

Our Global
RESEARCH
IMPACT



“Our multi-disciplinary, award-winning research shapes the future – through it we pioneer new approaches to some of society’s most pressing challenges, delivering innovative, practical solutions that improve lives and drive economies around the world.”



MAKING AN IMPACT

Across the World

Professor Richard A. Williams,
Principal and Vice-Chancellor

One of the key purposes of a university is to share the research it engages in, and to ensure the purpose of that research is socially and economically beneficial.

The development of human potential is core to Heriot-Watt University’s mission and drives the impact we wish to have.

We are leaders in many areas, pioneering new approaches and delivering innovative solutions across photonics and quantum sciences, marine and geosciences, deprivation and social sciences, robotics and medical technologies, logistics management, energy systems, and smart construction, to highlight just a few.

In parallel, our aim is to transform the global sustainability agenda, demonstrating our leadership in this area and fostering collaboration and innovative approaches which ensure we place the utmost priority on addressing this global issue.

Presented here is just a small selection of our research impact. I hope it gives you a flavour of how the Heriot-Watt community is providing practical solutions to critical challenges and making an impact across the world.”

INNOVATIVE PRACTICAL SOLUTIONS FOR GLOBAL CHALLENGES

Research Impact is defined as the contribution that excellent research makes to society and the economy. It includes the many ways in which research-related knowledge and skills benefit individuals, organisations and nations.

Forward-thinking and research-led, Heriot-Watt University has an impressive track record as a leader in ideas and solutions. Through multi-disciplinary approaches, significant international collaborations and connectivity to business, we make a direct impact on real-world problems.

We are focused on growing our impact through the creation of Global Research Institutes aligned to our frontier research and by recruiting new research leaders to increase capacity, as well as by funding PhD scholarships in exciting research areas.

Our global presence has supported the development of international networks, increasing the reach of our impact, and we have 34 active partnerships supported by the Global Challenges Research Fund.

Through our diverse research culture, we will continue to pioneer new approaches to some of society's most pressing challenges, delivering innovative, practical solutions that improve lives and drive the economy.



The Lyell Centre for Earth and Marine Sciences is our strategic partnership with the British Geological Survey, bringing together our combined expertise to create an interdisciplinary centre addressing global challenges associated with the Earth's surface, sub-surface, oceans and atmosphere, from protecting coastal ecosystems to finding deep-sea mining solutions, and from developing new energy technologies to tackling the effects of climate change.



The National Robotarium is a partnership between Heriot-Watt and the University of Edinburgh which combines the University's strengths in robotics for hazardous environments, manufacturing, healthcare, and human-robot interaction with the University of Edinburgh's expertise in space, construction, and humanoid robotics. It will create a world-leading research and development facility, translating cutting-edge research into innovative technologies that deliver real societal benefits.



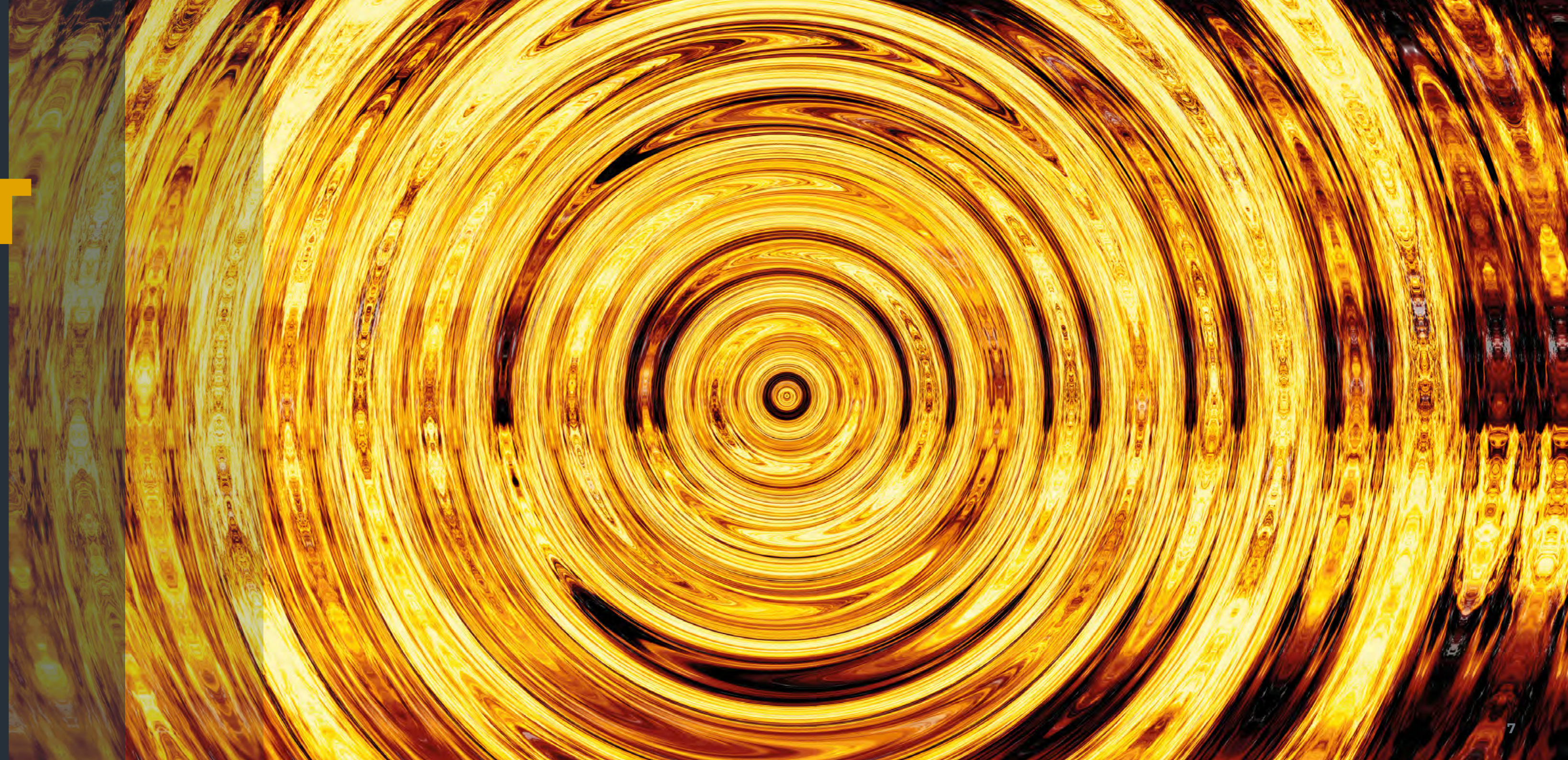
GRID is our ground-breaking ecosystem to advance our global research, innovation and discovery. It has been designed to create cohesion between academic disciplines, industry partners and the global community and stimulate tomorrow's thinkers and challengers. Through its Enterprise Hub we support start-ups and spin-out companies from our research expertise and foster new partnerships with industry to deliver impactful solutions.

