



# Research Review

2017





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# Welcome

As the University for the Common Good, GCU's Strategy 2020 is focused upon transforming lives, enriching cities and communities, creating societal benefit through social innovation and engaging globally. This focus provides the platform for research at GCU to achieve global impact by addressing multiple Sustainable Development Goals.

In September 2015, the United Nations adopted these Goals in order to "end poverty, ensure prosperity for all and protect the planet". Through our own research, GCU will address the Sustainable Development Goals via three societal challenges of Inclusive Societies, Healthy Lives and Sustainable Environments.

These challenges also reflect the strategies of other international organisations, international and national competitive grant funders, governments and industry, which call for inter-disciplinary, inter-sectoral and international approaches to inclusive growth and enhancement of health, wellbeing and sustainability, reflected in the academic strengths of GCU.

Our position as a world-class research institution was reaffirmed by

the Research Excellence Framework (REF) results in 2014, which ranked GCU as top modern university in Scotland by research power. Since then, the University has continued to build on its strengths.

The University is in the top 20 in the UK for health research at world-leading and internationally excellent standards. GCU research in the built environment performed strongly overall in the UK, with impact in this area rated as top 20 in the UK, combining world-leading and internationally excellent research submissions.

GCU proudly displays the European Commission HR Excellence in Research Award, which tells researchers that GCU is committed to supporting their careers and acknowledges the University's alignment with the principles of the European Charter for Researchers and Code of Conduct for their Recruitment.

The University is committed to enhancing and supporting a strong research culture, demonstrated by GCU's action plan for the implementation of the Concordat to Support the Career Development of Researchers and subsequent

researcher development by the Graduate School, which focuses on helping principal investigators and emerging research leaders to develop research excellence.

Research lies at the heart of a university's life and its contribution to society. It informs and underpins our teaching thereby helping to produce skilled, intellectually adept and employable graduates. The transfer of the knowledge we produce through research aids economic growth and wealth creation, develops innovative technologies and practice-based interventions, contributes to better public policy, social and cultural understanding and the advancement of social justice.

GCU has a unique social mission, For the Common Good, and our research priorities reflect the ethos of the University to work towards solving real societal challenges, both close to home and further afield.

**Professor Cam Donaldson**  
GCU Vice-Principal and Pro Vice-Chancellor Research and Enterprise





# GCU Research at a glance

Research is at the heart of GCU's mission as the University for the Common Good.

Our applied research addresses three major societal challenges, enabling communities in the UK and internationally to build **inclusive societies** and live **healthy lives** in **sustainable environments**.

As the top modern university in Scotland for Research Power (Research Excellence Framework, 2014), our strengths within and across GCU's Academic Schools and Research Centres allow us to be global in our ambitions and to offer our collaborators multi-disciplinary approaches to inclusive growth and enhancement of health, well-being and sustainability.

Our Research Centres bring together the research excellence of individuals and groups across the University.

Health and wellbeing is the largest area of research at GCU, and is supported through the **Centre for Living** which brings together world-leading health-related research, learning and teaching programmes, and the provision of specialised social healthcare through community partnerships.

The **Yunus Centre for Social Business and Health** is a unique, interdisciplinary centre of excellence, researching the impact of social business and microfinance provision on the health and wellbeing of disadvantaged communities in Scotland, the UK and overseas. The focus of its research includes social

business, microcredit and social inclusion interventions which aim to tackle vulnerability to low income or disadvantage, with its consequent impacts on health and wellbeing, and responses to health inequalities.

The **Centre for Climate Justice** is delivering high-quality policy-relevant research for development, teaching and broadening knowledge in the area of climate justice. Climate justice has become a vital component of sustainable development and climate change discourse.

The **WiSE Research Centre** focuses on gender and equality analysis of poverty, income inequality, financial exclusion, living standards within households, gender budgeting, labour market and occupational segregation, employability and skills, European employment and gender equality policies, and comparative gender equality policy.

Industry and certain sectors of society need to manage the physical assets they employ in production, delivery of services, and enjoyment of their environment. The **Centre for Built Environment Asset Management** conducts research aiming to maximise social, economic and environmental benefit through the effective development, use and revitalisation of the built environment.

Top modern university in Scotland by research power



GCU has over **550** postgraduate research students, a number which is increasing each year



Top ten in the UK for world-leading **social work** and **social policy** research **impact**

Top 20 in the UK for allied health research at **world-leading** (4\*) and internationally excellent standards (3\*)



Research grants and contracts income of

**£5.9m** in 2016



80% of GCU's **communication, cultural** and **media studies** research **impact** is world-leading and internationally **excellent**



Top 20 in the UK for **world-leading** and internationally excellent research **impact** in the **built environment**



GCU research:

- Contributes to the development of intellectual and social capital, generating economic, cultural, social, public policy and quality of life benefits and impacts
- Enhances our reputation as an international centre of knowledge and expertise
- Provides a basis for collaboration with other organisations in the UK and internationally across the public, voluntary and private sectors
- Attracts high quality staff and students from all over the world
- Shapes the content of all curricula
- Enhances the student experience helping to produce skilled, intellectually adept and employable graduates
- Informs the professional development of all staff.





**Professor Jim Woodburn**, Associate Dean of Research in the School of Health and Life Sciences, leads GCU's research to help people live healthy lives. Professor of Rehabilitation, Jim has research interests in the understanding and management of long-term conditions of the lower limb and foot and ankle, including arthritis and diabetes. His own research has included significant EU-funded studies aimed at tackling chronic foot and ankle pain.

# Healthy Lives

GCU's Healthy Lives research spans public health and the management of long-term conditions, with collaborative and interdisciplinary research activity in musculoskeletal health, stroke, visual health, diabetes, ageing well, sexual health and blood borne viruses, infection prevention, substance use and misuse, and parenting and family support.

## Public Health

GCU researchers in public health aim to prevent disease, promote health, and prolong life among the population as a whole.

GCU-led research has reduced avoidable infections in healthcare in the UK and Europe by stimulating policy debate and investment in new healthcare practice and influencing policy decisions, evidence guidelines, and educational practices.

Researchers generated the key evidence for and supported the Scottish Government in relation to the Sexual Health and Blood Borne Virus Framework. They are currently conducting an important analysis of people with Hepatitis C and risk behaviours among people who inject drugs in Scotland.

Working closely with health researchers, GCU's Yunus Centre for Social Business and Health aims to transform the lives of the poorest through pioneering research examining the relationship between social business and health improvement.

