Ship Transport Environmental Assessment Model: STEAM

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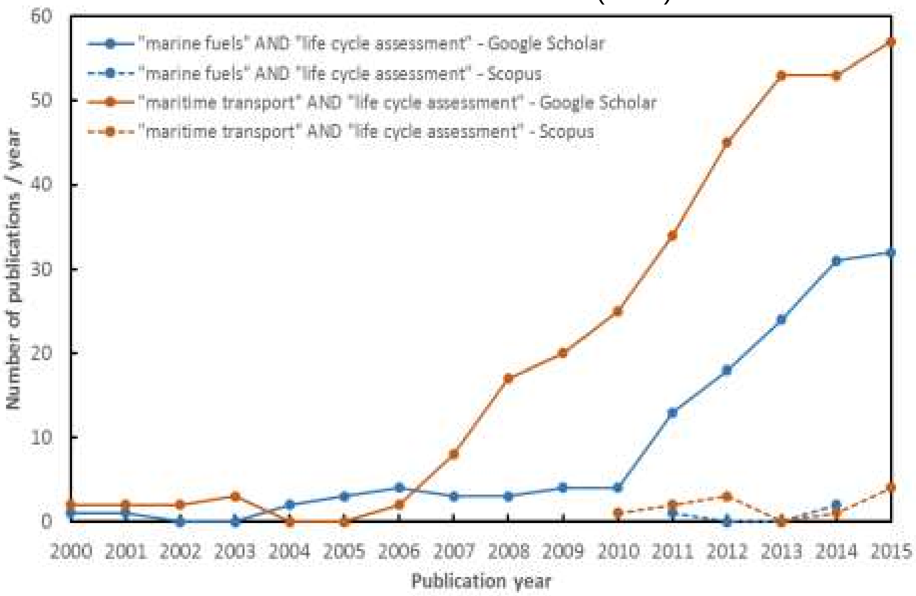
Introduction

