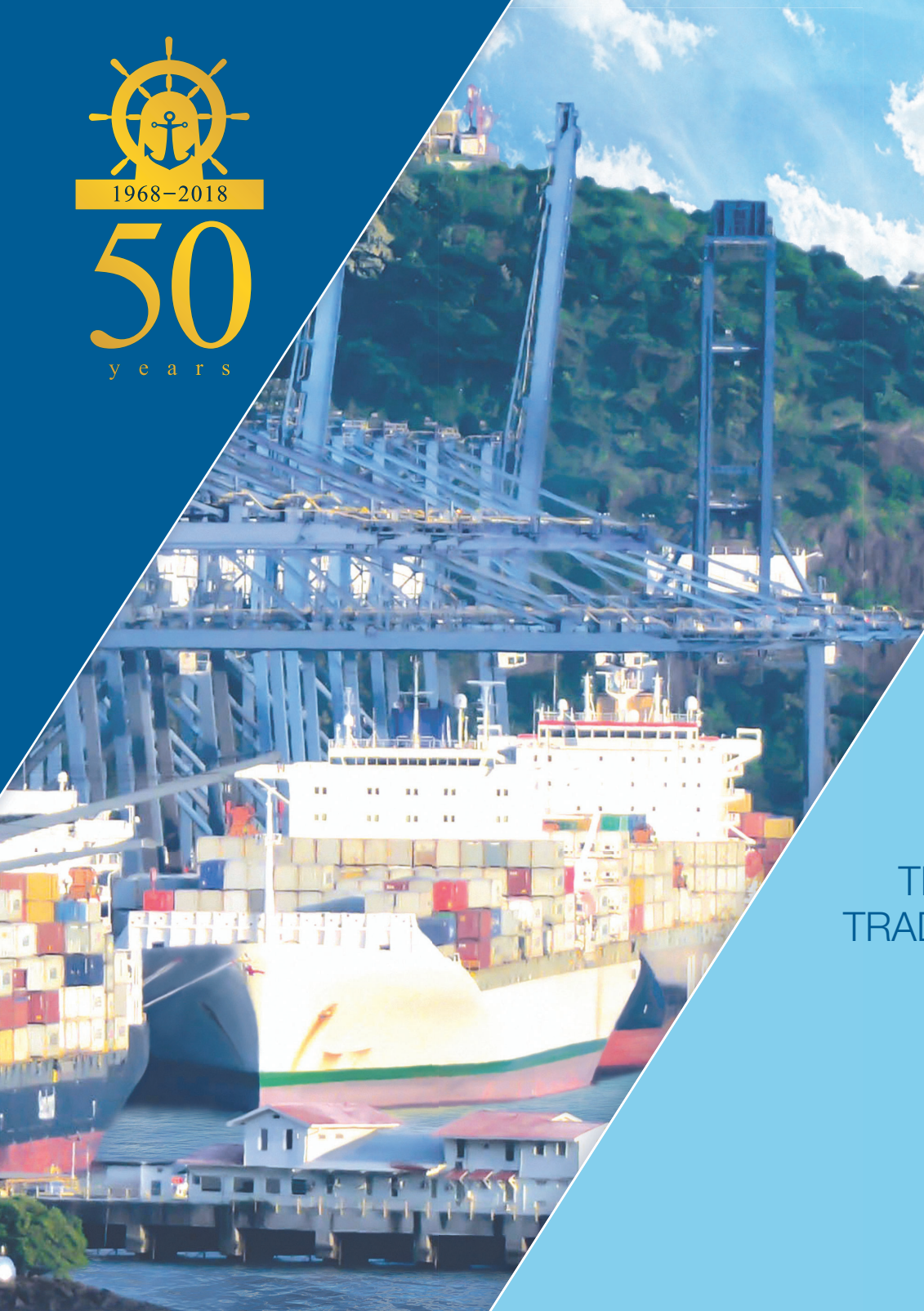




50 Years of Review of Maritime Transport, 1968-2018:

Reflecting on the past,
exploring the future



TRANSPORT AND
TRADE FACILITATION
Series No.10



UNITED NATIONS

**50 Years of Review of Maritime Transport, 1968-2018:
Reflecting on the past, exploring the future**

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Preface

Published for the first time in 1968, the UNCTAD annual Review of Maritime Transport (the Review) is the longest standing UNCTAD flagship report on record. For five decades, the Review has provided wide-ranging maritime transport data and statistics together with critical research and analyses that emphasized the strategic role of maritime transport as an enabler of trade and development.

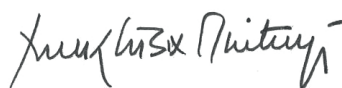
Fast-forward to 2018, the Review has become a reference for policy makers, researchers, academics, consultants, government agencies, as well as the maritime industry, including ports and shipping. I am pleased to see how this UNCTAD flagship report is now recognized as a 'must read' for all those interested in making informed and sound maritime transport policies and keen to understand the role of maritime transport as a trade and sustainable development enabling factor.

Today, developing countries, which have typically been users of international maritime transport services and mainly loading areas for raw materials, are increasingly participating in containerized trade flows and arising as suppliers of maritime transport services, among others, shipbuilding and registration as well as terminal handling operations.

UNCTAD's Review is unique and unrivaled. It remains the only global publication that annually covers relevant technical and policy aspects of maritime transport, combines both short term and long-term perspectives, supports sound maritime transport policy-making, informs relevant intergovernmental deliberations, while at the same time, bearing in mind the concerns of developing countries. To understand the unique contribution of the Review is to understand UNCTAD's efforts since the late 1960s to promote a level playing field and respond to developing countries' preoccupations over the prevailing shipping market structure, which undermined their ability to participate in global maritime transport services on equal footing with their developed countries' partners.

This special commemorative issue is timely and auspicious as the 50th anniversary is taking place at the intersection of several developments. The anniversary coincides with the world community committing to achieving a sustainable development path, a climate-friendly world and prosperity for all. It also coincides with early stages of the Fourth Industrial revolution driven by digitalization, with its myriad of challenges and opportunities. It is also taking place at a time of growing trade policy risks that could undermine a multilateral rule-based trading system and dampen the demand for maritime transport, which handles over 80 per cent of world trade volumes. Together, these new realities underscore the imperative for UNCTAD to reflect on how best the Review can continue to report on relevant developments and generate useful insights and requisite data that underpin evidence-based maritime transport policy-making.

I am confident that this Special Issue celebrating the 50th anniversary of the Review will help initiate a collective thinking process and start the debate among all stakeholders and users of this UNCTAD publication, in particular governments, industry and academia, about its future. This reflection will help ascertain ways in which, in an ever-changing world, the Review can continue to effectively respond to developing countries' needs for a level playing field in maritime transport that also promotes sustainable development objectives.



Dr Mukhisa Kituyi
Secretary General
UNCTAD

Acknowledgements

Prepared under the overall direction of Ms. Shamika N. Sirimanne, Director, Division on Technology and Logistics (DTL), the present study “50 years of Review of Maritime Transport, 1968–2018: Reflecting on the past, exploring the future” is a collaborative effort aimed at celebrating the 50th Anniversary of UNCTAD’s *Review of Maritime Transport (RMT)*. The Special Issue project was managed by the Trade Logistics Branch, DTL, namely Hassiba Benamara, Jan Hoffmann and Frida Youssef.

