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Sustainable and Resilient Supply Chains with Emerging Technologies: Workshop Series
February 2021

Overview: The workshop series will address opportunities, challenges, and environmental implications of increasing local inclusion and community participation in global value chain networks by using new technologies to strengthen resilience and sustainability in the face of recurring disruptions (e.g., natural disasters, disease outbreaks, demand/supply shifts). The discussions will explore the feasibility of introducing advanced manufacturing, logistics and decision-making under alternative supply chain scenarios in different sectors, with a view of strengthening the resilience of communities and adopting far more environmentally and economically sustainable consumption and production approaches in support of the United Nations Sustainable Development Goals.

Workshop II: Sustainability, Resilience and Risk
Thursday, February 4, 2021
(all times are U.S. Eastern Time)

Brief Background: Global value chains (GVCs) have been and continue to be subject to various types of disruptions. The constellation of weather-, trade- and pandemic-related events, compounded by economic dislocations and fiscal strains, presents the perfect trifecta of GVC disruptions for our times. What insights can we draw on from efforts to strengthen resilience, improve robustness, and manage the overall risk exposure inherent in GVCs (as well as alternative forms of organizing production patterns)? The recent National Academies of Sciences, Engineering, and Medicine's study on hurricanes and transport infrastructure as well as the COVID-19 response are two case studies to explore some of the underlying concepts, discuss tradeoffs, develop the concept of preparedness, and assess the extent to which the footprint of selected GVCs can be shifted to reduce vulnerabilities. From a sustainability perspective, consumer-facing supply chains, such as the fashion industry or the food industry, offer fresh insights in opportunities and trade-offs for reducing greenhouse gas emissions. Discussions will also include tradeoffs between resilience and sustainability and the capacity of local sectors.

10:00 am **Welcome and Goals for the Workshop Series**
Klaus Tilmes (Chair), Senior Policy Adviser and Economic Development Consultant
Franklin Carrero-Martinez, National Academies of Sciences, Engineering, and Medicine

10:05 am **Framing Remarks: Sustainability and Resilience in Supply Chains: Multiple Benefits and Tradeoffs**
Susan Lund, McKinsey & Company

10:25 am **Panel I: Impacts of Weather, Trade and Pandemic related Events toward More Resilient Supply Chains**
Moderator: Patricia Gruber, Independent Consultant

- Simon Evenett, University of St. Gallen, Switzerland (Global Trade and COVID-19 Supply Chains)
- Katharine Mach, University of Miami (Effective Adaptations to Climate Risks)
- Alan Erera, Georgia Institute of Technology (Transportation and Resilience of Food Supply Chains)

11:10 am **Panel II: Emerging Issues, Opportunities, and Tradeoffs for Reducing Greenhouse Gas Emissions toward Sustainable Supply Chains**
Moderator: Paul Pisano, Independent Consultant for Transportation Operations

- Lauri Ojala, University of Turku (Academic Perspective on Sustainable Supply Chains)
- Frank Hawkins, International Union for Conservation of Nature (Species Threat Abatement and Recovery)
- Allie Kelly, The Ray (Supply Chain Efficiency and Sustainability)

11:55 am **Summary Remarks**
Klaus Tilmes (Chair), Senior Policy Adviser and Economic Development Consultant

12:00 pm **Adjourn**

Background Readings

Evenett, S. J. 2021. Has the EU Opened Pandora's Box?: Export Controls on COVID-19 Vaccines. Available at https://www.globaltradealert.org/reports

McKinsey Global Institute. 2020. Could climate become the weak link in your supply chain? https://www.mckinsey.com/business-functions/sustainability/our-insights/could-climate-become-the-weak-link-in-your-supply-chain

McKinsey Global Institute. 2020. Risk, resilience, and rebalancing in global value chains. Available at https://www.mckinsey.com/business-functions/operations/our-insights/risk-resilience-and-rebalancing-in-global-value-chains

National Academies of Sciences, Engineering, and Medicine. 2020. Strengthening Post-Hurricane Supply Chain Resilience: Observations from Hurricanes Harvey, Irma, and Maria. Washington, DC: The National Academies Press. https://doi.org/10.17226/25490

The Ray. 2021. The Ray and Southwire Announce Partnership to Enhance Energy & Highway Infrastructure. https://www.thenewsmarket.com/news/the-ray-and-southwire-announce-partnership-to-enhance-energy---highway-infrastructure/s/b376f94d-c5e8-4768-908f-cb192b67f533

