

World Maritime University

# The Maritime Commons: Digital Repository of the World Maritime University

---

World Maritime University Dissertations

Dissertations

---

10-31-2021

## The application of electronic certificates for ships in China: an ecosystem-based approach

Huanhuan Song

Follow this and additional works at: [https://commons.wmu.se/all\\_dissertations](https://commons.wmu.se/all_dissertations)



Part of the [Systems and Communications Commons](#), and the [Transportation Commons](#)

---

### Recommended Citation

Song, Huanhuan, "The application of electronic certificates for ships in China: an ecosystem-based approach" (2021). *World Maritime University Dissertations*. 1748.  
[https://commons.wmu.se/all\\_dissertations/1748](https://commons.wmu.se/all_dissertations/1748)

This Dissertation is brought to you courtesy of Maritime Commons. Open Access items may be downloaded for non-commercial, fair use academic purposes. No items may be hosted on another server or web site without express written permission from the World Maritime University. For more information, please contact [library@wmu.se](mailto:library@wmu.se).

**WORLD MARITIME UNIVERSITY**

Malmö, Sweden

**THE APPLICATION OF ELECTRONIC  
CERTIFICATES FOR SHIPS IN CHINA: AN  
ECOSYSTEM-BASED APPROACH**

By

**SONG HUANHUAN**

**The People's Republic of China**

A dissertation submitted to the World Maritime University in partial  
fulfilment of the requirements for the award of the degree of

**MASTER OF SCIENCE**

**in**

**MARITIME AFFAIRS**

**(MARITIME LAW AND POLICY)**

2021

## Declaration

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

(Signature): ..... 宋欢欢 .....

(Date): ..... 20 September 2021 .....

Supervised by: .....

Supervisor's affiliation.....

## Acknowledgements

This paper completes my study at the World Maritime University (WMU) in Sweden, which I had been expecting for several years and finally made it. I am sincerely grateful to all my professors and classmates for such an impressive learning and networking experience. The 14-month program has not only deepened my understanding of various maritime issues, but also enhanced my abilities to identify, analyse and solve problems. I would also like to thank all the other staff members of the university for always being there and providing great support and assistance.

I would like to express my profound thanks to my supervisor, Associate Professor Aref Fakhry for his continuous guidance. His enlightening views, patient explanations and valuable suggestions have steered the whole journey of my dissertation. His strict requirements, although sometimes really stressful, have made my learning more enriching and fulfilling.

From the research proposal to the final paper, many of my colleagues and friends as well as the interview respondents have offered lots of information, comments and ideas. I am extremely grateful for their sincere support and precious inputs.

My special appreciation also goes to the Ministry of Transport of China and the China Maritime Safety Administration for fully supporting my study here in Malmö. I feel so lucky and proud to be part of such wonderful groups.

Last but not least, I want to say a huge thank you to all my beloved family members for their understanding and sacrifice. It is their constant love and encouragement that always motivate me to be a better daughter, daughter-in-law, wife and mother...



## Abstract

Title of Dissertation: **The Application of Electronic Certificates for Ships in China: An Ecosystem-based Approach**

Degree: **Master of Science**

Digitalization is significantly impacting the maritime sector and reshaping its future. It has become all the more vital and imperative ever since the maritime industry was severely affected by the COVID-19 pandemic. As one of the keystones and enablers of maritime digital transformation, the use of electronic certificates for ships (required to be carried on board ships), featuring various advantages over paper certificates, continues to gain global momentum.

In spite of the efforts and progress made by the Chinese government in applying electronic certificates, challenges remain in terms of the speed and scope of application.

This dissertation examines the application of electronic certificates in China from an ecosystem perspective, which was adopted in the areas of business, management and governance, amongst others. The dissertation pays close attention to the full range of stakeholders, the inter-connected relations among them, as well as the global maritime and digital context. It proposes forward-looking, holistic and sustainable solutions.

The dissertation focuses on “non-technical” (non-technology-related) aspects of the application of electronic certificates, which prove to be more burdensome than technical (technology-related) aspects. Relevant challenges and areas for improvement have been identified at the legal, policy and organizational layers. The political, economic, social and cultural impacts of the application of electronic certificates are discussed. Finally, targeted recommendations are provided at both specific and macro levels.

**KEYWORDS:** Electronic certificate, e-certificate, maritime digitalization, ecosystem, business ecosystem, ecosystem-based approach, e-government, China

## Table of Contents

<b>Declaration</b> .....	<b>i</b>
<b>Acknowledgements</b> .....	<b>ii</b>
<b>Abstract</b> .....	<b>iii</b>
<b>Table of Contents</b> .....	<b>iv</b>
<b>List of Tables</b> .....	<b>vi</b>
<b>List of Figures</b> .....	<b>vii</b>
<b>List of Abbreviations</b> .....	<b>1</b>
<b>Chapter 1 Introduction</b> .....	<b>3</b>
<b>1.1 Background</b> .....	<b>3</b>
<b>1.2 Problem Statement and Research Objectives</b> .....	<b>6</b>
<b>1.3 Research Methodology</b> .....	<b>9</b>
<b>1.4 Dissertation Outline</b> .....	<b>10</b>
<b>1.5 Literature Review</b> .....	<b>10</b>
1.5.1 Ecosystem.....	10
1.5.2 Interoperability in an Ecosystem .....	12
1.5.3 Electronic Certificates for Ships.....	13
<b>Chapter 2 The Ecosystem of Electronic Certificates for Ships in China</b> .....	<b>15</b>
<b>2.1 Overview of the Ecosystem</b> .....	<b>15</b>
<b>2.2 Key Aspects of the Application of Electronic Certificates for Ships in China</b> .....	<b>18</b>
2.2.1 Technical Perspectives .....	19
2.2.2 Non-technical Perspectives .....	22
<b>2.3 Conclusion</b> .....	<b>24</b>
<b>Chapter 3 The Application of Electronic Certificates at the Legal and Policy Layers</b> .....	<b>25</b>
<b>3.1 The Application of Electronic Certificates at the Legal Layer</b> .....	<b>25</b>
3.1.1 General Perspective .....	26
3.1.2 Maritime Perspective.....	29
<b>3.2 The Application of Electronic Certificates at the Policy Layer</b> .....	<b>30</b>
3.2.1 Further Considerations of Relevant Stakeholders .....	31
3.2.2 Further Considerations of the Broader Context.....	35
<b>3.3 Conclusion</b> .....	<b>35</b>
<b>Chapter 4 The Application of Electronic Certificates at the Organizational Layer</b> .....	<b>37</b>
<b>4.1 Inter-organizational Considerations</b> .....	<b>37</b>
4.1.1 Perspective from Organizational Structure and Processes .....	37
4.1.2 Perspective from Employees .....	40
<b>4.2 Intra-organizational Considerations</b> .....	<b>41</b>
<b>4.3 Conclusion</b> .....	<b>45</b>

<b>Chapter 5 Political, Economic, Cultural and Social Considerations .....</b>	<b>46</b>
<b>Chapter 6 Conclusion and Recommendations .....</b>	<b>49</b>
<b>References.....</b>	<b>53</b>
<b>Appendices.....</b>	<b>58</b>
<b>Appendix I List of Certificates and Documents Required to be Carried on Board     Ships.....</b>	<b>58</b>
<b>Appendix II Guidelines for the Use of Electronic Certificates.....</b>	<b>89</b>
<b>Appendix III List of Questions for the Semi-Structured Interview .....</b>	<b>93</b>

## List of Tables

Table 1: Main groups of certificates and documents required to be carried on board ships .....	4
Table 2: Stakeholder groups involved in the semi-structured interviews.....	10
Table 3: Main elements of a successful ecosystem of e-certificates in China.....	18
Table 4: Features of e-certificates as provided by IMO .....	21
Table 5: Layers of interoperability .....	23
Table 6: Comparison of the circulars on e-certificates issued by MPA and China MSA.....	34
Table 7: Major divisions within China MSA currently involved in the application of e-certificates .....	38
Table 8: Barriers in e-government service delivery (employee perspective within the government authority).....	40
Table 9: Major facets of Intra-organizational Coordination .....	42
Table 10: Main intra-organizational coordination challenges for the application of e-certificates .....	44

## List of Figures

Figure 1: The ecosystem of e-certificates for ships in China .....	16
Figure 2: E-documents Reference Architecture (Legal View) .....	26

## List of Abbreviations

ACMCM	ASEAN-China Maritime Consultation Mechanism
AI	Artificial Intelligence
APHoMSA	Asia-Pacific Heads of Maritime Safety Agencies
BIMCO	Baltic & International Maritime Council
CCS	China Classification Society
Circ.	Circular (by IMO)
e-certificate	Electronic Certificate
DG	Dangerous Goods
EC	European Commission
EGDI	E-Government Development Index
EIF	European Interoperability Framework
FAL	Facilitation (Committee of IMO)
FAL Convention	The Convention on Facilitation of International Maritime Traffic, 1965, as amended
FIoS	Future Internet of Ships
FONASBA	Federation of National Associations of Ship Brokers and Agents
GISIS	Global Integrated Shipping Information System
HTW	Human Element, Training and Watchkeeping (Committee of IMO)
IAPH	International Association of Ports and Harbors
ICHCA	International Cargo Handling Coordination Association
ICS	International Chamber of Shipping
ICT	Information and Communications Technologies
IHMA	International Harbour Masters' Association
ILO	International Labour Organization
IMO	International Maritime Organization
IMPA	International Maritime Pilots Association
IPCSA	International Port Community Systems Association
ISO	International Organization for Standardization

ISSA	International Ship Suppliers' Association
LEG	Legal (Committee of IMO)
MARAD	Maritime Administration
MASS	Maritime Autonomous Surface Ships
MEPC	Marine Environment Protection Committee (of IMO)
MOU	Memorandum of Understanding
MPA	Maritime and Port Authority of Singapore
MSA	Maritime Safety Administration
MSC	Maritime Safety Committee (of IMO)
MSW	Maritime Single Window
NPC	National People's Congress
OSI	Online Service Index
PDCA	Plan-Do-Check-Act
PSC	Port State Control
RO	Recognized Organization
STCW	The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers
UN	United Nations
UNCITRAL	United Nations Commission on International Trade Law
VDR	Voyage Data Recorder

## Chapter 1 Introduction

### 1.1 Background

A certificate (for ship) is a “document issued by an Administration or its representatives that is used to show compliance with IMO requirements and used to describe operating conditions, crewing requirements, and ship equipment carriage requirements” (International Maritime Organization [IMO], 2016, p.3). It is considered as *prima facie* evidence for a ship’s seaworthiness and its compliance with flag State, port State and coastal State requirements in accordance with relevant conventions or regulations. With the development of the shipping industry as well as more focus on safer, cleaner and more efficient shipping, the international maritime regulatory framework is expanding, and so is the number of certificates and documents required to be carried on board ships.

According to the latest *List of Certificates and Documents Required to be Carried on Board Ships, 2017* issued by IMO (FAL.2/Circ.131; MEPC.1/Circ.873; MSC.1/Circ.1586 & LEG.2/Circ.3, 2017), there are a total of 119 certificates and documents “required of shipowners by public authorities on the arrival, stay and departure of ships” under various IMO instruments, and this should not be interpreted as “precluding a requirement for the presentation for inspection by the appropriate authorities of certificates and other documents carried by the ship pertaining to its registry, measurement, safety, manning, classification and other related matters” (IMO, 2017, p.1). The main groups of certificates and documents for ships issued by



Maritime Administrations (MARADs), Recognized Organizations (ROs) acting on their behalf or other parties are provided in Table 1 below.

<b>Groups of certificates and documents for ships</b>	<b>Issued by</b>	<b>Examples</b>
Ship certificates	Flag State / RO	International Tonnage Certificate, International Load Line Certificate, Safety Management Certificate, International Oil Pollution Prevention Certificate
Class certificates	Class	class hull and machinery certificate
Equipment certificates	Flag State / RO	Voyage Data Recorder (VDR)
Ship documentation	Owner, Builder	Stability booklet, safety plan, mandatory operational routines (e.g., Shipboard Oil Pollution Emergency Plan, Shipboard Marine Pollution Emergency Plan)
Log books, records	Crew / Master	Deck logbook, Engine logbook, Oil Record Book, Garbage Record Book
Crew certificates	Flag State, Other authorities	Certificate of Competency, Medical certificate
Insurance	Insurance companies	Liability, pollution
Cargo and holds	Shipper, Operator	Cargo info, Dangerous Goods (DG) manifest, Gas Free Certificate

*Table 1: Main groups of certificates and documents required to be carried on board ships (compiled by Author from RINA, 2015; Ren, 2016 & IMO, 2017)*

The shipping business is traditionally a paper-intensive industry with hard copies of certificates stored on board for inspection and verification (Ren, 2016). As such, the heavy dependency upon paper certificates has caused stakeholders including shipowners, seafarers, flag administrations and classification societies, to mention but a few, to incur considerable manpower and financial costs, because paper certificates have to be prepared, printed, delivered and kept on board ships.

Driven by maritime digitalization and the well-recognized benefits of electronic certificates<sup>1</sup> over paper certificates in reducing administrative burdens and operational costs, improving shipping efficiency as well as enhancing security and competitiveness, the use and acceptance of e-certificates has been embraced throughout the maritime sector in recent years.

To facilitate the application of e-certificates, IMO adopted the *Guidelines for the Use of Electronic Certificates* (FAL.5/Circ.39/Rev.2, 2016), and invited member governments to “take the necessary actions at the national level to ensure that adequate legislation is in place for the use and acceptance of electronic certificates, as may be required” (IMO, 2016, p.1). At its 30th Assembly session, IMO adopted the revised Resolution A.1119(30) on *Procedures for Port State Control, 2017*, to reflect the validity of e-certificates. More recently, the IMO Sub-Committee on Human Element, Training and Watchkeeping (HTW) has been working under the auspices of the Maritime Safety Committee (MSC) on the development of amendments to the STCW Convention and the Code for the use of e-certificates and documents of seafarers with the target completion year of 2022.

Besides, IMO’s other requirements or initiatives in a broader scope with regard to “the establishment of systems for the electronic exchange of information by 8 April 2019”<sup>2</sup>, “Maritime Single Window (MSW)”<sup>3</sup> and “Maritime Autonomous Surface Ships

---

<sup>1</sup> According to the *Guidelines for the Use of Electronic Certificates* (FAL.5/Circ.39/Rev.2, 2016), “electronic certificate means a certificate issued in an electronic format” (IMO, 2016, p.3).

<sup>2</sup> According to 1.3bis Standard of Section 1.C of the Convention on Facilitation of International Maritime Traffic, 1965, as amended (FAL Convention), “Public authorities shall take all necessary measures for the establishment of systems for the electronic exchange of information by 8 April 2019”.

<sup>3</sup> The Facilitation Committee (FAL) of IMO approved *Guidelines for Setting up a Single Window System in Maritime Transport* (FAL.5/Circ.36) in 2011 and *Guidelines for Setting Up a Maritime Single Window* (FAL.5/Circ.42) in 2019.

(MASS)”<sup>4</sup> as well as the call for “greater maritime digitalization”<sup>5</sup> and “Future Internet of Ships (FIoS)”<sup>6</sup> from the whole maritime sector have given further impetus to the use and acceptance of e-certificates.

With the relevant framework for flag and port States to use and accept e-certificates agreed at IMO now in place, the application of e-certificates continues to gain global momentum. Since 2016 when Denmark first announced a complete transition from paper to electronic format of all statutory certificates issued to ships flying its flag<sup>7</sup>, more and more flag States have followed the flow, paving the way for further application of e-certificates at global level. For example, Class NK alone was authorized by 54 flag States to issue e-certificates for ships as of July 2021<sup>8</sup>.

## 1.2 Problem Statement and Research Objectives

As a large maritime country and seafarer-supplying country, China’s active participation in the application of e-certificates for ships is of great benefits not only to China itself, but also to the world for helping to speed up the global process. Over

---

<sup>4</sup> <https://www.imo.org/en/MediaCentre/HotTopics/Pages/Autonomous-shipping.aspx>

<sup>5</sup> On 5 June 2020, IMO issued the Circular Letter No.4204/Add.20 entitled “Coronavirus (COVID-19) – Accelerating digitalization of maritime trade and logistics – A call to action”, supporting the initiative by a group of global industry associations representing the maritime transportation and port sectors, consisting of ICS, IAPH, BIMCO, ICHCA, IMPA, ISSA, IHMA, FONASBA and IPCSA and encouraging collaboration between maritime supply chain industry stakeholders and Member States, as well as intergovernmental collaboration at local, national and regional level, to accelerate digitalization.

<sup>6</sup> According to Cosgrave (2018), “Future Internet of Ships (FIoS) encompasses internet of shipping services (e.g. sea traffic management voyage management and port collaborative decision making (STM Validation Project, 2018)), internet of shipping things (e.g. smart ships (autonomous vessels being the extreme example), smart objects enabled with radiocommunications to facilitate remote monitored such as engines and pumps), internet of shipping knowledge (documents online in real-time i.e. IMO GISIS modules), internet of shipping people (digital identities for seafarers /fishers). It is a technology paradigm that illustrates the shift of management, planning and execution of shipping to new services, new tools, new software packages, new interfaces, and new user interaction solutions” (p.59).

<sup>7</sup> <https://www.dma.dk/Presse/Nyheder/Sider/Danish-ships-to-be-issued-with-digital-certificates-.aspx>

<sup>8</sup> <https://www.classnk.or.jp/hp/en/activities/portal/e-cert.html>

the past few years, the China Maritime Safety Administration (MSA), as the competent maritime authority of China, has attached great importance to the use and acceptance of e-certificates. On 14 April 2018, the first electronic statutory certificate was issued to the Chinese-flagged vessel XIN MEI ZHOU by the China Classification Society (CCS), the RO authorized by China MSA. By 31 August 2021, CCS had issued 84,025 electronic statutory certificates to Chinese-flagged vessels engaged in international voyages. On 6 September 2019, China MSA and the Maritime and Port Authority of Singapore (MPA) signed *the Memorandum of Understanding (MOU) Relating to Promotion, Acceptance and Use of Electronic Certificates between China and Singapore* to strengthen cooperation in this area. With the successful completion of the pilot project (52 successful real-ship tests on the mutual use and acceptance of electronic statutory certificates accomplished by 31 July 2021), a more ambitious objective on the docking of MSW systems of the two countries is expected to be achieved in the near future.

Nevertheless, China's current application of e-certificates is still far from being sufficient and efficient in terms of the number of ships and types of certificates, as currently only statutory certificates are issued in electronic format to Chinese-flagged ships engaged in international voyages. With paper certificates now still taking a much larger proportion in real practice, the benefits of the wide use of e-certificates have not been realized.

To achieve the best outcome of reducing administrative and operational costs, improving shipping efficiency, and enhancing the competitiveness of China as a flag, port and coastal State, there is a pressing need to "go above and beyond" by promoting e-certificates towards quicker, wider and more sustainable application.

Besides, the need to increase maritime digitalization as highlighted by Mr. Kitack Lim, the Secretary-General of IMO, to "enhance the resilience of the maritime supply chain,

to support sustainable development and to enable recovery”<sup>9</sup> after the outbreak of the COVID-19 pandemic has intensified the urgency of further application of e-certificates by all countries, including China, given the fact that the use of e-certificates is an enabling and fundamental step in maritime digital transformation and is profoundly impacting the process.

For the purpose of better understanding the significance of e-certificates to the maritime sector, better analysing relevant opportunities and challenges as well as seeking more sustainable solutions with regard to further application of e-certificates in China, this dissertation adopts an ecosystem-based approach, which has been applied previously in the areas of business, management and governance, amongst others. Such an approach features holistic and forward-looking discussions by paying close attention to the full range of stakeholders of e-certificates, the inter-connected relations among them and the global maritime and digital context.

