EngineeringX

Safer End of Engineered Life

Safer Decommissioning of Offshore Structures and Ships

Workshop report

18 and 19 May 2022

Royal Academy of Engineering

LR Foundation

Contents

Executive summary

Engineering X hosted a second global workshop on safer decommissioning of offshore structures and ships online on 18 and 19 May 2022. The first global workshop was hosted in person in London in 2019. This follow-up workshop aimed to:

- reconvene past participants and reflect on any progress over the last three years
- look back and reassess where we are now with safety challenges identified in the first workshop
- look forward to how we will continue to tackle safety challenges.

This report outlines the workshop's motivation, background, activities, and key findings in addressing safer decommissioning of offshore structures and ships.

The workshop brought together 47 experts from 15 countries, from industry, government, NGOs, and academia, with specialties across decommissioning activities for offshore structures and ships.

Over two half days of activities, the project leads that were funded following the first workshop provided updates on their work and outcomes to date, with time for questions and comments from the other participants. Everyone participated in breakout room discussions on pre-selected priority topics of transparency, safety risks and accountability, hazardous waste, and engaging stakeholders. A panel discussion explored how safety in decommissioning offshore structures and ships had changed over the last three years, and the key safety challenges going forward. The workshop culminated with all participants reflecting on progress on the safety challenges identified at the 2019 workshop, and considering future challenges and actions required.

This report's purpose is to share the insights from this second global workshop and to shine a light on some of the challenges to be overcome to continue to improve safety going forwards.

There was consensus from participants that the aspirations from the first workshop were still relevant, and some progress had been made in improving safety. However, it was also noted that progress in the last three years has felt slow, although it was acknowledged that the COVID-19 pandemic had made for an unprecedented period. While there has been increased media attention on the issues in the industry, a continued lack of transparency and reliable data has been a key challenge to making improvements to safety in the industry.

Looking forward, there was agreement of: (1) the need for inclusive collaboration with all stakeholders bringing different global perspectives; (2) the necessity of early engagement in regions with young offshore decommissioning industries; (3) the potential of innovation and smart technology to improve safety and aid transparency of data collection and sharing in the industry; and (4) that a myriad of new decommissioning and safety challenges will emerge with the acceleration of the offshore renewable energy industry.

Introduction

On 18 and 19 May 2022, Engineering X hosted the second global workshop to address safer decommissioning of offshore structures and ships, as part of the Safer End of Engineered Life mission. The workshop was held online to allow wide participation from the decommissioning community and stakeholders.

During the workshop, participants highlighted any progress over the last three years and looked ahead to set priorities for the future. This report summarises the activities and key discussion points.

We are very grateful to all workshop participants for their valuable contributions and support of this work. A list of participants is included in Annex 1.

Background

Engineering X is an international collaboration founded by the Royal Academy of Engineering and Lloyd's Register Foundation that brings together some of the world's leading problem-solvers to address the great challenges of our age. It has a global network of expert engineers, academics and business leaders, working in partnership to share best practice, explore new technologies, educate and train the next generation of engineers, build capacity, improve safety, and deliver impact. Engineering X is currently working on five missions, one of which is Safer End of Engineered Life. This mission aims to improve safety in the decommissioning and disposal of products and structures at the end of their life. One focus is improving safety in decommissioning offshore structures and ships.

The first global workshop in 2019

As a starting point for the work around safer decommissioning offshore structures and ships, Engineering X held an international workshop in July 2019 that brought together 58 experts from 21 countries.

The workshop convened stakeholders from a broad range of disciplines and sectors to work together to identify fundamental safety challenges in the area and impactful ways to address them. It placed an emphasis on shaping new collaborations leading to projects that create impact in this area where it is most needed. Read the workshop report.

Participants of the first Safer Decommissioning of Offshore Structures and Ships workshop held in London in 2019.

Funded projects

The 2019 workshop was followed by a call for proposals for funding available to participants and their wider networks. From this, Engineering X funded six projects totalling almost £1 million lasting up to five years. One project has finished and five are still in progress. See the summary of projects below for more information.

There are a total of 21 organisations working on the six projects, each with its own project lead. The six project leads played an active role in planning and delivering aspects of the 2022 workshop.

Summary of the projects

The six projects funded in response to the first workshop are detailed below:

The risks of structural failure of decommissioned offshore oil and gas installations worldwide

Partners: Regional Maritime University (Ghana), University of Strathclyde (UK), SEIP 7 (Brazil), Liverpool John Moores University (UK)

Project duration and end date: two years, November 2022

Project lead: Lee Allford at the Energy Institute

To investigate worldwide the major accident risks associated with the loss of structural integrity of oil and gas platforms during their decommissioning and assess whether the sector has adequate arrangements for managing these risks.

Ensuring the rights of communities and workers affected by shipbreaking

Partner: Bangladesh Environmental Lawyers Association (BELA)

Project duration and end date: three years, March 2023

Project lead: Ingvild Jenssen at NGO Shipbreaking Platform

To increase awareness of existing workers' rights, including occupational health and safety, to support demands for safer working conditions.

Safety envelope for ship recycling practices in Bangladesh: hazard identification and risk evaluation

Partners: Bangladesh University of Engineering and Technology (Bangladesh), Kabir Steel Limited (Bangladesh)

Project duration and end date: five years, March 2026

Project lead: Dr Arun Dev at Newcastle University in Singapore

To achieve a better understanding of the relationship between ship recycling practices, their hazards, and the safety and wellbeing of the people who work in ship dismantling/recycling facilities in Bangladesh.

Establishing a global baseline and raising awareness to help deliver safety improvements

Partners: Advisian (UK), University tec de Monterrey (Mexico), University of Teramo (Italy), NGO Shipbreaking Platform (Belgium)

Project duration and end date: three years, June 2023

Project lead: Professor Fraser Sturt at University of Southampton

To develop an open access, dynamic and graphical web dashboard with associated evidential material and reports on a wide range of information including the number, age and location of offshore structures and ships globally, the materials they contain, their legislative contexts, and who has ownership and other responsibilities.

Safe and sustainable decommissioning of offshore structures taking into consideration the peculiarities of the ASEAN and South Asia Regions

Partners: Universiti Teknologi PETRONAS (Malaysia), PetroVietnam University (Vietnam), Newcastle University in Singapore (Singapore), Liverpool John Moores University (UK), Sea Sentinels Pte Ltd (Singapore), Mahidol University (Thailand), Institut Teknologi Bandung (Indonesia), R.L.Kalthia Ship Breaking Pvt. Ltd. (India)

Project duration and end date: four years, February 2024

Project lead: Led by Professor Omar bin Yaakob at Universiti Teknologi Malaysia

To develop technical guidelines for safe and sustainable decommissioning processes as well as safe and sustainable recycling facilities and safe downstream waste management facilities for decommissioned offshore structures in ASEAN and South Asia.

Supporting the Ship Recycling Transparency Initiative (SRTI) (project completed)

Project duration and end date: two years, February 2022

Project lead: Andrew Stephens at Sustainable Shipping Initiative

To build on the SRTI's existing aims to accelerate a voluntary market-driven approach to responsible ship recycling practices. Includes improvements to SRTI's online platform through which shipowners can publicly disclose their ship recycling policies, and further development of their disclosure criteria to improve transparency in ship recycling value chains.

Aims of the 2022 workshop

The workshop objectives reflect the aims of the safer decommissioning of offshore structures and ships work, which is:

- to achieve safety though raising standards, improving consistency and spreading the implementation of best practices in the global handling of the decommissioning of offshore systems and ships.

