



**GLOBAL ECONOMIC DYNAMICS  
AND THE BIOSPHERE**

THE ROYAL SWEDISH ACADEMY OF SCIENCES

*The Erling-Persson Family Academy Programme*

**ANNUAL  
REPORT  
2020**



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# Directors' Note

The year 2020 was unusual, to say the least. In particular, it was the year when the stark risks of the Anthropocene became clear and tangible to the wider public. The changing risk landscape included clear signs of climate change, but also the emergence of new infectious diseases – with the Coronavirus pandemic being an obvious example. The extreme global connectivity of human and natural systems was one reason for the rapid global spread of the disease. It challenged many of our existing social structures by interrupting global value chains and trade, forcing lockdowns to avoid spread while public agencies struggled to speed up decision-making and roll out novel guidelines to contain the disease, safeguard economies and protect public mental and physical health. In short, the pandemic devastatingly showcased the complex interconnections between economic, environmental and social dynamics that society must grapple with, now and in the future.

This complexity – and the importance of considering the multiple domains of biosphere resilience, human health, and economics and finance – illustrates the exceedingly important research that GEDB has advanced to date and continues to develop. The support received from the Erling-Persson Family Foundation is an instrumental and rare resource that has allowed GEDB to build a well-respected scientific base and a team of highly skilled researchers that can combine cutting-edge scientific approaches to tackle research questions of direct relevance to today's decision-makers.

The pandemic naturally presented challenges to the research process at GEDB. Transdisciplinary research is highly reliant on regular interactions among team members and knowledge transfer between researchers in different disciplines, or between different academic generations. This has been challenged by the limited social interaction during the pandemic. However, we have adapted our organisation to an online existence and tailored our organisational infrastructure to facilitate continued team-building and to maintaining open and active dialogue between members of the GEDB research group and with our collaborators. We long for a time when physical distance no longer has to be maintained, but we are proud to say that, in spite of a year challenged by a new reality, we were able to produce a number of exciting scientific outputs and complete several impactful outreach activities. These are described in this year's annual report.

Happy reading.



Beatrice Crona  
Executive Director, GEDB



Carl Folke  
Director, GEDB

## Aims and Visions

- To create a platform for interdisciplinary collaboration on the challenges of global change and sustainability, with a specific focus on how local-to-global, cross-scale interactions affect human wellbeing and sustainable use of natural resources and ecosystems.
- To facilitate and promote collaboration between early-career economists and scientists from other backgrounds focusing on sustainability science.
- To combine diverse knowledge systems and experiences, and conduct research for a broader understanding about the preconditions and opportunities for sustainable societal development in the new global context of the Anthropocene.

# Staff News

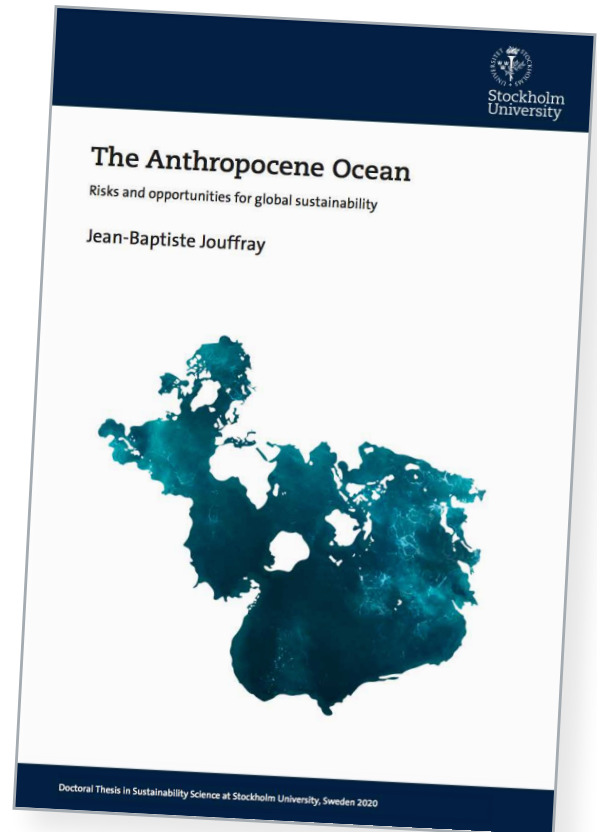
In July 2020, GEDB was joined by a new postdoc, **Hanna Ahlström**. Hanna brings a policy and legal perspective on issues of sustainable finance. In a study on sustainable finance regulation in the EU conducted over a 10-year period, she began to unravel the power of the financial sector in policy-making for sustainability. In the coming years she will build on this work and further investigate the implications for policy-making using a complexity lens. She will also examine more concrete sustainability implications emerging from the development of the incomplete, static and complicated EU taxonomy for the financial industry.

Two new research assistants were hired during the year. In April, we welcomed **Isabelle Jean-Charles**, who has a degree in Mathematics and an MSc in Financial Engineering from the International University of Monaco and 10 years' experience as a quantitative modeller in the finance sector. **Satnarain Anil Singh**, who joined GEDB in November, has an MSc in Social-Ecological Resilience for Sustainable Development from Stockholm Resilience Centre (SRC).

As the year ended, we saw the departure of two colleagues: **Amar Caucevic**, who had been a research assistant within the Biosphere Finance theme since 2017, and **Emma Sundström**, data analyst who since 2019 has been analysing Earth System sustainability of environmental, social and governance (ESG) metrics currently used in the financial sector.