The research is guided by the following three questions to attain the aforementioned objectives:

Question 1: How should the use and acceptance of e-certificates be viewed as an ecosystem?

Question 2: What are the major challenges in further promoting e-certificates in China?

Question 3: What measures should be taken by the Chinese government to achieve quicker, wider and more sustainable application of e-certificates?

This dissertation focuses on the certificates as provided in the *List of Certificates and Documents Required to be Carried on Board Ships, 2017* issued by IMO (FAL.2/Circ.131, MEPC.1/Circ.873, MSC.1/Circ.1586 & LEG.2/Circ.3), including

---

<sup>9</sup> <https://www.imo.org/en/MediaCentre/SecretaryGeneral/Pages/Digitalization-Maritime-Perspectives.aspx>

seafarer certificates while excluding documents such as log-books, records, manuals, files and booklets which are used to record or instruct ongoing operations of ships.

### 1.3 Research Methodology

This study adopts a multi-step qualitative approach which is practicably suitable for gaining an in-depth understanding and insightful findings. At the first stage, desk research is carried out, with sources covering books, peer-reviewed articles, stakeholders’ publications (policies, reports and media releases) as well as various instruments and documents of IMO and other relevant international organizations. Based on this, a better understanding of the application of e-certificates for ships in a broad context is achieved and the ecosystem-based framework for detailed discussions is established. Then, major findings regarding the status quo and challenges of application of e-certificates in China are identified through case studies, workplace observations and semi-structured one-to-one interviews. The interviews involve six respondents representing a wide range of stakeholder groups including government authorities, shipping companies, seafarers and ROs (table 2). Furthermore, comparison analysis on the practices by the maritime authorities in some other countries and China is conducted to identify relevant gaps and to provide more insights. Finally, practical and targeted recommendations on how to further promote the application of e-certificates in China are provided.

<b>Respondents</b>	<b>Stakeholder Groups</b>
Staff member from the China Maritime Safety Administration (MSA)	National MARAD
Staff member from the National Office of Port Administration	National MSW partner
Staff member from Maritime and Port Authority of Singapore (MPA)	Foreign MARAD
Seafarer from China COSCO SHIPPING Bulk Co., Ltd	Seafarer
Staff from CCS	RO

Agent from COSCO SHIPPING Lines South-China Co., Ltd	Shipping Agency
--	-----------------

*Table 2: Stakeholder groups involved in the semi-structured interviews (prepared by Author)*

## 1.4 Dissertation Outline

This dissertation examines the application of electronic certificates for ships in China by assessing and addressing major challenges. Chapter 2 provides an overview of the ecosystem of electronic certificates in China and establishes the main layers for detailed discussions. Chapter 3 analyses the legal and other policy-related concerns from both general and maritime perspectives, and identifies main gaps. Chapter 4 focuses on the challenges at the organizational layer by covering both inter-organizational and intra-organizational considerations, and points out areas for future improvements. Chapter 5 discusses the political, economic, social and cultural impacts and proposes ways forward. Chapter 6 draws conclusions and provides targeted recommendations at both specific and macro levels.

## 1.5 Literature Review

### 1.5.1 Ecosystem

The term “ecosystem” beyond biological or ecological contexts was first raised by Moore in the 1990s as “business ecosystem” to describe the business environment as “an economic community supported by a foundation of interacting organizations and individuals – the organisms of the business world” (1996, p.26). Afterwards, this metaphor was further used and developed by many researchers in social and economic domains with different focuses.

Studies on ecosystems vary from business, management, strategic, policy or governance perspectives, and consequently the definitions are wide-ranging

(Anggraeni et al., 2007; Jacobides et al., 2018; Zhang & Liang, 2011; Lappi et al., 2015 & Valkokari, 2015). Despite various descriptions focusing on different areas, it is widely accepted that an “ecosystem” connects multiple and varying elements with interdependence and interactions among a wide range of actors and resources (Harrison et al., 2012; Williamson & De Meyer, 2012 & Barykin et al., 2020). In other words, in the whole ecosystem, all stakeholders are interconnected in the collaborative and competitive environment, and prosper together with the sound and sustainable development of the ecosystem.

With the development of information technologies in the digital era, the term “digital ecosystem” was derived from “business ecosystem” with centrality of digital technology. Valdez-De-Leon (2019) defines it as “loose networks of interacting organisations that are digitally connected and enabled by modularity, and that affect and are affected by each other’s offerings” (p.44). While sharing the common elements of any other ecosystems, data and its connectivity are considered as the distinctive features of digital ecosystems (Subramaniam, 2020).

The meaning of addressing issues from the perspective of an ecosystem is identified by Harrison et al. (2012) that “this image replaces simple unidirectional models of causality and development with the idea of complex interactional systems in the process of adapting and growing” (p.905). Rong et al. (2015) state that a nurtured ecosystem with a friendly and healthy network of stakeholders helps to cope with the uncertainties of emerging industries. According to Iansiti and Levien (2004), an ecosystem perspective offers balanced attention to all areas (both living and non-living elements in the networked environment) during the delivery of a product or service, as the weakness of any link can undermine the performance of the whole. Moreover, ecosystem thinking does not respect traditional industry boundaries, but requires understanding of the whole environment and seeing the big picture (Tiivola, 2019) and the ecosystem-based approach helps to achieve more potential outcomes and generate more collective advantages and network effects in the shared environment (Ofe, 2020).



With regard to the successful evolution of an ecosystem, Moore (1993) concludes that the lifecycle should include four phases, namely, birth, expansion, leadership and self-renewal. Rong (2011) further proposes, in a more detailed process analysis, that the five phases of emerging (new solution proposed or simple supply chain formed), diversifying (product/service diversity explored), converging (partners' network integrated), consolidating (mass production and stable market formed) and renewing (original market replaced and networks re-organized for further improvement) constitute the whole lifecycle of a sound and healthy ecosystem.

The success of an ecosystem has been assessed by several scholars from different perspectives, but with similar measurements in essence. According to Iansiti and Levien (2004), productivity (able to create network effects by expanding users/markets), robustness (able to survive and prosper in the uncertain and changing environment) and niche creation (able to increase diversity through the creation of valuable new functions) should be the three critical elements for an effective and sustainable ecosystem.

### 1.5.2 Interoperability in an Ecosystem

The importance of “interoperability” among stakeholders has been highlighted by many researchers in their ecosystem-related studies. As pointed out by Kenney and Pon (2011) and Rong et al. (2013), an emerging industry experiences an uncertain environment and requires a high degree of interoperability among the ecosystem partners so that it can further expand and develop. Senyo et al. (2019) highlight that for digital business ecosystems, continuous development and improvement of existing approaches are required until seamless interoperability is achieved among partners, services, processes and technologies. According to Gasser (2015), interoperability in different forms at each layer is apparently needed in the digital ecosystem so as to interconnect all actors, promote diversity and innovation for better development of the

ecosystem. Moreover, interoperability enables stakeholders to “work together towards mutually beneficial and commonly agreed goals” (Kouroubali & Katehakis, 2019, p.1).

Furthermore, although there is a lack of a uniform definition of interoperability, it has been generally accepted that interoperability is a broad concept at various layers not merely limited to technological understandings, but refers to “the ability of people, organizations and systems to interact and interconnect so as to efficiently and effectively exchange and use information” (Baird, 2009, p.223). According to Gasser (2015), “Human and institutional aspects of interoperability are often just as - and sometimes even more - important than the technological aspects” (p. vi).

Within the context of government service delivery, the new European Interoperability Framework (EIF) identified four layers of interoperability including legal, organizational, semantic and technical (The European Commission [EC], 2016). This view is also supported by Baird (2009) who describes the four facets (technical, organizational, legal/public policy and semantic) of interoperability in an ecosystem, and go on to say that the effect of differing political, economic, cultural and social forces should be taken into consideration by the government while promoting interoperability.

### 1.5.3 Electronic Certificates for Ships

The use and acceptance of e-certificates for ships has been widely discussed and reported by almost all stakeholders of the maritime industry, which include but are not limited to IMO, maritime authorities, classification societies, shipowners, seafarers, agents, vetting companies, insurers, financial and legal advisers. The adoption of *the Guidelines for the Use of Electronic Certificates* (FAL.5/Circ.39/Rev.2) and *Procedures for Port State Control, 2017* (Resolution A.1119(30)) by IMO aims to facilitate the wide use and acceptance of e-certificates by providing general guidance.

However, no concrete or specific mandatory requirements have been introduced, and further efforts are needed by member governments to facilitate the application in real practice.

Despite extensive discussions on e-certificates across the entire maritime sector, there are few peer-reviewed articles directly addressing the application of e-certificates for ships. Instead, most publications focus on a wider concept, such as e-government or maritime digitalization, which the use of e-certificates is part of. Ren (2016) conducted a feasibility study on e-certificates and documents for reducing administrative burdens and the impacts in China, concluding that with strong legal and technical basis, the use of e-certificates and documents for ships should still be treated carefully due to the complexity of the issue. Cosgrave (2018) assessed the global challenges on application of ship e-certificates (seafarer certificates were not included in her paper) and proposed necessary steps from legal, operational as well as fraud and trust perspectives for maritime administrators to make the digital shift.

Among the literature on e-government or maritime digitalization, common findings can be categorized in two types. The first type is about technical aspects, with discussions on technology-related matters (methods, systems and devices which are the result of scientific knowledge being used for practical purposes, as defined by *The Collins Dictionary*)<sup>10</sup>, such as the opportunities and challenges of new technologies (Peronja et al., 2020; Agatić & Kolanović, 2020; Jović et al., 2020). The other type is about discussions on non-technical aspects, with discussions on non-technology-related matters, such as legal considerations (Laryea, 2005; Rukavina et al., 2016) and coordination among different parties (Wang, 2018). These papers together offer various insights for research on the application of e-certificates for ships.

---

<sup>10</sup> <https://www.collinsdictionary.com/dictionary/english/technology/related>

## Chapter 2 The Ecosystem of Electronic Certificates for Ships in China

This Chapter reviews the application of e-certificates for ships in China by taking a close look at the key elements in the ecosystem. Accordingly, the direction for further efforts in the application is made clear and the framework for detailed discussions with regard to the major challenges is established.

### 2.1 Overview of the Ecosystem

The networked ecosystem of e-certificates for ships involves various interconnected stakeholders with different features, ranging from governments, organizations, companies as well as individuals, who cooperate or compete in a co-evolutionary process. The sound and sustainable development of the entire ecosystem relies heavily on the interactions and interdependent relations among all the stakeholders in the global digital shipping context. Therefore, in order to further promote the application of e-certificates in China, holistic arrangements should be made by accommodating the requirements from all stakeholders. Additionally, the common needs should be identified and the shared objectives should be achieved among them.

Before discussing current challenges, it is necessary to have an overview of the ecosystem of e-certificates for ships in China, with stakeholders and the relations among them summarized in figure 1.

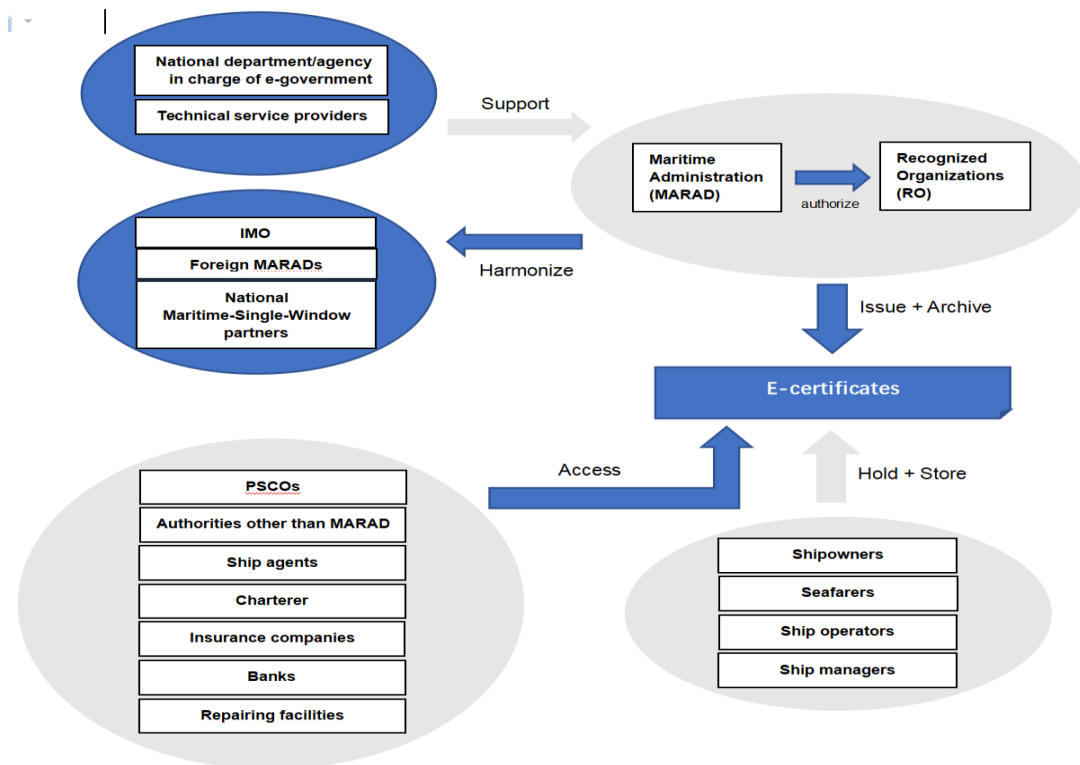


Figure 1: The ecosystem of e-certificates for ships in China (conceptualised by Author)

Figure 1 provides a visualization of the stakeholders involved in e-certificates with different roles and needs. Meanwhile, the full scenarios of e-certificate application including issuance, storage, access, verification and archiving are reflected.

It can be seen from Figure 1 that many of the stakeholders are not part of the traditional value chain of suppliers and distributors who directly contribute to the creation and delivery of e-certificates. Institutions that outsource business services, companies that offer technical support, and manufacturers of other related products/services that are used together with e-certificates for ships all fall into this ecosystem. The ecosystem also comprises rivals and users whose actions and feedback have an impact on the development of e-certificates or processes. Other regulatory agencies and industry outlets are part of the ecosystem too, and they can have a less immediate but significant impact on the application of e-certificates. Generally speaking, in the ecosystem of e-certificates, all stakeholders both affect and are affected by each other, either directly

or indirectly, and “rise and fall” together depending on the “good or ill” development of the entire ecosystem.

As pointed out by Iansiti and Levien (2004), “drawing the precise boundaries of an ecosystem is an impossible and, in any case, academic exercise”. This is mainly because of the reality that almost all businesses are now operating in the networked environment. Similarly, it is worth noting that there is no clear border of the ecosystem of e-certificates for ships in China. Due to the global feature of international shipping as well as the wider scope of maritime digitalization, such an ecosystem is constantly expanding. Consequently, any discussions on this issue should be carried out from more inclusive and holistic perspectives, that is, at both general (e-government as a whole) and maritime-specific levels as well as in national and international contexts, in order to achieve more forward-looking and sustainable approaches.

The related theory on ecosystems as mentioned in Chapter 1 can be applied to further view the ecosystem of e-certificates for ships in China, which is illustrated in Table 3.

<b>Key measurements of a successful ecosystem (Iansiti &amp; Levien, 2004)</b>	<b>The success of the ecosystem of e-certificates in China - what to achieve</b>	<b>How to do</b>	<b>Roles of MARAD</b>
Productivity (able to create network effects by expanding users/markets)	Promoting the application of e-certificates as wide as possible in terms of the number and scope of users.	Ensure interoperability at all layers among all stakeholders to enable further transition from paper certificates to e-certificates.	orchestrator, regulator, user, authorizer, service provider...
Robustness (able to survive and prosper in the uncertain and changing environment)	Developing and implementing forward-looking policies on e-certificates by taking into consideration future trends in global shipping (e.g., greater digitalization, more harmonization).		

Niche Creation (able to increase diversity through the creation of valuable new functions)	Promoting the application of e-certificates with more types with use in broader business areas / ranges (such as “Transport Service”, “Trade Service” and “Financial Service”).		
--	---	--	--

*Table 3: Main elements of a successful ecosystem of e-certificates in China (prepared by Author based on Iansiti & Levien, 2004)*

By applying Iansiti and Levien’s theory on the three key measurements of a successful ecosystem to the case of e-certificates, Table 3 puts forward the objectives that should be achieved for the sustainable application of e-certificates and points out what efforts should be made by the government.

A successful ecosystem of e-certificates in China requires the widest application of e-certificates in the number of users, geographic scope and business types. It also requires keen insights into emerging maritime digital development, demands and opportunities, thinking out of the traditional management mode, and breaking governance boundaries. Whether all stakeholders can work together to create shared and maximal value towards shared objectives will determine the health of the ecosystem. The main role of the MARAD is to bring together all other stakeholders and foster interoperability at all layers so as to facilitate information sharing and service delivery. During this complicated process, the MARAD has to not only play the rather single role as regulator, user, service provider or authorizer, but also act as an orchestrator who always needs to coordinate and promote at all levels to facilitate the well-functioning of the whole ecosystem.

## 2.2 Key Aspects of the Application of Electronic Certificates for Ships in China

The issuance, cancellation, endorsement, maintenance and verification of e-certificates among various stakeholders in China, like other digital initiatives, are complicated issues involving both technology-related and non-technology-related

areas. The key aspects of the application of electronic certificates are discussed by covering both technical aspects and non-technical aspects, with reference made earlier to the distinction between them in Chapter 1.4.3.

## 2.2.1 Technical Perspectives

There is no doubt that e-certificates need to be applied with the support of technology, so it is necessary to look at this issue from technical perspectives. Compared with the non-technical aspects, technical aspects prove to be less challenging to accomplish for the Chinese government with the following reasons.

### 2.2.1.1 *Technical Readiness and Maturity*

As pointed out by Cosgrave (2018), the possibility and capacity for maritime administrations to operate digitally is typically ensured by national policy for adoption of digital methods and instruments, which is commonly known as “e-government”. E-government gained its global momentum earlier this century and more recently has also been referred to as “digital government” interchangeably. Obviously, the readiness and maturity of the country to use Information and Communications Technologies (ICT) to deliver e-government services at the general level determine, to a large extent, the technical availability of the application of e-certificates for ships (a specific case of e-government) in the country.

The past two decades have witnessed profound developments in China’s e-government services. According to the United Nations E-Government Survey 2020, China joined the very high E-Government Development Index (EGDI) group, distinguishing itself by increasing its EGDI value by 16.7% from 2018 to 2020 and demonstrating its progress in implementing comprehensive digital governmental policies and initiatives at both the national and sub-national levels. Meanwhile, the country has been “actively incorporating frontier technologies such as big data, AI and 5G into digital government



to enhance the efficiency of public sector management and service delivery” (p.50), ranking the world’s No. 12 in terms of Online Service Index (OSI) value, a composite indicator of EGDI that measures the use of ICT by Governments for the delivery of public services.

On this point, it can be said that the application of e-certificates for ships in China has been technically enabled and favoured thanks to the efforts and achievements by the country in developing its e-government as a whole.

#### *2.2.1.2 Global Technical Requirements*

If discussed from the maritime perspective, IMO’s active role in promoting the use of e-certificates globally by providing rather prescriptive guidelines with respect to the certificate itself (such as must-have contents, tamper-proof features and verification requirements, as provided in Table 4) has laid a good foundation for the use and acceptance of e-certificates.

