



**Engineering a safer world:**  
Impact Review 2022

TOGETHER



**Lloyd’s Register Foundation is an independent global charity with a unique structure and an important mission: engineering a safer world.**

We focus on the most pressing global safety challenges and enhance the safety of life and property at sea, on land, and in the air. We do this by supporting high-quality research, accelerating technology to application, and through education and public outreach. Our unique structure comes from the fact that we own a significant trading company, Lloyd’s Register Group. We share the same mission and work together to make the world a safer place.

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## Foreword

# WELCOME TO 'TOGETHER'

Looking back on my first year as Lloyd's Register Foundation's Chief Executive, I have been reflecting on the difference we have made as a global safety charity over that time.

The safety of people around the world is still uncertain. Disasters like the earthquake in Turkey and Syria expose the desperate need not only for improved, resilient infrastructure built to high standards around the world, but also action informed by greater understanding of the resilience of the individual people and communities affected. Our World Risk Poll report 'A Resilient World? Understanding vulnerability in a changing climate' helps planners and policy makers across the world in preparing better when disaster strikes.

The latest IPCC reports show much more needs to be done to mitigate the impact of climate change, and with populations set to increase and the world economy forecast to double by 2050, we will be demanding even more from our engineered systems - both on land and in the ocean.

Engineers are critically important in keeping people safe – now and in the future. Often underappreciated, their role will grow in significance as these critical challenges facing society become more pressing. Our mission as a charity is to champion and empower people to engineer a safer world – especially in countries which are developing rapidly and where engineering skills are most needed.

When I look at the incredible people, teams, organisations and communities supported by Lloyd's Register Foundation, I am reminded how often teamwork and collaboration lead to breakthroughs and innovations that make a real difference. Our best work is done when we work across disciplines and sectors, sharing expertise and best practice with the goal of keeping people safe.

It is this spirit of collaboration that provided the inspiration for 'Together', the Foundation's Impact Review for 2022. It speaks to the convening power of Lloyd's Register Foundation – bringing people around the world to work together to deliver innovative solutions to the world's biggest safety challenges.

During the course of 2022, we have funded over 50 new projects in 12 countries, investing over £14million in support of our mission to engineer a safer world.

With thanks to all those who dedicate their lives to putting our mission into action: our colleagues, our global-grants community, and our partners such as the United Nations Global Compact, World Bank and High-Level Climate Champions, we continue to expand the scope and impact of our work, and I look forward to celebrating more successes and achievements in the coming year.

We hope you enjoy reading our Impact Review - and that these stories will inspire you to work with us in the future.