Sustainable and Resilient Supply Chains with Emerging Technologies

Workshop II: Sustainability, Resilience and Risk
Thursday, February 4, 2021

Moderator and Speaker Biographical Information

KLAUS TILMES (Planning Committee Chair) is a Senior Policy Adviser and Economic Development Consultant who most recently worked with the Office of the World Bank President to develop the institution's strategy on emerging technologies and scaling adoption through financial assistance, policy advice, and partnerships. He also works closely with the African Center for Economic Transformation and the United Nations Science Technology and Innovation (STI) Forum. Previously, Mr. Tilmes served as Director of the Trade and Competitiveness Global Practice at the World Bank, overseeing operations in Sub-Saharan Africa and the Middle East and global teams on Trade and Competition Policy and Innovation and Entrepreneurship. During his 30-year career at the World Bank, Mr. Tilmes held positions as Director of Strategy and Operations in the Financial and Private Sector Development Network; Knowledge Strategy Advisor; Manager at the Independent Evaluation Group; and Advisor, Corporate Strategy Group. He holds a Master's degree in Public Administration from Harvard University and a Master's in Economics from the University of Mannheim.

FRANKLIN CARRERO-MARTINEZ (Staff) joined the National Academies of Sciences, Engineering, and Medicine in 2018 where he directs the Global Sustainability and Development and the Science and Technology for Sustainability program within the division of Policy and Global Affairs. Prior to this appointment, he was the Acting Deputy Science and Technology Adviser to the Secretary of State. Dr. Carrero-Martínez holds a B.S. in biology, with honors from the University of Puerto Rico (UPR), a Ph.D. in cell and developmental neurobiology, and a certificate in business administration from the University of Illinois at Urbana-Champaign. Previously, Dr. Carrero-Martínez held appointments as associate professor at the UPR, Mayagüez, Adjunct Professor at the UPR Medical Science Campus, and as visiting scholar at Duke University, Massachusetts Institute of Technology, and Japan's Institute of Genetics. Dr. Carrero-Martínez started his career in science diplomacy and policy as the American Association for the Advancement of Science's Roger Revelle Fellow in Global Stewardship. He served this prestigious fellowship with a joint appointment between the Office of the Science and Technology Adviser to the Secretary of State (STAS) and the National Academy of Sciences. At the end of his fellowship, he served as program director at the National Science Foundation supporting the foundation's diplomatic and representational obligations, while managing a portfolio of international basic science collaboration grants before returning to STAS in 2016. In this role he provided senior officials with analysis, guidance, recommendations and strategic planning to anticipate the foreign policy impacts of emerging STI issues, built STI capacity within the Department, and engaged the National Security Innovation Base to promote Department priorities.

ALAN ERERA is the Associate Chair for Research and the UPS Professor of Logistics in the H. Milton Stewart School of Industrial and Systems Engineering at Georgia Institute of Technology. He is also the faculty director for the M.S. in Supply Chain Engineering program and a co-director for Global Transportation in the Supply Chain & Logistics Institute. His research focuses on transportation and logistics systems planning and control, with an emphasis on planning under uncertainty and real-time operational control. His recent work has addressed dynamic vehicle routing systems for same-day distribution; resilient logistics network design for food supply chains; service network design, linehaul equipment management, and driver scheduling for consolidation freight carriers; robust container fleet

management for global shipping companies; and robust and flexible vehicle routing system planning and control for distribution companies. He has written extensively in these subject areas, and has delivered over 100 technical presentations and invited lectures. His research program has been supported by federal agencies and major U.S. freight carriers and manufacturing firms. Dr. Erera received his B.S. Eng. from Princeton University, and his Ph.D. from the University of California, Berkeley.

SIMON EVENETT is Professor of International Trade and Economic Development and MBA Director at the University of St. Gallen, Switzerland. Dr. Evenett specializes in how governments tilt the commercial playing field in favor of local firms. At the start of the Global Financial Crisis Dr. Evenett created the Global Trade Alert initiative, the leading independent monitor of protectionism and commercial policy choice based at the University of St Gallen. He has taught at the Said Business School at the University of Oxford, the Ross School of Business, University of Michigan (where he was a Visiting Professor of Corporate Strategy three times), and Rutgers University. In addition, Dr. Evenett has served as a World Bank official twice, has been a Non-Resident Senior Fellow in the Economics Studies programme of the Brookings Institution, and a member of the UK Competition Commission. Recently, he was the DLA Piper Distinguished Visiting Professor at the Carey School of Business, Johns Hopkins University. He holds a Ph.D. in Economics from Yale University and a B.A. (Hons) in Economics from the University of Cambridge. Simon has written over 200 articles, book chapters, and volumes.