	<b>Features</b>
Issuance	validity and consistency with the format and content required by the relevant international convention or instrument, as applicable
	protected from edits, modifications or revisions other than those authorized by the issuer or the Administration
	a printable and visible symbol that confirms the source of issuance
	electronic signatures applied to electronic certificates should meet authentication standards, as adopted by the Administration
Verification	a unique tracking number used for verification as defined in paragraphs 3.5 and 3.6 of IMO’s Guidelines for the Use of Electronic Certificates

Other safety and security requirements	Administrations that use websites for online viewing or verifying electronic certificates should ensure that these sites are constructed and managed in accordance with established information security standards for access control, fraud prevention, resistance to cyber-attacks and resilience to man-made and natural disasters.
	Shipowners, operators and crews on ships that carry and use electronic certificates should ensure that these certificates are controlled through the safety management system, as described in section 11 of the International Safety Management Code.

*Table 4: Features of e-certificates as provided by IMO (Source: IMO, 2016)*

In addition, the efforts by the International Organization for Standardization (ISO) together with relevant member States and observers have, through several submissions to IMO including technical options and standards for implementing e-certificates, have facilitated the use of e-certificates.

### *2.2.1.3 Technical Challenges*

E-certificates, if treated generally as digital data or information processing, are mainly challenged technically with security concerns with regard to data/information confidentiality, integrity and availability (Ren, 2016 & Cosgrave, 2018). In view of the current technical development, such challenges are no longer tough technical problems very difficult to be addressed by breaking technical limitations or improving technical conditions. As expressed by the Correspondence Group on Electronic Access to Certificates and Documents established by the IMO Facilitation Committee in 2014 in its report, “the use and acceptance of electronic certificates is a policy issue, not a technological one, to be made primarily by the Administration and partly by the RO or other issuer” (The United States, 2016, p.9). In other words, proper and adequate policy arrangements at the national level offer strong and indispensable support for the secure and orderly application of e-certificates for ships.

Such views are also commonly supported by the participants of the interviews<sup>11</sup> with responses including:

*“During the application of e-certificates, we noticed that with the trend of maritime digitalization, the upgrading of the Maritime Single Window is imperative in order to include more types of certificates. Also, the database requires a clear display channel for certificates obtained from other countries through regional cooperation projects. However, once such decisions are made, technically speaking, there is no real difficulty that can’t be overcome in the end.”* [National MARAD Respondent]

*“While carrying out cross-border application of e-certificates, the greatest technical problem is the instability of network connection, causing shipping companies sometimes unable to obtain e-certificates immediately, but countermeasures have been made to address such problems.”* [National MSW Partner Respondent]

*“Major technical concerns on cyber-security and non-harmonized approaches among different governments need to be addressed mainly by amending existing statutory requirements. In addition, collaboration should be enhanced to gain better understanding of each other’s context and issues, and work out a common solution.”* [Foreign MARAD Respondent]

Therefore, it can be concluded that the technical challenges for the application of e-certificates are not really great technical difficulties for the government. Rather, more non-technical considerations need to be taken to address such challenges.

### 2.2.2 Non-technical Perspectives

Just as any other ecosystem, the use and acceptance of e-certificates requires considerations at all relevant layers to ensure seamless interoperability among the partners, products, services, information and processes. While discussing interoperability, several previous studies have provided rather comprehensive views, as listed in Table 5.

---

<sup>11</sup> Unless otherwise specified, the interviews in this dissertation refer to the semi-structured interviews as introduced in Chapter 1.3.

<b>Key Layers</b>		<b>Proposed by</b>
<b>Technical perspectives</b>	<b>Non-technical perspectives</b>	
Semantic, Technical	Legal, Organizational	EC, 2016
Data	Human, Institutional	Palfrey & Gasser, 2012
Technical, Semantic,	Organizational, Legal & public policy, Political/economic/cultural/s ocial	Baird, 2009
Technical, Semantic & syntactic	Legal, Policy & procedures,	Rantos et al., 2020
Technical, Semantic,	Regulation, Actor-related interaction	Lenkenhoff et al., 2018

*Table 5: Layers of interoperability (compiled by Author)*

Table 5 provides a summary of different layers of interoperability by previous studies, which are categorized into technical and non-technical perspectives for better illustration.

According to Baird (2009), semantic interoperability is defined:

Semantic interoperability mainly refers to the assurance that the semantics and syntax of communication must be formalized in such a way that users know the appropriate inputs and the computing system recognizes meaning with few errors [...] a semantic interoperability challenge becomes one that is, in part, addressed by technology (p.233 & 266).

Therefore, the semantic layer is put into the category of technical perspectives. Such a categorization is also applicable to e-certificates, because the semantic interoperability for e-certificate application is more related to the harmonization of technical standards and arrangements, which have been worked on globally such as by IMO and ISO, and are supposed to be further addressed with concerted efforts by all relevant parties mainly from the technical perspective.

With regard to the non-technical perspectives of interoperability, despite the slight differences in wording, shared views are held covering legal, policy and organizational layers. Moreover, the impact of political, economic, cultural or social differences on different people, organizations or countries is raised. Based on these non-technical perspectives of interoperability, relevant challenges for application of e-certificates in China are discussed in detail in the following chapters.

## 2.3 Conclusion

Fostering a successful ecosystem enables the use and acceptance of e-certificates in a more facilitated and sustainable way, which requires efforts in promoting interoperability among all stakeholders at all layers. With technical readiness and requirements in place, the technical difficulties for the application for e-certificates are no longer the greatest concern for the government. In this situation, the paper mainly studies in detail the non-technical perspectives which cover legal, policy and organizational layers. Moreover, the impact of political, economic, cultural or social differences will be discussed.

## Chapter 3 The Application of Electronic Certificates at the Legal and Policy Layers

In China, e-certificates are implemented by different policy approaches, with legislation including binding laws, rules and regulations ensuring the validity and security of e-certificates, while non-legally-binding arrangements such as strategies, outlines, plans and other measures contribute to further promoting e-certificate application. The combination of these approaches, if in a desirable manner, will help encourage and achieve wider and quicker application of e-certificates.

When discussing e-government services of which the use of e-certificates for ships is part, it is generally agreed that legal issues should be addressed in the first place provided that such services cannot be delivered justifiably and properly unless adequate legislation is in place (Vassilakis et al., 2005). The interviews with different stakeholders have also revealed that legal aspects relating to e-certificate application are one of the major concerns that need to be addressed.

Therefore, this chapter will first discuss relevant legal issues, then other policy-related issues.

### 3.1 The Application of Electronic Certificates at the Legal Layer

The legal issues regarding the application of e-certificates involve both the common features as shared by all the e-government services and the unique feature in the

specific context. Accordingly, discussions are made from both the general perspective and the maritime perspective.

### 3.1.1 General Perspective

In accordance with the United Nations E-Government Survey 2020, Europe remains as the leader in e-government development with the highest proportion of countries in the very high EGDI group (12 countries among the world top 20). The Survey also concludes that an integrated institutional ecosystem through a comprehensive legal and regulatory framework is among the key pillars of successful digital government transformation. In this sense, experiences can be learned from the EU's e-documents reference architecture (legal view) incorporating the key legislative elements when designing an e-Document solution, of which the use of e-certificates is a specific case.

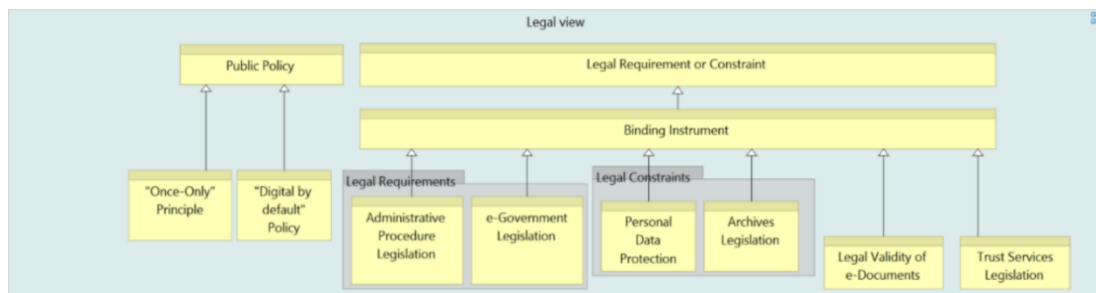


Figure 2: E-documents Reference Architecture (Legal View) (Source: EC, 2016)

Figure 2 illustrates the scope of legal aspects that should be taken into account for any e-document solution led by the government. According to the EC (2016), the solution should include the following legal elements:

- Administrative procedure laws, which establish general provisions for administrative procedures, and among others, the role of (electronic) documents and citizens' rights when interacting with public administrations;

- Electronic signature laws, which provide a framework for legal recognition of electronic signatures, seals and time stamps on e-Documents;
- Personal data protection laws, which set the conditions and liabilities for the processing of personal data;
- Archival related laws, which set the legal framework for archiving documents and files used by public administrations.

The development of a general law on administrative procedures and e-government is a common practice among leading countries, such as the Federal Administrative Procedure Act in the United States, the Administrative Procedure Act in Sweden, the Electronic Government Act in Korea. Additionally, some relevant model laws by the United Nations Commission on International Trade Law (UNCITRAL) such as UNCITRAL Model Law on Electronic Commerce (1996) and UNCITRAL Model Law on Electronic Signatures (2001) have facilitated the development of such national legislation by providing legislators with a set of internationally acceptable principles, rules and criteria.

In comparison, China features separate legislation on administrative procedures and e-government without a general law, and the legal validity of e-documents and legal requirements of e-government have been reflected in multiple separate laws, rules and regulations. As a result, the role, scope, requirements, procedures and liabilities regarding e-government are less highlighted and less clearly specified compared with a general law on administrative procedures.

Most recently, *The Several Provisions of the State Council on Online Government Services*<sup>12</sup> (Order No. 716) issued on 26 April 2019 has further regulated the use of e-

---

<sup>12</sup> All the national laws and regulations referenced in this dissertation are originally issued in Chinese. Unless otherwise specified, the English translation of titles or contents are from the



documents in public administrations, but in a very general and simple manner that still does not cover all the requirements and procedures clearly.

Therefore, more efforts are needed to further refine and improve relevant legislation so as to better encourage and manage e-government services, including e-certificates for ships in China.

Encouragingly, progress has been made by China in improving legislation on personal data protection, archives and trust services in order to address the security concerns related to e-documents. *The Law of the People's Republic of China on Electronic Signatures* adopted in 2005 was revised in 2015 and *The Archives Law of the People's Republic of China* adopted in 1987 was revised in 2020 for the third time. In addition to data protection requirements in current special laws, rules and regulations, *The Law of the People's Republic of China on Personal Information Protection* (draft) and *The Law of the People's Republic of China on Data Security* (draft) have been launched for public consultation after preliminary consideration by the National People's Congress (NPC), with passage expected in the very near future, and will help to further enhance data protection in a more focused and stronger manner.

In a nutshell, with many years of e-government development and continuous legal improvement, the validity and security of e-documents has been generally addressed in the national legislation in different forms. However, challenges still remain in specifying the role, scope, requirements, procedures and liabilities of e-government services more clearly, coherently and comprehensively. Further efforts in improving the national legislation should be made so that China's application of e-certificates can be provided with a more solid legal foundation.

---

official website of the State Council of the People's Republic of China (<http://english.www.gov.cn/archive/lawsregulations/>).

### 3.1.2 Maritime Perspective

Apart from the common legal features of any e-government policy, legal aspects for e-certificates in the maritime context should be taken into full consideration by the MARAD. From an ecosystem-based point of view as introduced in Chapter 2, on the one hand, China's application of e-certificates for ships should harmonize its standards with IMO, ISO, foreign MARADs and many more. On the other hand, it should incorporate the general requirements of China's other broader digital initiatives such as MSW. Only in this way can e-certificates be used and accepted as widely as possible. Consequently, new legislation needs to be developed by taking such considerations.

In addition to new legislation, existing rules and regulations issued by China MSA should be carefully reviewed and thoroughly revised to legitimize and encourage the use and acceptance of e-certificates. Take as an example *The Rules on Ship Safety Supervision of the People's Republic of China*, which serve as the basic legal framework for ship inspection including Port State Control (PSC) in China, no such information as "certificates may be in hard copy or electronic form" has been provided or reflected in the current version. As a result, the scenario and procedures of inspection on e-certificates has not been covered yet in the rules.

The need to review and revise existing rules and regulations especially at the implementation level is also highlighted by some respondents of the interviews who clearly articulated as follows:

*"Implementation of e-certificates is mainly subject to individual administration's statutory requirements, and the existing statutory requirements may need to be amended in order to accommodate the application of e-certificates." [Foreign MARAD Respondent]*

*"Although such national legislation as 'The Marine Traffic Safety Law of the People's Republic of China' and 'The Procedures for Inspection of International*

*Navigation Ships Entering and Exiting Ports of the People's Republic of China' do not require the submission of paper certificates for ships, posing no obstacles for the use of e-certificates, some specific regulations at the implementation level issued by the maritime authority need to be reviewed. For example, in 'The Maritime Law Enforcement Procedures (2018 edition)', due to the lack of considerations on the use of e-certificates, descriptions regarding inspection procedures of ships' seaworthiness are no longer applicable on all occasions, thus need modification...it is necessary to thoroughly review and revise all the relevant regulations and normative documents (maritime part) to ensure that e-certificates enjoy the same status as traditional paper certificates and encounter no barriers in any scenarios during the use and acceptance."* [National MARAD Respondent]

To address such issues, some of IMO's practices can be learned from by China MSA to improve its existing rules and regulations. For example, the acceptance of e-certificates has been clearly specified in regulation 2.2.3.1 of the *Procedures for Port State Control, 2017* by IMO (A 30/Res.1119).

### 3.2 The Application of Electronic Certificates at the Policy Layer

Apart from the legal aspects, there are many other issues at the policy layer that deserve attention. According to the Deming cycle of Plan-Do-Check-Act (PDCA) in controlling and improving the management process, the "Plan" stage is of key importance and should focus on setting goals and processes to achieve specific results (Isniah et al., 2020). Furthermore, as proposed by Mejia (2019) in the public policy model of "Agenda-setting-Formulation-Implementation-Evaluation", during the first step in the policy design and implementation process, problems must be identified, goals must be set and visions must be formed in order to address the exact issue.

Therefore, for the purpose of better promoting the application of e-certificates for ships in China, policy should be formulated on the basis of a deep understanding of the real problems as well as clear visions and goals, which again can be better accomplished by adopting the ecosystem-based approach as illustrated in Chapter 2.

For example, the consideration of the views and comments from all relevant stakeholders may help to identify as many relevant problems as possible for a comprehensive understanding and further analysis. Viewing the application of e-certificates as an ecosystem enables broader perspectives, more forward-looking visions and more holistic solutions. In other words, a good policy with clear objectives, steps, approaches and time lines on promoting e-certificate application should be developed by taking into account the needs, requirements, strengths and weaknesses of all relevant stakeholders as well as the opportunities and challenges of the broad context of the entire ecosystem.

### 3.2.1 Further Considerations of Relevant Stakeholders

#### *3.2.1.1 Improvements to application of other types of e-certificates*

The successful and sustainable e-certificate application in China requires the widest use and acceptance of e-certificates in terms of the number of users, scope and business types. Recently, relevant decisions have been made by China MSA to expand the issuance of mere electronic statutory certificates to other types of certificates for ships, including seafarer certificates. However, not all relevant plans have been made with clear aims, measures and schedules, thus cannot fully meet the needs of other stakeholders. During the interviews, one respondent expressed his concern:

*“The government has made lots of efforts in promoting ship e-certificates, but seems to attach less importance to seafarer e-certificates, as in my view, the progress has been rather slow.” [Seafarer Respondent]*

Another respondent from an RO is also of the view that “application of e-certificates towards more types and areas should be sped up with stricter plans”.

#### *3.2.1.2 Improvements to compliance with the IMO guidelines*

With regard to answering the call of IMO, one of the stakeholders of e-certificates, there are also areas of improvements for the government.

Although the *Guidelines for the Use of Electronic Certificates* (FAL.5/Circ.39/Rev.2) issued by IMO is not a mandatory instrument, member States are encouraged to meet the recommendatory requirements as provided in the Guidelines, including the following on notifications and implementation:

### **Notifications**

Administrations deciding to issue or authorize issuance of electronic certificates are invited to inform the Committee on their experience. All Administrations are urged to communicate to the Organization through the relevant module in the Global Integrated Shipping Information System (GISIS), the list of certificates categories identified in FAL.2/Circ.127-MEPC.1/Circ.817-MS.1/Circ.1462 which will be issued by the Administration or its representative as electronic certificates.

### **Implementation**

Administrations should put in place the necessary procedures in order to ensure that all related stakeholders' needs, capacities and expectations are taken into consideration before and during the implementation of electronic certificates (Annex, p.3).

The above requirements should ideally be followed by member States so as to achieve better application of e-certificates. However, relevant arrangements have not been properly made in China. On the one hand, so far in the relevant GISIS module, no such notification information has been communicated by the Chinese government. On the

other hand, though some ad hoc channels were established between the government and other stakeholders to seek views and comment while designing and planning the use of e-certificates, there should be fixed mechanisms or procedures to target at addressing the needs, capacities and expectations from all related stakeholders during the whole implementation process of e-certificates. Such mechanisms or procedures will be further discussed in Chapter 4.

### 3.2.1.3 Improvements to relevant policy notifications

In March 2018, China MSA issued *The Circular on the Authorization of CCS in Issuing Electronic Statutory Certificates to Chinese-flagged Ships Engaged in International Voyages* (No.5), specifying relevant requirements (e.g., the validity, features and verification of e-certificates) in accordance with IMO’s *Guidelines for the Use of Electronic Certificates* (FAL.5/Circ.39/Rev.2). The Circular is considered as one of the major policy notifications issued to relevant stakeholders by China MSA on the use and acceptance of e-certificates in China.

Nevertheless, the Circular is rather simple and general and unable to cover or explain all the important aspects as mentioned in the IMO Guidelines, and fails to provide many facilitating measures necessary to encourage the wider use of e-certificates. To better illustrate this issue, a comparison is carried out between the Circular by China MSA and the Circular on the use of electronic certificates on board Singapore ships (No. 26 of 2017) by MPA, one of the leading MARADs in the application of e-certificates. The main gaps are provided in Table 6.

Circular by MPA	Circular by China MSA	Comparison Analysis
-----------------	-----------------------	---------------------

<p>“Clear and simple instructions shall be provided on board for any relevant party who may wish to verify the validity and authenticity of the electronic certificates.”</p>	<p>No specific requirements</p>	<p>In accordance with the IMO guidelines, “instructions for verifying the information contained in the electronic certificate...should be available on board the ship.”</p>
<p>“A copy of this Shipping Circular should be placed on board to facilitate the acceptance of electronic certificates by other relevant authorities.”</p>	<p>“The e-certificates as well as the circular should be kept on board to facilitate the verification by relevant parties. ”</p>	<p>Keeping e-certificates on board is not necessary, and should not be encouraged, as it will cause additional burdens and costs to ships.</p>
<p>“MPA will be progressively moving towards the full implementation of electronic certificates that are issued to ships by our Administration commencing from December 2017.”</p>	<p>“Currently, e-certificates and paper certificates will be issued in parallel to facilitate ships’ normal operation.”</p>	<p>Issuing both e-certificates and paper certificates in the short term may be more feasible, but in the long run, issuing e-certificates alone is more powerful in widening and speeding up the use and acceptance of e-certificates.</p>
<p>Detailed information is provided on how to verify (all channels and steps).</p>	<p>Very general and limited information is provided for verification (even without a direct link for online verification).</p>	<p>In China, verification and contact details are provided by CCS, while notifications by MARAD are commonly regarded as more authoritative and rigorous.</p>
<p>Contact details are provided in case of queries or in need of assistance.</p>	<p>No relevant information is provided.</p>	

*Table 6: Comparison of the circulars on e-certificates issued by MPA and China MSA (prepared by Author)*

As shown in Table 6, improvements can be made by China MSA in order to better notify relevant stakeholders and further facilitate the use and acceptance of e-certificates. Furthermore, as expanding the application of e-certificates to more types apart from ship statutory certificates is under consideration and planning by China

MSA, more and more policy notifications on infrastructural construction, administrative procedures, authorization, business operation and other areas will be issued accordingly, and due improvements should be taken into full account in future development of these documents.

