UNIVERSITY OF SURREY

University of Surrey

# SUSTAINABLE DEVELOPMENT GOALS

**2021-2022**

Annual Report

SUSTAINABLE DEVELOPMENT GOALS

## INTRODUCTION FROM THE VICE-CHANCELLOR

**The University of Surrey is a world-class university, with dual excellence in both teaching and research, as well as high impact in sustainability.**

Our students and staff are consistently engaging in sustainability activity to lead change and make a real impact to achieving the United Nations Sustainable Development Goals (SDG).

Through our collective endeavours we have risen to a best-ever position of 46th in the Times Higher Education (THE) University Impact Rankings. In line with our strategic priorities, our commitment to improving the health of our planet and communities continues to grow.

Our campus in Guildford is home to the Institute for People-Centred AI and the Institute for Sustainability, which push the knowledge boundaries with a forward-thinking agenda and bring together expertise from a large number of disciplines from science and engineering, to social and health sciences.

Over 40 research centres, networks and special interest groups are working in sustainability areas ranging from clean energy, and clean air and water, to sustainable prosperity, sustainable living and sustainable tourism and transport. The University partners with many industrial companies to deliver research and training to ensure we have a positive impact locally, regionally, nationally and globally.

This year, we have enhanced our research capacity by appointing our first cohort of Sustainability Fellows and we will recruit more in the coming year.

Our University has ambitious plans to achieve Net Zero Carbon (NZC) emissions by 2030 and to offer sustainability learning in all courses. Our proposal to create a new solar farm is now in the planning phase, the first installations for Electric Vehicle (EV) charging are due on campus this year and we are making a significant investment to help us reduce our energy consumption.

The University of Surrey continues to invest in the student experience and creating the conditions for everyone to succeed.

We are now fourth in the UK for overall student satisfaction in the National Student Survey and are ranked 13th in the Complete University Guide 2024, 21st in both the 2024 Times Good University Guide and the Guardian University Guide 2024.

Professor Max Lu
President and Vice-Chancellor

# CONTENTS


6

LEADING UNIVERSITIES WORKING IN ENTERPRISE PARTNERSHIP

## GIVING EVERYONE IN THE WORLD A CHANCE TO PROSPER WITH SETSQUARED SURREY

The University of Surrey is committed to supporting new business growth. SETsquared Surrey is the business incubation centre of the University, part of a unique enterprise partnership and a dynamic collaboration between six leading research-led UK universities: Bath, Bristol, Cardiff, Exeter, Southampton and Surrey. This world-leading business incubator provides a wide range of support programmes to help turn ideas into thriving businesses. SETsquared Surrey supports a diverse range of tech start-ups by offering membership packages with bespoke business support to suit entrepreneurs' needs throughout their business growth journey.

## GIVING EQUAL CHANCES TO PROSPER WITH OUR FREE UNIVERSITY SUMMER SCHOOLS

The University of Surrey is passionate about supporting learners who are underrepresented within higher education. To this end, we host a series of free residential and virtual summer schools for a specific range of state-educated Year 12 pupils. It's one of the ways we work towards our goal of giving people an equal chance to prosper and live a life rich in possibility and fulfilment. We view this as an act of justice and the key to unlocking enormous human potential.

The summer schools give pupils a chance to explore all the subjects and support that the University offers. They meet new friends and fellow pupils who share similar experiences to theirs, finding mutual support and inspiration. They see what it's like to study a subject they love at degree level, and their awareness of their aspiration increases.

Pupils talk to current Surrey students with similar experiences, and try their hand at a range of exciting subjects and activities. During the evenings they enjoy social activities on the University campus, or in the surrounding area. The summer school runs over four days and three nights, and pupils can stay in University accommodation with catering.

> "I have learnt about my future options after level 2 education. I have learnt how to achieve my goals."

*Discover University Student 2022*

1 NO POVERTY

## INGENUITY 2022 TACKLING COST OF LIVING AND HEALTH INEQUALITIES

Cost of living and health inequalities disproportionately impact the lives of the UK's deprived, under-served, and underrepresented groups. The Ingenuity Programme tackles these major social and environmental challenges through the creation of impactful new start-ups.

Surrey is one of the Programme's five partner universities in the south-east and is proud to support many amazing entrepreneurs. One of these companies is Socially Responsible Content (SRC) Ltd, a social enterprise and creative agency that aims to change the way marginalised communities are represented through their campaign; 'Ethical storytelling. For the community. By the community.'

Set up by Surrey postgraduate researcher Abi Weaver, an award-winning producer and director, SRC works with Corporate Social Responsibility and Non-Governmental Organisations to develop community-led content strategies. These improve a community's media literacy, empowers through self-representation, and employs local stakeholders in the process.

> "The Ingenuity Programme runs each October to June, and we were proud to become South East Regional hosts in 2022. The skills and training help participants from universities and the local community develop ideas, build business plans and prepare for launch. Our Student Enterprise department provided wrap-around support to participants, preparing them to pitch for funding. Each year, the National Showcase reveals the top ideas for each region and we were delighted to see University of Surrey graduate, Rui Silva announced South East champion with his lab plastic sustainability business."
>
> *Kat Mack, Student Enterprise Manager*

## MORE LIFE-CHANGING EXPERIENCES FOR STUDENTS WITH A SECOND YEAR OF TURING-FUNDING

In 2021, the University of Surrey secured £1.7m from the Turing Scheme, giving our students access to life-changing work and study opportunities across the globe, thanks to the grant from the UK Government's Scheme.

In 2022, Surrey was pleased to secure a second year of Turing Scheme funding to support student study and employment opportunities abroad. We are delighted to continue to offer our students access to this funding which provides such life affirming opportunities – particularly to those from disadvantaged backgrounds.

Along with providing unique global opportunities to students from a wide range of backgrounds, Surrey uses a large proportion of its Turing Scheme grant to support students with a background of widening participation; for example, additional support grants for those from low-income backgrounds, or those with special educational needs and disabilities.

The University uses the Turing funding to support a wide range of activities, including student exchanges, professional training year experiences abroad, post-graduate research placements, clinical nursing placements, veterinary placements, summer internships, and many more.

The United States, Brazil, China and Australia are among over 50 international destinations where Surrey students will be funded for work and study placements – alongside popular European countries like Germany and France.

£1.7M

SECURED FUNDS FROM THE TURING SCHEME

OVER 50

INTERNATIONAL DESTINATIONS WHERE STUDENTS WILL BE FUNDED FOR WORK AND STUDY PLACEMENT

# ZERO HUNGER

## CROPS, STONES AND SECURE HOMES: SURREY SPOTLIGHTS ENTREPRENEURIAL AFRICAN FARMERS

Millions of families in sub-Saharan Africa (SSA) who rely on subsistence farming for food, increase their earnings through 'Artisanal and Small-scale Mining' (ASM). This helps them stabilise their income when their farming is affected by drought or other climate shocks.

Donors and policymakers have historically downplayed this important link because ASM is part of the informal economy. But the emergence of the Sustainable Development Goals (SDG) and a climate change agenda in SSA which prioritises food security, gender equality, adaptation and rural resilience has legitimised and put this activity into the spotlight.

Surrey researchers Professor Gavin Hilson and Dr M. Mahdi Tavalaei have explored how income from ASM assists vulnerable farm-dependent families. ASM activities are all very different, populated by unique people, each with their own story about coming into the sector. Many of the stories cite poverty as the driver. Many have since skilfully used the earnings from their entrepreneurial ASM work to diversify their income portfolios. Hilson and Tavalaei have emphasised the value of the link between subsistence farming and ASM opportunities.

*Crushing machine used in ASM*

## GOVERNMENTS AROUND THE WORLD, INCLUDING THE UK, 'HINDERING NOT HELPING' SYSTEMS TO TACKLE HUNGER AND POVERTY, SURREY RESEARCHER TELLS UN

National governments, including the UK's, are holding back food transformation systems – this is the message a University of Surrey expert gave to the United Nations' 17th Annual Session of the Global Forum on Human Settlements, which addressed the role cities play in solving the crises of climate change, nature loss, economic downturn and more.

Surrey's Roberta Sonnino, Professor of Sustainable Food Systems, led the writing of the Framework for the Urban Food Agenda for the United Nations' Food and Agriculture Organization. She says:

"It's no secret that existing food systems aren't working for the world's poor or for the planet, yet national governments fail to act. Even worse, with their red-tape and silo working, they stymie the efforts of organisations on the ground trying to tackle the problem."

"Food is a connector which impacts everyone and everything: the economy, health, agriculture, environment, business, transport and more. It's an obvious priority but government responses are piecemeal and inadequate. We need collaboration and for governments to listen to the voices of people tackling the problem at local levels."



## SURREY LEADS RESEARCH ON HOW NUTRITION, COOKING SKILLS AND FOOD SECURITY CAN ADDRESS FOOD CHALLENGES

Regularly eating safe and nutritious food is key to life, health and wellbeing. But the World Health Organization (WHO) estimates that around 60 per cent of global disease is connected with poor diet or unsafe food. It's urgent that better strategies for food and water security are found throughout the world.

Surrey researchers' response is to develop research programmes to address these challenges — from investigating electron shuffle in microbial communities, to instigating behaviour change in people. One investigation led by Professor Monique Raats, Director of Surrey's Food, Consumer Behaviour and Health Research Centre focuses on food skills in Ireland. The study enhances our understanding of how people around the world cook, and develops suggestions for improving skills and promoting healthful diets.

Other areas of research include examining how diseases and drug treatments affect the GI microbiome in people and animals, and highlighting ways to prevent contamination of food and water, reducing the likelihood of antimicrobial resistance.

60%

GLOBAL DISEASE IS ATTRIBUTABLE TO POOR DIET OR UNSAFE FOOD

## SURREY RESEARCHERS CALL FOR GREATER CLARITY IN CLASSIFYING PROCESSED FOODS

Our researchers have found that classification for processed foods lacks consistency, resulting in confusion even among food scientists. Researchers from the University of Surrey and European Food Information Council reviewed over 100 scientific papers to examine if different criteria exist in developing classification systems for processed foods and, if so, what distinguishes them.

