

**Introduction to autonomous shipping in
the Asia-Pacific region and beyond**

**Ekaterina Molodtsova
MARINET**

**Workshop
Autonomous Shipping for select countries in Asia and the Pacific
1 - 2 June 2023
Bangkok**

Analytical report on relevant developments, regulation, economic, social and environmental benefits and practical application of innovative autonomous shipping technologies

is developed in the framework of the project “Improving the safety of navigation and the sustainability of shipping through the introduction of innovative autonomous shipping technologies in the Asia-Pacific region” implemented by ESCAP and is aimed at:

Beneficiary countries: Indonesia, Malaysia, Thailand, the Philippines and Viet Nam

Improving the safety of navigation and the sustainability of shipping through the introduction of innovative autonomous shipping technologies in the Asia-Pacific region

Analytical report on relevant developments, regulation, economic, social and environmental benefits and practical application of innovative autonomous shipping technologies

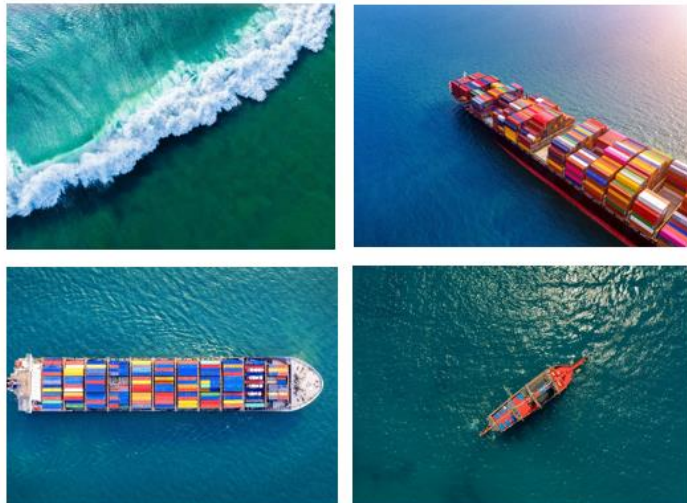


Image: Freepik.com



Raising awareness of relevant stakeholders about benefits and developments in autonomous shipping technologies and developing policy recommendations for the introduction of autonomous navigation in the region



Presenting best practice examples and exploring possible collaboration between countries and relevant stakeholders in practical implementation of autonomous shipping technologies



Supporting selected countries in strengthening their capacity to effectively implement autonomous navigation technologies through the development of national plans for the implementation of autonomous shipping technologies in line with the specific needs of each country

Benefits of autonomous navigation technology

Economic Impact

Increased efficiency and cost savings

By analyzing data on weather patterns, sea conditions, traffic, and other factors autonomous navigation system can optimize shipping routes and speeds, reducing fuel consumption, increasing frequency of shipping minimize costs

Promoted economic growth of the region

By minimizing costs companies can reduce their operating expenses while increasing their competitiveness in the market in the region

Environmental Impact

Increased use of renewable energy sources

Autonomous vessels can integrate renewable energy sources more easily than traditional vessels