### 3.2.2 Further Considerations of the Broader Context

As mentioned previously, developing and implementing forward-looking policies on e-certificates by taking into consideration future trends of global shipping (e.g., greater digitalization, more harmonization) helps to ensure the value, vitality and robustness of e-certificates in the long term, and this should be considered as a clear objective by the government. In addition, standard harmonization in the use and acceptance of e-certificates among different MARADs, MSW partners and industry players should be promoted to lay a solid foundation for wider cross-sector and cross-border cooperation.

Encouragingly, China MSA has made a good beginning by jointly launching the MSW system with other government authorities in the country in 2017 and signing the MOU with MPA in 2019 to mutually promote the use and acceptance of e-certificates between the two countries. However, more initiatives and arrangements (such as cooperative agreements and activities) need to be made with more foreign MARADs and other relevant stakeholders to promote further cooperation and collaboration so that e-certificates can be applied in a wider scope, creating more network effects and generating greater value in global shipping.

## 3.3 Conclusion

To address the various legal and policy challenges in the application of e-certificates in China, more efforts should be made at both the general and maritime levels. Moreover, there is a pressing need for the government to further consider the needs and requirements of all stakeholders as well as the broader context during the



formulation and implementation of policies. By improving its legal and policy arrangements at different levels and areas, China will enjoy a more friendly national and international environment for application of e-certificates towards a more efficient and sustainable maritime future.

## Chapter 4 The Application of Electronic Certificates at the Organizational Layer

As pointed out by Baird (2009), a successful implementation of interoperability within an ecosystem requires efficient and effective collaboration across an organization as well as among organizations in order to eliminate administrative barriers, reduce resource redundancies and promote integration. Therefore, it is critical that all aspects of inter-organizational and intra-organizational interoperability are adequately paid attention to and properly addressed by the government to achieve desirable application of e-certificates for ships.

### 4.1 Inter-organizational Considerations

When discussing inter-organizational barriers that need to be addressed, Baird (2009) summarized two categories - organizational structure and processes as well as the people and workforce (namely, the employees). That is to say, considerations need to be taken from both structural and individual perspectives within the government authority while promoting e-certificate application.

#### 4.1.1 Perspective from Organizational Structure and Processes

To deliver the best work productivity and efficiency, appropriate measures need to be taken to ensure good communication and cooperation among the divisions within China MSA currently involved in the application of e-certificates as provided in table 7.

<b>Divisions involved</b>		<b>Main responsibilities</b>
Divisions with general obligations	Policy and Legal Affairs Division	Developing relevant legislation and policy
	Science, Technology and Information Division	Providing technical support
	Finance Division	Providing financial support
	International Affairs Division	Promoting cooperation between China MSA and other foreign MARADs in the use and acceptance of e-certificates
Divisions with particular business focuses	Ship Supervision Division (Office of Maritime Transport Facilitation Committee of China)	Promoting acceptance of ship e-certificates during inspections, promoting application of ship e-certificates in broader systems such as MSW, planning for further application of e-certificates to other types
	Ship Survey Management Division	Managing the issuance of electronic statutory certificates for Chinese-flagged ships engaged in international voyages and planning for further application of e-certificates to ships engaged in domestic voyages
	Seafarers Management Division	Planning the application of e-certificates for seafarers
	Dangerous Cargo and Pollution Prevention Management Division	Planning the application of e-certificates for ships to other types

*Table 7: Major divisions within China MSA currently involved in the application of e-certificates (prepared by Author)*

The divisions within China MSA currently involved in the application of e-certificates include those with general obligations regardless of the types and areas as well as those with particular business focuses on certain certificate types or business areas. That is to say, general divisions mainly offer administrative support while specific divisions mainly make business plans. Good cooperation among them helps to create synergy

and achieve the overall objective of the organization in a more efficient and effective manner.

In real practice, each specific division (e.g., Ship Survey Management Division, Ship Supervision Division and Seafarers Management Division) takes the lead in promoting, rather independently, one particular business area related to e-certificates, supported by general divisions when necessary. Different specific divisions work in parallel without enough interactions. Consequently, it is understandable that with so many divisions involved in the application of e-certificates in different depths and scopes, some may have better sight of the whole picture of the overall task, enjoy more favours in resources and funds, and gain more relevant experiences and attention. Due to various reasons such as different working styles, job features, office cultures and internal/external situations, it is also natural that some divisions may be better at collaboration while others may consider cooperation not as that necessary or important, resulting that practicable and achievable solutions have not been delivered in the most holistic and desirable way at the general organizational level.

For example, there is no such a leading division within the organization to take charge of the overall application of e-certificates, failing to join and coordinate all efforts appropriately. Consequently, strategic planning and phased approaches to promote application of e-certificates all around have not been fully developed and implemented. Due to the lack of a clear overall strategy and action plans, the progress monitoring and work assessment are not carried out strictly, which has lowered the efficiency of the application. In addition, as different divisions often work in parallel in promoting e-certificates with different focuses, sharing of information and experiences is not carried out sufficiently, which has failed to promote the whole task very efficiently.

To enhance top-down management and overall planning, a fixed mechanism to facilitate divisional communication and collaboration should be established, such as a

leading group led by the Director-General or one of the deputy Director-Generals, participated by directors of all involving divisions. In this way, holistic approaches to promote application of e-certificates can be better developed and implemented. Besides, one division should be nominated to take overall charge by monitoring all the processes and progresses in accordance with the agreed overall strategy and action plans so that the whole work can be delivered more efficiently.

#### 4.1.2 Perspective from Employees

The knowledge and behaviour of every individual staff from the top to the bottom matter a lot to the success of the entire organization, as people are the most important components. It is without any doubt that staff's understanding of the maritime sector's embrace of digitalization, readiness to welcome and promote e-certificates, and motivation to serve the industry will make a difference in the application.

When discussing e-government service implementation, Vassilakis et al. (2005) identified several barriers related to employees within the government which need to be overcome, as summarized in Table 8.

<b>Barriers</b>	<b>Reasons</b>
Reluctance by the staff in e-government service delivery	Reorganization to better accommodate e-government service delivery is not well-accepted by employees due to fear of power/status loss, change in job content / duties / interpersonal relationship / decision making approach
Inefficiency by the staff in e-government service delivery	Lack of methods for productivity and accountability
Lack of qualified personnel	Inadequate training; too much service outsourcing

*Table 8: Barriers in e-government service delivery (employee perspective within the government authority) (Source: Vassilakis et al., 2005)*

The barriers as illustrated in Table 8 exist, more or less, within China MSA during the application of e-certificates, which has also been reflected from the interviews with one respondent explaining:

*“It is obvious that some staff members have less understandings and less awareness of the significance of e-certificates...some staff members seem to just negatively respond to divisional efforts in e-certificate application and their inactiveness have definitely slowed down the whole progress...some staff members, especially elder ones, are less motivated or comfortable to adapt to changes in policy, processes and skills.” [National MARAD Respondent]*

To address these possible barriers, it is of vital importance to the organization that proper guidance, instructions and training should be provided to assist all staff members in improving their understanding, capabilities and readiness to facilitate the application of e-certificates. Also, an effective scheme to determine the accountability for an individual’s lack of progress should be established to encourage productivity.

## 4.2 Intra-organizational Considerations

The successful application of e-certificates for ships is highly dependent on the realization of shared visions and objectives of all stakeholders, requiring collective efforts and efficient coordination among various agencies, organizations, institutions and groups from both public and private sectors. Due to differing priorities, perspectives and interests of different stakeholders towards e-certificates, the intra-organizational coordination, though necessary, is difficult to accomplish.

According to the global ports survey on the implementation of electronic data exchange to conform with the FAL Convention conducted by International Association of Ports and Harbors (IAPH) in 2020, multi-stakeholder collaboration has been identified as the greatest barrier in implementing electronic data exchange systems in line with the requirements of the FAL Convention, rated by nearly two

thirds of the respondents as a high or extremely high challenge, thus deserves more attention.

On the basis of organizational literature, Wang (2018) summarized five major facets of intra-organizational coordination as provided in Table 9, which is also applicable to the application of e-certificates.

<b>Facets</b>	<b>Patterns</b>
Structural coordination	Vertical and horizontal coordination
Public-private coordination	Coordination between the public and private sectors
Procedural coordination	Standardized work procedures or specific arrangements
Technical coordination	Technical tools or setups
International coordination	International harmonization of standards/rules/practice

*Table 9: Major facets of Intra-organizational Coordination (Source: Wang, 2018)*

First, structural coordination requires well-organized structures of roles among all partners both vertically and horizontally. To be more specific, structural hierarchy among stakeholders is needed during coordination to ensure strong leadership, alignment and non-compromise implementation. Meanwhile, differentiation and interactions among stakeholders should be well maintained to enhance communication and cooperation.

Second, public-private coordination is important to the success of policy making and implementation of e-certificates. Stakeholders from the private sector such as seafarers, shipping companies, agents, charters, banks, insurance companies and ship repairers, to name just a few, are the major users of e-certificates. Some private companies are technically involved as service providers (co-builders of the e-certificate system). In this spirit, policies can only be successfully made and well

implemented with their inputs and support. Regular and systematic consultation at both the strategic and operational levels should be in place to facilitate exchange of needs, concerns, expertise and ideas.

Third, procedural coordination mainly refers to “mechanisms for managing work by specification and resolution” (Wang, 2018), such as standardized work procedures or outputs, specific schedules and plans to coordinate the work and efforts of stakeholders. Such mechanisms not only ensure multi-stakeholder coordination but also mandate designated organizations to take the leadership when necessary.

Fourth, the technical tools or setups, in particular, the IT infrastructure (both software and hardware), are indispensable to the application of e-certificates, so relevant tools, equipment, devices and systems should be coordinated to allow smooth flow of data and sharing of information.

Fifth, due to the global feature of shipping, international coordination should be highlighted for application of e-certificates, and harmonization of standards/rules/practice is considered as the precondition enabling cross-border use and acceptance of e-certificates.

Although these five facets of intra-organizational coordination are actually interconnected and interchangeable, with one often complementing another (e.g., standardized work procedures may also reflect structural settlement and relate to technical arrangement), they should be taken into holistic consideration in order to achieve integrated approaches and solutions for the application of e-certificates.

When applied to the work and efforts by the Chinese government during the application of e-certificates, main challenges identified both through research/observations by the author and by the respondents of the interviews can be summarized in Table 10.



<b>Facets</b>	<b>Main challenges</b>	<b>Examples</b>
Structural coordination	Lack of regulatory and structural reforms	Slow in change of regulations, relations between the governments at different levels, restructuring and building new partnerships
Public-private coordination	Insufficient mechanisms for continuous communication and consultation	Lack of multi-stakeholder meetings / workshops
Procedural coordination	Less streamlined approaches	Different requirements for ships to present paper certificates on some occasions and e-certificates on other occasions by different parties
Technical coordination	Less efficiency in exchange of information	Docking of data between different systems
International coordination	Differing levels of digitalization; differing concerns and priorities	Cybersecurity, data openness

*Table 10: Main intra-organizational coordination challenges for the application of e-certificates (prepared by Author)*

As shown in Table 10, the intra-organizational coordination by the Chinese government during the application of e-certificates still needs to be improved from several aspects. In terms of the structures, the roles, responsibilities and contributions of various stakeholders and governments at different levels should be further considered and differentiated through regulatory or administrative arrangements. Necessary reforms (such as change of regulations, restructuring and new partnerships) should be carried out so that all can be organized and functional. Fixed communication and consultation mechanisms (such as regular multi-stakeholder meetings or workshops) with the private sector should be established by the government so that in-time feedback and suggestions can be taken to continuously evaluate current policies and make improvements accordingly. As more and more stakeholders take part in the use and acceptance of e-certificates with different paces, challenges regarding less streamlined approaches and less efficiency in exchange of information are inevitable

at the early stage due to different systems, focuses and requirements. However, proactive harmonization measures by the government based on deep analysis of the whole ecosystem and thorough consultation with all stakeholders will surely facilitate the procedural streamlining and technical integration efforts. Lastly, several issues should be considered and addressed including the levels of digitalization, willingness of cooperation, attitudes towards data openness and concerns about cybersecurity while carrying out international cooperation on e-certificates.

### 4.3 Conclusion

To address the organizational challenges in the application of e-certificates in China, more efforts should be made at both inter- and intra-organizational levels by the government. For one thing, effective measures need to be taken to further enhance top-down management, divisional collaboration and employee motivation within the government. For another thing, transparent multi-stakeholder collaboration approaches should be adopted to further achieve better user participation, involvement and satisfaction, improve structural, procedural and technical efficiency and facilitate international cooperation.

## Chapter 5 Political, Economic, Cultural and Social Considerations

Different political, economic, cultural and social paradigms may impact countries' desire and capacity to establish the frameworks and policies needed to engage with one another (and their governments and companies). The dominant norms and beliefs that characterize a culture, as well as the political aims and dynamics of a society, may affect how a government, industry and other organizations approach their work (Baird, 2009). For the application of e-certificates, similar challenges also exist, especially during policy formulation and multi-stakeholder coordination.

For example, views on costs versus benefits, data privacy, digital trust as well as challenges versus opportunities vary from one stakeholder to another, leading to different supporting attitudes and cooperative efforts towards the use of e-certificates. The maritime policies by different countries at different development stages are firmly based on their own economic conditions (Li & Cheng, 2007) and e-certificates are no exception, making the development of harmonized approaches even more difficult. Cooperation among parties doesn't often happen spontaneously, and instead can be promoted through determined political/administrative will at the strategic or high level (Wang, 2018).

The political, economic, cultural and social impacts and challenges both inside and outside the country have also been highlighted by different respondents of the interviews:

*“It is of utmost importance to change the mentality or way of thinking of everyone involved in the application of e-certificates, as well as their attitude towards digitalization. Everyone in the industry chain must understand that the core driving force of industry development is the degree and scale of digitalization, and it is necessary to emphasize that digital transformation is actually a great way and opportunity for them to improve their professional capabilities, prepare for their future careers and truly control the process by themselves, so as to eliminate the fear of being eliminated ...” [Shipping Agency Respondent]*

*“International cooperation has several barriers as it is affected by different national visions and leadership capabilities. Some countries in the region may adopt the ‘wait-and-see’ attitude. Meanwhile, uneven economic development leads to different priorities. Different concerns about data sensitivity, privacy and security are difficult to address...” [RO Respondent]*

*“The biggest obstacle to the docking of multinational government systems comes from a general lack of understanding of data science, low political priorities, lack of data leadership and concerns about data quality, security and privacy. Besides, different shipping industries, including classification societies, have varying concerns and motivations in participating in digital reforms.” [National MARAD Respondent]*

As stated by De Cremer (2012), “respect would communicate important relational information, consequently enhancing people’s motivation to promote the group’s welfare” (p.1335). Therefore, awareness of and respect for the existing political, economic, cultural and social differences among different stakeholders should be ensured by the government before taking proactive and feasible measures to minimize relevant negative impacts during the application of e-certificates.

First, fostering learning in different forms (such as media advocacy, training, education, discussions and awareness campaigns) helps to improve understanding, raise situational awareness and rebuild thoughts and behavioural intentions. Targeted programs should be designed and implemented to address the specific concerns of special groups of stakeholders. For example, familiarization training on e-certificates should be sufficiently provided to elder seafarers and other users less skilful at information technologies. Publicity on the benefits of e-certificates and digital

transformation should be promoted with clear and persuasive proofs (such as scientific data, economic gains and first-mover successful experiences). At the same time, the government should also learn more about the views, needs and concerns of other stakeholders to improve its policy making and implementation.

Second, efforts should be made to reconcile the differences in economic, political, social and cultural norms among different stakeholders by better identifying common interests and maximizing common benefits, which will help to forge a better foundation for cooperation. For example, countries reliant on shipping, supporting maritime digitalization, closely connected with China in business and trade should be targeted for cooperation. Technical assistance and capacity-building programs should be carefully designed and offered by taking into account the actual needs and interests of the participants. Besides, considering that economic benefits constitute impetus for joint efforts, market-driven cooperation between cross-border shipping companies, industries and associations should be encouraged, which in turn, may raise other governments' willingness and participation in international cooperation.

## Chapter 6 Conclusion and Recommendations

In conclusion, the paper illustrates the application of e-certificates for ships in China by adopting an ecosystem-based approach, which enables inclusion of the full range of stakeholders, analysis on various layers of challenges and proposals for holistic and sustainable solutions. The government roles in the acceleration and expansion of e-certificate application have been discussed from a broader and forward-looking perspective by taking into considerations the global situations and trends.

The framework for discussions and analysis are also applicable to other maritime issues with global features in the digital era, and the approaches put forward is also of reference value to the use and acceptance of e-certificates in other countries. Due to the great variety of stakeholders which are still expanding with the further application of e-certificates, the number and types of stakeholders involved in this dissertation can be broadened in future research to obtain more comprehensive inputs. Also, as the dissertation mainly focuses on non-technical aspects of e-certificate application, the technical aspects can be further explored and discussed in future research.

On the basis of the research and findings of this study, the following recommendations are provided with regard to future successful and sustainable application of e-certificates in China.

1. At specific level:

- E-certificate Task Force

A task force should be established by the government with strong leadership and wide involvement to develop overall strategy, make holistic action plans, carry out necessary legal and structural reforms, and strictly push forward. Decisions should be made by taking the whole ecosystem of e-certificates into account in the global shipping and maritime digital contexts. All aspects, in particular, legal, policy and organizational issues as well as political, economic, cultural and social influences should be considered holistically while planning and implementing all relevant work.

- E-certificate Multi-stakeholder Partnership

An effective communication and coordination mechanism should be established by involving as many stakeholder groups and interested parties as possible, including industry associations, trade unions, maritime universities and research institutes and media. Such a scheme should not only facilitate information exchange, problem-solving and efficiency improvement, but also benefit policy making, innovative thinking and business integration. Moreover, the online two-way communications and multiple interactions should be emphasized to promote expression of public opinions, capture public demands and enhance user empowerment so that more stakeholders can deeply participate in the process of decision-making, provision, and evaluation of e-certificate service.

- E-certificate International Cooperation Mechanism

The existing dozens of bilateral and multilateral maritime cooperation mechanisms (e.g., the High-level Maritime Consultation Mechanism between China and Singapore, the Maritime Safety Cooperation Meeting between China and Korea, the Maritime Cooperation Mechanism between China and Panama, the ASEAN-China Maritime Consultation Mechanism (ACMCM), the Asia-Pacific Heads of Maritime Agencies

(APHoMSA) Forum and many more) should be further used by China MSA to encourage more cooperative activities on application of e-certificates. Such activities may include but are not limited to the exchange of best practice and lessons learned, the launch of joint study/research, pilot projects and capacity-building programs and the co-submission of documents to IMO, the International Labour Organization (ILO) and other international organizations. Through the active participation and joint efforts of more and more countries, the application of e-certificates can be better harmonized and more proactively promoted in standards, systems, processes and people at the global level, making more contributions to maritime digitalization by creating more network effects and greater values.

## 2. At macro level:

- Digital Twin Technology<sup>13</sup> for E-certification Application

As the maritime digital transformation proceeds and ecosystem of e-certificates expands, the digital twin technology can be used by the government, at the initial stage, to depict full-scale scenarios of e-certificates across the industry, develop optimum designs, processes and performances of e-certificate service, predict potential challenges and test the outcome of approaches. In this way, better application of e-certificates can be achieved through improved decision-making, seamless connections of difference steps/phrases, enhanced security and improved cost-efficiency.