Our gratitude goes to Mary R Brooks (Professor Emerita, Dalhousie University, Halifax, Canada) and Peter Faust (Former Head, Trade Logistics Branch, UNCTAD), the two leading authors, for their valuable and insightful contributions. Peter Faust contributed Chapter 2, which presents the historical perspective of *Review of Maritime Transport*. The Chapter highlights *RMT*’s main intellectual contributions over the past half-century and describes the key events that have shaped the structure and general orientation of the publication. Mary R. Brooks shared her perspective regarding how maritime transport is expected to evolve over the next decades and highlighted potential implications for *RMT* (Chapter 4). She also compiled and edited the full manuscript and integrated contributions received.

We extend our deep appreciation to the eminent essayists who were invited to contribute to the Special Issue. These were Kitack Lim, Secretary General of the International Maritime Organization (IMO); Cleopatra Doumbia-Henry, President of the World Maritime University (WMU); Serigne Thiam Diop, Former Secretary General of the Union of African Shippers Councils (UASC); Peter Hinchliffe, Former Secretary General of the International Chamber of Shipping (ICS); Martin Stopford, President of Clarkson Research Services Limited; Patrick Verhoeven, Managing Director of the International Association of Ports and Harbors (IAPH); and Chris Welsh, Former Secretary General of the Global Shippers’ Forum (GSF). They have generously shared their views on how they see the future of maritime transport unfold over the coming decades and how *RMT* can help improve understanding of relevant emerging issues and their implications, in support of developing countries trade and development.

Last but not least, this Special Issue was informed by the views received from a number of UNCTAD colleagues and some members of the International Association of Maritime Economists (IAME). They kindly took the time to respond to an informal opinion survey distributed in June 2018. A special thank-you is extended to all.

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Abbreviations

AI	artificial intelligence
AIS	Automatic Identification System
ASD	Agenda for Sustainable Development
BRI	Belt and Road Initiative
CO ₂	carbon dioxide
DWT	dead-weight ton
EU	European Union
GATS	General Agreement on Trade in Services
GATT	General Agreement on Tariffs and Trade
GDP	gross domestic product
GHG	greenhouse gas
IAME	International Association of Maritime Economists
ICS	International Chamber of Shipping
ICT	Information and Communication Technologies
ILO	International Labour Organization
IMO	International Maritime Organization
ITF	International Transport Forum
IoT	Internet of Things
JIT	just-in-time
LSCI	Liner Shipping Connectivity Index
LSBCI	Liner Shipping Bilateral Connectivity Index
LDCs	least developed countries
LNG	liquefied natural gas
MTO	multimodal transport operator
NO _x	nitrogen oxide
OECD	Organization for Economic Co-operation and Development
<i>RMT</i>	<i>Review of Maritime Transport</i>
SDG	Sustainable Development Goals
SIDS	small island developing states
SO _x	sulphur oxide
TEU	20-foot equivalent unit
TFA	Trade Facilitation Agreement
UNCTAD	United Nations Conference on Trade and Development
ULCC	ultra large crude carrier
WTO	World Trade Organization

50 Years of Review of Maritime Transport, 1968–2018: Reflecting on the past, exploring the future

1.0 Introduction and Editorial Overview

By UNCTAD secretariat

Established in 1964, the United Nations Conference on Trade and Development (UNCTAD), published its annual *Review of Maritime Transport (RMT)* for the first time in 1968. *RMT* is part of UNCTAD's research and analytical work in the field of maritime transport aimed at helping developing countries maximize their trade and investment opportunities and increase their participation in the world economy. In October 2018, UNCTAD will publish the 50th annual edition of *RMT* and to celebrate this achievement it has commissioned this Special Issue, with contributions from a number of individuals.¹

The Special Issue has three purposes: (1) to examine the history of *RMT* over the past 50 years (Chapter 2); (2) to publish contributed essays representing the views of selected experts, scholars and industry executives (Chapter 3), and (3) bearing in mind the perspective of developing countries and UNCTAD's mandate in support of developing countries' trade and development, offer a forward-looking assessment of *RMT* and explore some relevant thematic areas for future research and analysis (Chapter 4). Therefore, this Special Issue is divided into four substantive chapters.

First, a history of *Review of Maritime Transport* is presented in Chapter 2. The Chapter recalls the *raison d'être* of *RMT*, its foundations, structure, purpose, and thematic areas. It offers a historical account of *RMT*, issues analysed over the years, insights gained and its main intellectual and policy contributions over the 1968–2018 period. It also highlights relevant events and milestones that have shaped the content and orientation of *RMT*, including political, institutional, economic and technological. Furthermore, it overlays the evolution of *RMT* with the evolution of UNCTAD's mandate and shifts in its internal structures. For those looking for an understanding of how the industry evolved over the last 50 years, Chapter 2 provides an excellent foundation for thinking about 'What's Next?'

Second, UNCTAD sought contributions from seven selected eminent guest essayists, chosen for their expertise and role within the industry. Their contributions presented in Chapter 3 were to answer two questions: (1) From your perspective, what do you think the future holds for the maritime transport sector in the near, medium and long term (within next 5 years, 5–19 years, 20–50 years)? (2) Are there particular issues, themes and topics that will shape maritime trade and logistics in those time frames? What does this mean for the direction of UNCTAD's annual *RMT* publication? Each contributed essay has focused on what the essayist believes will be critical to address as UNCTAD contemplates the future issues of *Review of Maritime*

¹ The views presented in Chapters 2, 3 and 4 are those of the authors and do not necessarily represent the views of the United Nations.

Transport. Each may be read in isolation or when referred to in the text, as suits varying reading styles.

Third, a forward-facing chapter (Chapter 4) looks at changing times, and what might be expected in our uncertain future. In addition to a literature review, which explored a variety of topics, an informal opinion survey was conducted by the author, Professor Emerita Mary Brooks. Three groups of participants (selected UNCTAD secretariat staff, a number of UNCTAD collaborators and partners, and members of the International Association of Maritime Economists (IAME)) were invited to provide their opinions on what topics they believed would be important and relevant to discuss in the Special Issue, and what UNCTAD might expect in future in the areas of technology, regulation and future trends. While UNCTAD will continue to be guided by its mandate and respond to ongoing developments, in particular those of interest to the trade and transport of developing countries, this exercise has generated some thoughts and ideas which may be worth exploring. Chapter 4 draws on the views expressed by the respondents to the opinion survey and examines the most important and relevant topics as seen by the 22 UNCTAD secretariat staff and invited partners and collaborators, as well as the 34 opinion survey respondents from the IAME. Relevant literature to understand these topics was identified and reviewed. This literature and forward-looking studies presented in section 4.5 offer a sense of the possible futures that UNCTAD and the maritime transport community may be facing in the years to come. Sections 4.2–4.4 of this chapter focus on three key drivers in the future—technologies and the opportunities they offer, regulation and the impact it has in shaping the future world, and factors beyond business and government control. It then closes with a discussion on what existing research indicates as to the kind of future *RMT* could be facing.