The second global workshop in May 2022 aimed to:

- reconvene past participants and reflect on any progress over the last three years.
- look back and reassess where we are now with safety challenges identified in the first workshop.
- look forward to how we will continue to tackle safety challenges.

An emphasis was placed on reassessing where we are now with the critical safety challenges identified in the first workshop and updating the community on the progress of the 6 projects funded by Engineering X after the first workshop.

Participants

Participants were drawn from across the globe and represented cross-sector interests in decommissioning offshore infrastructure and ship recycling.

Workshop participants, project leads and Engineering X staff attended the second global workshop.

The workshop brought together 47 experts from academia, industry, NGOs, and government. All participants from the 2019 workshop were invited and 32 attended the second workshop. There were also 15 new participants who were identified from participants' networks. A list of participants is included in Annex 1.

As in the first workshop, participants were invited to ensure broad geographical representation and representation from industry, government, NGOs, and academia with principal interests in decommissioning offshore structures and/or ships. Figure 1 and figure 2 show a breakdown of participants by country and sector.

Some past participants expressed interest in the workshop but were unable to attend. They have been included in the post-workshop opportunities such as the community of practice.

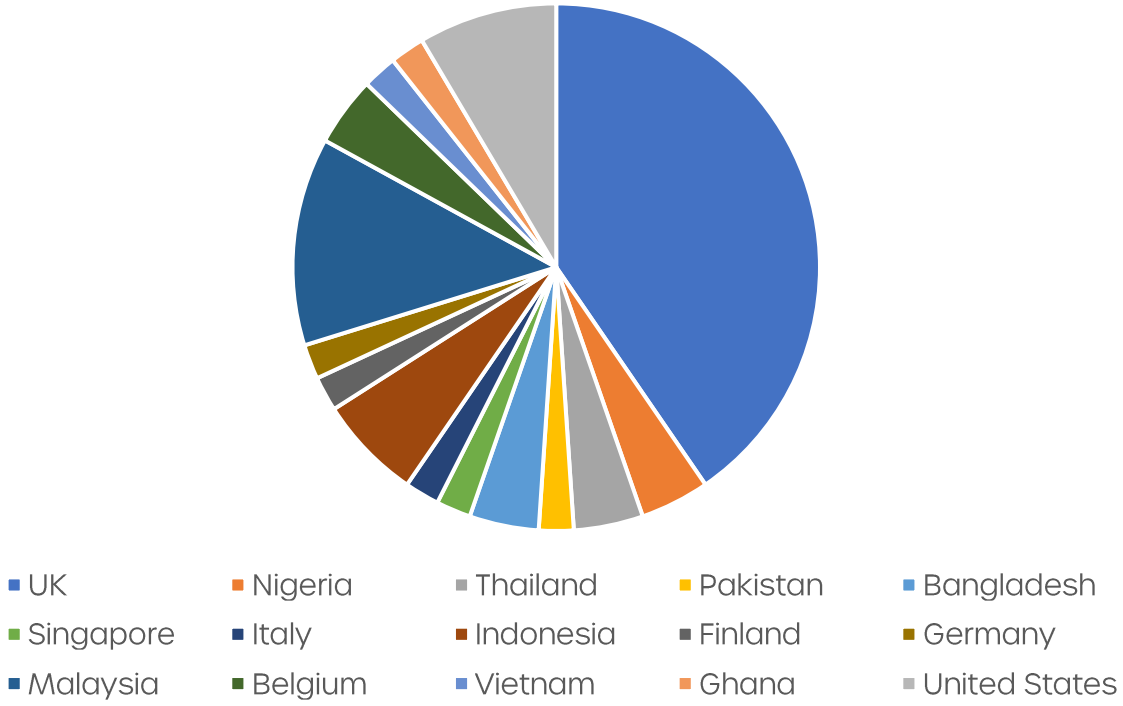


Figure 1. Breakdown of participants by country.

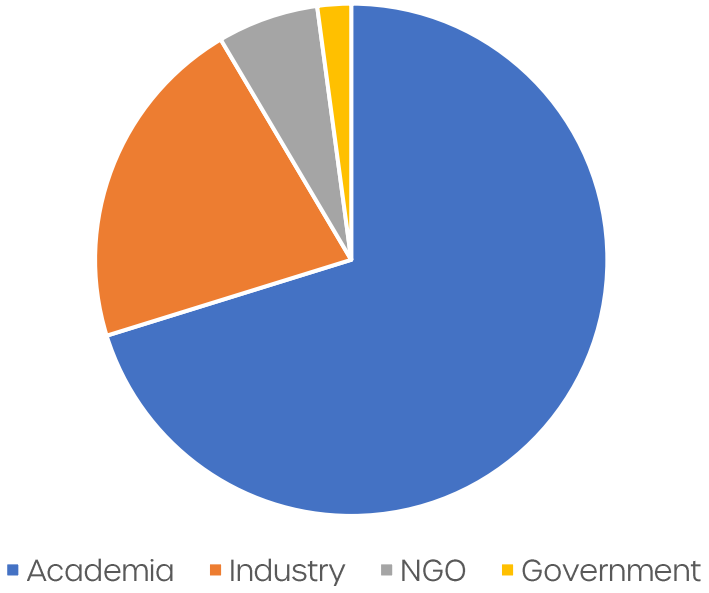


Figure 2. Breakdown of participants by sector.

The workshop chair

Professor Susan Gourvenec FREng, who is the theme lead, chaired the second workshop, as she did the first one. She is Royal Academy of Engineering Chair in Emerging Technologies – Intelligent and Resilient Ocean Engineering, Deputy Director of Southampton Marine and Maritime Institute, and Professor of Offshore Geotechnical Engineering at the University of Southampton. She also sits on the Safer End of Engineered Life Programme Board.

Professor Gourvenec provides technical knowledge and expertise to steer the work around safer decommissioning of offshore structures and ships.

Professor Susan Gourvenec, theme lead, chaired the workshop.

Workshop schedule

On day one of the workshop, project leads shared the progress of the six projects funded by Engineering X and participants discussed some of the critical topics related to safety in decommissioning of offshore structures and ships. The project leads also facilitated breakout room discussions on the themes that they identified as critical safety issues prior to the workshop.

Day two looked at safety challenges from different perspectives through a panel discussion and looked ahead to how to tackle future key safety challenges.

See the full workshop agenda in Annex 2.

Poll results

At the start of the workshop, Engineering X asked questions to participants to highlight the range of expertise in the room through a series of polls. The same questions were also asked in the first workshop. The results are shown in figures 3 to 6, and compared with the results from the 2019 workshop.

The poll highlighted a similar balance of those principally involved in ship recycling and decommissioning offshore structures present in the room compared to the first workshop. The poll demonstrated a collective desire for collaboration to assess where we are now with safety challenges and to look ahead to how we continue to tackle them.