Our ageing well research uses behavioural and lifestyle interventions to develop skills and assets across the life course and develops approaches to measuring factors which impact on quality of life and participation.

Tackling substance use is a global priority. Scotland has one of the highest rates of alcohol-related mortality in Western Europe. GCU researchers aim to understand the social context of substance use and develop interventions to reduce harm.

The Parenting and Family Support team undertake research that seeks to uncover risk and protective factors in the context of the health and wellbeing of children and young people; investigate the effects of parenting interventions designed to promote health and wellbeing; and, reduce serious behavioural, emotional and health related problems in children and young people.

## Long-term Conditions

Better management of people with long-term conditions has been a key priority of the NHS since the early 1990s. GCU researchers work to develop interventions for people with long-term conditions such as arthritis,

stroke, multiple sclerosis and diabetes, who require ongoing care and support.

Stroke is the single most common cause of severe disability in the world. Other common long-term neurological conditions include multiple sclerosis and Parkinson's Disease. With an ageing population, the number of people living with these conditions is set to rise.

GCU researchers have expertise in the development and implementation of complex interventions; national surveys, systematic reviews and the design and successful completion of randomised controlled trials.

Researchers conducted the first trial of pelvic floor muscle training for the prevention of prolapse symptoms in women with early signs of prolapse

several years after childbirth, publishing their findings in the world's leading medical journal *The Lancet*.

In the musculoskeletal field we have an overarching theme of understanding the pathways that lead from primary disease mechanisms to impairment and disability across a range of rheumatic and musculoskeletal diseases. This includes inflammatory and degenerative joint and soft-tissue disease across adult and childhood forms of arthritis and regional musculoskeletal pain disorders.

GCU researchers are currently leading one of Europe's largest ever investigations into the diagnosis and treatment of knee osteoarthritis, a painful condition which affects around 500,000 people in Scotland, including

one in five people over the age of 50. Vision research at GCU ranges from a fundamental understanding of perceptual processes, to the mechanisms underlying inflammatory processes in dry eye, to very practical, patient-centered issues, which are reflected in our specialist eye clinic services provided for the public.

GCU's diabetes research spans the impact of obesity on diabetes, xenotransplantation, retinal degeneration, diabetic foot disease management and chronic non-healing diabetic wounds.

Over the following pages, you will read about some of the ways in which our research is helping people to live healthy lives.



# Scotland's world-leading response to hepatitis C risks

Researchers are undertaking a significant analysis of people with hepatitis C and risk behaviours among people who inject drugs in Scotland.

Undertaken in collaboration with Health Protection Scotland, the Needle Exchange Surveillance Initiative is extremely important as it provides NHS Boards and the Scottish Government with information about the behaviour of people who inject drugs, their service utilisation and prevalence of blood-borne viruses.

Scotland's Chief Medical Officer Dr Catherine Calderwood said: "I'm pleased to see Glasgow Caledonian University taking on this important epidemiological research work. The Needle Exchange Surveillance Initiative has contributed much to the Scottish Government's world-leading response to hepatitis C and I am sure it will continue to offer us much evidence and intelligence in the coming years."

More than 200,000 people in the UK have hepatitis C, commonly spread

through sharing of needles, syringes and other equipment by people who inject drugs.

The Needle Exchange Surveillance Initiative, a biennial survey since 2008, has already contributed important knowledge about an ongoing HIV outbreak in Glasgow, the emerging threat of legal high injecting, and the establishment of the first indicators for the Scottish Government's Sexual Health and Blood Borne Virus Framework. The research also provides internationally unique surveillance on the Scottish Government's National Naloxone Programme, an overdose prevention initiative endorsed by the World Health Organization (WHO).

Led by Professor of Epidemiology and Population Health Sharon Hutchinson with Senior Research Fellows Dr

Andrew McAuley and Dr Norah Palmateer, GCU will undertake the research, funded by almost £600,000 from Health Protection Scotland, focusing on the prevention of the hepatitis C virus among people who inject drugs and providing information to evaluate and target interventions aimed at reducing the spread of infection.

The survey will use individual participants' dry blood spot samples and questionnaire responses to establish the drugs taken, the prevalence of HIV and hepatitis among participants, and risk behaviours such as sharing injecting equipment.

GCU was a host partner in the world's first World Hepatitis Summit in Glasgow during September 2015, which brought together over 400 global stakeholders representing over 90

countries to garner political and financial commitments required to tackle viral hepatitis. Delegates at the inaugural Summit endorsed the Glasgow Declaration on Viral Hepatitis, which calls upon governments and stakeholders to develop comprehensive, funded national programmes to eliminate viral hepatitis as a public health concern.

Since the Summit, researchers have been working in close collaboration with WHO and the World Hepatitis Alliance (WHA) to understand progress made by countries to tackle viral hepatitis. Professor Hutchinson is leading the sessions on Strategic Information for Focused Action at the second World Hepatitis Summit to be hosted in São Paulo later this year, where the latest data on the global viral hepatitis situation will be presented.

"As a University that is ranked in the top 20 in the UK for health research, GCU prides itself on its multidisciplinary and collaborative approach to addressing societal challenges with strategic national and international partners."

Professor Sharon Hutchinson





# Analysing speech therapy interventions

GCU is home to internationally recognised expertise in rehabilitation in long-term neurological conditions such as stroke, and interventions such as speech and language therapy.

**P**rofessor Marian Brady was the 2016 recipient of The Robin Tavistock Award, presented annually by The Tavistock Trust for Aphasia for significant contributions to the field of aphasia.

Aphasia is a condition, resulting from stroke and common progressive neurological conditions, which affects the brain and leads to problems using or understanding written or spoken language correctly. It affects around 250,000 people in the UK alone.

The Trustees of The Tavistock Trust for Aphasia also awarded a new three-year grant from to the Collaboration of Aphasia Trialists, Chaired by Professor Brady, which currently comprises 150 members from across 26 countries, to support the second phase of its development.

The network was established in 2013 with the support of the European

Cooperation in Science and Technology and includes experts in neurology, stroke rehabilitation, linguistics, neuropsychology, speech and language therapy, neuroscience, anthropology, audiology and statistics.

Professor Brady is also involved in a £2million collaborative research project investigating the effectiveness of different types of speech therapy for people with Parkinson's disease.