Reduced greenhouse gas emissions due to efficient routing and reduced speeds

Social Impact

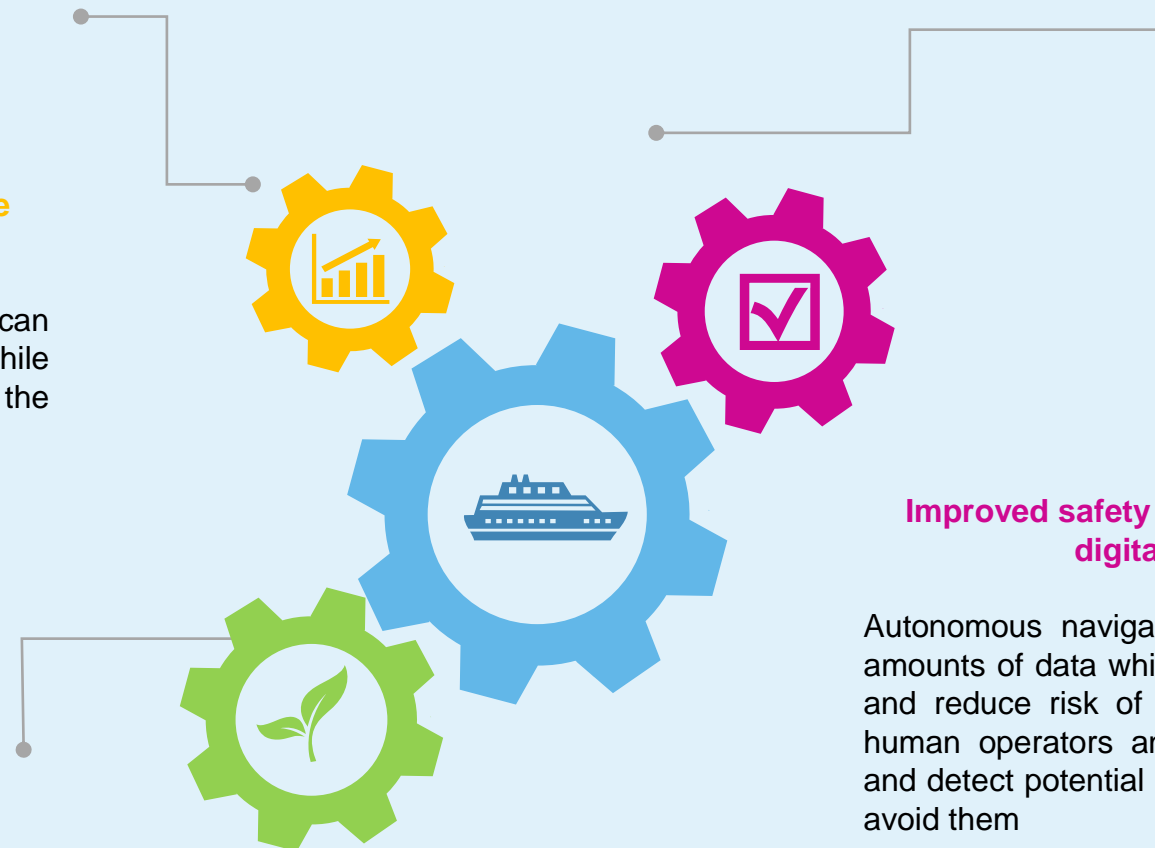
Gender equality and the empowerment of women in the maritime sector

Increased access to job opportunities and more flexible work arrangements for women and other underrepresented groups in maritime industries

New job opportunities for workers in the shipping industry (new jobs created in areas such as vessel monitoring, maintenance, and control)

