



GLOBAL STAKEHOLDER WORKSHOP AGENDA

Wednesday 5 February (8:15 AM to 5:00 PM) and Thursday 6 February 2020 (8:30 AM to 5:00 PM)

The Pendry Hotel, 550 J Street, San Diego, California, USA

Parlour 2 and 3 or via webinar

Hosted by DeepGreen Metals Incorporated (DeepGreen) and Nauru Ocean Resources Incorporated (NORI)
Facilitated by Strategic Earth Consulting

Join us for a special global stakeholder workshop to engage in a thoughtful and collaborative exploration into sourcing battery metals from ocean nodules and provide guidance on NORI’s program to assess environmental and social impacts

Metal production today generates a host of serious environmental and social issues. And yet, we will need to extract hundreds of millions of tonnes of virgin metal this century. Is sourcing metals from ocean nodules a better alternative for the planet and its people?

DeepGreen and NORI invite stakeholders to collaboratively explore the opportunities and challenges of collecting deep sea nodules as a source for metals and transitioning to a green society, and to learn about and provide feedback on DeepGreen’s proposed Environmental and Social Impact Assessment (ESIA) program for collection in the Clarion Clipperton Zone (CCZ).

FORMAT An interactive forum involving a multidisciplinary group of experts, scientists, policy makers and conservationists.

DAY 1 - WEDNESDAY, FEBRUARY 5 WHY COLLECT NODULES FROM THE CCZ SEABED?

TIME	ITEM	DETAIL	SPEAKER
8:15 AM	Sign in and be seated	Please sign in, collect your name badge and make yourself comfortable.	
8:30 AM	Official welcome and remarks	Workshop participants will be welcomed and introduced to DeepGreen leadership.	Gerard Barron, Chairman and CEO, DeepGreen

TIME	ITEM	DETAIL	SPEAKER
8:40 AM	Participant introductions	Participants will be provided with an overview of the workshop approach, confirm meeting agreements, and be invited to introduce themselves and to share their intentions for attending the workshop.	Strategic Earth Consulting
9:00 AM	Context and stakeholders	<i>Who has a stake in the future of the planet and our oceans?</i>	Dr Gregory Stone, Chief Ocean Scientist, DeepGreen
10:00 AM	Metal supply and demand in the 21st century	<i>How much more metal do we need? Can recycling help meet demand?</i>	Alex Laugharne, CRU
10:45 AM	MORNING TEA		
11:00 AM	Environmental and social impacts of virgin metal supply	<i>Where should metals for the green transition come from?</i>	Dr. Steven Katona, College of the Atlantic / Daina Paulikas
12:00 PM	International Seabed Authority's environmental requirements	<i>What are the relevant regulatory processes and the environmental obligations of contractors in the CCZ during the ESIA process?</i>	Wanfei Qiu, Programme Manager (Marine Environment), ISA
12:45 PM	Sponsoring state perspective	<i>What is the legacy of terrestrial mining in Nauru, and what does the future look like for Nauru?</i>	Margo Deiye (Nauru) Permanent Representative to the ISA
1:15 PM	CATERED LUNCH		
2:15 PM	Additional perspectives	<i>What are the major concerns with collecting nodules?</i>	Facilitated discussion led by Strategic Earth Consulting
3:45 PM	AFTERNOON TEA		
4:00 PM	DeepGreen	<i>What motivates us? How do we plan to evolve our business? What are our commitments?</i>	Gerard Barron, Chairman and CEO, DeepGreen
4:45 PM	Day 1 recap	Recap of day 1 and expectations for day 2.	Strategic Earth Consulting
5:00 PM	Adjourn		
5:30 PM	INFORMAL DRINKS AND APPETISERS - SIDE BAR, 536 MARKET STREET BETWEEN FIFTH & SIXTH AVE, SAN DIEGO		