Parkinson's is a progressive neurological condition which affects approximately 127,000 people in the UK, of which two-thirds have speech-related problems, leading to increased physical and mental demands during conversation, reduced independence and social withdrawal.

Speech and language therapy is advocated for people with Parkinson's disease but current provision is low,

with a recent Parkinson's UK survey reporting that just 37% of the patients included had received therapy.

Funded by the National Institute for Health Research (NIHR)'s Health Technology Assessment Programme, the 'PDCOMM' research project will compare the clinical and cost effectiveness of two speech and language therapy approaches with no access to therapy: a therapy approach called the Lee Silverman Voice Treatment; and the standard NHS speech and language therapy.

The Lee Silverman Voice Treatment focuses on increasing vocal loudness and is delivered by a speech therapist over 16 hours over four weeks. The standard speech and language therapy intervention is tailored to the individual patient's needs, but typically consists of an hour per week for six to eight weeks.

During the research project, people with Parkinson's will be randomly assigned to one of the three different groups and their communication effectiveness and quality of life will be compared over 12 months of their participation. The findings will be used to inform the future commissioning of therapy services for people with such speech problems. Led by Chief investigator Professor Catherine Sackley of King's College London, the project will involve more than 500 patients with speech problems using elderly care and neurology units across the UK.

The Nursing, Midwifery and Allied Health Professions Research Unit (NMAHP RU) at GCU and the University of Birmingham Clinical Trials Unit are research hubs for the project, collating and analysing data throughout the trial.

"We are delighted to be able to contribute to this trial for people with Parkinson's disease which will enhance our understanding of how we can best support and treat people with speech problems related to their Parkinson's disease. It is also a wonderful way for NHS therapists to get involved in high-quality clinically relevant research being led by an experienced research team."

**Professor Marian Brady**





# Tackling perceptions of drinking alcohol

Media coverage on binge drinking shows bias against women, according to new research by GCU and the University of Glasgow.

Researchers including Dr Carol Emslie investigated how the media report women's and men's binge drinking and found that women who binge drink are depicted more negatively by the media than men who do the same.

The study, published in the BMJ Open, analysed 308 articles published over two years in seven popular UK national newspapers.

It highlighted that women's binge drinking was given more media coverage, despite men drinking more in reality.

As well as misrepresenting differences in the amount that each gender drinks, the researcher found that articles depicted women's and men's binge drinking in different ways.

Women were depicted as out of control, unfeminine, under-dressed and undignified, with a strong emphasis on the deterioration of women's physical appearance and attractiveness due to alcohol. Women were described as 'ravaged', 'ruined' and 'haggard' and there was a tendency to characterise females as inconvenient burdens to their male drinking companions.

The researchers noted the media's unrealistic portrayal of binge drinking could mask – or even create – health problems by offering audiences inaccurate understandings of what binge drinking is, what its effects are, and how to lower their own health risks.

In another study, researchers from GCU and London South Bank University have found that alcohol consumed after observing a crime can actually make a person's eyewitness account more reliable.

Dr Julie Gawrylowicz, who recently joined GCU's Department of Psychology, Social Work and Allied Health Sciences from London South Bank University, led a study into how alcohol affected the memories of witnesses of crime.

Dr Gawrylowicz's research team asked participants to watch a simulated crime video, in which a man and a woman entered a house and conducted a survey with the homeowner in the living room. The visitors then stole some jewellery, money and a laptop. The homeowner ran after the thieves realising he has been robbed.

After watching the film, the

participants were split into three groups: one third expected and received alcohol; a third of the group did not think they were drinking but did receive alcohol (reverse placebo group); and a third received no alcohol.

While most research would suggest that alcohol can have detrimental effects on an individual's memory, this study examined whether alcohol consumed after witnessing a crime could make one less vulnerable to misleading post-event information (misinformation).

All 83 study participants, some of whom had consumed alcohol, were exposed to misinformation – such as the colour of the victim's jumper – embedded in a written narrative about the crime. The following day, participants completed a questionnaire about the event.

Those who did not drink alcohol were found to be more likely to report misinformation compared to the alcohol and reverse placebo group.

Dr Gawrylowicz has now received a fully-funded PhD-studentship at GCU to explore how alcohol and trauma affects memory.

"In the UK, men still drink more than women and are more likely to die from alcohol-related causes. However, the media's disproportionate focus on women's drinking, including the headlines and images used, may lead the public to think that it is primarily young females who are the problem drinkers. Alcohol is more freely available, more affordable and more heavily marketed today than it has been for decades, and excessive drinking affects all sections of the population."

Dr Carol Emslie





# Preventing prolapse through pelvic floor exercises

Researchers have conducted the first trial of pelvic floor muscle training for the prevention of prolapse symptoms in women with early signs of prolapse several years after childbirth, publishing their findings in the world's leading medical journal *The Lancet*\*.

**P**elvic organ prolapse – when the bladder, womb or bowel moves downward from its normal position – is common and is associated with childbirth and increasing age.

The symptoms of prolapse, such as a feeling of something 'coming down', urinary and bowel issues, affect up to 30% of women.

Led by Professor Suzanne Hagen, Programme Director at the Nursing, Midwifery and Allied Health Professions Research Unit at GCU, and funded by Wellbeing of Women the UK's only charity that funds medical research into women's reproductive and gynaecological health, researchers conducted a trial with 414 women in the UK and New Zealand to identify the effectiveness of pelvic floor muscle training on the development of prolapse symptoms.

The study compared women who were provided with one-to-one pelvic floor muscle training (five physiotherapy appointments over 16 weeks, including tailored lifestyle advice) plus Pilates-based pelvic floor muscle training classes and a DVD for

guided home exercise, with the other half of the group, who received only a prolapse lifestyle advice leaflet.

The study found the intervention led to fewer prolapse symptoms. Within two years, a significantly higher proportion (14.4% compared to 6%) of the women who did not have the pelvic floor muscle training reported having had prolapse treatment, which includes surgery, pessaries, physiotherapy or GP consultation.

The researchers, from GCU, the universities of Aberdeen and

Birmingham, the Dunedin School of Medicine, and the University of Otago, claimed women should be recommended to undertake pelvic floor muscle training even before they have bothersome symptoms. Professor Hagen is also author of the Cochrane review of conservative prevention and management of prolapse. The review, first published in 2006, identified no existing prolapse prevention trials, informing her present research.