Former PhD student **Jean-Baptiste Jouffray** won the Hugo and Emma Björkman Memorial Fund Award for outstanding doctoral work for his 2020 thesis *'The Anthropocene Ocean: Risks and Opportunities for Global Sustainability'*. The award is given by the Royal Swedish Academy of Agriculture and Forestry. The motivation in Jouffray's case reads:

"In five articles, he moves with impressive creativity from the study of coral reef environmental exposure to marine resource utilization, over collaboration between research and industry and financial opportunities to influence the fishing industry, to finally man's intensified use of the earth's ecosystem." And further: "The author has in an impressive way and with intellectual sharpness tackled one of the global challenges of our time and also provides perspective on how sustainable development can be favored."



On 25 November 2020, PhD candidate **Sofia Käll** successfully defended her licentiate thesis entitled *'Opportunities and Barriers for how Private Governance can Contribute Towards Sustainable Fisheries – A Case Study of Fishery Improvement Projects'*. Environmental governance approaches increasingly include non-state actors, such as industry and NGOs, to promote and implement voluntary private sustainability standards, particularly within the fisheries sector. Alongside the rise in certification and ecolabelling for sustainable seafood, a new type of market-based incentive called Fishery Improvement Projects (FIPs) has become a key feature of the global seafood landscape. Employing a multi-stakeholder approach, these projects aim to use the power of the private sector to improve fishery management and fishing practices. Sofia Käll's thesis describes the potential and challenges for private governance approaches as pathways towards more sustainable fisheries, using FIPs as a case study.

The opponent at the public defence was Louisa Evans (Exeter University) and the supervisors were Beatrice Crona, Tim Daw (SRC) and Tracy Van Holt (NYU Stern Center for Sustainable Business).

# Research Achievements and Activities

Commuters in early morning air pollution in Amritsar, India. GEDB researchers work to identify ways for investors to help reduce black carbon emissions in Asia.

## Biosphere Finance

The Biosphere Finance theme at GEDB examines the broader financial sector, specifically capital markets, and the many ways in which they are intertwined with, and determine outcomes for, the biosphere. The theme was initially developed to tackle a perceived need to bridge sustainability science and research on investments and capital markets. Over the years that GEDB has existed, the team has built up a scholarly foundation through high-impact published work, as well as a reputation for being able to deliver frontier science to users in the financial sector. Examples of the latter are highlighted in the section below, detailing the impact and engagement of GEDB staff.

### A financial sector more aware of Earth System challenges

The work to deliver new scientifically sound, and industrially salient ways of assessing corporate environmental impact continued in 2020. This work included the development of a prototype Earth system impact metric, which will be tested by using it to assess environmental impacts across a number of pilot sectors, most likely including agrifoods and the garment industry. The novelty of this work lies in its incorporation of several Earth System processes that are considered important for stabilising the climate. These include land use change and altered global water flows, which can trigger escalated warming and cascading negative changes in ecosystems and society. Another way in which GEDB research hopes to contribute to a more Earth System savvy corporate and financial system is through examining the impact that opaque financial flows may have on environmental degradation in regions of global relevance to sustainability. Given the difficulty of accessing

proprietary data from financial institutions, the aim of this work is to find reliable ways of assessing opaque financial flows and of examining their possible contribution to deforestation in highly sensitive and globally important regions, such as the Amazon. In 2020, this work focused on developing new methodologies for analysing publicly available data that are relatively difficult to access and interpret, and using these methodologies in novel studies to identify opaque financial flows. The goal is to compare the environmental impacts and deforestation risks of different sources of finance with different degrees of transparency. This will help determine how opaque finance can be made more accountable for reducing deforestation.

A third means of leveraging the influence and power of the financial sector is by identifying key sectors and supply chain segments where sustainability criteria can be applied. This would allow investors to promote sustainable practices, while diverting capital from those that undermine agreed targets, such as the United Nations Sustainable Development Goals (SDGs). Work at GEDB on financial dimensions and implications of the atmospheric brown cloud (ABC) over Asia aims to do exactly this. The ABC is the result of many different activities, with fossil fuel use and crop residue burning being two important contributors. Black carbon and other particles released from these activities not only have negative climate impacts, but also cause significant harm to human health. During 2020, the team worked to connect data on black carbon emissions to agricultural value chains that underlie the crop residue burning contributing to these black carbon emissions in India. The aim was to identify the most salient issues for investors to consider if they want to influence change towards improved practices and contribute to both SDG 13 (Climate) and SDG 3 (Good health), while also minimising impacts in SDG 1 (No hunger) and SDG 2 (No poverty).



Victor Galaz and Anna Breman, deputy general, Central Bank of Sweden, at a seminar in March.

## ACTIVITIES

- In December, former GEDB PhD student and now affiliated postdoc, Jean-Baptiste Jouffray, co-organised the UN Global Compact 'sprint' on sustainable seafood with Wenche Grønbrekk (Head of Sustainable Development at Cermaq Group). A 'sprint' is an action-oriented, short workstream taking place within one month and with the aim of accelerating progress on a specific ocean stewardship topic – in this case sustainable seafood. Over the course of three calls, around 50 stakeholders from policy, business, science and finance discussed how the sustainable development of the seafood sector could be accelerated. Three thematic areas were dealt with: i) the role of measurement, including tools to enable effective company comparison; ii) the role of finance, and how both traditional and innovative financial mechanisms can play a key part in driving the sustainable development of the sector; and iii) the role of policy and regulatory frameworks.
- Jean-Baptiste Jouffray co-organised a session of the symposium 'Virtual Ocean Dialogues – Deep dive session on ocean finance' hosted by the World Economic Forum and Friends of Ocean Action (online) 1 June 2020, where he also gave a presentation on *Leverage points in the financial sector for seafood sustainability*.
- GEDB was part of the organising team behind the first official speech by the Central Bank of Sweden's new deputy general, Anna Breman, on 3 March in Stockholm. In her speech, Anna Breman emphasised that the bank must fully incorporate the risk of irreversible regime shifts in the climate system and act accordingly. She also presented key measures that the Central Bank could use to mitigate the effects of climate change, but also how it can act to prevent it escalating. Putting a price on CO<sub>2</sub> needs to be a priority for society, she claimed.
- During 2020, Beatrice Crona co-led a major effort, together with partners from KTH, Gothenburg University, Stockholm School of Economics, IVL and Luleå Tekniska Högskola, to secure funding from Vinnova for a new competence centre for Sustainable Finance. The bid was successful and the work will be reported on in the coming years.