TIME	ITEM	DETAIL	SPEAKER
8:25 AM	Sign in and be seated	Please sign in, collect your name badge and make yourself comfortable.	
8:30 AM	Welcome and introductory remarks	Participants will be welcomed and provided with an overview of the workshop approach that reflects information shared and discussions on day 1.	Strategic Earth Consulting
8:40 AM	Deep sea environment in the CCZ	<i>What do we know and what do we not know about the abyssal plains environment in the CCZ?</i>	Larry Madin, Woods Hole Oceanographic Institution
9:10 AM	Deep sea nodule collection system	<i>How does it work? What type of impacts are expected?</i>	Tony O'Sullivan, Chief Development Officer, DeepGreen
9:40 AM	ESIA process	<i>What does a successful ESIA process look like?</i>	Dr. Jennifer Durden, National Oceanography Centre, Southampton
10:10 AM	MORNING TEA		
10:25 AM	DeepGreen's ESIA	<i>What are the key objectives? What does the work program look like?</i>	Dr. Michael Clarke, Environmental Manager, DeepGreen
10:55 AM	Environmental management	<i>With so many unknowns, how can we manage the impacts?</i>	Dr. Michael Clarke, Environmental Manager, DeepGreen
11:25 AM	Serious harm	<i>How do we define it and measure it? How do we avoid it? What can we accept as society?</i>	Dr. Jason Smith, Environmental Scientist, DeepGreen
12:30 PM	CATERED LUNCH		
1:30 PM	DeepGreen's key environmental studies	<i>What questions will we work to answer over the next three years? What new scientific knowledge do we expect to generate?</i>	Dr. Jason Smith, Environmental Scientist, DeepGreen
1:45 PM	Work Package 1 overview	<i>How are we assessing the sediment physical and biogeochemical properties?</i>	Professor Andrew Sweetman, The Lyell Centre, Heriot Watt University / Dr. Clare Woulds, University of Leeds

TIME	ITEM	DETAIL	SPEAKER
1:55 PM	Work Package 2 overview	<i>How are we assessing marine mammals, near-surface animals and birds in the CCZ?</i>	Dr. Adrian Flynn, Fathom Pacific
2:05 PM	Work Package 3 overview	<i>How are we assessing benthic biology? What does it look like?</i>	Dr. Daniel Jones, National Oceanography Centre / Dr. Thomas Dahlgren, University of Gothenburg / NORCE
2:15 PM	Work Package 5 overview	<i>What Specialist Technical Services are required for the ESIA's support studies?</i>	Brian Balcom, CSA Ocean Sciences Inc.
2:25 PM	Mooring and Plume Modelling	<i>What can we learn from ongoing physical and chemical oceanography studies and sediment plume modelling?</i>	Dr. Chris Kelly, CSA Ocean Sciences
2:35 PM	AFTERNOON TEA		
2:50 PM	NORI's Terms of Reference (ToR) and Scoping Report	<i>What are the core tasks and delivery methods? What are our initial priority topics and studies?</i>	Dr. Michael Clarke, Environmental Manager, DeepGreen
3:50 PM	Work Package 4 overview	<i>How are we assessing pelagic biology?</i>	Dr. Jeff Drazen, Department of Oceanography, University of Hawaii <i>(Via webinar)</i>
4:05 PM	Trust, transparency and commitment	<i>How can key stakeholders follow and engage with the ESIA process? What if we discover that serious harm is unavoidable?</i>	Gerard Barron, Chairman and CEO, DeepGreen
4:45 PM	Workshop recap and feedback	Recap of workshop key discussions and next steps. Participants will be invited to reflect on the workshop and provide constructive feedback on their experience.	Strategic Earth Consulting
5:00 PM	Adjourn	Thank you for participating in today's workshop.	Gerard Barron, Chairman and CEO, DeepGreen

** Please note agenda topics and approach may be updated further in advance of, or during, the workshop*



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(in alphabetical order by surname)

