MEDCITY

UNLEASHING INNOVATION

A Sustainable Future for London's Life Science Sector 2021

MEDCITY

INTRODUCTION

– Neelam Patel, CEO, MedCity

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CEO, MedCity

The human race thrives at turning crisis into opportunity, and climate change is perhaps the greatest crisis of our time. During 2021 we have witnessed an intense focus from governments, businesses, academia, and wider society looking to address this crisis, including from those of us in healthcare and the life sciences sector.

Last year, life sciences and healthcare pioneers stepped up to meet a significant and unknown challenge head on. Much like our response to the COVID-19 pandemic, tackling climate change requires whole areas of business and health systems to adapt, with new levels of cooperation and collaboration required to implement the most impactful, least disruptive, solutions. To achieve this, London will be a catalyst, this time in the green healthcare revolution, accelerating the UK's contribution to the global effort in tackling the effects of climate change.

In November, the UK Government hosted the 26th Conference of the Parties (COP26) of the United Nations Framework Convention on Climate Change. To deliver on commitments made at COP26 and in striving to go beyond these, governments cannot act alone. Imagine what life sciences will achieve as we move into a bold new future with the UK, and London, as a global hub for green healthcare innovation.

Unleashing Innovation 2021 showcases the green shoots of the "Green Healthcare Revolution". Across the healthcare and life sciences sector, innovators and scientists in academia, industry and the not-for-profit sector are already working tirelessly to research and implement solutions to the challenges governments are looking to address.

By acting now, we can do our part to help meet the UK Government's target to cut emissions by 78% by 2035[1], and achieve net zero by 2050. We can achieve this through developing and scaling up sustainable technologies and processes in the life sciences that deliver wider benefits to society, the economy, and the environment. Globally, healthcare is thought to account for the equivalent of 4.4% of net emissions – this is two gigatons of carbon dioxide [2]. The health of the planet is inextricably linked to our health, and how we develop and deliver these services. London's health and life sciences cluster is transforming to respond to the call for decarbonisation in healthcare delivery and medical research.

References

[1] UK enshrines new target in law to slash emissions by 78% by 2035 - GOV.UK (www.gov.uk)

[2] Health Care's Climate Footprint - publications https://www.arup.com/-/media/arup/files/publications/h/health-cares-climate-footprint.pdf [accessed 24/11/2021]

By nurturing and supporting innovative new technologies, the UK can take a leading role in the response to the climate crisis, and secure its position as a global science superpower, tackling the health emergencies and potential inequalities a changing climate threatens. The Government's £1.5bn investment for net zero innovation announced at the Spending Review can go a long way to support creating a global hub for green R&D in the life sciences.

MedCity is incredibly proud to foster collaborations and partnerships across London's research and health ecosystem, and beyond. From 2022, MedCity will be supporting partners in the London life science cluster – from industry large and small, academia and spin outs to investors and the NHS – to create partnerships in life sciences that reduce carbon and waste and increase adaptation technology, research and development.

Unleashing Innovation 2021 demonstrates the difference that the life sciences are making in a range of areas: greener labs, medicine, impacts, biotech, partnerships, and homes. Collaboration, innovation, and excellence are at the heart of all the case studies shared here. The richness of what is happening in London across universities, biotech companies, investors and the NHS is anchoring London as a future global leader in sustainable healthcare. We want to make the UK a global hub for net zero R&D and life science, with London as the gateway.

And that is why, today, we are launching a call to action across the healthcare and life sciences community – to commit to real, meaningful action.

We are networked across the globe as healthcare and life sciences professionals. Looking to the future, and the long-term decarbonisation of life sciences driven by green and clean technologies.