Classification to categorise food according to "level of processing" are used to predict diet quality and health outcomes, inform guidelines and in product development.

However, researchers found that most classification does not align with scientific evidence. Only a few acknowledge food processing done at home, as opposed to industrially processed foods. Researchers believe that this omission is misguided.


Christina Sadler, a postgraduate researcher and PhD candidate at the University of Surrey and a Senior Manager at EUFIC who led on the research, said: "It is concerning that there are no clear agreements on what features make food more or less processed, and how this relates to healthy eating advice, which may make it more difficult for consumers to make informed choices consistently."


# GOOD HEALTH AND WELLBEING

## LISTENING TO HEALTH WORKERS TO IMPROVE PATIENT EXPERIENCES

In January 2022, the Royal Surrey County Hospital (RSCH), supported by the University of Surrey, launched 'Bid for Better', a call to action for RSCH employees to make a small change with a big impact for staff and patients. Thanks to funding from the Royal Surrey Charity, RSCH staff have been asked to submit project ideas worth £5,000-£30,000, on anything from events to equipment, and new apps to refurbishing patient areas.

Where projects align with the University's research or areas of expertise, we're supporting with co-funding, academic support and use of our facilities and equipment.

Rachel Hargreaves, Healthcare Partnerships Manager at Surrey, said: "We're delighted to support the hospital in this exciting initiative. Through co-designing and co-funding projects we are demonstrating our commitment to develop strategically aligned and mutually beneficial collaborations with our local hospital."

## SURREY SPORTS PARK PROVIDES SATURDAY CLUB FOR YOUNG PEOPLE WITH SPECIAL EDUCATIONAL NEEDS

The Saturday Sport Club is for young people from eight years old with special educational needs and disabilities, as well as their families. This links in with our aim to promote wellbeing and a healthy lifestyle for everyone, at all ages.

The fully inclusive, fun, multi-sport sessions take place in a safe and friendly environment, offering participants opportunities to try new activities like trampolining, climbing and multisports. The welcoming and relaxed environment helps young people build their personal skills and self-confidence.



## COVERS ON BIKE TRAILERS COULD HALVE AIR POLLUTION FOR BABIES ON BOARD

Babies and children sitting in bicycle trailers breathe in more polluted air than the adults riding the bikes that pull them, according to research from the University of Surrey.

Surrey's Global Centre for Clean Air Research (GCARE) found that on typical school or nursery runs, the average concentration of pollution particles in a bike trailer is 14% higher than for the cyclist, rising to 18% higher in the afternoons, when parents or carers typically collect children.

The researchers discovered that young children were exposed to even higher concentrations of air pollution during peak morning periods at urban pollution hotspots, such as traffic lights. Air pollution is a leading cause of death in children under the age of five.

18% HIGHER

POLLUTANTS AT TRAILER LEVEL THAN BICYCLE HEIGHT IN AFTERNOONS

They found that covers halved the levels of particles in trailers during peak morning hours.

Professor Prashant Kumar, Founding Director of GCARE at the University said: "I'd encourage adults pulling bike trailers to use covers in heavy traffic."

## SURREY ACADEMICS CONTRIBUTE TO NATIONAL INNOVATION TO TRANSFORM FOOD AND DRINK SECTOR

A Food Innovation Hub led by Dr Kourosh Ahmadi from the University of Surrey is investigating if plant-based dietary alternatives could provide a healthier and more sustainable solution to improve public health.

The Hub at Surrey, called Start Healthy – Stay Healthy (STAR), is one of six new Innovation Hubs across the country, created by the UK's Biotechnology and Biological Sciences Research Council. They share almost £15m investment between them to conduct research to improve and modernise the food and drink sector. The hubs bring together world-class leaders from academia, industry and wider stakeholders, each investigating a different issue, from maximising the nutritional value of foods to better understanding what influences food choices and the relationship between food and health.

STAR Hub works with industry partners to produce novel, affordable and sustainably produced plant-based foods that will aim to improve the mental and cognitive health of individuals throughout life (pregnancy, lactation, childhood, middle and older age).

Head of Surrey's Department of Nutritional Sciences, Professor Sue Lanham-New is Co-Investigator on a second Hub led by Imperial College London and PepsiCo. This Hub investigates what can be changed in our current food system to avoid the continued rise in diseases such as obesity, type 2 diabetes and cancer, to keep people healthy and well.

Professor Roberto La Ragione, Head of the School of Biosciences said: "Having our academics involved in two out of six of these Innovation Hubs reinforces the strength of our nutrition programmes here at Surrey."

£15M

RESEARCH FUNDING TO IMPROVE AND MODERNISE THE FOOD SECTOR

## SURREY'S FREE MOBILE APP REWARDS STAFF AND STUDENTS WHO AIM TO STAY ACTIVE

SurreyMoves+ give discounts and prizes in return for points that students and staff of the University can earn by engaging in physical activities - as simple as walking to a lecture, or as challenging as running a marathon. Earned points challenge people who have set themselves goals, and help people who are aiming to develop healthy exercise habits.

4 QUALITY EDUCATION

# QUALITY EDUCATION

## IN2SURREY

The University of Surrey is committed to inclusive, equitable and quality education. We believe that if we want a diverse and representative society, we must ensure everyone with the potential to succeed can do so - regardless of their background or personal experience.

In2Surrey is our contextualised admissions and transition programme, coordinated by the Widening Participation and Outreach Team. It is designed to support eligible students in their preparation for studying at the University of Surrey.

Contextualised admissions use additional information, like socio-economic factors, to understand the context in which applicants have achieved their qualifications, enabling the University to identify performance and potential.

## SURREY WOMEN IN ENGINEERING SOCIETY AIMS TO INFLUENCE, MOTIVATE AND SUPPORT

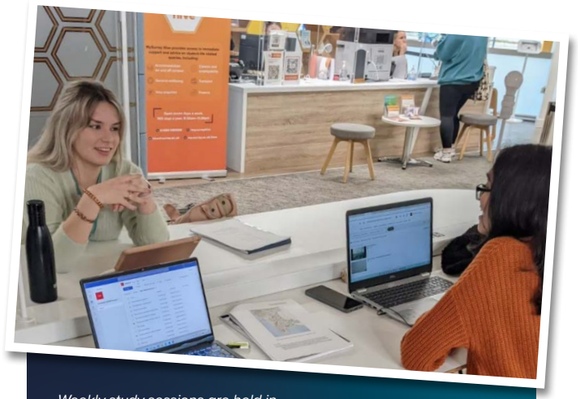
Surrey's Women in Engineering Society – which is affiliated to the UK's national Women's Engineering Society – is a thriving network of students from across the engineering disciplines. Although set up to encourage women, the Society is open to all.

Treasurer Isobel Adamyk, who studied for an MEng Aerospace Engineering and is now doing a PhD at Surrey, says: "We're a very friendly Society of around 50 students from not only engineering but also science disciplines such as chemistry and physics. Our aim is to bring together a community of women in STEM, empower them in their studies and promote their careers."

The Society runs a busy and varied programme of events which has recently included theatre trips, movie nights and a pottery painting event. There's a weekly study session for socialising and academic support.

Isobel says: "It's very important to us that financial considerations are not a barrier, so membership of the Society is free, and events are either free or very discounted. We also make sure that our events are physically accessible to all.

"The Society plays a very important role in enabling you to feel part of a supportive community. We welcome not just women but people of all genders because allies are so important to our network."

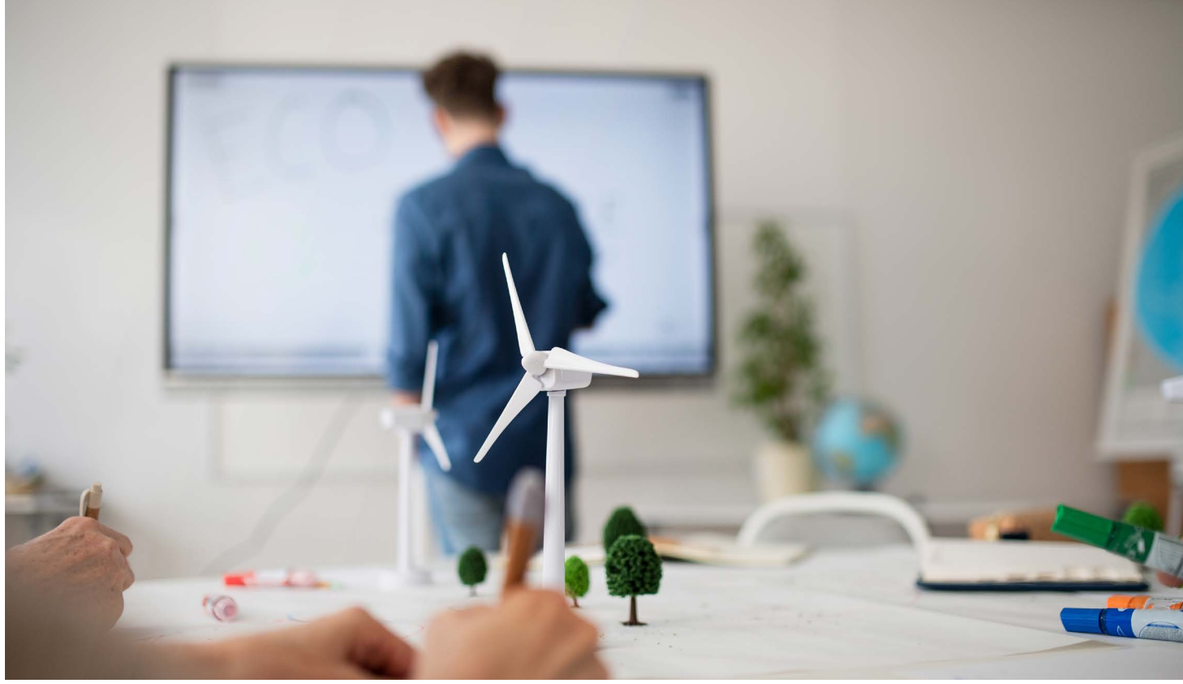


*Weekly study sessions are held in the Hive on Wednesday lunchtimes*

AROUND 50

STUDENTS FROM DIFFERENT UNIVERSITY DISCIPLINES AIMING TO EMPOWER WOMEN IN STEM





## STUDENT-CENTRED, SUSTAINABLE EDUCATION

From the moment students arrive at the University, we encourage and support them to put sustainability first. Sustainability is embedded into all programmes as a core graduate attribute. This is achieved through a student-centred, enriching learning environment, with an emphasis on practice-based learning. The University's Education Strategy 2021-2024 stresses that Surrey graduates will be educated to think critically and differently and make a real impact on society.