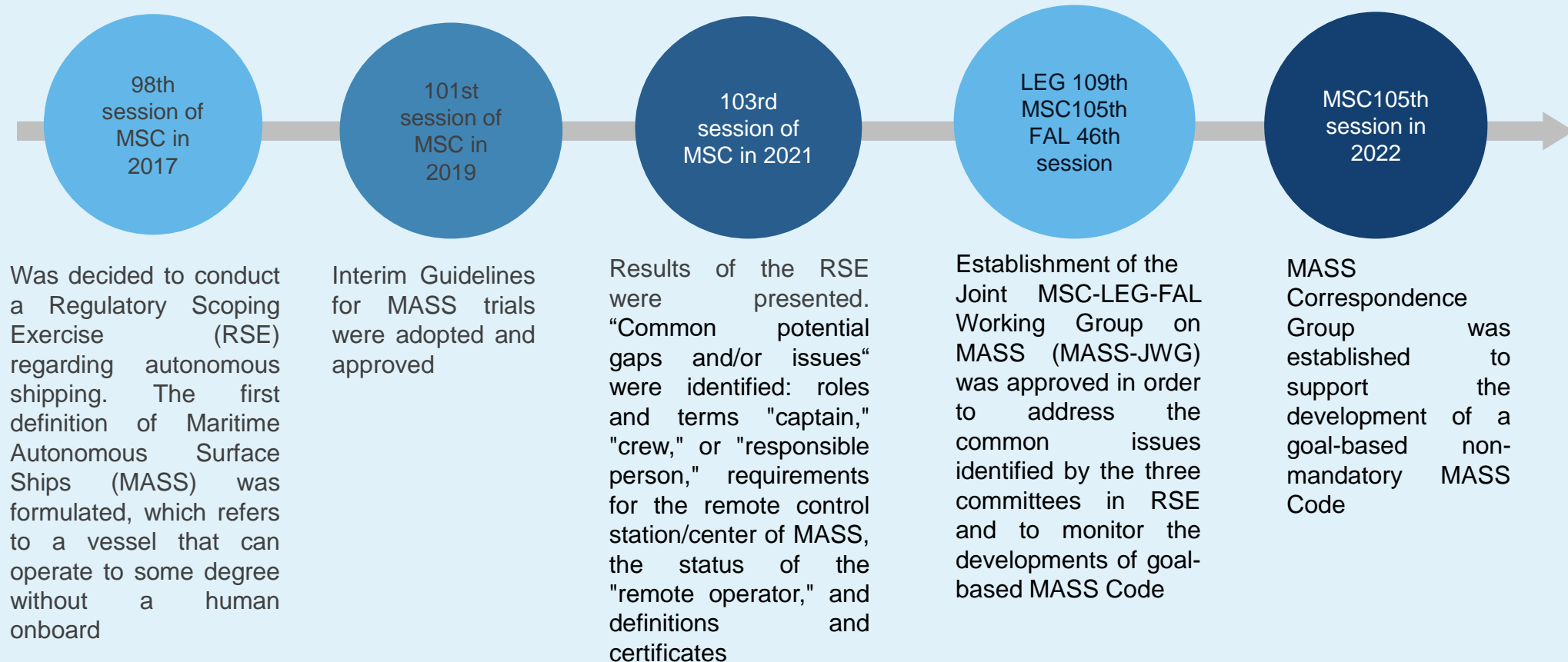
Improved safety and situational awareness through digitalization and automation

Autonomous navigation systems collect and analyze vast amounts of data which can help to make informed decisions and reduce risk of accidents. by eliminating the need for human operators and can navigate with greater accuracy and detect potential hazards and take proactive measures to avoid them



Development of international regulation at IMO

MASS Code is being developed with the goal of completion in 2025 as a non-mandatory guideline and by 2028 as a mandatory Code



Examples of national regulation

- **Russian Federation** has been working on developing autonomous navigation technology for its commercial vessels. The first initiative to incorporate the autonomous navigation into the national legislation was initiated in 2019. Currently, the Russian government is discussing the Federal Law regulating autonomous navigation. The draft law has already developed and is under the consideration of the Parliament
- **United Kingdom** has already introduced its own legislation with regards to autonomous shipping. UK has launched and continued to support an international working group on autonomous shipping – Maritime Autonomous Systems Regulatory Working Group
- **Major classification societies** have already conducted their own researches and published risk assessment of usage of autonomous technologies. They also issued regulatory documentations on maritime autonomous ship classification and operations

Autonomous navigation impact analysis in the Asia-Pacific region

Autonomous navigation has a potential to transform the maritime industry and the global economy, including the Asian-Pacific region's role and development. In particular through:

- **Enhanced port operations.** Autonomous navigation technology can be integrated with other digital technologies, such as smart sensors and data analytics, to improve port operations and reduce congestion
- **Improved cross-border connectivity.** Autonomous navigation technology can help to overcome these barriers by providing standardized, data-driven solutions that can be adapted to different contexts and languages
- **Improved last-mile logistics.** Autonomous delivery vehicles, such as drones and ground-based robots, can improve last-mile logistics by delivering goods more quickly and efficiently
- **Increased mobility options.** Autonomous navigation technology can expand mobility options in the region, particularly in areas where traditional transportation infrastructure is limited or inadequate
- **Reduced environmental impact.** Autonomous navigation technology can reduce the environmental impact of transportation by optimizing routes and speeds to minimize fuel consumption and emissions

Implementation of autonomous navigation technologies

Good practice example

CHINA

In China autonomous ships are now considered part of the country's national "Smart Ship" program. In 2003, the Innovation Center for Intelligent Control and Applied Technologies for Marine Equipment was established in China, with support from which construction of the first "smart ships" began in 2016. In 2018, the China State Shipbuilding Corporation, together with the China Classification Society, announced plans to create autonomous ships, which were supported by the Chinese government. The main focus of development lies in the area of technical management, which is based on China's rapidly growing capabilities in engine manufacturing and marine equipment production.