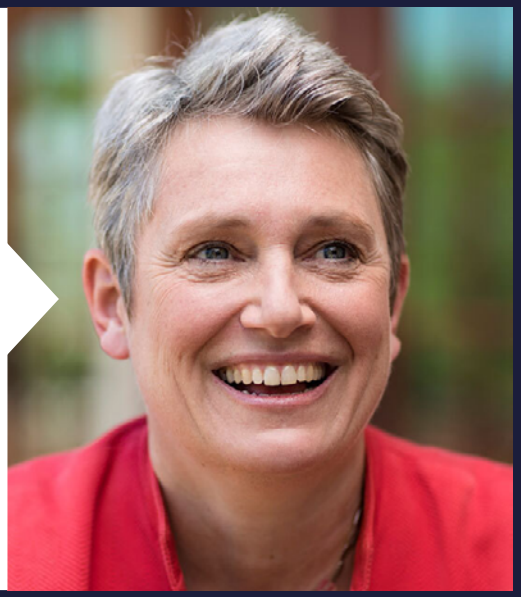
Next year we will launch a consultation as a first step to making this happen. If you work in the healthcare or life sciences, whether you're a fledgling start-up or a multinational corporation, we want to hear from you. Contact us at medcity@ovidhealth.co.uk and become part of the conversation, helping us make 2022 the year we establish the life sciences as a leading force for good in the green industrial revolution.

FOREWORD

by Dame Kate Bingham, DBE

"I'm delighted to be writing the foreword for this year's Unleashing Innovation 2021 report, which celebrates a range of groundbreaking and innovative research and development projects across the MedCity network."

Dame Kate Bingham, DBE
Managing Partner, SV Health Investors
MedCity Advisory Board member



I'm delighted to be writing the foreword for this year's Unleashing Innovation 2021 report, which celebrates a range of groundbreaking and innovative research and development projects across the MedCity network.

Last year, the successful roll-out of the COVID-19 vaccine programme showcased the incredible skill, expertise, dedication, and overwhelmingly collaborative response from so many healthcare and life science professionals. This collaborative response to the pandemic is what we celebrated in last year's *Unleashing Innovation 2020*. This year we're celebrating the same level of ingenuity and creativity in the sector's response to the potentially devastating impacts on our way of life and health threatened by climate change. As innovation led solutions to this challenge are required, we must again come together to deliver this as experts in our field.

This year's COP26 meeting hosted in Glasgow and the UK Government's *Roadmap to Sustainable Investing* make it clear we need a sustainability-first culture across healthcare and the life sciences. I am hugely impressed with how far we have come in a short space of time as a sector. Innovation is our solution to the challenges facing us, but only through scaling up sustainable healthcare and R&D solutions and investing in them can we succeed. We all have a part to play in this, as Bill Gates said in his recent speech at COP26, we must fund and build a green industrial revolution; this is an imperative to address climate change.

Whether it's green laboratories, biodegradable plastics, or revolutionary new green technology – the life sciences sector can make a real impact on decarbonisation, with London becoming a global hub of research in sustainable healthcare and life science R&D. Investors will play their part too, and indeed they already are – with sustainable investment a leading priority for those of us based in the UK. In fact, we already know from *recent polling data* that 100% of UK asset managers have explicit environmental assessments in their investment process in 2021.

So, as you read this report showcasing what the MedCity community is doing, keep in mind these are the green shoots of a coming revolution in green healthcare and life sciences. We have a bold bright future ahead, in tackling the challenges of global warming through science and technology, whilst continuing to deliver world-leading care and innovative treatment.

Here at MedCity we are excited to bring these case studies to you, and to celebrate the cutting-edge work already taking place across London, as we continue to strive to be a force for good, as well as a network of excellence.

GREENER LABS

Lab Efficiency Assessment Framework (LEAF)