**Dr Ruth Bounphrey**  
Chief Executive





CEPOLAR

AALTO UNIVERSITY, FINLAND



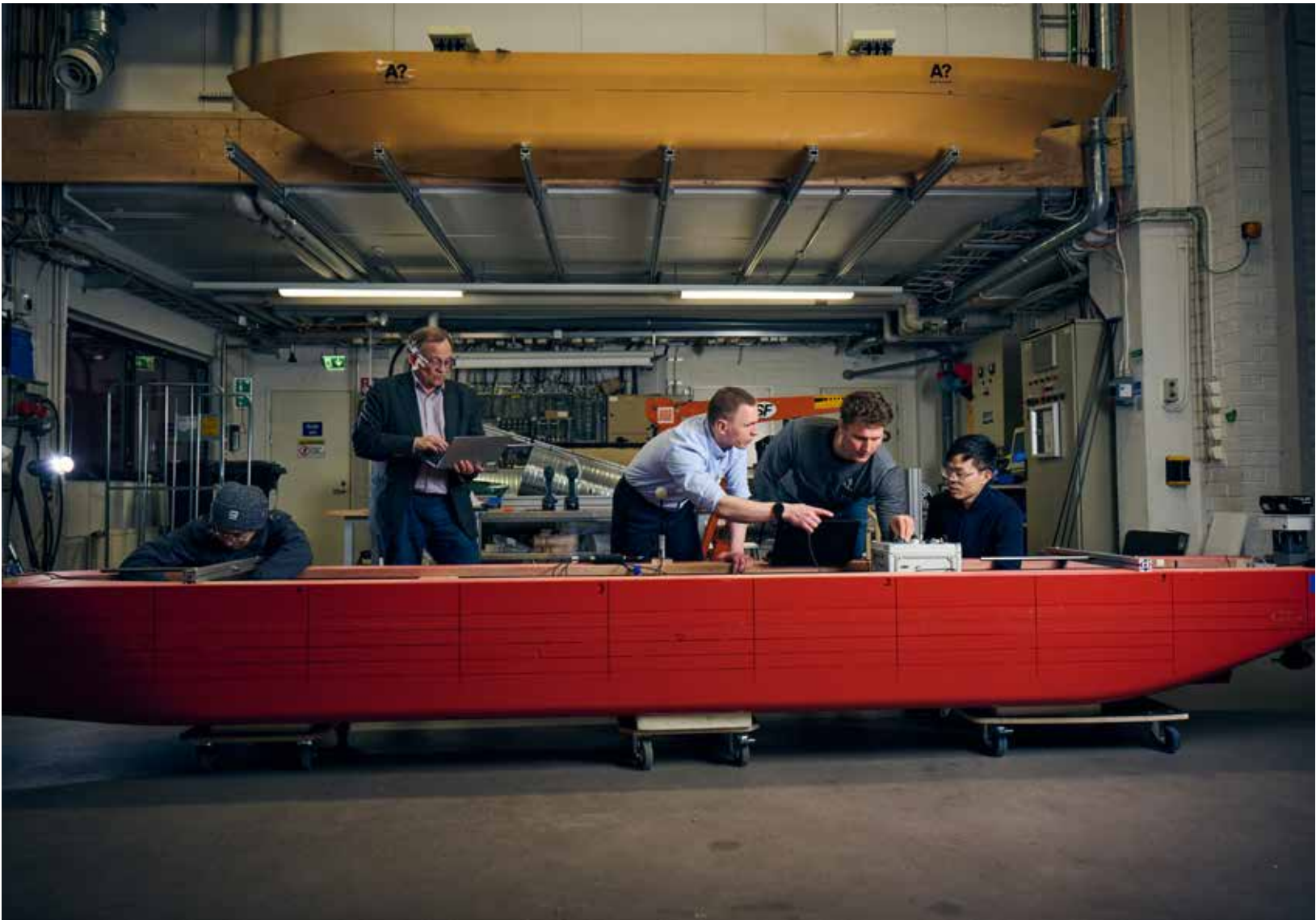
**“Ice poses significant and very specific challenges for ships transiting polar waters,”** explains Pentti Kujala of Finland’s Aalto University. “But current regulations for the design of ice-going ships don’t predict actual safety levels and don’t take proper account of ice-induced loads due to the changing ice-environment.”

“Historically, polar ship design has been based on tradition, not science, and that means that the lives of crews and passengers can be at risk. Our work at the Centre of Excellence for Scenario-based Risk Management in Polar Waters (CEPOLAR) has aimed to change that by developing recommended practice and associated software for the safe and sustainable design of ice-class fleets. Our project is multidisciplinary, combining expertise in design methods, ice environment, ship-ice interaction, and structural damage and consequence analysis.”

