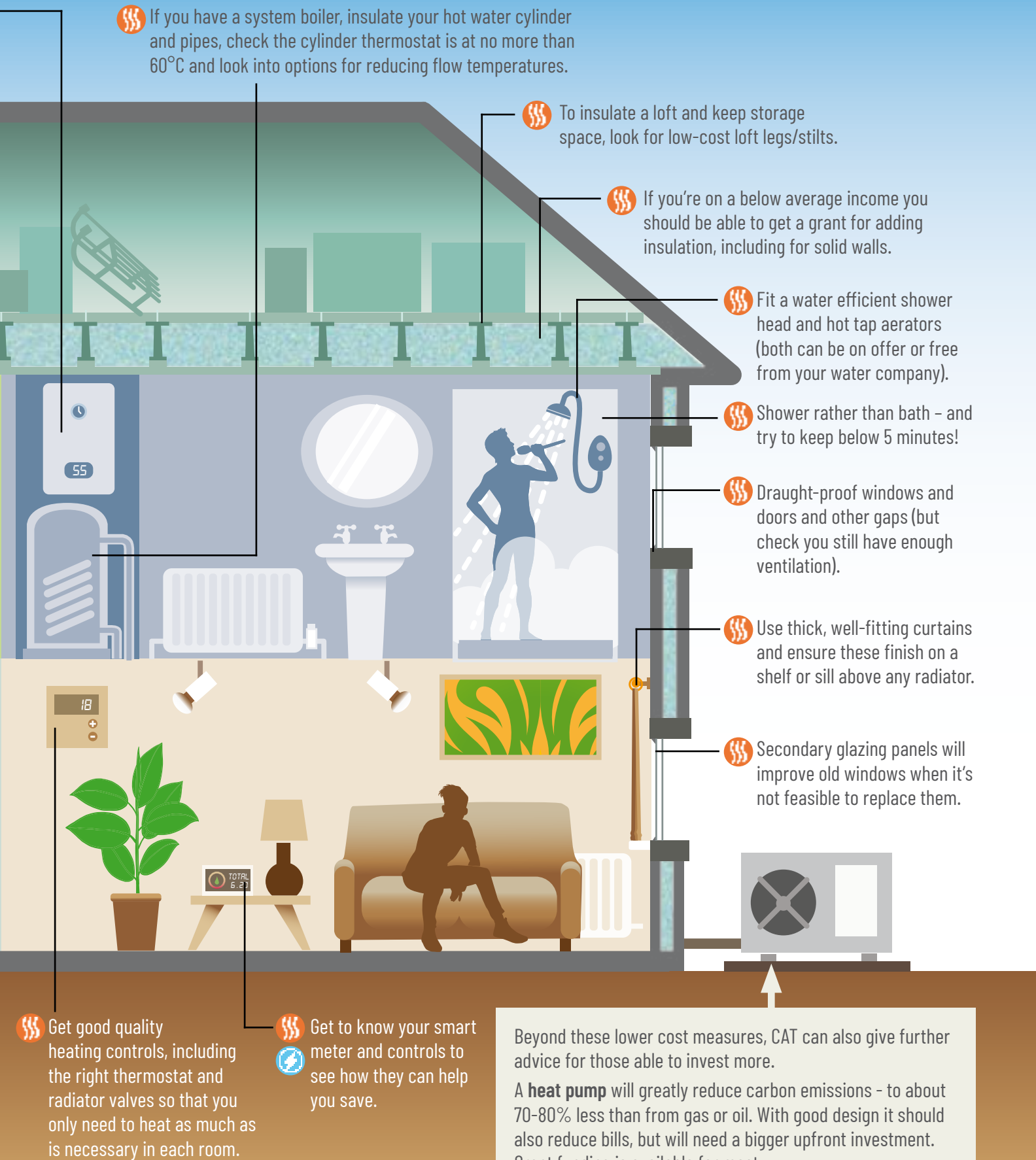
 Where possible, switch off electronic appliances at the plug instead of leaving them on standby.

 If you're on below average income, check about grant funding for upgrading an old heating system.

 Bleed radiators to reduce cold spots.

Find out more:

cat.org.uk/energy-saving-at-home ● info@cat.org.uk ● 01654 705989



Beyond these lower cost measures, CAT can also give further advice for those able to invest more.

A **heat pump** will greatly reduce carbon emissions – to about 70-80% less than from gas or oil. With good design it should also reduce bills, but will need a bigger upfront investment. Grant funding is available for most.

See www.cat.org.uk/info for advice on home retrofit plans, heat pumps, solid wall insulation, upgrading windows, ventilation systems, and more.

Why do we teach... thermal comfort?

In the first of a new series looking at themes and topics explored by students on CAT Masters degrees, **Frances Hill** looks at thermal comfort – what it means, why it matters and some of the main teaching methods used on our courses.



In guided learning in small groups, our students look at a range of topics relating to thermal comfort.

Second only to having a roof to keep the rain off, what we want most from our homes and places of work is to be thermally comfortable – warm enough, but not too hot. This involves using energy, of one sort or another, to maintain a comfortable temperature range.

Teaching about thermal comfort therefore underpins our teaching of the MSc module ‘Energy Flows in Buildings’ (aka ‘Buildings and People’), which also looks at heat transfers through the building fabric and by air movement, passive design to reduce energy demand, and the impacts of an energy efficient home on wellbeing, and therefore on society and the wider economy. Occupant behaviour is important too and interacts with thermal comfort in some important ways.

Why is thermal comfort important?