BRIAN BALCOM

Brian Balcom is a Senior Scientist with CSA Ocean Sciences based in Monterey, California. He is a benthic ecologist with nearly 40 years of experience in conducting impact assessments, biological baseline studies, and applied marine research. Brian has specific expertise with assessing, mitigating, and monitoring the environmental impacts associated with offshore energy-related exploration, development, and decommissioning, including oil and gas, wind energy, and marine minerals. He has worked off the U.S. coastline and internationally and he frequently consults with foreign ministries, local and international researchers, and non-governmental organizations regarding baseline environmental conditions, current environmental regulations, environmental impacts, and available mitigation and monitoring measures.

GERARD BARRON

Gerard Barron is on a mission to help wean humanity off fossil fuels and transition to a circular resource economy. He is a seasoned entrepreneur with a track record of building global companies in battery technology, media and future-oriented resource development both as a chief executive and strategic investor. He became involved in the early strategic development and financing of DeepGreen during its formation in 2011 and stepped into the role of Chairman and CEO in 2017.

DR. MICHAEL CLARKE

Dr. Michael Clarke has over 25 years' experience in environmental management and impact assessment with a focus on mining and renewable energy sectors. With certifications as an Environmental Practitioner and Environmental Impact Assessor from the Environmental Institute of Australia and New Zealand (EIANZ), he has successfully delivered highly complex Environmental Impact Assessments for large infrastructure projects across the globe. Michael is also an accomplished marine biologist, he led a team to map marine turtle nesting and migration patterns on the northern coast of the Sinai Peninsula as part of a Darwin Initiative for the Conservation of Species project and has conducted marine conservation programs and baseline studies in Egypt, Indonesia, Vanuatu and Australia. Michael has a PhD from the University of Texas and completed post-doctoral studies at Queen Mary University in London.

DR. THOMAS DAHLGREN

Dr. Thomas Dahlgren has a PhD in zoology from the University of Gothenburg. He has specialized in deep sea zoology with the emphasis on species discovery and naming. Dr Dahlgren has also worked extensively on biodiversity assessments in regard to impact from marine anthropogenic activities such as deep-sea mining, oil and gas extraction, offshore wind energy and aquaculture. In this project Dr Dahlgren will work on characterizing the fauna living in the areas of interest for the mining industry as well as how this fauna is distributed and connected on the sea floor. Currently Dr Dahlgren holds positions at the Norwegian Research Centre in Bergen Norway and at the University of Gothenburg, Sweden.

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MARGO DEIYE - NAURU'S AMBASSADOR TO THE ISA

DR. JEFF DRAZEN

Dr. Jeff Drazen is a professor in the Department of Oceanography at University of Hawaii, Manoa. His research interests are the trophic ecology and energetics of the open ocean and deep sea, particularly fishes and higher trophic levels. His research has explored the structure of deep sea and pelagic food webs using stable isotopes and other biomarker techniques, evaluated abyssal fish and scavenger populations in areas that will be mined for metal resources, and examined the structure and function of trench communities including the Mariana and Kermadec Trenches. He has been chief scientist on 16 cruises, and participated in dozens more, often using ROVs, HOVs, trawls and landers. He was a coPI of the Abyssline program sampling seafloor communities in the eastern CCZ and a co-leader on the DeepCCZ project sampling the western APEIs.

DR. JENNIFER DURDEN

Dr. Jennifer Durden is a deep-sea benthic ecologist and engineer. Her research examines the structure, dynamics and variability of abyssal plains communities, and the development of photographic methods used to study them. She also has experience with environmental management, risk assessment, remediation, and guidance development as an environmental consultant on industrial projects in North America, Europe and Africa. She combines this expertise to develop policy advice for the environmental management for deep-sea mining, and more widely to understand anthropogenic impacts to the seabed environment.