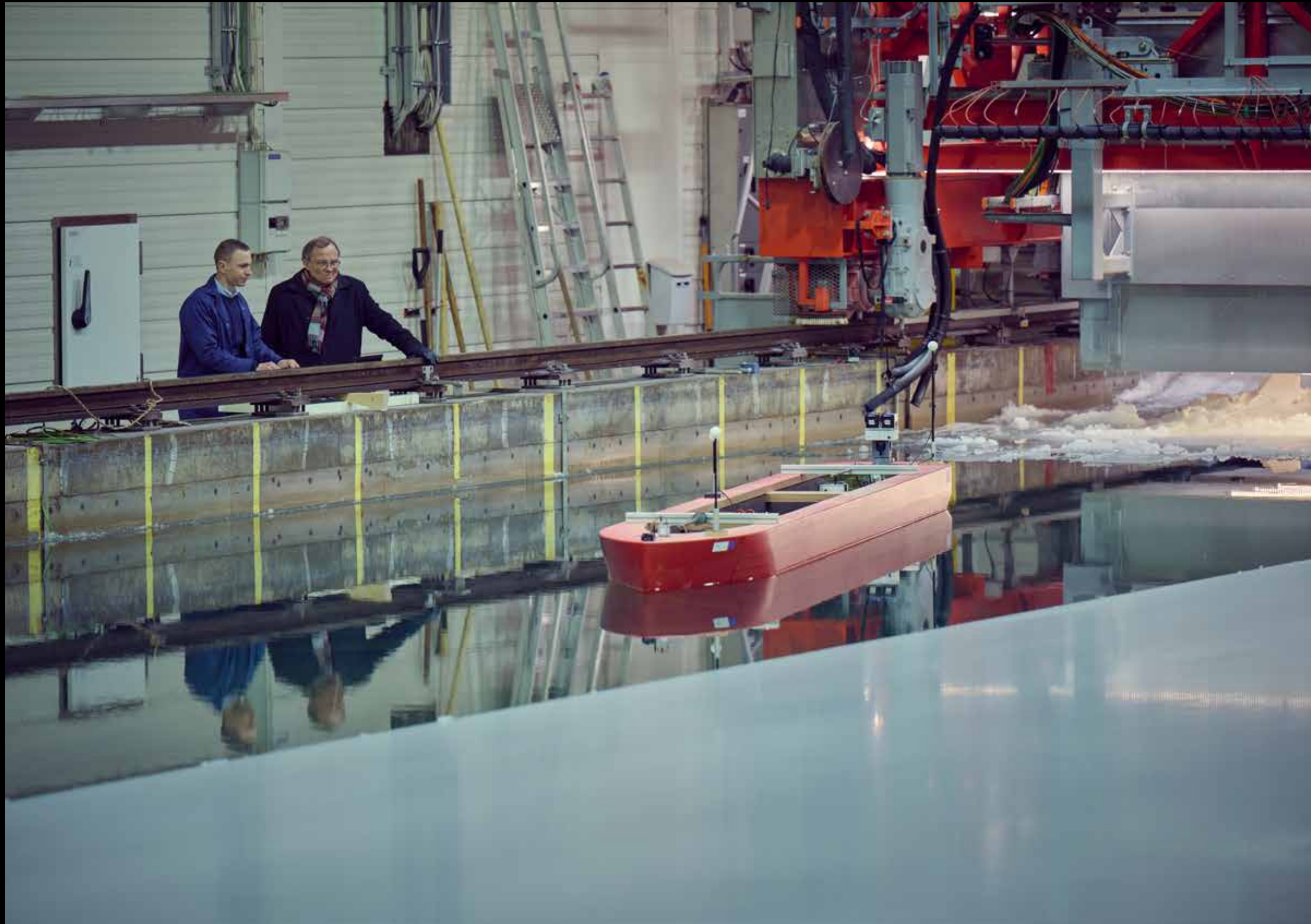
Funded by Lloyd’s Register Foundation, CEPOLAR is led by Aalto University in collaboration with the University of Helsinki, Hamburg University of Technology, Memorial University in Newfoundland and the Norwegian University of Science and Technology. The Centre has access to a 40-metre ice and wave tank at Aalto University that reproduces sea-ice – the only such facility of its size in the world.

“CEPOLAR brought together some of the most experienced and knowledgeable minds in arctic shipping,” adds Pentti. “In June 2022, we presented our guidelines through seven presentations at the International Conference on Ocean, Offshore and Arctic Engineering (OMAЕ 2022) in Hamburg.”

“You might think that building safer ships means building more expensive ships. But that isn’t the case at all. In fact our guidelines can lead to a weight reduction of around 20%, reducing fuel consumption and emissions. So saving lives can also mean saving costs and saving the planet – and that’s good news for everybody.”







Professor Pentti Kujala  
Aalto University, Finland

**“ICE IS A REAL DANGER  
TO SHIPS NOT DESIGNED  
FOR POLAR WATERS —  
OUR GUIDELINES WILL  
HELP KEEP CREWS AND  
PASSENGERS SAFE.”**



# DISCOVERING SAFETY

DERBYSHIRE, ENGLAND







**“Over half a million workers are injured every year in the UK, with over a hundred tragically losing their lives. The effect these incidents have on the lives of family, friends and colleagues are extensive”** says Helen Balmforth, who is leading Discovering Safety. “We must find a way to keep reducing health and safety risks to workers. Where incident rates are consistent year-after-year, data can help get us back on track.”