Children harvesting rice in Thailand.

## Global Health and Biosphere Stewardship

The Global Health and Biosphere Stewardship research theme, launched in 2019, aims to uncover how key elements of the biosphere can best be managed to improve global health and wellbeing. Like the Biosphere Finance theme, work in this domain is motivated by the need to address the many under-researched connections between human health, welfare and sustainable development.

Human health is intimately tied to our living planet. Global health scholars often focus primarily on proximal risk factors, while work at GEDB aims to complement this by focusing on complex systems dynamics and the often very diffuse and indirect ways in which the biosphere determines health outcomes. Four cases are currently being explored: *Child health outcomes*, *Emerging infectious diseases*, *Antimicrobial resistance* and *Sustainable, resilient and healthy production systems*.

### Child health outcomes

The global child health project is examining how food system characteristics, such as yield and diversity, relate to child health outcomes in low- and middle-income countries (LMIC). This is the first time that these types of datasets have been brought together in a large, spatially explicit analysis. During 2020, work focused on developing methods that deal with large amounts of data, while also finding patterns and testing hypotheses.

### Emerging infectious diseases

The work on emerging infectious diseases (EIDs) aims to improve the empirical foundation for identification of risk zones for first occurrences of infectious diseases. The novelty of this work is that it goes beyond human EIDs to also include diseases in livestock and crops. During the year, the work resulted in a database of infectious diseases in crops, humans and livestock. In the coming year, we will use this database to test the robustness of risk factors identified for human EIDs, such as Covid-19. The next step will be to combine this new state-of-the-art dataset with spatial modelling of risk factors to test theoretical predictions for how pathogens can (i) colonise, (ii) expand in and (iii) adapt to human-modified habitats (Anthromes).

### Antimicrobial resistance

An area closely related to infectious diseases is the work on antimicrobial resistance (AMR). The team has continued work to illuminate and exemplify what makes societies capable of dealing with this challenge (AMResilience project). Building on results from 2019, research by Peter Søgård Jørgensen, Carl Folke and others published in 2020 began to establish a platform for learning about interventions and what makes them successful or not. The work also outlined a social-ecological framework for analysing these interventions. Additional empirical studies analysing success factors and obstacles for large-scale AMR interventions in low- and high-income settings are under review and will be added to this resource in the future. A prototype of the learning platform is available at [amr-resilience.gtglab.net](https://amr-resilience.gtglab.net).

## Sustainable, resilient and healthy production systems

GEDB researchers have contributed to the development of, and are leading, work packages within the newly funded Mistra Food Futures programme, which is designed to provide a science-based platform to enable transformation of the Swedish food system. Specifically, GEDB staff are involved in work to set targets and to develop strategies for transformation and identify barriers to achieving these.

[mistrafoodfutures.se](http://mistrafoodfutures.se)

### ... with a blue twist

GEDB contributed to the EAT-Lancet Commission on sustainable and healthy diets, launched in 2019. In that year, work began to develop a similar assessment to unpack the specific contributions of aquatic foods for improved sustainability and human health. In 2020 this work, conducted under the name 'Blue Food Assessment', was officially launched, as funding was secured through a joint collaboration between GEDB, Stockholm Resilience Center and the Stanford Center for Ocean Solutions. The initiative is co-chaired by GEDB executive director Beatrice Crona and Stanford Professor Roz Naylor, and involves Beijer Institute and GEDB researchers Max Troell and Malin Jonell.

The assessment consists of a set of 8–10 scientific articles destined for Nature-Springer outlets. Blue food comprises extraordinary diversity and the papers examine the nutritional value of different species and their environmental impact.



Team members of the Blue Food Assessment at the kick-off meeting at Stanford University in February 2020.

Moreover, they show how these different species support local and national economies and how the benefits of blue food production are inequitably shared among nations, genders and social groups. The assessment aims to provide state-of-the-art decision support relating to the role that aquatic foods can play in a future sustainable and healthy food system, and it will feed into the preparatory work for the upcoming UN Food System Summit in September 2021.

[bluefood.earth](http://bluefood.earth)

## ACTIVITIES

Due to the Coronavirus pandemic, the theme did not host any major events during 2020. However, theme researchers participated in a number of events designed to have an impact. For example, in June 2020, a set of 'Virtual Ocean Dialogues' was held, instead of the second UN Ocean Conference, to assess and catalyse progress towards implementation of SDG 14 (Life below water). GEDB Executive director Beatrice Crona and other members of the Blue Food Assessment group participated as speakers and panellists at this forum.

It is also worth highlighting that GEDB researchers in combination obtained over 20 million SEK for research related to global health and biosphere stewardship, some of which will directly contribute to developing work under this theme in the coming years.

- In March, Peter Søgaaard Jørgensen visited the Uppsala Centre for Antibiotics and gave an invited seminar on the AMResilience project, including a recorded podcast episode.
- In October, Carl Folke gave a keynote presentation at a symposium celebrating Elinor Ostrom's landmark publication *'Governing the Commons'*.
- In December, Carl Folke and Peter Søgaaard Jørgensen organised and participated as special invited participants in the US National Academy of Sciences symposium on sustainability science.
- Carl Folke is a member of the Steering Committee for the Nobel Prize Summit 'Our Planet, Our Future', a virtual event to be held in April 2021, and is in charge of the science session at the summit. 2020 was spent planning for this event and preparing the white paper that will underpin the summit.