MAKING AN IMPACT

Heriot-Watt University is specialist and pioneering, consistently ranked at a high level for its research performance.

Our established reputation for practical, leading-edge research – from robotics and photonics to carbon capture and homelessness – is focused on major global challenges and delivers results with direct impact on real-world problems.

In this brochure we showcase our impact across Innovating Industry, Environmental Sustainability, Inclusive Society and Advancing Health.



INNOVATING INDUSTRY

We are committed to working closely with business and industry to deliver transformational innovation, ensuring our leading research benefits business and the economy.

The impact of our engineering research is felt internationally across many industry sectors, including smart construction, robotics, quantum technology and sensors, water resource management and sustainable design.

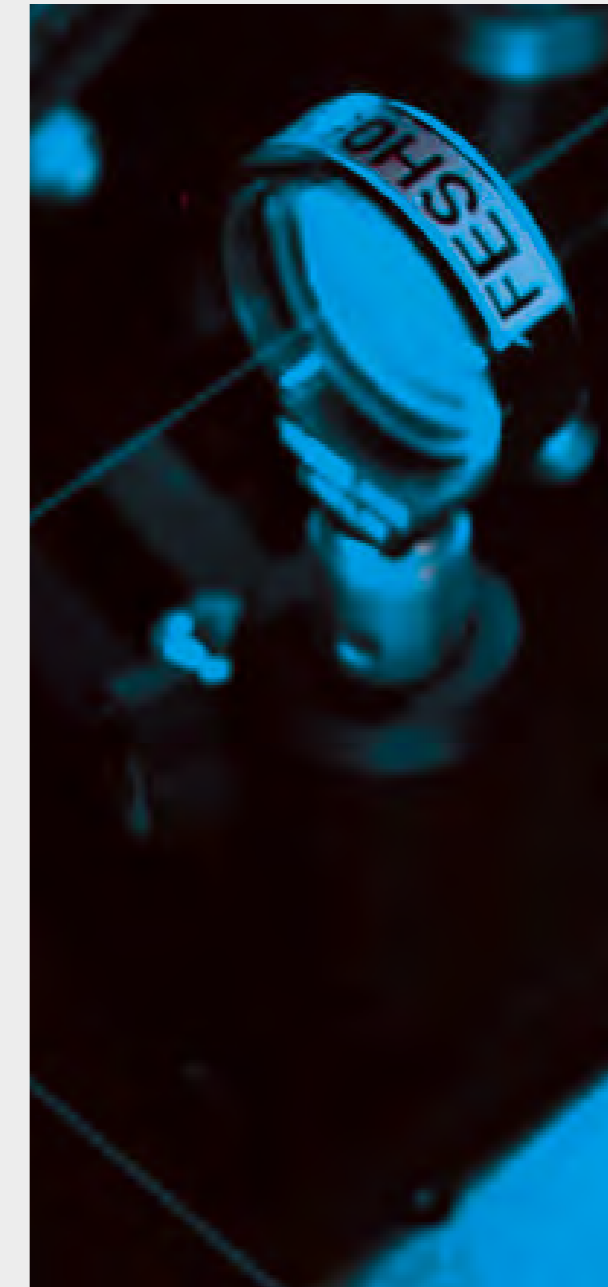
Enabling the scientific community and industrial partners to push boundaries

Developing exceptional performance lasers

The Ultrafast Optics research group is working in partnership with Chromacity on novel solutions to important global challenges.