Bouman et al. (2016) SNAME-SMC-16

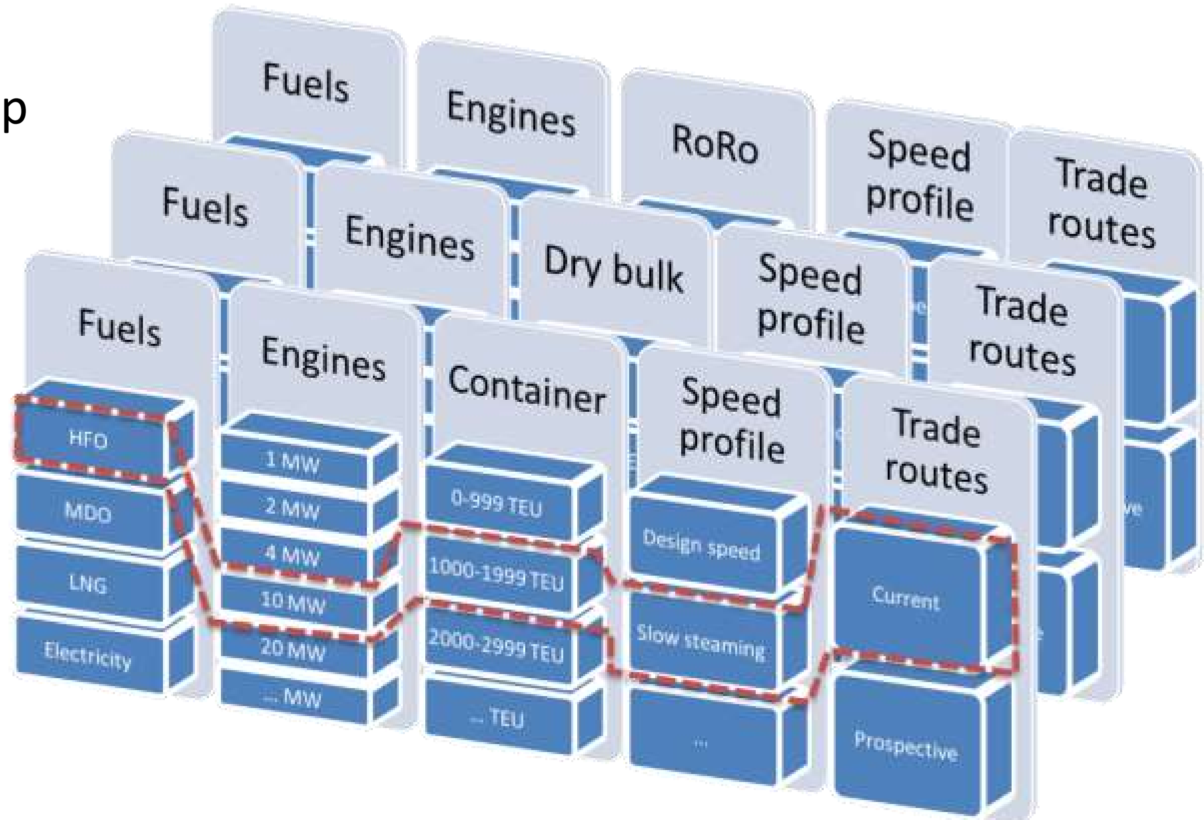


- Interest in Life-Cycle work is increasing
- Outlined life cycle approaches for bottom-up assessment of environmental impacts of shipping – conference paper SNAME SMC-16
- Started building a model capturing various design and operational choices

Working title:
Ship Transport Environmental Assessment Model

Model structure illustration

Goal: Enable quick LCA studies of individual ship designs with various mitigation measures



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Changes in operational profile and hull design

Annual operational cycle	Time (h)	Speed (knots)	Power (kW)	Speed (knots)	Power (kW)
Cb = 0.84		*Case A1*		*Case B1*	
Idle in port or at anchor	1 610		250		250
Load, discharge, and slow zones	2 400		2 000		2 000
Calm water	3 000	13	8 400	9	3 450
4 meter head waves	1 400	11	8 300	9	5 700
High sea states	250	4	9 500	4	9 500
Full power	100		13 500		13 500
Cb = 0.75		*Case A2*		*Case B2*	
Idle in port or at anchor	1 610		250		250
Load, discharge, and slow zones	2 400		2 000		2 000
Calm water	3 000	13	7 800	9	3 300
4 meter head waves	1 400	11	8 000	9	5 550
High sea states	250	4	9 600	4	9 600
Full power	100		13 500		13 500

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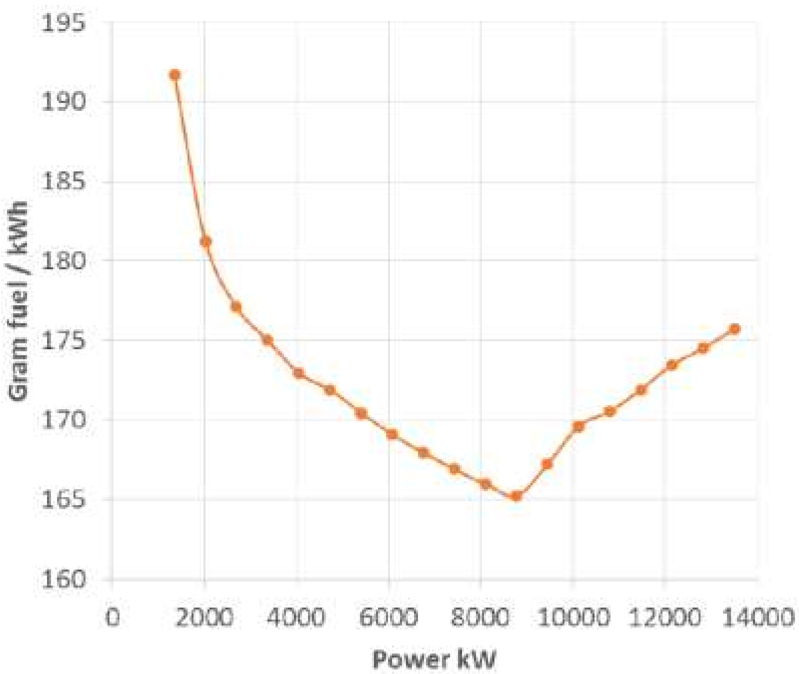
Fuel and emissions as function of engine rating