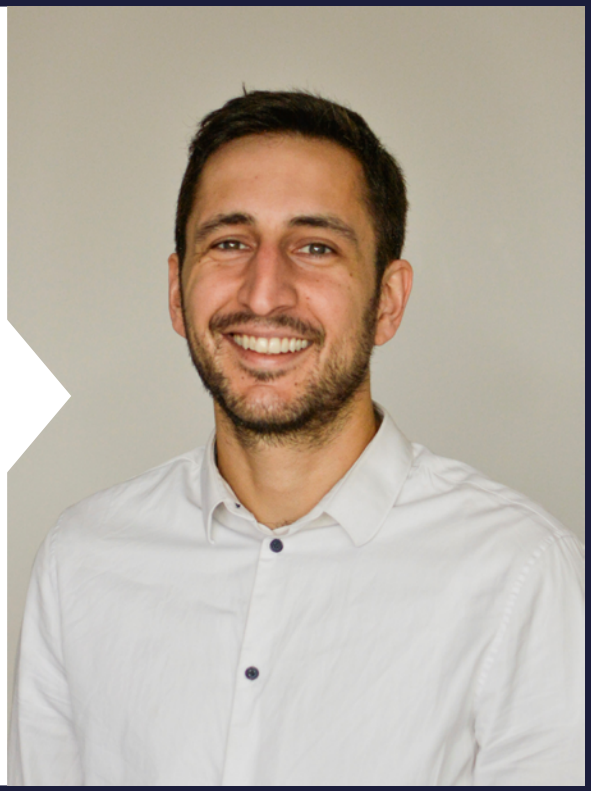
LEAF enables lab users to save plastics, water, energy and other essential resources. Developed by Sustainable UCL and piloted in 23 institutions and more than 230 laboratory groups in the UK, the online tool provides a list of actions which lab users can take to be more sustainable.

Labs are awarded either a Gold, Silver or Bronze level depending on how many sustainability actions they take.

LEAF's built-in calculators enable labs to estimate the impact of their actions in both carbon and financial terms.

"On average, each participating lab group reported avoiding 2.9 tonnes of CO_2 emissions, reducing their costs by £3,700 each."

Martin Farley
Lab Efficiency Assessment Framework



GREENER LABS

Person Environment Activity Research Laboratory (PEARL)

University College London's PEARL is both the university's first research building in East London, and their first net zero carbon building.

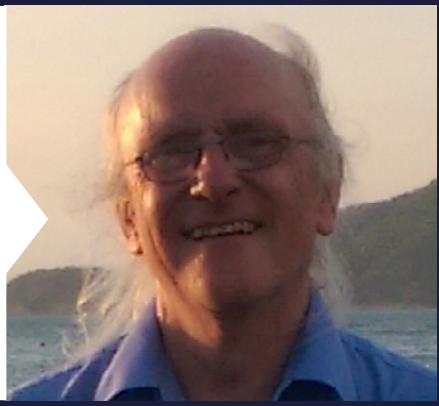
PEARL produces its own energy from solar panels that span the roof, supplying all of its energy needs.

Opened this year, PEARL's construction used only durable materials and since occupying the site, UCL has planted more trees and installed box planters to reduce air pollution and support local biodiversity.

As the design of PEARL's systems – including the Heating and Ventilation systems - is exceptionally energy efficient, it only uses about one third of the total energy generated. PEARL then shares approximately one third of the surplus energy with the rest of the science park where it is located, before the remaining third of the energy is exported to the National Grid. This means that the building's energy consumption is actually carbon negative.

"Since May 2021, PEARL has saved around 80 tonnes of carbon emissions and 'planted' the equivalent of over 3,000 trees."

Nick Tyler
Person Environment Activity Research Laboratory



Unleashing Innovation 2021: Effective and sustainable public health solutions

Arctech Innovation, a spin-out from the London School of Hygiene & Tropical Medicine (LSHTM), is developing and commercialising effective, sustainable, and environmentally friendly public health solutions that support those most at risk, whilst tackling the impact of climate change on health.

DIAGNOSTIC DOGS

This includes sustainable and eco-friendly diagnostic solutions, such as trained dogs which can detect COVID-19. Partnering with the Medical Detection Dogs charity, LSHTM and Durham University, the team produced positive Phase 1 clinical trial data – when used in combination with PCR tests, the dogs were able to detect COVID-19 with up to **94% accuracy**, averting 2.2 times the transmission compared with isolating alone. The dogs are now in training in real-world settings.

