



**ZULU**  
ASSOCIATES

THE CASE  
FOR  
VESSELS OPERATING AUTONOMOUSLY



# ZULU Associates

ZULU Associates is active as an initiator, developer and operator of innovations in the marine component of logistic chains.

Its goal is to develop zero emission operation of autonomous commercial vessels on:

- inland waterways;
- short sea; and
- coastal routes.

The vessels will be operated through Remote Control Centres (RCC) and will be fitted with a range of alternative propulsion systems.



# AUTONOMOUS OPERATIONS

Autonomous operations allow major cost savings in the operation of vessels, in essence by

- Lowering significantly the cost of the crew (salaries, safety, food & beverage, accommodation, ...);
- Improving safety due to the reduction of human error; and
- Increasing efficiency.

This in turn will allow relatively smaller vessels to be competitive with larger manned vessels.

The vessels will operate from smaller ports and provide direct links between inland waterways and the high seas. Road transport requirements will be reduced, easing bottlenecks on major routes.

This opens the door to the use of more sustainable propulsion systems.

In sum, this will enable the achievement of increased sustainability levels in marine operations.

# SUSTAINABILITY – CLIMATE CRISIS



- Climate change is happening
- Sense of urgency
- Zero Emission by .... 2050?

or earlier ?

 **European Green Deal**



**BANK OF ENGLAND**

‘The challenges currently posed by climate change pale in significance compared with what might come. The far-sighted amongst you are anticipating broader global impacts on property, migration and political stability, as well as food and water security’.

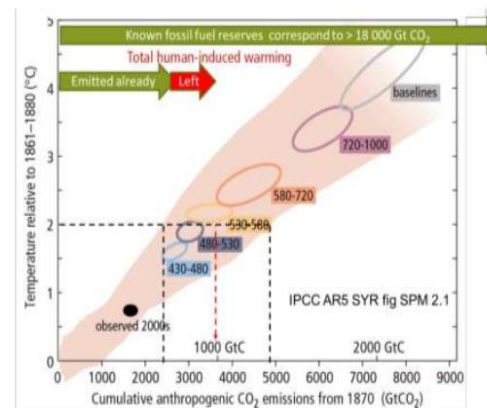
Mark Carney September 2015

# SUSTAINABILITY – CLIMATE CRISIS

## Urgency, scale and fairness in the collective response

- The carbon-intensity of economies must reduce by 40% by 2030 if the agreed 2°C limit is to be respected
- By mid-century, total greenhouse gas emissions need to be not only halted, but reversed – we need to figure out how to permanently remove CO<sub>2</sub> from the atmosphere in an affordable way
- The remaining carbon budget is 300 PgC (billion tonnes). Historical emissions were overwhelmingly from OECD countries. Current emissions are about equally from developed and developing countries, with the latter growing fast. The issue requires cooperation from both sides to be solved.

Key sources: IPCC 2018 SR on 1.5C and  
Pachauri 2014 (IPCC 5<sup>th</sup> Assessment report)