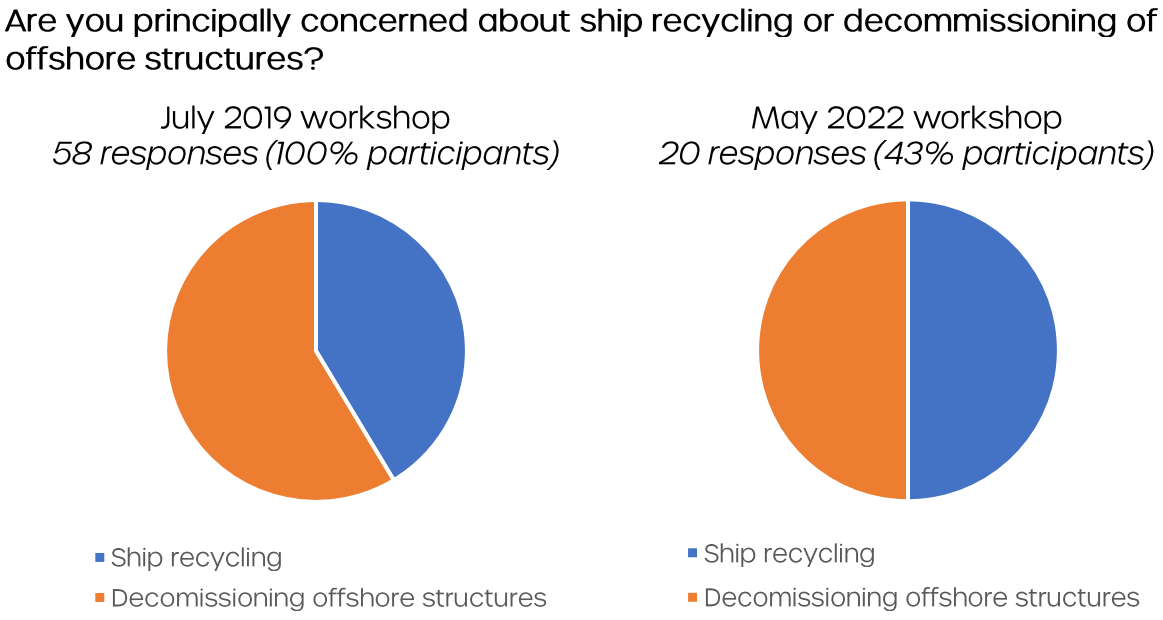


Figure 3. Comparison of poll results between the 2019 and 2022 workshop for the question 'Are you principally concerned about ship recycling or decommissioning of offshore structures?'

How many years of experience do you have?

July 2019 workshop
55 responses (95% participants)

May 2022 workshop
27 responses (57% participants)

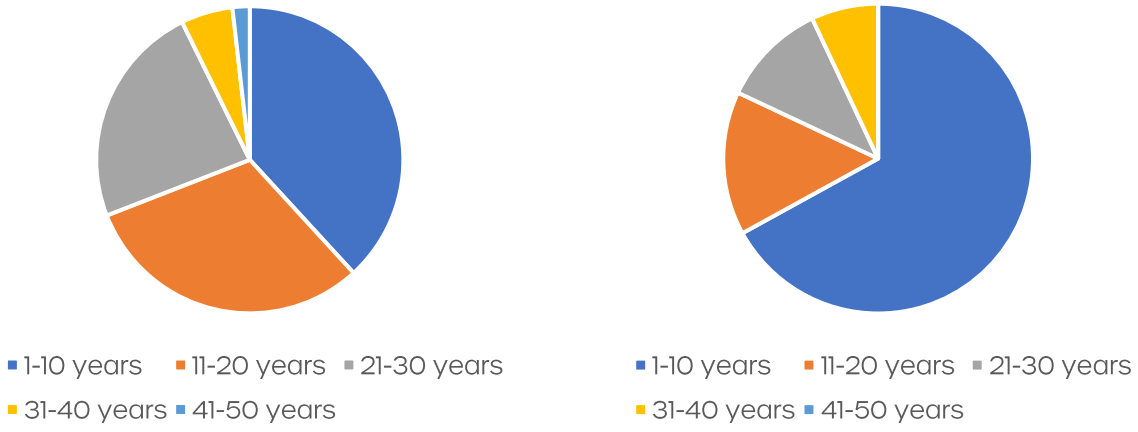


Figure 4. Comparison of poll results between the 2019 and 2022 workshop for the question 'How many years of experience do you have?'

The workshop aim that most aligns with my interests is...

July 2019 workshop
54 responses (93% participants)

May 2022 workshop
28 responses (60% participants)

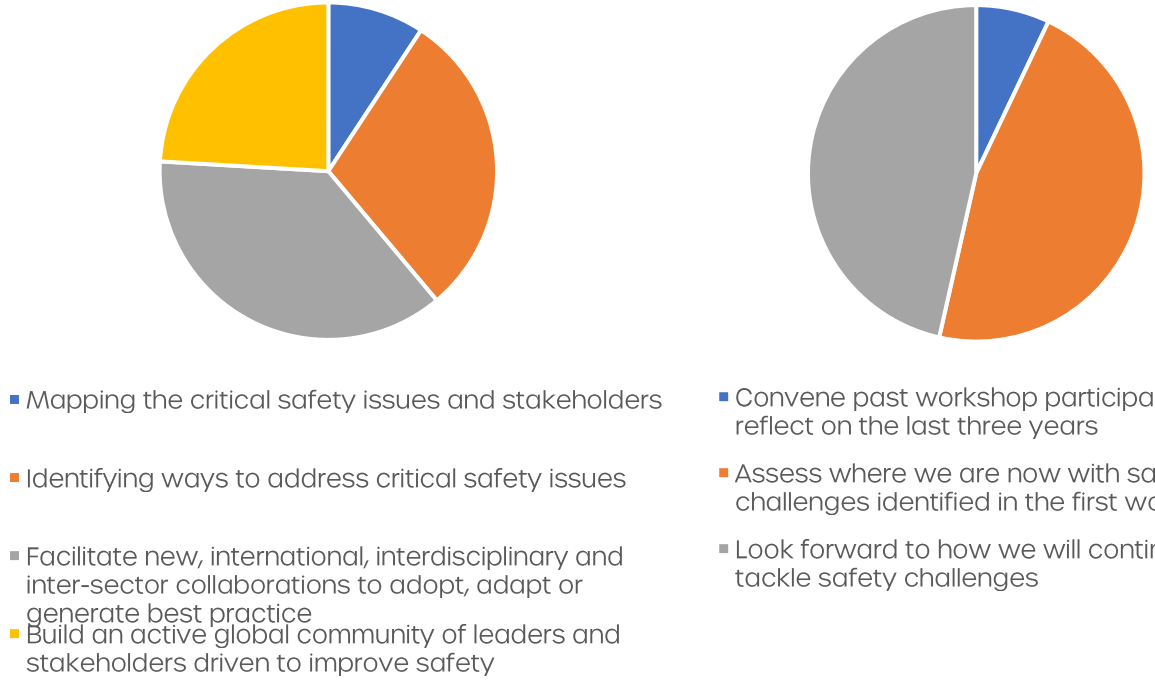


Figure 5. Comparison of poll results between the 2019 and 2022 workshop for the question 'The workshop aim that most aligns with my interests is...'

Describe what you hope to get out of the workshop in one word

July 2019 workshop

May 2022 workshop

Figure 6. Comparison of poll results between the 2019 and 2022 workshop for the question 'Describe what you hope to get out of the workshop in one word.'

Project progress update

The project leads each presented an update of their progress at the workshop. A summary is presented on the Miro board Showcase as illustrated in figure 7. A summary of the updates from each project is outlined below.