For Discovery Safety – a Health and Safety Executive (HSE) initiative funded by Lloyd’s Register Foundation – that new approach has meant bringing together safety data on an almost unimaginable scale. “HSE has been gathering facts on workplace accidents and incidents for nearly 50 years, including over 175,000 new reports every year” adds Helen. “By supplementing that with data from industry stakeholders, we have access to over 1.7 terabytes of data. That’s the equivalent of around 2,000 filing cabinets of information.

The aim of Discovering Safety is to translate all that data into meaningful insights that can be used to prevent risks and ultimately save lives. “It’s a huge task and we know we can’t do it on our own, so we work closely with our partners from academia and industry, as well as with the Foundation. So far we have worked with 250 key stakeholders across 21 countries” explains Helen.

Beginning in 2017, the Foundation’s involvement helped the project take its first steps and is now supporting six innovative and ground-breaking workstreams that focus on developing new data and analytical techniques to better understand and reduce health and safety risks to workers. Discovering Safety has an initial focus on the UK construction industry but shares knowledge and new techniques globally.

“This is a massive programme that’s going to make a difference to health and safety on a truly global scale,” says Helen. “That might sound like a hugely ambitious goal, but it’s absolutely achievable if we use innovative techniques to open up the wealth of data available to us.”





Dr Helen Balmforth  
Discovering Safety Programme Director

**“SAVING THE LIVES  
OF WORKERS. USING DATA  
TO DRIVE DOWN HEALTH  
AND SAFETY INCIDENT  
RATES GLOBALLY.”**



NSIRC

CAMBRIDGESHIRE, ENGLAND





**“It’s easy to take the integrity of the structures around us for granted,”** says Anurag. “An unexpected bridge collapse, failure of a sub-surface weld on an oil tanker, or an unforeseen interaction between two aircraft components are thankfully highly unusual occurrences. But if and when they do happen, the results can be catastrophic.”

A long-established partnership between Lloyd’s Register Foundation and The Welding Institute (TWI) is aiming to make such events rarer still, by supporting the work of PhD students studying at the National Structural Integrity Research Centre (NSIRC), a state-of-the-art postgraduate engineering facility in Cambridge, UK.

“By changing the DNA of a material, we can see how it reacts with other materials and technologies, and how that could influence performance, life cycle and safety, as well as repair regimes under different environmental conditions,” explains Anurag. “For example, we can model what will happen if we reduce the thickness of a steel panel in a ship hull. How can we do that safely? We know the existing panel will have a life of, say, 20 years. But if we reduce the thickness by x%, what happens to that operational life, and why?”

“At the same time, our studies are helping develop new materials and processes, such as new coatings with different combinations of polymers and plastics.”

The Foundation’s backing for TWI and NSIRC has so far funded [\[83\]](#) students in obtaining doctorates in the UK. Now the partnership is expanding internationally, with NSIRC Malaysia, Indonesia and Thailand all being founded in 2022 to enable students from around the world to access the best facilities and education in their own regions. In addition, NSIRC has signed Memorandums of Understanding towards NSIRC India with the Indian Institute of Technology Madras, and for NSIRC Greece with the Hellenic Mediterranean University in Crete. In many cases, these regions are in serious need of more qualified engineers and higher infrastructural standards, so will benefit massively from NSIRC’s presence.

“We simply couldn’t have done this without the Foundation,” says James Brookman, TWI & NSIRC Marketing Lead. “They provide us with financial support but also so much more, including hands-on expertise and valuable industry connections. Together, we’re improving the understanding of structural integrity and how infrastructure performs – helping to make the world’s built environments safer.”







Anurag Niranjana  
PhD student

**“IF A STRUCTURE ISN’T FIT  
FOR PURPOSE, IT THREATENS  
THE LIVES AND LIVELIHOODS  
OF COUNTLESS PEOPLE.”**

# MARITIME DECARBONISATION HUB

LONDON, ENGLAND







**“Shipping produces almost 3% of the world’s man-made emissions of carbon dioxide and is a major contributor to climate change”** says Charles. “But reducing this impact isn’t going to happen by chance – the industry needs help and support to identify and develop future fuels and ensure a smooth energy transition.”