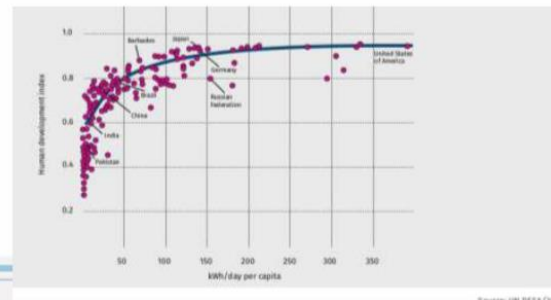
# SUSTAINABILITY – CLIMATE CRISIS

## Climate change mitigation solutions

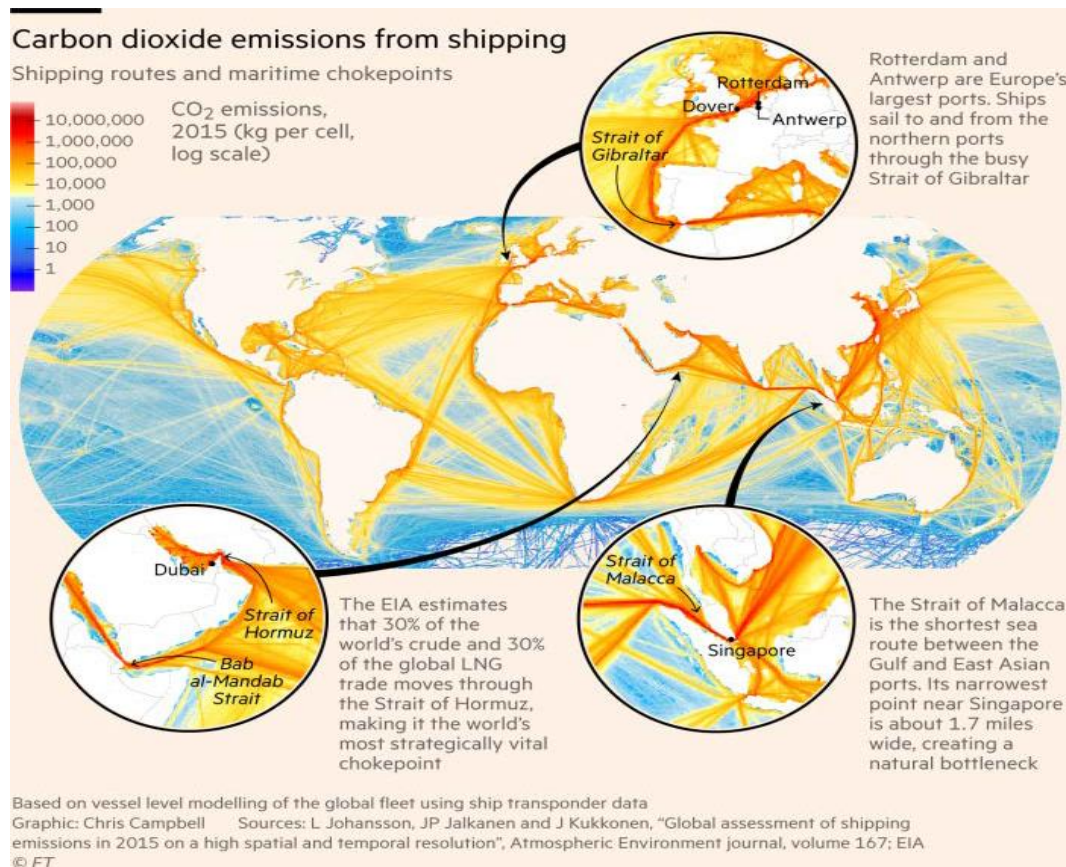
### Decarbonise the economy

- rapid transition to renewable energy sources
- electric vehicles, biofuels for air transport
- increased energy efficiency (product or service out/energy in)
- reduce absolute energy dependence where it is surplus to the needs for a good life
- halt deforestation and restore the carbon in agricultural soils

For all of the above, disincentives like carbon taxes, and incentives like tradeable carbon credits and innovation subsidies, in combination with fair, global and industry-wide standards and regulations, will help



# SUSTAINABILITY – CLIMATE CRISIS





# MARITIME AUTONOMOUS SURFACE SHIPS (MASS) OR AUTONOMOUSLY OPERATED VESSELS (AOV)

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- Set of sensors
- Artificial Intelligence on Board
- Situation Awareness
- AI taking Action
- Remote Control Centres (RCC)
- Ultimate control by RCCs





## AOV Economics : Lower Investment & Opex

### Lower Investment

- *Accommodation*
- *Safety Systems*

### Lower Opex

- *Crew Costs*
  - Wages
  - Personal Equipment
  - Catering
  - Safety Equipment
- *Increased Safety*
- *More efficient voyage planning*



## AOV Economics : Higher Investment & Opex

### Higher Investment

- *On board AI*
- *Sensors*
- *Communications*
- *RCC*

### Higher Opex

- *RCC costs*
- *Additional equipment maintenance*
- *Communication*

Requirement for  
autonomous berths in  
ports

## AOV Economics : Results

- AOV investment = crew accommodation/safety investment
- AOV Opex =  $\frac{1}{2}$  of crewed Opex



Margin for increased competitiveness vs crewed vessels

## AOV Economics : Results

Smaller vessels use less engine power, therefore less energy and therefore evolve more easily to zero-emission propulsion