\* Volume 389, No. 10067, p393–402, January 2017

## Participants said:

*"Taking part has helped me realise some of the effects childbirth and ageing has had on my body and how I need to look after myself to ensure I keep fit and healthy. I feel more positive about ageing/menopause – it is always good to know that you are not the only one going through something. I have benefitted physically and mentally."*

*"Since taking part in the study and attending both 1:1 physiotherapy sessions and group Pilates there has been a noticeable difference to the incontinence I was experiencing. I am now more confident when going out, no longer need to plan journeys around toilets. This has made so much difference to my quality of life. Talking to friends and work colleagues, it's amazing how many other women are suffering in silence as they are too embarrassed to go to their GP."*

"Knowing that these exercises and lifestyle advice can help to avoid symptoms in the future will allow women to be proactive about maintaining their pelvic floor health. Wellbeing of Women has provided invaluable support for an important, but often overlooked and difficult-to-fund area of research, which has undoubtedly helped many women who are at risk of these problems."

Professor Suzanne Hagen





**Professor Ole Pahl**, Associate Dean of Research in the School of Engineering and Built Environment, leads GCU's research to help people build sustainable environments. An environmental engineer, Ole has received significant European funding to raise awareness of the presence of pharmaceutical residues in waste water and explore new methods of reducing them.

GCU's Sustainable Environments research spans built environments and efficient systems. In the 2014 Research Excellence Framework (REF) results, GCU research in the built environment performed strongly overall in the UK, with impact in this area rated as top 20 combining world-leading and internationally excellent research submissions.

## Built Environments

Research at GCU has played a key part in driving sustainable waste management practices in Scotland, while a series of projects has helped set the agenda for the refurbishment of historic buildings.

Researchers in green infrastructure are proposing a new way of making cities cooler through climate-sensitive design, including creating 'canyon-like' shopping streets with rows of buildings providing adequate protection from rain and sun; gathering places located near urban waterfronts; and new networks of

pedestrian links independent of the city streets. These would feature shaded pathways, strategically placed and adequate vegetation cover and water misting.

Changing building design and materials, enhancing airflows and planting trees could help make cities and their residents more resilient to the urban heat island effect, which can worsen pollution, boost energy demand and even curb economic activity.

Researchers are also working to revolutionise health and safety on construction projects across the globe.

They will deliver an innovative system for educating architects and other designers to help them improve health and safety for construction workers, as well as the occupiers and users of buildings.

GCU's Centre for Climate Justice, supported by the Mary Robinson Foundation - Climate Justice, is a leading organisation in this field, taking a global lead in the delivery of high-quality policy relevant research for development, teaching and learning, and broadening knowledge in the area of climate justice.

## Efficient Systems

GCU's researchers support efficient systems through a number of long-standing research partnerships with industrial companies.

The Doble Innovation Centre for On-line Systems at GCU was opened after the signing of a new partnership agreement with the multinational engineering firm in 2013. Under a framework agreement, researchers are working with Doble to improve the measurement and assessment of the condition of high-voltage systems, the identification of new opportunities to

enhance the reliability and integrity of power stations and the development of new products and technologies.

Geckotech Solutions Ltd provides specialist industrial access services to a range of clients in the transport, energy and construction sectors. In collaboration with GCU, Geckotech is working to develop specialised imaging systems for use in tunnel and shaft safety inspections.

GCU is also a partner in several SFC-funded innovation centres, including CENSIS (sensors and imaging systems), the Oil and Gas Innovation

Centre, DataLab, the Digital Health and Care Institute (DHI), and the Construction Innovation Centre (CSIC), which bring together business partners and academia to solve significant societal and industry challenges.

One such current project, funded through the DHI, is the development of a low-cost indoor-positioning device to precisely monitor the movements of people with dementia.

In the following pages, you will read about some of the ways in which our research is helping people build sustainable environments.



# Improving health and safety in construction design

Researchers at Glasgow Caledonian University are working to revolutionise health and safety on construction projects across the globe.

A new project led by GCU's Professor Billy Hare, working with Professor Bimal Kumar and Julie Campbell, will deliver an innovative system for educating architects and other designers to help them improve health and safety for construction workers, as well as the occupiers and users of buildings.

The developed app will integrate with existing Building Information Modelling (BIM) software and make use of video, images and memes that highlight particular health and safety issues pertinent to individual designs.

BIM is a computer-generated model containing graphical and tabular information about the design, construction and operation of a project, which is accessible by all the partners involved in its delivery – from the architects, engineers and contractors to manufacturers and suppliers. Research into the app has been made possible by a £102,800 grant from the Institution of Occupational Safety and Health (IOSH), the world's largest professional organisation for OSH practitioners. The international research team will include RMIT University in Melbourne, Australia.

Professor Hare, Professor in Construction Management in GCU's School of Engineering and Built

Environment, said: "Academics in the past have attempted to create systems that tell architects and designers the 'safest' design option, but this approach is too simplistic and those who make design choices don't work that way. We want to create a knowledge database that recognises there are many design options, and each has its own pros and cons when it comes to health and safety. Therefore, designers can make informed decisions.

"For example, flat roofs without edge protection can result in falls from height. Using the app, an alert would come up to suggest building a handrail or harness anchor point into the design to improve safety for maintenance workers. Another area that could be highlighted is that prefabricated concrete stairs reduce time working at height and eliminate cement burns, slips and trips over formwork."

GCU research has previously improved worker safety on construction sites across the UK. Funders including the UK Health and Safety Executive, Engineering and Physical Sciences Research Council and CITB Construction Skills have backed a number of projects which have improved communication between workers and managers.

"The app is aimed at all designers, but will predominantly help inform new and inexperienced designers who have no, or very little, site experience and therefore may not fully understand the health and safety consequences of their designs."

Professor Billy Hare





# Taking the heat out of cities

Researchers have warned that increasing use of air conditioning will add to the global warming problem and bring further heat extremes to the already warm tropical areas in Asia, Africa and Latin America.

In the journal *Urban Climate*, GCU's Professor Rohinton Emmanuel highlights the importance of developing new means of 'climate-sensitive' urban design to manage rising temperatures rather than exacerbating the problem with air cooling.

Experts estimate that, in Sub-Saharan Africa, unprecedented heat extremes will cover an increasing percentage of land area as global warming intensifies from 2 to 4 °C, resulting in significant changes in vegetative cover and drought events. In Southeast Asia, heat extremes are expected to cover nearly 60–70% of land area in summer, even under a 2 °C global warming scenario.