## Cross-cutting themes:

### Cross-scale dynamics

A common aspect of global dynamics relating to both the GEDB research themes is the increasing organisation of corporate actors into larger coalitions. A cross-cutting project connecting the two topical themes, named 'Anthropocene Mobilisations', has started to build a framework for assessing the role and capacity of large actor coalitions in food systems and biosphere finance to promote biosphere-based transformations. The project is a collaboration between GEDB (Peter Søgaard Jørgensen and Sofia Maniatakou) and Stockholm Resilience Centre (Per Olsson). The plan is to seek additional funding for expanding the application of the framework to a larger set of coalitions and to strengthen it with assessments of outcomes of the observed coalitions.

### Risk in a rapidly changing world

There is increasing awareness that the complexity of the world today gives rise to a range of different risks, including financial crises and volatility, global health crises, the climate change crisis and the global crisis of biosphere degradation. In research to date, these risks have been treated in isolation. However, recent research on, for example, systemic risk has started to highlight the interconnectivity of risks in different systems. Under this emerging theme, GEDB researchers involved in different research projects meet to explore how the diverse interdisciplinary knowledge around risk can be useful in reframing risk thinking related to sustainability. Specifically, we have begun to ask questions such as: How do diverse risk assessments promote or undermine sustainable future trajectories? This work aims to connect the two GEDB research themes through the topic of risk, addressing biosphere risk, financial risk and risk and resilience for human health.

As part of her postdoc, new recruit Hanna Ahlström worked to integrate conceptual aspects of global systemic risk into corporate risk management. Perception of risk is a key factor for businesses and determines their strategies for addressing different issues, for example climate change. However, as widely acknowledged, businesses tend to focus on short-term risks that have direct impacts on their decisions. This temporal bias prevents business from integrating future risks into their models. Risks with temporal and spatial attributes, or risks at different scales, are often overlooked by managers and are not aligned with their conceptual understanding of risk. A corporate risk management conceptualisation that addresses the multi-level nature and social-ecological connectivity across scales and time of different varieties of risk would not only better inform the functioning of markets, but would also facilitate positive contributions of markets to sustainability.

Risk dynamics at broader systemic levels and in relation to major shocks like the ongoing global pandemic have also been addressed in recent publications by Carl Folke in collaboration with leading resilience scholars. In an article in *Ecology and Society*, they warn that the window of opportunity for building back better after the Covid-19 crisis may be short and suggest that resilience theory could provide the necessary framework for achieving real transformational change. The authors advocate interpreting the current pandemic as part of an adaptive cycle. They identify five broad underlying dimensions determining human well-being and environmental sustainability in the present global system which they believe can and should be changed: (i) the economic system, (ii) homogenisation, (iii) human population growth, size and densities, (iv) consumption patterns, human ethics and behaviour, and (v) governance.



# Bridging science, policy and practice

GEDB continues its ambition to deliver science to a range of prominent public and private sector decision-makers. Below, we outline a selection of activities to showcase the diversity in our engagement.

- In spring 2020, two Swedish reports that review methods for steering food consumption in a more sustainable direction were published. Both were driven in part by GEDB researchers and advocate a change in focus from consumers to instruments that target the retail and food industry, and also increased action from the government. The report *'Measures for Changing Food Diets'* was commissioned by the Swedish Consumer Agency and written by Malin Jonell (GEDB and Beijer Institute) together with Beijer Institute colleague Therese Lindahl. It outlines methods for reducing consumption of animal-based foods, especially red meat, which has negative environmental impacts and potentially negative health effects. Among the measures identified as most effective, but also more challenging to implement, are economic instruments such as a carbon tax on food and choice restrictions in the retail and restaurant sectors. The drawback is that the risk of public resistance is relatively high and restaurants and stores risk losing market share and customers.

The report *'Policy Instruments for Sustainable Food Consumption'* was a collaboration between Mistra Sustainable Consumption, SLU Future Food, the Beijer Institute, Chalmers and CeCAR/Gothenburg University. GEDB researcher Malin Jonell contributed to the report, which identifies what public actors in Sweden can do in the short term to promote positive development.

- In 2020, Peter Sogaard Jørgensen was contacted by the World Bank to provide a list of priority interventions for

anti-microbial resistance (AMR) to implement in low- and middle-income countries (LMIC).

- During the year, a group of GEDB researchers and research assistants conducted a targeted effort to review and synthesise the scientific evidence on positive and negative impacts of economic sectors on the United Nations Sustainable Development Goals. The work was commissioned by the Swedish bank SEB and resulted in delivery of an impact assessment tool for portfolio screening. The tool can provide a broad comparison of impacts between economic sectors, helped by the visualisation of impacts in a traffic light, user-friendly interface. It is also designed to help investors identify investment opportunities in sectors where a growing number of companies are working to make improvements (e.g. through reduced negative impact), or where there is evidence of new technology or practices.
- GEDB Executive Director Crona was invited as a keynote speaker at the Sweden-India Nobel Memorial week, hosted by the Swedish Embassy in Delhi, to talk about key sustainability challenges and inspire young women to take up a career in STEM research (science, technology, engineering, and mathematics).
- Outreach among the international investment community continues, with Executive Director Crona invited to present GEDB research at venues such as the BNP Paribas LfC500 Conference series "The Future We Choose". (LfC500 stands for 'Leadership for change' and refers to the top 500 managers across the global BNP Paribas group.)
- During the year, Carl Folke gave presentations about the Anthropocene risks and biosphere stewardship for the

leadership of Atlas Copco and the leadership of Thai Union Group. He also gave a keynote speech to the OECD Working Party of Innovation and Technology Policy on the role of science, technology and innovation in building resilience.