- *Smaller traditional (diesel) propulsion are available with lower emissions (Euro 6 equivalent);*
- *Alternative fuels for propulsion (Hydrogen, Biodiesel,..) exist in smaller scale;*
- *Smaller propulsion is possible with fuel cells or batteries.*

AOV



AUTOSHIP  
Autonomous Shipping Initiative for European Waters



## Autonomous Shipping Initiative for European Waters

- *Building and Operating an Autonomous Ship at TRL 7 - The main target of the project is to develop and demonstrate to TRL 7 or above two fully autonomous vessels for Short Sea Shipping and Inland Water Way services respectively in real environment;*
- *Demonstrating Key Enabling Technologies;*
- *Development of Standards, Tools and Methods;*
- *Skilled and Updated Operators;*
- *Regulatory and socio-economic Framework.*

AOV



AUTOSHIP  
Autonomous Shipping Initiative for European Waters



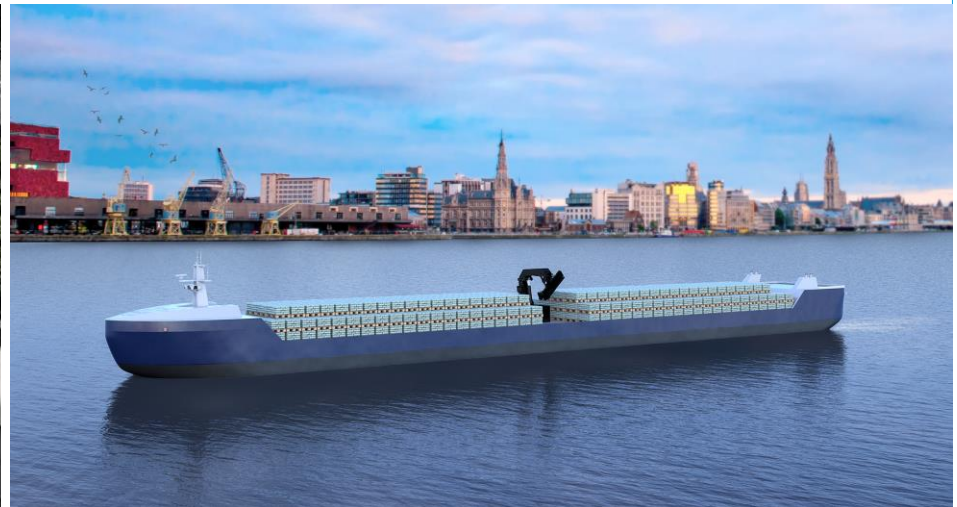
- Time-Line : 2018 - 2021
- Members :Kongsberg, Sintef Ocean, University of Strathclyde, De Vlaamse Waterweg, Bureau Veritas Marine & Offshore, Eidsvaag, Blue Line Logistics.
- The project has received funding from the European Union's Horizon 2020 research and innovation program under Grant Agreement N°815012.
- More info with press event 21<sup>st</sup> of January & on:
  - <https://www.linkedin.com/company/autoship/>.

# AOV Inland Waterways Replacement Segment

- Presently 12.800 + vessels active on European inland waterways (excluding Danube, Eastern Europe, ..)
- Total load capacity of 16.4 million tonnes
- Average year of construction of a dry cargo vessel is 1967 (50 years+ !)
- Tanker transport the average year of construction is 1976 (45 years+ !)
- Need for replacement : with smaller vessels
  - *Less power, less emissions with existing propulsion*
  - *Alternative propulsion*
  - *No need for large infrastructure*
  - *Low draught increasing use of waterways (Rhine, Danube, small waterways,..)*
  - *More redundancy*

# AOV Inland Waterways New “ZULU” segment

## MODAL SHIFT





# AOV Short Sea Shipping Coaster Replacement Segment

- 10,000 Coaster vessels in service in MPV segment
- Average age is 27.5 years, while geared coasters are more than 39 years old on average
- Outdated both technically and in terms of performance
- Ships travel at relatively low speeds, and coasters rarely cover very long distances and operate near land
- IMO 2020 has already had a major effect

Source: DNV-GL Next Generation Coasters (15/8/2018)



Coasters are a promising segment for replacement by AOV with sustainable propulsion