In addition, Surrey offers specific environment and sustainability courses that develop future leaders in these fields. The courses equip students with the knowledge and skills to make informed, responsible decisions that promote the wellbeing of present and future generations.

The University is involved with Green Impact and Student Switch Off - engagement programmes organised by Students Organising for Sustainability UK (SOS-UK), to encourage a University-wide transition towards sustainability.

## SHARING OUR GUIDELINES ON PROTECTING CHILDREN FROM AIR POLLUTION WITH SCHOOLS AROUND THE WORLD

In a great example of local research going global, a guidance booklet for schools – which originated with citizen science activities within Guildford Living Lab (GLL) – has now been translated and published in Hindi, Punjabi, Urdu, Bengali, Tamil, Portuguese, Chinese, Spanish, Swahili, Kurdish and Arabic, and is being used in an increasing number of countries worldwide.

The booklet, 'Mitigating Exposure to Traffic Pollution in and around Schools', published by Surrey's Global Centre for Clean Air Research (GCARE), provides actionable advice and tangible measures which can be taken to improve the air children breathe in and around schools.

The guidance is based on research undertaken by GCARE with local school and community groups in Guildford, along with input from the broader Guildford Living Lab community including parents, schools, academics, councillors, environmental groups, professional bodies and other experts.


The translated versions represent a significant step towards reduced air pollution exposure for schoolchildren worldwide.

Professor Shijie Cao of the Southeast University in Nanjing, China, commented: "This guidance in Chinese (PDF) will enable schools, children and communities to make correct decisions, and further help reduce the exposure risk of children to air pollution."


## THE MENOPAUSE PROJECT

The Menopause Project is a University initiative designed to support those experiencing menopause. The Project aims to raise awareness, encourage conversation around the topic without fear of judgement, provide support, retain talent and promote wellbeing.

The project is inclusive of everyone who goes through the menopause or menopausal symptoms as a result of hormonal changes. It supports staff and students through a variety of platforms such as The Menopause Support Network, which provides opportunities for women at Surrey to connect with others through monthly menopause cafés, and an online network.

## RETURNERS' INITIATIVE

We care about the welfare and experience of staff and students who leave Surrey to have a child. It is really important to us that we provide the right support, and equip all managers and colleagues to create an inclusive and supportive environment for returning staff and students. We have developed toolkits to provide support and have plans to introduce a buddy scheme, Lunch and Learn sessions and a returners' network for everyone who takes parental, maternal or paternal leave.

Returning from parental leave can trigger a variety of different emotions for many. While it can be really refreshing to get stuck back into work, have that adult conversation and a nice hot cup of tea for once, it can also be a very daunting prospect, worrying about fitting back in and picking up the work again.

The Returners' Initiative offers the reassurance and understanding that is needed for people coming back from parental leave. It's important that we recognise the experience might not have been the same for all. This initiative aims to ensure that everyone has a positive experience of returning to their role. It also sets a good standard for staff recruitment and shows the focus that Surrey places on family life.



## SPRINGBOARD AT SURREY

Springboard is a mentoring scheme for University staff. The aim of the scheme is to enable women to think deeply about their skills, their values, their world, their assertiveness. It supports women in networking, putting themselves across positively, building personal image and setting goals.

Women who complete the four-day programme report increased confidence, a greater ability to create and embrace change, and a stronger drive to achieve new qualifications, promotions, skills, and attitudes.

Springboard is open to women working at all levels and in all job families at the University of Surrey, offering a unique opportunity to network with a range of colleagues from across the University community.

## SURREY IS PROUD TO HAVE BEEN AWARDED CHAMPION STATUS BY PROJECT JUNO

We are Juno Champions, a recognition awarded by the Institute of Physics to university physics departments that demonstrate action on gender equality at all levels.

The three-step award scheme requires a significant amount of effort, evidence and commitment, as well as the demonstration of long-term improvements in order for applicants to be recognised. It is the first award of its kind specifically created for the physics community. Feedback from applicants has shown it can have a profound and lasting impact on gender equality in the awarded department or establishment.

## ATHENA SWAN DEVELOPMENT AT THE UNIVERSITY OF SURREY

The Athena SWAN Charter is a scheme run by Advance HE, which recognises advancement of gender equality in terms of representation, progression and success for all.

Our School of Biosciences and Medicine was awarded Gold, while the Schools of Health Sciences gained Silver. Bronze awards were achieved by: the Schools of Psychology, Hospitality and Tourism Management, Law and Literature and Languages; the Departments of Music and Media, Politics, and Mathematics; Guildford School of Acting; and Surrey Business School.


# CLEAN WATER AND SANITATION

## KEEPING DRINKING WATER SAFE: HELPING THE WORLD HEALTH ORGANIZATION (WHO) IMPROVE ITS GLOBAL GUIDANCE

A Surrey-based research team is helping the World Health Organization (WHO) revise their guidelines for safe drinking water.

Around the world, huge numbers of people rely on small drinking water supplies for this most essential of human needs. For instance, parts of the UK are reliant on water from private wells or boreholes rather than the large, regulated organisations which manage water regionally.

Dr Kathy Pond and her team at the Centre for Environmental Health and Engineering are examining how these supplies are kept safe, what checks are done on the water and how the resultant data is used. The University of Surrey is a designated WHO Collaborating Centre for the Protection of Drinking Water and Human Health, and the team's findings are being incorporated into the revised WHO guidelines around water quality and health. Surrey has developed films, shared by the WHO, that help communities assess risks to small water supplies.

## IDENTIFYING WHY ACTION OFTEN ISN'T TAKEN TO KEEP DRINKING WATER SAFE

Jo Herschan is a PhD student in Dr Pond's team examining why action often isn't taken, even after water quality checks are conducted.

"We see a similar story across the world," she says, "in England, Canada, Uganda, Gaza. There's a lack of human and financial resources. Not enough technical expertise. Fragmented data systems. It might be scattered pieces of paper in one country and spreadsheets in another, but the fundamental problem is the same."

## HOW CLIMATE CHANGE IMPACTS DRINKING WATER SUPPLIES

Extreme weather events caused by climate change, like floods and droughts, pose a significant threat to drinking water supplies. The research team led by Dr Kathy Pond is examining how to protect the resilience of small drinking water supplies.

**60M**
LITRES OF WATER SAVED ANNUALLY THROUGH URINAL TECH

**106**
REFILL STATIONS ACROSS UNIVERSITY CAMPUS

**29K**
LITRES OF WATER SAVED ANNUALLY THROUGH SHOWER INNOVATION



## WATER REDUCTION MILESTONES

Surrey has achieved further significant milestones in its water reduction targets. The installation of passive infrared sensors across almost all urinals saves over 60,000,000 litres of water per year. The leak detection work carried out with the help of a masters student in Civil and Environmental Engineering identified a hidden leak saving approximately 8,400,000 litres per year.

The University's onsite borehole is now being used as an exemplar, providing a close and well-designed resource for enhancing the teaching of engineering and sustainability students. Our water-saving measures combined save the equivalent of 35 Olympic swimming pools worth of water a year!

## CONSERVING WATER

The University estate and landscaping is maintained by a dedicated team which employs a range of methods to conserve water:

- Adopting a water probe irrigation system to assess soil moisture, promoting targeted rather than widespread watering
- Compost and mulch are used to retain moisture around trees and reduce the amount of watering required
- Removal of water fountain systems, replacing them with planted beds with drought-resistant species
- Installation of water efficient shower heads in all bathrooms, along with an extensive meter network to detect leaks and other issues.

## SURREY INNOVATION CUTS SHOWER TIMES AND DRIVES GREENER HABITS

To help address the growing pressure on water supplies and to achieve our water reduction target, the University partnered with Aguardio ApS to conduct a living lab experiment.

The innovative Aguardio G2 shower sensor was used in student accommodation to test the efficacy of real-time feedback and messaging. Initial results indicated that real-time feedback led to a 20% reduction in shower time and that a 30% reduction in shower time was achieved when real-time feedback was combined with messaging encouraging selfless pro-environmental behaviour. Annually, in each communal shower that has the device installed, this will result in savings of over 29,000 litres! The water and gas savings were commended by participants, and the experiment has marked implications for take-up by a widening pool of users.

## WATER USAGE AND ENVIRONMENTAL CARE

The University treats wastewater from its Veterinary School and dilutes it before it enters the public sewers. Surrey Sports Park facilities have abatement systems to limit the flow rate of water into the public sewers and reduce pressure on infrastructure.

At our Stag Hill, Manor Park, and Surrey Research Park campuses, we have several ponds and lakes that not only improve the site's biodiversity but also function as abatement systems. They collect surface runoff using fuel interceptors and slow its entry into watercourses, reducing the risk of flooding. Additionally, these interceptors prevent any spillages from entering the lakes.

Our Control of Hazardous Substances Policy aims to reduce environmental impact from the use or disposal of hazardous substances.

We recognise plastic's impact on our ecosystems, so we're committed to reducing the use of single-use plastic bottles. The University offers 106 refill points around campus, and all cold-water taps are drinkable unless otherwise labelled.