With air conditioning systems providing less exposure to heat, our bodies can fail to acclimatise physiologically to summer conditions.

They can also increase 'Heat-Island' phenomena, where the temperature of the central area of a city becomes high because of an increase in artificial heat exhausted from buildings.

Professor Emmanuel proposes a new way of making cities cooler through climate-sensitive design, including creating 'canyon-like' shopping streets with rows of buildings providing adequate protection from rain and sun; gathering places located near urban waterfronts; and new networks of pedestrian links independent of the city streets. These would feature shaded pathways, strategically placed and adequate vegetation cover and water misting.

Changing building design and materials, enhancing airflows and planting trees could help make cities and their residents more resilient to the

urban heat island effect, which can worsen pollution, boost energy demand and even curb economic activity.

While specific data on Latin America is limited, a 2015 global study showed significant increases in urban heatwaves over a 40-year period, alongside a fall in city winds. Minimum temperatures are rising quicker than maximum temperatures around the world, causing more hot nights. While high-rise city centres can generate their own heat islands as glass sky-scrapers reflect the sun, block airflow and pump out warm air from cooling systems, slum areas such as Rio's favelas can also become heat traps with their tightly packed concrete-block houses and lack of trees.

While persuading local governments to invest in climate-related measures is tricky, experts say there are plenty of cheap and effective options available.

"In our increasingly urbanised world, most people will experience the effects of climate change in cities, such as Tokyo (pictured above). This is particularly so in the tropical world, where the effect of local warming super-imposed on the regional and global warming, will make urban life intolerable. It is therefore essential that cities are planned in a climate-sensitive manner to act as the first line of defence against the negative consequences of a warming world."

**Professor Rohinton Emmanuel**





# Developing innovative imaging systems

Geckotech Solutions Ltd provides specialist industrial access services to a range of clients in the transport, energy and construction sectors. In collaboration with GCU, Geckotech Solutions Ltd is working to develop specialised imaging systems for use in tunnel and shaft safety inspections.

The areas in which Geckotech Solutions Ltd operates are very diverse, ranging from the railway sector to viaducts, bridges and wind turbines and have most recently added subsea inspection as one of the services provided.

Edinburgh-based Geckotech partnered with GCU through a Knowledge Transfer Partnership (KTP) in order to incorporate the latest image acquisition and processing techniques into their services.

KTP is Europe's leading graduate scheme for helping business to improve their competitiveness and productivity through the better use of knowledge, technology and skills

that reside within the UK's universities.

Supervised by GCU's Dr Gordon Morison, Mark Jenkins is working with Geckotech as the KTP Associate.

He started a PhD in image processing techniques for visual object tracking at GCU in October 2013 shortly after completing a BSc Hons in Mechatronics. Before completing his PhD in 2016, Mark started as a KTP Associate on the project to work on the development of image processing and acquisition systems.

By combining the industrial skills of Geckotech Solutions Ltd and the image processing knowledge possessed by Mark and Dr Gordon Morison, a

bespoke image acquisition and processing system will be utilised to aid examiners in their inspections. This system will allow examiners to be directed towards areas most likely containing faults or defects, reducing inspection time while increasing accuracy.

The other major benefit of this project is the direct comparison of current and past inspections to analyse trends in structural defects and monitor them over time.

This will increase the quality of service provided by Geckotech Solutions Ltd by allowing it to provide a more detailed and accurate reports to their customers.

"The opportunity to utilise the academic knowledge I gained during my PhD in developing real world industrial applications is very rewarding. The KTP allows me to continue building my image processing and software development skills while directly mapping them to industrial solutions. Furthermore, the opportunities to develop new skills as a KTP Associate are endless.



"As my first step into the world outwith university, KTP has been an excellent transition from academia to industry. My time as a KTP Associate has been completely positive and I feel that it will have a great benefit to my future both personally and professionally. I would strongly recommend that anyone who has the opportunity to undertake a KTP does so. It is a unique and fulfilling opportunity that should not be missed."

Mark Jenkins, KTP Associate



# Combating climate change impacts

In September 2015, countries adopted a set of goals to end poverty, protect the planet, and ensure prosperity for all as part of a new United Nations sustainable development agenda. Goal 13 is to 'take urgent action to combat climate change and its impacts'.

At the Paris Climate Conference (COP 21) in December 2015, 195 countries adopted the first ever agreement which sets out a global action plan. Late in 2016, negotiators arrived in Marrakech for the latest annual climate change conference, COP 22, which became the start of the important process of turning the UN's Paris Agreement into a detailed blueprint for action. A focal issue of COP 22 was that of water scarcity, water cleanliness, and water-related sustainability, a major problem in the developing world, including many African states.

GCU's Centre for Climate Justice, overseen by Professor Tahseen Jafry, is a leading organisation in this field, taking a global lead in the delivery of high-quality policy relevant research for development, teaching and learning, and broadening knowledge in the area of climate justice.

The Water for ALL project, funded by the Scottish Government, was set up to improve access to water among the poorest and most vulnerable groups in Malawi and Zambia. The project helped to build sustainable capacity in achieving equity and entitlement in accessing water. Professor Jafry led the project, working with the Centre for Social Research at the University of

Malawi and the University of Lusaka. Over the past five years, the Scottish Government's Climate Justice Fund has already invested £6 million for projects in sub-Saharan African countries. In Malawi, for example, around 30,000 people now have access to safe clean drinking water and over 100 committees have been trained in natural resources rights and management.

This project shared knowledge to support these national policies and strategies on water and the governments' gender policies by addressing some of the challenges and bottlenecks through a climate justice framework.

A climate justice framework analysis was designed and conducted both in Zambia and Malawi to determine whether human rights, social justice, equity and equality, vulnerability and climate change indicators feature in any of the approaches to water resource management. The research in Zambia and Malawi suggested that inequalities regarding access to water are deeply rooted in cultural and gendered inequalities and power structures. Challenging such deep-seated social inequalities will require not only a collective voice but also demands for dignity, compassion and solidarity with

the aim of reducing deeper forms of intersecting inequalities. The team also found that communities are becoming more aware of the relationship between erratic weather patterns and climate change but they generally do not understand why this is happening nor how to respond; communities are 'forced' to exploit their local natural environment for survival thus provoking climate change and water scarcity; and women and girls continue to be distanced from accessing education due to their role in the provision of water and this is becoming more challenging due to climate change.