The use of energy and building materials both impact our wider environment – in particular through emissions from the creation and transport of materials, and

through use of energy for heating and cooling, which of course contributes to increasing global temperatures and climate change.

As many of us know from our own experiences of summer heatwaves and difficult-to-heat homes, our thermal comfort can also make a lot of difference to our physical and mental wellbeing. This doesn’t only impact us as individuals and families, but can also lead to social costs. For example, sickness due to cold homes increases absenteeism from schools and employment and raises the costs of healthcare.

What are the key aspects to consider?

To a certain extent, thermal comfort can be predicted via a calculation which factors in temperature, humidity and speed of air movement. However, our comfort range depends on many other factors, including physiological factors such as age, psychological factors such as our emotional state, and contextual factors like light levels.

Our students begin by looking at

perception of thermal comfort, on a scale from too cold, through “neutral” (= comfortable), to too hot, and then explore what might be impacting this perception.

We look at adaptive behaviours and their potential impact. For example, how we can adapt by changing clothing, position or activity, or by changing the conditions of our surroundings. The latter may involve the use of energy, both in the materials used for building/ improving the home or workplace and in heating or cooling it.

We also look at climate impacts on our thermal comfort. Key factors are temperature and humidity. Through the experience of a sauna, we compare the impacts of a hot humid climate (typically a temperature of 28°C, and 85% relative humidity) and hot arid (perhaps 36°C and 40% relative humidity).

We then look at passive design strategies that can achieve improved thermal comfort in different climatic conditions, such as extending roofs to shade south-facing windows to reduce solar gain, or adding additional

insulation, draughtproofing or thermal mass, and look at calculations that can help quantify the impact of these measures.

When we consider the increasing demand for cooling in buildings, we identify and quantify heat sources in buildings – including anthropogenic (from ourselves) and the electrical devices we use, as well as solar gain (heat from the sun through windows).

What are the main teaching methods?

CAT's whole approach to learning is to give students a range of different ways to explore topics and develop a deep understanding. As with other modules, we have some highly practical sessions alongside in-depth lectures, discussion seminars and numerical workshops.

To really get to grips with the concept of thermal comfort, and factors that affect this, we have students note their “comfort scores” during a couple of lecture sessions, and at the same time we collect data on the temperatures of air, walls, floors, etc, in order to explore how well the scores match the calculation routes.

We also offer students experience in a sauna, where we monitor homeostatic responses (physical responses like sweating or shivering) and core temperature variation – and then again in response to subsequent cooling (we run a “virtual sauna” by distance learning too).


In guided learning in small groups, our students look at a range of topics relating to thermal comfort, such as sunpaths, use of monitoring equipment, choice of building/insulation materials, calculating U-values (how much heat is transferred through walls, etc) and potential for interstitial condensation (condensation inside walls, floors or roofs).

Drawing on knowledge from these workshops and lectures as well as additional independent reading, our students then work on independent assignments that explore building design/improvement strategies that support enhanced thermal comfort.

How do students use this learning?

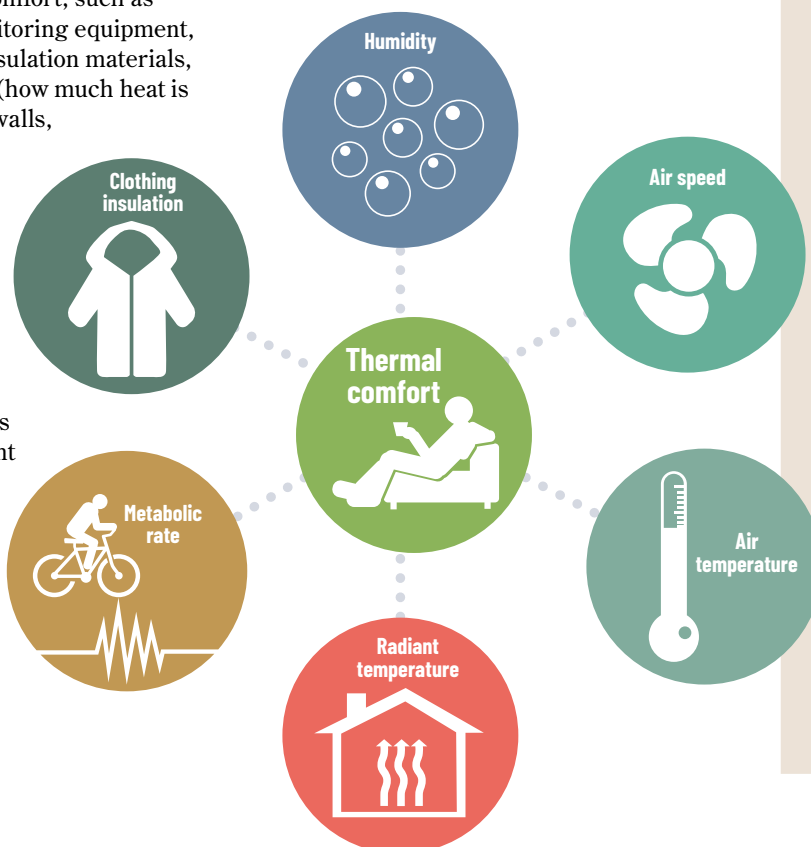
Students and graduates have applied knowledge of thermal comfort in a variety of ways. For example, one of our graduates looked at understanding occupant needs and perceptions of thermal comfort in a social housing project in Surrey, working with the designers and occupants to improve both thermal comfort (and wellbeing) and energy efficiency.

Others have worked on projects tackling fuel poverty, providing information, advice and practical measures to help improve thermal comfort in affordable ways. Some have gone on to further research and teaching positions or are practising architects.