- Decentralized Maritime Public Database

---

<sup>13</sup> According to the Digital Twin Consortium, a digital twin is defined as “a virtual representation of real-world entities and processes” which features in transforming business by accelerating holistic understanding, optimal decision-making and effective action, using real-time and historical data to represent the past and present and simulate predicted futures, and being motivated by outcomes, tailored to use cases, powered by integration, built on data, guided by domain knowledge, and implemented in IT/OT systems.

<https://www.digitaltwinconsortium.org/initiatives/the-definition-of-a-digital-twin.htm>



The vitality and diversity of maritime e-government service (including e-certificate service) lies in open standards for data. A decentralized maritime public database should be gradually established to realize the inter-connectivity of key data across the whole sector not only nationally, but also regionally and globally, thus maximally encourage wider expansion of the maritime digital ecosystem, cut down global shipping costs and improve maritime service efficiency.

## References

- Agatić, A., & Kolanović, I. (2020). Improving the seaport service quality by implementing digital technologies. *Pomorstvo*, 34(1), 93–101. <https://doi.org/10.31217/p.34.1.11>
- Anggraeni, E., Hartigh, E.D., & Zegveld, M. (2007). Business ecosystem as a perspective for studying the relations between firms and their business networks. In FM. van Eijnatten, & J. Peters (Eds.), *Phase Transitions in Organizations* (1-21). TVA.
- Baird, S. (2009). Government role and the interoperability ecosystem. *Journal of Law and Policy for the Information Society*, 5(2), 219-290. <https://core.ac.uk/download/pdf/159579083.pdf>
- Barykin, S., Kapustina, I., Kirillova, T., Yadykin, V. & Konnikov, Y. (2020). Economics of Digital Ecosystems. *Journal of Open Innovation: Technology, Market and Complexity*, 6(124). <https://doi.org/10.3390/joitmc6040124>
- China MSA. (2018). Circular on the authorization of CCS in issuing statutory e-certificates to Chinese-flagged ships engaged in international voyages. <http://www.gdssa.org/news/news-show.php?id=431>
- Cosgrave, B. (2018). *Electronic certificates for ships: a LOFTY (legal, operations, fraud, trust) analysis*. [Master's thesis, World Maritime University]. [https://commons.wmu.se/all\\_dissertations/654/](https://commons.wmu.se/all_dissertations/654/)
- De Cremer, D. (2002). Respect and Cooperation in Social Dilemmas: The Importance of Feeling Included. *Personality and Social Psychology Bulletin*, 28(10), 1335–1341. <https://doi.org/10.1177/014616702236830>
- EC. (2016) . ISA<sup>2</sup> - Interoperability solutions for public administrations, businesses and citizens. [https://joinup.ec.europa.eu/site/isa\\_edocuments/edocuments/index.html](https://joinup.ec.europa.eu/site/isa_edocuments/edocuments/index.html)
- Gasser, U. (2015). Interoperability in the Digital Ecosystem. *SSRN Electronic Journal*. Published. <https://doi.org/10.2139/ssrn.2639210>
- Gasser, U., & Palfrey, J. G. (2008). Breaking Down Digital Barriers: When and How ICT Interoperability Drives Innovation. *SSRN Electronic Journal*. Published. <https://doi.org/10.2139/ssrn.1033226>
- Guijarro, L. (2007). Interoperability frameworks and enterprise architectures in e-government initiatives in Europe and the United States. *Government Information Quarterly*, 24(1), 89–101. <https://doi.org/10.1016/j.giq.2006.05.003>
- Harrison, T. M., Pardo, T. A., & Cook, M. (2012). Creating Open Government Ecosystems: A Research and Development Agenda. *Future Internet*, 4(4), 900–928. <https://doi.org/10.3390/fi4040900>
- Iansiti, M., & Levien, R. (2004). *The keystone advantage: What the new dynamics of business ecosystems mean for strategy, innovation, and sustainability*. Harvard Business School Press.
- IAPH. (2021). IAPH survey on the implementation of electronic data exchange to conform with the FAL Convention. FAL 45/5

- IAPH. (2021). Global ports survey on the implementation of electronic data exchange to conform with the IMO Convention on Facilitation of International Maritime Traffic (FAL). <https://sustainableworldports.org/wp-content/uploads/IAPH-FAL-Survey-Report-Jan-2021.pdf>
- IMO. (2011). Guidelines for Setting up a Single Window System in Maritime Transport. FAL.5/Circ.36
- IMO. (2016). Guidelines for the Use of Electronic Certificates. FAL.5/Circ.39/Rev.2
- IMO. (2017). Procedures for Port State Control, 2017. Resolution A.1119(30)
- IMO. (2017). List of certificates and documents required to be carried on board ships, 2017. FAL.2/Circ.131; MEPC.1/Circ.873; MSC.1/Circ.1586 & LEG.2/Circ.3
- IMO. (2019). Guidelines for setting up a Maritime Single Window. FAL.5/Circ.42
- IMO. (2020). Coronavirus (COVID 19) – Preparing for post COVID-19 operations: considerations and practicalities for port community systems, single window and other electronic exchange platforms. Circular Letter No.4204/Add.17
- IMO. (2020). Coronavirus (COVID-19) – Accelerating digitalization of maritime trade and logistics – A call to action. Circular Letter No.4204/Add.20
- IMO. (2021). Update on initiatives to implement maritime single window systems. FAL 45/5/1
- IMO. (2021). *Report to the Maritime Safety Committee*. HTW 7/16
- Isniah, S., Hardi Purba, H., & Debora, F. (2020). Plan do check action (PDCA) method: literature review and research issues. *Jurnal Sistem Dan Manajemen Industri*, 4(1), 72–81. <https://doi.org/10.30656/jsmi.v4i1.2186>
- ISO. (2014). Technical standards for implementing electronic certificates. FAL 39/5/2
- ISO. (2014). Information paper from ISO TC8 on technical options for implementing electronic certificates. FAL 39/INF.2
- ISO. (2015). Future Proof and Cost-Effective Standardization of Electronic Ship Certificates. FAL 40/6/2
- Jacobides, M. G., Cennamo, C., & Gawer, A. (2018). Towards a theory of ecosystems. *Strategic Management Journal*, 39(8), 2255–2276. <https://doi.org/10.1002/smj.2904>
- Jović, M., Tijan, E., ŽGaljić, D., & Aksentijević, S. (2020). Improving Maritime Transport Sustainability Using Blockchain-Based Information Exchange. *Sustainability*, 12(21), 8866. <https://doi.org/10.3390/su12218866>
- Kenney, M., & Pon, B. (2011b). Structuring the Smartphone Industry: Is the Mobile Internet OS Platform the Key? *Journal of Industry, Competition and Trade*, 11(3), 239–261. <https://doi.org/10.1007/s10842-011-0105-6>
- Kouroubali, A., & Katehakis, D. G. (2019). The new European interoperability framework as a facilitator of digital transformation for citizen empowerment. *Journal of Biomedical Informatics*, 94, 103166. <https://doi.org/10.1016/j.jbi.2019.103166>
- Lappi, T., Haapasalo, H. & Aaltonen K. (2015). Business Ecosystem Definition in Built Environment Using a Stakeholder Assessment Process. *Management, University of Primorska, Faculty of Management Koper*, vol. 10(2), 111-129.

- Laryea, E. (2005). Facilitating paperless international trade: a survey of Law and Policy in Asia. *International Review of Law, Computers & Technology*, 19(2), 121–142. <https://doi.org/10.1080/13600860500131200>
- Lenkenhoff, K., Wilkens, U., Zheng, M., Süße, T., Kuhlenkötter, B., & Ming, X. (2018). Key challenges of digital business ecosystem development and how to cope with them. *Procedia CIRP*, 73, 167–172. <https://doi.org/10.1016/j.procir.2018.04.082>
- Li, K. X., & Cheng, J. (2007). The determinants of maritime policy. *Maritime Policy & Management*, 34(6), 521–533. <https://doi.org/10.1080/03088830701695172>
- Lloyd's List. (2021). *Digitalisation & Data: A Special Report*. Informa UK Ltd.
- Ma, Z. (2019). Business ecosystem modelling - the hybrid of system modeling and ecological modeling: an application of the smart grid. *Energy Informatics*, 2(1). <https://doi.org/10.1186/s42162-019-0100-4>
- Moore, J. F. (1993). Predators and prey: A new ecology of competition. *Harvard Business Review*, 71(3), 75–83
- Mejia, M. (2021). Maritime Policy Design, Implementation, and Analysis: Review of Basic Concepts in Public Policy [PowerPoint slides]. Moodle@WMU. <http://academics.wmu.se>
- Moore, J. F. (1996). *The Death of Competition - Leadership and Strategy in the Age of Business Ecosystems*. Harper Business.
- MPA. (2017) . Circular on the use of electronic certificates on board Singapore ships. <https://www.mpa.gov.sg/web/portal/home/port-of-singapore/circulars-and-notices/detail/e403bc03-8256-415d-b268-1f00b5a9d5d7>
- Ofe, H. A. (2020). Orchestrating emerging digital ecosystems: investigating the establishment of an open data platform in the Swedish public transport industry. [PhD thesis, Umeå Universitet]. <http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-170763>
- Palfrey, J., & Gasser, U. (2012). *Interop: The Promise and Perils of Highly Interconnected Systems (1st ed.)*. Basic Books.
- Peronja, I., Lenac, K., & Glavinović, R. (2020). Blockchain technology in maritime industry. *Pomorstvo*, 34(1), 178–184. <https://doi.org/10.31217/p.34.1.19>
- Rantos, K., Spyros, A., Papanikolaou, A., Kritsas, A., Ilioudis, C., & Katos, V. (2020). Interoperability Challenges in the Cybersecurity Information Sharing Ecosystem. *Computers*, 9(1), 18. <https://doi.org/10.3390/computers9010018>
- Ren W. (2016). *Feasibility Study on Electronic Certificates and Documents for Reducing Administrative Burden and its Impacts on the Chinese Shipping Sector*. [Master's thesis, World Maritime University]. [https://commons.wmu.se/msem\\_dissertations/45/](https://commons.wmu.se/msem_dissertations/45/)
- RINA. (2015). *Certified E-document Authority, a Business Concept*. CEDA. ITALY: RINA.
- Rong, K. (2011). Nurturing business ecosystem from firm perspectives: Lifecycle, nurturing process, constructs, configuration pattern. University of Cambridge
- Rong, K., Hu, G., Lin, Y., Shi, Y., & Guo, L. (2015). Understanding business ecosystem using a 6C framework in Internet-of-Things-based sectors.

- International Journal of Production Economics*, 159, 41–55.  
<https://doi.org/10.1016/j.ijpe.2014.09.003>
- Rong, K., Shi, Y., & Yu, J. (2013). Nurturing business ecosystems to deal with industry uncertainties. *Industrial Management & Data Systems*, 113(3), 385–402.  
<https://doi.org/10.1108/02635571311312677>
- Rukavina, B., Rak, L., & Buneta, S. (2016). Legal framework for establishing a single maritime transport space without barriers. *Journal of Maritime & Transportation Science*, 52(1), 165–182. <https://doi.org/10.18048/2016.52.09>
- Senyo, P. K., Liu, K., & Effah, J. (2019). Digital business ecosystem: Literature review and a framework for future research. *International Journal of Information Management*, 47, 52–64. <https://doi.org/10.1016/j.ijinfomgt.2019.01.002>
- Subramaniam, M. (2020). Digital ecosystems and their implications for competitive strategy. *Journal of Organization Design*, 9(1). <https://doi.org/10.1186/s41469-020-00073-0>
- The Archives Law of the People’s Republic of China (2020).  
 The Law of the People’s Republic of China on Data Security (Draft) (2020).  
 The Law of the People’s Republic of China on Electronic Signatures (2015).  
 The Law of the People’s Republic of China on Personal Information Protection (Draft) (2020).  
 The Rules on Ship Safety Supervision of the People’s Republic of China (2020).  
 The Russian Federation. (2020). *Report of the Correspondence Group on the Use of Electronic Certificates for Seafarers*. HTW 7/9  
 The Several Provisions of the State Council on Online Government Services (2019).  
 The United States. (2016). *Report of the Correspondence Group on Electronic Access to Certificates and Documents*. FAL 40/6  
 Tiivola, R. (2019). SME Internationalization in a Business Ecosystem Context - The Case of Finnish Smart Mobility Companies. [Master’s thesis, Hanken School of Economics]. <https://helda.helsinki.fi/dhanken/handle/10227/243456>
- UN. (2020). *United Nations E-Government Survey 2020: Digital Government in the Decade of Action for Sustainable Development*.  
<https://publicadministration.un.org/en/Research/UN-e-Government-Surveys>
- UNCITRAL Model Law on Electronic Commerce (1996), 12 June 1996.  
[https://uncitral.un.org/sites/uncitral.un.org/files/media-documents/uncitral/en/19-04970\\_ebook.pdf](https://uncitral.un.org/sites/uncitral.un.org/files/media-documents/uncitral/en/19-04970_ebook.pdf)
- UNCITRAL Model Law on Electronic Signatures (2001), 5 July 2001.  
<https://uncitral.un.org/sites/uncitral.un.org/files/media-documents/uncitral/en/ml-elecsig-e.pdf>
- Valdez-De-Leon, O. (2019). How to Develop a Digital Ecosystem – a Practical Framework. *Technology Innovation Management Review*, 9(8), 43–54.  
<https://doi.org/10.22215/timreview/1260>
- Valkokari, K. (2015). Business, Innovation, and Knowledge Ecosystems: How They Differ and How to Survive and Thrive within Them. *Technology Innovation Management Review*, 5(8), 17–24. <https://doi.org/10.22215/timreview/919>

- Vassilakis, Lepouras, Fraser, Haston, & Georgiadis. (2005). Barriers to Electronic Service Development. *E-Service Journal*, 4(1), 41. <https://doi.org/10.2979/esj.2005.4.1.41>
- Wang F. (2018). Interagency coordination in the implementation of single window: Lessons and good practice from Korea. *World Customs Journal*, 12(1), 49-68.
- Williamson, P. J., & De Meyer, A. (2012). Ecosystem Advantage: How to Successfully Harness the Power of Partners. *California Management Review*, 55(1), 24–46. <https://doi.org/10.1525/cm.2012.55.1.24>
- Zhang, J., & Liang, X. J. (2011). Business ecosystem strategies of mobile network operators in the 3G era: The case of China Mobile. *Telecommunications Policy*, 35(2), 156–171. <https://doi.org/10.1016/j.telpol.2010.12.009>

# Appendices

## Appendix I List of Certificates and Documents Required to be Carried on Board Ships



**E**

4 ALBERT EMBANKMENT  
LONDON SE1 7SR  
Telephone: +44 (0)20 7735 7611 Fax: +44 (0)20 7587 3210

FAL.2/Circ.131  
MEPC.1/Circ.873  
MSC.1/Circ.1586  
LEG.2/Circ.3  
19 July 2017

### LIST OF CERTIFICATES AND DOCUMENTS REQUIRED TO BE CARRIED ON BOARD SHIPS, 2017

1 The Facilitation Committee, at its forty-first session, the Marine Environment Protection Committee, at its seventieth session, the Maritime Safety Committee, at its ninety-seventh session, and the Legal Committee, at its one hundred and fourth session, approved the List of certificates and documents required to be carried on board ships, 2017, as set out in the annex.

2 This work was carried out in accordance with the provisions of section 2 of the annex to the FAL Convention concerning formalities required of shipowners by public authorities on the arrival, stay and departure of ships. It is reiterated that these provisions should not be read as precluding a requirement for the presentation for inspection by the appropriate authorities of certificates and other documents carried by the ship pertaining to its registry, measurement, safety, manning, classification and other related matters.

3 Since the issuance of FAL.2/Circ.127-MEPC/Circ.817-MSC/Circ.1462, several instruments addressed in that circular have been amended. New instruments have been added, including the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 and Nairobi International Convention on the Removal of Wrecks, 2007. Further, pursuant to a decision of the Legal Committee taken at its 103rd session, this document is now also a LEG circular.

4 This circular lists only the certificates and documents that are required under IMO instruments and it does not include certificates or documents required by other international organizations or governmental authorities.

5 This circular should not be used in the context of port State control inspections for which convention requirements should be referred to.

6 Member Governments are invited to note the information provided in the annex and take action as appropriate.

7 This circular supersedes FAL.2/Circ.127-MEPC/Circ.817-MSC/Circ.1462.

\*\*\*

I:\CIRC\MEPC\01\MEPC.1-CIRC.873.docx





**ANNEX**

**CERTIFICATES AND DOCUMENTS REQUIRED  
 TO BE CARRIED ON BOARD SHIPS, 2017**

(Note: All certificates to be carried on board must be valid and drawn up in the form corresponding to the model where required by the relevant international convention or instrument)

No.	Contents	Reference
1	<b>All ships to which the referenced convention applies</b>	
	<b>International Tonnage Certificate (1969)</b> An International Tonnage Certificate (1969) shall be issued to every ship, the gross and net tonnage of which have been determined in accordance with the Convention.	Tonnage 1969, article 7
	<b>International Load Line Certificate</b> An International Load Line Certificate shall be issued under the provisions of the International Convention on Load Lines, 1966, to every ship which has been surveyed and marked in accordance with the Convention or the Convention as modified by the 1988 LL Protocol, as appropriate.	LL 1966, article 16; LL PROT 1988, article 16
	<b>International Load Line Exemption Certificate</b> An International Load Line Exemption Certificate shall be issued to any ship to which an exemption has been granted under and in accordance with article 6 of the Load Line Convention or the Convention as modified by the 1988 LL Protocol, as appropriate.	LL 1966, article 16; LL PROT 1988, article 16
	<b>Exemption Certificate<sup>1</sup></b> When an exemption is granted to a ship under and in accordance with the provisions of SOLAS 1974, a certificate called an Exemption Certificate shall be issued in addition to the certificates listed above.	SOLAS 1974, regulation I/12; SOLAS PROT 1988, regulation I/12

<sup>1</sup> SLS.14/Circ.115, Add.1, Add.2 and Add.3 refer to the issue of exemption certificate.