MAN B&W 6S60ME-C8.2

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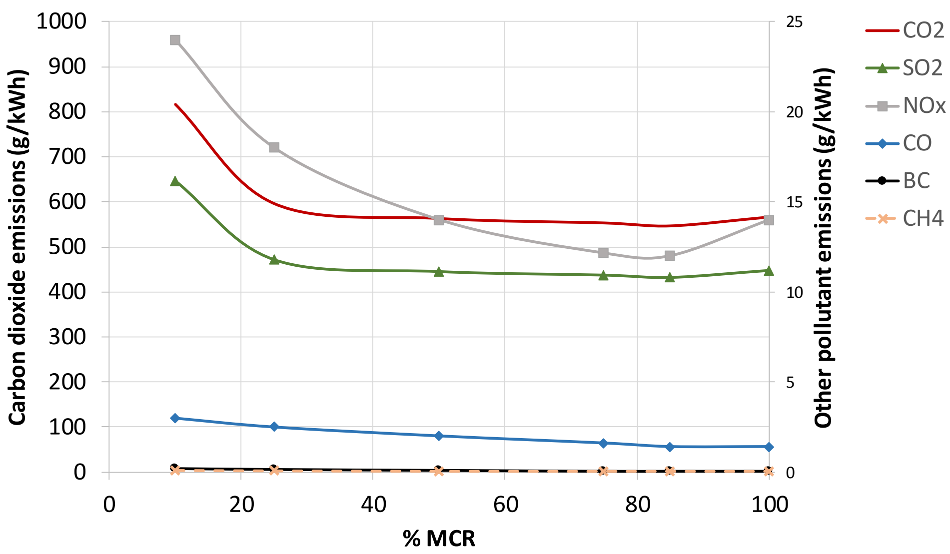
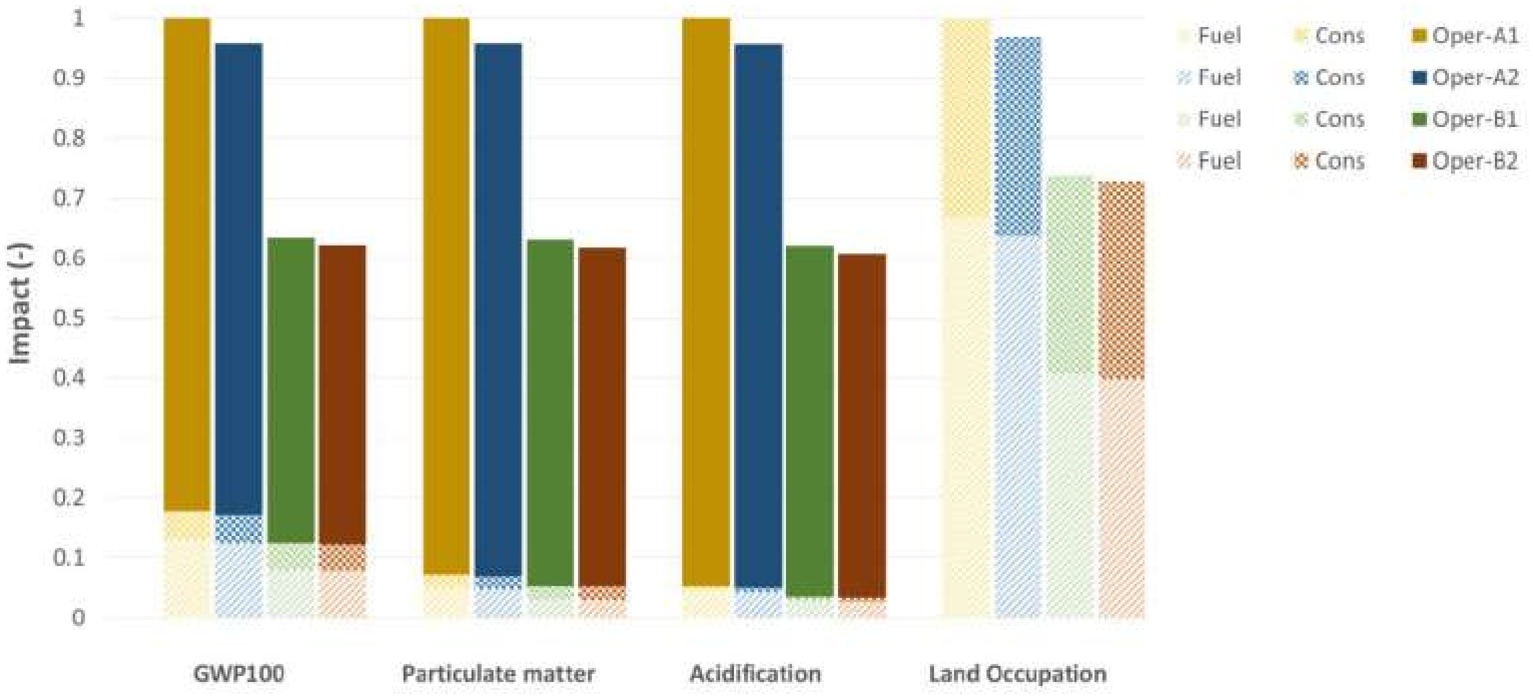