REUSABLE SENSORS

The company is also developing a reusable electronic sensor device that can provide rapid screening for hundreds of people for COVID-19, and is a sustainable and environmentally friendly solution in stark comparison to single-use PCR and LFT tests that cause significant plastic pollution.

ORGANIC INSECT CONTROL TOOLS

Arctech Innovation is also developing insect control tools using organic volatile odour compounds. These are sustainably produced and minimise the use of harmful insecticides that contaminate the environment and affect non-target organisms.

*Photo: Neil Pollock, Diagnostic Dogs

GREENER MEDICINE

Plastic is not fantastic

Chelsea and Westminster Hospital NHS Foundation Trust,
Ms Katsarma, Zoe Thompson and Dr Armes

Chelsea and Westminster NHS Hospital Foundation Trust Hand Clinic are working on a project to reduce the amount of non-biodegradable thermoplastics used to make hand splints. Splints are a vital and unavoidable part of treatment, but are often only needed for a few months.

Production and disposal of these plastic splints uses harmful chemicals and creates large amounts of non-biodegradable waste, often sent to landfill. Introducing a biodegradable woodchip material for splints, and one that matches the thermoplastic material in its qualities of stability and ability to mould and remould, has dramatically reduced the amount of plastics being used.

84%

A survey of patients showed that 84% wanted to see the NHS using more eco-friendly materials

GREENER MEDICINE

Body cooling device

“Every year, over 489,000 people die from extreme heat, and this is projected to increase by 257% by 2050. We’re here to change that”

Matt Anderson
CEO of CryogenX

Cryogenx is looking to revolutionise current treatments for heatstroke, something that is set to become a growing problem with climate change driving up the number of heat-related fatalities by 257%.

The most effective current treatment is a full body ice bath, but this typically requires transportation to a hospital.

Operating out of the Central Research Laboratory in London, in response to this challenge, Cryogenx is developing a portable and wearable high performance body cooling device designed to revolutionise heat stroke treatment.

A powerful coolant stored within compact, portable canisters is injected into conductive pads delivering instant and sustained cooling. This wearable body cooling technology delivers comparable cooling capacity to an ice bath, but using comparably minimal resources.

The product can be transported and operated by a single person, and cooling is able to continue during patient transportation.

GREENER TECH

Creating a circular bioeconomy

Imperial spinout Lixea is challenging the chemical industry to move us away from crude oil usage through the creation of a circular bioeconomy.

Their process transforms waste plant matter into input materials for fuels, chemicals, and materials.

Their innovative Dendronic® process separates the different naturally occurring chemical components of wood to allow them to be used in a variety of applications such as biochemicals, precursors for plastics, or as new materials themselves.

The company is currently focussed on building their pilot plant in Sweden, which will use waste sawdust from a nearby timber mill.

In the long-term, Lixea is looking to convert part of the 100 million tonnes of unrecycled waste wood that are produced in the EU and US every year.

GREENER TECH

Biotransformation – biodegradable plastic

A start-up based at Imperial's White City Campus, Polymateria has pioneered innovative "biotransformation" technology that alters the properties of plastic to make it biodegradable.

This technology has enabled Polymateria to create a plastic cling film that breaks down in under a year.

Polymateria has also developed rigid plastic material that breaks down in natural environments in under a year.

It is the first polyethylene film independently proven to be both recyclable and biodegradable in the natural environment.

GREENER TECH

BioSolar Leaf

Imperial College London alumnus-founded start-up Arborea is developing pioneering technology to purify air by exploiting photosynthesis in microscopic plants such as microalgae and phytoplankton.

Grown on large, solar panel-like structures, the 'BioSolar Leaf' removes greenhouse gases from the environment whilst generating breathable oxygen. These can then be installed on land, buildings, and other developments to improve the surrounding air quality.

Imperial College London has partnered with Arborea on a pilot project, funding the installation of the BioSolar Leaf cultivation system on its White City Campus South Site.

Arborea's cultivation system could remove CO_2 and produce breathable oxygen at a rate equivalent to one hundred trees.