The last chapter (Chapter 5) draws concluding remarks and focuses on the direction *Review of Maritime Transport* might go in the future. This will start the thinking process about the content and scope of *RMT*—what is needed and what is likely to be needed as *RMT* addresses the trade and maritime transport challenges of the future.

2.0 Review of Maritime Transport – A Historical Perspective

Reflections by Peter Faust, Transport and Trade Facilitation Advisor, Former Head of the Trade Logistics Branch, UNCTAD

2.1 Introduction—UNCTAD and Shipping

When assessing the work of UNCTAD in shipping in general and the development of *Review of Maritime Transport (RMT)* in particular, it is useful to reflect on the approach adopted by UNCTAD in the face of developments and changes experienced over time since its inception. Helping developing countries promote their international trade and creating a stable and a more equitable world economy serving the interest of all people has always been at the centre of UNCTAD's mandate. Two elements in this mandate need to be considered. First, the approach of a trade-based development process—one that is particularly and directly relevant for assessing the role of *RMT* over the last 50 years—and, secondly, the perception of creating a more equitable and stable world economy by better integrating developing countries therein.

It was evident from the beginning that maritime transport, as an important element of trade transaction costs, needed to be addressed if trade-based development was to be seen as a functional and sustainable concept. In fact, the way trade costs were being considered by UNCTAD, namely as a systemic issue affecting development prospects, was distinctly different from the trade negotiations approach under the General Agreement on Tariffs and Trade (GATT) or later the World Trade Organization (WTO) looking primarily at trade-related governmental policies.

The purpose of this chapter is not to address the broad underlying global policy developments that characterized the 1960s and 1970s and their impact on developing countries, and hence also on UNCTAD. Instead, the paper looks at the very specific role that shipping has played in the world trade and development process and how this was reflected in *RMT*.

When UNCTAD was created in 1964, the issue of 'shipping' was one of the first to be on the agenda of the organization. At the first quadrennial conference of UNCTAD (UNCTAD I), held in Santiago de Chile in 1964, a permanent working party was established to consider how maritime transport could best contribute to enhancing the foreign trade of developing countries and improve their development prospects. Hence, deliberations on maritime transport commenced with the premise that shipping services were an indispensable industrial service that fosters the development of trade rather than as a service sector in its own right in which developing countries could have a competitive advantage. This second distinct aspect was added only later to the shipping agenda of UNCTAD. This general approach, however, needed to be translated into operational concepts that reconciled existing commercial shipping practices and the trade and development needs of developing countries. In brief, these related to two major aspects of global shipping, namely

- access by developing countries to adequate shipping services, including shipper/carrier relations and
- the development of merchant fleets by developing countries.

These broad categories of shipping issues have been at the root of UNCTAD deliberations on shipping ever since its establishment and have consequently underpinned the analyses

undertaken in *RMT* as well as other publications on shipping prepared and published by UNCTAD. Over time, *RMT* has become an indispensable tool for industry analysts and policymakers. They use *RMT* to better understand the industry and make rational decisions on national regulatory and promotional policies. They also value the publication as a comprehensive and up-to-date support for international deliberations.¹ This is important in understanding the success and continued need for *RMT*. The link between the short- and long-term perspectives provided by *RMT* confirms its value and contribution and makes it distinct from publications focusing on day-to-day market developments ably produced and published by industry sources.

The broad coverage of shipping and related developments in *RMT* did, of course, see some adjustments over the 50 years of its existence. Just as the shipping industry is dynamic, *RMT* has reflected this dynamism through different approaches and new topics taken up either as permanent features or on an ad hoc basis. Additionally, *RMT* saw some changes in its role as policy support document over time. Most notable in this context is the change in the role of UNCTAD that was decided at the eighth session of UNCTAD's Conference in Cartagena, Colombia in 1992. The conference removed the negotiating mandate from UNCTAD and changed the nature of the organization from a negotiating, rule-setting organization to a knowledge-based capacity-building one (Behnam & Faust, 2004). At about the same time, international deliberations and negotiations on economic and commercial aspects of shipping were limited to deliberations taking place in a broader context such as, for instance, under the General Agreement on Trade in Services (GATS) of the WTO.²

2.2 Seaborne Trade Volume and Structure

Seaborne trade volumes

Over the last 50 years seaborne trade has seen a remarkable development. Shipping carries the vast majority of international trade with its share ranging between 80 and 90 per cent of trade. This predominance is particularly pronounced in developing countries where trade structures including the low volumes of intraregional trade leave limited space for land transport and air transport. In terms of trade value, of course, the shipping share is considerably lower with various estimates hovering around 60 to 70 per cent of trade. Meanwhile, air transport, including express carriage, is on the rise, making considerable inroads in the field of higher valued cargoes.

Table 2.1 provides long-term trends in seaborne trade since 1970. *RMT* data reveal the shift from liquid to dry bulk as the driver of global seaborne trade. This change is largely rooted in the 1980s, a decade that saw a decrease in oil and gas trade (including products) of about 10 per cent, reflecting a decline in petroleum consumption in main consumer countries after the

¹ As stated in the introduction to *RMT* 1968 and somewhat revised in 1974 where a stronger emphasis is being placed on global developments:

"The purpose of this review is to present statistical evidence of developments in international maritime transport and to comment on these developments, with special reference to factors affecting the trade and shipping of developing countries." (1968).

"Statistical evidence and other information with regard to the development of international maritime transport is presented and discussed in the review with a view to relating year-to-year developments to relatively longer-term trends in world shipping. Particular attention is given to factors and developments affecting the trade and shipping of developing countries." (1974).

² See also the discussion on market access in section 2.3.

oil shocks of the 1970s (UNCTAD *RMT*, various; Hamilton, 2013), whereas main bulks (i.e., iron ore, grain, coal, and phosphate rock) increased by about 60 per cent. Hence in 1970 oil and gas amounted to about 55 per cent of total seaborne trade, while this share had dropped to about 30 per cent in 2017. This structural shift was further emphasized by the rapid development in manufactures trade, which is included under 'Dry cargo other than main bulks' in Table 2.1.

RMT has always been concerned about developing countries' participation in world trade. Key questions are: 'Who generates trade and where does it go?'. In other words, where is the cargo loaded and unloaded? Figure 2.1 features international seaborne trade in terms of volumes loaded between 1970 and 2017.

Table 2.1: International seaborne trade development in selected years
(Millions of tons loaded)

Year	Crude oil, Petroleum products & Gas	Main bulks ^a	Dry cargo other than main bulks ^a	Total (all cargoes)
1970	1 440	448	717	2 605
1980	1 871	608	1 225	3 704
1990	1 755	988	1 265	4 008
2000	2 163	1 295	2 526	5 984
2005	2 422	1 711	2 976	7 109
2006	2 698	1 713	3 289	7 701
2007	2 747	1 840	3 447	8 034
2008	2 742	1 946	3 541	8 229
2009	2 642	2 022	3 194	7 858
2010	2 772	2 259	3 378	8 409
2011	2 794	2 392	3 599	8 785
2012	2 841	2 594	3 762	9 197
2013	2 829	2 761	3 924	9 514
2014	2 825	2 988	4 030	9 843
2015	2 932	2 961	4 131	10 024
2016	3 055	3 041	4 193	10 289
2017	3 146	3 196	4 360	10 702

Note: a: figures for "Main bulks" include iron ore, grain, coal, bauxite/alumina and phosphate. Starting in 2006, "Main bulks" include iron ore, grain and coal only. Data relating to bauxite/alumina and phosphate are included under "Dry cargo other than main bulks".