No.	Contents	Reference
	<p><b>Coating Technical File</b>            A Coating Technical File, containing specifications of the coating system applied, where applicable, to dedicated seawater ballast tanks in all types of ships and double-side skin spaces of bulk carriers of 150 m in length and upwards and cargo oil tanks of crude oil tankers, record of the shipyard's and shipowner's coating work, detailed criteria for coating sections, job specifications, inspection, maintenance and repair, shall be kept on board and maintained throughout the life of the ship.</p>	<p>SOLAS 1974, regulation II-1/3-2 and II-1/3-11; resolution MSC.215(82), as amended by resolution MSC.341(91) and MSC.1/Circ.1381; resolution MSC.288(87) as modified by circular MSC.1/Circ.1381 and amended by resolution MSC.342(91)</p>
	<p><b>Emergency Towing Procedure</b>            All ships shall be provided with a ship-specific emergency towing procedure. Such a procedure shall be carried on board the ship for use in emergency situations and shall be developed based on the guidelines developed by the Organization.</p>	<p>SOLAS, regulation II-1/3-4; MSC.1/Circ.1255</p>
	<p><b>Construction drawings</b>            A set of as-built construction drawings and other plans showing any subsequent structural alterations shall be kept on board a ship constructed on or after 1 January 2007.</p>	<p>SOLAS 1974, regulation II-1/3-7; MSC/Circ.1135</p>

No.	Contents	Reference
	<p><b>Ship Construction File</b>            A Ship Construction File with specific information should be kept on board oil tankers of 150 m in length and above and bulk carriers of 150 m in length and above, constructed with single deck, top-side tanks and hopper side tanks in cargo spaces, excluding ore carriers and combination carriers:</p> <p>.1 for which the building contract is placed on or after 1 July 2016;</p> <p>.2 in the absence of a building contract, the keels of which are laid or which are at a similar stage of construction on or after 1 July 2017; or</p> <p>.3 the delivery of which is on or after 1 July 2020 shall carry a Ship Construction File containing information in accordance with regulations and guidelines,</p> <p>and updated as appropriate throughout the ship's life in order to facilitate safe operation, maintenance, survey, repair and emergency measures.</p>	<p>SOLAS 1974, regulation II-1/3-10; MSC.1/Circ.1343</p>
	<p><b>Noise Survey Report</b>            Applicable to new ships of 1,600 gross tonnage and above, excluding dynamically supported crafts, high-speed crafts, fishing vessels, pipe-laying barges, crane barges, mobile offshore drilling units, pleasure yachts not engaged in trade, ships of war and troopships, ships not propelled by mechanical means, pile driving vessels and dredgers.</p> <p>A noise survey report shall always be carried on board and be accessible for the crew.</p> <p>For existing ships, refer to section "Other certificates and documents which are not mandatory – Noise Survey Report" (resolution A.468(XII)).</p>	<p>SOLAS 1974, regulation II-1/3-12; Noise Code, section 4.3</p>

No.	Contents	Reference
	<p><b>Stability information</b>            Every passenger ship regardless of size and every cargo ship of 24 m and over shall be inclined on completion and the elements of their stability determined. The master shall be supplied with stability information containing such information as is necessary to enable him, by rapid and simple procedures, to obtain accurate guidance as to the stability of the ship under varying conditions of service to maintain the required intact stability and stability after damage. For bulk carriers, the information required in a bulk carrier booklet may be contained in the stability information.</p>	<p>SOLAS 1974, regulations II-1/5 and II-1/5-1; LL 1966, regulation 10; LL Protocol 1988, regulation 10</p>
	<p><b>Damage control plans and booklets</b>            On passenger and cargo ships, there shall be permanently exhibited plans showing clearly for each deck and hold the boundaries of the watertight compartments, the openings therein with the means of closure and position of any controls thereof, and the arrangements for the correction of any list due to flooding. Booklets containing the aforementioned information shall be made available to the officers of the ship.</p>	<p>SOLAS 1974, regulation II-1/19; MSC.1/Circ.1245</p>
	<p><b>Manoeuvring booklet</b>            The stopping times, ship headings and distances recorded on trials, together with the results of trials to determine the ability of ships having multiple propellers to navigate and manoeuvre with one or more propellers inoperative, shall be available on board for the use of the master or designated personnel.</p>	<p>SOLAS 1974, regulation II-1/28</p>
	<p><b>Evaluation of the alternative design and arrangements</b>            Where applicable, a copy of the documentation, as approved by the Administration, indicating that the alternative design and arrangements comply with this regulation shall be carried onboard the ship.</p>	<p>SOLAS 1974, regulations II-1/55.4.2, II-2/17.4.2, and III/38.4.2</p>
	<p><b>Maintenance plans</b>            The maintenance plan shall include the necessary information about fire protection systems and fire-fighting systems and appliances as required by regulation II-2/14.2.2. For tankers, additional requirements are referred to in regulation II-2/14.4.             For passenger ships carrying more than 36 Passengers, the maintenance plan should include low-location lighting and public address system as required by SOLAS regulation II-2/14.3.</p>	<p>SOLAS 1974, regulations II-2/14.2.2, II-2/14.3 and II-2/14.4</p>

No.	Contents	Reference
	<p><b>Onboard training and drills record</b>            Fire drills shall be conducted and recorded in accordance with the provisions of regulations III/19.3 and III/19.5.</p>	SOLAS 1974, regulation II-2/15.2.2.5
	<p><b>Fire safety training manual</b>            A training manual shall be written in the working language of the ship and shall be provided in each crew mess room and recreation room or in each crew cabin. The manual shall contain the instructions and information required in regulation II-2/15.2.3.4. Part of such information may be provided in the form of audio-visual aids in lieu of the manual.</p>	SOLAS 1974, regulation II-2/15.2.3
	<p><b>Fire control plan/booklet</b>            General arrangement plans shall be permanently exhibited for the guidance of the ship's officers, showing clearly for each deck the control stations, the various fire sections together with particulars of the fire detection and fire alarm systems and the fire-extinguishing appliances, etc. Alternatively, at the discretion of the Administration, the aforementioned details may be set out in a booklet, a copy of which shall be supplied to each officer, and one copy shall at all times be available on board in an accessible position. Plans and booklets shall be kept up to date; any alterations shall be recorded as soon as practicable. A duplicate set of fire control plans or a booklet containing such plans shall be permanently stored in a prominently marked weathertight enclosure outside the deckhouse for the assistance of shoreside fire-fighting personnel.</p>	SOLAS 1974, regulations II-2/15.2.4 and II-2/15.3.2
	<p><b>Fire safety operational booklet</b>            The fire safety operational booklet shall contain the necessary information and instructions for the safe operation of the ship and cargo handling operations in relation to fire safety. The booklet shall be written in the working language of the ship and be provided in each crew mess room and recreation room or in each crew cabin. The booklet may be combined with the fire safety training manuals required in regulation II-2/15.2.3.</p>	SOLAS 1974, regulation II-2/16.2
	<p><b>Operations manual for helicopter facility</b>            Each helicopter facility, if fitted, shall have an operations manual, including a description and a checklist of safety precautions, procedures and equipment requirements. This manual may be part of the ship's emergency response procedures</p>	SOLAS 1974, regulation II-2/18.8.1

No.	Contents	Reference
	<p><b>Statement of acceptance of the installation of replacement release and retrieval system to an existing lifeboat</b></p> <p>For all ships, no later than the first scheduled dry-docking after 1 July 2014, but no later than 1 July 2019, lifeboat on-load release mechanisms not complying with paragraphs 4.4.7.6.4 to 4.4.7.6.6 of the LSA Code shall be replaced with equipment that complies with the Code.</p>	<p>SOLAS 1974, regulation III/1.5; LSA Code, para. 4.4.7.6; MSC.1/Circ.1392/Corr.1</p>
	<p><b>Muster list and emergency instructions</b></p> <p>All ships shall be provided with muster list and emergency instructions, which shall comply with the requirements of regulation 37 and be exhibited in conspicuous places throughout the ship including the navigation bridge, engine-room and crew accommodation spaces. In the case of passenger ships, these instructions shall be drawn up in the language(s) required by its flag State and in the English language.</p>	<p>SOLAS 1974, regulations III/8 and III/37</p>
	<p><b>Ship-specific Plans and Procedures for Recovery of Persons from the Water</b></p> <p>All ships shall have ship-specific plans and procedures for recovery of persons from the water. Ships constructed before 1 July 2014 shall comply with this requirement by the first periodical or renewal safety equipment survey of the ship to be carried out after 1 July 2014, whichever comes first.</p> <p>Ro-ro passenger ships which comply with regulation III/26.4 shall be deemed to comply with this regulation.</p> <p>The Plans and Procedures should be considered as a part of the emergency preparedness plan required by paragraph 8 of the ISM Code.</p>	<p>SOLAS 1974 regulation, III/17-1; resolution MSC.346(91); MSC.1/Circ.1447</p>
	<p><b>Training manual</b></p> <p>The training manual, which may comprise several volumes, shall contain instructions and information, in easily understood terms illustrated wherever possible, on the life-saving appliances provided in the ship and on the best methods of survival. Any part of such information may be provided in the form of audio-visual aids in lieu of the manual.</p>	<p>SOLAS 1974, regulation III/35</p>

No.	Contents	Reference
	<p><b>Radio record</b>            A record shall be kept, to the satisfaction of the Administration and as required by the Radio Regulations, of all incidents connected with the radiocommunication service which appear to be of importance to safety of life at sea.</p>	SOLAS 1974, regulation IV/17
	<p><b>Minimum safe manning document</b>            Every ship to which chapter I of the Convention applies shall be provided with an appropriate safe manning document or equivalent issued by the Administration as evidence of the minimum safe manning.</p>	SOLAS 1974, regulation V/14.2
	<p><b>Voyage data recorder system – certificate of compliance</b>            The voyage data recorder system, including all sensors, shall be subjected to an annual performance test. The test shall be conducted by an approved testing or servicing facility to verify the accuracy, duration and recoverability of the recorded data. In addition, tests and inspections shall be conducted to determine the serviceability of all protective enclosures and devices fitted to aid location. A copy of the certificate of compliance issued by the testing facility, stating the date of compliance and the applicable performance standards, shall be retained on board the ship.</p>	SOLAS 1974, regulation V/18.8
	<p><b>AIS test report</b>            The Automatic Identification System (AIS) shall be subjected to an annual test by an approved surveyor or an approved testing or servicing facility. A copy of the test report shall be retained on board and should be in accordance with a model form set out in the annex to MSC.1/Circ.1252.</p>	SOLAS 1974, regulation V/18.9; MSC.1/Circ.1252
	<p><b>Nautical charts and nautical publications</b>            Nautical charts and nautical publications for the intended voyage shall be adequate and up to date. An electronic chart display and information system (ECDIS) is also accepted as meeting the chart carriage requirements of this subparagraph.</p>	SOLAS 1974, regulations V/19.2.1.4 and V/27
	<p><b>LRIT conformance test report</b>            A Conformance test report should be issued, on satisfactory completion of a conformance test, by the Administration or the ASP who conducted the test acting on behalf of the Administration and should be in accordance with the model set out in appendix 2 of MSC.1/Circ.1307.</p>	SOLAS 1974, regulation V/19-1; MSC.1/Circ.1307

No.	Contents	Reference
	<p><b>International Code of Signals and a copy of Volume III of IAMSAR Manual</b>            All ships required to carry a radio installation shall carry the International Code of Signal; all ships shall carry an up-to-date copy of Volume III of the International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual.</p>	<p>SOLAS 1974, regulation V/21</p>
	<p><b>Records for pilot ladders used for pilot transfer</b>            All pilot ladders used for pilot transfer shall be clearly identified with tags or other permanent marking so as to enable identification of each appliance for the purposes of survey, inspection and record keeping. A record shall be kept on the ship as to the date the identified ladder is placed into service and any repairs effected.</p>	<p>SOLAS 1974 regulation V/23.2.4</p>
	<p><b>Records of navigational activities</b>            All ships engaged on international voyages shall keep on board a record of navigational activities and incidents including drills and pre-departure tests. When such information is not maintained in the ship's logbook, it shall be maintained in another form approved by the Administration.</p>	<p>SOLAS 1974, regulations VI/26 and V/28.1</p>
	<p><b>Cargo Securing Manual</b>            All cargoes other than solid and liquid bulk cargoes, cargo units and cargo transport units, shall be loaded, stowed and secured throughout the voyage in accordance with the Cargo Securing Manual approved by the Administration. In ships with ro-ro spaces, as defined in regulation II-2/3.41, all securing of such cargoes, cargo units and cargo transport units, in accordance with the Cargo Securing Manual, shall be completed before the ship leaves the berth. The Cargo Securing Manual is required on all types of ships engaged in the carriage of all cargoes other than solid and liquid bulk cargoes, which shall be drawn up to a standard at least equivalent to the guidelines developed by the Organization.</p>	<p>SOLAS 1974, regulations VI/5.6 and VII/5; MSC.1/Circ.1353/Rev.1</p>
	<p><b>Material Safety Data Sheets (MSDS)</b>            Ships carrying oil or oil fuel, as defined in regulation 1 of annex 1 of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto, shall be provided with material safety data sheets, based on the recommendations developed by the Organization, prior to the loading of such oil as cargo in bulk or bunkering of oil fuel.</p>	<p>SOLAS 1974, regulation VI/5-1; resolution MSC.286(86)</p>



No.	Contents	Reference
	<p><b>Safety Management Certificate</b>            A Safety Management Certificate shall be issued to every ship by the Administration or an organization recognized by the Administration. The Administration or an organization recognized by it shall, before issuing the Safety Management Certificate, verify that the company and its shipboard management operate in accordance with the approved safety management system.</p>	<p>SOLAS 1974, regulation IX/4; ISM Code, paragraph 13</p>
	<p><b>Document of Compliance</b>            A document of compliance shall be issued to every company which complies with the requirements of the ISM Code. A copy of the document shall be kept on board.</p>	<p>SOLAS 1974, regulation IX/4; ISM Code, paragraph 13</p>
	<p><b>Continuous Synopsis Record (CSR)</b>            Every ship to which chapter I of the Convention applies shall be issued with a Continuous Synopsis Record. The Continuous Synopsis Record provides an onboard record of the history of the ship with respect to the information recorded therein.</p>	<p>SOLAS 1974, regulation XI-1/5</p>
	<p><b>Ship Security Plan and associated records</b>            Each ship shall carry on board a ship security plan approved by the Administration. The plan shall make provisions for the three security levels as defined in part A of the ISPS Code. Records of the following activities addressed in the ship security plan shall be kept on board for at least the minimum period specified by the Administration:</p> <ul style="list-style-type: none"> <li>.1 training, drills and exercises;</li> <li>.2 security threats and security incidents;</li> <li>.3 breaches of security;</li> <li>.4 changes in security level;</li> <li>.5 communications relating to the direct security of the ship such as specific threats to the ship or to port facilities the ship is, or has been, in;</li> <li>.6 internal audits and reviews of security activities;</li> <li>.7 periodic review of the ship security assessment;</li> <li>.8 periodic review of the ship security plan;</li> <li>.9 implementation of any amendments to the plan; and</li> <li>.10 maintenance, calibration and testing of any security equipment provided on board, including testing of the ship security alert system.</li> </ul>	<p>SOLAS 1974, regulation XI-2/9; ISPS Code, part A, sections 9 and 10</p>



No.	Contents	Reference
	<p><b>International Ship Security Certificate (ISSC) or Interim International Ship Security Certificate</b>            An International Ship Security Certificate (ISSC) shall be issued to every ship by the Administration or an organization recognized by it to verify that the ship complies with the maritime security provisions of SOLAS chapter XI-2 and part A of the ISPS Code. An interim ISSC may be issued under the ISPS Code, part A, section 19.4.</p>	<p>SOLAS 1974, regulation XI-2/9.1.1; ISPS Code, part A, section 19 and appendices.</p>
	<p><b>International Oil Pollution Prevention Certificate</b>            An international Oil Pollution Prevention Certificate shall be issued, after survey in accordance with regulation 6 of Annex I of MARPOL, to any oil tanker of 150 gross tonnage and above and any other ship of 400 gross tonnage and above which is engaged in voyages to ports or offshore terminals under the jurisdiction of other Parties to MARPOL. The certificate is supplemented with a Record of Construction and Equipment for Ships other than Oil Tankers (Form A) or a Record of Construction and Equipment for Oil Tankers (Form B), as appropriate.</p>	<p>MARPOL Annex I, regulation 7</p>
	<p><b>Oil Record Book</b>            Every oil tanker of 150 gross tonnage and above and every ship of 400 gross tonnage and above other than an oil tanker shall be provided with an Oil Record Book, Part I (Machinery space operations). Every oil tanker of 150 gross tonnage and above shall also be provided with an Oil Record Book, Part II (Cargo/ballast operations).</p>	<p>MARPOL Annex I, regulations 17 and 36</p>
	<p><b>Shipboard Oil Pollution Emergency Plan</b>            Every oil tanker of 150 gross tonnage and above and every ship other than an oil tanker of 400 gross tonnage and above shall carry on board a Shipboard Oil Pollution Emergency Plan approved by the Administration.</p>	<p>MARPOL Annex I, regulation 37; resolution MEPC.54(32), as amended by resolution MEPC.86(44)</p>
	<p><b>International Sewage Pollution Prevention Certificate</b>            An International Sewage Pollution Prevention Certificate shall be issued, after an initial or renewal survey in accordance with the provisions of regulation 4 of Annex IV of MARPOL, to any ship which is required to comply with the provisions of that Annex and is engaged in voyages to ports or offshore terminals under the jurisdiction of other Parties to the Convention.</p>	<p>MARPOL Annex IV, regulation 5; MEPC/Circ.408</p>

No.	Contents	Reference
	<p><b>Document of approval for the rate of sewage discharge</b>            Untreated sewage from ships other than passenger ships in all areas and from passenger ships outside special areas that has been stored in holding tanks shall be discharged at a moderate rate approved by the Administration based upon the standards developed by the Organization.</p>	<p>MARPOL Annex IV, regulation 11.1.1; resolution MEPC.157(55)</p>
	<p><b>Garbage Management Plan</b>            Every ship of 100 gross tonnage and above and every ship which is certified to carry 15 persons or more shall carry a garbage management plan which the crew shall follow.</p>	<p>MARPOL Annex V, regulation 10; resolution MEPC.220(63)</p>
	<p><b>Garbage Record Book</b>            Every ship of 400 gross tonnage and above and every ship which is certified to carry 15 persons or more engaged in voyages to ports or offshore terminals under the jurisdiction of other Parties to the Convention and every fixed and floating platform engaged in exploration and exploitation of the seabed shall be provided with a Garbage Record Book.</p>	<p>MARPOL Annex V, regulation 10</p>
	<p><b>International Air Pollution Prevention Certificate</b>            Ships constructed before the date of entry into force of the Protocol of 1997 shall be issued with an International Air Pollution Prevention Certificate. Any ship of 400 gross tonnage and above engaged in voyages to ports or offshore terminals under the jurisdiction of other Parties and platforms and drilling rigs engaged in voyages to waters under the sovereignty or jurisdiction of other Parties to the Protocol of 1997 shall be issued with an International Air Pollution Prevention Certificate.</p>	<p>MARPOL Annex VI, regulation 6</p>
	<p><b>International Energy Efficiency Certificate</b>            An International Energy Efficiency Certificate for the ship shall be issued after a survey in accordance with the provisions of regulation 5.4 to any ships of 400 gross tonnage and above before that ship may engage in voyages to ports or offshore terminals under the jurisdiction of other Parties.</p>	<p>MARPOL Annex VI, regulation 6</p>
	<p><b>Ozone-depleting Substances Record Book</b>            Each ship subject to MARPOL Annex VI, regulation 6.1 that has rechargeable systems that contain ozone-depleting substances shall maintain an ozone-depleting substances record book.</p>	<p>MARPOL Annex VI, regulation 12.6</p>

No.	Contents	Reference
	<p><b>Fuel Oil Changeover Procedure and Logbook (record of fuel changeover)</b>            Those ships using separate fuel oils to comply with MARPOL Annex VI, regulation 14.3 and entering or leaving an emission control area shall carry a written procedure showing how the fuel oil changeover is to be done. The volume of low-sulphur fuel oils in each tank as well as the date, time and position of the ship when any fuel oil changeover operation is completed prior to the entry into an emission control area or commenced after exit from such an area shall be recorded in such logbook as prescribed by the Administration.</p>	<p>MARPOL Annex VI, regulation 14.6</p>
	<p><b>Manufacturer's Operating Manual for Incinerators</b>            Incinerators installed in accordance with the requirements of MARPOL Annex VI, regulation 16.6.1 shall be provided with a Manufacturer's Operating Manual, which is to be retained with the unit.</p>	<p>MARPOL Annex VI, regulation 16.7</p>
	<p><b>Bunker Delivery Note and Representative Sample</b>            Bunker Delivery Note and representative sample of the fuel oil delivered shall be kept on board in accordance with requirements of MARPOL Annex VI, regulations 18.6 and 18.8.1.</p>	<p>MARPOL Annex VI, regulations 18.6 and 18.8.1</p>
	<p><b>EEDI Technical File</b>            Applicable to ships falling into one or more of the categories in MARPOL Annex VI, regulations 2.25 to 2.35.</p>	<p>MARPOL Annex VI, regulation 20</p>
	<p><b>Ship Energy Efficiency Management Plan (SEEMP)</b>            All ships of 400 gross tonnage and above, excluding platforms (including FPSOs and FSUs) and drilling rigs, regardless of their propulsion, shall keep on board a ship specific Ship Energy Efficiency Management Plan (SEEMP). This may form part of the ship's Safety Management System (SMS).</p>	<p>MARPOL Annex VI, regulation 22; MEPC.1/Circ.795</p>
	<p><b>Technical File</b>            Every marine diesel engine installed on board a ship shall be provided with a Technical File. The Technical File shall be prepared by the applicant for engine certification and approved by the Administration, and is required to accompany an engine throughout its life on board ships. The Technical File shall contain the information as specified in paragraph 2.4.1 of the NO<sub>x</sub> Technical Code, 2008.</p>	<p>NO<sub>x</sub> Technical Code 2008, paragraph 2.3.4</p>