- PhD student Alice Dauriach participated as a panellist in a workshop at the International Anti-Corruption Conference. The panel discussion gathered representatives from the Green Climate Fund, advocacy organisations and investigative journalists, and was moderated by the NGO Transparency International. Attendees included more than 300 people from around the world. These represented

a variety of organisations, such as the standard-setting Extractive Industries Transparency Initiative (EITI), local and global conservation and anti-corruption non-profit organisations, financial institutions such as the IMF, the World Bank, the Nordic Investment Bank and HSBC bank, development organisations such as USAID, GIZ, the Inter-American Development Bank and Sida, and government officials from e.g. Albania and Mexico. The workshop was an opportunity to showcase and disseminate research results to this wide audience and engage in dialogue about the importance of tackling financial secrecy for improving climate action.

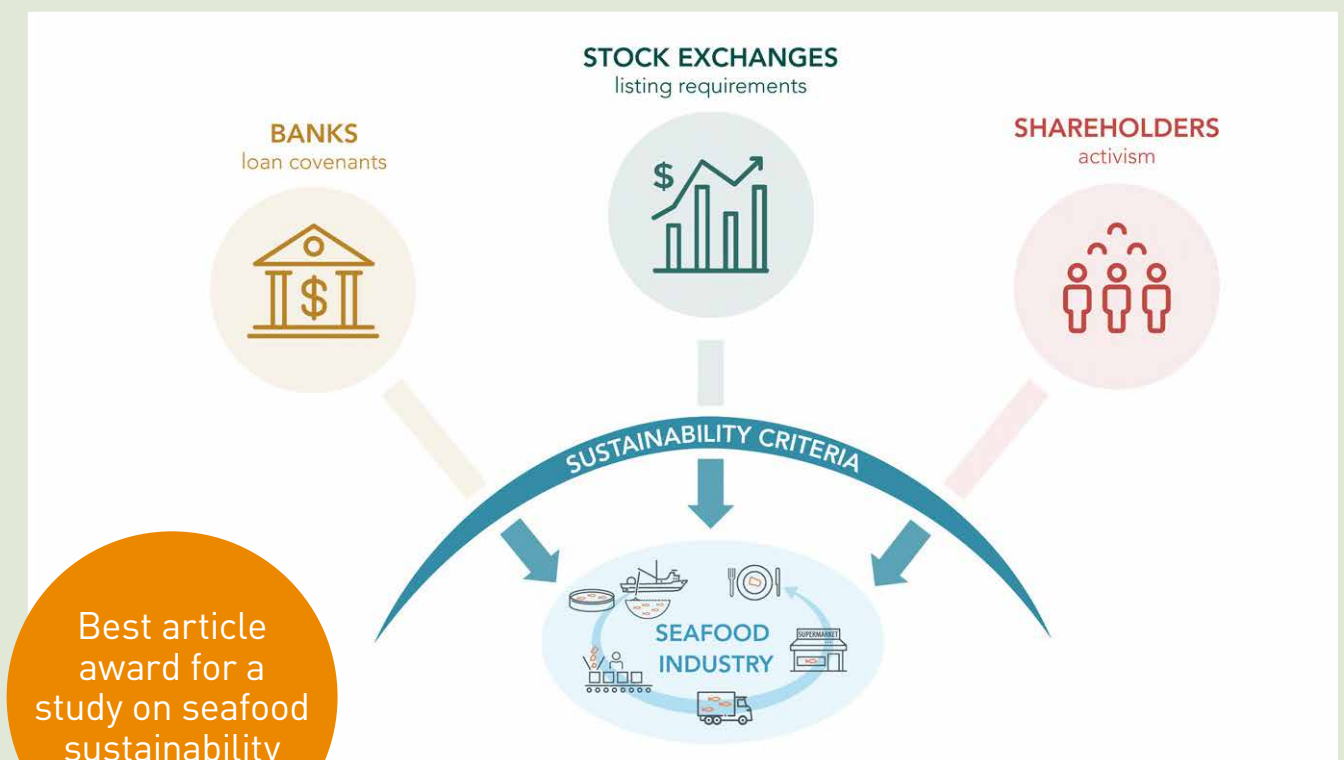


Figure from: Jouffray, J.-B., B. Crona, E. Wassénus, J. Bebbington and B. Scholtens. 2019. Leverage points in the financial sector for seafood sustainability. *Science Advances* 5 (10): eaax3324

An innovative GEDB publication won the European FIR-PRI Finance and Sustainability award for Best Published Article 2020. Published in *Science Advances*, the article 'Leverage points in the financial sector for seafood sustainability' takes a holistic systems view of how the financial system affects the state of the ocean. Together with colleagues from Birmingham Business School (UK), University of Groningen (Netherlands) and University of St Andrews (UK), GEDB researchers Jean-Baptiste Joffray, Beatrice Crona, Emmy Wassénus and colleagues map prominent financial mechanisms along a seafood firm's development trajectory. They identify three leverage points that can

redirect capital toward more sustainable practices: loan covenants, stock exchange listing rules, and shareholder activism. Seafood sustainability requirements need to be integrated into traditional financial services and used to propose key research avenues for academic, policy and practice, the team concludes. These conclusions are also of high relevance to other extractive industries. The Finance and Sustainability award is given by the French Sustainable Investment Forum (FIR), a non-profit and multi-stakeholder organisation, and the UN-backed Principles for Responsible Investment Initiative (PRI), a network of international investors.

GEDB conducts interdisciplinary collaboration on the challenges of global change and sustainability.