In 2019, the corporation reported an experimental voyage of a bulk carrier whose technical equipment was controlled remotely, and in December 2019, the first autonomous ship test was conducted in China - the 13-meter JinDouYun-0.

In 2021 the electric container ship Zhi Fei was launched, which is expected to be equipped with autonomous navigation systems. The Zhi Fei has three driving modes: manual driving, remote control, and autonomous navigation. It can realize the functions of route independent planning, intelligent collision avoidance, automatic berthing and disembarking, and remote control driving.



Regulatory
framework

R&D

Infrastructure
development

Skills
development

Public
engagement

Trial projects

Implementation of autonomous navigation technologies

Good practice example

JAPAN

In **Japan** in 2018 a cooperation with more than 30 commercial companies such as Mitsubishi Heavy Industries Group, Mitsubishi Shipbuilding Co., Ltd., and Shin Nihonkai Ferry Co., Ltd., and others the project MEGURI2040 the Fully Autonomous Ship Program was launched. The companies work together using an open-innovation approach with the aim of practical implementation. A land-based Fleet Operation Center is also being built in Makuhari, Chiba Prefecture, for remote operations in emergency situations. The consortium is developing fully autonomous navigation systems for container ships and ferries.

In 2018 Ministry of Land, Infrastructure, Transportation and Tourism of Japan set a goal to ensure the introduction of autonomous ships in the country starting in 2025. In October 2018, the Centers for the Promotion of the Marine Innovation Strategy were established

In 2022 container ship Suzaku, operating in a congested sea area, demonstrated the use of a comprehensive fully autonomous navigation system, including remote control and land support. The Suzaku is of 95 m and 749 gross tons navigated a round-trip route of 790 kilometers in Tokyo Bay using a comprehensive fully autonomous navigation system, including remote operation from the Fleet Operation Center in Chiba Prefecture.



Regulatory framework

R&D

Infrastructure development

Skills development

Public engagement

Trial projects

Implementation of autonomous navigation technologies

Good practice example

REPUBLIC OF KOREA

Since 2020, **Republic of Korea** develops a Korea Autonomous Surface Ship Project. This national R&D project is under implementation since 2020 till 2025 and includes 10 subprojects on autonomous navigation systems, autonomous engine systems, and sea test-bed & validation. Korea Autonomous Surface Ship Project (KASS) project involves research institutes, commercial companies, regulatory entities of the maritime field, and others. The program covers car ferry and containership with the goal to build 250 autonomous ships by 2025.

In 2022, Avikus, an autonomous navigation company belonging to one of the world's largest shipbuilders HD Hyundai the successful voyage of the LNG carrier Prism Courage from Free-port, Texas to South Korea's Boryeong LNG Terminal, via the Panama Canal. The 33-day voyage covered roughly 10,800 nautical miles, of which half was navigated autonomously using Avikus' technology. The technology is a navigation system that creates optimal routes and speeds using artificial intelligence that recognizes conditions such as weather and wave heights and nearby ships, and then controls the vessel's steering commands in real-time. The company said that during the voyage, the system accurately recognized the locations of nearby ships and maneuvered to avoid collision about 100 times. The company also said that by allowing the system to select the optimal route, the ship was able to increase its fuel efficiency by 7% while reducing greenhouse gas emissions by about 5%.