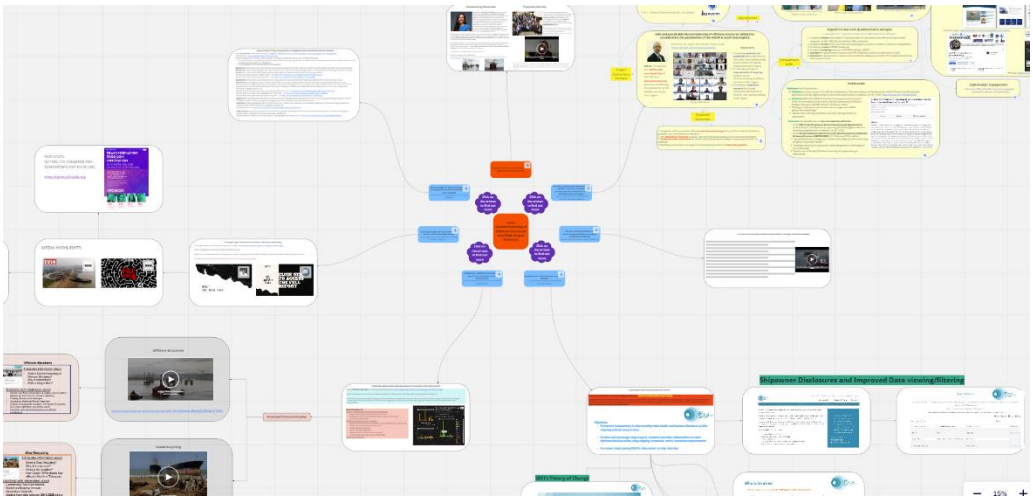


Figure 7. Project progress highlighted on the Miro board Showcase.

The risks of structural failure of decommissioned offshore oil and gas installations worldwide

Partners: Regional Maritime University (Ghana), University of Strathclyde (UK), SEIP 7 (Brazil), Liverpool John Moores University (UK)

Project duration and end date: two years, November 2022

Project lead: Lee Allford at the Energy Institute

Summary of the update:

- Each partner was assigned a region to investigate the prevailing offshore regime as applied to decommissioning and local risks posed to structural integrity during this phase to life safety.
- Information has been gathered through loss and incident databases, interviews with operators and regulators, reference materials, media stories, and participation in webinars.
- There is little information on the risk of structural failure to be found in publicly available databases on incidents specifically during decommissioning phase.
- Interviews with regulators in some regions uncovered concerns regarding increasing support vessel size and risks posed to installation integrity (even more emphasised with heavy lift vessels during decommissioning).
- The research report is in concluding phases prior to publishing in full.

Ensuring the rights of communities and workers affected by shipbreaking

Partner: Bangladesh Environmental Lawyers Association (BELA)

Project duration and end date: three years, March 2023

Project lead: Ingvild Jenssen at NGO Shipbreaking Platform

Summary of the update:

- There has been in-depth media coverage in both ship owning and shipbreaking countries.
- Bangladesh authorities have acted on several cases, including bans on importing Floating Storage and Offloading (FSO) tanker J. NAT and MV Princess.
- Bangladesh authorities reversed on the decision to downgrade the shipbreaking sector from ‘red’ to ‘orange’ code.
- A fundraising campaign for injured workers has been launched in collaboration with Centre for the Rehabilitation of the Paralysed.
- Criminal liability for the illegal export of end-of-life ships has been confirmed by the Norwegian Court and new investigations are underway in the UK, Iceland and Germany.

- Major cruise company (Carnival Corporation) and offshore company (SBM) have adopted sustainable recycling policies.
- Next steps are the ship recycling lab in Rotterdam on 20 to 21 September.

Safety envelope for ship recycling practices in Bangladesh: hazard identification and risk evaluation

Partners: Bangladesh University of Engineering and Technology (Bangladesh), Kabir Steel Limited (Bangladesh)

Project duration and end date: five years, March 2026

Project lead: Dr Arun Dev at Newcastle University in Singapore

Summary of the update:

- A meeting was held with the representatives from the Ministry of Industries (MoI) in August 2021 to present the project's goals and benefits, get access to the ship recycling yards and to gather data on previous years' hazards and accidents.
- Three field visits have taken place to Kabir Group Ship Recycling Facility, HR Ship Management Limited (Safety Agency) and SN Corporation Ship Recycling Facility.
- Online activities include an introductory discussion session with the representative from the industrial partner (Kabir Steel), three sessions based on online surveys with HR Ship Management Limited (safety agency) and collection of Bangladesh's ship recycling statistical data for the creation of a database.
- A paper titled *A Techno-Economic Study on Ship Recycling Practices in Bangladesh: From Safety Perspective*, was presented at DECOM (3rd International Conference on the Decommissioning of Offshore and Subsea Structures 2022).
- Online seminar in March 2022 about sectors affiliated with the ship recycling industry and ship recycling research prospects had over 50 participants. The attendees included representatives from the Bangladesh Ship Breakers Association (BSBA), ship recycling yards, safety agencies, the Ministry of Industries, Department of Explosives, Department of Environment, researchers, and academics from various local universities.
- The project website was launched in February 2022. The website will be gradually updated as the project progresses.

Establishing a global baseline and raising awareness to help deliver safety improvements

Partners: Advisian (UK), University tec de Monterrey (Mexico), University of Teramo (Italy), NGO Shipbreaking Platform (Belgium)

Project duration and end date: three years, June 2023

Project lead: Professor Fraser Sturt at University of Southampton

Summary of the update:

- A robust global (open access) baseline dataset and story maps to demonstrate trends are being created, analysing data to show spatial and temporal trends and generating indicative Inventory of Hazardous Materials (IHMs).
- Ethical and economic contexts are being established by reviewing the current legislative environment in a format suitable for lay audience.
- Artificial intelligence methods are being used to detect offshore structures using free available satellite imagery (e.g., Sentinel-1, Landsat) and Google Earth Engine. This will be tested on known and well-documented locations of platforms (Gulf of Mexico and North Sea) and applied on other areas around the world.

Supporting the Ship Recycling Transparency Initiative (project completed)

Project duration and end date: two years, February 2022

Project lead: Andrew Stephens at Sustainable Shipping Initiative

Summary of the update:

- New signatories continue to join and now total 30, of which 12 are disclosing shipowners.
- The inclusion of three major shipowners (Evergreen Marine, Crowley Maritime and NYK), brings the total number of vessels covered by the SRTI to 3,467, which is about 7% of the global fleet.
- Swiss Re Corporate Solutions and American Hellenic Hull Insurance Company have joined the initiative and become members of the steering group.
- Volkswagen Group Logistics joined in January 2022 (alongside BMW Group, John Deere and Scania).
- Improvements have been made to the online platform and there has been further development of the platform's data-filtering capability.
- Safety and environmental performance has somewhat improved across the industry but a direct causal link difficult to assign.
- Promotion and engagement – perverse outcome of COVID-19, meaning SRTI have increased their reach with online events (webinars, panels, roundtables), social media, and so on.
- Links made with the Sustainable Shipping Initiative's work on ship lifecycle and steel to circular economy.