A joint initiative between Lloyd’s Register Foundation and Lloyd’s Register Group Foundation, the Decarbonisation Hub brings together thought leaders and subject matter experts with the skills, knowledge and capability to help the maritime industry successfully decarbonise. “Our mission is to enable the delivery and operation of safe, technically feasible and commercially viable zero-emission vessels by 2030,” adds Charles.

In line with the Foundation’s mission, the Hub follows an independent, evidence-based approach – carrying out research into future fuels, creating projects with partners, managing pilot programmes and publishing the results openly and transparently. Candidate fuels include hydrogen, ammonia, methane, nuclear and biofuels, but the Hub maintains an entirely neutral, independent and fuel agnostic position. Using its Zero Carbon Fuel Monitor, stakeholders can track the state of readiness of each fuel across three key areas – shipping communities, investors, and the technology itself.

Through its presence in the UK, Singapore, Greece and the US, the Hub is working with a wide range of stakeholders across the world. “This is a global problem that needs a global solution,” explains Charles. “In Singapore, for example, we’ve enabled 12 stakeholders from across the supply chain to collaborate and develop a fleet fuel transition strategy that can be the basis of a highly scalable green corridor cluster in Singapore and the wider Asia region.”

“Working together, we’re committed to putting up a meaningful fight against climate change. It’s not going to be simple – but the Hub is already playing a key role in helping the industry rise to the challenge.”



**Charles Haskell**

Director, Lloyd's Register  
Maritime Decarbonisation Hub

**“SHIPPING CAN LEAD  
THE WORLD TO DECARBONISE  
QUICKER AND SAFER.”**



# UNIVERSITY OF SOUTHAMPTON

UK





**“Thousands of shipwrecks lie in the waters around Britain,”**

says Jack, a maritime archaeologist by profession. “But these are a lot more than relics of a forgotten age or hazards to modern day shipping. Thanks to the records of the Lloyd’s Register Foundation’s Heritage & Education Centre (HEC), these broken hulls and rotting timbers can tell real world stories that can teach us about everything from family histories to the evolution of maritime safety.”

The HEC’s mission is to inform, educate, influence and inspire policy makers, researchers and business leaders – helping them learn lessons from the past that can help shape a safer ocean economy for tomorrow.

Jack was so inspired by the wealth of information in the HEC archives that during lockdown he organised a course to help participants navigate through the extensive online catalogue for their own research. “All of Britain’s maritime history is there, with material covering over 260 years of ships, their journeys and often their ends,” he explains. “The HEC’s Visitor Centre is open to all, offering a unique collection of resources from the reference library and corporate archives – it’s invaluable for historians, archaeologists and anybody interested in the history of our oceans.”

Jack cites a tale of two vessels to highlight how the HEC archive adds to the sum of our knowledge. “The Ocean and the Rhoda Mary were similar ships, built a few years apart in the 19th Century,” he says. “The HEC helped researchers from the University of Southampton, supported by CITiZAN, identify their wrecks from multiple possibilities, as well as who owned and sailed them, where they were going and what they were carrying. Using ship survey reports, we can then compare and contrast the technologies used in their construction and map how and when innovations such as copper-alloy fastenings, copper sheathing and iron frames became common currency.”

“Through the HEC, we can see how shipbuilding and safety have evolved over the years, and understand how the lessons of the past are contributing to making the maritime world a safer place for everybody.”







Jack Pink

Senior Research Assistant, University of Southampton

**“EVERY SHIPWRECK HAS A  
STORY TO TELL — OF PEOPLE  
AND TRADE, SEASCAPES  
AND STORMS, ADVENTURE  
AND HEARTBREAK.”**



# OPEN BURNING OF WASTE

ENGINEERING X, KENYA

Photograph taken at Boredo Supplies Ltd in Nairobi County  
Left to right: Mr. George Achieng, founder Boredo Supplies Ltd; Dr Andriannah Mbandi, UNHLC Waste Lead; Mr. Dancan Miheso, Chief Environment Officer, Nairobi City Council







Photograph taken at Mr Green Africa

“In Africa, up to 90% of waste in cities is openly dumped and often burned, causing irreversible damage to people and the environment,” says Andriannah. “But in the absence of an effective waste management infrastructure, what choice do people have?”