PATRICIA GRUBER (Planning Committee Member) is a science and technology consultant who most recently served as the Technical Director for the Office of Naval Research Global, an organization within the US Department of Navy. In this capacity, she led a group of technical experts who facilitate international research collaboration and act as liaisons to operational fleet/forces in support of naval missions. She previously served as the Director of Research at the Office of Naval Research, providing overall coordination of the US Navy and Marine Corps. fundamental research portfolio. Dr. Gruber has served as the Vice President, Maritime Systems at Battelle and as the Deputy Director, Applied Research Laboratory at the Pennsylvania State University. She has held a number of technical management and business development positions at AT&T, Lucent and Marconi Communications. She holds a B.S. in meteorology from the Pennsylvania State University and a M.S. and Ph.D. in applied marine physics from the University of Miami.

FRANK HAWKINS has been the Director of the International Union for Conservation of Nature (IUCN) office in North America. The North America office supports the 130+ members in the region, and works with domestic foundations, policy offices and government institutions. Dr. Hawkins focuses on policy work, particularly in the use of natural capital data in investment decision-making, and on bringing the North American conservation community together to drive changes in international conservation. He is a conservation biologist and policy advisor with many years of experience working with governments, finance institutions, civil society and local communities in Africa and around the world. Prior to joining IUCN, Dr. Hawkins was Senior Vice-President at Conservation International (CI). In addition to leading CI's programme in Africa and Madagascar, he worked closely on green economy policy and land-use planning issues, emphasizing the value of nature as the basis for sustainable development. For 20 years until 2007, Dr. Hawkins worked primarily in Madagascar, with CI and other nongovernmental organizations (NGOs), where he conducted research on birds, lemurs and carnivores, and supported the government, local communities and local NGOs in implementing the National Environmental Action Plan. He has written or co-authored over 60 peer-reviewed papers and 10 books.

ALLIE KELLY is Executive Director of The Ray. In that role, she leads the nonprofit organization that has built the nation's only publicly accessible, living laboratory for transportation innovation. Ms. Kelly was recruited to lead as its first Executive Director in 2015. In three years, she has helped the organization to implement and build almost a dozen ground-breaking, world-leading technology demonstrations, including the first solar road in the United States and the world's first public demonstration of a drive-

through tire safety station. She is also a frequent public speaker and delivered keynote remarks about The Ray from the main stage at transportation, environmental, and technology industry conferences around the world including the U.S. Transportation Research Board, AASHTO, VERGE, the Federal Reserve Bank of Atlanta, AREDAY and, in 2019, TedX Atlanta, WTS and MOVE. She was the recipient of the 2018 Atlanta Technology Professionals (ATP) Impact Award and was listed as one of the 100 Women to Know by Engineering Georgia in 2018 and 2019. A Georgia native, Ms. Kelly earned a B.A. in political science from the University of Georgia. She has over 15 years of experience working in public policy, first as a lobbyist for UPS in Washington, DC, then returning to Atlanta and founding Georgia Watch, the state's only consumer watchdog organization. Ms. Kelly and the Trustees of the Ray C. Anderson Foundation partnered with Georgia Institute of Technology and the Georgia Conservancy on a "net zero highway" feasibility study for the project that would become The Ray.

SUSAN LUND is a partner of McKinsey & Company and a leader of the McKinsey Global Institute. As a Ph.D. economist, her research focuses on globalization and trade, and the impact of technology on work and workers. She is also a leader of McKinsey's team modeling the impact of Covid-19 on economic growth. Her most recent research explores how global value chains and trade flow are evolving, and on how digital flows are transforming globalization and creating new winners and losers. Dr. Lund has an active travel schedule discussing research findings with CEOs and other executives at global Fortune 500 companies and she is a frequent speaker at global conferences. She has authored numerous articles in leading business publications, including Harvard Business Review, The Financial Times, The Wall Street Journal, The Washington Post, and Foreign Affairs. Dr. Lund is on the Economic Advisory Board of the International Financial Corporation; a Board Director of the National Association of Business Economics; and a member of the Center for Global Development Study Group on Technology and Development Prospects. Dr. Lund holds a Ph.D. in applied economics from Stanford University and a B.A. in economics from Northwestern University. She has lived and worked in Africa and Asia and currently resides in Washington, DC.