Chromacity's ground-breaking femtosecond lasers are set apart by their distinctive performance characteristics, offering a unique combination of wavelength coverage, compactness, efficiency and high power that enables users to perform imaging, spectroscopy, metrology and material characterisation and modification which would otherwise be technically impossible or cost prohibitive. These operate from one to 12 micrometre wavelengths and are making an impact across multiple sectors, from life sciences and engineering, to defence and academia. They are helping to accelerate the development of cancer and dental therapies, improve chemical weapons sensing, and play a routine part in debugging chips destined for the next generation of smartphones and computers.

Over the last five years, from its Scottish base, Chromacity has fully commercialised its tuneable femtosecond lasers, selling them throughout the UK, Europe and the US.



Delivering transformative smart systems for crucial industries

Enhancing insight through sensor technology

The Smart Systems Group leads multidisciplinary research in sensor technologies, manufacturing and embedded intelligence to create smart monitoring systems.

In industries such as aviation, space, subsea and energy, high-value assets are often deployed in harsh environments. This presents significant challenges in terms of their operation and maintenance, heightening their need for effective monitoring, which is fundamental to ensuring the safety of personnel, the environment and the general public.

The Smart System's Group's novel Environment and Health Monitoring System (EHMS) delivers enhanced insight into the interdependences of components and sub-systems within complex assets. A multi-sensor system, it operates autonomously and enables access to previously unobtainable data on system performance and the operating environment, providing new visibility and understanding of the condition of assets. Through a partnership with MacTaggart Scott, its applications range from supporting the Naval Defence and Marine industries, to Offshore Wind Turbine Condition Monitoring and Oil and Gas Infrastructure Asset Management.

Innovating technologies for the defence, energy, and oceanography sectors

Delivering advanced software solutions

SeeByte is a globally leading spin-out that creates smart software solutions for unmanned maritime systems. It aims to help the defence, oil and gas, and oceanography sectors to use robotics and AI technologies to operate safely in hazardous environments.

The research behind SeeByte has set a number of new world firsts. It underpinned the first commercially available pipeline inspection system for an autonomous underwater vehicle, Seebyte Autotracker – a product which has also set the world record for the longest uninterrupted pipeline inspection. University research is also used by Seebyte in the first commercially available vehicle for autonomous inspection of deep water oilfields, created in collaboration with Subsea7, a company specialising in the design, installation and inspection of 'seabed-to-surface' structures. In the military domain, SeeByte's SeeTrack software is originally based on the University's automatic target recognition and seabed classification research. SeeTrack is the de-facto standard for autonomous mission planning, real-time data processing and post-mission analysis. It is currently sold to 15 navies worldwide.



Increasing exports for gin creators

The unique Botanical Library

The University's International Centre for Brewing and Distilling, in partnership with the Scottish Distillers Association and five distilleries, developed a unique library of botanicals grown in Scotland to help the country's gin producers create new products and increase their exports.

The researchers spent three years distilling and cataloguing 72 botanicals that can be grown in Scotland, and are available in dried form, from a sustainable source, to ensure consistency and availability. The library includes everything from nettles and dandelion to the chagga fungus, which grows on birch trees. Each botanical has been individually distilled, and its taste, aroma and mouth feel catalogued by the team.

The library was initially developed to help Scotland's gin producers create new products. Now it's helping producers to ensure their Scottish gin products meet the import standards of countries like the USA. With 70% of the UK's gin produced in Scotland, the library is an essential resource for producers who are looking to make an impact in both domestic and international markets.

Professor Mercedes Maroto-Valer

SOLUTIONS FOR A SUSTAINABLE WORLD

The first Deputy Principal of Global Sustainability at Heriot-Watt and the UK's Industrial Decarbonisation Champion explains how the University's leading expertise is tackling the critical challenge of decarbonisation.



“*I believe we have harvested the low hanging fruits for decarbonisation, so now we have the harder challenges in front of us, such as decarbonising industry and transport, including aviation. Heriot-Watt has leading experts who are generating novel solutions to these critical challenges. From developing novel materials like clay-based sponges that capture CO₂, to creating aviation fuels made from wood and agricultural waste and captured CO₂, we are exploring many angles.*”

We are approaching these challenges holistically to develop low-carbon systems that will allow decarbonisation across electricity, transport and heat.

For example, our Research Centre for Carbon Solutions (RCCS) is investigating sustainable aviation fuel from waste wooden pellets. This unique process can produce 2.4 million tonnes of aviation fuel per year and its use is equivalent to taking more than three million cars per year off the road.

We are also developing a ground-breaking process recovering waste heat energy in data centres, resulting in a 50% reduction in cooling energy consumption and saving 740 tonnes CO₂ annually. The SMART-DAC system, which we are developing in partnership with the Net Zero Technology Centre and a wider consortium of business partners, will deliver a cost-effective process for direct capture of CO₂ from the air using membrane gas absorption and membrane electrolysis regeneration.

My role is to place the UK at the forefront of the global shift to Clean Growth

In 2020, I was appointed as the UK's Industrial Decarbonisation Champion to drive the country's delivery of net zero emissions from industry. My role is to place the UK at the forefront of the global shift to Clean Growth. The unique Industrial Decarbonisation Research and Innovation Centre (IDRIC), based at Heriot-Watt's Edinburgh campus, is the national focal point and international gateway for this work. With a diverse range of over 140 partners, IDRIC will support four low-carbon industrial clusters by 2030 and the world's first net-zero emissions industrial cluster by 2040.