DR. ADRIAN FLYNN

Dr. Adrian Flynn is Director of Australian-based consulting firm, Fathom Pacific Pty Ltd. He is a specialist in marine ecology, environmental impact assessment and monitoring. He has completed ecological studies and impact assessments for some of the highest-profile development projects in the Asia-Pacific region. Adrian has participated in deep sea mining projects involving polymetallic nodules, seafloor massive sulphides and seafloor phosphates. He has an academic specialisation in deep-sea mesopelagic ecology and has published several papers in this area in addition to benthic ecological papers and reports. He is skilled in biostatistics and ecological modelling and has experience working in a wide range of local and international regulatory jurisdictions. Adrian and the Fathom Pacific team is involved in three areas of the NORI-D EIA: the Surface Biology work package, habitat mapping, and the q-Core environmental and operational database.

DR. ADRIAN GLOVER

Dr. Adrian Glover is a Merit Researcher at the Natural History Museum, London where he leads the Deep-Sea Systematics and Ecology Research Group. The group specialises in studying the taxonomy, biogeography, biodiversity and connectivity of marine invertebrates from poorly studied marine regions including deep-sea abyssal plains, hydrothermal vents and Antarctica. The deep-sea group at the NHM builds on a long history of deep-sea research in the institution with a particular focus on describing new species, understanding their evolutionary and ecological significance, and archiving specimens, tissue, imagery and DNA for future generations to study. Dr Glover is an experienced field biologist, participating in 20 oceanographic research cruises on 13 different vessels, including twice as Chief Scientist. He has taken part in 5 cruises to the Clarion-Clipperton Zone (CCZ) and published over 80 scientific research papers, 10 of these on the CCZ.

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DR. DANIEL JONES

Dr. Daniel Jones is a deep-sea biologist working at the National Oceanography Centre in Southampton UK, where he leads the DeepSeas Group. He specialises in understanding temporal and spatial patterns in deep-water ecosystems, including those impacted by anthropogenic disturbances such as mining. He applies his experience in working in the deep sea to improving environmental management. This includes regular work with the mining and hydrocarbon industries. He has been on over thirty research expeditions, including to the Clarion-Clipperton Zone, Mid-Atlantic Ridge and many other deep-water areas. He has published over one hundred scientific papers, primarily on describing patterns and processes in deep-sea ecosystems. Much of his research focusses on deep-sea benthic megafaunal communities.

DR. STEVE KATONA

Dr. Steve Katona received his BA and PhD from Harvard University. He was sustainability consultant to the New England Aquarium for three years, then spent 7 years as a research scientist at Conservation International, where he co-founded the Ocean Health Index –the first comprehensive project to measure the sustainability of the ocean-human system at global and local scales—and served as its Managing Director. He has published research on marine ecology, laboratory culture, mating behavior and pheromone communication in calanoid copepods, individual photo identification, population abundance, stock structure and migrations of humpback and fin whales, and strategies for marine management. Among his achievements he served on the Acadia National Park Advisory Commission and now serves on the Advisory Board of the Marine Conservation Action Fund. More recently he has worked as a consultant to DeepGreen Metals to evaluate the social and environmental costs and benefits of deep sea mining for metals critical to the global transition to a renewable, emissions-free energy economy.

DR. CHRIS KELLY

Dr Chris Kelly is a marine ecologist and has been with CSA Ocean Sciences since 2011. He is currently the Chief Scientist for the Metocean and Seasonal Studies Program conducted by CSA on behalf of DeepGreen/NORI. He earned his B.S. in Marine Biology / Ecology at Florida Institute of Technology and his Ph.D. in Marine, Estuarine, and Environmental Sciences from University of Maryland. In the intervening years he served as a U.S. Peace Corps Volunteer with the Rural Aquaculture Promotion Program in Zambia, Africa. Dr Kelly has a strong background designing and implementing statistically rigorous survey designs for environmental baseline studies, monitoring programs, and experimental research investigations. His background includes linking the ecological process of benthic and pelagic systems, investigating the importance of habitat complexity on predator-prey interactions, and assessing sediment and water quality parameters for anthropogenic and/or biologically relevant inputs and anomalies. He regularly serves as Chief Scientist for numerous environmental field baseline, monitoring, and research surveys around the globe (e.g., Clarion-Clipperton Fracture Zone, Cyprus, Eastern Mediterranean, Mexico, and West Africa). He has also counsels numerous clients and government regulatory agencies on statistically robust sampling procedures that are compliant with U.S., OSPAR, ISO, ISA, and industry best practices.