Andriannah, the Waste Lead for United Nations High Level Climate Champions (UNHLC), leads a team of scientists that began working in partnership with Engineering X in 2021 to find a solution to the open burning of waste, with an initial focus on Africa. Founded by the Royal Academy of Engineering and Lloyd’s Register Foundation, Engineering X is an international collaboration that brings together some of the world’s leading problem-solvers to address the great challenges of our age. Engineering X and the United Nations High Level Climate Champions, along with other key partners, have been working together to introduce and elevate the open burning of waste onto the agenda of high-level discussions worldwide.

“From the first moments, our team knew that partnership was the only way to end an unsafe practice that has been going on for centuries,” explains Andriannah, who took over as project lead in January 2023. “By bringing together NGOs and civil society, alongside public and private sector entities – including those informal groups that currently handle waste, often by burning – we’ve already made excellent progress. Together, we’ve brought the issue to the front of minds everywhere in major global and regional forums, including the African Ministerial Conference on Environment, and the 26th and 27th UN Climate Change Conferences.”

Achievements to date include a resolution by governments across Africa, following the 18th African Ministerial Conference on Environment, to reduce the open burning of waste by 60% by 2030 and to eliminate it completely by 2040. The project has now gathered real momentum, highlighted by the launch of a new multi stakeholder partnership led by the African Ministerial Conference on the Environment, United Cities and Local Governments of Africa, Engineering X and UNHLC at COP 27 in November 2022.

“The ownership of this project now sits squarely with our partners,” adds Professor Desta Mebratu of Stellenbosch University, who led the project until the end of 2022. “It’s quite tremendous to see this level of support from stakeholders right across Africa. We have momentum, we have goodwill and – with the backing of Engineering X – we have the resources to help bring people and organisations together to work towards ending this practice and prevent more impact on health, safety and the environment.”

United Nations High-Level Champions

The United Nations High-Level Champions (UNHLC) for Climate Action was established at COP21 and has a UN mandate to work with the non-state actor community (businesses, investors, cities, regions and civil society) to strengthen ambition, accelerate action and facilitate collaboration between parties and non-parties to achieve the goals of the Paris Agreement. The UNHLC launched the following two flagship initiatives with the objective of fulfilling its mandate.

- **The Race to Zero<sup>1</sup>:** A global campaign to rally leadership and support to secure commitment of state and non-state actors to achieving zero emissions as soon as possible - and by 2050 at the very latest; and
- **The Race to Resilience<sup>2</sup>:** Aims to catalyse action by non-state actors that builds the resilience of four billion people from groups and communities who are vulnerable to climate risks by 2030. The decommissioning, dismantling and disposal of products and structures at the end of their life can damage the environment and squander scarce resources if not carried out responsibly.

<sup>1</sup> For more information, you may visit: <https://racetozero.unfccc.int/>.  
<sup>2</sup> For more information, you may visit: <https://racetozero.unfccc.int/race-to-resilience-launches/>.





Dr Andriannah Mbandi  
UNHLC Waste Lead

**“BURNING OF WASTE IS SETTING ALIGHT BILLIONS OF DOLLARS AS THIS IS A MISSED OPPORTUNITY TO PROTECT THE ENVIRONMENT, SUSTAIN LIVELIHOODS, PROTECT HUMAN HEALTH AND REDUCE CONTRIBUTION TO CLIMATE CHANGE.”**



SAFETYKNOT

BATTAMBANG, CAMBODIA





**“Around 90% of the five million injury-related deaths that occur every year happen in low and middle income countries,”** says Katherine, Founder of safety and first-aid training organisation Safetyknot. “From road traffic collisions and burns, to cuts and falls, these injuries can ruin lives and families. Yet most could be prevented from happening in the first place if appropriate safety training was readily available.”

“I was working for many years in low and middle income countries across Asia,” she adds. “So many preventable injuries were happening everyday in plain sight. Whilst some organisations were trying to help, too often their resources were just transplanted from a high income country – they didn’t take into account local culture or context and therefore this safety support didn’t resonate with the communities who needed it.”

Katherine’s response was to establish Safetyknot in 2018, and since then the organisation has developed a range of training packs that include everything required to train people in safe practices. All training and resources are grounded in storytelling and events from real life, using contextually appropriate content that local people can understand and engage with – even those who cannot read or write. “Thanks to financial support from Lloyd’s Register Foundation’s small grants programme, we’ve been able to distribute training packs to 29 organisations in Cambodia and Nepal, reaching an estimated 7,000 people,” says Katherine.