Our aim is to co-develop a whole systems approach that integrates engineering, environmental and technical solutions alongside economic, behavioural and policy perspectives. It's about accelerating cost-effective decarbonisation of industry which delivers long-lasting growth and societal benefits in a green economy. We will look at decarbonising solutions for industry but also how these will shape society and economies at both a local and national level.”

ENVIRONMENTAL SUSTAINABILITY

Our focus is on addressing some of the most urgent challenges for our planet.

We have a long history of environmental research, delivering innovative and impactful Earth and marine science that makes a difference to societies across the world. We are pioneers in areas including carbon capture and storage, green logistics, future energy systems, management of ocean resources and climate change processes.

Revolutionising construction through sustainable innovation

The brick made from recycled construction waste

Kenoteq is a clean-tech company, founded on research, focused on the creation of advanced, cost-effective building materials.

The K-Briq™ is Kenoteq's first product with huge potential to help the building industry reduce waste and create a sustainable circular economy approach. Unlike conventional brick production, which uses clay baked at high temperatures in kilns that mainly use fossil fuels, the K-Briq™ is made from 90% recycled construction and demolition waste – including bricks, gravel, sand and plasterboard – and is air dried. It produces just a tenth of the CO₂ emissions of a traditional fired clay brick and requires less than a tenth of the energy in its manufacture. K-Briqs are stronger and more durable than fired clay bricks and provide better insulation too. The bricks can also be tinted with recycled pigments and made in any colour.

With around 32% of landfill waste in the UK coming from construction waste, and 45% of total UK carbon emissions coming from the construction sector, the sustainable K-Briq™ is an exemplar circular economy product.



Game-changing biotechnology delivering circular economy innovation

A whisky by-product that is feeding fish

Horizon Proteins Ltd spun out from a collaboration between academics in the areas of process engineering, biopharmaceutical manufacture and whisky distilling

The company has developed a unique, cost-effective separation and extraction process to isolate the protein of pot ale – a residue from whisky manufacturing, which is very challenging to dispose of – and transform it into a highly nutritional feedstock for aquaculture. This 'game-changing' biotechnology increases the asset value of the previously underutilised residue by 600% and significantly improves the sustainability of distillery processes. The research team has also investigated the broader potential of the technology within the grain whisky, grain spirit, US rye and bourbon processes.

Supporting rural circular economies, through greater sustainability, job creation and the provision of a local source of high-quality feedstock that lowers the need for feed imports, the impact of this technology is also environmental as it reduces the oxygen required to treat the waste residue through normal processes.



Enterprising energy conservation for the global agricultural sector

A ground-breaking app for irrigation control

One of the most pressing challenges facing small-holder farmers in developing countries is the need to reduce water use and minimise energy consumption. The SCORRES project looked to address this challenge by developing an irrigation system that significantly reduced both water and energy use. Farm-Hand Ltd, and an Indian subsidiary 'Water-Hand', were formed to commercialise the outcomes of SCORRES.

The project trialled a cloud-controlled, micro-irrigation system on a farm in India, and its success led to the creation a mobile phone app that farmers can use to adjust the water delivered to their crops. The smart irrigation system works by combining local weather forecasting and electricity availability with a sophisticated modelling technique, calculating the precise water needs for the crops based on crop type, location and soil.

The technology is delivering ground-breaking impact: a 70% reduction in water and energy usage, as well as a 30% crop yield increase and a 10% decrease in labour. It has the potential to revolutionise small-holder farming and create a more resource efficient and sustainable future for the global agricultural sector.

Pioneering synergistic partnership restoring crucial marine habitats

Rebuilding oyster reefs with a Scottish distillery

A 25-year legacy of research focused on critically important biogenic reef systems has improved understanding of these declining habitats, including their biodiversity and importance as Blue Carbon Stores.

Oyster reefs are amongst the most endangered biogenic reef systems on Earth; over-harvesting, pollution and disease have contributed to the loss of around 85% of them in the last two centuries. An innovative partnership between the University, Glenmorangie and the Marine Conservation Society is reintroducing oysters to the Dornoch Firth, where Glenmorangie is based, via the Dornoch Environmental Enhancement Project (DEEP).

DEEP is an exemplar of marine habitat restoration, delivering more than increased biodiversity. It is a pioneering partnership delivering significant additional impact: the restored oyster beds work in tandem with the Glenmorangie's anaerobic digestion plant to purify the water of the Firth. This ground-breaking synergistic approach is contributing to conservation of the local area but also shaping government policies and plans for sustainable practices and stimulating new oyster restoration supply chains beyond Scotland.



Professor Phil Greening

DECARBONISING ROAD FREIGHT

Deputy Director of the Centre for Sustainable Road Freight and Director of Heriot-Watt's Centre for Logistics and Sustainability explains how the University is developing innovative technical solutions to road freight transport challenges.



