



Modelling regional and global socio-economic costs of Arctic change (ICE-ARC WP4)

Dr. Dmitry Yumashev

Lancaster University Management School

Adaptation Futures 2016, 11 May 2016, Rotterdam



ICE-ARC project (www.ice-arc.eu)



- EU FP7 project
- Over 20 institutions participating
- 11 European Union countries and Russia
- Project budget: ~€12 million
- Project duration: 4 years (2014 - 2017)
- **Ice:** Unprecedented retreat of Arctic sea ice and its implications for global change, and for the transformation of the Arctic marine environment [WP1-WP5]
- **Climate:** Improved climate predictions through the reduction in uncertainty in models [WP2]
- **Economics:** Drive to better quantify the costs associated with Arctic Change [WP4]
- **Society:** Understanding how Arctic marine change effects human communities [WP3]

ICE-ARC WP4 partners

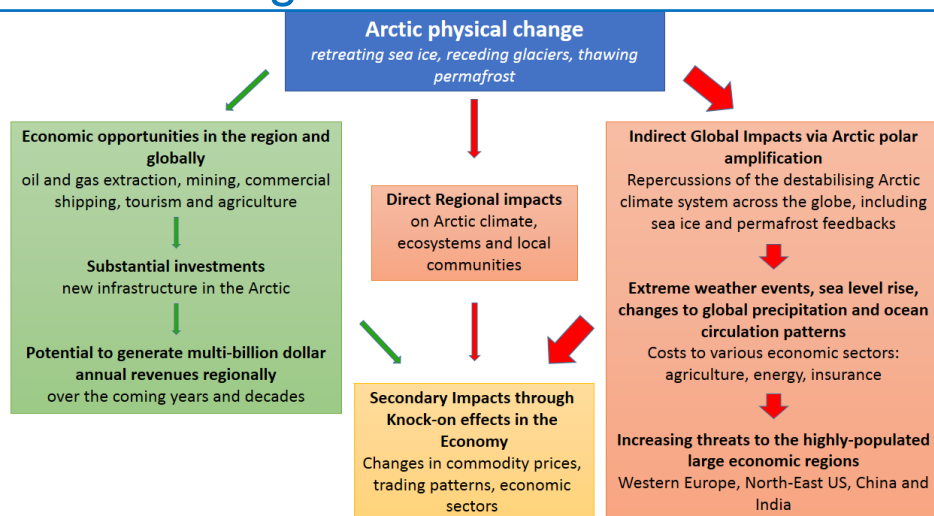


- Lancaster University – Prof. Gail Whiteman, Dr. Dmitry Yumashev, Jimena Alvarez
- University of Cambridge – Prof. Peter Wadhams (DAMTP) [also WP1-WP2], Dr. Chris Hope (JBS), Prof. Doug Crawford-Brown (4CMR), Lydia Prieg
- BAS [WP1-WP5] – Dr. Jeremy Wilkinson, Lydia Prieg
- AWI-OASYS [WP2] – Prof. Ruediger Gerdes, Dr. Cornelia Koeberle, Dr. Kathrin Riemann-Kampe, Dr. Michael Karcher, Dr. Frank Kauker
- ECORYS – Prof. Henri de Groot, Johan Gille, Karel van Hussen
- SINTEF [WP2] – Dr. Ingrid Ellingsen, Prof. Dag Slagstad



Adaptation Futures 2016, 11 May 2016,
Rotterdam

Arctic change: benefits & costs



Wadhams, 2012; Winton, 2006; Lenton et al., 2008; Maslowski et al., 2012; Gautier, 2009; Smith and Stephenson, 2013; Bekkers et al., 2015; Aksenov et al., 2016; Hansen et al., 2016; Stroeve et al., 2012; Hezel et al., 2014; Emmerson and Lahn, 2012; Francis and Vavrus, 2012, 2015; Coumou et al., 2014; Hall et al., 2014; Kug et al., 2015; Iglesias et al., 2012; WEF, 2014; IPCC, 2014; Schuur et al., 2009, 2015; Romanovskii et al., 2005; Shakhova et al., 2010, 2014; Nicolsky et al., 2012; Whiteman et al., 2013; Hope and Schaefer, 2015; Bates and Mathis, 2009; Givati and Rosenfeld, 2013; McGlade and Ekins, 2015