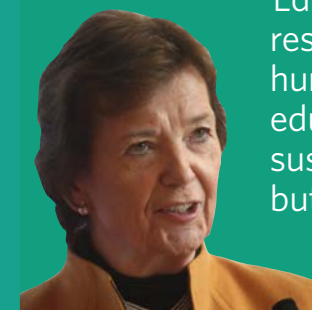
GCU's work through the Centre for Climate Justice is also supported by the most accessible database of climate justice research. Created in partnership with the Mary Robinson Foundation, the GCU climate justice research repository is the first single portal through which good quality information and knowledge-based research can be accessed on the climate change agenda and in particular its social and economic impacts in developing countries.

Former Irish President Dr Mary Robinson has emphasised the critical role of education and political participation in tackling climate change, and has given her support to GCU's own MSc Climate Justice programme.



"As the University for the Common Good, GCU aims to reduce inequalities and promote social justice, and to contribute to regeneration and growth. We work to apply our research and knowledge to address societal challenges associated with a changing climate via a climate justice approach to enrich cities and communities on an international scale."

Professor Tahseen Jafry



Dr Mary Robinson

"Education is a privilege afforded to the few. With this privilege comes a responsibility to find ways to apply learning for the betterment of humanity. When delivered in an effective, multidisciplinary way, education can increase consciousness of climate change and sustainable development, and produce new insights, not only scientific, but sociological and political."





**Dr John Harris**, Associate Dean of Research in Glasgow School for Business and Society, leads GCU's research to help people develop inclusive societies. With expertise in international sport, John is the author of *Rugby Union and Globalization* and has worked with a variety of organisations looking at the ways in which sport can contribute to community development.

GCU's work in the area of Inclusive Societies focuses on social innovation and public policy, and social justice, equalities and communities. This theme of research has had a significant impact on improving gender equality, the analysis and development of tourism in Scotland, evolving social enterprise and microcredit models, and challenging perceptions of poverty.

**Social Innovation and Public Policy**

Social innovation involves new strategies, ideas and organisations that meet social needs of all kinds. At GCU, researchers are exploring collaborative approaches and other responses to social problems, focusing on the governance and impact of public and civil society organisations, responsible management and sustainable business, and risk, accountability and regulation.

GCU was the first university in Scotland to be designated a

Changemaker Campus by Ashoka U, reflecting its global reputation in promoting social innovation through teaching and research.

The Yunus Centre for Social Business and Health is working with colleagues from the University of Sheffield and Newcastle University on a project funded by the Chief Scientist Office (CSO) to analyse the perspectives of low-income individuals of the impact of microcredit initiatives on their health and wellbeing.

New Scottish Government legislation to implement health and social care

integration came into force last year, bringing together NHS and local council care services under one partnership arrangement for each area to manage almost £8 billion of health and social care resources. In a ground-breaking project, researchers from GCU are developing the first framework for making difficult healthcare decisions which integrates economics, decision-analysis, ethics and law to be applied in this new context of shifting the balance of care.

GCU researchers are also working on CommonHealth, a Medical Research

Council-funded programme which is developing methods for evidencing social enterprise as a public health intervention.

**Social Justice, Equalities and Communities**

GCU researchers are exploring the dynamics of social vulnerability and well-being, focusing on identities, diversity and equity, enhancing the evidence base for initiatives and interventions, and the socio-cultural analysis of policy and practice.

Funded by the European Commission, a team explored intercultural issues that students and graduates are facing and developed an integrated learning programme that could help them deal with issues of cultural diversity and enable them to use intercultural contexts to their advantage.

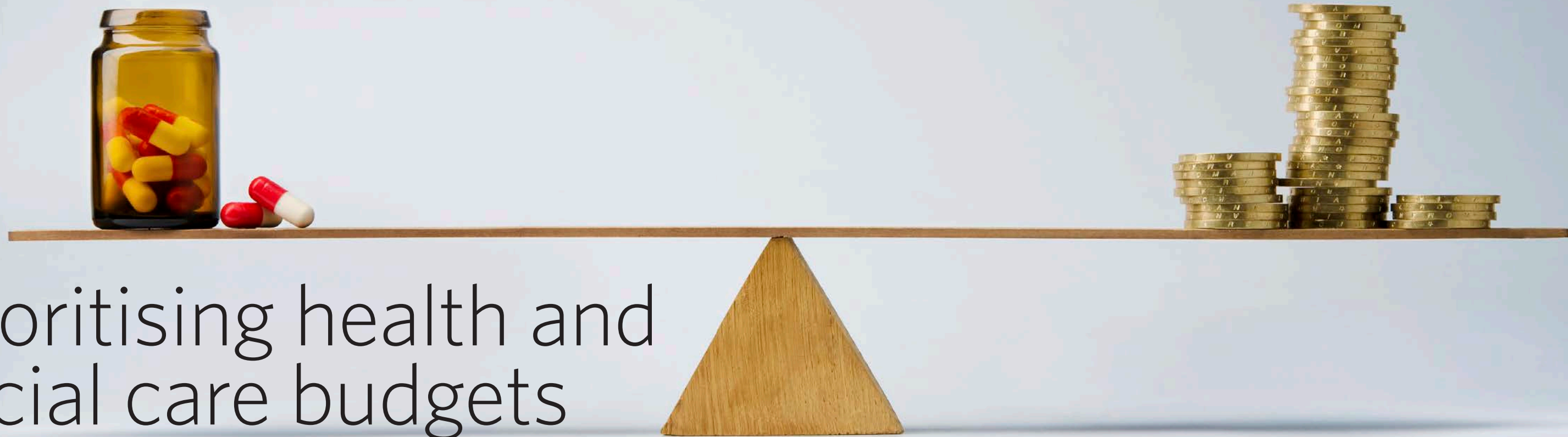
GCU research also looks at how cuts to public services and changes to welfare provision are making living in some communities more and more challenging, and redistributing risk from state to individuals and communities.

Recent publications have focused on how austerity measures may be viewed as mechanisms by which existing social and societal risks are intensified.

As the responsibility of the state shrinks, increased responsibilities for dealing with social risks are placed with local communities – as a result of this there is a shift of responsibility away from collectives to individuals.

In the following pages, you will discover how GCU's research is supporting inclusive societies.





# Prioritising health and social care budgets

Decisions about how to allocate health and social care resources fairly and efficiently are increasingly difficult for healthcare providers, particularly with competing claims on budgets that could benefit different groups of patients, clients and the public.