GREENER RESEARCH

CHILL COGNITION

Transport contributes to 27% of the UK's greenhouse gas emissions, with the major proportion derived from personal and commercial car use. Reducing car use or accelerating the transition to non-exhaust emitting vehicles is not only essential for the UK to meet its net zero objectives, it also provides tangible health benefits to the population by reducing emissions of fine particulate matter and nitrogen dioxide. To help quantify these benefits, researchers from Queen Mary University of London, Imperial College and the University of Leeds are evaluating the impact of London's Ultra Low Emission Zone (ULEZ) on children's development, in a project funded by Barts Charity. The project is investigating whether improvements in air quality due to the introduction of the ULEZ helps cognitive and motor development and decreases mental ill health in children growing up in heavily populated urban areas. This work forms part of the larger National Institute for Health Research's 'Children's Health in London and Luton (CHILL)' study, which is investigating the impact of the ULEZ on the respiratory health of primary school children.

GREENER RESEARCH

Breathe London

Originally launched in December 2020, the Breathe London project was set up to tackle the challenge of London's air pollution, making high-quality, reliable data on air quality available and affordable to community groups, charities, businesses, researchers and other stakeholders. On Clean Air Day 2021 (17th June), Mayor of London Sadiq Khan announced a significant expansion of the Breathe London project. The expansion added 131 additional air quality sensors with more than 300 air quality sensors in total now installed at hospitals, schools, and other priority locations around London. This project is a partnership between Imperial College London and the Mayor of London supported by Bloomberg Philanthropies.

GREENER RESEARCH

The Global Vector Hub

ArcTech Innovations, a London School of Hygiene and Tropical Medicine spin out company, are building international epidemic preparedness and capacity to cope with the public health challenges our changing climate will bring. They are creating the first open-access database of vector control information for researchers, public health officials and wider public use. The Global Vector Hub revolutionises the way we monitor the transmission pattern of vector-borne diseases. In the future, ArcTech wishes to expand the scope of this project by incorporating data from national vector control programmes to grow their repository of data and further vector control research.

GREENER RESEARCH

Net Zero Innovation Programme

Launched jointly by UCL and the Local Government Association (LGA) in 2020, the Net Zero Innovation Programme helps councils and universities address climate change at a local level. Bringing together partnerships of researchers and climate change officers from councils across all the regions in England, NZIP leads action to reduce carbon emissions, transition to net zero, and ultimately to improve the quality of life for local communities. The scope of projects addressing climate-related challenges is broad, tackling anything from improving air quality to decarbonising transport to adaptation measures that aim to reduce the impact of climate change on the most vulnerable communities. The programme offers training, funding and support and looks to expand partnerships for and between those operating in the climate response space.

GREENER MEDICINE

Reducing carbon emissions through use of reusable gowns

(Imperial NHS Trust)

This eight-week trial in Imperial Surgical Innovations centre theatres, using reusable gowns, found a reduction in associated carbon footprint of just over one tonne of CO_2 equivalent and was cost-neutral. It found that 91% of staff surveyed rated the reusable gowns positively after using them clinically. This trial has also been replicated in radiology, with similar success, and Imperial NHS Trust is working to better understand the business case and logistics required to roll this out across the Trust.

GREENER MEDICINE

Patients Know Best

Patients Know Best provides a revolutionary integrated personal health record which consolidates health, social care and patient-generated data. A patient's access and contribution to their record enables supported self-management of their health. State-of-the-art shared care planning functions also enable patients to interact with their healthcare providers remotely, with capability for patients and clinicians to collaborate, 'co-edit' and 'co-produce' care plans, for ultimate personalised care. Patients Know Best enables organisations and regions to decrease the carbon footprint associated with the delivery of care by reducing the need for patient travel and reducing emergency admissions. So far, Patients Know Best has realised a 127,000kg reduction in CO_2 emissions.