“*Adapting our transport systems to low carbon technologies is vital for the future health of the planet. Strategies to achieve low-emission freight are still being developed and achieving zero road emissions by 2050 is not going to happen easily. Electrification of passenger vehicles is accelerating but commercial vehicles represent a unique challenge. I lead a team of 27 researchers at the Centre for Sustainable Road Freight* who work with large scale high-fidelity virtual worlds and data analysis to develop novel low carbon logistics solutions.*”

*The Centre for Sustainable Road Freight is a collaboration between Heriot-Watt, Cambridge and Westminster Universities, and a consortium of leading organisations in the freight and logistics sectors

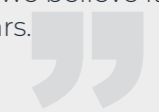
Through the 'Integrated Energy Systems for Commercial Vehicles' project we are building understanding of the maximum contribution that V2G (vehicle to grid) technology can make to commercial vehicle economics within the constraints of real-world operations.

One aspect of this work is how shared wireless charging hubs could better support the use of electric LCVs and HGVs. To facilitate the research, the UK's first wireless charging hub for light commercial vehicles has been installed at the Edinburgh campus and is servicing specially adapted vans from both City of Edinburgh Council and the University's estates team.

In the 'Up-Featured Trailers for Future Logistics' project we are working to understand how articulated trailers, the backbone of the commercial transport industry, will need to evolve in a changing world. The design developed will benefit from testing in a virtual environment built to mimic end user duty cycles.

The UK's first wireless charging hub has been installed at our Edinburgh campus

We're also looking at how to eliminate the majority of CO₂ emissions from road freight by installing overhead charging cables for electric HGVs on 'e-highways' across the UK. Using catenary cables, powered by the national electricity grid, through an extendable rig known as a pantograph – similar to those on the top of electric trains – it would be possible to power HGVs, electric motors, and recharge an onboard electric battery that could power them to their destinations beyond the electrified roads. While the creation of this electrified system and adapted HGVs would require significant investment, we believe it could pay for itself within 15 years.



INCLUSIVE SOCIETY

We are leaders in research that drives policy and change for a fairer and more inclusive society.

Working with many organisations, and the private and public sectors, our research has an impact on everyday life. We have distinctive expertise in tackling extreme disadvantage and supporting the deaf community.

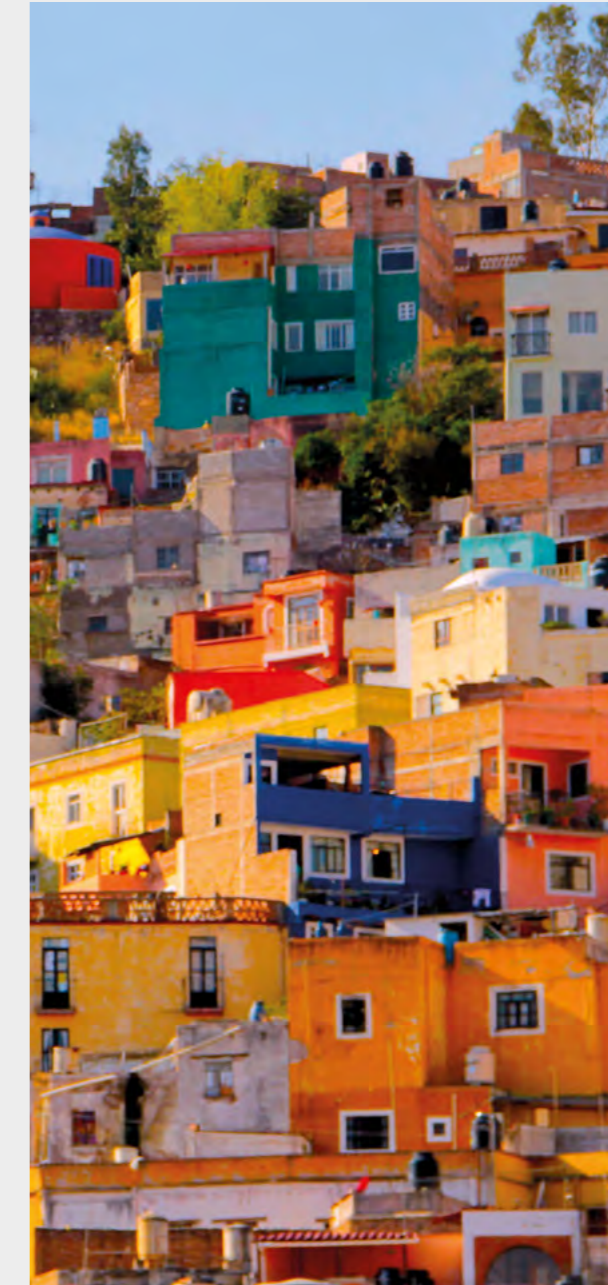
Protecting vulnerable communities exposed to environmental risks

Transforming engagement through empowerment

Action research into community and local government approaches to managing environmental risk, has empowered communities in Latin America.

This research has empowered communities in Latin America to participate in managing risks that are intensifying due to climate change. It has transformed low-income communities' and local governments' understanding of how to co-manage environmental risk and co-produce risk-reduction strategies. Improving awareness, understanding and management of hazards, such as landslides and floods, through environmental education, has initiated practical and social improvements to the management of these risks, and informed policy and practice.

Its impact has directly benefitted over 3,400 vulnerable households, exposed to landslide risk, in the major Latin American cities of Medellin in Colombia, São Paulo in Brazil and Puebla in Mexico, through neighbourhood mitigation plans and implemented works. It has indirectly benefitted over 700,000 inhabitants through municipal development policies and new regulations and shifted attitudes from confrontation, linked to the threat of eviction, to co-operation.