KATHARINE MACH is an Associate Professor at the University of Miami (UM) Rosenstiel School of Marine and Atmospheric Science and a faculty scholar at the UM Abess Center, focused on environmental science and policy. Her research assesses climate change risks and response options to address increased flooding, extreme heat, wildfire, and other hazards. Through innovative approaches to integrating evidence, she informs effective and equitable adaptations to the risks. Dr. Mach is the 2020 recipient of the Piers Sellers Prize for world leading contribution to solution-focused climate research. She previously was a Senior Research Scientist at Stanford University and Director of the Stanford Environment Assessment Facility. Before that from 2010 until 2015, she co-directed the scientific activities of Working Group II of the Intergovernmental Panel on Climate Change (IPCC). This work on impacts, adaptation, and vulnerability culminated in the IPCC's Fifth Assessment Report and its Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. The associated global scientific collaborations have supported diverse climate policies and actions, including the Paris Agreement. Dr. Mach is a lead author for the IPCC Sixth Assessment Report and the US Fourth National Climate Assessment. She serves as Co-Editor in Chief for Climate Risk Management, an editorial board member for Oxford Open Climate Change, and an advisory committee member for the Aspen Global Change Institute, the Stratospheric Controlled Perturbation Experiment, and Carbon180. Across all of her research projects, she engages in relevant policy processes, and she frequently discusses climate change risk and adaptation with the media, the private sector, nongovernmental organizations, and communities. Mach received her Ph.D. from Stanford University and A.B. summa cum laude from Harvard College.

LAURI OJALA is Professor of Logistics at the Turku School of Economics, University of Turku (Finland) since 1997, Adjunct Professor of Logistics at Linköping University (Sweden) and at National Defence University (Finland), and Chief Executive Officer of logscale oy, a supply chain compliance

consultancy. Dr. Ojala has worked as an expert for The World Bank, European Commission, Asian Development Bank, Organisation for Economic Co-operation and Development, and United Nations Economic Commission for Europe, as well as for Ministries of Transport of several countries. He is an initiator of World Bank's biennial Logistics Performance Index since 2007. He also heads the biennial Finnish Logistics Surveys, which comprise the largest national logistics survey database in the world. Since 2006, Dr. Ojala has been the Project Director of five European Union's projects, with a combined volume of 16+ M€ including Baltic Sea Region projects HAZARD on Seaport Safety and Security in 2016-2019 and OIL SPILL on combatting coastal oil spills in 2018-2021.

PAUL PISANO (Planning Committee Member) is an independent consultant for transportation operations. Previosuly, Mr. Pisano was the Team Leader of the Road Weather and Work Zone Management Team in the Federal Highway Administration (FHWA), Office of Transportation Operations. Mr. Pisano worked for the FHWA for over 32 years and was responsible for programs that address the effects of weather on transportation safety and operations, and that seek to improve transportation safety and mobility in and around work zones. Mr. Pisano also served as the Team Leader of the Road Weather Management, in addition to the Traffic Safety Research Team at FHWA. Mr. Pisano is the recipient of the 2016 Kenneth C. Spengler Award from the American Meteorological Society, and his education is in Civil Engineering, holding Bachelor of Science and Master of Science degrees from the University of Maryland.

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Fostering Sustainable and Resilient Supply Chains with Emerging Technologies: A Virtual Workshop Series

Statement of Task

An expert committee of the National Academies of Sciences, Engineering, and Medicine will organize and conduct a series of virtual public workshops on fostering sustainable and resilient supply chains with emerging technologies. The workshops will convene experts from local government, the private sector, the philanthropic community, academia, and nongovernmental organizations to address the advantages, disadvantages, and environmental implications of moving toward localized production, which may be less vulnerable to some types of natural disasters and disease outbreaks. Workshop participants will also discuss and share their perspectives on the feasibility of and need for underlying supply chain elements required to implement a scalable model for additive and advanced manufacturing taking into consideration various scenarios. Discussions will include those relevant to the United Nations Sustainable Development Goals related to creating greater resilience for communities and far more environmentally and economically sustainable consumption and production approaches. A Proceedings of a Workshop—in Brief will be prepared by a designated rapporteur in accordance with institutional guidelines.

Audiences and Impact

The intended audiences for this workshop series include Congress, governments, academia, private and nonprofit sectors, and the philanthropic community interested in addressing issues of supply chain sustainability and resilience. The workshops are expected to better inform these various sectors on the complex issue of supply chain sustainability, help identify potential research needs and possible strategies related to harnessing emerging technologies for sustainable and resilient supply chains, and build connections among participants from local government, the private sector, and nongovernmental organizations.

Work Plan

An expert committee will develop the agenda for the virtual workshop series, select presenters and discussants, and moderate the discussions. A rapporteur-authored workshop proceedings in brief will be produced in accordance with institutional procedures. The proceedings will be subject to an appropriate review procedure prior to release and will be distributed widely to the sustainability community.

Committee Membership Information

Klaus Tilmes (Chair), Senior Policy Adviser and Economic Development Consultant
Banning Garrett, Faculty of Global Policy and Development, Singularity University
Patricia Gruber, Independent Consultant
Paul Pisano, Independent Consultant for Transportation Operations
Catherine Ross, Regents' Professor and Harry West Chair, School of City and Regional Planning and Civil and Environmental Engineering, Georgia Institute of Technology
Sarah Thorn, Senior Director of Global Government Affairs, Walmart

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