By understanding the factors that impact thermal comfort and how occupant wellbeing can be optimised in ways that also lower energy use and emissions, we can create healthier, happier, cheaper-to-run homes and workplaces whilst taking action on the climate emergency. 

About the author

Frances is Programme Leader on CAT's Sustainability in Energy Provision and Demand Management MSc. She has a background in physics and a PhD in Environmental Engineering. Her teaching focuses on heat transfers in buildings, heating, cooling and ventilation.



Shady spaces and cosy homes

Building design and furnishings can help to reduce the amount of energy used to keep homes warm in winter and cool in summer, reducing greenhouse gas emissions at the same time as adapting to the changing UK climate. There are many inter-related factors to consider, but a few key areas are outlined below.

- Warm rugs on the floor help keep feet warm, improve thermal comfort and reduce heating demand. Warm clothes help too!
- Good detailing around windows and doors will help avoid heat being lost through draughts – but good ventilation is needed to prevent condensation.
- Insulation doesn't just keep the heat in in winter, it also helps keep the heat out in summer. But insulation can also add to overheating due to “internal gains” from occupants and their activities, so other measures might still be needed to keep cool in a heatwave.
- Air conditioning is very power-hungry – ceiling or desk fans that create air movement, or exhaust fans that remove heated air are lower energy options.
- Incorporating materials with high thermal mass, which absorb heat during the day and slowly release it at night (for example rammed earth or natural stone) can help to regulate indoor air temperature.
- The orientation of a building can have an impact – glazing on south-facing facades can increase solar gain, for example, which may reduce heating demand in winter, but can cause overheating in summer.
- Roofs with larger overhangs on the south side can provide shading for windows to help keep homes cool.

In our hands: creating a positive future

In communicating climate change, the arts must play a central role. **Cathy Cole, Paul Allen, Holly Owen** and **Anna Bullen** explore the power that diverse art forms can have in connecting people meaningfully with the science and the solutions behind our climate crisis.



Strata Suomi/ Flickr

Tree Mountain. A Living Time Capsule-11,000 Trees, 11,000 People, 400 Years, 1992-96, (420 x 270 x 28 meters) Ylojarvi, Finland by Agnes Denes.

“Gazing out to sea and back to my palette of chalky blues, I find myself softly trembling. With the rhythmic drumming of waves on flint, I remember running shoeless on this shoreline, some thirty years ago. As a child, the depth of the ocean frightened and excited me equally, an expanse of water that was surely endless. But in the decades that passed, that endless expanse silently swallowed heat at an unfathomable scale. Warming, rising, fuelling fiercer storms. Sitting now on shingle below the calcified cliffs, written with their own tale of more ancient climate change, my painting etches a deeply personal story. In another thirty years, will my children have grown into a world where we acted on what we knew, with their own children playing safely on this same shore? There is only one answer that I can bear.” –
Cathy Cole

Many decades of scientific evidence demonstrate, unequivocally, that human activities are changing the global climate, with devastating consequences. It’s hard to imagine a more convincing dataset than the climbing sawtooth of atmospheric carbon dioxide levels. Temperatures everywhere are rising – on land, in the air, and through the depths of the sea. As our world warms and melts, and as we clear the forests and strip the oceans, we are losing a richness that we crucially depend on for life.

Whilst people and nations are rallying to address this crisis, society is still not unified in ambition for the deep and transformative action needed to avoid more dangerous change. Perhaps the rigorously tested computer models, and likely mid-century scenarios under different emissions regimes, lack a tangible realism that many of us need to imagine the future. To feel empowered

as agents of our own destiny, we need greater personal meaning, and a more human perspective. Here, the arts take centre-stage.

Scientific data is, and will always be, a vital cornerstone, yet art and stories are often what works best to change hearts and minds, and ultimately behaviours, towards a healthier planet. Whether crafted by professional creatives, or offered as a participatory medium for a wider audience, art can offer a far more immersive and relatable lens through which to nurture connection and embodiment. In the process of creating a piece, whether it is written or played or sculpted, we can go beyond merely representing an issue – we can respond to it. Art expands imagination, creates space for renewed vision, and liberates those involved. Narratives rooted firmly in scientific understanding can be brought to life, clearly showing why they matter, and evoking emotions that move people.

Below left: 'Switching Heads – sound mapping the Arctic', a 2015 collaboration between Holly Owen, Kristina Pulejkova and local people of Tromsø, Norway.
 Below right: 'Switching Heads (Llwyngwern slate)', 2016, Holly Owen.



As a CAT artist-in-residence, Holly Owen, in collaboration with Kristina Pulejkova, created 'Switching Heads', inviting the audience to trade places with a natural sculpture, and experience the sounds and sights of their world: the peril of the changing Arctic, or the return of nature to a Welsh slate quarry. Displayed as part of the art and culture festival (artCOP21) in the weeks leading up to the Paris Agreement, their Arctic film transported the beauty and challenges

of this iconic land to the busy streets of Paris.

In the right places, art wakes us up to the reality of climate change, and connects us to the serious impacts that we must address. Gideon Mendel's 'Submerged Portraits' show people all over the world facing devastating flooding in their homes. These events occur more frequently and more seriously as our climate changes further, and will continue to worsen unless we act

with urgency. In Wales, landscape artists Pete Monaghan and Julian Ruddock vividly portray the changing coastline as part of the EU-funded CHERISH project. 'Inundation', shown below, starkly depicts the vulnerability of communities by the sea as water levels rise.

But perhaps one of the most important ways that art can lead the fight against climate change is in helping people to visualise the future. In particular, what it could be like to live in a future where we have collectively succeeded in keeping fossil fuels in the ground and restoring nature.