GREENER MEDICINE

Reducing carbon emissions, one gas at a time (Innovation/QI project)

(Chelsea and Westminster Hospital NHS Trust)

Chelsea and Westminster Hospital NHS Foundation Trust is reducing their carbon emissions by minimising their use of nitrous oxide as an anaesthetic gas in paediatric care. Nitrous oxide use accounts for the biggest contribution to carbon emissions from anaesthetic gases in acute NHS hospitals. Using targeted education sessions and Trust-wide guidelines on reducing the use of nitrous oxide, the Trust aims to reduce the consumption of nitrous oxide under anaesthetic care. Going forward, Chelsea and Westminster Hospital NHS Foundation Trust want to become a leading example of how anaesthetic paediatric care can be safely adapted to support the NHS' vision of carbon neutrality by 2040.

GREENER MEDICINE

Minimising unnecessary cannulations in Charing Cross Emergency Department

(Imperial NHS Trust)

Imperial NHS Trust is looking to reduce their emissions from single use plastics, committing to a 10% reduction in clinical single-use plastics in the short-term. To do this, they are looking at reducing the number of patients cannulated in their Charing Cross Emergency Department. While 86% of patients attending 24-hour consultant-led A&E departments were cannulated, over 40% of these cannulas were not used. Engagement with phlebotomy and nursing staff, alongside internal communication campaigns led to a 25% decrease in cannulation during A&E attendance after 12 months. This resulted in an annual reduction in carbon emission of approximately 19,000kg CO_2 equivalent.

GREENER MEDICINE

Reducing carbon emissions through the use of remanufactured devices

(Imperial NHS Trust)

Imperial NHS Trust has been looking to reduce their waste through returning their single-use medical devices such as scalpels and electrophysiology catheters, which are then being cleaned, disinfected, sterilised, tested and restored to meet technical and safety standards, and then bought back at a reduced rate. This has been shown to halve the carbon footprint associated with the manufacturing of these devices. Currently, these remanufactured devices are being trialled in the Trust, with plans to expand current trials to multiple departments.

GREENER MEDICINE

The Royal Marsden

The Royal Marsden Hospital is looking to lower the environmental impact of their anaesthetic care by altering the types of anaesthetics used from Desflurane, a highly fluorinated methyl ethyl ether, to more Total Intravenous Anaesthesia methods. Switching to Total Intravenous Anaesthesia methods have been demonstrated to have a significantly lower impact on the environment. Simultaneously, they are looking to address fresh gas flow rates during anaesthesia to extend the use of CO_2, reducing transportation and glass waste.

GREENER MEDICINE

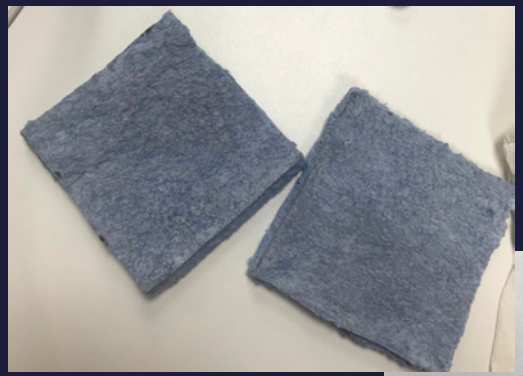
Guy's and St Thomas' NHS Foundation Trust

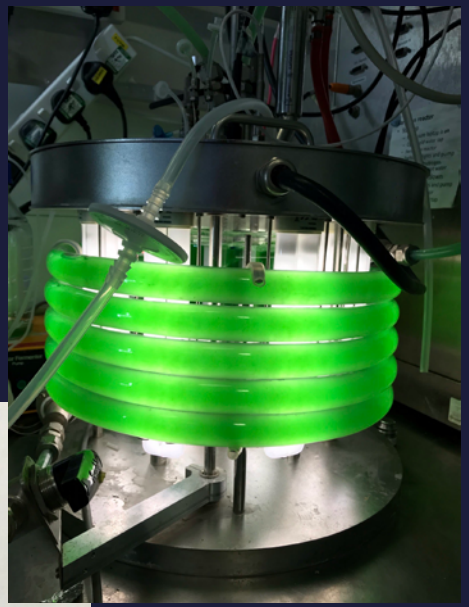
Guy's and St Thomas' is pioneering green delivery services, becoming the first NHS trust in the country to pilot a riverboat delivery service. This move hopes to decrease the number of trucks on the road in the country's capital while providing a reliable delivery route into London. For every truck removed from the road, up to 708kg of CO_2 could be saved every week. On top of the new boat deliveries, pathology samples are now delivered by cargo bike between Guy's Hospital and St Thomas' Hospital. The Trust's goal is to remove over 40,000 truck deliveries from central London every year.