Source: UNCTAD. *Review of Maritime Transport* 2018, Table 1.3.

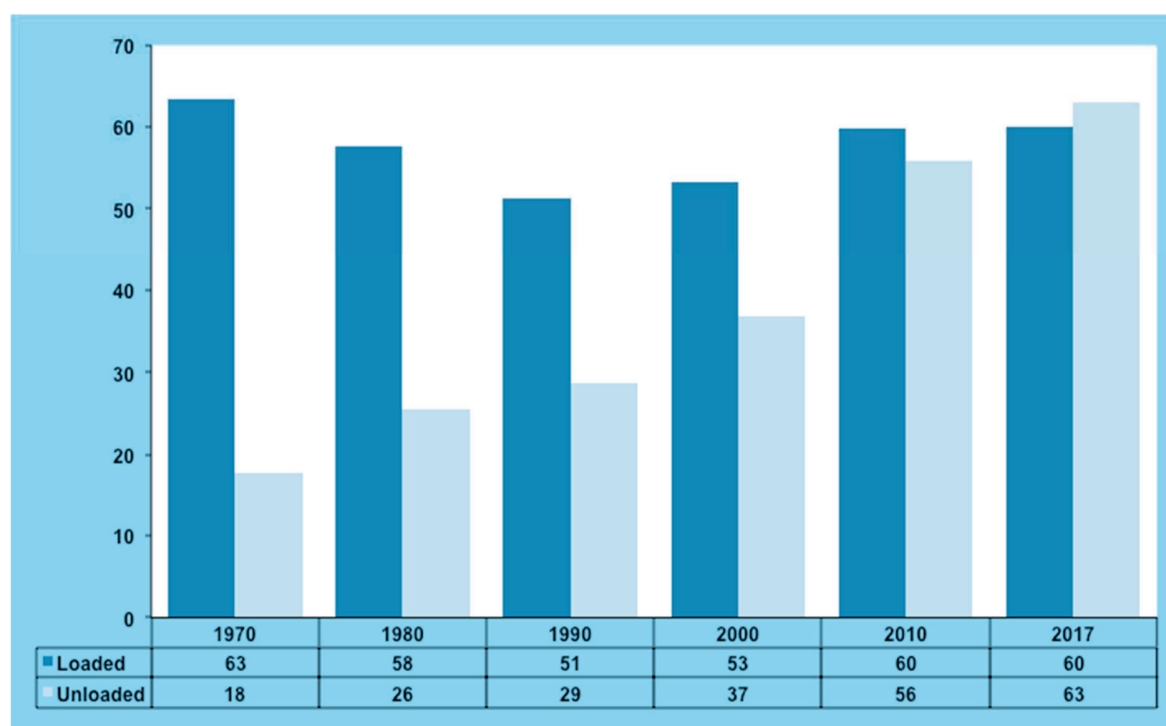
Two elements in Table 2.1 merit particular attention. First, over time, developing countries have been the main exporting countries for world trade with nearly two-thirds originating in their territories. The 1980s showed a decline reflecting oil trade developments. On the importing side, developing countries did not figure very prominently until the year 2000. Before that, we clearly had a colonial trade patterns where developing countries exported raw materials and imported—as marginal players—mainly consumer goods. Since 2000, the situation has changed dramatically with many developing countries being involved in in

primary product trades but also major exporters and importers of finished and semi-finished products.

Participation in international trade has, however, not developed equally in all developing regions.

Growing imbalances are characterizing the process of which Figure 2.1 provides a snapshot. The decline in African participation, particularly in terms of goods loaded, reflects the decreasing relative importance of traditional African exporters of liquid and dry bulk cargoes. This decline was only partly compensated for by alternative African raw material sources and not by expanding exports of manufactured or processed food products. Equally notable has been the relative decline of Latin American countries as trade generators. On the contrary, Asian countries have experienced a large increase in intraregional trade mostly based on manufactures trades. This structural change could not be observed in Africa and only to a limited extent in South America, due to some extent to the similarities in factor endowments in the region and also to limitations in infrastructure and transport and shipping services (Table 2.2).

Figure 2.1: Participation of developing countries in world seaborne trade in selected years (Percentage share in world trade)



Source: UNCTAD. *Review of Maritime Transport*, various issues.

The geography of trade

Another element that has always been important for UNCTAD relates to the direction and structure of trade, or in the widest sense the 'Geography of Trade'. Topics addressed include inter alia:

- Wide differences in developing countries development levels
- South–South trade expansion
- The dynamic development of intra-regional trade and
- The emergence and further development of developing countries in manufactures trade, including their participation in global supply chains.

Table 2.2: Participation of developing regions in world seaborne trade

Year	Loaded/ Unloaded	Total developing countries	Africa	Developing America	Developing Asia
1967	Loaded	63	12	19	31
	Unloaded	19	3	7	8
2000	Loaded	53	6	12	31
	Unloaded	37	3	6	21
2017	Loaded	60	7	13	40
	Unloaded	63	5	6	53

Source: UNCTAD. *Review of Maritime Transport*, various issues.

Changes in trade structures have also been made possible through developments in maritime transport. Better services in terms of quality and price allowed developing countries to benefit from trading opportunities in the context of the New Geography of Trade. The New Geography does not necessarily imply a substitution of North–South trade but rather a diversification of trading partners. Developments in trade have been primarily considered in other relevant UNCTAD publications, both recurrent and ad hoc ones. Of particular relevance in this context is the annual ‘Trade and Development Report’ and other specific publications on developments in international merchandise trade (e.g., UNCTAD, 2013), which directly relate to maritime transport issues covered by *RMT*.

The increase in world trade over the last decades has to a large extent been driven by the rise in trade between developing countries.

As of 2011, the value of trade between developing countries (South–South) is almost as high as that of trade between developed countries (North–North). In terms of share of world trade, South–South trade has risen from less than a tenth in 1980 to almost a third of world trade in 2011 (UNCTAD, 2013). On the other hand, North–North trade has increased at a much lower rate. As a result, the relative importance of North–North trade has declined over time, falling from almost half of world trade in 1980 to around one-third in 2011. Trade between developed and developing countries accounts for 40 per cent of world trade, with their respective exports being fairly on par.

Global supply chains

Another element that has characterized trade development in this millennium is the increasing importance of intra-industry trade with the rise of globalized production processes and supply chains. Developing countries particularly in East and Southeast Asia have increasingly become part of global supply chains. For seaborne trade, this implies increasing demands in

terms of service quality, particularly reliability in the context of just-in-time (JIT) deliveries, service frequencies and low transport costs.