A powerful collaborative example gifted by environmental artist Agnes Denes in the 1990s is Tree Mountain in Finland. Under the guardianship of 11,000 people, 11,000 native trees were planted in a reclamation project that will protect the land for centuries to come, and eventually restore it to virgin forest. In this extraordinary act of unity, each custodian was part of a celebration of a positive future, connecting with the lives of many generations yet unborn.

Fostering collaborative work between communities and artists, and between scientists and artists, is growing, with huge success. It is often in the boundaries between disciplines where eureka moments emerge and change happens. In the same way, where scientific understanding merges with lived experiences and local knowledge, stories are formed that resonate with and relate to people. In today's media, too often the messages around our changing climate are overwhelmingly of global doom and political delay, stirring feelings of helplessness and despair. The situation is urgent in the extreme, but rather than



Inundation (2019) by Julian Ruddock, based on an original Crown Copyright. RCAHMMW aerial photograph (<https://www.walesartsreview.org/cherish-an-artistic-response/>).



'Hinemoana Tethys: Call of the Ocean, 2018' by Pam McKinlay and Jesse-James Pickery, Art + Ocean exhibition.

Art and creative practice has the power to trigger emotional responses that can bring about lasting change for individuals, communities, culture, and policy. Bringing about positive change in the rapidly changing world we now inhabit demands the weaving of resilient solutions into our imagination.

Since CAT first began engaging with the arts and storytelling, we have seen some shifts which reveal important new stories. In the run up to COP26, climate issues were briefly mentioned in key UK soaps. But from the Age of Stupid and the BBC/PBS Big Oil vs the World, to the highly popular 'Don't Look Up', we are still describing the end of the Earth. There is, therefore, a need to forge direct links between local zero carbon solutions and those working in the arts and sustainability to create a community of practice to catalyse big shifts in how we think.

An incredibly ambitious example of big

thinking in creative climate storytelling was brought to us this autumn, in the GALWAD project, in which CAT was privileged to be a partner. Across Wales, hundreds of creative practitioners, together with community members and climate scientists, came together to imagine a future world and produce a story told in real-time, through film and live performance. In this created world, lead character Efa (16) swaps with her 46-year old self thirty years into the future, revealing extraordinary possibilities.

Looking forward, the Future Wales Fellowship is a collaboration between CAT, Arts Council Wales (ACW) and Natural Resources Wales (NRW), which supports eight artists to explore the impact that climate change is having on the people of Wales. The artists are working in a variety of art forms to challenge the way people think about climate change and to inspire a



'It's time to change for climate change' by Janice Huang (2021), depicting winter temperatures as part of a community workshop.

fuelling paralysing anxiety, we need to motivate people with positivity and hope, celebrating actions. Around the world, collaborative art and creative practice does exactly this, sharing brighter messages to inspire and transform. In a moving live performance with piano accompaniment, Paul Allen from CAT's Zero Carbon Britain team presents 'The Extraordinary Story of Human Beings, Energy and Happiness', capturing a sense of collective excitement about a climate positive future. Other recent projects, like Climate Stories, have brought climate scientists and professional artists together to explore new forms of creative storytelling, with beautiful results. In New Zealand, the exhibition Art + Ocean showcased spectacular visual works that interpret and extend science research into new contexts, whilst community workshops bring a treasure trove of climate data to life through personal connections to that data.




The GALWAD project: multimedia collaborative climate storytelling in Wales, 2022.



Nootul and Anjuma Bibi in their flooded home, Chandajan Village, Assam, India, September 2014. Photograph © Gideon Mendel (<https://gideonmendel.com/submerged-portraits/>).

more sustainable lifestyle. Heledd Wyn is leading an artistic exploration enquiring how food and the act of eating is central to contemporary life – Troi Tir is a collaborative community project which focuses on sustainable local food production, farming traditions and healthier living. Working alongside musicians, poets and scientists in the community, short films will explore the potential of different crops for feeding the future, tackling climate change, protecting biodiversity, and supporting the well-being of the local community.

Clearly there is no shortage of positive stories of people and communities embracing change and finding innovative solutions that work for them. In these stories, we are far from the dystopian world projected tirelessly in the media. They offer an incredible opportunity to build trust and cultivate the kinds of connections that will help us rise to the known and as yet unknown future challenges. By sharing such works in diverse art forms, we can unleash our collective imagination of what the future could hold.

We have seen this happen before. In tackling issues of race, gender, sexual orientation and class, the arts and creative practice have demonstrated they can reveal our blind spots and help us see our prejudices; they can break through denial and kick-start a transformation of attitudes and behaviours. The arts offer a much-needed mirror that can help individuals and societies reflect on where we really are, and tools to help us to explore new positive stories. Reports such as Zero Carbon Britain show that humanity can take action on the climate emergency with the technologies we have around us today – and the arts can help inspire us to rise to that challenge. 

About the authors

Cathy recently joined CAT as a Senior Lecturer in Sustainability within the Graduate School of the Environment. She has a PhD in marine science, professional experience working for the Met Office at the interface between climate science and policy, and academic expertise teaching and researching science communication at the University of Otago in New Zealand.

Holly joined CAT in 2016 as an ACW-funded artist in residence. She is now CAT's Engagement Team Manager, utilising her background in engaging audiences with climate change through creative, collaborative practices. Holly has an MA in Art and

This year, a 'Discipline Hopping' project funded by the Natural Environment Research Council brought five poets to CAT to immerse themselves in learnings about the climate and ecological emergency, resulting in a collection of poems reflecting their experiences. Matthew Jarvis shares one of his poems.

