



## Work Group #4: Sustainable Marine Fuels

### Deliverable 3.1 Report Review Template

1. Report title	<b>Alternative Fuels: The future of zero emissions shipping</b>
2. Publication date	2018-07-31
3. Author	Jennifer Brown (EDF Europe)  EDF is a nonprofit environmental organization mainly financed by contributions of its members and donations from foundations.
4. Client (organization and type of organization, specifying private/commercial/public; research institute/interest group etc.)	n/a
5. Context of study (e.g. project in the context of which report is published or titles of other reports if part of a series)	Article published on the website of EDF.
6. Length (pages)	2-3 (article on website)
7. Link (or where to get if not available online)	<a href="https://sustainableworldports.org/wp-content/uploads/EDF_2018_Alternative-fuels-report.pdf">https://sustainableworldports.org/wp-content/uploads/EDF_2018_Alternative-fuels-report.pdf</a>
8. Sector coverage	Maritime shipping
9. Main aim of the study	This article aims to argue that sustainability criteria are implemented for low-carbon marine fuels, such that low life-cycle emissions can be guaranteed.

<p>10. Methodology</p>	<p>Literature review considering academic and grey literature.</p>
<p>11. Topic(s) and indication of the level of detail For example:</p> <ul style="list-style-type: none"> <li>• System Description - <i>A description of the full marine energy system.</i></li> <li>• System Components - <i>A description of all the components.</i></li> <li>• Infrastructure requirements for new fuels</li> <li>• Applicability - <i>which of the new fuels are expected to replace existing fuels?</i></li> </ul>	<p>The following topics are covered without much detail:</p> <ul style="list-style-type: none"> <li>- emission reduction targets for maritime shipping</li> <li>- types of alternative fuels to reduce GHG emissions of shipping</li> <li>- lifecycle emissions of the fuels, depending on the energy source used to produce the fuels</li> </ul> <p>Policy recommendations are given.</p>
<p>12. What are the main conclusions from the report?</p>	<p>It is important to consider the lifecycle emissions of the alternative bunker fuels, which can vary greatly depending on the energy source used for the production of the fuel. It is recommended that the shipping sector should develop sustainability criteria for the fuels 'ensuring the integrity of the carbon benefits and the social and environmental impacts'. A centralized certification process is also proposed to be established. This could help to reduce the possibility of double counting. And in combination with the sustainability criteria, a minimum threshold, e.g. in terms of carbon benefit, could be established.</p>
<p>13. What fuel/energy type(s) are discussed in the report and in what level of detail? For example:</p> <ul style="list-style-type: none"> <li>• Fuel description e.g. type, energy density, specific energy density, flash point, boiling point, fire point, flammability limits, hazards</li> </ul>	<p>The fuel types which are discussed in the article are:</p> <ul style="list-style-type: none"> <li>• Methanol</li> <li>• Biofuel</li> <li>• Ammonia</li> <li>• Hydrogen</li> <li>• LNG</li> <li>• HFO</li> </ul> <p>Details provided for each of these fuel types are:</p> <ul style="list-style-type: none"> <li>• The energy source that could be used to produce the fuel</li> </ul>

	<ul style="list-style-type: none"> <li>• The types of engines in which these fuels can be used</li> <li>• The way the fuels can be stored (liquid/gas)</li> <li>• The range of lifecycle CO<sub>2</sub> emissions depending on energy source used for production</li> </ul>
14. What environmental aspects does the report consider? E.g. Air quality emissions, climate change emissions (GHG + BC), other (for example terrestrial or underwater noise, water quality, emergency releases, fugitive emissions, odour, water resources, mining)	The article mainly considers greenhouse gas emissions. Air pollutant emissions are only briefly touched upon.
15. Does the report consider exhaust emissions only, or life-cycle, or both (or some other range of emissions)?	The article considers lifecycle CO <sub>2</sub> emissions.
16. If determined in the report, what are the emission rates/factors by pollutant? NO <sub>x</sub> , SO <sub>x</sub> , PM <sub>10</sub> , PM <sub>2.5</sub> , ultra fine PM, VOC, NH <sub>3</sub> , GHGs, Black carbon, and any others e.g. that may be unique to the fuel/energy.	The ranges of lifecycle CO <sub>2</sub> emissions of methanol, biofuel, ammonia, hydrogen, LNG and HFO are presented in a bar chart diagram in terms of g CO <sub>2</sub> /MJ. The ranges reflect the different energy sources that can be used to produce the fuels.
17. Does the report discuss barriers and opportunities for <u>ships</u> to use the fuel(s)/energy? Does the report identify the maturity level of the fuel on a regional or global scale with respect to use by vessels?	This is not specified in the article.
18. Does the report discuss barriers and opportunities for <u>ports</u> to provide the fuel(s)/energy? Does the report identify the maturity level of the fuel on a regional or global scale with respect to provision by ports?	This is not specified in the article.



<p>19. Does the report include capital and operating cost estimates for the ship and/or land-side?</p>	<p>This is not specified in the article.</p>
<p>20. When are the fuel(s)/energy expected to be at a demonstration stage vs. commercialization? For example:</p> <ul style="list-style-type: none"> <li>• Technology Readiness Level of the system - <i>Estimated maturity of the system technology</i></li> <li>• On Board Safety Readiness Level of the system - <i>Estimated maturity of the risk mitigations on board (on a scale of 1-9)</i></li> <li>• External Safety Readiness Level of the system - <i>Estimated maturity of the risk mitigations for bunker operations (on a scale of 1-9)</i></li> </ul>	<p>This is not specified in the article.</p>
<p>21. Are the fuels suitable for short and/or long (trans-oceanic) voyages?</p>	<p>This is not specified in the article.</p>
<p>22. Does the report identify/discuss potential issues around community acceptance for this fuel, or potential social/community impacts associated with the system?</p>	<p>This is not specified in the article.</p>