It is necessary to establish more detailed curves on emissions per kWh engine output

Preliminary results



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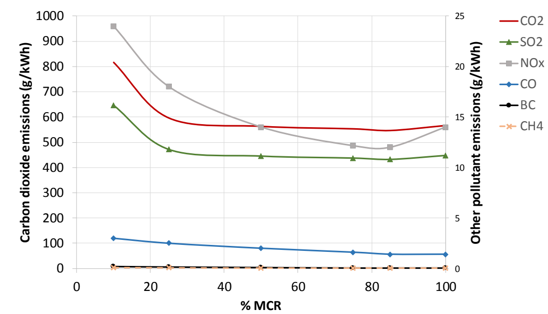
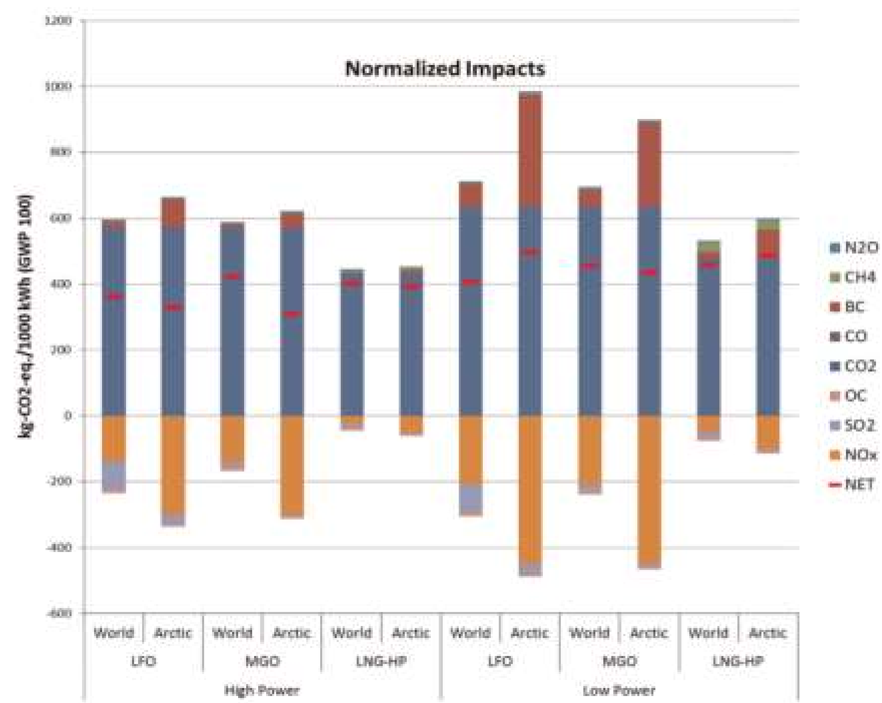
The importance of detailed emission data

- Operational profiles in combination with detailed SFOC and emissions curves add quality and value to analysis



- This will also improve assessment of regional impacts for near-term climate forcers
- Impact of each species depends on where a vessel operates



Lindstad et al. (2016) Trans Pol 45

Ongoing work (1)

- Testing and verification of key-modules
- Gradually increasing complexity and data availability to the model
- Include emissions abatement measures, fuel switch options, etc.