Driving change for people affected by extreme disadvantage

Preventing and tackling homelessness

Delivering impactful research that drives policy and legislative change to improve the lives of society's most vulnerable citizens.

The Institute for Social Policy, Housing and Equalities Research (I-SPHERE) has produced a critical mass of internationally recognised expertise on the topic of acute hardship. This has been pivotal in modernising homelessness legislation, and its ground-breaking reports on destitution in the UK have opened-up an entirely new research agenda in the poverty field.

The two largest revolutions in UK homelessness policy in the past 40 years have been underpinned by I-SPHERE research: the Homeless Reduction Act 2017 explicitly implemented the recommendations of an I-SPHERE-led review, and the paradigm shift to the evidenced-based Housing First model of intervention was propelled by its research. The 2017 Homeless Reduction Act radically expanded single homeless people's entitlements in England, backed by £72.2M of government funding. Government support was also given to the Housing First approach, with £28M ascribed to tackling rough sleeping.

The University was awarded a Queen's Anniversary Prize in 2019 in recognition of this work.



Preventing and mitigating child poverty and inequality

Changing legislation and increasing support

Almost one quarter of all children in Scotland are living in poverty, the effects of which are considerable, undermining health, wellbeing and educational attainment. As well as being harmful to children and families, child poverty has wider costs for society.

I-SPHERE's research, on the measurement, causes, consequences, mitigation and prevention of child poverty is building better understanding of the issue and helping to improve inclusiveness. It has led to changes across legislation, local authority policies, planning and practice, the practice of health and education professionals, and the campaigning and influencing of third sector partners.

It has directly impacted more than 120,000 children who are living in poverty across Scotland, who now have access to support such as a school clothing grant and free meals in breakfast clubs and during school holidays. In addition, services have been introduced to ensure the uptake of child-related benefits to maximise the income of families, in schools, and at the point of pregnancy and birth.



Breaking down barriers for deaf sign language users

Increasing participation, access and inclusion

The University has been tackling the challenges facing deaf sign language users in Scotland, the UK and internationally, through a range of impactful research in sign language use, policy and access. Our academics have raised the profile of sign languages and promoted the interests of signers worldwide.

Globally, our impact has helped to re-position signing in public life, enabling 70 million deaf signers to participate in, and have access to, an inclusive society in various contexts. Our research has shaped policy on professional services and education in Scotland, the UK and Uganda; led to frameworks for teaching British Sign Language in schools; and informed law reform allowing signers to serve as jurors in Australia and Ireland.

In addition, our guidelines improve signers' access to services and information by raising the quality of professional sign language translation and interpreting provision worldwide. All of this impact has supported greater inclusion of signers within society, who consequently, can live better lives.

Professor Michel Kaiser

SUSTAINING OUR SEAS

Heriot-Watt's Chief Scientist, and leading marine science expert, explains how the University's research is contributing to ocean sustainability.



“*Across the globe, the sustainable management of our seas is fundamental to the well-being of the planet, people and world economies. Blue economy sectors – spanning aquaculture, fisheries and marine biotechnology to energy and marine renewables – have a crucial role to play in this sustainability agenda and our related frontier research is set to make a leading contribution to global solutions.*”

The need to develop the seas in a way that is sustainable and that recognises the underpinning value of natural resources, is of vital importance to economic growth and livelihoods around the world. Our frontier research focuses on the stewardship of our blue resources, for the improvement of human wellbeing and social equity, while reducing environmental risks and ecological scarcities.

The transdisciplinary nature of our research is key to its societal impact

Our marine science expertise is diverse, addressing the ocean surface to the deep sea floor, and from high latitudes to the tropics. The University stands out – with 29 marine science faculty experts and 15 PhDs plus significant expertise across other related areas, such as renewable energy, underwater robotics, geoscience, and eco-toxicology. Beyond these 'STEM' areas we also integrate our research expertise in business, economics, social sciences, psychology and textiles.

LEADING EXPERTISE

This breadth of expertise, coupled with our international presence, makes the University a strong force in the marine arena. For example, we are using our expertise in satellite communications technology to look at how we can improve the monitoring of fishing activity in the sea and the collection of data from fishing vessels; we're looking at the potential to apply the I-SPHERE expertise in poverty and related areas to the issue of social welfare in seafood supply chains; and considering how we can apply our ground-breaking research in textile technology to improve safety at sea. Our conservation restoration expertise is pioneering collaborations with industry partners to enhance the blue carbon capture potential of species such as native oysters.

Our Orkney campus in particular, is a tremendous resource. Building on the established research of its International Centre of Island Technology, now part of the new Orkney Research and Innovation Campus, , and together with the Islands Centre for Net Zero, we are pioneering a range of related research activity from renewable energy to marine ecology, food production and fisheries.”

ADVANCING HEALTH

We have a truly distinctive approach to health-related research which spans an unusual diversity of expertise from pioneering medical technologies to supporting healthy ageing.

Our expertise and integrative approach across fundamental neuroscience, cancer biology, bioengineering, biophysics and biological chemistry, combined with robotics and AI, and blended with social science and psychology research, is helping us to create ground-breaking solutions to a diversity of healthcare challenges.