Safe and sustainable decommissioning of offshore structures taking into consideration the peculiarities of the ASEAN and South Asia Regions

Partners: Universiti Teknologi PETRONAS (Malaysia), PetroVietnam University (Vietnam), Newcastle University in Singapore (Singapore), Liverpool John Moores University (UK), Sea Sentinels Pte Ltd (Singapore), Mahidol University (Thailand) Institut Teknologi Bandung (Indonesia), R.L.Kalthia Ship Breaking Pvt. Ltd. (India)

Project duration and end date: four years, February 2024

Project lead: Led by Professor Omar bin Yaakob at Universiti Teknologi Malaysia

Summary of the update:

- The team has run five seminars and two workshops to share best practices including two international seminars on 'Challenges and opportunities in offshore decommissioning in Southeast Asia and beyond' and 'Industry meets academia – decommissioning and abandonment in Indonesia', as well as a seminar on 'Waste management challenges and strategies for decommissioned offshore structures in ASEAN'.
- Project leader participation as a panel speaker in IMA 3.0 seminar event by PETRONAS (UTP).
- There have been 12 site visits to PTSC Supply Base (Vietnam), Ha Loc HM Treatment Plant (Vietnam), Bintan Offshore Marine Centre (BOMC) and PT, Meitech Eka Bintan (subsidiary of Meindo Elang Indah) yards (Indonesia), Malaysia Marine and Heavy Engineering (MMHE) Shipyard (Malaysia), PPLi Batam Transfer Station and Meindo Handil yard (Indonesia) and an online site visit to STP&I (Thailand).
- Three reports/reviews and three questionnaires have been completed with more than 70 stakeholders engaged in information collection and networking.

Critical safety topic discussions

Participants joined breakout rooms for a deep-dive discussions into critical topics, which the project leads identified prior to the workshop as important challenges to address. Participants chose a breakout room to join that aligned with their interests and expertise. Each room had a set of questions related to the topic to spark discussions and participants also added to a Jamboard, illustrated in figure 8 and 9.

The breakout rooms' topics and key questions are shown in table 1.

Breakout room topic	Discussion questions
Transparency	• What reliable information is out there? • How do we make data open and accessible? • What can be done about unreliable statements of compliance with guidelines such as the Hong Kong convention?
Safety risks and accountability	• Do we fully understand the risks posed to workers when decommissioning ships? • How do we bring attention to risks associated with end of life of offshore structures and ships? • How do we hold those involved in the design accountable for these risks? • How do we bring attention to gaps in assumed responsibility?
Hazardous waste	• How we manage hazardous waste associated with decommissioning offshore structures and ships safely? • What are the greatest challenges regarding transboundary movement of hazardous waste? • How do we address these?
Engaging stakeholders in safety challenges	• Do we have buy-in from key industry stakeholders about the importance of safety in decommissioning? • If not, how do we get buy-in? • How do we get key stakeholders in decommissioning offshore structures and ships around the same table?

Table 1. Breakout room topics and discussion questions.

Key comments from participants during the discussions are outlined below. Note, they are summaries of discussion points and not direct quotes, and any one comment may not reflect the views of all participants.

Transparency

Access to data

Access to yards remains difficult and there continues to be a lack of reliable data that is publicly available. This makes collecting baseline data or monitoring health, safety and environmental challenges very difficult.

A lack of transparency from ship owners and yards stops authorities, trade unions and NGOs from holding these companies accountable. However, shipyard owners are fearful of sharing data unless they are assured that they will not be penalised if they have high levels of injury/accidents.

Some opportunities exist to make data more accessible. For example, The EU ship recycling regulation (a list of approved ship recycling facilities created by

the EU Commission) is an independent and transparent scheme that audits facilities. However, it is currently one of a kind and more opportunities for making data more accessible and transparent are needed.

A platform for sale of end-of-life vessels that allows ship recycling facilities (SRF) or ship breaking yards (SBY) to bid for vessels openly would increase awareness about what vessels are being sold and to what buyer.

Data that is not disclosed by individual parties could be collected and used, such as satellite observation data.

Hazardous materials

More transparency relating to hazardous materials (type, quantity, storage, disposal etc) would lead to better handling of hazardous materials in all stages of a ship's life.

Misleading statements of compliance

Statements of compliance with the Hong Kong Convention can be misleading and cannot be used as evidence of sustainable ship recycling. Safety standards are not always maintained after the statement of compliance is given.

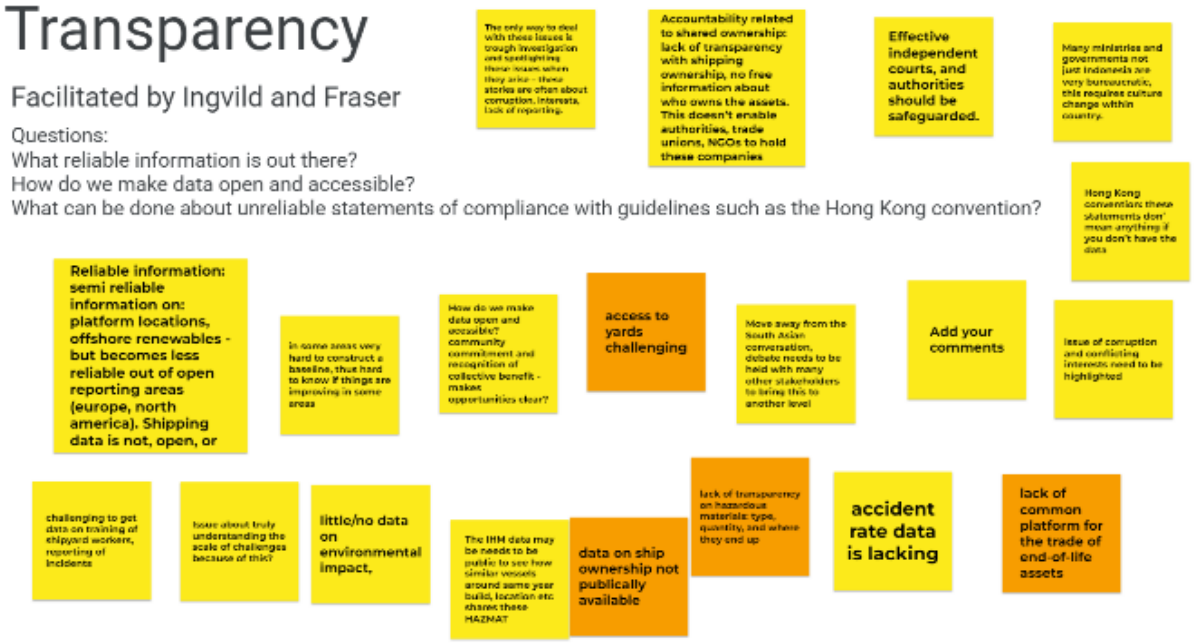


Figure 8. Jamboard showing ideas captured from participants in the breakout room discussing transparency.

Safety risks and accountability

Managing risks in floating production storage and offloading (FPSOs/FSOs/FDPSOs/FSUs/FSRUs/FLNGs)

FPSOs have high risks in yards because of a myriad of materials within the vessels. Some yards in Europe segregate and manage waste products well, which reduces safety risks to workers and the environment. An up-to-date inventory of materials on board the vessel is key to safe waste removal and management.

Differences between offshore structures and ships

There are many different safety risks associated with offshore structures and ships. For example, fixed oil and gas structures have a very different regulatory framework to ships and floating oil and gas structures (which are treated as vessels). As they pose different risks, they also require different solutions. Future work should consider different approaches.

Traceable ownership for recreational vessels

The EU legislation for recreational craft directive states that a recreational craft that is sold requires a file detailing what has happened to the vessel and lists the various owners. This kind of legislation could be replicated for commercial vessels to keep track of ownership before decommissioning.