'In Praise of Verges'

"Species with rough, hairy or waxy leaves are particularly effective at trapping pollutants" – Odhran S. O'Sullivan et al, 'Optimising UK urban road verge contributions to biodiversity and ecosystem services with cost-effective management', Journal of Environmental Management, 191 (2017), 162-71, <http://dx.doi.org/10.1016/j.jenvman.2016.12.062>

*above all do not mow / frequent low to ugly strangle-
short grass alone / shake off that drag towards the
neat 'n' trim / spin your dreaming thought from tidy as
some hoped holy, some grieved pursuit of how this
gloried scrubby patch should one day be / revealed*

*no, sow sow deep that yellow rattle / and let the
floral chatter bloom / until it all unfurls, petal
by burstin'-out syllabic petal / until it all un-
curls that word / polli...what now? / on every buzz
and every wingy crittered thing that spins by / to a-
light and say 'how may I serve you this day, flower?'*

*so go on, let that mower sulk / the blade unspun, un-
oiled, the engine still in silent discontent / until
the season's out / the summer's spent / leave long
the rough and hairy trail that's creepin' / by your
pavement-hurrying feet / that's sneakin' up to trap /
your car's particulate cough, this lorried wheeze*

*pause, just pause your scything hand from this herbaceous
surge / what's left to love in razored fuzz of stub-
bled stem / when you could leave all this to riot /
to tilt at fumes and sweep 'em off / to colour-joy
your dull commuting eyes / to raise the day on insect
wings beyond a one-tone screen / to seize a bordering
wealth / there is no strim, there's only – grow*

Matthew Jarvis (maj52@aber.ac.uk,
<https://www.matthew-jarvis.co.uk/>)

Science and has worked across the UK and Europe as a practising environmental artist.

Anna manages CAT's Zero Carbon Britain Innovation Lab. She has a degree in Environmental Management and Resource Development, an MA in Space, Place and Politics and a PhD in Sustainable Citizenship. She is currently leading an innovation lab supporting Arts Council of Wales in the co-creation of a strategy for climate justice and the arts.

Paul is Knowledge and Outreach Coordinator for CAT's Zero Carbon Britain Hub – see pages 12-14 for more information.



Centre for Alternative Technology
Canolfan y Dechnoleg Amgen

SHORT COURSES SPRING 2023

January

24-25 January **Zero Carbon Britain: Carbon Literacy for the Housing Sector online** (also available 18-19 April)

February

7-8 February **Zero Carbon Britain: Carbon Literacy for Local Authorities Online** (also available 22-23 March)

27 February - 3 March **Sustainable Woodland Management**

March

4-5 March **Self-build Project Management**

14-15 March **Zero Carbon Britain: Live online**

April

1-2 April **Building Natural and Healthy Homes** (also available 20-21 May)

22 April **Compost Toilets**

23 April **Reedbeds and Waste Water Management**

May

2-3 May **Fixing your Damp House**

5-8 May **Build a Tiny House** (also available 2-5 June)

9-10 May **Zero Carbon Britain: Carbon Literacy for Communities online**

June

2-5 June **Eco Refurbishment**

24-25 June **Cob Building**

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Helping hands: volunteering at CAT

Throughout CAT's near-50-year history, volunteers have been at the heart of our work. **Dulcie Fairweather** celebrates all that we have achieved together and gives us a glimpse into life as a CAT volunteer.



Joe Downie volunteering with our woodland team

It would not be an exaggeration to say that without volunteers the Centre for Alternative Technology would not exist. The passion and hard graft of volunteers believing in an idea is how CAT was born. They came in many forms at the beginning – CAT was started by a group of committed volunteers, including engineers, architects, builders and growers, as well as those who were happy to volunteer with administration and fundraising.

Almost 50 years on, we still heavily rely on the support of dedicated volunteers – they are the glue that holds together all the moving parts. Generations of volunteers have created, shaped and enriched the site as we know it today.

"CAT allowed me the space and time to disconnect and just be, but ultimately reconnect to nature and myself. My time volunteering gave me more clarity on where I wanted to go in life, but more importantly who I wanted to be. I'm forever grateful for the experiences I had and the people I met along the way. Diolch CAT.... for being a space of regeneration, of nature and the human spirit."

Julia Robertson, Woodland and Water volunteer (October 2021 – March 2022)

As the volunteer co-ordinator here at CAT, I consider myself privileged to be in a role that has the responsibility of continuing and nurturing this incredible legacy. It is a joy to meet and work alongside volunteers, sharing ideas and developing lasting relationships.

Most volunteers work with either our woodlands and water team or our gardens team. The woodlands and water team help to manage our woodlands, our off-grid water and sanitation systems and make improvements around site using our natural resources. We have 18 acres of sustainably managed woodland, so there is never a shortage of jobs to do!

Most recently, the team finished their bridge build, which involved a lot of problem solving, physical labour and, regrettably, soggy feet. This new bridge offers users of the woodland more accessibility and is much more visually pleasing than the previous structure.

In the gardens, their green fingers have been kept busy with daily composting, harvesting for our café, and assisting with the ongoing maintenance and development of the display gardens.

The vibrancy and diversity of the gardens this summer was an incredible testament to the commitment of the gardening team. The site truly burst into life, captivating our visitors as well as providing pollinators with an abundance of pollen and nectar-rich plants.

As the seasons shift, so do our primary tasks and responsibilities. Winter in the woodlands sees us monitoring, managing and felling some of the damaged or dying trees. We leave a lot of deadwood in situ, as it's a great source of nutrients and shelter for a wide range of species, but trees that overlook paths or parking spaces have to be carefully managed and sometimes removed.