# Appendix

## STAFF:

Director	Carl Folke
Executive Director	Beatrice Crona
Deputy Executive Director:	Peter Søgaard Jørgensen
Senior Academy Researchers:	Victor Galaz Thomas Hahn Emma Sundström Max Troell
Research Fellows	Andrea Downing Gustav Engström Johan Gars Malin Jonell Steven Lade
Post-Doctoral Researchers:	Hanna Ahlström Tiscar Graells Fernandez Jean-Baptiste Jouffray Miina Porkka
PhD Candidates:	Alice Dauriach Ami Golland Sofia Käll Emmy Wassénus
Research Assistants	Amar Causevic Isabelle Jean-Charles Kate Lillepold Sofia Maniatakou Moa Ohlsson Anil Singh
Communications Officer:	Agneta Sundin
Finance and HR Administration:	Sofia-Kristin Kokinelis
Operations Manager	Marie Huss

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## NEW FUNDING:

'The Blue Food Assessment'. OAK Foundation through EAT Foundation, USD 36 926 for 2020. Project lead: Crona.

'Blue Food Assessment: Placing aquatic foods at the center of a sustainable and healthy future of food'. MAVA Fondation pour la Nature, through Stanford University, USD 59 539 for 2020. Project lead: Crona.

'Mistra Food Futures'. The Swedish Foundation for Strategic Environmental Research, MISTRA, SEK 64 000 000 [of which 3 720 475 to GEDB] for 2020-2024. Project lead: Crona.

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## SPECIAL ISSUE

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## BOOK CHAPTER

- Galaz, V. 2020. Climate and environmental crises. In: Stern, E. (ed). *Encyclopaedia of Crisis Analysis*, Oxford University Press, Oxford, UK.

## REPORTS

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- Jonell, M. and T. Lindahl. 2020. *Metoder för att ändra kostvanor (Methods for Changing Dietary Habits)*. Konsumentverket (The Swedish Consumer Agency) Report 2020:4.
- Röö, E., J. Larsson, K. Resare Sahlin, M. Jonell, T. Lindahl, E. André, S. Säll, N. Harring, and M. Persson. 2020. *Styrmedel för hållbar matkonsumtion – en kunskapsöversikt och vägar framåt (Policies for Sustainable Food Consumption – An Overview of Knowledge and Ways Forward)*. SLU Future Food Reports 13, Sveriges lantbruksuniversitet, forskningsplattformen SLU Future Food.
- Smith, M., F. Lundmark Hedman, J. Lundström, and M. Troell. 2020. *Axfoundation: Kriterier och frågebatteri för ansvarsfull användning av antibiotika till livsmedelsproducerande djur (Axfoundation report: Criteria and Questionnaire on Responsible Use of Antibiotics in Food-producing Animals)*.
- Sumaila, U.R., M. Walsh, K. Hoareau, A. Cox, et al. 2020. *Ocean Finance: Financing the Transition to a Sustainable Ocean Economy*. Washington, DC: World Resources Institute.

## OTHER

- André E., N. Harring, M. Jonell et al. *Om politikerna vägar kan de hjälpa oss att äta rätt (If politicians want, they can help us to eat right)*, Op-ed in newspaper Dagens Nyheter. 14 June 2020.
- Galaz, V. *Klimatförnekare bör kallas vid sitt rätta namn (Climate deniers should labelled as such)*. Newspaper article, Svenska Dagbladet, Kultur. 3 March 2020.
- Galaz, V. *Planeten efter pandemin (The planet after the pandemic)*, Newspaper article, Sveriges Natur. 3 June 2020.
- Galaz, V. *Vem blir väl manligare av att äta en blodig biff? (Does eating rare steak make you manlier?)*, Newspaper article, Svenska Dagbladet, Kultur. 4 September 2020.
- Jonell, M. *Kost som gör gott för hälsan och planeten (Diets that are good for both health and the planet)*. Article in member journal for Swedish paediatricians. Barnläkaren 2 (2020).
- Käll, S. 2020. *Opportunities and Barriers for how Private Governance can Contribute Towards Sustainable Fisheries: A Case Study of Fishery Improvement Projects*. Licentiate thesis in Sustainability Science. Stockholm Resilience Centre, Stockholm University, Sweden.

## JOURNAL ARTICLES IN PRESS

Ahlström, H. and D. Monciardini. The regulatory dynamics of sustainable finance: Paradoxical success and limitations of EU reforms. *Journal of Business Ethics*. In press.

Ahlström, H. Sustainability in EU business and financial market law: An interdisciplinary methodology. In: Sjøfjell, B., R. Russell, and M. van der Velden (eds.) *Interdisciplinary Research for Sustainable Business: Perspectives from Female Business Scholars*. Springer, London, UK. In press.

Ahlström, H. Systems thinking and the law in the age of the Anthropocene. In: Sjøfjell, B., C. Liao, and A. Argyrou (eds.) *Innovating Business for Sustainability: Regulatory Approaches in the Anthropocene*. Edward Elgar, Cheltenham, UK. In press.

Brugere, C., M. Troell, and H. Eriksson. More than fish: Policy coherence and benefit sharing as necessary conditions for equitable aquaculture development. *Marine Policy*. In press.

Causevic, A., M. LoCastro, D. David, S. Selvakkumaran, and Å. Gren. Financing resilience efforts to confront future urban and sea-level rise flooding: Are coastal megacities in ASEAN doing enough? *Environment and Planning B: Urban Analytics and City Science*. In press.

Farmery, A.K., E.H. Allison, N.L. Andrew, M. Troell, M. Voyer, B. Campbell, H. Eriksson, M. Fabinyi, A.M. Song, and D. Steenbergen. Blind spots in visions of a 'blue economy' could undermine the ocean's contribution to eliminating hunger and malnutrition. *One Earth*. In press.