# AOV Short Sea Shipping Modal Shift: RORO to LOLO

## RORO

- *Large propulsion needs;*
- *50% of the Tare, or unladen, weight, is the weight of the empty vehicle or container (i.e. non-cargo);*
- *Large port infrastructure;*
- *Truck movements: congestion/emissions.*

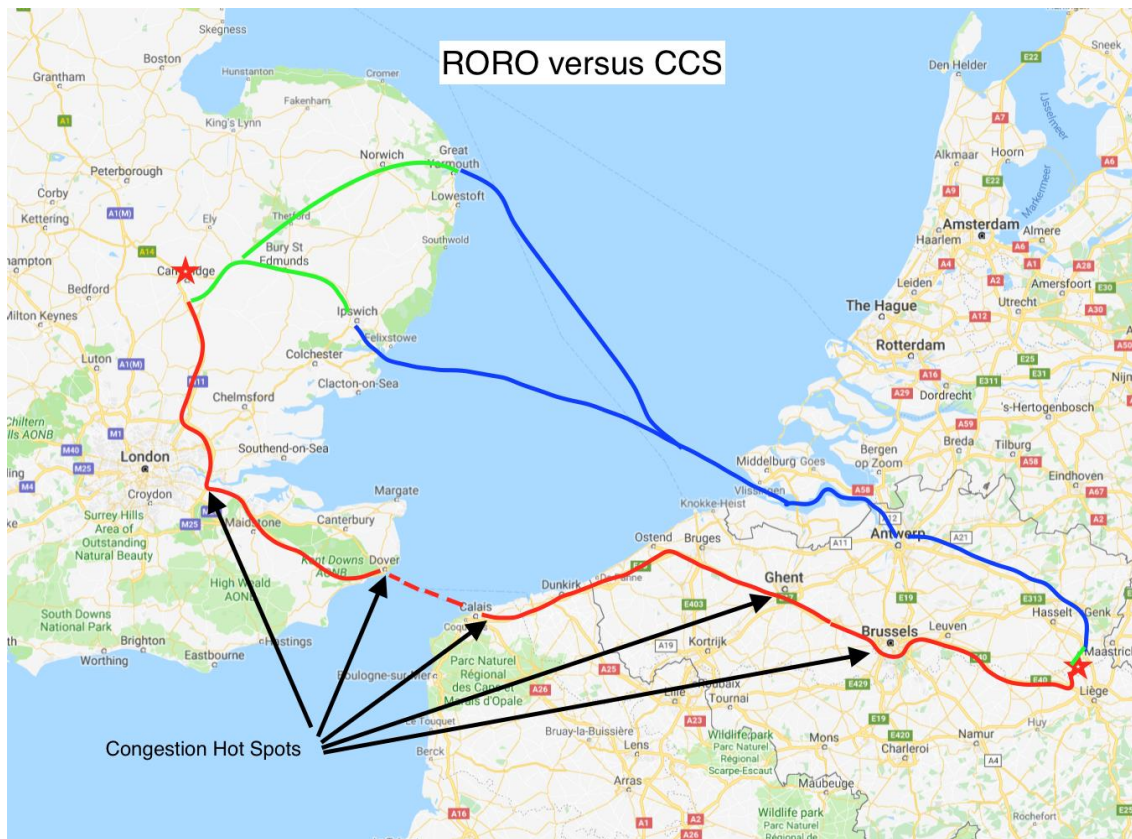
## AOV Alternative

- *Small propulsion;*
- *Tare is limited to the container;*
- *Small port infrastructure;*
- *Less truck concentration & movements.*