New Scottish Government legislation to implement health and social care integration came into force last year, bringing together NHS and local council care services under one partnership arrangement for each area. In total 31 local Health and Social Care Partnerships (HSCPs) have been set up across Scotland to manage almost £8 billion of health and social care resources.

As a result, there is a greater emphasis on provision for people in their own homes or local communities, while considering cost, quality and the value of services provided for local populations. The need to shift the balance of care from acute to community services, and re-prioritise

spending, has since been reinforced by the Scottish Government in 'A Plan for Scotland'.

In a ground-breaking project, researchers from GCU are developing the first framework for making difficult healthcare decisions which integrates economics, decision-analysis, ethics and law to be applied in this new context of shifting the balance of care.

With £244,000 funding from the Chief Scientist Office (CSO), the research team is developing and implementing the new framework in four HSCPs to establish barriers and facilitators to its use, but also make a comparative assessment of what difference it makes to priority setting processes in practice and to evidence-

based shifts in the allocation of health and social care resources.

Led by GCU's Professor Cam Donaldson, the team comprises researchers from the University of Strathclyde, Cardiff University, the University of Liverpool and the Scottish Government.

Professor Donaldson is working with colleagues Professor Rachel Baker, Marissa Collins and Dr Micaela Mazzei in GCU's Yunus Centre for Social Business and Health, a unique, interdisciplinary centre of excellence which hosts GCU's health economists, internationally recognised for their work across boundaries of care, including partnerships between the NHS, social care and the third sector.

"Difficult decisions will need to be made in Scotland about which services to fund and to what extent, and which existing services to scale back. Practically, with little or no increases in global budgets, frameworks need to facilitate resource shifts involving disinvestment from low-value services to move resources to higher-value services in areas of most need. This requires transparent and justifiable processes that consider costs and outcomes, the needs and values of local populations and a range of ethical, economic and legal arguments.



"Any new framework has to be practically and ethically robust to ensure that it is acceptable to stakeholders and to uphold the underpinning principles of healthcare provision. A study of this nature has never been undertaken before and would place Scotland at the forefront of this important field of social and economic policy."

Professor Cam Donaldson



# Austerity's impact on Scotland

At GCU, research led by Professor John McKendrick and Professor Darinka Asenova aims to inform the work of practitioners and campaigners who seek to tackle poverty in Scotland and the UK.

"At all levels – that is, UK government, Scottish government, local government and communities – there is a need to adopt or strengthen analysis of the cumulative risk impact of policy changes, in the context of wider societal and socio-economic trends, to ascertain, and if necessary thereafter to ameliorate, any deleterious impact of shifting risk onto the most vulnerable groups in society."

Professor John McKendrick



The combined impact of the economic recession, slow economic recovery, sustained government spending cuts and welfare reform have together impacted on already disadvantaged communities and groups within society.

GCU research looks at how cuts to public services and changes to welfare provision are making living in some communities more and more challenging, and redistributing risk from state to individuals and communities.

Recent publications have focused on how austerity measures may be viewed as mechanisms by which existing social and societal risks are intensified. As the responsibility of the state shrinks, increased responsibilities for dealing with social risks are placed with local communities – as a result of this there is a shift of responsibility away from collectives to individuals.

However, this increased responsibility for dealing with social risks has been placed with individuals and communities regardless of their ability or capacity to absorb them. This can affect, in particular, older people, lone parents and people experiencing in-work poverty.

Recent welfare reform and public service spending cuts are the most visible policy-driven contributing factors to risk redistribution in Scotland, creating a longer-term

'risk shift'. The rapid pace of change has led to a heightened sense of insecurity for vulnerable individuals and communities.

Current risk shifts coincide with significant social changes. In particular, it is projected that between 2010 and 2035 the number of adults living alone in Scotland will increase from 863,000 (37% of all households) to over 1.29 million (45% of households). This is attributable, in part, to a projected 63% increase in the population of pensionable age (65 plus) and a projected 51% increase in the number of lone parent households (National Records of Scotland, 2014).

These demographic changes will have significant implications for the capacity of vulnerable communities to handle risk. An ageing population and rise in lone parent households will create more pressures on inter-generational support, both financial and in-kind. At the same time, population ageing will create its own new demands (e.g. for healthcare and social support).

Increased numbers of adults living alone may exacerbate isolation (Age UK, 2010) and some traditional sources of informal social support (e.g. older family members) may shift from being providers to recipients of such support in future. Such changes will place more demands on public services at a time when provision is contracting.

Attempts have been made to

mitigate the impact of new risk exposure at local and Scottish national government levels; overall, the Scottish government has emphasised the importance of prevention policies and has invested in more of these than other devolved administrations in the UK.

However, the rapid pace of change has led to a heightened sense of insecurity for vulnerable individuals and communities. Recent and forthcoming austerity measures compound existing vulnerabilities that, in turn, may result in longer-term societal 'risk shift'. For those living on low and/or unstable incomes, existing vulnerabilities are made more acute by measures such as changing entitlements and timetables for welfare reform, uncertainty about service cuts and unequal economic recovery.

Although the relative cumulative impact of the austerity measures varies according to the particular circumstances of individuals and communities, there are potential long-term implications which can undermine the resilience of some communities. In conditions of further devolution, it is even more important for Scotland to develop a better understanding of the knock-on effect on individuals and communities and to identify effective policy measures within Scottish policy which could be modified so as to mitigate the risks faced by some citizens.



# Creating an inclusive intercultural student society

Researchers from GCU London have developed an open-source toolkit for universities and international students aimed at developing intercultural competence and contributing to inclusive society.

**F**unded by the European Commission's Erasmus Mundus programme for promoting European Higher Education, a team comprising researchers from GCU London; the University of Deusto, Spain; the University for Peace, Costa Rica; and the University of Porto, Portugal, explored intercultural issues that students and graduates are facing. They then developed an integrated learning programme that could help them deal with issues of cultural diversity and enable them to use intercultural contexts to their advantage.

The Erasmus Mundus Intercultural Competence (EMIC) project was led by GCU's Dr Dane Lukic, Senior Lecturer in Organisational Learning, who has expertise in learning processes in different contexts, organisational and workplace learning, intercultural competence, organisational dynamics and human resource development. The mobility that the Erasmus Mundus programme provides is one of its most important characteristics. Students gain educational experience in at least two countries that have different teaching and learning models. Students also live

in culturally diverse settings. In order to successfully work and collaborate with their colleagues from across the world, study in culturally different educational institutions and live in different countries, students require a set of abilities for dealing with such diversity. These abilities, collectively termed 'intercultural competence', enable effective studying, living and working across different cultural boundaries.