Read more here


1,100

TONNES FEWER CARBON EMISSIONS PER YEAR THROUGH SOLAR FACILITY

24%

REDUCTION IN EMISSIONS BETWEEN 2005 AND 2019

## NEW UNIVERSITY SOLAR FARM TO ACCELERATE NET ZERO TARGET

The University is to launch a new 12.2MW solar farm on our own land to the west of Guildford, helping accelerate our journey to net zero.

Our partnership with SSE Energy Solutions means our on-site renewable energy generation will leap from 0.1% to 20% of total annual demand. Once complete, the farm will be capable of generating enough energy to supply the equivalent of 4,000 UK homes each year.

This amazing project also means we can enhance the surrounding biodiversity of the land with wildflower planting, nature corridors, hedgerow expansion and bug hotels. Solar facilities that have been monitored regularly by ecologists demonstrate an increase over time in the local abundance and variety of plants, pollinators, birds, and other wildlife.

The solar facility will reduce carbon emissions by an estimated 1,110 tonnes per year and is crucial in meeting the University's 2030 net zero carbon target. Surrey has already made progress towards meeting our target; we cut emissions by 24% between 2005 and 2019.



## POTENTIAL FOR MASS PRODUCTION OF 'MIRACLE MATERIAL' COULD SLASH COST OF SOLAR PANELS

Surrey scientists discovered that coating solar cells made out of 'miraculous' perovskite with special "ink" can improve their stability enough to make them suitable for mass production.

Perovskite is a cheaper, lighter and more efficient material that could replace conventional silicon-based solar cells. If the cheap-to-produce perovskite cells can be manufactured at scale while retaining their durability and reliability, then the cost of solar panels would plummet.

University researchers discovered that a coating of aluminium oxide could minimise the drop in efficiency that occurs during the production of perovskite solar cells.

"Performance limits of traditional solar cells are why researchers are switching to examining perovskite as the next-generation solar technology, especially as applications both terrestrial and in space are rapidly growing," said Dr Imalka Jayawardena from the University's Advanced Technology Institute (ATI).

"Our key development in solar panel technology shows a cost-effective approach to scaling of perovskite solar cells, a development which could help countries around the world to reach their net zero targets faster."

## ADVANCING BIOENERGY RESEARCH THROUGH THE TAEDA PROJECT

The University of Surrey leads on the Taeda Tech Project, which is committed to developing a novel aeroponic technology to grow woody crops more rapidly. This multi-million pound project receives funding from the Department for Business, Energy and Industrial Strategy (BEIS) under their Biomass Feedstock Innovation Programme, which forms part of the Net Zero Innovation Portfolio.

A report on mitigation by the Intergovernmental Panel on Climate Change (IPCC) shows that bioenergy is a major opportunity to support climate change efforts. When used correctly, it is a negative-emissions source of energy. Surrey believes that the technology will enable the UK to confidently transition to cleaner energy technologies, supporting the aim of net zero.

We have an ambitious vision for the future to further tap the potential of aeroponic technologies, not just in reducing resource consumption in growing, but also in exploring beyond growing leafy greens.

## ENERGY REDUCTION PROGRAMME

The University of Surrey has approved an eight point framework to reduce demand for energy, and to decarbonise its energy supply.

Working towards this goal includes adopting the Laboratory Efficiency Assessment Framework (LEAF) which sets out 50+ criteria for lab users to improve their sustainability. An example is changing the operating temperature for ultra-low temperature freezers (of which the University has hundreds), dropping from –80 to –70. While this does not affect research, it does reduce carbon emissions by 25% for each freezer.

25%

REDUCTION IN CARBON EMISSIONS OF EACH FREEZER PER YEAR


# DECENT WORK AND ECONOMIC GROWTH

UNI OF THE YEAR

THE TIMES/SUNDAY TIMES GOOD UNIVERSITY GUIDE 2022

50

NEW FUNDED INTERNSHIPS FOR STUDENTS

## UNIVERSITY OF THE YEAR FOR GRADUATE EMPLOYMENT

The University of Surrey was awarded the prestigious accolade of University of the Year for Graduate Employment in *The Times/Sunday Times* Good University Guide for 2022.

The award recognised the University's consistently high performance in the employability of our graduates.

Graduate Outcomes data collected by the Higher Education Standards Agency (HESA) rated the University of Surrey's graduates as amongst the most employable in the UK. These outcomes come from our consistent focus on preparing students for employment in our curriculum, our successful Professional Training Year, other placement schemes and the excellent support provided by our Employability and Careers team – exemplified by the University winning the Best University Placement Service in the National Undergraduate Employability Awards three years in a row.

We introduced 50 new funded internships for students, focused on underrepresented groups to help boost their employment prospects when they graduate – and we are planning to grow the scheme in the years to come.

Surrey has always placed a huge emphasis on developing the employability of our graduates, and we are proud of the data that shows approaching 90 per cent of our graduates consistently finding higher-skilled work. We will continue to invest and innovate to ensure our graduates always have an advantage in the ever-changing jobs market.

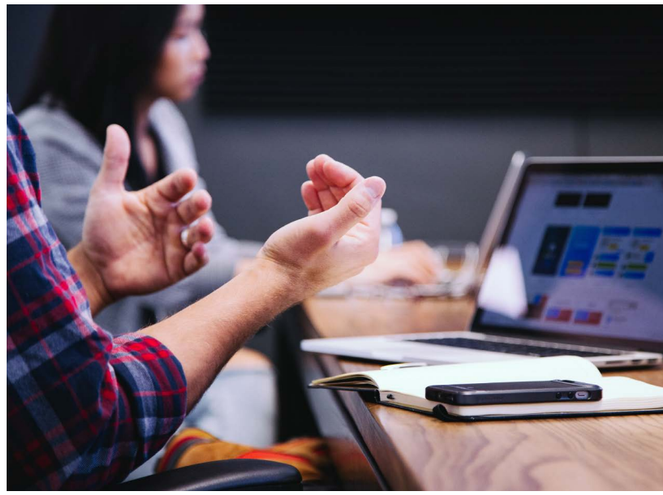


## SURREY DIGITAL INTERNS

The Surrey Digital Interns Programme was launched by Student Enterprise at the University of Surrey. The successful programme offers 10 fully funded digital internships with Student Enterprise Start-Ups and 10 digital internships with the Surrey Research Park and SETsquared small and medium-sized enterprises (SMEs).

Thanks to a generous funding pot from Santander Universities and the ERA Foundation, our talented students and graduates benefit from paid work within a small company to suit their skillset through taking on a diverse range of digital roles.

Students enjoy the opportunity to give back to the local Surrey community and start-ups, giving assistance with various digital skills including creating promotional material, digital marketing and content creation.




## UNIQUE ACCESS TO THE WORLD OF WORK

Surrey's Professional Training placements give students the opportunity to develop their professional, academic and personal potential. Placements equip students to be adaptable, resilient, globally minded, confident, entrepreneurial and digitally savvy in the workplace. These qualities are widely recognised by employers, and a significant proportion of placement students at Surrey are offered graduate-level jobs or go on to further study. Placements help students gain confidence, maturity and knowledge, find a focus for their final year of study and test out a career path.

We help students to find a placement that matches the needs of their degree and their future career plans, working with them to prepare for the role. Our exceptional careers fairs bring future employers and students together, to the benefit of both. We actively promote job creation with expanded access to banking and financial services, to ensure that everybody gets the benefits of entrepreneurship and innovation.

## LAUNCHING THE GUILDFORD SUSTAINABLE BUSINESS NETWORK

In 2021 the University of Surrey Innovation team researched need and appetite for a Sustainable Business Network (SBN) in the Guildford area, funded by the Higher Education Innovation Funding (HEIF). Surprisingly, no such network existed in Surrey, and the report found that there was significant enthusiasm from a wide range of organisations to establish one, with SMEs being the main target member group.

Surrey partnered with ZERO Carbon Guildford to set up the Guildford SBN. To better understand the challenges faced by SMEs, a baseline survey discovered that despite wishing to take steps toward decarbonisation and improved sustainability, the majority of SMEs simply do not know where to start. The SBN will therefore help businesses focus on their main sustainability objectives, and highlight the most impactful ways to achieve these.

On 14 September 2022, the Guildford SBN officially launched to a full capacity crowd in the ZERO community space. The University of Surrey's Dr Stelvia Matos talked about how to avoid some of the pitfalls and unintended consequences of innovation, and the SBN team shared the programme of activity for the next 12 months.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

# INDUSTRY, INNOVATION AND INFRASTRUCTURE

## UNIVERSITY'S SPACE TECH ADVANCES ARE DRIVING ECONOMIC GROWTH AND JOBS

Space and satellite technology is in Surrey's DNA. We are world-leaders in space research and innovation, and have a strong focus on developing and commercialising new technologies for the space industry. We are committed to playing a leading role in the future of space exploration and innovation. Our space research and business activities are helping to advance space technology and create new opportunities for economic growth and job creation.

The Surrey Space Centre (SSC) is one of the largest and most successful academic space research centres in Europe. SSC researchers are at the forefront of a wide range of space-related technologies, including satellite engineering, space propulsion, space instrumentation, and remote sensing.

The University also has a strong track record of commercialising space technologies. The SSC has spun out over 20 companies, including the highly successful Surrey Satellite Technology Ltd (SSTL), which is now the world's leading provider of small satellites.



## SURREY BOOSTS SMES WITH SPACE TECH CONSORTIUM

The University of Surrey is excited to be part of a space consortium that supports SMEs in using space technologies and applications to compete and grow.

The SPace Research and Innovation Network for Technology (SPRINT) consortium is made up of five leading space-sector universities and is the perfect "early business support-Space Sector" programme, creating great investment opportunities. Surrey's academics are champions of excellence and scholarship, and they are increasingly energised by how their research can make a difference. Academic-industry partnerships such as SPRINT exemplify and funnel this ambition.