Working together to tackle safety challenges

The safety risks are very different in Asia and in Europe, for example decommissioning activities are more often completed manually in Asia. Both perspectives are needed to find the best solutions to address the global challenge, especially as many people's livelihoods rely on the decommissioning industry. To find integrated solutions to the challenges, the industry needs to come together more.

Business incentives for improving safety

Shipyard owners could be motivated to implement a safety culture if they can see the business benefit gained, for example implementing safety measures also increases productivity. Data evidence is needed to show the benefits, but this is not available currently. Designing for decommissioning will also help to make the industry safer and more efficient.

Hazardous waste

Waste found in offshore structures and ships

There are some common hazardous waste materials in decommissioning offshore structures and ships including asbestos, batteries, and flame retardants.

Oil and gas structures and floaters may also include hydrocarbons, mercury and naturally occurring radioactive material (NORM). Whereas ships can contain ballast water and bilge water, which is not found in offshore structures.

It is important to note the differences in the hazardous waste materials found in offshore structures and ships to ensure the materials are managed and disposed of appropriately.

Figure 9. Jamboard showing ideas captured from participants in the breakout room discussing hazardous waste.

Different experiences using inventory of hazardous material (IHM)

One participant found that it was easy to establish an IHM on a decommissioned offshore installation but noted this was not the case for all workers who use IHM throughout a structure's lifetime.

Hazardous waste storage

Hazardous waste storage should be available in all ships, offshore structures and floaters' decommissioning facilities. All yards should also provide

impermeable surface, such as concrete to prevent contamination of the ground surface.

Transboundary movement

Southeast Asian countries have less experience in managing hazardous waste in ship recycling and decommissioning offshore structures than European countries. There is often limited access to or no facilities available in country to manage the hazardous waste. Until this is available, facilities will need to transport waste to other countries where it can be properly disposed of, but this is not always possible.

Transboundary movement is often restricted in the Southeast Asia region unless there are bilateral agreements between countries. For example, many Organization for Economic Co-operation and Development (OECD) countries that already have agreements in place.

Until there are more agreements in place between Southeast Asian countries to allow for transboundary movement of hazardous waste, managing it safely will remain challenging for countries without suitable facilities.

Engaging stakeholders with safety challenges

Engaging with SRFs and SBYs

One participant reported that many SRFs and SBYs do not feel like they are being listened to.

Addressing the identified safety risks requires better cooperation with shipyard owners to discover issues in practice. For example, it is well known that workers need to wear personal protective equipment (PPE), but many workers will not wear PPE in 40°c heat. New PPE needs to be developed that works in this context.

Regulators need to work with SRFs and SBYs to develop and implement realistic regulations that work in practice to keep workers safe.

Engaging with workers

Most ship breaking workers are temporary so it can be challenging for SRFs and SBYs to create a permanent workforce with proper safety training. Workers' illiteracy is another barrier for properly training workers and informing them of any regulations.

Engaging stakeholders in online workshops

Online workshops were a successful way of bringing all stakeholders together. The awareness-raising activities helped with networking and bringing people's attention to safety challenges. Ensuring that the workshops and reports are accessible to all stakeholders is important.

One participant shared that recent online seminars in Bangladesh have been well accepted by SBY owners, which is a step forward. However, a critical question from them has been how to make safety belong to everyone along the value chain when currently safety issues are concentrated on those that are decommissioning.

Inclusive collaboration

Collaborative and inclusive activities are key to stakeholder engagement and conversations should always be two way. It is important to include regulators, ship recyclers and ship breaking aid organisations from all ship breaking regions into the policymaking process so there is an opportunity for people from all areas of the industry with on the ground experience to input into the regulations.

This concluded the workshop for day one.

Key take away from day one

Day two of the workshop started with a poll asking, 'What was your key takeaway from day one?'

The feedback showed enthusiasm for the projects' progress and acknowledgment that there are still many ongoing safety challenges that need to be addressed.

Summary of responses:

- Projects are progressing well.
- Frank and open discussions at the workshop.
- Key challenges are similar to the first workshop and actions have effects.
- Need for greater transparency to drive change in relation to ship recycling.
- Greater synergy between industry, academia and government is needed to speed up our progress to handle the safety challenge.

All responses to the poll are shown in Annex 3.

Panel discussion

The panel discussion's aim was to spark conversations around how safety in decommissioning has changed over the last few years, what panellists think the key safety challenges are moving forward and how we address them. The discussion was chaired by Engineering X Senior Manager, Hazel Ingham.

The expert panellists were:

Professor Amila Zawawi – Associate Professor of Civil Engineering, and currently holding the post of Director, Research Management Center (RMC) at Universiti Teknologi PETRONAS. She is leading the decommissioning initiatives for the centre in promoting sustainable decommissioning framework in Malaysia.

Henning Gramann – Internationally recognised expert for all aspects of green ship recycling and has established GSR Services GmbH (Green Ship Recycling Services). He is also a guest professor at the World Maritime University.

Anuchit Limsuwat – Director of Safety and Environmental Division at the Department of Mineral Fuels, Ministry of Energy in Thailand. He has a background in environmental engineering and works in the decommissioning management group (in the Operation Supervision Division).

Panel discussion. Clockwise from the top left, Hazel Ingham, Henning Gramann, Professor Amila Zawawi and Anuchit Limsuwat.

A summary of key comments during the discussions are presented below. The comments below outline the discussion points and are not direct quotes.

Developing local capacity in Malaysia

There is limited local capacity in Malaysia and most knowledge and experience has come from other parts of Southeast Asia or the North Sea. There are very few guidelines, which means that asset owners are approaching academia to help develop, for example decommissioning option assessment guidelines that are more focussed on safety.

One way to develop local capability is awareness raising. PETRONAS and UTP developed a platform in 2019 that brings together academia, industry, asset owners, and a consortium of service providers. The platform is used to share experience and there was no platform for the parties to connect before. Bringing people together is a key step to move the industry forward to develop local capacity.

Good practice in Thailand

The project funded by Engineering X titled 'Safe and sustainable decommissioning of offshore structures taking into consideration the peculiarities of the ASEAN and South Asia regions' has so far found that Thailand is the most advanced in terms of regulation so there are lessons to be learned.

In Thailand the government, industry and an independent authority worked together for 10 years to draft regulations that were released in 2016. In the last few years, seven oil platforms have been removed safely in Thailand. For reference, seven platforms have been decommissioned in Malaysia in the last 16 years.

Good communication between departments was key to managing the various regulations and safely decommission the structures. From experience, pushing for change cannot just come from government, it also needs to come from industry. Research and changes in regulation are needed to improve safety.

Compliance with regulation in ship recycling

It has become more common for yards to be certified by the Hong Kong Convention requirements; however, this doesn't necessarily mean that they have improved their standards as it depends on the quality of the certifier and the scope of the audit.

Clearer guidance from the industry, potentially in the form of a checklist, for inspectors visiting yards to assess compliance could help improve standards. Currently some inspectors may only measure arbitrary statistics such as percentage concrete coverage, which does not indicate safety.

Maintaining an IHM

There was huge demand for IHM in 2020 due to the EU deadline of end of the year. The general feeling in the industry is that IHM is a time-consuming additional requirement rather than a tool or a useful part of their corporate social responsibility (CSR).

An IHM must be maintained in line with normal ship management. If it is not maintained, problems arise in 10 to 15 years when a ship recycling facility is trying to use it to prepare for ship recycling.