No.	Contents	Reference
	<p><b>Record Book of Engine Parameters</b>            Where the Engine Parameter Check method in accordance with paragraph 6.2 of the NO<sub>x</sub> Technical Code, 2008 is used to verify compliance, if any adjustments or modifications are made to an engine after its pre-certification, a full record of such adjustments or modifications shall be recorded in the engine's Record Book of Engine Parameters.</p>	<p>NO<sub>x</sub> Technical Code 2008, paragraph 2.3.7</p>
	<p><b>Certificates for masters, officers or ratings</b>            Certificates for masters, officers or ratings shall be issued to those candidates who, to the satisfaction of the Administration, meet the requirements for service, age, medical fitness, training, qualifications and examinations in accordance with the appropriate provisions of the 1978 STCW Convention and STCW Code. Formats of certificates are given in section A-I/2 of the STCW Code. Certificates must be kept available in their original form on board the ships on which the holder is serving.</p> <p>Fishing vessel personnel serving on board seagoing fishing vessels shall be certificated in accordance with the provisions of STCW-F Convention 1995. Formats of certificates are given in the appendix 1, 2 and 3 of the Convention.</p>	<p>STCW 1978, article VI, regulation I/2; STCW Code, section A-I/2</p> <p>STCW-F 1995 article 6, regulation 3</p>
	<p><b>Records of daily hours of rest</b>            Records of daily hours of rest of seafarers shall be maintained on board.</p>	<p>STCW Code, section A-VIII/1; IMO/ILO Guidelines for the development of tables of seafarers' shipboard working arrangements and formats of records of seafarers' hours of work or hours of rest</p>
	<p><b>International Anti-fouling System Certificate</b>            Ships of 400 GT and above engaged in international voyages, excluding fixed or floating platforms, FSUs and FPSOs, shall be issued after inspection and survey an international Anti-fouling System Certificate together with a Record of Anti-fouling Systems.</p>	<p>AFS 2001, regulation 2(1) of annex 4</p>

No.	Contents	Reference
	<p><b>Declaration on Anti-fouling System</b>            Ships of 24 m or more in length, but less than 400 GT engaged in international voyages, excluding fixed or floating platforms, FSUs, and FPSOs, shall carry a declaration signed by the owner or owner's authorized agents. Such a declaration shall be accompanied by appropriate documentation (such as a paint receipt or a contractor invoice) or contain appropriate endorsement.</p>	<p>AFS 2001, regulation 5(1) of annex 4</p>
	<p><b>International Ballast Water Management Certificate</b>            Ships of 400 gross tonnage and above to which the BWM 2004 applies, excluding floating platforms, FSUs and FPSOs, shall be issued the certificate after successful completion of a survey conducted in accordance with regulation E-1.</p> <p><i>Note: The item was added by the Secretariat as per the relevant requirements of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (BWM 2004), which will enter into force on 8 September 2017.</i></p>	<p>BWM 2004, regulation E-2</p>
	<p><b>Ballast Water Management Plan</b>            Each ship shall have on board and implement a ballast water management plan. Such a plan shall be approved by the Administration taking into account guidelines developed by the Organization.</p> <p><i>Note: The item was added by the Secretariat as per the relevant requirements of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (BWM 2004), which will enter into force on 8 September 2017.</i></p>	<p>BWM 2004, regulation B-1; resolution MEPC.127(53)</p>



No.	Contents	Reference
	<p><b>Ballast Water Record Book</b></p> <p>Each ship shall have on board a ballast water record book that may be an electronic record system, or that may be integrated into another record book or system and which shall at least contain the information specified in appendix II of the Convention. The ballast water record book entries shall be maintained on board the ship for a minimum period of two years after the last entry has been made and thereafter in the Company's control for a minimum period of three years.</p> <p><i>Note: The item was added by the Secretariat as per relevant requirements of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (BWM 2004), which will enter into force on 8 September 2017.</i></p>	<p>BWM 2004,          Regulation B-2</p>
	<p><b>Certificate of insurance or other financial security in respect of civil liability for bunker oil pollution damage</b></p> <p>Certificate attesting that insurance or other financial security is in force in accordance with the provisions of this Convention shall be issued to each ship having a gross tonnage greater than 1,000 after the appropriate authority of a State Party has determined that the requirements of article 7, paragraph 1 have been complied with. With respect to a ship registered in a State Party such certificate shall be issued or certified by the appropriate authority of the State of the ship's registry; with respect to a ship not registered in a State Party it may be issued or certified by the appropriate authority of any State Party. A State Party may authorize either an institution or an organization recognized by it to issue the certificate referred to in article 7, paragraph 2. This compulsory insurance certificate shall be in the form of the model set out in the annex to the Convention.</p>	<p>Bunkers 2001, article 7</p>

No.	Contents	Reference
	<p><b>Certificate of insurance or other financial security in respect of liability for the removal of wrecks</b>            Certificate attesting that insurance or other financial security is in force in accordance with the provisions of the Convention shall be issued to each ship of 300 gross tonnage and above by the appropriate authority of the State of the ship's registry after determining that the requirements of article 12.1 have been complied with. With respect to a ship registered in a State Party, such certificate shall be issued or certified by the appropriate authority of the State of the ship's registry; with respect to a ship not registered in a State Party it may be issued or certified by the appropriate authority of any State Party. This compulsory insurance certificate shall be in the form of the model set out in the annex to the Convention.</p>	<p>Nairobi WRC 2007, article 12</p>
2	<p><b>In addition to the certificates listed in section 1 above, passenger ships shall carry:</b></p>	
	<p><b>Passenger Ship Safety Certificate</b>            A certificate called a Passenger Ship Safety Certificate shall be issued after inspection and survey to a passenger ship which complies with the requirements of chapters II-1, II-2, III, IV and V and any other relevant requirements of SOLAS 1974. A Record of Equipment for the Passenger Ship Safety Certificate (Form P) shall be permanently attached.</p>	<p>SOLAS 1974, regulation I/12; SOLAS PROT 1988, regulation I/12</p>
	<p><b>Decision support system for masters</b>            In all passenger ships, a decision support system for emergency management shall be provided on the navigation bridge.</p>	<p>SOLAS 1974, regulation III/29</p>
	<p><b>Search and rescue cooperation plan</b>            Passenger ships to which chapter I of the Convention applies shall have on board a plan for cooperation with appropriate search and rescue services in event of an emergency.</p>	<p>SOLAS 1974, regulation V/7.3</p>
	<p><b>List of operational limitations</b>            Passenger ships to which chapter I of the Convention applies shall keep on board a list of all limitations on the operation of the ship, including exemptions from any of the SOLAS regulations, restrictions in operating areas, weather restrictions, sea state restrictions, restrictions in permissible loads, trim, speed and any other limitations, whether imposed by the Administration or established during the design or the building stages.</p>	<p>SOLAS 1974, regulation V/30</p>

No.	Contents	Reference
	<p><b>Special Trade Passenger Ship Safety Certificate, Special Trade Passenger Ship Space Certificate</b>            A Special Trade Passenger Ship Safety Certificate issued under the provisions of the Special Trade Passenger Ships Agreement, 1971.</p> <p>A certificate called a Special Trade Passenger Ship Space Certificate shall be issued under the provisions of the Protocol on Space Requirements for Special Trade Passenger Ships, 1973.</p>	<p>STP 71, rule 5</p> <p>SSTP 73, rule 5</p>
	<p><b>Certificate of insurance or other financial security in respect of liability for the death of and personal injury to passengers</b>            A certificate attesting that insurance or other financial security is in force in accordance with the provisions of this Convention shall be issued to each ship that is licensed to carry more than 12 passengers, after the appropriate authority of a State Party has determined that the requirements of article 4bis paragraph 1 have been complied with. With respect to a ship registered in a State Party, such certificate shall be issued or certified by the appropriate authority of the State of the ship's registry; with respect to a ship not registered in a State Party it may be issued or certified by the appropriate authority of any State Party. A State Party may authorize an institution or an organization recognized by it to issue the certificate. The certificate shall be in the form of the model set out in the annex to the Convention.</p> <p>Pursuant to resolution A.988(24), States are recommended to ratify the Athens Protocol as soon as possible with the reservation that they reserve the right to issue and accept insurance certificates with such special exceptions and limitations as the insurance market conditions at the time of issue of the certificate may necessitate, examples being the biochemical clause and terrorism-related clauses (Circular Letter No.2758 refers).</p>	<p>PAL 1974 as modified by PAL PROT 2002, article 4bis; resolution A.988(24); Circular Letter No.2758</p>
3	<p><b>In addition to the certificates listed in section 1 above, cargo ships shall carry:</b></p>	



No.	Contents	Reference
	<p><b>Cargo Ship Safety Construction Certificate</b>            A certificate called a Cargo Ship Safety Construction Certificate shall be issued after survey to a cargo ship of 500 gross tonnage and over which satisfies the requirements for cargo ships on survey, set out in regulation I/10 of SOLAS 1974, and complies with the applicable requirements of chapters II-1 and II-2, other than those relating to fire-extinguishing appliances and fire-control plans.</p>	<p>SOLAS 1974, regulation I/12; SOLAS PROT 1988, regulation I/12</p>
	<p><b>Cargo Ship Safety Equipment Certificate</b>            A certificate called a Cargo Ship Safety Equipment Certificate shall be issued after survey to a cargo ship of 500 gross tonnage and over which complies with the relevant requirements of chapters II-1 and II-2, III and V and any other relevant requirements of SOLAS 1974. A Record of Equipment for the Cargo Ship Safety Equipment Certificate (Form E) shall be permanently attached.</p>	<p>SOLAS 1974, regulation I/12; SOLAS PROT 1988, regulation I/12</p>
	<p><b>Cargo Ship Safety Radio Certificate</b>            A certificate called a Cargo Ship Safety Radio Certificate shall be issued after survey to a cargo ship of 300 gross tonnage and over, fitted with a radio installation, including those used in life-saving appliances, which complies with the requirements of chapter IV and any other relevant requirements of SOLAS 1974. A Record of Equipment for the Cargo Ship Safety Radio Certificate (Form R) shall be permanently attached.</p>	<p>SOLAS 1974, regulation I/12, as amended by the GMDSS amendments; SOLAS PROT 1988, regulation I/12</p>
	<p><b>Cargo Ship Safety Certificate</b>            A certificate called a Cargo Ship Safety Certificate may be issued after survey to a cargo ship which complies with the relevant requirements of chapters II-1, II-2, III, IV and V and other relevant requirements of SOLAS 1974 as modified by the 1988 SOLAS Protocol, as an alternative to the Cargo Ship Safety Construction Certificate, Cargo Ship Safety Equipment Certificate and Cargo Ship Safety Radio Certificate. A Record of Equipment for the Cargo Ship Safety Certificate (Form C) shall be permanently attached.</p>	<p>SOLAS PROT 1988, regulation I/12</p>

No.	Contents	Reference
	<p><b>Ship Structure Access Manual</b>            This regulation applies to oil tankers of 500 gross tonnage and over and bulk carriers, as defined in regulation IX/1, of 20,000 gross tonnage and over, constructed on or after 1 January 2006. A ship's means of access to carry out overall and close-up inspections and thickness measurements shall be described in a Ship Structure Access Manual approved by the Administration, an updated copy of which shall be kept on board.</p>	<p>SOLAS 1974, regulation II-1/3-6</p>
	<p><b>Cargo Information</b>            The shipper shall provide the master or his representative with appropriate information, confirmed in writing, on the cargo, in advance of loading. In bulk carriers, the density of the cargo shall be provided in the above information.</p>	<p>SOLAS 1974, regulations VI/2 and XII/10; MSC/Circ.663</p>
	<p><b>Bulk Carrier Booklet</b>            To enable the master to prevent excessive stress in the ship's structure, the ship loading and unloading solid bulk cargoes shall be provided with a booklet referred to in SOLAS regulation VI/7.2. The booklet shall be endorsed by the Administration or on its behalf to indicate that SOLAS regulations XII/4, 5, 6 and 7, as appropriate, are complied with. As an alternative to a separate booklet, the required information may be contained in the intact stability booklet.</p>	<p>SOLAS 1974, regulations VI/7 and XII/8; BLU Code</p>
	<p><b>Document of authorization for the carriage of grain and grain loading manual</b>            A document of authorization shall be issued for every ship loaded in accordance with the regulations of the International Code for the Safe Carriage of Grain in Bulk. The document shall accompany or be incorporated into the grain loading manual provided to enable the master to meet the stability requirements of the Code.</p>	<p>SOLAS 1974, regulation VI/9; Grain Code, section 3</p>
	<p><b>Enhanced survey report file</b>            Bulk carriers and oil tankers shall have a survey report file and supporting documents complying with paragraphs 6.2 and 6.3 of annex A/ <del>and</del> annex B, part A/part B, 2011 ESP Code.</p>	<p>SOLAS 1974, regulation XI-1/2; 2011 ESP Code (resolution A.1049(27), as amended)</p>

No.	Contents	Reference
	<p><b>Dedicated Clean Ballast Tank Operation Manual</b>            Every product carrier of 40,000 tonnes deadweight and above delivered on or before 1 June 1982, operating with dedicated clean ballast tanks shall be provided with a Dedicated Clean Ballast Tank Operation Manual detailing the system and specifying operational procedures. Such a Manual shall be to the satisfaction of the Administration and shall contain all the information set out in the Specifications referred to in subparagraph 8.2 of MARPOL Annex I regulation 18. If an alteration affecting the dedicated clean ballast tank system is made, the Operation Manual shall be revised accordingly.</p>	<p>MARPOL Annex I, regulation 18.8; resolution A.495(XII)</p>
	<p><b>Condition Assessment Scheme (CAS) Statement of Compliance, CAS Final Report and Review Record</b>            A Statement of Compliance shall be issued by the Administration to every oil tanker which has been surveyed in accordance with the requirements of the Condition Assessment Scheme (CAS) and found to be in compliance with these requirements. In addition, a copy of the CAS Final Report which was reviewed by the Administration for the issue of the Statement of Compliance and a copy of the relevant Review Record shall be placed on board to accompany the Statement of Compliance.</p>	<p>MARPOL Annex I, regulations 20 and 21; resolution MEPC.94(46), as amended by resolutions MEPC.99(48), MEPC.112(50), MEPC.131(53), resolution MEPC.155(55), and MEPC.236(65)</p>
	<p><b>Subdivision and stability information</b>            Every oil tanker to which regulation 28 of Annex I of MARPOL applies shall be provided in an approved form with information relative to loading and distribution of cargo necessary to ensure compliance with the provisions of this regulation and data on the ability of the ship to comply with damage stability criteria as determined by this regulation.</p>	<p>MARPOL Annex I, regulation 28</p>
	<p><b>Record of oil discharge monitoring and control system for the last ballast voyage</b>            Subject to the provisions of paragraphs 4 and 5 of regulation 3 of MARPOL Annex I, every oil tanker of 150 gross tonnage and above shall be equipped with an oil discharge monitoring and control system approved by the Administration. The system shall be fitted with a recording device to provide a continuous record of the discharge in litres per nautical mile and total quantity discharged, or the oil content and rate of discharge. The record shall be identifiable as to time and date and shall be kept for at least three years.</p>	<p>MARPOL Annex I, regulation 31</p>

No.	Contents	Reference
	<p><b>Oil Discharge Monitoring and Control (ODMC) Operational Manual</b>            Every oil tanker fitted with an Oil Discharge Monitoring and Control system shall be provided with instructions as to the operation of the system in accordance with an operational manual approved by the Administration.</p>	<p>MARPOL Annex I, regulation 31; resolution A.496(XII); resolution A.586(14), as amended by resolution MEPC.24(22); resolution MEPC.108(49), as amended by resolution MEPC.240(65)</p>
	<p><b>Crude Oil Washing Operation and Equipment Manual (COW Manual)</b>            Every oil tanker operating with crude oil washing systems shall be provided with an Operations and Equipment Manual detailing the system and equipment and specifying operational procedures. Such a Manual shall be to the satisfaction of the Administration and shall contain all the information set out in the specifications referred to in regulation 35 of Annex I of MARPOL.</p>	<p>MARPOL Annex I, regulation 35; resolution MEPC.81(43)</p>
	<p><b>STS Operation Plan and Records of STS Operations</b>            Any oil tanker involved in STS operations shall carry on board a plan prescribing how to conduct STS operations (STS operations Plan) not later than the date of the first annual, intermediate or renewal survey of the ship to be carried out on or after 1 January 2011. Each oil tanker's STS operations plan shall be approved by the Administration. The STS operations plan shall be written in the working language of the ship.</p> <p>Records of STS operations shall be retained on board for three years and be readily available for inspection.</p>	<p>MARPOL Annex I, regulation 41</p>
	<p><b>VOC Management Plan</b>            A tanker carrying crude oil, to which MARPOL Annex VI, regulation 15.1 applies, shall have on board and implement a VOC Management Plan.</p>	<p>MARPOL Annex VI, regulation 15.6</p>

No.	Contents	Reference
	<p><b>Document of approval for the stability instrument</b>            All ships, subject to the IBC, IGC, BCH and GC Codes, should be fitted with a stability instrument capable of verifying compliance with intact and damage stability approved by the Administration, at the first scheduled renewal survey of the ship on or after 1 January 2016, but not later than 1 January 2021, having regard to the performance standards recommended by the Organization. The Administration should issue a document of approval for the stability instrument.</p>	<p>IBC Code para. 2.2.6;            IGC Code para. 2.2.6;            BCH code para. 2.2.1.2;            GC Code para. 2.2.4;            2008 IS Code;            MSC.1/Circ.1229;            MSC.1/Circ.1461</p>
	<p><b>Certificate of insurance or other financial security in respect of civil liability for oil pollution damage</b>            A certificate attesting that insurance or other financial security is in force shall be issued to each ship carrying more than 2,000 tonnes of oil in bulk as cargo. It shall be issued or certified by the appropriate authority of the State of the ship's registry after determining that the requirements of article VII, paragraph 1, of the CLC Convention have been complied with.</p>	<p>CLC 1969,            article VII</p>
	<p><b>Certificate of insurance or other financial security in respect of civil liability for oil pollution damage</b>            A certificate attesting that insurance or other financial security is in force in accordance with the provisions of the 1992 CLC Convention shall be issued to each ship carrying more than 2,000 tonnes of oil in bulk as cargo after the appropriate authority of a Contracting State has determined that the requirements of article VII, paragraph 1, of the Convention have been complied with. With respect to a ship registered in a Contracting State, such certificate shall be issued by the appropriate authority of the State of the ship's registry; with respect to a ship not registered in a Contracting State, it may be issued or certified by the appropriate authority of any Contracting State.</p>	<p>CLC 1992,            article VII</p>

