Roadmap towards commercial autonomous shipping in 2025

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DIMECC
The One Sea – Autonomous Maritime Ecosystem is exceptionally advanced and a natural step towards digitalizing marine industry.
Ecosystem Roadmapping – Purpose

• To **plan and initiate** a portfolio of activities that make the vision to become reality
• To **involve** the best and most relevant global actors, including corporations, SMEs, startups, industry groups, researchers, standardization bodies, regulators, and public authorities
• To **communicate** efficiently, raise awareness, and make impact
## Timeline for autonomous ships

<table>
<thead>
<tr>
<th>Year</th>
<th>Remote monitoring</th>
<th>2020</th>
<th>2023</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>Fully remote controlled vessel (manned) – unmanned with special approval</td>
<td>Gradual increase of autonomous control</td>
<td>Autonomous ship traffic commercial</td>
<td></td>
</tr>
<tr>
<td>Test areas</td>
<td>National pilots</td>
<td>Several pilots globally</td>
<td>Full scale testing / validation</td>
<td></td>
</tr>
<tr>
<td>International collaboration</td>
<td>Design requirements for autonomous power and propulsion systems</td>
<td>Developed data transfer tech eg. 5G (limited to ferries/ports)</td>
<td>Satellite becomes cheaper</td>
<td></td>
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<tr>
<td></td>
<td>Autonomous automobile commercial</td>
<td></td>
<td>Mobility as a service</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>&quot;Industry standards in place&quot;</td>
<td></td>
</tr>
<tr>
<td>Ethical issues</td>
<td></td>
<td></td>
<td>Strongly decreased data communication</td>
<td></td>
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<tr>
<td>Development of cyber security</td>
<td></td>
<td></td>
<td>Infrastructure</td>
<td></td>
</tr>
<tr>
<td>Projects, IPR, competences, education</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>National, IMO and global legislation development</td>
<td></td>
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</tbody>
</table>
Main themes

Autonomous Maritime

- Technical
- Operational
- Security
- Ethical
- Regulatory
- Traffic control
One Sea Technical Roadmap

- **Data platform**
  - Define
  - Develop
  - Pilot
  - Deploy

- **Industry standard**
  - Define
  - Develop
  - Pilot
  - Deploy

- **Remote control**
  - Define
  - Develop
  - Pilot
  - Deploy

- **Fault diagnostics & prognostics**
  - Define
  - Develop
  - Pilot
  - Deploy

- **Situational awareness**
  - Define
  - Develop
  - Pilot
  - Deploy

- **Electrification power & energy**
  - Define
  - Develop
  - Pilot
  - Deploy

Timeline:
- 2017
- 2018
- 2019
- 2020
- 2021
- 2022
- 2023
- 2024
- 2025
One Sea Regulatory Roadmap


Rules and regulations:
- Define
- Develop National
- Pilot National
- Deploy National
- Develop International
- Pilot International
- Deploy International

New vessel designs:
- Define
- Develop
- Pilot
- Deploy

Safety without human:
- Define
- Develop
- Pilot
- Deploy
# One Sea Ethical Roadmap

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Define</th>
<th>Develop</th>
<th>Pilot</th>
<th>Deploy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrich human contribution</td>
<td>Define</td>
<td>Develop</td>
<td>Pilot</td>
<td></td>
</tr>
<tr>
<td>AI</td>
<td>Define</td>
<td>Develop</td>
<td>Pilot</td>
<td>Deploy</td>
</tr>
</tbody>
</table>
One Sea

Operational Roadmap


Ship owners and operators
- Define
- Develop
- Pilot
- Deploy

Increased reliability
- Define
- Develop
- Pilot
- Deploy

Autonomous maintenance
- Define
- Develop
- Pilot
- Deploy

Cargo loading and unloading
- Define
- Develop
- Pilot
- Deploy

Low hanging fruits
- D
- Deploy

Testing of vessels
- With back-up crew onboard
- Without crew national
- Without crew international

2017: Low hanging fruits
2018: Testing of vessels
2019: Ship owners and operators
2020: Increased reliability
2021: Autonomous maintenance
2022: Cargo loading and unloading
2023: Low hanging fruits
2024: Testing of vessels
2025: Ship owners and operators

Key:
- D: Define
- P: Pilot
- D: Deploy
Levels of autonomy

• Two independent sides to maritime autonomy
  • Operational and systems autonomy

• Areas considered within operational autonomy
  • Role of human, steering and/or watch-keeping assistance, vessel features, back-up systems, who is responsible etc.

• Areas considered within systems autonomy
  • Service place and type, automation during operation, systems architecture, efficiency of system etc.

• The work is not yet completed, your input would be valued
Levels of Operational Autonomy

- Human in complete control
- Human in control improved steering assistance and situational awareness
- From partially remote controlled to partially autonomous
- Fully autonomous with remote access
Levels of Systems Autonomy

- **DIY (or phone) service support, system operated manually (on/off)**
- **Pre-emptive service with crew, on-board assisted automation of systems**
- **Artificial or virtual reality assisted maintenance, remote assisted automation of systems**
- **Maintenance at port only, autonomous AI operation of systems**
DIMECC’s co-creation ecosystem One Sea seeks global partners to join the leading research co-creation ecosystem.

Join us!

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