Regulatory
framework

R&D

Infrastructure
development

Skills
development

Public
engagement

Trial projects

Implementation of autonomous navigation technologies

Good practice example

RUSSIAN FEDERATION

- The first initiative to incorporate the autonomous navigation into the national legislation was initiated in 2019. Currently, **the Russian government is discussing the Federal Law regulating autonomous navigation**. The draft law has already developed and is under the consideration of the Parliament.
- In 2019 - 2021 **Maritime Autonomous Surface Ships (MASS) trials** were conducted in Russia. The project aimed at developing and testing a set of MASS technologies on different commercial vessels with different levels of automation and with various operation conditions.
- On the 5th of December, 2020, the Government of the Russian Federation issued a Regulation No.2031 “**On Experiment on Trial Operations of Autonomous Ships Flying the State Flag of the Russian Federation**”. Under this regulation, any shipping company is allowed to equip its ships flying the Russian flag with a Navigation systems and use them in commercial operation with proper classification and review of the minimum safe manning of the ship.
- Federal Agency on Maritime and River Transport developed and officially published **Recommendations on the application of Convention on the International Regulations for Preventing Collisions at Sea (COLREG, 1972) by autonomous ships** within the trial operations of autonomous ships flying the State flag of the Russian Federation.
- In September 2022 the Ministry of Transport of the Russian Federation developed a set of **advanced training programmes** for MASS personnel based on the applicable standards of the STCW Convention and the Code, taking into account the practical experience of MASS use in the Russian Federation.

Regulatory
framework

R&D

Infrastructure
development

Skills
development

Public
engagement

Trial projects

Implementation of autonomous navigation technologies

Good practice example

SINGAPORE

Singapore has wide access to foreign advanced developments in autonomous navigation. In October 2019, ABB signed a contract with Keppel Offshore & Marine for the trial operation of an autonomous tug at the Port of Singapore with the support of the Government of Singapore and the American Bureau of Shipping ABS.

UNITED STATES OF AMERICA

In the autonomous navigation, the US developments are mostly focused on the US Navy, the world's largest navy known to be at the forefront of technological advancements. Unmanned Systems (variety of unmanned systems, including unmanned aerial vehicles (UAVs), unmanned surface vehicles (USVs), and unmanned underwater vehicles (UUVs)) are already used in the USA.

Regulatory
framework

R&D

Infrastructure
development

Skills
development

Public
engagement

Trial projects

General components to strengthen the Asia-Pacific countries' capacities to implement innovative autonomous navigation technologies

Regulatory framework

Clear regulatory framework that addresses the legal and liability issues, including standards for autonomous vessel design, operation, and maintenance, as well as regulations for data privacy and cybersecurity

Research and development

Funding for research and development to support the innovation and testing of these technologies, including partnerships between industry and academia to develop and test new technologies

Infrastructure development

Investments in infrastructure are needed to support the technologies, including the development of autonomous ports, shore-based control centers, and communication networks to support the operation of autonomous vessels

Skills development

Programs to develop skills and knowledge needed to operate and maintain the technologies, including training programs for seafarers, engineers, and other stakeholders

Public engagement

Engagement of public and building support for these technologies, including public consultations, stakeholder engagement, and communication campaigns to raise awareness of the benefits and risks associated with autonomous shipping

Trial projects

Trial projects to test these technologies in a real-world environment, including partnerships between industry and government to test autonomous vessels in different operating conditions and assess their performance and safety

Survey to support the preparation of national implementation plans



Workshop on Autonomous Shipping for select countries in Asia and the Pacific. Bangkok, Thailand. 1-2 June 2023

Session 1 Survey 1
Please fill out the form in ENGLISH

Indicate your country _____

TABLE 1. What are the current challenges and gaps for implementation of autonomous navigation technologies in your country? Please list them below

N	List of challenges and gaps	Comments

TABLE 2. What are the opportunities and advantages for implementing your country? Please list them below

N	List opportunities and advantages

Please provide your contact details: name, company, position, phone, email

You are kindly asked to return the filled survey to organizers

Outcomes of current survey will facilitate the process of preparation of national implementation plans on autonomous navigation for selected countries in the framework of the project "Improving the safety of navigation and the sustainability of shipping through the introduction of innovative autonomous shipping technologies in the Asia-Pacific region" implemented by ESCAP