GSR Services are working with an industry working group on ship recycling that includes major associations from the shipping and ship supply industry. They have come together to create guidance on the maintenance of IHM that will help to end the malpractice.

Learning from other industries

There are lessons to be learnt from the industries that construct new assets. These industries bring in well experienced experts to ensure everything is built according to plan and in line with regulation. This is not the case when it comes to end-of-life assets and decommissioning. Usually, the cheapest solution provider is used without checking their references or experience.

Working together

Safety is often not the immediate concern in decommissioning. Guidelines are starting to be developed but stakeholder engagement is limited.

Moving forward there must be collaboration in the industry. Asset owners, government and academia can come together to collaborate and create one set of standards that are agreed upon by all industry participants.

There is still a long way to go but working together can achieve higher safety standards across the industry.

Priority-setting breakout session

This breakout room session focused on looking back at the short-, medium- and long-term priorities set in the first workshop in July 2019 and considering where we are now in relation to these priorities and if anything has changed. See table 2, which shows priorities and aspirations set in the 2019 workshop.

In the breakout rooms participants then looked ahead to consider whether the industry is moving in the right direction to address the identified safety challenges, considering if we are being reactive or proactive.

Short term Less than five years	Medium term Ten years	Long term Twenty-five years
• Clarity of responsibilities of asset owners, governments etc. • Policies for impartiality and independence of processes, agencies, reports. • Ratification and implementation of the Hong Kong Convention. • Development of international guidelines for decommissioning offshore assets in line with Hong Kong and Basel conventions. • Standards for training and education. • Standardisation and harmonisation of industry practices. • Funding and government support. • Transparency and reduction of corruption. • Independent compliance monitoring. • Knowledge sharing/exchange. • Improved baseline data sets. • Better public understanding. • Reduction in number or severity of incidents and accidents.	• Tighten Hong Kong Convention. • Regional cooperation of stakeholders. • Standard operating procedures. • Embedded safety culture. • Improved infrastructure and ship recycling facilities. • Improved waste management infrastructure. • Reduction in number or severity of incidents and accidents. • Design for decommissioning or reuse/lifecycle product design. • Risk-based framework for benefit and comparison. • Research and knowledge creation to better understand problems and find solutions.	• Global cooperation (in developing, implementing and enforcing safety measures). • Appropriate infrastructure globally. • Automation to remove people from hazardous spaces. • No accidents or deaths. • Zero-waste design, established design approach for decommissioning or recycling/no hazmats.

Table 2. Table of the priorities and aspirations set by participants from the first global workshop in 2019 for reflection in 2022.

A summary of participants' key comments during the discussions are below. These outline the discussion points and are not direct quotes, and any one comment may not reflect the views of all participants.

Looking back

Collaboration

Some parts of the industry are moving in the right direction and are focusing on transparency and responsibility and there are aspirations to create more green ship recycling facilities, but the cheaper solution often wins out. More collaboration is needed across the industry to develop cost-effective, safer solutions.

Key differences in decommissioning offshore structures and ships

There are issues with treating decommissioning of offshore structures and ships the same when the industries face different challenges and need different levers for change to improve safety. Oil and gas structure owners pay the yard for a service to dismantle the structure whereas ship breakers buy the asset to dismantle.

In ship recycling it is the transfer of ownership and responsibility that creates many of the problems. (There is some overlap with floating oil and gas infrastructure which are regulated as vessels not structures.)

Changing the economic model in the ship recycling industry would help reduce the devolved responsibility of safety in the industry and make it a community problem.

Pace of change

Agreement that aims and aspirations from the first workshop were good and still valid. Although there has been increased media attention, changes in the industry are not happening quickly enough. There are continued issues with transference of benefit in some parts of the world and cost to human health and the environment in others.

Hazardous waste

A lack of infrastructure remains a barrier for handling hazardous waste safely in the South Asia region. One example is in Bangladesh where there have been some improvements in safety and some yards have started testing for asbestos. However, the samples must be sent to China/Singapore, which is an expensive and lengthy process.

Treatment, storage and disposal facilities (TSDFs) for management of hazardous wastes in country are needed to reduce pressures and cost to operators.

Regulation

Yards can get statements of compliance from the Hong Kong Convention that last several years. This can lead to complacency and some yards do not continually monitor safety.

Another significant barrier is a lack of consistency in safety standards. Some regulators make individual judgment leading to a lack of consistency between yards who are assessed at the same standard.

Transparency

Improving safety education in all regions will mean that workers are more aware of safety risks. To keep workers safe, facilities should have their own policies that recognise the hazards to workers and develop preparedness and response plans for when an incident/accident occurs.

Looking forward

Regions with young industries

More countries have started to actively decommission in recent years including Thailand and Indonesia. Other countries such as Ghana have started putting regulation in place to start decommissioning offshore structures soon. Early discussions about safety at the end of life should take place in these regions with young industries to embed it.

Criminal liability

Legislation on criminal liability at the national level could help provide impartiality in controlling authorities. Although this could cause organisations to hide more of their actions, which would lead to less transparency in the industry and could create issues of cover ups.

Innovation and smart technology

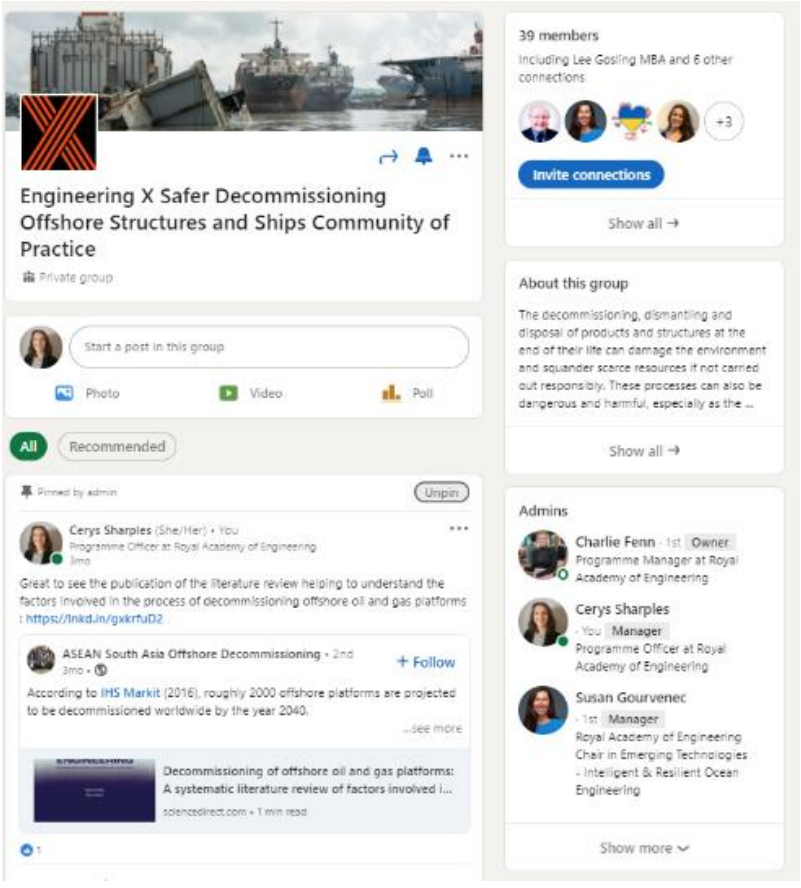
Greater innovation, digitalisation, robotics or AI could be used to improve safety in decommission. For example, sensors on workers could be used to identify risks like height. This could also help with data collection and data sharing in the industry.