“The Foundation also invited me to speak at the Safer World Conference 2022, and that experience – together with my involvement with the Foundation’s Network to Engineer a Safer Tomorrow (NEST) scheme – has enabled me to meet and network with other Foundation grant holders and safety professionals. The more we work together, the safer the world will be.”

Katherine is now expanding Safetyknot’s reach into Thailand, Vietnam and the Philippines, and has also launched the Safetyknot App which provides practical safety tips. The app is free, available in Khmer, Nepali, Thai, Vietnamese and English, and includes an audio option so it’s accessible to all, regardless of literacy level. “It’s all about supporting the most vulnerable and keeping people safe,” she says.







Katherine Weatherburn  
Founder, Safetyknot

**“I DON’T THINK MONEY,  
EDUCATION OR WHERE YOU  
LIVE SHOULD BE BARRIERS  
TO SAFETY.”**

# UNIVERSITY OF THE PHILIPPINES VISAYAS

ILOILO CITY, PHILIPPINES







**“I come from a long line of Filipino seafarers,”** says Sanley. “They encounter social isolation, tough work and long hours, few employment protections and many months at sea with little shore leave. Safeguarding their mental health is an issue close to my heart and something that needs much greater understanding.”

Through the Seafarers International Research Centre (SIRC) at Cardiff University and other institutions, Sanley has been involved in research programmes around this issue for many years, including an exploration of how piracy off the coast of Somalia impacted seafarers’ wellbeing. When Covid-19 hit, it made an already acute mental health crisis many times worse, with thousands of seafarers suddenly stranded miles from home.

Funded by the Lloyd’s Register Foundation’s small grants scheme and part of an extensive programme of work to address mental health among seafarers, Sanley led a collaborative research project to identify which mental health interventions had been offered by employers and industry stakeholders. Crucially, the project – which was led by the University of the Philippines Visayas and conducted with World Maritime University and the University of Plymouth – also aimed to discover which interventions were considered most valuable by the seafarers themselves.

“We found an important difference between what was provided and what seafarers really wanted,” adds Sanley. “For example, while employers correctly identified timely crew changes as being very important, only 21% of companies provided immediate family support – yet seafarers cited this as the second most useful intervention.”

Sanley’s research led to a series of recommendations that aim to help the industry provide the right support in any future crisis. “My father went to sea, while both my brother and few cousins including a female cousin are currently seafarers,” he says. “For them and thousands like them, our work will make the world a safer place.”





**Dr Sanley Abila**

Project Leader, 2021 Mental health interventions for international seafarers provided during the COVID-19 pandemic

**“MENTAL HEALTH HAS  
LONG BEEN AN ISSUE FOR  
SEAFARERS, BUT COVID MADE  
A DIFFICULT SITUATION  
SO MUCH WORSE.”**



# NATIONAL SPACE ACADEMY

SOUTH AFRICA





**“Young people are inspired by the mind-blowing possibilities of space science to impact life here on Earth,”** says Anu.

“The UN has recognised around 30 climate change variables, the majority of which can only be measured from space in real time. So the more that young people learn about space, the more they can address some of the issues threatening sustainability and safety here on Earth, such as climate change and connectivity.”

The National Space Academy was founded on the belief that space science and capabilities can present solutions to the most pressing challenges facing humanity. Supported by Lloyd’s Register Foundation since 2013, the Academy provides schools with the extra activities and resources they need to help young people navigate their way into career pathways in science and engineering. To date, over 55,000 students and 5,000 teachers in the UK have participated in its masterclasses and teacher training programmes.

In 2018, the Academy extended its reach, initially to China, by hosting international graduate summer schools with the University of Leicester. Now, thanks to more backing from the Foundation, the Academy is developing a wider strategy for international collaboration on space and education. The latest outcome of this new global outreach programme is the launch of a partnership with the South African National Space Agency (SANSA).

Dan Matsapola, Science Engagement Manager at SANSA in Pretoria, takes up the story: “Our continent has the youngest population in the world, with 70% of people in sub-Saharan Africa under the age of 30. At SANSA, we’re inspiring them with space’s ‘wow factor’. During 2022, we engaged directly with over 30 000 young people through attendance at multiple, district Space Week events, together with a combination of school visits and workshops”

“Our planet is undeniably in crisis,” adds Anu. “Space science is no longer a ‘nice to have’. It’s a ‘must have’ if we’re going to rise to our big challenges and make the world a safer place. We’re inspiring young people to reach for the stars – and helping them make a real difference to the planet they call home.”