## SURREY RESEARCHERS DISCOVER METHOD TO CAPTURE AND REPURPOSE CO2

A study from Surrey Labs has discovered technology that can capture carbon dioxide (CO2) from the surrounding atmosphere and repurpose it into useful chemicals usually made from fossil fuels. The technology uses patent-pending switchable Dual Function Materials (DFMs), that capture carbon dioxide on their surfaces and catalyse the conversion of captured CO2 directly into chemicals.

The "switchable" nature of the DFMs comes from their ability to produce multiple chemicals, depending on the operating conditions or the composition of the added reactant. This makes the technology responsive to variations in demand for chemicals as well as availability of renewable hydrogen as a reactant.

## SURREY PROJECT TARGETS COOLING OF BRAZILIAN TOWNS AND CITIES

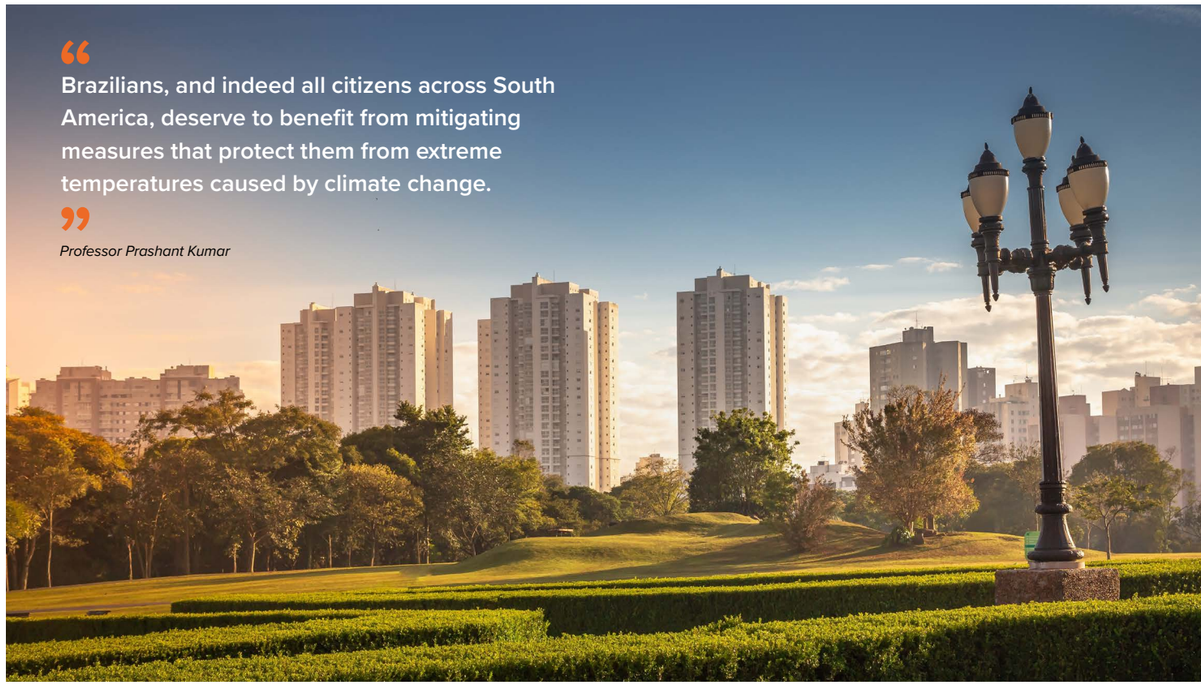
Nature-based solutions could help Brazilian towns and cities keep cool and safe from the effects of rising temperatures caused by climate change, according to a project led by the University of Surrey and the University of São Paulo, Brazil.

The GreenCities International Partnership project investigates how urban parks can help to reduce temperatures and air pollution in humid regions, such as those in Brazil and elsewhere in South America.

Professor Prashant Kumar, the Principal Investigator of the GreenCities project, said:

"Parks and green spaces in urban areas have been shown to reduce the impact of the urban heat island effect greatly, but what we don't understand is how these measures work in areas of humidity such as South America. We hope to learn and develop solutions that can keep citizens in São Paulo cool and safe."

> "Brazilians, and indeed all citizens across South America, deserve to benefit from mitigating measures that protect them from extreme temperatures caused by climate change."
>
> *Professor Prashant Kumar*



10 REDUCED INEQUALITIES

# REDUCED INEQUALITIES

## SURREY'S EQUALITY DIVERSITY AND INCLUSION PLAN

The University launched its Equality, Diversity and Inclusion (EDI) Plan 2020-2025. It outlines Surrey's ongoing and future efforts to embed EDI at the heart of our activities, and seeks to build on the significant progress that we've already achieved.

Overall, the aims of the strategy are to:

- Develop an inclusive and supportive culture
- Eliminate discrimination, harassment and victimisation
- Advance equality of opportunities.

The EDI Plan applies to everyone who visits, works and studies with us and, more broadly, anyone associated with the University. This includes staff, students, contractors, visitors and alumni, regardless of race or ethnicity, sex, gender reassignment, disability, sexual orientation, age, religion or belief, pregnancy or maternity status, marriage and civil partnership status or socioeconomic background. It works in conjunction with other relevant University policies and strategies.

## INSPIRING FUTURE GENERATIONS: SURREY'S PARTNERSHIP WITH KINGS COLLEGE GUILDFORD

The Widening Participation and Outreach (WPO) team champions the success of underrepresented students. By nurturing aspirations and supporting educational engagement, the team empowers individuals to achieve their full potential.

Through targeted outreach and engagement, the WPO team fosters aspirations, expectations, and attainment, helping students overcome barriers to higher education and thrive.

An important partnership with Kings College Guildford, and successful initiatives there, enabled the University to pilot and further develop activities before rolling them out more broadly for other schools.

Kings College is a state secondary school that is unique in both location and its approach to widening access. The school is one mile from the University, in a ward where 40 per cent of children are affected by income deprivation in comparison with 10 per cent across Surrey. A number of the students are from areas of multiple deprivation.

The vision for the Kings College partnership is to provide a 'whole school approach to providing a coherent and individualised programme of academic and pastoral support that aims to assist students in raising their aspirations and attainment'.

The University employs a member of staff, the Kings College Aspirations Lead, who is embedded in the school. A sustained programme called Finding our Futures aims for each student to participate in a minimum of three activities a year and to close attainment gaps.



## MAKE COOKING SAFE FOR ALL TO REDUCE INEQUALITY

Surrey researchers suggest that keeping non-essential occupants, such as children, out of kitchens during cooking can help reduce their exposure to hazardous air pollution levels in developing countries.

Researchers from Surrey's Global Centre for Clean Air Research (GCARE) also highlighted the benefits of using cleaner fuels and electric appliances that help reduce carbon dioxide levels within a kitchen by more than 32 per cent, compared to the use of polluting fuels.

The study is the first to monitor 60 low-income kitchens across Asia, South America, the Middle East and Africa for carbon dioxide exposure, ventilation and thermal comfort.

The team found that cooking resulted in an average increase of 22 per cent in carbon dioxide levels across the 60 homes. The low-tech act of having both kitchen doors and windows open during cooking was shown to reduce carbon dioxide levels by 14 per cent when compared with environments that only kept their doors open.

The regions involved in the study include: Dhaka (Bangladesh), Chennai (India), Nanjing (China), Medellín (Colombia), São Paulo (Brazil), Cairo (Egypt), Sulaymaniyah (Iraq), Addis Ababa (Ethiopia), Blantyre (Malawi), Nairobi (Kenya), Akure (Nigeria) and Dar-es-Salaam (Tanzania).

EDI

EQUALITY, DIVERSITY AND INCLUSION PLAN LAUNCHED

32%

REDUCTION IN CARBON DIOXIDE EMISSIONS CAN BE ACHIEVED BY USING CLEANER FUELS AND ELECTRICITY

KEEPING BOTH DOORS AND WINDOWS OPEN HELPS REDUCE CARBON DIOXIDE BUILD-UP BY

14%

11 SUSTAINABLE CITIES AND COMMUNITIES

# SUSTAINABLE CITIES AND COMMUNITIES

## FILMING THE FUTURE

Surrey's Institute for Sustainability co-created an animated film, *Remember the Future*, to inspire communities to support its vision of a sustainable world where everyone can live fulfilling and healthy lives.

The thought-provoking film seeks to win hearts and minds over to the need to collaborate and act. It achieved many accolades including :

- **Nominated for 'Best Environmental Film' at the Cannes World Film Festival**
- **Tatras International Film Festival - Best Animation**
- **Paris International Short Festival - Best Animated Short**
- **Official Selection Vancouver International Movie Awards (Semi-finalist so far)**
- **Official Selection Berlin Shorts Award (Semi-finalist so far)**
- **Official Selection Milan Filmmaker Awards (Semi-finalist so far)**
- **Official Selection Palermo International Film (Semi-finalist so far)**

*Remember the Future* was co-produced by Nathalie Hinds, Lorenzo Fioramonti and Jon Weinbren and directed by Weinbren, Programme Director for Surrey's MA in Film, Animation and Digital Arts.

Remember the Future *is an award-winning film by The Institute for Sustainability and Jon Weinbren*



Zenexton (2022) *is a contemporary amulet to ward off disease, by Surrey artist-in-residence Anna Dumitriu*

## USING ART TO ENGAGE COMMUNITIES WITH SCIENTIFIC RESEARCH

The University's first Artist in Residence, Anna Dumitriu, showcased her incredible, thought-provoking art, following her collaboration with scientists from the University of Surrey.

The event exhibited the fascinating pieces to local people, showing how scientific research can represented artistically to help those unfamiliar with the science to feel involved, start discussions and ask questions.

One of the pieces was a 3D-printed amulet containing a vaccine that is helping the world combat plague. Other pieces included sculptures painted with 'living latex' containing cyanobacteria which has the potential to capture carbon and could play a part in mitigating climate change; an embroidery made with fluorescent proteins used in quantum biology; and a carving impregnated with ancient DNA.

Anna said: "It has been a privilege to work hands-on in the laboratories at the University and use the tools and techniques of science to develop this new series of artworks that focus on complex research topics and aim to bring those ideas to new audiences."