Meanwhile, in the gardens, our leaf litter area has had a bit of a revamp to allow us to put all the fallen autumn leaves to good use. There is a cycle of life contained in leaf litter – although a little hard work is involved, these fallen leaves are valuable; they can be composted, making a rich organic mulch and soil improver, given a little time and encouragement.

As a mid-life career changer, coming to live and work at CAT as a residential volunteer has indeed been life-changing. It's helped me put down roots in a new part of the world after two decades in London, and I now plan to study here and develop a more nature-focused career. All the site staff and volunteers look out for each other, it's almost like being part of an extended family. I've loved my time at CAT and am excited about what comes next." Joe Downie, Woodland and Water volunteer (October 2021 – September 2022)



Gaining skills and knowledge with our expert gardeners

Find out more about volunteering

Volunteers built the foundations of CAT almost five decades ago, and they are still at the core today – our beating heart. We welcome you to join a great team, learn a variety of skills, forge new friendships and discover nature in unique ways. Our volunteers have gone on to various paths, including green woodworking, setting up community woodlands, forestry and further degree level study gravitating around conservation, gardening and sustainability.

If you'd like to join us, please email volunteering@cat.org.uk or visit our website for more information. [!\[\]\(dbb487ae73b31e08806d77e34dd87a8f_img.jpg\)](#)

About the author

Dulcie is CAT's Natural Resource and Volunteer Officer, helping manage our woodlands and wild spaces for people and nature as well as looking after volunteers.



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Meet CAT's Display Gardener



Clean Slate (CS): How did you get involved with CAT?

Petra: I came to volunteer in the garden for six months in summer 1996. I had finished a course in 'Commercial, Organic Crop Production' the previous year and was gathering experience. After WWOOFing (volunteering on organic farms), the opportunity to work in an established educational garden and smallholding alongside CAT's expert growers seemed ideal. It was a summer to remember – so many interesting conversations with inspiring and innovative people who worked hard and also knew how to enjoy life. Helping to look after the garden, grow and harvest produce was immensely satisfying.

That summer wasn't all about work, there were some wonderful evenings too. The craggy parts of site were all ablaze with heather and gorse at that time. There were hot saunas, cold water dips, bonfires, and music under the stars. I relished it all, as so many other volunteers have before and since!

To be welcomed into a community of people who were working positively together to find solutions and raise awareness was a revelation. I felt like I had found my people and was no longer wading against the tide alone. That is why I decided to stay in Machynlleth and have worked as a gardener ever since.

In 2015 I got a job as the new CAT Display Gardener, taking over from Clo Ward after her many years of fantastic work here, and working alongside long-standing CAT grower Roger Mac.

CS: What's your fondest memory of your time working and volunteering at CAT, or your proudest moment?

Petra: In honour of the UN 'International Year of Pulses' in 2016, a group of us collaborated on a project called 'The Pulse

Petra Weinmann has been CAT's Display Gardener since 2015, after first joining us as a volunteer more than 25 years ago. Beautiful flower beds that boost biodiversity, scrumptious salads for the CAT café, trails and displays to help people learn more about food and growing – Petra oversees it all, and much more besides.

Trail'. It still runs through the gardens now, exploring the many environmental benefits of growing peas, beans, lentils and chickpeas for their superb nutritional value and simple deliciousness. We pulled together a display that is beautiful to behold while addressing such weighty issues as sustainable diets and soil care. Which reminds me, that trail needs some work this winter!

CS: What does the role of Display Gardener involve?

Petra: Initially, I thought my job would mostly involve looking after the borders and garden-related educational displays, but I soon realised that I was also going to be groundskeeper, handy-person, garden liaison officer, tour guide, workshop leader, flower arranger, composter, and weeder of every metre of gravel path on site.

While quaking in my muddy boots, I took up the challenge because the garden and the organisation are precious to me.

Over the years, new people have joined the team and dedicated volunteers have made a huge contribution in helping to keep the garden interesting through the seasons, and the supportive relationships in our small Estates team have been invaluable. I wouldn't want to be anywhere else.

CS: What do you hope to see CAT achieve in the next five to ten years?

Petra: Well, the ambition is to inspire, inform and enable people (from individuals to governments) to enact the changes that will bring about a sustainable future for humans and all species. It can feel pretty huge! Often, I am just glad to kindle a little spark of inspiration in someone. I do feel heartened by some of the people I have met and worked with here over the years, and the things they have gone on to do. I have seen the capacity of humans to get things done when we pull together and realise how much we love the Earth. [CS](#)

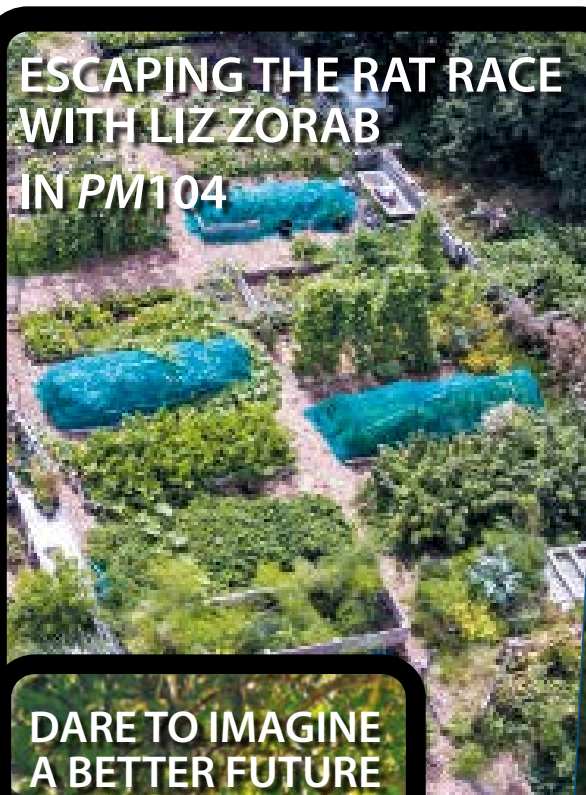


The Pulse Trail explores the many benefits of growing and eating peas, beans, lentils and chickpeas