Preventing arsenic mass poisoning from contaminated water supplies

Pioneering water technology

It's estimated that globally around 137 million people, across 70 countries, are consuming arsenic-laced groundwater, greatly increasing their risk of ill health. The conventional technologies for arsenic remediation are based on a 'pump and treat' method, which is uneconomical to run and has problems associated with waste disposal.

Water technology research at the University has delivered a new approach – Subterranean Arsenic Removal (SAR) – which doesn't use chemicals or generate any waste, making it a uniquely low-cost solution. SAR's signature process encourages the growth of arsenic oxidising bacteria in the aquifer which converts arsenic into soluble masses that return safely to the soil. The underground aquifer is effectively turned into a natural biochemical absorber that removes the dangerous substances from groundwater, triggering a series of physical, chemical and biological processes which result in an oxygen-rich supply of water for local people.

SAR treatment plants have been established in many locations across South Asia, including a world first, solar-powered, fully autonomous plant in Bangladesh in 2017. These pioneering plants have won a clutch of prestigious awards and are delivering significant impact for thousands of people.



Exploring interventions to improve the health and wellbeing of older people

Promoting brain health

Cognitive decline is one of our most feared aspects of ageing and is a major determinant of health, independence and quality of life.

Research at The Ageing Lab is particularly focused on how interventions that encourage older people to become more active, or learn new things, might improve their health and wellbeing, and specifically reduce or delay age-related mental decline. The principal research project is the Intervention Factory which considers a range of community-based activities as potential interventions for cognitive ageing.

Translating research to real-world benefit is a key part of this work, and the researchers have delivered a wide range of public awareness and outreach activities. These have reached wide audiences, numbering hundreds of thousands, and even millions – through workshops, national events and contributions to national TV and radio programmes – winning prestigious awards for impact and effectiveness in public engagement.



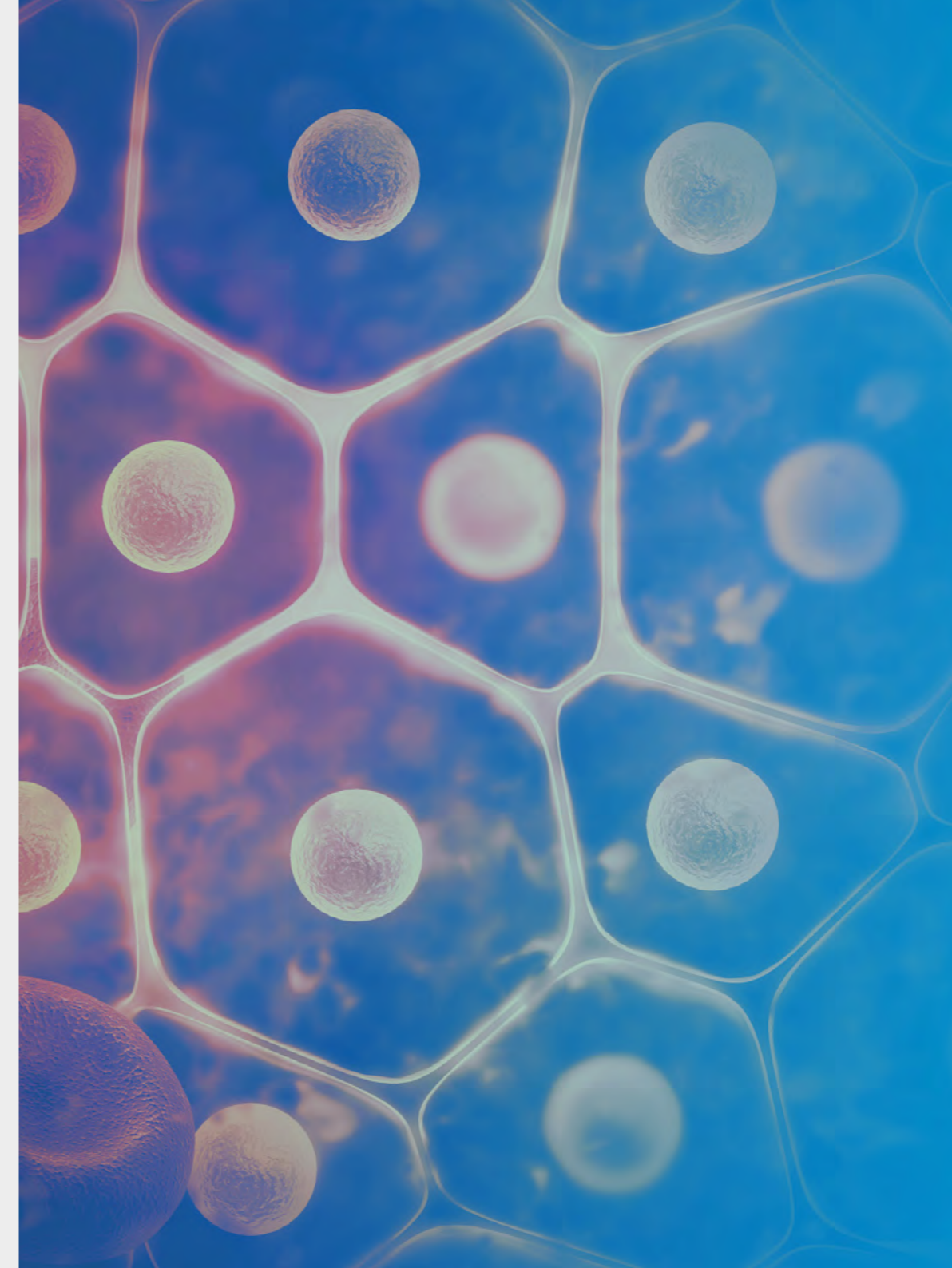
Revolutionising pressure garments to improve patient recovery