No.	Contents	Reference
4	<p><b>In addition to the certificates listed in sections 1 and 3 above, where appropriate, any ship carrying noxious liquid chemical substances in bulk shall carry:</b></p>	
	<p><b>International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk (NLS Certificate)</b>            An international pollution prevention certificate for the carriage of noxious liquid substances in bulk (NLS Certificate) shall be issued, after survey in accordance with the provisions of regulation 8 of Annex II of MARPOL, to any ship carrying noxious liquid substances in bulk and which is engaged in voyages to ports or terminals under the jurisdiction of other Parties to MARPOL. In respect of chemical tankers, the Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk and the International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk, issued under the provisions of the Bulk Chemical Code and International Bulk Chemical Code, respectively, shall have the same force and receive the same recognition as the NLS Certificate.</p>	<p>MARPOL Annex II, regulation 9</p>
	<p><b>Cargo Record Book</b>            Ships carrying noxious liquid substances in bulk shall be provided with a Cargo Record Book, whether as part of the ship's official log book or otherwise, in the form specified in appendix II to Annex II.</p>	<p>MARPOL Annex II, regulation 15.1</p>
	<p><b>Procedures and Arrangements Manual (P &amp; A Manual)</b>            Every ship certified to carry noxious liquid substances in bulk shall have on board a Procedures and Arrangements Manual approved by the Administration.</p>	<p>MARPOL Annex II, regulation 14; resolution MEPC.18(22), as amended by resolution MEPC.62(35)</p>
	<p><b>Shipboard Marine Pollution Emergency Plan for Noxious Liquid Substances</b>            Every ship of 150 gross tonnage and above certified to carry noxious liquid substances in bulk shall carry on board a shipboard marine pollution emergency plan for noxious liquid substances approved by the Administration.</p>	<p>MARPOL Annex II, regulation 17; resolution MEPC.85(44), as amended by resolution MEPC.137(53)</p>

No.	Contents	Reference
5	<p><b>In addition to the certificates listed in sections 1 and 3 above, where applicable, any chemical tanker shall carry:</b></p>	
	<p><b>Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk</b>            A certificate called a Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk, the model form of which is set out in the appendix to the Bulk Chemical Code, should be issued after an initial or periodical survey to a chemical tanker engaged in international voyages which complies with the relevant requirements of the Code.</p> <p><i>Note: The Code is mandatory under Annex II of MARPOL for chemical tankers constructed before 1 July 1986.</i></p> <p><b>Or</b></p>	<p>BCH Code, section 1.6</p>
	<p><b>International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk</b>            A certificate called an International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk, the model form of which is set out in the appendix to the International Bulk Chemical Code, should be issued after an initial or periodical survey to a chemical tanker engaged in international voyages, which complies with the relevant requirements of the Code.</p> <p><i>Note: The Code is mandatory under both chapter VII of SOLAS 1974 and Annex II of MARPOL for chemical tankers constructed on or after 1 July 1986.</i></p>	<p>IBC Code, section 1.5</p>
6	<p><b>In addition to the certificates listed in sections 1 and 3 above, where applicable, any gas carrier shall carry:</b></p>	
	<p><b>Certificate of Fitness for the Carriage of Liquefied Gases in Bulk</b>            A certificate called a Certificate of Fitness for the Carriage of Liquefied Gases in Bulk, the model form of which is set out in the appendix to the Gas Carrier Code, should be issued after an initial or periodical survey to a gas carrier which complies with the relevant requirements of the Code.</p>	<p>GC Code, section 1.6</p>



No.	Contents	Reference
	<p><b>International Certificate of Fitness for the Carriage of Liquefied Gases in Bulk</b>            A certificate called an International Certificate of Fitness for the Carriage of Liquefied Gases in Bulk, the model form of which is set out in the appendix to the International Gas Carrier Code, should be issued after an initial or periodical survey to a gas carrier which complies with the relevant requirements of the Code.</p> <p><i>Note: The Code is mandatory under chapter VII of SOLAS 1974 for gas carriers constructed on or after 1 July 1986.</i></p>	<p>IGC Code, section 1.4</p>
7	<p><b>In addition to the certificates listed in sections 1, and 2 or 3 above, where applicable, any high-speed craft shall carry:</b></p>	
	<p><b>High-Speed Craft Safety Certificate</b>            A certificate called a High-Speed Craft Safety Certificate shall be issued after completion of an initial or renewal survey to a craft which complies with the requirements of the 1994 HSC Code or the 2000 HSC Code, as appropriate.</p>	<p>SOLAS 1974, regulation X/3;            1994 HSC Code, section 1.8;            2000 HSC Code, section 1.8</p>
	<p><b>Permit to Operate High-Speed Craft</b>            A certificate called a Permit to Operate High-Speed Craft shall be issued to a craft which complies with the requirements set out in paragraphs 1.2.2 to 1.2.7 of the 1994 HSC Code or the 2000 HSC Code, as appropriate.</p>	<p>1994 HSC Code, section 1.9;            2000 HSC Code, section 1.9</p>
8	<p><b>In addition to the certificates listed in sections 1, and 2 or 3 above, where applicable, any ship carrying dangerous goods shall carry:</b></p>	
	<p><b>Document of compliance with the special requirements for ships carrying dangerous goods</b>            The Administration shall provide the ship with an appropriate document as evidence of compliance of construction and equipment with the requirements of regulation II-2/19 of SOLAS 1974. Certification for dangerous goods, except solid dangerous goods in bulk, is not required for those cargoes specified as class 6.2 and 7 and dangerous goods in limited quantities.</p>	<p>SOLAS 1974, regulation II-2/19.4</p>



No.	Contents	Reference
9	<b>In addition to the certificates listed in sections 1, and 2 or 3 above, where applicable, any ship carrying dangerous goods in packaged form shall carry:</b>	
	<b>Transport information</b> Transport information relating to the carriage of dangerous goods in packaged form and the container/vehicle packing certificate shall be in accordance with the relevant provisions of the IMDG Code and shall be made available to the person or organization designated by the port State authority.	SOLAS 1974, regulation VII/4.1
	<b>Dangerous goods manifest or stowage plan</b> Each ship carrying dangerous goods in packaged form shall have a special list or manifest setting forth, in accordance with the classification set out in the IMDG Code, the dangerous goods on board and the location thereof. Each ship carrying dangerous goods in solid form in bulk shall have a list or manifest setting forth the dangerous goods on board and the location thereof. A detailed stowage plan, which identifies by class and sets out the location of all dangerous goods on board, may be used in place of such a special list or manifest. A copy of one of these documents shall be made available before departure to the person or organization designated by the port State authority.	SOLAS 1974, regulations VII/4.2 and VII/7-2.2; MARPOL Annex III, regulation 4
10	<b>In addition to the certificates listed in sections 1, and 2 or 3 above, where applicable, any ship carrying INF cargo shall carry:</b>	
	<b>International Certificate of Fitness for the Carriage of INF Cargo</b> A ship carrying INF cargo shall comply with the requirements of the International Code for the Safe Carriage of Packaged Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes on Board Ships (INF Code) in addition to any other applicable requirements of the SOLAS regulations and shall be surveyed and be provided with the International Certificate of Fitness for the Carriage of INF Cargo.	SOLAS 1974, regulation VII/16; INF Code (resolution MSC.88(71), as amended), paragraph 1.3

No.	Contents	Reference
11	<p><b>In addition to the certificates listed in sections 1, and 2 or 3 above, where applicable, any Nuclear Ship shall carry:</b></p>	
	<p><b>Operating Manual for nuclear power plant</b>            A fully detailed Operating Manual shall be prepared for the information and guidance of the operating personnel in their duties on all matters relating to the operation of the nuclear power plant having an important bearing on safety. The Administration, when satisfied, shall approve such Operating Manual and a copy shall be kept on board the ship. The Operating Manual shall always be kept up-to-date.</p>	SOLAS 1974, regulation VIII/8
	<p><b>A Nuclear Cargo Ship Safety Certificate or Nuclear Passenger Ship Safety Certificate, in place of the Cargo Ship Safety Certificate or Passenger Ship Safety Certificate, as appropriate.</b>            Every Nuclear powered ship shall be issued with the certificate required by SOLAS chapter VIII.</p>	SOLAS 1974, regulation VIII/10
12	<p><b>In addition to the certificates listed in sections 1, and 2 or 3 above, where applicable, any Ship operating in Polar waters shall carry:</b></p>	
	<p><b>Polar Ship Certificate</b>            Every ship to which the Polar Code applies shall have on board a valid Polar Ship Certificate. The certificate shall include a supplement recording equipment required by the Code.</p>	Polar Code, part I-A Section 1.3
	<p><b>Polar Water Operational Manual (PWOM)</b>            Every ship to which the Polar Code applies shall have on board a Polar Water Operational Manual (PWOM) as required in part I-A section 2.3 of the Code.</p>	Polar Code, part I-A section 2.3

No.	Contents	Reference
<b>Other certificates and documents which are not mandatory</b>		
<b>Special purpose ships</b>		
	<p><b>Special Purpose Ship Safety Certificate</b>            In addition to SOLAS certificates as specified in paragraph 7 of the Preamble of the 1983 SPS Code and 2008 SPS Code, a Special Purpose Ship Safety Certificate should be issued after survey in accordance with the provisions of paragraph 1.6 of the 1983 SPS Code and 2008 SPS Code. The duration and validity of the certificate should be governed by the respective provisions for cargo ships in SOLAS 1974. If a certificate is issued for a special purpose ship of less than 500 gross tonnage, this certificate should indicate to what extent relaxations in accordance with 1.2 were accepted.</p> <p>The 2008 SPS Code applies the every special purpose ship of not less than 500 GT certified on or after 13 May 2008.</p>	<p>1983 SPS Code (resolution A.534(13), as amended);            2008 SPS Code (resolution MSC.266(84), as amended),            SOLAS 1974, regulation I/12;            SOLAS PROT 1988, regulation I/12</p>
<b>Offshore support vessels</b>		
	<p><b>Offshore Supply Vessel Document of Compliance</b>            The Document of Compliance should be issued after satisfied that the vessel complies with the provisions of the Guidelines for the design and construction of Offshore Supply Vessels, 2006.</p>	<p>resolution MSC.235(82), as amended by resolution MSC.335(90)</p>
	<p><b>Certificate of Fitness for Offshore Support Vessels</b>            When carrying such cargoes, offshore support vessels should carry a Certificate of Fitness issued under the "Guidelines for the Transport and Handling of Limited Amounts of Hazardous and Noxious Liquid Substances in Bulk on Offshore Support Vessels". If an offshore support vessel carries only noxious liquid substances, a suitably endorsed International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk may be issued instead of the above Certificate of Fitness.</p>	<p>resolution A.673(16), as amended by resolutions MSC.184(79), MSC.236(82) and MEPC.158(55); MARPOL Annex II, regulation 11.2</p>
<b>Diving systems</b>		

No.	Contents	Reference
	<p><b>Diving System Safety Certificate</b>            A certificate should be issued either by the Administration or any person or organization duly authorized by it after survey or inspection to a diving system which complies with the requirements of the Code of Safety for Diving Systems. In every case, the Administration should assume full responsibility for the certificate.</p>	<p>resolution A. 831(19), as amended by resolution MSC.185(79), section 1.6</p>
	<p><b>Passenger submersible craft</b></p>	
	<p><b>Safety Compliance Certificate for Passenger Submersible Craft</b>            Applicable to submersible craft adapted to accommodate passengers and intended for underwater excursions with the pressure in the passenger compartment at or near one atmosphere.             A Design and Construction Document issued by the Administration should be attached to the Safety Compliance Certificate.</p>	<p>MSC/Circ.981, as amended by MSC/Circ.1125</p>
	<p><b>Dynamically supported craft</b></p>	
	<p><b>Dynamically Supported Craft Construction and Equipment Certificate</b>            To be issued after survey carried out in accordance with paragraph 1.5.1(a) of the Code of Safety for Dynamically Supported Craft.</p>	<p>DSC Code (resolution A.373(X), as amended) section 1.6</p>
	<p><b>Mobile offshore drilling units</b></p>	
	<p><b>Mobile Offshore Drilling Unit Safety Certificate</b>            To be issued after survey carried out in accordance with the provisions of the Code for the Construction and Equipment of Mobile Offshore Drilling Units, 1979, or, for units constructed on or after 1 May 1991, but before 1 January 2012, the Code for the Construction and Equipment of Drilling Units, 1989, or for units constructed on or after 1 January 2012, the Code for the Construction and Equipment of Drilling Units, 2009.</p>	<p>1979 MODU Code (resolution A.414(XI), as amended) section 1.6;            1989 MODU Code (resolution A.649(16), as amended) section 1.6;            2009 MODU Code (resolution A.1023(26), as amended), section 1.6</p>
	<p><b>Wing-In-Ground (WIG) Craft</b></p>	

No.	Contents	Reference
	<p><b>Wing-in-ground Craft Safety Certificate</b>            A certificate called a WIG Craft Safety Certificate should be issued after completion of an initial or renewal survey to a craft, which complies with the provisions of the Interim Guidelines for WIG craft.</p>	<p>MSC/Circ.1054, as amended by MSC/Circ.1126, section 9</p>
	<p><b>Permit to Operate WIG Craft</b>            A permit to operate should be issued by the Administration to certify compliance with the provisions of the Interim Guidelines for WIG craft.</p>	<p>MSC/Circ.1054, as amended by MSC/Circ.1126, section 10</p>
	<p><b>Noise levels</b></p>	
	<p><b>Noise Survey Report</b>            Applicable to existing ships to which SOLAS II-1/3-12 does not apply.             A noise survey report should be made for each ship in accordance with the Code on Noise Levels on Board Ships.</p>	<p>resolution A.468(XII), section 4.3</p>

## Appendix II Guidelines for the Use of Electronic Certificates



**E**

---

4 ALBERT EMBANKMENT  
LONDON SE1 7SR  
Telephone: +44 (0)20 7735 7611 Fax: +44 (0)20 7587 3210

FAL.5/Circ.39/Rev.2  
20 April 2016

### GUIDELINES FOR THE USE OF ELECTRONIC CERTIFICATES

- 1 The Facilitation Committee, at its fortieth session (4 to 8 April 2016), approved the attached *Guidelines for the use of electronic certificates* (the Guidelines).
- 2 Member Governments are invited to bring the Guidelines to the attention of all stakeholders, in particular, those who are involved in the process of issuance, maintenance, endorsement and revision of electronic certificates, such as recognized organizations, port State control officers, shipowners and crew, agents and vetting companies.
- 3 Member Governments are also invited to take the necessary actions at the national level to ensure that adequate legislation is in place for the use and acceptance of electronic certificates, as may be required.
- 4 Member Governments, international organizations and non-governmental organizations with consultative status are also invited to bring to the attention of the Committee, at the earliest opportunity, the results of the experience gained from the use of the Guidelines for consideration of action to be taken.
- 5 This circular revokes FAL.5/Circ.39/Rev.1.

\*\*\*

---

[https://edocs.imo.org/Final Documents/English/FAL.5-CIRC.39-REV.2 \(E\).docx](https://edocs.imo.org/Final Documents/English/FAL.5-CIRC.39-REV.2 (E).docx)



## ANNEX

### GUIDELINES FOR THE USE OF ELECTRONIC CERTIFICATES

#### 1 Introduction

1.1 The Organization aims to reduce the administrative burden on Administrations, port State control officials, ships' crews and other stakeholders caused, amongst other reasons, by reliance on traditional paper certificates.

1.2 Signed paper certificates issued by Governments and recognized organizations authorized to act on their behalf have been the traditional means of documenting compliance with IMO requirements.

1.3 Contracting Governments using electronic certificates, including printed versions of electronic certificates, have experienced instances of port State control officers or other stakeholders denying the validity of these certificates, resulting in a burden to the master and crew, shipowner or operator, port State control officers, Administration and other stakeholders.

1.4 In addition, ships have experienced instances of port State control actions because a traditional paper certificate has been issued but has not arrived on the ship or the traditional paper certificate has been damaged or lost.

1.5 Establishing a recognized set of features for using electronic certificates should help alleviate problems inherent in reliance on paper.

#### 2 Purpose

The purpose of these Guidelines is to facilitate the use and acceptance of electronic certificates.

#### 3 Definitions

For the purpose of these Guidelines:

- .1 *Certificate* means a document issued by an Administration or its representatives that is used to show compliance with IMO requirements and used to describe operating conditions, crewing requirements, and ship equipment carriage requirements. The term "certificate" does not include publications, manuals, instructions or ships' logs used to record ongoing operations;
- .2 *Electronic certificate* means a certificate issued in an electronic format;
- .3 *Electronic signature* means data in electronic form which is attached to or logically associated with other electronic data to serve as a method of authentication of the issuer and contents of the electronic data;

- .4 *Printed version of electronic certificate* means a paper printout produced from the electronic certificate;
- .5 *Unique tracking number* means a string of numbers, letters or symbols used as an identifier to distinguish an electronic certificate issued by an Administration or its representative from any other electronic certificate issued by the same Administration or its representative; and
- .6 *Verifying* means a reliable, secure and continuously available process to confirm the authenticity and validity of an electronic certificate using the unique tracking number and other data contained on or embedded in the electronic certificate.

#### **4 Features**

4.1 Administrations that use electronic certificates should ensure that these certificates have the following features:

- .1 validity and consistency with the format and content required by the relevant international convention or instrument, as applicable;
- .2 protected from edits, modifications or revisions other than those authorized by the issuer or the Administration;
- .3 a unique tracking number used for verification as defined in paragraphs 3.5 and 3.6; and
- .4 a printable and visible symbol that confirms the source of issuance.

4.2 Administrations that use websites for online viewing or verifying electronic certificates should ensure that these sites are constructed and managed in accordance with established information security standards for access control, fraud prevention, resistance to cyberattacks and resilience to man-made and natural disasters.<sup>1</sup>

4.3 Shipowners, operators and crews on ships that carry and use electronic certificates should ensure that these certificates are controlled through the safety management system, as described in section 11 of the International Safety Management Code.

4.4 Electronic signatures applied to electronic certificates should meet authentication standards, as adopted by the Administration.

#### **5 Verification**

Instructions for verifying (see paragraph 3.6) the information contained in the electronic certificate, including confirmation of periodic endorsements, when necessary, should be available on board the ship.

---

<sup>1</sup> Such as the International Organization for Standardization/International Electrotechnical Commission 27000 series standards and similar guidelines, including requirements of the Administration.



**6 Notifications**

Administrations deciding to issue or authorize issuance of electronic certificates are invited to inform the Committee on their experience. All Administrations are urged to communicate to the Organization through the relevant module in the Global Integrated Shipping Information System (GISIS), the list of certificates categories identified in FAL.2/Circ.127-MEPC.1/Circ.817-MS.C.1/Circ.1462 which will be issued by the Administration or its representative as electronic certificates.

**7 Acceptance**

All stakeholders should accept electronic certificates containing the features identified in section 4. These electronic certificates should be verified, when necessary, following the instructions available on board the ship (see paragraph 3.4). Furthermore, port State control officers, in accepting electronic certificates, should follow the *Procedures for Port State Control, 2011* (resolution A.1052(27)).

**8 Implementation**

Administrations should put in place the necessary procedures in order to ensure that all related stakeholders' needs, capacities and expectations are taken into consideration before and during the implementation of electronic certificates.

---

### Appendix III List of Questions for the Semi-Structured Interview

1. What do you think of the current cooperation and coordination mechanism for promoting ship e-certificate application in China?
2. To the best of your knowledge, how do you evaluate the technical difficulties in promoting ship e-certificate application in China?
3. To the best of your knowledge, how do you evaluate the non-technical difficulties (such as legal, policy, organizational, economic/political/social/cultural aspects, etc.) in promoting ship e-certificate application in China?
4. What are the good practices or examples, if any, in promoting ship e-certificate application in China?
5. What are the barriers or bottlenecks, if any, in promoting ship e-certificate application in China?
6. Please provide your suggestions, if any, for further improvements regarding ship e-certificate application in China.