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ALEX LAUGHARNE

Alex is a Principal Consultant based in CRU's New York office. CRU is a leading independent authority on the metals, mining, and fertilizer markets. Alex relocated to New York in 2015 after eight years working for CRU Consulting in London. While Alex works across a broad range of commodities supporting predominately North American customers, in recent years he has focused principally on working in the battery metals space, providing clients with strategic analysis relating to the markets for cobalt, nickel, lithium and other key materials.

LARRY MADIN

Larry Madin is Senior Science Advisor at the Woods Hole Oceanographic Institution in the US. He served previously as Deputy Director and Vice President for Research, Director of the Ocean Life Institute, and Senior Scientist and Chair of the Biology Department at WHOI. His principal research interests are in the biology of oceanic and deep-sea zooplankton and fishes. He has participated in over 70 research cruises, serving as Chief Scientist on half of them, and was among the first biologists to use SCUBA and submersibles for the in-situ study of the oceanic plankton. He had a role in the development of new opportunities for expanding WHOI's portfolio in ocean science and engineering, including development of new international and industry partnerships and in the formation of the WHOI Center for Marine Robotics. His current role as Senior Science Advisor includes internal advisory functions and liaison to external organizations. Laurence holds an adjunct appointment at the Monterey Bay Aquarium Research Institute, is a member of AGU, ASLO, and Sigma Xi, and serves on several advisory and steering committees.

TONY O'SULLIVAN

Tony O'Sullivan has over 30 years mining experience with a track record of delivering innovative solutions across multiple continents both in the terrestrial and marine environments. He is an innovator in mining and has a proven commitment to sustainable and ethical practices. As Chief Operating Officer of Nautilus he led exploration, engineering and design, project development and was involved in an ore sales agreement and the subsequent project design and start up of one of China's leading copper producers - Tongling Nonferrous Metals Group. He was previously part of the BHP Billiton Global Exploration Leadership Team with responsibility for the company's iron ore, bauxite, coal and non-porphyry base metal exploration portfolios. He is the named co-inventor on 5 subsea mining patents.

DAINA PAULIKAS

Daina is a professional analyst and strategist. She holds an MSc in Econometrics and Mathematical Economics from London School of Economics, an MBA from Harvard Business School, and a Bachelor of Science in Physics from Caltech. Daina spent nine years working as an engineer, including as a systems engineer of complex billion-dollar network systems and safety-critical defense systems at Northrop Grumman, a co-founder of an RFID locating system startup funded by the U.S. Defense Logistics Agency, and a programmer of low-level C++ software for derivatives trading. After her MBA, Daina consulted for 2 years with Boston Consulting Group, which included policy work for Saudi Arabia and economic development strategies for Puerto Rico. Since then, her independent consulting roster has included the World Bank Group, the government of Buenos Aires, Google, startups, a Latin American Venture Capital firm, and several universities. Her focus is on socially impactful causes which require both deep analysis and holistic, pragmatic thinking.

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WANFEI QIU

Wanfei Qiu joined the secretariat of the International Seabed Authority (ISA) in March 2019 as the Program Manager (Marine Environment) in the Office of Environmental Management and Mineral Resources (OEMMR). Her main role at the ISA secretariat is to support implementation of the strategy for the development of regional environmental management plans, and other related functions of the OEMMR. Before joining the ISA secretariat, she was a Research Associate at the China Institute for Marine Affairs, Ministry of Natural Resources of China during 2013 - 2019. She holds a PhD in Human Geography from the University College London (UCL) in the UK and worked as a Research Associate at UCL during 2010-2013.