Léger, A., I. Lambraki, T. Graells, M. Cousins, P.J.G. Henriksson, S. Harbarth, C. Carson, S. Majowicz, M. Troell, E.J. Parmley, P.S. Jørgensen, and D. Wernli. AMR-Intervene: A social-ecological framework to capture the diversity of actions to tackle antimicrobial resistance from a One Health perspective. *Journal of Antimicrobial Chemotherapy*. In press.

Love, D.C., E.H. Allison, F. Asche, B. Belton, R.S. Cottrell, H.E. Froehlich, J.A. Gephart, C.C. Hicks, D. Little, E.M. Nussbaumer, P. Pinto da Silva, F. Poulain, A. Rubio, J.S. Stoll, M. F. Tlusty, A.L. Thorne-Lyman, M. Troell, and W. Zhang. Emerging COVID-19 impacts, responses, and lessons for building resilience in the seafood system. *Global Food Security*. In press.

Naylor, R.L., R.W. Hardy, A.H. Buschmann, S.R. Bush, L. Cao, D.H. Klinger, D.C. Little, J. Lubchenco, S.E. Shumway, and M. Troell. A 20-year retrospective review of global aquaculture. *Nature*. In press.

## SELECTED ACTIVITIES FEATURING GEDB RESEARCH:

Workshop: A 20-Year Retrospective Review of Global Aquaculture. Center for Food Security and the Environment (FSE), Stanford University, USA. 7-9 January 2020. Presentation: [Climate change and aquaculture](#) (Troell).

Seminar: The friction-free life – sustainable production and consumption. The Royal Swedish Academy of Agriculture and Forestry (KSLA), Stockholm. 16 January 2020. Presentation: [Choosing sustainable without effort – which methods are working?](#) (Jonell)

Workshop: Genomförandet av den strategiska forskningsagendan för livsmedel: Vägen till ett hållbart och konkurrenskraftigt livsmedelssystem (Implementation of the strategic research agenda for food: The road to a sustainable and competitive food system). FORMAS, Stockholm. 21 January 2020. Participant (Troell).

Seminar: De-escalation of AMR for global sustainability. Uppsala Antibiotic Centre (UAC), Uppsala, Sweden. 7 February 2020. Presentation (Søgaard Jørgensen).

Seminar: Aquabiota, Stockholm, Sweden. 12 February 2020. Presentation: [The Anthropocene ocean](#). Invited speaker (Jouffray).

Parliament seminar (Riksdagsseminarium): Ett år med nya regler för AP-fonderna (One year with new rules for the AP Pension Funds). Swedish Parliament. 19 February. Invited speaker/panellist (Crona).

Seminar: Central banks and climate change. With Deputy Governor of the Swedish Central Bank (Riksbanken), Anna Breman, Stockholm, Sweden. 3 March 2020. Co-organiser and moderator (Galaz).

Workshop: Policies for sustainable food consumption, Gothenburg, Sweden. 10 March 2020. Presentation (online): [Information & education](#) (Jonell)

Workshop: Overfishing-climate science. Organised by Our Fish and University of British Columbia (online). 12-13 March 2020. Participant (Jouffray).

Webinar: Corona and Climate Change – A webinar on the role of disruptors in the transformation to sustainability. Mistra Geopolitics, Stockholm, Sweden. 23 March 2020. Invited speaker and panellist (Galaz).

Hearing: Policies and investments for the pandemic recovery with a focus on the need for climate transition. Swedish Climate Policy Council. 3 April 2020. Advisor (Galaz).

Seminar: Resilient Food Systems. Stockholm Resilience Centre, Stockholm, Sweden. 28 April 2020. Presentation: [Co-evolutionary dynamics as predictors of hotspots for new emerging infectious diseases \(EID\)](#) (Lillepold).

Workshop: SeaBOS Working Meeting, online. 11-13 May 2020. Presentation: [Fishery Improvement Projects \(FIPs\): Global overview and current SeaBOS activities](#) (Käll)

Webinar: Methods to change eating habits – what works? Organised by the Swedish Food authority Stockholm. 27 May 2020. Presentation: [Methods to change eating habits – what works?](#) (Jonell)

Workshop: How can Blue Economy and sustainable management of the Ocean in the fields of tourism, transport, energy, fishing and aquaculture, be reconciled? Workshop #3 in the Monaco Ocean Week, arranged (online) by Monaco Blue Initiative. 28 May-9 June 2020. Panel member (Folke).

Symposium: Virtual Ocean Dialogues – Deep dive session on ocean finance, online. 1 June 2020. Presentation: [Leverage points in the financial sector for seafood sustainability](#). Organiser (Jouffray).

Workshop: UN Global Compact, COVID-19 Task force Sprint 2:3, online. 9 June 2020. Participant (Jouffray).

Webinar: How to make food consumption more sustainable, Organised by Mistra Sustainable Consumption, SLU Future Foods, The Beijer Institute, Chalmers and CeCAR. 15 June 2020. Presentation: [Policies for sustainable food consumption – an overview of knowledge and ways forward](#) (Jonell).

Workshop: Earth Resilience and Sustainability Initiative. Stockholm Resilience Centre (SRC), Princeton and Potsdam Institute for Climate Impact Research (PIK) (online). 14-21 August 2020. Presentation and participant (Wassénus).

Roundtable: Climate and health co-benefits for the post-COVID world. Arranged (online) by The Swedish Institute for Global Health Transformation and Stockholm Resilience Centre (Stockholm University), together with the Swedish Ministry for Foreign Affairs. 19 August 2020. Invited speaker and panellist (Galaz).

Webinar: Antimicrobial Resistance. SEABOS Task Force III. 25 August 2020. Presentation (Troell).