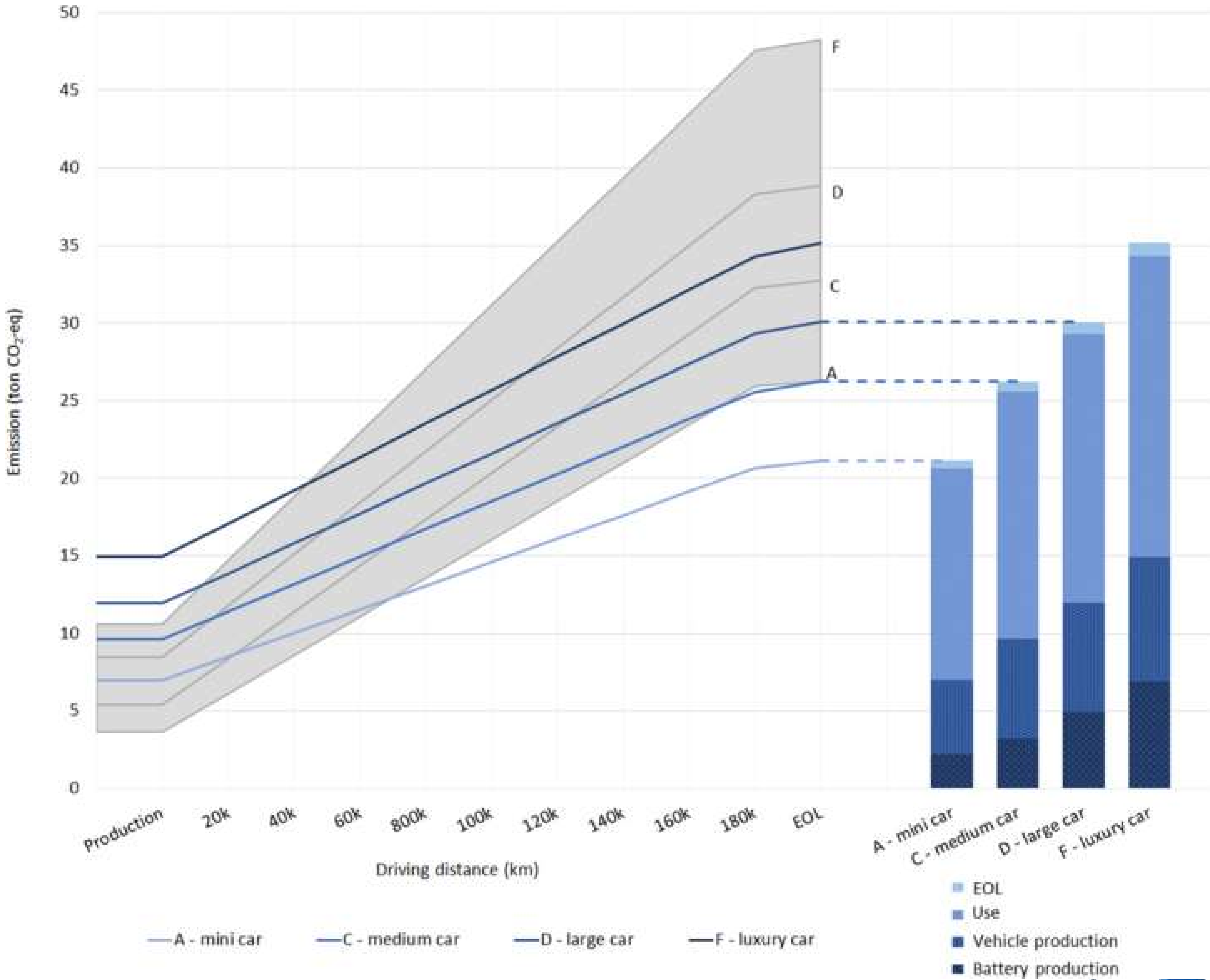
- 2 MSc students working on both container and bulk carriers providing up-to-date life-cycle data

Ongoing work (2)

- Aim to support development of the sector towards a 2-degree target
- While preventing environmental problem-shifting

- Upscaling of the model to fleet level assessment

- 2-degree target requires climate impact indicators in ΔT – not just CO_2
- Improving capability to use state-of-the-art climate models



Ellingsen, 2016