# AOV Economics : Case Study

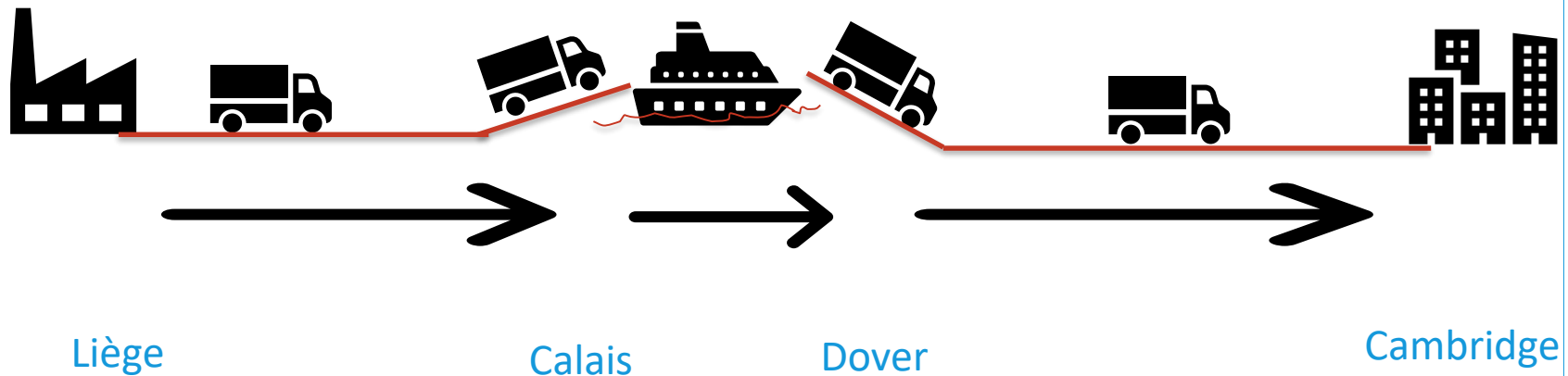
## Liège – Cambridge : 2 Logistic chains

### 400 km less road freight



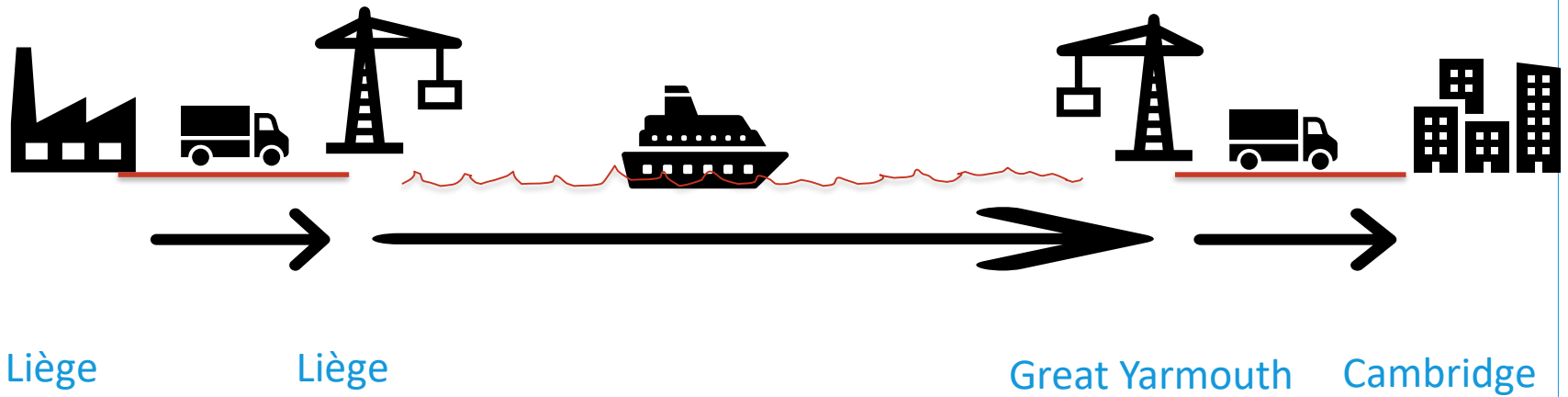
# AOV Economics : Logistic Chains

## Traditional RORO



# AOV economics : Logistic Chains

## Alternative with AOV



# AOV: Short Sea Shipping Anglo Belgian Shipping Company (ABSC)



Length Overall 90.0 metres  
 Draft mid. 5.50 metres  
 Service Speed 10.5 knots (85% MCR)

Beam mid. 15.0 metres  
 Air draft limit (Assumed) 9.10 metres (ab. WL)  
 Max TEU Capacity 150 (varies)

Beam mid. 15.0 metres  
 Air draft limit (Assumed) 9.10 metres (ab. WL)  
 Max TEU Capacity 150 (varies)



KONGSBERG



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# Questions



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