The EMIC project was established to develop proper support and training to fully utilise the potential for innovative learning that the cultural diversity of a study abroad experience can provide.

The project was designed to develop an integrated learning programme in order to help students deal with issues of cultural diversity and, from a developmental perspective, use intercultural contexts to their advantage.

Learning is contextualised within students' own experience, to allow them to compare the theoretical concepts with situations encountered in everyday study and life.

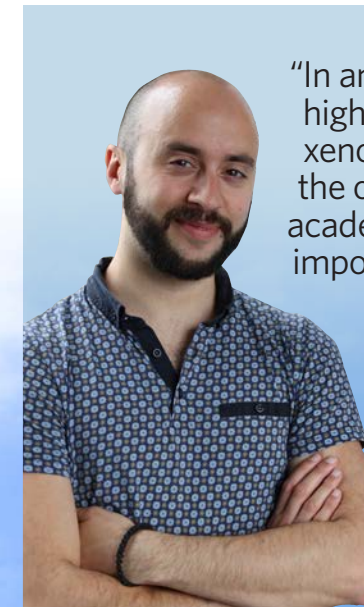
Based on the experiences of Masters students from around the world studying in European Higher Education

Institutions, the researchers developed an integrated learning programme, tested in four international joint Masters, and produced an open source toolkit which is potentially useful for other higher educational programmes.

The purpose of the EMIC Toolkit is to provide a set of flexible resources and tools to support developing intercultural competence in contexts similar to the Erasmus Mundus programme. It is composed of a series of learning activities organised in 'bundles' so that they can be used as a reflection tool. Activities are arranged in a blended learning model with a mix of face-to-face workshops and online activities.

The EMIC Toolkit also offers easy-to-use strategies for customising and implementing contextualised learning activities in the users' own cultural and academic contexts through guidelines and examples of good practice.

It will be useful for higher education institutions which want to develop support programmes for developing intercultural competence of their students as well as individual students who want to develop their intercultural competence and/or organise similar activities with their colleagues.



"In an era of increased mobility and internationalisation in higher education on the one hand, and increasing xenophobia and challenges to intercultural interactions on the other, developing intercultural competence for social, academic and professional contexts is of essential importance. The Erasmus Mundus Intercultural Competence (EMIC) learning programme, outlined in the toolkit, creates a unique environment for developing intercultural competence, sharing experiences and strengthening bonds with other colleagues, and fostering a network for future intercultural experiences and professional contacts."

Dr Dane Lukic



# Research funders and industrial collaborators

- Action on Hearing Loss
- Addaction
- Alzheimer's Research UK
- Arcadia Group
- Arthritis Research UK
- Arts and Humanities Research Council (AHRC)
- Australian Research Council
- Baily Thomas Charitable Fund
- Bòrd na Gàidhlig
- British Association for American Studies (BAAS)
- British Council
- Centre for Sensors and Imaging Systems (CENSIS)
- Charlesfort Properties Ltd
- Chartered Institution of Wastes Management (CIWM)
- Chest Heart & Stroke Scotland
- Chief Scientist Office (CSO)
- Child Poverty Action Group
- Coalition of Care and Support Providers in Scotland
- Construction Scotland Innovation Centre (CSIC)
- Cosmic Lab
- Diabetes UK
- Doble Engineering Company
- Dunhill Medical Trust
- Eaga Charitable Trust
- Economic and Social Research Council (ESRC)
- EDF Energy
- Energy Technology Partnership
- English Heritage
- Erskine
- European Commission
- European Forum for Research in Rehabilitation
- European Oncology Nursing Society (EONS)
- Everwood Interactive
- Fossil Grove Trust
- Gas Sensing Solutions
- Glasgow & Clyde Valley Green Network Partnership
- Glasgow Children's Hospital Charity
- Glasgow Social Enterprise Network
- Global Young Academy
- Gordon and Ena Baxter Foundation
- Health and Safety Executive (HSE)
- Health Protection Scotland
- Heart Research UK
- Highlands and Islands Enterprise
- Historic Environment Scotland
- Howden Process Compressors
- Infection Prevention Society
- Innovate UK
- Institute for Geri Olympics and Active Living
- Institution of Occupational Safety and Health (IOSH)
- International Association for the Study of Pain
- Lake Constance Water Supply
- LGBT Youth Scotland
- Lifeline Applications
- Mary Robinson Foundation – Climate Justice
- Medical Research Council (MRC)
- Medical Research Scotland
- MS Society
- National Institute for Health and Clinical Excellence (NICE)
- National Institute for Health Research (NIHR)
- National Trust for Scotland
- NESTA
- NHS Scotland
- Pal Technologies Ltd
- Peacocks Medical Group
- Playlist for Life
- Police Scotland
- Poverty Alliance
- Reaching Older Adults in Renfrewshire
- Royal Environmental Health Institute of Scotland (REHIS)
- SBRI Healthcare
- ScotRail
- Scottish Ambulance Service
- Scottish Ancestral Tourism Group
- Scottish Canals
- Scottish Economic Society
- Scottish Enterprise
- Scottish Environment Protection Agency (SEPA)
- Scottish Funding Council (SFC)
- Scottish Government
- Scottish Health Action on Alcohol Problems (SHAAP)
- Scottish Infection Research Network (SIRN)
- Scottish Social Services Council (SSSC)
- Scottish Tourism Alliance
- Seric Systems
- SPT
- SST Sensing
- Stewart Milne Group
- Stream Technologies
- Stroke Association
- Tenovus Scotland
- Terrence Higgins Trust
- The Carnegie Trust
- The Cochrane Stroke Group
- The College of Optometrists
- The Data Lab
- The Digital Health and Care Institute (DHI)
- The Historic Houses Association
- The Patron's Fund
- The Royal Society of Edinburgh
- The Tavistock Trust for Aphasia
- Topcon GB Ltd
- TopiVert
- Traceall Global
- Visibility
- VisitScotland
- Visual Research Trust
- Wellcome Trust
- World Health Organization (WHO)
- World Hepatitis Alliance
- Young Enterprise Scotland





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