## ENGAGING THE LOCAL COMMUNITY

Each year, Surrey invites those living in its home of Guildford to take part an annual Residents' Survey. Launched in 2015, the survey provides valuable insight, feedback and ideas to strengthen the links between the University and its home town. More than 1,000 local residents, take part each year, proving the success of the scheme in listening to, and informing our local communities.

Feedback informs our local engagement activities over the following year, allowing us to know what we're doing well – and what we could do better. Ross Kelway, Public Engagement Manager at the University of Surrey, says: "It's incredibly important that we not only support our own staff and students, but that we also support our local community. However, we can only do this if we understand what matters to Guildford residents. So this scheme is very important to us."

## PARLIAMENT MENTION FOR SURREY'S RESEARCH ON ARTS' BOOST TO INCOME AND WELLBEING

Arts and Culture contribute greatly to the local economy and improve community welfare.

This was what academics from the University of Surrey confirmed during a study on the Economic and Social impacts of the Arts in Surrey. They found that for every £10 spent at a venue, there was an further local spend of up to £13.28.

Led by Caroline Scarles, Professor of Technology in Society, and colleagues from the School of Hospitality and Tourism Management, we used our SME Innovation Voucher scheme to collaborate with the Yvonne Arnaud theatre, the Watts Gallery – Artists Village in Compton, and The Lightbox in nearby Woking.

The SME Innovation Voucher Scheme funds innovative, collaborative projects between SMEs and our world-class academics. This industry collaboration helped evaluate the range of economic and social contributions that are being made within each organisation and provided insights not only on an organisational scale, but on the potential tri-fold benefits and wider impact of culminative arts experiences to the social and economic environment of Surrey.

This project was referenced by Angela Richardson MP in Parliament in her contribution to the budget debate. It helped to provide strategic direction to the business partners involved, and evidence to support their funding applications. For our academics, the project provided a great opportunity to engage with the industry and the local arts community.

Caroline Scarles said:

> **"Working with our partners provided the opportunity, not only to reflect upon the existing role that the arts play in the economic and social health of our region, but also to provide insight into the ways in which the arts can continue to provide support to communities."**

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

# RESPONSIBLE CONSUMPTION AND PRODUCTION

## SURREY ACADEMIC DEVELOPS TOOL TO AID SOUTH EAST ASIA'S RENEWABLE ENERGY TRANSITION


*Dr Short (second from right) with workshop delegates*

In a project funded by the British Council, Dr Michael Short of Surrey's School of Chemistry and Chemical Engineering has helped develop a planning tool aimed at improving South East Asian Nations' transition to renewable energy. He promoted the research at a workshop held in Kuala Lumpur in 2022.

The decarbonisation planning project was designed to help ASEAN (Association of South East Asian Nations) meet ambitious emissions targets agreed at the Paris Agreement. During the workshop, eight speakers from the group of universities in the project team, including Dr Short, made presentations. They discussed different techniques, tools, and considerations in planning for carbon emission reductions, and presented the software planning tool developed during the COP26 Trilateral Research Initiative project. The project team has won further funding to continue the project, expanding its remit to the Philippines.

Dr Short says: "Climate change is the gravest threat to humanity's long-term prosperity, and ASEAN countries, as developing economies, have seen dramatic rises in CO2 emissions over the past 20 years.

"As academics the most important thing we can do is facilitate knowledge transfer to show how our research can improve business practices, both for decarbonisation of industries and also to improve the efficiency of processes."



## CLEAN AIR FOR ALL - UNIVERSITY'S INFLUENTIAL CAMPAIGN TO ASSESS IMPACT OF AIR POLLUTANTS

In June 2021 the University's Global Centre for Clean Air Research (GCARE) celebrated four years of research contributing to its mission of 'clean air for all'.

GCARE was set up in June 2017 by Director Professor Prashant Kumar to research the impact of air pollutants on quality of life, and how to mitigate this through engineering-driven solutions and by influencing regulatory strategies.

Led by Professor Kumar, the Centre – which sits within the Department of Civil and Environmental Engineering – has secured over £10m in research funding since its launch.

GCARE also leads RECLAIM (Reclaiming Forgotten Cities - Turning cities from vulnerable spaces to healthy places for people) - a £1.2m EPSRC-funded Network+ grant. GCARE works on this project in collaboration with the UK Centre for Ecology & Hydrology, Universities of Bath, Bangor and Warwick.

Professor Kumar says:

**"GCARE works towards the vision of clean air for all, understanding the impact of air pollution in our life. That's why we are working globally on developing fundamental research to fill the missing knowledge gaps, conducting application-orientated research to address real pollution issues, and translating this into awareness-raising and public engagement activities."**

£10M

SECURED RESEARCH FUNDING FOR GCARE SINCE LAUNCH

£1.2M

RECEIVED EPSRC-FUNDED NETWORK+ GRANT FOR RECLAIM


## GREENER HYDROGEN PRODUCTION IS ONE STEP CLOSER

New quantum chemistry research has brought us a huge step closer to being able to industrially convert methane, a greenhouse gas, into super-clean hydrogen fuel. Researchers at Surrey have found that using metal-free catalysts made from nitrogen-doped edge-decorated nano carbons could lead to a cost-effective and sustainable way to produce hydrogen.

Hydrogen fuel is a clean and renewable energy source that has the potential to decrease carbon emissions and reduce our dependence on fossil fuels. The only by-product of hydrogen fuel is water vapour, making it an environmentally-friendly alternative. However, current production methods rely on fossil fuels and metal catalysts, which can negatively affect the environment. The study's findings are a significant step forward in realising the full potential of hydrogen fuel as a clean energy source.


## LAUNCH OF SURREY'S INSTITUTE FOR SUSTAINABILITY

Institute for Sustainability
UNIVERSITY OF SURREY

In December 2022, the University of Surrey launched its new Institute for Sustainability during a special event at the Royal Society in London. Led by Professor Lorenzo Fioramonti, the Institute aims to increase the scale and enhance the excellence of the University's research and innovation on all aspects of sustainability.

The event was also an opportunity for members of the Department of Sociology to showcase some of the sustainability research being undertaken. Drawing on contacts made though her work on the Sustainable Cut Flowers Project, Dr Jill Timms provided a fantastic display of fair trade flowers, which highlighted the challenges of supplying sustainable cut flowers, but also that alternative approaches are possible. Professor Kate Burningham and Dr Anastasia Loukianov exhibited photographs highlighting their project Children and Youth in Cities—Lifestyle Evaluations and Sustainability (CYCLES). This project, from the Centre for Understanding of Sustainable Prosperity (CUSP), explored the lifestyles and aspirations of young people living in cities.

In his new role as Co-Director of the Institute for Sustainability, Dr Tom Roberts is working with colleagues across the Faculty of Arts and Social Sciences (FASS).

Dr Roberts said:

> **"We have now reached a stage in the transition to a low-carbon society where the biggest challenges are social, political and economic rather than technological, so we need to see more sustainability research designed and led by the social sciences and humanities. For example, there is an urgent need to explore what a post-carbon society might look like, how to ensure the transition is fair and equitable and how it can be brought about with the consent and support of society."**



## WORKING WITH LOCAL COMMUNITY SCHOOLS TO TALK ABOUT CLIMATE CHANGE

An innovative programme by the University of Surrey that educates local school children about climate change will be expanded into a nationwide initiative.

Surrey's Global Centre for Clean Air Research (GCARE) has designed a playful learning tool to enable school students to gain a better understanding of climate change. The Heat-Cool programme has been brought to schools across London and Surrey, and the first phase of the initiative successfully ended with Guildford County School last February. During the visits, primary and secondary school students explored the drivers of climate change by getting hands-on with practical experiments and interactive learning. They used thermal imaging technology to get real-time visualisation of heat transfer between physical objects and the environment, as well as taking part in quizzes and watching videos.

## UNIVERSITY LEADS COUNTY'S CHARGE TO TACKLE CLIMATE CHANGE WHILE BUILDING ECONOMY

Coinciding with the 2021 United Nations Climate Change Conference in Glasgow, the University of Surrey hosted two events looking at how the county of Surrey can play its role in reducing carbon emissions and moving to Net Zero by 2050 while achieving economic growth. The events were part of the ESRC Festival of Social Science 2021, an annual, UK-wide, free celebration of the social sciences.

Both events looked at global and national issues in the specific context of Surrey:

- **Engaging a Sustainable Surrey** looked at cutting-edge research on climate action and the transitions needed for Net-Zero and wider sustainability, in a Surrey context. The discussion explored what it will take to engage the whole community – citizens, businesses, public bodies and NGOs – in taking decisive action to combat climate change.
- **Charting Community Based Growth in Surrey** launched an in-depth analysis, commissioned by Surrey County Council and conducted by the University of Surrey's Centre for Britain and Europe, into how the county can evolve post-Covid and develop in a community-centred way.

Professor Amelia Hadfield, who organised both events said: "At COP26, world leaders are looking at the big picture, but each area has a role to play in tackling climate change, and this is a chance for the people of Surrey to move their thinking forward and identify how to work together, pull together, to develop the county in a sustainable way. We want communities to lead green growth and create the changes that they want to see, to maximise the wonderful assets of our county in a way which also protects them."


## NANOSTRUCTURED TIN GAS SENSORS COULD HELP THE WORLD TACKLE THE CLIMATE CRISIS

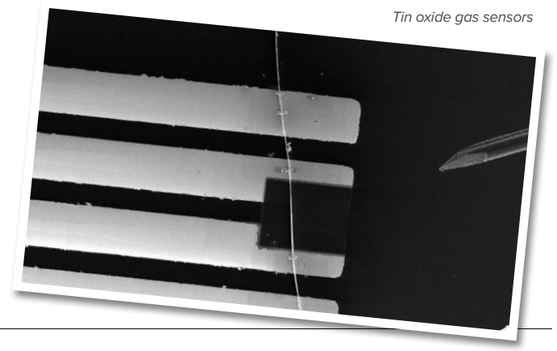
Researchers from the University of Surrey believe that tin-based gas sensors could help track and control harmful nitrogen ($NO_2$) gases that pollute our planet.