DR JASON SMITH

Dr. Smith holds a Bachelor of Science in microbiology (University of Florida), Master of Science in environmental science (University of Florida) and a Ph.D. in earth system science (Stanford University). During his fifteen years as an environmental scientist and researcher, he has conducted high impact research throughout the marine environment, from the activity and diversity of biological communities in marine sediments to the chemical and biological properties of deep ocean waters. These efforts have proven highly productive, as evidenced by more than \$5 million in funding awards and 22 peer-reviewed publications - many of which are very well cited. On top of his academic career, he has gained substantial experience conducting environmental baseline surveys in offshore environments - the results of which have consistently met regulatory approval.

DR GREG STONE

Dr. Stone Greg is an ocean scientist and widely known as a global thought leader who finds ways for humanity and the ocean to co-exist and support each other in the modern world. He was a catalyst at the genesis of the Ocean Health Index and specializes in sustainable fishing, aquaculture, climate adaptation and seamount ecology. Greg's ability to communicate complex science is illustrated by his compelling TED and Davos talks, and his appearances in documentaries for Discovery and National Geographic. He has undertaken over 10,000 dives throughout Earth's ocean down to 18,000 feet using submarines, SCUBA, underwater habitats and robotics. He's authored hundreds of publications including for Nature and National Geographic. Greg is also Senior Science Advisor to the Special Envoy for Ocean and the World Economic Forum Ocean Program. Previously, he was Chief Scientist for Conservation International and head of their Global Ocean Program.

PROFESSOR ANDREW SWEETMAN

Professor Andrew Sweetman leads the Deep-Sea Ecology, Biogeochemistry and In situ Technology research group at the Lyell Centre for Earth and Marine Science and Technology at Heriot-Watt University. Dr. Sweetman has over 20-years' experience in deep-sea ecology, and extensive expertise in running baseline surveys in the Clarion-Clipperton Zone related to deep-sea mining. He has participated in over 30 deep-sea research cruises, 5 of which were baseline/ research cruises in the western and eastern CCZ. He was a PI on the ABYSSLINE project that was funded by UK Seabed Resources Ltd that ran from 2013-2016. In this project, he was responsible for generating information on benthic biogeochemistry and ecosystem functioning in the UK Seabed Resource Ltd and Ocean Minerals of Singapore claim areas. He has also coordinated baseline studies for the Bundesanstalt für Geowissenschaften (BGR) to document the biodiversity of abyssal fish and invertebrate scavengers in the BGR claim area in the eastern CCZ. Dr. Sweetman runs a state-of-the-art seafloor lander facility at the Lyell Centre that

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comprises benthic chamber landers, micro-profiling and baited camera landers (all rated to 6000m depth) which will be used during the NORI-D study. Dr. Sweetman will be primarily responsible for leading the benthic biogeochemistry and seafloor ecosystem functioning studies in the project.

DR CLARE WOULD

Dr Clare Woulds is a marine benthic biogeochemist. She completed a degree in Environmental Geoscience and then her PhD at the University of Edinburgh and is now an Associate Professor in the School of Geography, University of Leeds. Clare's research focuses on Carbon and nutrient cycling and burial in seafloor sediments, with a particular focus on the interaction between benthic biological communities and biogeochemical processes. She uses stable isotope pulse chase techniques, manipulative experiments and organic geochemical analysis to understand the factors which control the biological uptake, cycling, degradation and burial of organic matter deposited in marine sediments. Clare has carried out investigations in a wide range of benthic environments, from intertidal estuarine sites, via coastal fjords, to the Arabian Sea oxygen minimum zone and chemosynthetic sites in the Southern Ocean.