GREENER MATERIALS

Algreen Ltd

Algreen Ltd, based in Imperial White City Incubator, is using innovative biotechnology to develop the fully biobased decarbonized adhesive to be used in a range of industrial and consumer-facing applications, including in healthcare. Algreen has invented fully biobased decarbonised adhesive formulas that can be used as packaging glue, chipboard glue and surgical glue. These provide sustainable alternatives to traditional petrol-based adhesives, and retain tensile strength, water-resistance and durability.





GREENER MEDICINE

Promoting Green Plan goals through Imperial NHS Trust's new Ward Accreditation Programme (WAP+)

(Imperial NHS Trust)

Imperial NHS Trust is trialling a number of data-driven and observational metrics that will support three of their Green Plan goals including reducing energy usage, managing waste better, and reducing the use of plastics. Embedding these green metrics into WAP+ presents a huge opportunity to rapidly diffuse a small number of key actions and behaviours across all of their clinical areas that can significantly reduce their carbon footprint.

GREENER MATERIALS

Biohm

Biohm is a multi-award-winning research and development-led biomanufacturing company tackling the effect of construction on the environment. Its research includes innovative applications for mycelium by using them to grow materials fuelled by organic and synthetic substrates that are considered to be the by-products or ‘waste’ of other industries.

Biohm will be producing the world's first accredited mycelium insulation panel which will save energy across industries, including healthcare settings. Biohm are investigating further novel alternative applications for mycelium in healthcare: in partnership with BUPA, Biohm are piloting a study to use mycelium to consume medical waste.

GREENER INVESTMENT

The Greenhouse

Imperial College London has launched a new cleantech accelerator, The Greenhouse, with the help of a £2.5 million gift from HSBC UK. Over the next four years, The Greenhouse will provide around 85 UK start-ups developing services or technologies with the potential to positively affect climate change with a 12-month programme of support and training to aid their commercial development, and technological expertise to allow them to become credible and investable businesses. Further support is given to these start-ups in the form of an initial business development cash grant which supports them with their transition to working on their business full-time. A discretionary grant will be available to teams in later stages of the programme.

A select number of businesses participating in The Greenhouse will go on to join the HSBC's global Climate Solutions Partnership innovation accelerator, powered by the WWF's Impactio platform, which will help further scale climate solutions.

GREENER LABS

Stanhope PLC

Built in partnership with Mitsui Fudosan UK Ltd and AIMCo, Stanhope's cluster of workspace buildings, White City Place, is an award-winning hub for the life sciences, creative and technology sectors.

Currently housing eight the life sciences organisations, the building project repurposes and reuses existing buildings, halving the amount of carbon expended during construction when compared with new-build alternatives.

The buildings are constantly undergoing energy monitoring and tenant engagement to make consistent and incremental savings and to develop a net zero pathway for the buildings' users.

GREENER HOMES

Tomorrow's Home

Tomorrow's Home, a Royal Academy Ingenious Award project, is a multi-disciplinary immersive exhibition, using input from bio-, life- and health scientists to create an artistic take on what homes may look like in the year 2050. This exhibition aims to showcase how our home lives may change in the future due to advancing technology and climate change, exploring how healthy ageing and independent living may be promoted using home-healthcare technologies. A programme of talks runs alongside this exhibition discussing five themes of scientific research that this project is grounded in: connectivity; community; adaptability; sustainability; and responsibility. The exhibition will be available for public viewing at the Museum of the Home.

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