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CAT STORIES

To tackle the climate and biodiversity emergencies we need people with the skills and knowledge to implement solutions across every sector. Meet two of CAT's recent graduates who are using their learning to help create change.



Joe Simpson:
researching climate risk
and the food system

Joe began to study CAT's Sustainability and Behaviour Change MSc in 2019 and graduated in 2021. Studying at CAT provided Joe with the opportunity to move from a background in environmental chemistry towards broader sustainability issues and social science.

Joe says: *"I chose CAT because it provided exactly what I needed to transition from STEM to social science research. Additionally, it seemed like an interdisciplinary and diverse environment."*

"I applied for my role [at the Stockholm Environment Institute] shortly after I completed my dissertation with CAT, and I can definitely say that without my academic experiences at CAT I would

have not been successful in attaining my current position. I developed many independent research skills through my studies at CAT that I now use directly in my current role."

Currently working as a research assistant at the Stockholm Environment Institute in York, Joe sits within their Sustainable Consumption and Production group which researches climate risk and the global commodity trade, with a particular focus on the food system. The group provides data and information for policymakers, NGOs, industry and the public, and helps develop systems-level understanding of sustainability issues related to food and other agricultural products.

Joe's dissertation topic looked at 'Exploring the Role of UK Trade Unions in Driving Sustainable Transitions.' In the next few years, Joe hopes to continue with social science research studies by undertaking a PhD programme.

Roshan is a Principal Architect at Ávása Architects in Kerala, India. Having studied with us through distance learning on our MSc in Green Building course she is steering her small architecture firm to adopt and experiment with the sustainable ideas and materials she learnt about on the course, aiming to find suitable solutions for ongoing design and build projects.

Roshan says: *"Before joining CAT, I was struggling to run my firm, as I felt I was doing more damage to the planet without understanding ways to change popular mindsets about the indiscriminate use of energy in buildings."*

"My passion for influencing a sustainable lifestyle and search for solutions led me to CAT. I could see that CAT shared similar values regarding sustainability, and everyone seemed to exhibit the same kind of passion towards doing something for the planet and making the Earth a better place. Moreover, CAT offered a flexible learning experience which allowed me to study by distance."



Roshan Nageena Sabeer:
sharing knowledge of low impact
architecture

"I now intend to use the knowledge gained to further shift my firm to a more sustainable model and to share these ideas to influence others through sustainability consultancy work in the future."

Roshan is also passing along the knowledge gained on her energy and building modules to students in India through her work as an Associate Lecturer at the College of Engineering and Technology in Payyannur, Kerala and as Visiting Faculty at M.E.S. Architecture School.

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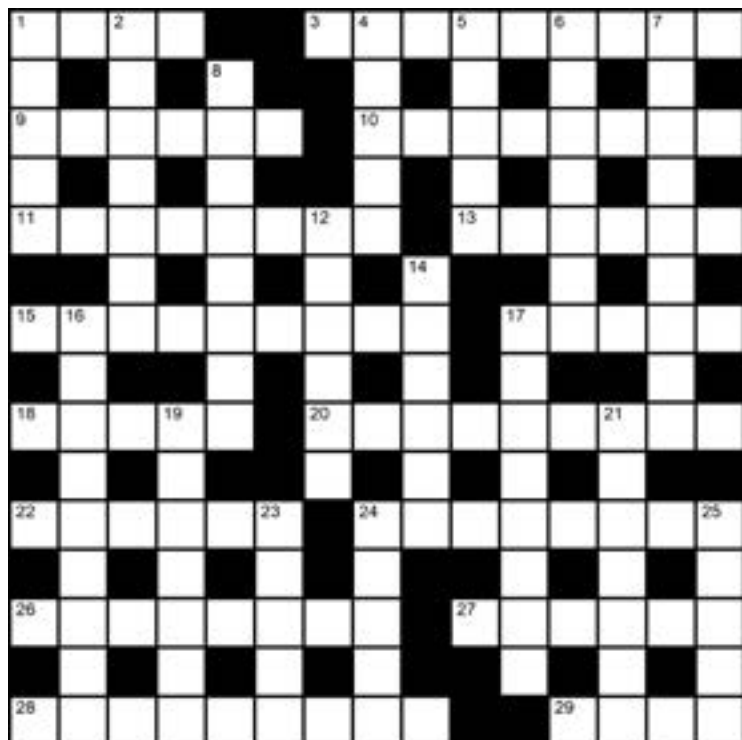
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The first correct entry pulled from a hat wins a £20 voucher for the CAT EcoStore - store.cat.org.uk.

Please send your completed crossword entry by 30 January 2023 to *Clean Slate* Crossword, Centre for Alternative Technology, Machynlleth, Powys, SY20 9AZ.