A continuous stream of technological advances has also affected—and continues to affect—the world economy and existing organizational and social structures. The growing division of labour leads to increasing numbers of separate economic activities (production of components) to produce a given end product. Thus, on average, more than half of the output of firms in industrialized countries is now produced and/or sold abroad while the same proportion of raw materials or intermediate products is imported from abroad and may possibly be purchased from foreign affiliates (UNCTAD, 2013). Consequently, many markets have become increasingly international and interdependent.

The trend towards globalization of production and markets has posed enormous challenges and influenced production and transportation patterns and requirements. They raised new challenges for national governments, particularly of developing countries, in the management of their economic and social development.

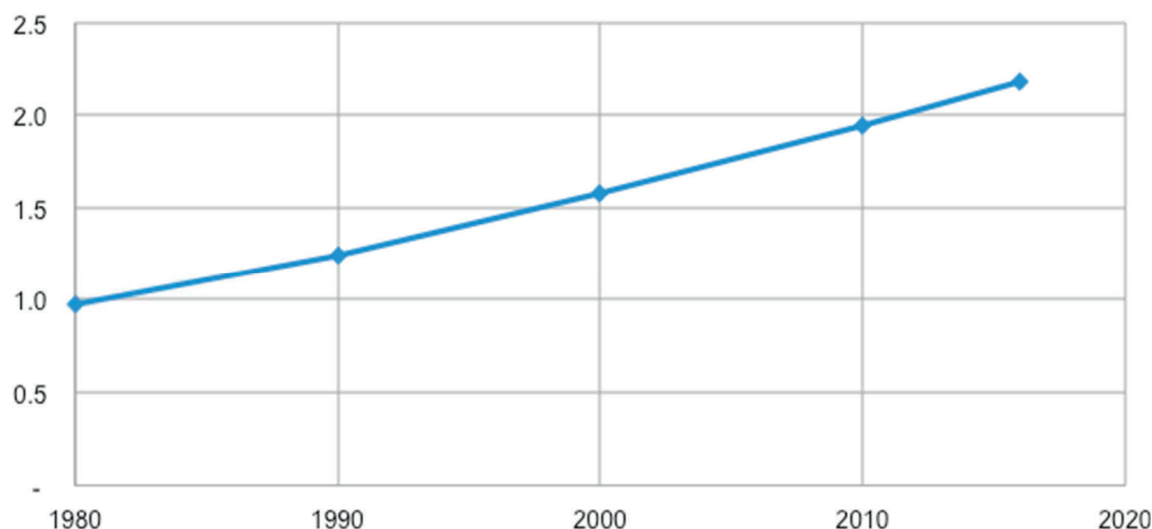
Along with the development of trade in intermediate goods, RMT documented a change in transport requirements of international trade in manufactures.

Just-in-time requirements have resulted in smaller, more frequent shipments to reduce warehousing costs at the receivers' end. This, in turn, has increased demands on shipment costs and reliability to ensure the uninterrupted implementation of planned production processes. At the same time, JIT has led to a changing relationship between transport and warehousing cost. As can be seen in Figure 2.2, the share of transportation costs in total logistics costs is constantly increasing, while there is a corresponding decrease in warehousing costs. In 1980, warehousing and transport costs were still at about the same level and the share of transport slowly increased to 55 per cent after a decade. Since 1995, JIT has grown with transport costs being more than twice the inventory costs by 2016.

Although the data in Figure 2.2 reflects the situation specific to the United States (US), it describes an important global relationship: as expenditures on transport go up, expenditures on inventory holding go down. This does not mean that transport has become more expensive; in fact, the opposite is true. As transport has become less costly and more important, traders prefer to buy timely, fast and possibly more expansive transport services rather than pay for inventory holding. The increase in trade in intermediates has particularly benefitted from container transport developments. Availability of shipping space at competitive rates on various container trade routes has characterized shipping markets for most of the last two decades, and thus has driven trade in intermediates, particularly in East Asia.

Meanwhile, developing countries of Africa and America, with the notable exception of Brazil, have to a much lesser extent managed to participate in global supply chains and the consequent growth in production and trade. Available information shows that countries of these regions still very much depend on exports of raw materials (UNCTAD, 2013).

Figure 2.2: Ratio of expenditures on transport to inventory holdings within logistics costs in the United States



Source: UNCTAD, based on the annual State of Logistics Report of the Council of Supply Chain Management Professionals, various issues.

RMT has related these trends to developments in container transport by sea, both regionally and globally. As a regular feature, *RMT* has over the years looked at container shipping, which can be seen as a proxy for developments in globalized production processes and international supply chains. Persistent growth of intraregional trade in intermediate and consumer goods over recent years, particularly intra-Asian trades of China, has considerably supported container trade growth and added an element of stability to the generally volatile container trade environment (Figure 2.3).

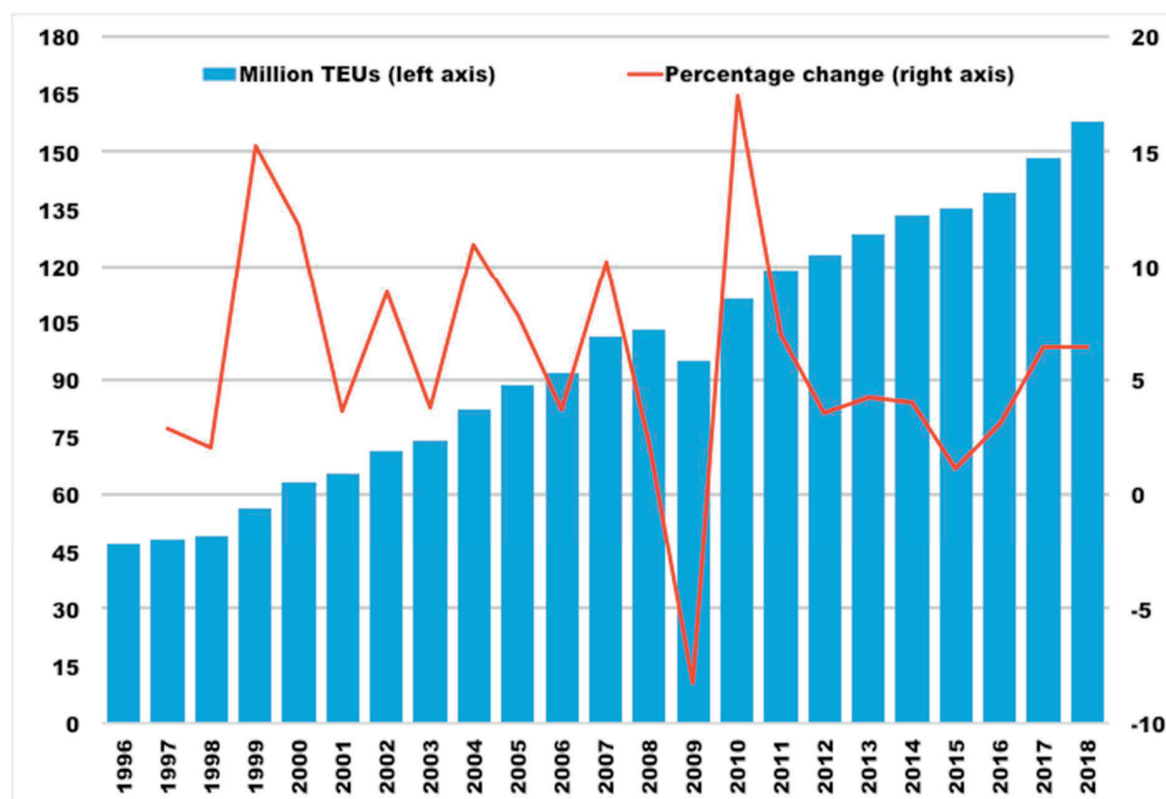
Liner Shipping Connectivity Index (LSCI)