Redesigning medical compression

Around the world, pressure garments are used to prevent and treat hypertrophic burn scars – the most common complication of a burn injury. Research within our School of Textiles and Design discovered that traditional ‘reduction factor’ methods of calculating garment dimensions had a number of limitations, resulting in the production of garments which exerted pressures ranging from ineffectively low to dangerously high.

Through the development of a set of user-friendly Pressure Garment Design (PGD) tools the research has revolutionised the effectiveness of these garments. The PGD tools allow calculations to be made more efficiently and ensure that monitoring of the applied pressure is more accurate, while their ease of use is reducing mistakes and improving safety.

Supplied to NHS hospitals making garments ‘in-house’ and to global pressure garment manufacturers, these new PGD tools have led to a distinct improvement in the creation of these garments, making treatment more consistent and predictable, as well as reducing waste, cutting costs and shortening lead times.



Improving clinical diagnosis and biomarker discovery

Innovating solutions for vital health screening

Researchers in our spin-out, Natantis, are working to revolutionise the way blood samples are prepared for use in disease diagnosis and treatment monitoring.

Natantis’ MicroTotal Pre Analytical Systems (MTPAS) is a near-patient approach for next-generation sensing. It has developed a faster, sustainable solution to analysing cell-free nucleic acids (cfNAs) from a blood sample. Cell-free nucleic acids (cfNAs), such as DNA, RNA and microRNA, can be used as biomarkers for rapid diagnosis and prognosis across a range of pathologies including cancer, sepsis, fetal chromosomal abnormalities and transplant rejection.

The MTPAS technology takes blood to the desired end-product with minimal user intervention, in a standardised and automated way. It increases both the quantity and quality of circulating nucleic acids in samples, which can dramatically improve clinical diagnosis and biomarker discovery.

This innovative solution provides faster, cheaper, more reliable and better-quality samples for vital health screening, which will not only improve healthcare efficiency but quality of life for patients through earlier diagnosis of disease.

DISCOVERY FOR INNOVATION

We are focused on strengthening our research capabilities and enabling cross-disciplinary discovery in order to deliver a diversity of impact.

Our challenge-focused research underpins the innovation pipeline through which we transform discovery into tangible solutions that can drive environmental, economic or societal change.

Since forming our first spin-out in 1971, we have helped to grow a number of multi-million-pound businesses which capitalise on our research excellence to provide innovative products, processes, services and technologies. We have many active spin-out companies, with more in the pipeline, and are highly ranked in Scotland for company creation.

Areas of current and emerging strength

We have significant capability in many critical areas which will deliver future impact. Some areas of ground-breaking research that is on the way to delivering real-world benefits include:

- **Net Zero:** industrial decarbonisation, energy systems, and acceleration of clean cold;
- **Robotics and AI:** socially assistive robots and offshore robotics for hazardous environments;
- **Medical Technology:** super-resolution imaging, deep ultraviolet light therapies, and medical device manufacturing;
- **Smart Construction:** sustainable materials, decarbonisation, design and asset management;
- **Quantum Technology:** communication, information processing and metrology, and imaging systems to secure data systems;
- **Marine Sciences:** aquaculture, marine biotechnology, marine renewables and energy.

Our culture of commercialisation and enterprise will ensure we transfer innovative solutions from these areas of strength into products and services that will provide solutions to global challenges and benefit industry and society around the world.

LEARN MORE

Our Impact

[hw.ac.uk/research-impact](https://www.hw.ac.uk/research-impact)

Our Research

[hw.ac.uk/research](https://www.hw.ac.uk/research)

Our Global Pioneers

[hw.ac.uk/global-pioneers](https://www.hw.ac.uk/global-pioneers)

*Our research collaboration
at the Research Engagement Hub*

ResearchEngagement@hw.ac.uk

*Contact our Global Research, Innovation and Discovery team for
Enterprise and Business Partnership Opportunities*

GRID@hw.ac.uk

Edinburgh

[hw.ac.uk/uk/edinburgh.htm](https://www.hw.ac.uk/uk/edinburgh.htm)

Scottish Borders

[hw.ac.uk/uk/scottish-borders.htm](https://www.hw.ac.uk/uk/scottish-borders.htm)

Orkney

[hw.ac.uk/uk/orkney.htm](https://www.hw.ac.uk/uk/orkney.htm)

Dubai

[hw.ac.uk/dubai](https://www.hw.ac.uk/dubai)

Malaysia

[hw.ac.uk/malaysia](https://www.hw.ac.uk/malaysia)



[@HeriotWattUni](https://twitter.com/HeriotWattUni)



[@heriot-watt-university](https://www.linkedin.com/company/heriot-watt-university)