Professor Anu Ojha  
Director, National Space Academy

**“SPACE SCIENCE IS  
INSPIRING YOUNG PEOPLE  
TO SOLVE CRISES  
MUCH CLOSER TO HOME.”**



HELMEPA

ATHENS, GREECE







**“The seas around Greece are incredibly busy with everything from huge container ships and ferries to small fishing boats and yachts,”** says Constantinos. “Despite advances such as improved ship design and navigation technology, we continue to see too many people hurt and vessels damaged – with the vast majority of incidents attributed to human error and the lack of maritime safety culture.”

“Attitudes to safety are often shaped by the cultural context. Rules and regulations exist, but the challenge is to encourage people to follow them and adopt safe practices. At the Hellenic Marine Environment Protection Association (HELMEPA), we’re working hard to strengthen a culture of safety in the Eastern Mediterranean and our activities also extend to Cyprus, in cooperation with our sister Association, CYMEPA.”

The maritime safety project is the fourth HELMEPA campaign to be funded by Lloyd’s Register Foundation. At its heart is a Voluntary Incident Reporting Platform (VIRP) that enables shipping companies and operators of smaller craft such as fishing vessels and yachts to share reports of incidents and near-misses. All details are anonymised to protect commercially sensitive information.

“It’s all about learning lessons from the experiences of others,” explains Constantinos, who has worked with HELMEPA since 2001. “Through collaboration, teamwork and the sharing of lessons learned, we can help cut out the sort of incidents that happen time and time again. These include everything from serious accidents due to fires or entry into enclosed spaces, to more trivial, but often equally impactful, incidents due to the incorrect use of pilot ladders and slips, trips and falls on board ships. By May 2023, the VIRP included over 1,200 reports from 36 major shipping companies and members of HELMEPA as well as input from operators of fishing and recreational boats.”

The Foundation’s support also extends to other HELMEPA activities, such as two- and three-day seminars, workshops and webinars that provided maritime training to more than 2,000 participants between 2020 and 2022. Each course covers various safety-related topics and is delivered by expert speakers from within HELMEPA’s membership, including Lloyd’s Register Greece, who share their knowledge, expertise and best practices with their fellow members.

HELMEPA membership has increased seven-fold since 2020 and now encompasses 315 shipping companies and organisations, 2,270 ocean-going vessels of all types and 14,000 Greek seafarers. A recent TV spot to promote the wearing of lifejackets by yacht owners, fishermen and skippers of sailing boats bears testament to the organisation’s growing role in Mediterranean shipping. “In my view, this is one of the most beautiful parts of the world,” adds Constantinos. “By working together, we can also make it one of the safest.”





**Constantinos Triantafyllou**  
Head of Strategy & Development, HELMEPA

**“GREEK WATERS ARE  
AMONG THE BUSIEST IN THE  
WORLD. BY TRANSFORMING  
ATTITUDES, WE’RE HELPING  
TO ALSO MAKE THEM AMONG  
THE SAFEST.”**







# ACKNOWLEDGEMENTS

**We would like to thank**

- Pentti Kujala
- Helen Balmforth
- Gemma Turner
- Andrew Keevil
- Charles Haskell
- Andy Franks
- Samie Parker
- Ahila Karan
- Carlo Raucci
- Jack Pink
- Julian Whitewright
- Charlie Fenn
- Hazel Ingham
- Andriannah Mbandi
- Destra Mebratu
- Sanley Abila
- Lorna Lewin
- Anu Ohja
- Dan Matspola
- Thandile Vuntu
- Constantinos Triantafillou

**Design and copywriting**

- Luminous
- James Moore
- Emily Anderson
- Charlie McCormick

**Photography credits**

- Sam Barker

**Editing**

- Sam Dadd
- Rachel Wells
- Beth Elliot
- David Reid
- Christine Cook
- Mathea Berghouse
- Debbie Blackmore

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and limited company (Reg. no. 7905861) registered in England and Wales.

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INV009932  
Printed on carbon neutral paper  
from Elliott Baxter & Co Ltd