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

Across

- 1 Furniture 20% off, until now (4)
- 3 Square area (9)
- 9 See 1 Down
- 10 Bond extra grapples with essentially dated gag (8)
- 11 Last day in month is looking unsettled (8)
- 13 Area of shade behind hospital (6)
- 15 Washington office, ultimately some kind of target for intruders! (9)
- 17 Evaluate American behind old-fashioned agreement (5)
- 18 Ungodly dilapidated no-go area (5)
- 20 Left to play in bed, that's how they were brought up (6-3)
- 22/25 Bug contaminating bathing area (6,5)
- 24 What joint to have for dinner? An issue for women in the 70's (5,3)
- 26 Area inhabited by man, wife and son (8)
- 27 Area that gets checked after six (6)
- 28 Sit around inside, still compiling data? (9)
- 29 Note way this attracts attention (4)

Down

- 1/9 Area huge with tourists lacks golf (crazy) (5,6)
- 2 Area that provides an excellent broadband service (7)
- 4 Area of responsibility includes raising alarm? (5)

- 5 Area reportedly a quarter of the total (5)
- 6 Slug seems content after chewing plants (7)
- 7 Get garage to adjust total (9)
- 8 Keen to go round old market area (8)
- 12 Area bishops inhabit, extremely modest and run-down (6)
- 14 Restrain yourself and be quiet! (4,2)
- 16 Recreation area teen mum's redeveloped (9)
- 17 Chopping wild garlic, the French might be susceptible (8)
- 19 Re-edit end of film removing fault (7)
- 21 Area that is protected by strongholds (7)
- 23 Where arachnid usually nests (5)
- 24 See South America and Hawaii before getting fare to Japan (5)
- 25 See 22 Across

Clean Slate 125 Solution



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Looking back, looking forward

Freya Randall, Fundraising Manager

Next year, we celebrate CAT's 50th anniversary – a 50-year journey of educating and inspiring future generations of environmental leaders, of training people in the practical skills needed to transition their communities to net zero, and of bringing messages of empowerment and hope to the table.

The past five decades has also been marked by irreversible changes to our environment – as a CAT supporter and Clean Slate reader, you will be well aware of the facts – and it's clear that we need hope, community and change more than ever. Change that is grounded in practical, achievable, sustainable solutions and a shared determination to build a better world.

Here at CAT, we must continue to keep doing what we do best – sharing the solutions that your support enables. We will work to support policymakers but cannot pin our hopes on ratcheted targets and promises of future action. Together, we have to grieve for what's changed irreversibly and bravely look at what the next 50 years might bring and how we can most effectively hold back catastrophic change whilst working to protect people, communities and ecosystems from those impacts that can no longer be avoided.

For many of us, this is a hugely daunting task – the problem is too unfathomable in scale and complexity to fully understand and absorb. If you are reading this, you're most likely thinking about how you can best enable change within your own means. Supporting CAT's work through a gift in your Will is one way to do this, without any cost to your present circumstances or loved ones.

The next 50 years is absolutely crucial for humanity – urgent action is needed this month, this year, this decade, but the work doesn't stop when the world reaches net zero. This is a long-haul

problem and in the decades to come we'll need new generations of people with the skills, knowledge and understanding to protect and restore nature and work towards a safer, healthier, fairer world for all.

We know there are a lot of uncertainties ahead. The effects of the climate and ecological crisis are by nature unpredictable, and so is our economic landscape. This is why we are building our resources, capacity and response to match the scale and longevity of the emergency. Gifts in Wills offer some security for this next chapter of CAT's important work, and these special gifts will be gratefully received in a potentially very changed world.

Types of gift in your will

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- A specific item, such as property, art or jewellery.

If you are considering leaving a legacy of kindness and hope, in whatever way feels right for you, we hope you'll be in touch. There is no obligation to commit, but we can talk through any details you're unsure about.

Please contact me at freya.randall@cat.org.uk 

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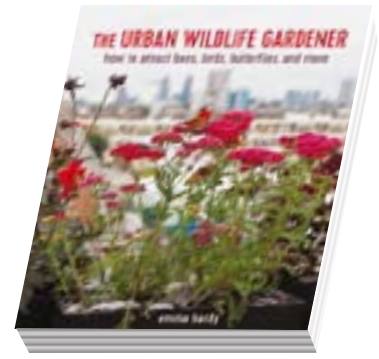
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194 edible fruits, nuts and seeds, flowers, greens and vegetables, herbs, roots, whole plants, fungi, seaweeds and shellfish that you can forage for safely and legally in the UK and Europe. **£6.99 pb**

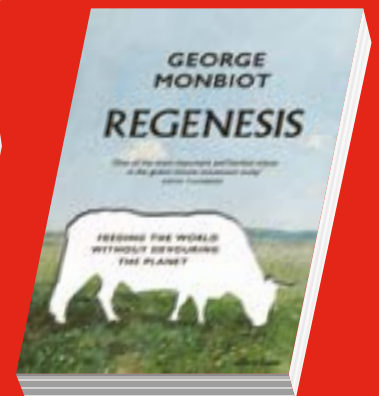


The Plant Lover's Backyard Forest Garden

Whatever the size, and with limited time, money and resources. A forest garden doesn't have to be big; you can grow a productive edible paradise in pots and containers too. **£16.00 pb**



Regenesi s : Feeding the World without Devouring the Planet. George Monbiot explores a vision for the future of food. **£20.00 HB**



Agent Apple Extreme Immersion Degreaser.
Great for Immersing grimy chains, **£15.00**

Wet Chain Lube

Green Oil can also be used for cables, brake leavers, bike locks. **£9.00**



Wooden Bug Kits

Butterfly, Honeybee, Praying Mantis, Dragonfly
Make wonderful stocking fillers **£5.00**



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