Decommissioning renewable energy infrastructure

Looking ahead, decommissioning offshore wind turbines and other offshore renewable structures will present a host of new safety challenges. The scale of decommissioning offshore renewables infrastructure will also be much greater than from the oil and gas industry given the forecast numbers of wind turbines to meet decarbonisation targets.

Community of practice

The workshop launched the Safer Decommissioning of Offshore Structures Community of Practice. This LinkedIn group was designed for information sharing and networking for those working in the industry who are interested in improving safety. We encourage you to join the community of practice to keep up to date with the latest news, events and projects shared by other members. [Join the LinkedIn community.]



Community of practice on LinkedIn, used for information sharing and networking.

Concluding remarks

The workshop held on the 18 and 19 May 2022 was an important part of Engineering X work to address fundamental safety challenges in decommissioning offshore structures and ships globally.

The first step was the global workshop held in London in July 2019 where participants mapped the critical safety challenges to improve safety in the industry. After the workshop, Engineering X funded six projects totalling almost £1 million lasting up to five years.

To build on this impact, the workshop in May 2022 brought together 47 participants form academia, industry, government, and NGOs from 15 countries to reassess where we are now with the critical safety challenges identified in the first workshop and to update the community on the progress of the six projects funded by Engineering X.

Participants' input during the workshop has been collected in this report and will be shared with Engineering X networks to highlight the continued safety challenges in the industry and how they can be addressed.

The workshop reconvened the global community of stakeholders working in safer decommissioning of offshore structures and ships to help build an active global community to encourage collaboration and working together. A community of practice was launched at the workshop, which aims to continue this collaboration in the industry to improve safety in decommissioning of offshore structures and ships.

Annexes

Annex 1 – Participant list

Name	Organisation	Country
Akber Ali	PGR	Pakistan
Alan Stokes	Worley	United States
Alec Gunner	TWI	United Kingdom
Alexandra Karamitrou	University of Southampton	United States
Chengi Kuo	University of Strathclyde	United Kingdom
Christiana Akpoduado	Nigeria Maritime University	Nigeria
David Garcia Cava	University of Edinburgh	United Kingdom
Dega Damara Aditramulyadi	Institut Teknologi Bandung	Indonesia
Eko Charnius Ilman	Institut Teknologi Bandung	Indonesia
Garry Stevenson	BP plc	United Kingdom
Gianluca Sardi	Studio Legale Prof. Avv. Gianluca Sardi	Italy
Henning Gramann	GSR Services GmbH	Germany
Hooi Siang Kang	Universiti Teknologi Malaysia	Malaysia
Huyen Le	PetroVietnam University	Vietnam
Ingvild Jenssen	NGO Shipbreaking Platform	Belgium
Ini Akpadiaha	University of Strathclyde	United Kingdom
Isaac Animah	Regional Maritime University	United States
Jemo-Kee Paik	University College London	United Kingdom
Jin Wang	Liverpool John Moores University	United Kingdom
John Munnings-Tomes	The Hartford	United Kingdom
Julius Kwaku Kattah	Bernawel Management Consulting Services Limited	Ghana
Kabari Sam	University of Portsmouth	United Kingdom
Md Jahir Rizvi	University of Plymouth	United Kingdom
Mohammad Nabil Jainal	Universiti Teknologi Malaysia	Malaysia
Mohd Arif Ismail	Universiti Teknologi Malaysia	Malaysia
Nafisa Mehtaj	BUET	Bangladesh
Nikolaos Nikitas	University of Leeds	United Kingdom
Noor Amila Zawawi	Universiti Teknologi Petronas	Malaysia
Richard Neilson	University of Aberdeen	United Kingdom
Rukevwe Siakpere	Centre for Environment, Human Rights and Development	United States
Sari Amelia	ITB & BOMC	Indonesia
Sefer Anil Gunbeyaz	University of Strathclyde	United Kingdom
Shaumik Sharif Dipto	BUET	Bangladesh
Siti Fariya	University of Strathclyde	United Kingdom
Spyros Hirdaris	Aalto University	Finland

Susan Gourvenec	University of Southampton	United Kingdom
Tat-Hean Gan	TWI	United Kingdom
Wonsiri Punurai	Mahidol university	Thailand
Andrew Stephens	Ship Recycling Transparency Initiative	United Kingdom
Arun Dev	Newcastle University in Singapore	Singapore
Anuchit Limsuwat	Department of Mineral Fuels	Thailand
Prof Fraser Sturt	University of Southampton	United Kingdom
Lee Allford	University of Leeds	United Kingdom
Muhammad Hanis Kamaruddin	Universiti Teknologi Malaysia	Malaysia
Pilar Gianni	NGO shipbreaking platform	Belgium

Annex 2 – Workshop agenda

Agenda day one

9.30am	**Session 1: Welcome and introductions**	
Chair's welcome by Professor Susan Gourvenec FREng *Introduction to SEEL programme*		10 minutes
9.40am	**Session 2: Project updates**	
Each project lead will give a brief update on their projects followed by Q&A *Each presentation will last 5 minutes with 5 minutes for Q&A* The order will be as follows: 1. Lee Allford at the Energy Institute 2. Ingvild Jenssen at NGO Shipbreaking Platform 3. Dr Arun Dev at Newcastle University in Singapore 4. Prof Fraser Sturt at University of Southampton 5. Prof Omar bin Yaakob at Universiti Teknologi Malaysia 6. Andrew Stephens at Sustainable Shipping Initiative		60 minutes
Break		10 minutes
10.50am	**Session 3: Breakout rooms**	
Participants will join breakout rooms for a deep dive into one of the following topics: 1. Transparency 2. Safety risks and accountability 3. Hazardous Waste 4. Engaging stakeholders with safety challenges *Breakout rooms will be facilitated by project leads*		45 minutes
11.35am	**Wrap up and closing remarks**	5 minutes

Agenda Day 2

9.30 am	**Session 1: Welcome**	
Chair's welcome by Susan Gourvenec		5 minutes
9.35am	**Session 2: Reflections and feedback from day 1**	
One person from each breakout room will feedback *Following discussions chaired by Susan Gourvenec*		20 minutes
9.55am	**Session 3: Panel discussion**	
Panel discussion with Henning Gramann, Dr Amila Zawawi and Anuchit Limsuwat *Chaired by Hazel Ingham*		40 minutes
Break		15 minutes
10.50am	**Session 4: Priority setting**	
Participants will join breakout rooms to discuss what safety challenges need to be prioritised in the future *Breakout rooms will be facilitated by project leads/Engineering X*		40 minutes
Plenary session		20 minutes
11.50am	**Wrap up and closing remarks**	10 minutes

Annex 3 – Poll results

All answers to poll asking 'what is your key take away from day one?':

- Synergy between industry, academia, government is needed to speed up our progress to handle the safety challenge
- Update of decommissioning
- Projects progressing well
- Key challenges are similar and actions have effects
- Idea
- Curiosity
- Same problems are going on. Industry collaboration is not satisfactory, we still see reluctance to change from the industry
- There's so much to be done
- Enthusiasm for the projects, but progress slow
- Information and experience sharing
- Recap
- Stakeholder engagement
- Interesting
- Floating structures are more allied than fixed petroleum structures
- Frank and open discussions
- Great progress in all projects
- Need for greater transparency to drive change in relation to ship recycling
- Safety
- Interesting discussion of views
- Ongoing challenges