Workshop: Interventions to Reduce the Development and Transmission of AMR. Joint Programme Initiative on Antimicrobial Resistance (JPIAMR), Paris, France (online). 3-4 September 2020. Project representative and participant (Graells).

Webinar: Sleeping Giants in the Climate System, and the Role of Finance. Norges Bank Investment Management (online webinar for their global branches). 7 September 2020. Invited lecturers (Crona and Galaz).

- Workshop: Blue Climate Initiative, online. 10 September 2020. Participant (Jouffray).
- Conference: The 2020 Virtual Forum on Earth System Governance. Utrecht University, the Netherlands and the Earth System Governance project (online). 14–18 September 2020. Participant and member of Task Force for Earth System Law (Ahlström).
- Seminar: Science-Policy-Society interactions in ecosystem-based marine resources management and planning webinar, online. 17 September 2020. Presentation: *Science for complex marine socio-ecological systems*. Invited speaker (Jouffray).
- Webinar: Forest Positive Leadership – a conversation with Chief Almir Narayamoga Surui on Saving the Amazon Forests. Arranged by the Domini Forest project as part of the NYC Climate Week. 24 September 2020. Invited speaker and panellist (Galaz).
- Temasek Ecospherity Advisory Group meeting, online. October 2020. Member (Folke).
- Symposium: Governing the Commons, 30 years later. Arranged by the Ostrom Workshop (online). 2 October 2020. Keynote (Folke).
- Workshop: The 2020 Virtual Keystone Dialogue. Resilience through Ocean Stewardship – Leadership, Actions, and Opportunities. SeaBOS, online. 5–7 October 2020. Presentation: *Fishery Improvement Projects: Introduction and Global Overview* (Käll) Participants (Folke, Jouffray).
- Workshop: Ocean affairs, Swedish Government Offices, Stockholm, Sweden. 13 October 2020. Participant (Jouffray).
- Conference: The Future We Choose, the BNP Paribas LfC500 Conference series [LfC500 stands for 'Leadership for change' and refers to the top 500 managers across the global BNP Paribas group]. 14 October 2020. Invited speaker and panellist (Crona).
- Conference: Regulating Business in Times of Turbulence: Thinking out of the Box for a Sustainable Future. The Daughters of Themis: International Network of Female Business Scholars conference, Sabanci University, Turkey (online). 15 October 2020. Presentation (Ahlström).
- Seminar: The great Anthropocene transition. Centre for Cultural Evolution, Stockholm University. November 2020. Presentation (Søgaard Jørgensen).
- Conference: Tokyo Sustainable Seafood Symposium, online. 9 November 2020. Presentation: *Leverage points in the financial sector for seafood sustainability*. Invited speaker (Jouffray).
- Webinar: Antibiotic resistance in the Anthropocene: Solutions to a multi-faceted problem. Organised by Axfoods and Prosperous Planet. 24 November 2020. Presentation and panel member (Troell).
- Workshop: UN Global Compact Sustainable Seafood Sprint: Measuring sustainable seafood, online. 25 November 2020. Organiser and participant (Jouffray).
- Webinar: The responsibility of research and academia in the sustainability crisis. Concerned Scientists Norway, Oslo University, Norway (online). 26 November 2020. Organiser (Ahlström).
- Conference: International Anti-Corruption Conference, Government of Republic of Korea (online). 30 November 2020. Presentation: *Financial secrecy and environmental degradation* (Dauriach).
- Workshop: Progress, Challenges, and Opportunities for Sustainability Science, National Academies of Sciences, Engineering, and Medicine, online. 30 November–4 December 2020. Panel chair and introduction (Folke); invited speaker: *Anthropocene Risks: connectivity, shocks, and surprise* (Galaz); invited participants (Jouffray, Søgaard Jørgensen).
- Presentation: For the leadership of Thai Union Group (online). December 2020. (Folke).
- Workshop: The Financial Risks of Unsustainability: Academic Workshop. Oslo University, Norway (online). 1 December 2020. Organiser and moderator (Ahlström), presentations (Crona and Wassénus).
- Workshop: UN Global Compact Sustainable Seafood Sprint – Financing sustainable seafood, online. 2 December 2020. Organiser and moderator (Jouffray).
- Webinar: SHE STEM: Women Leading the Way' – a celebration of women scientists and entrepreneurs in Sweden and India. Arranged by the Swedish Embassy in Delhi as part of the Embassy Sweden-India Nobel Memorial week. 7 December 2020. Keynote speaker (Crona).
- Conference: Conference on Complex Systems (online). 8 December 2020. Presentation: *Leverage points in the financial sector for seafood sustainability* (Jouffray).
- Workshop: What role for science, technology and innovation in building resilience? Working Party of Innovation and Technology Policy, OECD (online). 9 December 2020. Keynote speaker (Folke).
- Workshop: UN Global Compact Sustainable Seafood Sprint – Regulating sustainable seafood, online. 16 December 2020. Organiser and moderator (Jouffray).
- Conference: American Geophysical Union (AGU) Fall meeting. 1–17 December 2020. Early Career Innovations Day. Presentation: (Søgaard Jørgensen).
- Commission: 2020–2021 World Bank – identifying priority AMR interventions for implementation in World Bank projects (Søgaard Jørgensen),.







**GLOBAL ECONOMIC DYNAMICS AND THE BIOSPHERE**  
THE ROYAL SWEDISH ACADEMY OF SCIENCES  
BOX 50005 SE-104 05 STOCKHOLM, SWEDEN  
VISITING ADDRESS LILLA FRESCATIVÄGEN 4A STOCKHOLM, SWEDEN  
WEBSITE [www.gedb.se](http://www.gedb.se)