Workshop on Autonomous Shipping for select countries in Asia and the Pacific. Bangkok, Thailand. 1-2 June 2023

Session 2 Survey 2
Please fill out the form in ENGLISH

Indicate your country _____

Some countries are now actively implementing innovative autonomous navigation technology. Please indicate any technologies, companies or names of the projects on autonomous navigation you are familiar with

1. _____

2. _____

3. _____

Outcomes of current survey will facilitate the process of preparation of national implementation plans on autonomous navigation for selected countries in the framework of the project "Improving the safety of navigation and the sustainability of shipping through the introduction of innovative autonomous shipping technologies in the Asia-Pacific region" implemented by ESCAP

Your comments, if any:

Please provide your contact details: name, company, position, phone, email (not mandatory):

You are kindly asked to return the filled survey to organizers

Outcomes of current survey will facilitate the process of preparation of national implementation plans on autonomous navigation for selected countries in the framework of the project "Improving the safety of navigation and the sustainability of shipping through the introduction of innovative autonomous shipping technologies in the Asia-Pacific region" implemented by ESCAP



Workshop on Autonomous Shipping for select countries in Asia and the Pacific. Bangkok, Thailand. 1-2 June 2023

Session 3 Survey 3
Please fill out the form in ENGLISH

Indicate your country _____

The following components are essential for effective development and implementation of autonomous navigation technologies. You are kindly asked to fill out the table below in relation to your country.

Indicate priority from 1 (most important) to 3 (less important)	Component	Already exist in the country (+/-)	Needs to be developed in the
	Regulatory framework. Clear regulatory framework that addresses the legal and liability issues, including standards for autonomous vessel design, operation, and maintenance		
	Research and development. Funding for research and development to support the innovation and testing of these technologies, including partnerships between industry and academia to develop and test new technologies		
	Infrastructure development. Investments in infrastructure are needed to support the technologies, including the development of autonomous ports, shore-based control centres, and communication networks to support the operation of autonomous vessels		
	Skills development. Programs to develop skills and knowledge needed to operate and maintain the technologies, including training programs for seafarers, engineers, and other stakeholders		
	Public engagement. Engagement of public and building support for these technologies, including public consultations, stakeholder engagement, and communication campaigns to raise awareness of the benefits and risks associated with autonomous shipping		
	Real projects. Collaboration and knowledge sharing among countries, companies and research institutions to advance the implementation of autonomous navigation technologies. Countries can facilitate collaboration by creating networks and platforms that enable to test and validate new technologies in a real-world environment and in different operating conditions to assess their performance and safety		
	<i>Any other components. Please indicate, if any</i>		

Please provide your contact details: name, company, position, phone, email

You are kindly asked to return the filled survey to organizers

Outcomes of current survey will facilitate the process of preparation of national implementation plans on autonomous navigation for selected countries in the framework of the project "Improving the safety of navigation and the sustainability of shipping through the introduction of innovative autonomous shipping technologies in the Asia-Pacific region" implemented by ESCAP



Workshop on Autonomous Shipping for select countries in Asia and the Pacific. Bangkok, Thailand. 1-2 June 2023

Session 4 Survey 4
Please fill out the form in ENGLISH

Indicate your country _____

Develop national roadmap on autonomous shipping

Please use this form to create a draft strategy on effective implementation of autonomous navigation technologies in your country (starting with the most important priority)

N	Components	Comments

Your comments, if any:

Please provide your contact details: name, company, position, phone, email

You are kindly asked to return the filled survey to organizers

Outcomes of current survey will facilitate the process of preparation of national implementation plans on autonomous navigation for selected countries in the framework of the project "Improving the safety of navigation and the sustainability of shipping through the introduction of innovative autonomous shipping technologies in the Asia-Pacific region" implemented by ESCAP

The background is a gradient of blue shades, from a darker blue at the edges to a lighter blue in the center. It is decorated with various geometric elements: thin white lines of varying lengths and orientations, semi-transparent circles of different sizes, and elongated, rounded rectangular shapes. These elements are scattered across the frame, creating a modern, minimalist aesthetic.

THANK YOU