High transport costs remain the greatest impediment to developing countries' trade competitiveness and equitable access to global markets. Improved maritime connectivity should be at the core of any strategy that aims to stimulate exports and promote participation of national economies in the global production chains. Such improvement could only contribute to the reduction of transport costs. Unequal and imbalanced countries' participation in global supply chains and trade is reflected in the liner shipping connectivity of the different regions. This can be observed when looking at the country values of the LSCI developed by UNCTAD in 2004.

The starting point when measuring the liner shipping connectivity is the country's volume of containerized trade given its role in attracting liner shipping services. It can be said that 'supply follows demand'. At the same time, however, demand follows supply.

Increased connectivity, lower transport costs, and trade facilitation are important determinants of competitiveness that explain trade volumes and growth.

Figure 2.3: Global container trade since 1996
(Million TEU and annual percentage change)



Source: UNCTAD. *Review of Maritime Transport 2018*.

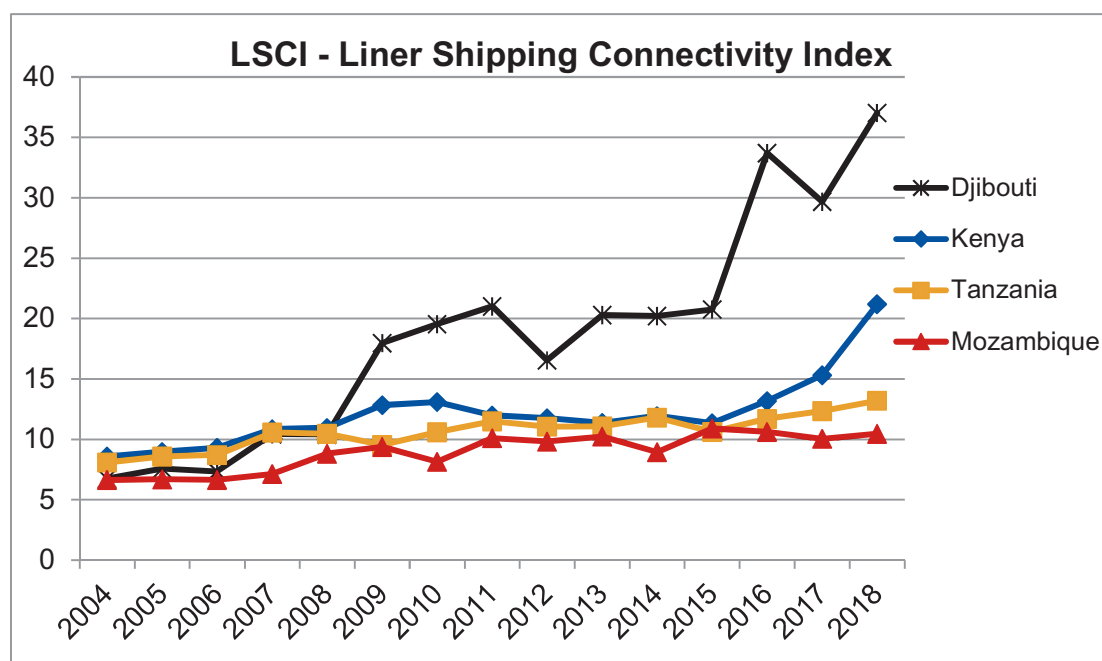
Two underlying reflections have led to the development of the LSCI. First, there is a clear linkage between trade costs and connectivity. Transport connectivity, together with logistics performance, are major determinants of trade costs and hence of economic distances of developing countries from markets. Secondly, developing countries' regional and interregional trades are mostly carried by sea.

It was thus only natural that the issue of connectivity be addressed as one of 'maritime' connectivity and more specifically as one of 'liner shipping' connectivity, since in the latter case, bulk shipping is available on demand and subject to more specific or restrictive connectivity criteria, such as availability of port facilities.

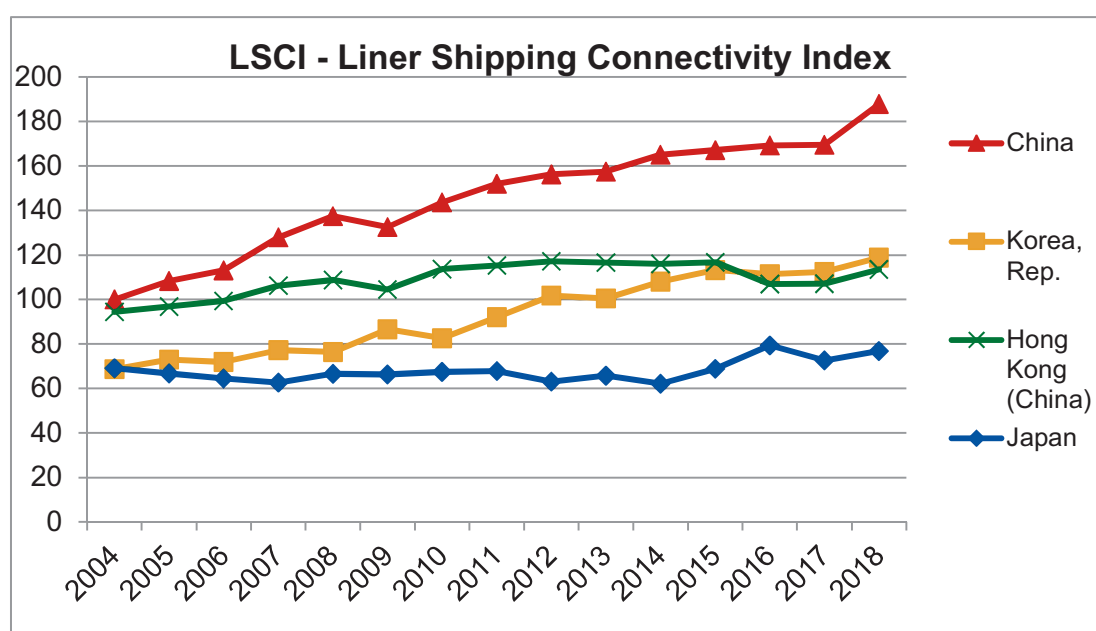
Connectivity has been considered by UNCTAD and regularly reflected in *RMT* at the country and bilateral trade level. To compare and analyse countries' positions within the global liner shipping network, the LSCI generated from the schedules of the world's container shipping fleet, uses five components: the number of ships deployed to and from each country's seaports, their combined container-carrying capacity, the number of companies that provide regular services, the number of services and the size of the largest ship. Figure 2.4 illustrates the indices and connectivity trends in the Far East and East Africa, reflecting the much-advanced integration of Far Eastern countries in global trade as opposed to the East African region.