In a paper published by the *Physical Chemistry Chemical Physics* (PCCP) journal, researchers from Surrey, in collaboration with colleagues from São Paulo State University (UNESP), Brazil, detail how gas sensor devices can play an important role in the fight against climate change by monitoring emission sources such as nitrogenous gasses.

The research team used different combinations of the tin oxide system and constructed two device groups: devices containing a single structure nanofabricated in a Dual Beam Microscope; and a number of them in a "carpet" mode. The configuration of the two devices allowed the researchers to estimate the depletion layer (Debye length) of the materials and to propose gas-solid interaction mechanisms between the $NO_2$ and the reduced/stoichiometric surfaces.

Professor Ravi Silva, Director of the Advanced Technology Institute and Head of the Nano-Electronics Centre at the University of Surrey, said: "Our remarkable team of researchers at Surrey and colleagues in São Paulo have been assessing and developing gas sensor devices to help tackle the climate crisis – the top priority of our time. We will do all we can to help the world reach net zero by 2050."

*Tin oxide gas sensors*



14 LIFE BELOW WATER

# LIFE BELOW WATER

## LISTENING TO THE ELUSIVE BLUE WHALE WITH SURREY SOUND ARTIST

The University of Surrey's leading sound artist, Professor Tony Myatt, has produced a new, state-of-the-art sound and light installation featuring recordings of the elusive blue whale to draw attention to the significance of sound for ocean inhabitants, and the devastating impact sound pollution can have on marine life.

Seaphony - The Symphony of Life on Planet Ocean allowed visitors to experience the grandness of the ocean through unique and extraordinary spatial soundscapes and light, at the Alte Münze in Berlin Mitte, Germany.

The work was commissioned to support the launch of the United Nation's Decade of Ocean Science for Sustainable Development 2021-2030. The adventure in California is the subject of a three-part podcast from *The Guardian*, entitled Deep Blue Notes.

## SURREY HOSTS GLOBAL WORKSHOP TO PROMOTE MARINE RENEWABLE ENERGY

The University of Surrey hosted a two-day workshop on marine renewable energy with North Carolina State University and the University of Wollongong. Dr. Liang Cui from Surrey was the main organiser. The workshop aimed to disseminate the proof-of-concept studies on the development of a hybrid energy harvest platform integrating various marine renewable energy devices and energy storage devices. It also aimed to establish a research consortium and discuss the potential of future internationally collaborative research projects.

## ADDRESSING THE GLOBAL SHORTAGE OF WATER AND ENVIRONMENTAL ENGINEERS

There's a global shortage of qualified professionals who specialise in water and environmental engineering. Students of our Water and Environmental Engineering MSc all share the global interest in water quality, sanitation and integrated water resources management. Our UK and international cohorts will be transformed through their studies into experts on water and environmental sustainability, ready to tackle the industry's complex challenges.

The fully accredited course is taught by experts from our Centre for Environmental Health and Engineering (CEHE). This sits within our Department of Civil and Environmental Engineering and is a designated World Health Organization Collaborating Centre for the Protection of Water Quality and Human Health.

Our course is increasingly popular and relevant to the needs of future engineers, scientists and professionals in environmental health, water quality, sanitation, water resource management, pollution control and other sectors.

## ROBOTICS RESEARCHERS TURN THE PUBLIC'S IDEAS INTO 'ROBO-FISH' REALITY

A robot fish that filters microplastics has been brought to life after it won the University of Surrey's public competition - The Natural Robotics Contest.

The robot fish design, which was designed by student Eleanor Mackintosh, was selected by an international panel of judges because it could be part of a solution to minimise plastic pollution in our waterways.

The competition, which ran in the summer of 2022, was open to anyone who had an idea for a bio-inspired robot, with the promise that the winning design would be turned into a working prototype.

Dr Robert Siddall, Lecturer at the University of Surrey and the contest's creator, says:

> **"We don't know where the vast majority of plastic dumped into our waterways ends up. We hope that this robo-fish and its future descendants are the first steps in the right direction to helping us to find and eventually control this plastic pollution problem."**

The contest received ideas from across the globe, ranging from forest-protecting bear robots to crab-inspired space rovers – and even a robotic sea urchin.

15 LIFE ON LAND

# LIFE ON LAND

## GIVING HABITAT A HOME ON CAMPUS – AND IN LOCAL COMMUNITIES

During the summer of 2022, the University celebrated the launch of the 'HABITAT – community eco spaces' project, with the installation opened by the Mayor of Guildford, Councillor Dennis Booth. This project, led by Surrey Hills Arts and funded by Arts Council England, explores how artists and artworks can positively contribute to increasing biodiversity in urban spaces. One area of our campus has been transformed by four artists to attract and help wildlife. The venture was supported by our Centre for Environment and Sustainability; our Horticulture and Landscape team; and our Archives and Special Collections team. Surrey Wildlife Trust also advised on the project.

In addition to the campus-based aspect of this project, Surrey Hills Arts worked with the artists to create workshops with local community groups including Halow, The Hive and King's College secondary school. Professor Richard Murphy, Director of Surrey's Centre for Environment and Sustainability said:

"It has been a delight and privilege for the University to work in partnership with Surrey Hills Arts and others on this inspiring 'HABITAT' community eco-space on our campus. This is a perfect fit with our biodiversity and wellbeing ambitions – both for our communities and more widely in Guildford and Surrey. We will be looking after it carefully and are excited to see its evolution and impact."



## A FAST GROWING NATURE DATA BUSINESS RUN BY OUR ALUMNI MOVES TO SURREY RESEARCH PARK

NatureMetrics relocated to Surrey Research Park to expand its growing business delivering biodiversity data to business, NGOs and governments using DNA. The company is run by three Surrey alumni and employs over 45 people. It surveys biodiversity using tiny traces of DNA left behind in the environment by all species, from bacteria to blue whales.

The business is set for rapid growth as the world wakes up to the urgency of reversing the current decline in nature. The company equipped its new 6000-square-foot laboratory with cutting-edge technology. This will ensure that the tiny quantities of DNA present in samples can be extracted and reported to their clients, a method they have perfected over the company's history.

This collaboration will bring high-value jobs to Surrey and help grow a product range that provides data to businesses about their biodiversity impacts, using DNA left behind in water and soil.

## MORE LOCALISED, IMPACT-BASED ALERTS COULD MITIGATE EFFECTS OF EXTREME WEATHER

England's extreme weather warning system could be further refined using an impact-based alert system to help mitigate the public health effects of heatwaves, according to a new study from the University of Surrey.

The summer of 2020 saw an estimated 2,556 excess deaths during episodes of heat in England – the highest since the Heatwave Plan introduced by the UK Government in 2004.

According to modelling undertaken as part of the third Climate Change Risk Assessment (CCRA3) for the UK, excess deaths due to hot weather could rise to around 7,000 by 2050 and around 12,500 per year by 2080.

## GARFIELD WESTON FOUNDATION FUNDING ADDS NEW HABITATS TO TRAILBLAZING WILDLIFE PROTECTION PROJECT

Nature in Surrey's wetlands, urban areas and urban fringes will benefit from a grant of £200,000 from the philanthropic Garfield Weston Foundation.

This donation will allow scientists at the University of Surrey and ecologists at the Surrey Wildlife Trust, Buglife and Painshill Park Trust to expand their trailblazing Space4Nature work, which combines satellite Earth Observation, Artificial Intelligence (AI) and citizen science to boost biodiversity in Surrey.

The new funding follows the £1.25m Dream Fund 2022 award from players of the People's Postcode Lottery. This means a wider range of habitats can be studied, adding Surrey's towns and wetlands to the grassland, heaths, chalk downland and woodland already being researched through Space4Nature.

Professor Richard Murphy, Director of the Centre for Environment and Sustainability, University of Surrey, said:

**"It's fantastic we're getting this grant to enable more types of habitats and more areas in Surrey to benefit. By combining information from local people exploring nature with AI and satellite images, we are developing a new way to protect and enhance nature, boosting biodiversity.**

**Garfield Weston's support will mean we can look at wetlands, which are particularly sensitive to climate change, and urban and peri-urban areas, which are on the edges of Surrey's many towns and villages. More funding means we can help more nature recover."**

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

# PEACE, JUSTICE AND STRONG INSTITUTIONS

## THE UNIVERSITY OF SURREY IS AT THE FOREFRONT OF RESEARCH INTO ARTIFICIAL INTELLIGENCE BIAS IN PREDICTIVE POLICING

The artificial intelligence revolution is upon us. At present, AI cannot fully understand the difference between right and wrong, or gauge judgement on any ethical basis. Yet it is being employed, ungoverned, by law enforcement around the world to predict criminal behaviour.

Research at the University of Surrey into AI points to police scrutiny expanding into a guessed-at and institutionally biased future.

The Surrey research is already informing the US Congress, the UK Government and the judicial system in the Republic of Korea.

“If machines are trained on biased data, they too will become biased,” says Surrey’s Professor Melissa Hamilton, Professor of Law and Criminal Justice at Surrey.’

“Communities with a history of being heavily policed will be disproportionately affected by predictive policing.”

Public bodies and all 43 police forces in the UK are free to individually commission whatever tools they like or buy them from companies eager to get in on the burgeoning AI market.