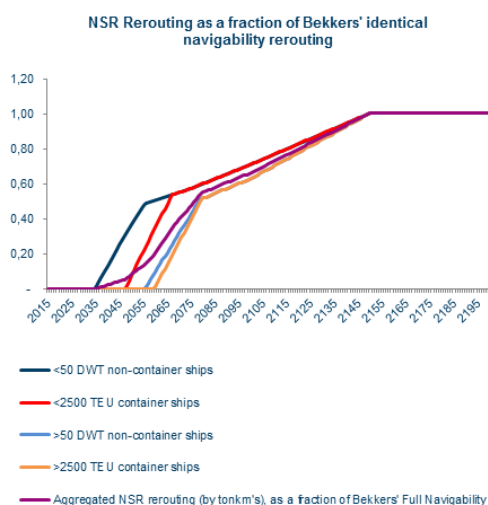


Adaptation Futures 2016, 11 May 2016,
Rotterdam

Research questions for ICE-ARC WP4

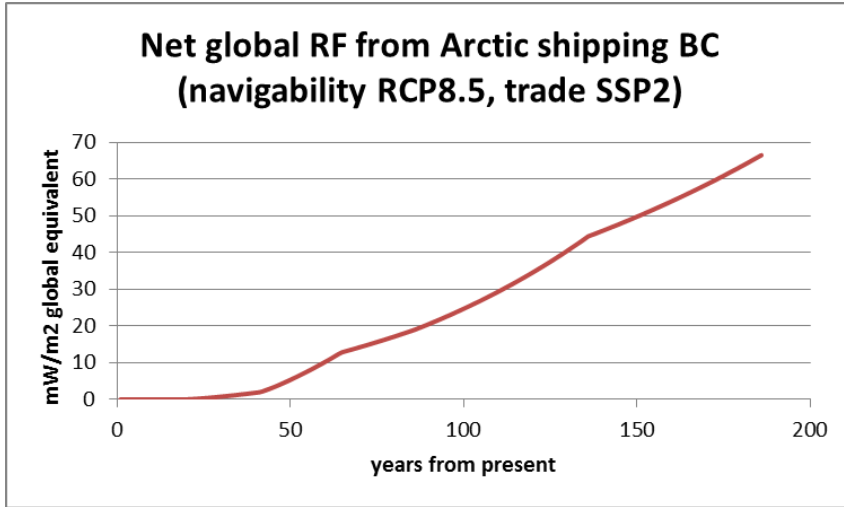
- Net climate cost of moving selected industries such as commercial shipping into the Arctic region under climate change
- Tipping points in long-term Arctic sea ice decline projections and their impact on global climate and economy
- Using Arctic sea ice decline as a barometer for global biophysical and economic impacts
- CH₄ and CO₂ emissions from thawing permafrost, both on-land and sub-sea, their contribution to climate change and the resulting impacts on global economy
- Possible link between Arctic warming and growing volatility in the jet stream, leading to more weather extremes in mid-latitudes and causing greater economic losses
- Accelerated melting of the Greenland ice sheet, its contribution to global sea level rise and the relevant economic impacts

Re-routing of commercial shipping through NSR



Downscaling of the results from Bekkers et al. (2015) for identical navigability with the Suez Canal route. The “trigger years” are obtained from the business model by Hansen et al. (2016)

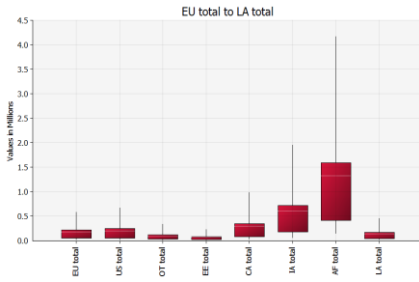
Climate feedback from BC emissions on NSR



Adaptation Futures 2016, 11 May 2016,
Rotterdam

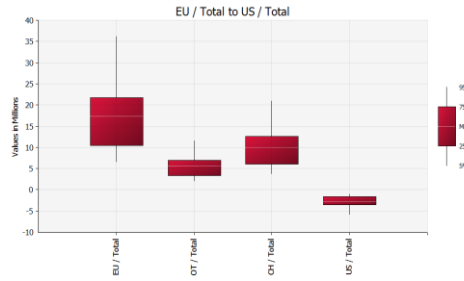


Global economic losses and gains from NSR



Probability ranges for climate-driven losses due to BC emissions from Arctic shipping in the 8 world regions of the PAGE model, \$trillion (NPV), RCP8.5, SSP2

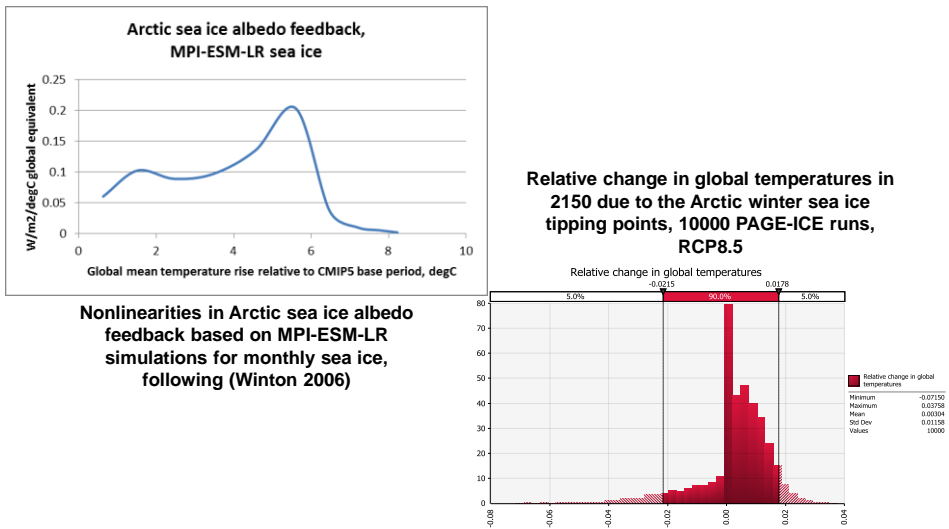
Probability ranges for regional macroeconomic gains from NSR shipping in the regions of the PAGE model, \$trillion (NPV), RCP8.5, SSP2, based on Bekkers et al. (2015)



Adaptation Futures 2016, 11 May 2016,
Rotterdam



Tipping points in Arctic sea ice



Stakeholders for ICE-ARC WP4

- World Economic Forum (WEF)
- World Business Council for Sustainable Development (WBCSD)
- Pentland Group
- Industry Roundtables: Shipping, Agriculture, Insurance
- High-Level Arctic Panel