Figure 2.4: Development of connectivity of East African and Far Eastern countries, 2004–2018

a. East Africa



b. Far East



Source: UNCTAD, based on the LSCI as published by UNCTAD under <http://stats.unctad.org/LSCI>

The Liner Shipping Bilateral Connectivity Index (LSBCI) is more complex and considers the liner shipping connections between two countries. The most straightforward connection would be a direct one, but consideration of direct services only would give a partial view of options available to shippers in a particular trade. Given the operational characteristics of container transport and the development of global networks by individual carriers or by global alliances, shippers increasingly have access to trans-shipment trades, which may be better and more cost-efficient services than direct ones. This holds particularly true for the developing countries that have very few direct services with severe adequacy issues. Thus, the LSBCI reflects the state of play in terms of direct and trans-shipment services as well as their operational characteristics, such as the number of trans-shipments, the level of competition among carriers, the size of vessels on individual legs, etc. (RMT, 2017 and referred sources).

2.3 Users and Suppliers of Shipping Services—Shipper/Carrier Relations

Freight rates and conference pricing

Since inception, UNCTAD has taken a very close look at the impact of maritime transport on the performance of developing countries. This was the case with regard to both bulk and liner trades. At the same time the work was supported by constant data flows disseminated through RMT. Market organization and pricing issues were at the root of work on trade costs as well as the protection of shippers' interests and fleet developments.

One reason for the early interest in the level and structure of freight rates was the realization that developing countries in their typical trades were the ones that would bear the incidence of high freight costs both in export and import trades. In a very important report (UNCTAD, 1969) that had considerable influence on the intergovernmental work of UNCTAD in the 1970s it was found:

For many of the world's agricultural products, on which developing countries rely for much of their export earnings... the elasticity of demand facing the individual supplier or the whole group of suppliers in a single country is likely to be relatively high. Most primary commodities are produced from a number of sources or have substitutes, the growing range of synthetics being particularly important in this respect. The supplier in these cases therefore normally bears the bulk of the transport costs and any increase in these costs is matched by an almost equal decline in his net receipts per unit sold; in other words, an increase in transport costs, other things remaining equal, has more effect on lowering f.o.b. prices than on raising c.i.f. prices (UNCTAD, 1969).

As to the impact of transport costs on the imports of developing countries, the report states:

Although the elasticities of demand for many manufactured products tend to be relatively high in developing countries, they remain lower than the elasticities of their supply to the countries concerned. ... In developing countries, the demand for manufactured products has a high price elasticity in the consumer goods range, but normally a low-price elasticity in the capital goods range, since these are necessary for development. However, since any individual developing country normally accounts for a relatively small proportion of the total market of any manufacturer in a developed country, the supply elasticity of these goods to the developing country is usually very much higher than the demand elasticity.... Because the over-all market is relatively small, it is generally uneconomic for a large number of manufacturers to establish distribution channels in each developing country. The result is that once one or two

manufacturers have established export connections in a particular developing country, it ceases to be economical for other manufacturers of similar products to enter the market in competition. The result is that the demand for the product of any individual manufacturer is, in its elasticity, very close to the entire demand for that product (UNCTAD, 1969).

Another issue was of considerable importance to developing countries and to UNCTAD in the 1960s and 1970s. As developing countries were largely producers and exporters of raw materials at the time, increasing efforts were being undertaken or at least contemplated to engage in downstream activities and export semi-finished products rather than raw materials. The question relating to the location of downstream activities, i.e., in the exporting or importing country, is also one of differences in freight costs of raw materials and semi-finished products. Hence, two developments that adversely affected potential growth of downstream activities unfolded. On the one hand, there was permanent downward pressure on bulk freight costs, thus reducing the need to create geographic linkages between raw materials exploration and first processing steps in developing countries. Iron ore trades may serve as an example here. Low freight costs enabled importers to continue carrying iron ore even low Fe content ores with a high waste content to the importing country rather than installing processing facilities in exporting countries. Secondly, rate differences between ship sizes and types like general cargo and bulk, for instance, were such that the potential benefits of preliminary processing were largely negated. Additionally, the question of customs tariffs arises, which may increase with the degree of processing.

In liner shipping, conference practices and pricing were of permanent concern to developing countries in the early years of UNCTAD. Liner conferences are groups of shipping lines operating on specific routes with basic agreements for charging uniform rates, for allocating routes, berthing and sailing rights, and for pooling cargo and revenues. From the earliest days there has accordingly been considerable discontent on the part of shippers, who complained that the monopoly power of the conferences had led to abuse. Specifically, this discontent related to rate setting that is based on the argument of 'what the traffic can bear' as well as to lack of transparency in rate setting, limited consultations, loyalty arrangements and abuses thereof, discrimination of shippers, and excessive resort to rate surcharges without prior consultations (e.g., port surcharges, bunker adjustment factors [BAF], and currency adjustment factors [CAF]). Furthermore, rate levels were considered unjustifiably high as conferences tended to fix freight rates at levels that allowed conference member lines, including the highest-cost lines, to make profits.

Over the years *RMT* closely monitored freight rate developments both as far as base rates and surcharges were concerned. Additionally, it provided assistance to shippers' organizations to conduct negotiations with conferences on freight rates and other issues of service adequacy.

The Code of Conduct³

For more than 100 years, liner conferences had provided the organizational framework within which liner shipping developed as a largely self-regulated industry. Despite apparent shortcomings, they were generally recognized as beneficial for trade, both from the point of view of the suppliers and the users of liner shipping. The inherent adverse effects on competition were either tacitly or expressly accepted, with the notable exception of the US where 'open conferences' developed. Regulatory action taken at the national, regional and international levels did not necessarily call into question the existence of conferences but was rather geared at avoiding abuses to which the system might lend itself.⁴

Dissatisfaction with the conference system and the way it functioned was at the root of growing concerns over the quality of general cargo shipping services available to developing countries.

Studies undertaken by the UNCTAD secretariat in the 1960s helped to structure intergovernmental deliberations and put in perspective RMT data.

These were, first, the two documents on the establishment and development of freight rates (UNCTAD, 1969) and on the economic impact of the establishment of merchant marines (UNCTAD, 1968). These two documents gave factual information on the issues under consideration and were of particular importance for policymakers in developing countries. They helped them to better understand the underlying economic logic and to arrive at rational decisions regarding the potential need to adjust shipping services available to them. Thus, the deliberations at the Third Conference of UNCTAD (UNCTAD III) concluded that:

The points of view of developed countries, on the one hand, and of developing countries, on the other, on questions relating to shipping and ports appear now to be better understood and more amenable to discussion as a result of the consideration of these matters within the Committee on Shipping. At its most recent session (January 1972) the Working Group (on International Shipping Legislation) discussed the question of a draft code of conduct for liner conference practices and transmitted its resolution on this subject to the third session of the Conference. (UNCTAD, 1973, p. 6).