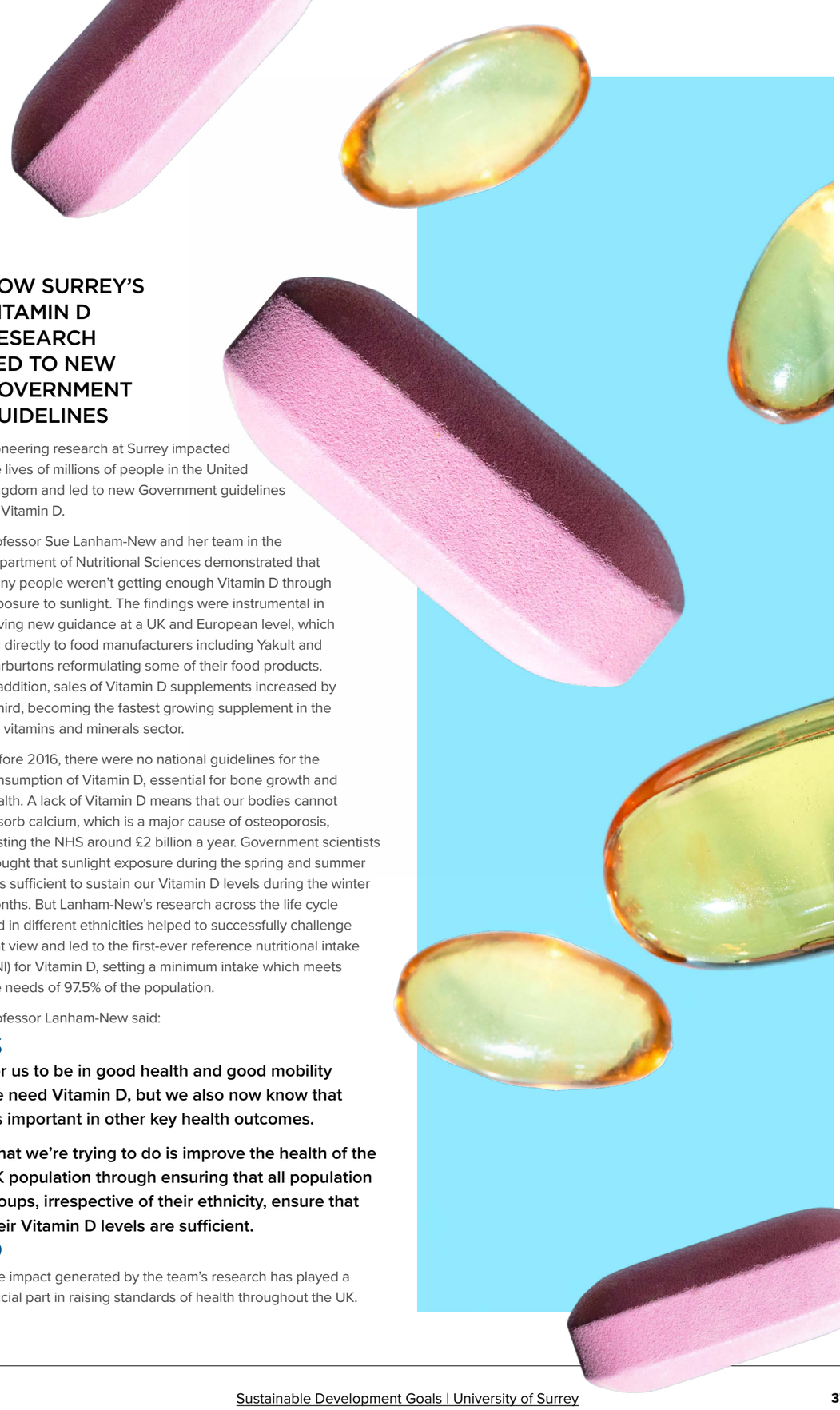
At the University of Surrey, Professor Hamilton’s research is trying to increase transparency by providing an independent review of how algorithmic risk is operating in practice.

Her research also chimes with the House of Lords and the US Congress premise calling urgently for a regulatory framework.

But Hamilton warns that the technologies will advance quicker than the regulatory regime can be completed:

**“There needs to be some middle ground. We need more public education as citizens have a right to know something about how the government uses technologies that might impact their lives.”**





## HOW SURREY’S VITAMIN D RESEARCH LED TO NEW GOVERNMENT GUIDELINES

Pioneering research at Surrey impacted the lives of millions of people in the United Kingdom and led to new Government guidelines on Vitamin D.

Professor Sue Lanham-New and her team in the Department of Nutritional Sciences demonstrated that many people weren’t getting enough Vitamin D through exposure to sunlight. The findings were instrumental in driving new guidance at a UK and European level, which led directly to food manufacturers including Yakult and Warburtons reformulating some of their food products. In addition, sales of Vitamin D supplements increased by a third, becoming the fastest growing supplement in the UK vitamins and minerals sector.

Before 2016, there were no national guidelines for the consumption of Vitamin D, essential for bone growth and health. A lack of Vitamin D means that our bodies cannot absorb calcium, which is a major cause of osteoporosis, costing the NHS around £2 billion a year. Government scientists thought that sunlight exposure during the spring and summer was sufficient to sustain our Vitamin D levels during the winter months. But Lanham-New’s research across the life cycle and in different ethnicities helped to successfully challenge that view and led to the first-ever reference nutritional intake (RNI) for Vitamin D, setting a minimum intake which meets the needs of 97.5% of the population.

Professor Lanham-New said:

**“For us to be in good health and good mobility we need Vitamin D, but we also now know that it’s important in other key health outcomes.**

**What we’re trying to do is improve the health of the UK population through ensuring that all population groups, irrespective of their ethnicity, ensure that their Vitamin D levels are sufficient.”**

The impact generated by the team’s research has played a crucial part in raising standards of health throughout the UK.

17 PARTNERSHIPS FOR THE GOALS

# PARTNERSHIPS FOR THE GOALS

## GUILDFORD LIVING LAB AND GREEN PARTY SET UP LOCAL TOWN'S FIRST AIR POLLUTION MONITORING NETWORK

Surrey's Global Centre for Clean Air Research (GCARE) and Guildford Living Lab (GLL) helped to implement the Green Party's initiative to measure pollution levels around Woking over 12 months.

Eight portable particulate matter (PM) air pollution sensors were installed at different locations, from south west Woking to nearby Byfleet, and were also used to measure pollution levels near to Woking centre and on busy main roads at peak traffic times.

As part of the initiative, the GLL team at Surrey – led by Professor Prashant Kumar – conducted a laboratory assessment of the Davis Airlink sensors used in the initiative, in GCARE's state-of-the-art ENVILUTION chamber. The team worked closely with Woking Green Party to evaluate the measurement results after three, six and 12 months, giving a full picture of pollution levels throughout the year.

Professor Prashant Kumar, founding Director of GCARE and Associate Dean (International) said:

> **It is highly encouraging to see community groups coming forward to help fight the intractable issue of air pollution. This is an excellent example of a community-run sensor network collaborating with researchers from GCARE as a part of our GLL commitment to work with local communities. The initiative is taking a truly 'citizen science' approach and we are very much looking forward to continuing to work together with this group of highly driven and committed people to help bring positive change to the air pollution situation in Woking.**

Woking Green Party member Nigel Ridgeon said: "It's critical to the success of the Woking initiative that the air pollution data we gather is of the highest quality, and that the public can access the findings easily. Close collaboration with Professor Kumar of the University of Surrey and Prodata Weather Systems (UK distributor of Davis Instruments) has therefore been crucial to our initiative. Woking Green Party looks forward to being able to deliver real insight into pollution levels which will drive better decisions and actions regarding the Woking environment."

## SUSTAINABLE DEVELOPMENT GOALS

At Surrey, we are strongly committed to creating a sustainable future, and the United Nations' Sustainable Development Goals (SDGs) are woven into our research, teaching and day-to-day life.

Through our Institute for Sustainability we are undertaking multidisciplinary research aimed at bringing us closer to sustainable living, net-zero energy, clean air for all, and sustainable prosperity. On our campuses we are committed to net-zero carbon emissions by 2030 and are working towards ambitious targets for heat de-carbonisation, solar power generation and electrifying our vehicle fleet, among other projects.

The Times Higher Education (THE) Impact Rankings are global performance tables that assess universities against the United Nations' Sustainable Development Goals (SDGs). The University of Surrey ranked 55th in the 2022 Impact Rankings and 61st in 2021 Impact Rankings. We provided evidence to show how we contribute to 13 of the 17 SDGs, in 2022, and 12 in 2022, excellent increases on the eight in the 2020 rankings.

Nathalie Hinds, Head of Operations and Partnerships for the Institute for Sustainability said: "Surrey had tangible strengths in sustainable consumption, production, and sustainable tourism practices: our colleagues in Surrey's Governing Plastics Network, our Sustainability and Wellbeing in the Visitor Economy, and our Energy and Materials research teams taking a lead in progressing SDG 12 and SDG 11. This was reflected in our performance within THE Impact Rankings since 2019."

390
INTERNATIONAL PARTNERSHIPS

## MORE THAN 390 ACTIVE INTERNATIONAL PARTNERSHIPS IN OUR GLOBAL NETWORK

With hundreds of active international partnerships, Surrey has a far-reaching and multilateral global outlook, encompassing research, teaching, professional training, and student and staff exchange activities. We're a founding member of the University Global Partnership Network (UGPN), a foundation for international collaboration that enables academics and students from the world's top universities to develop sustainable, world-class research, education and knowledge transfer through collaboration.

## GLOBAL GRADUATE AWARDS

Delivered by specialists from across the University and beyond, our Global Graduate Awards are a series of free extracurricular courses unique to the University of Surrey. They are available in global citizenship, languages and sustainability.

Our students' chosen awards are taken alongside their course of study and appear on their final transcript, providing an excellent opportunity to expand their horizons and enhance their employability.

Our Global Graduate Award in Sustainability improves students' understanding of the world we live in. They gain an in-depth understanding of a wide range of issues affecting the sustainability of our planet including:

- The environment: including climate change and biodiversity loss, as well as resource management for energy, food and water provision.
- The economy: including discussion of taxes, subsidies, economic growth, corporate social responsibility and supply chains.
- Social issues: Spanning the sociology and psychology of sustainability, environmental law and sustainable tourism. and the possible solutions to resolve these.

ONE OF OUR HIGHLIGHTS WITHIN THE 2021 THE RANKINGS WAS ACHIEVING

4TH

POSITION IN THE UN'S DECENT WORK AND ECONOMIC GROWTH GOAL (SDG 8)

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