Furthermore, in 1972, the UNCTAD secretariat submitted a study dealing with the regulation of liner conferences in various countries and the lack of a common approach to the anti-trust implications of their existence and working mechanisms (UNCTAD, 1972). This study was remarkable in the sense that it gave a comprehensive picture of the regulatory environment and served as background for the deliberations at UNCTAD III, the subsequent work of the Working Group on International Shipping Legislation and the Plenipotentiaries Conference, which adopted the UN Convention on a Code of Conduct for Liner Conferences on 6 April 1974. The Code entered into force on 6 October 1983 with 58 Contracting Parties (UNCTAD RMT, 1984).

³ For the text of the Code of Conduct see United Nations (1974).

⁴ This was, for instance, the case in 1986 with the European Union (EU) and the liner conference block exemption contained in Regulation 4056/86. It was only at a much later stage that regulatory action enshrined in European Commission (Regulation No. 1419/2006 repealed the block exemption from competition rules of 1986).

The immediate objective of the Code was to ensure:

- rights of participation of national lines in the carriage of their foreign trade,
- facilitation of the orderly expansion of liner trade, and
- a fair balance of shippers' and carriers' interests (Faust, 1984).

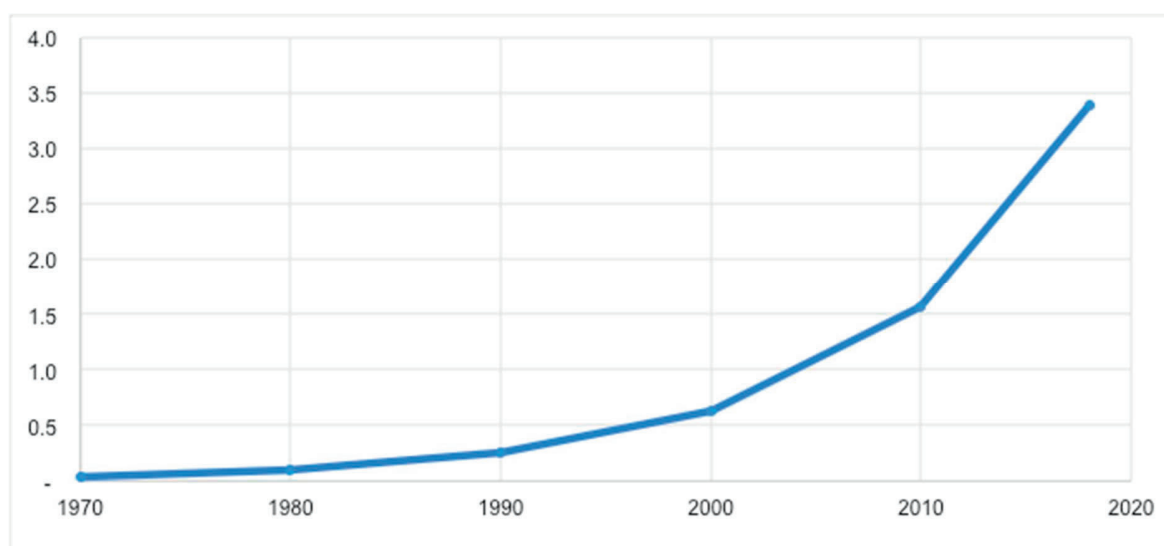
To achieve these objectives, the Code:

1. Regulates the relationship between member lines of the conference, in particular the rights of admission of national shipping lines to conferences serving their countries' foreign trade,
2. Establishes rules for the participation by member lines in the trade carried by conferences. Unless otherwise agreed when determining a share of trade within a pool operated under a conference, the group of national shipping lines of the two countries the trade between which is carried by the conference shall have equal rights to participate in the freight and volume of trade carried by the conference. Cross-traders shall have the right to acquire a significant part of that trade, such as 20 per cent (hence the famous/notorious 40/40/20 rule arrived at by deduction),
3. Sets rules for the establishment of pools within the conferences and for other internal activities, such as self-policing,
4. Sets rules for the relationship between conferences and shippers by establishing equitable principles for loyalty arrangements, the need for consultations with shippers on matters of concern to shippers, such as changes in freight rates, loyalty arrangements, imposition of surcharges, and,
5. Establishes a mechanism for mandatory dispute settlement based on conciliation.

While the Code was the subject of heated and controversial debate, its application after entry into force in 1983 had only limited impact on liner shipping operations. Technological and organizational developments, i.e., the development of containerization and multimodal transport had heralded the demise of the conference system, as it had existed for more than a century (see Figure 2.5). In parallel, new policy approaches unfolded, favouring the liberalization of shipping markets and services and the move away from public services approaches particularly of liner shipping. Hence, the Code came too late—and the regulatory approach possibly being too timid—to have an impact on the global development of liner shipping. When the issue of the Code was taken up in the Working Group there was still a clear dominance of general cargo in the liner sector.

However, in the time between adoption and entry into force of the Code it clearly evolved that global port-to-port general cargo shipping—and with it the liner conference system—was on a path to extinction.

While conferences no longer play a role in modern-day liner shipping, other non-rate-fixing cooperative agreements among carriers have emerged, such as vessel sharing and slot chartering arrangements, or global/strategic alliances are focused on sharing of vessel operations. These types of agreement have the potential to provide important operating efficiencies and can lead to improved quality of services to customers by taking advantage of genuine economies of scale and coordinating port-to-port operations. These operations, however, are being scrutinized by the competition authorities of different countries and generally do not operate outside existing national competition rules.

Figure 2.5: Ratio of container to general cargo fleet (tonnage), 1970–2018

Source: UNCTAD. *Review of Maritime Transport*. Various issues.

Technological development and organizational changes

Technological developments of the past 50 years in shipping are reflected in fleet development trends. Distinct technological trends have influenced markets and operations in different ways and include ship size and automation developments.

These developments could be observed in dry bulk and tanker shipping. Both sectors have seen the processes of labour substitution through shipboard operation, cut the operating costs. In terms of economies of scale in the tanker sector, there was a clear path to reducing unit costs in the 1970s through increasing ship sizes. Tankers of up to 560,000 dead-weight tons (dwt) were ordered in the early 1970s and delivered between 1976 and 1979. In the meantime, however, the economic environment of tanker trades had changed dramatically and made these vessels obsolete before even entering into service.⁵ The reopening of the Suez Canal in 1975—and the inability of the ultra large crude carriers (ULCCs) to pass through the canal laden or in ballast—as well as the oil shock of 1974 called into question the economies of scale. The value of a full load of oil of nearly 4 million barrels doubled from about \$19 million in 1973 to \$37 million in 1974. At the end of the decade after the 1979 oil crisis this value had gone up four times to about \$150 million. In terms of inflation-adjusted 2017 prices, this would represent a value of about \$470 million for a single consignment. Thus, the deviation cost as well as the cargo financing cost coupled with operational inflexibility led to the demise of these ULCCs. In today's environment, the largest tankers have a capacity of around 300,000 dwt, just about half the size of the ships in service at the end of the 1970s and can transit the Suez Canal in ballast.

⁵ It is interesting to note, in this context, that most vessels of the Batillus class (550,000 dwt) were scrapped before 1985 at an age of not even 10 years.

In the dry bulk sector, ship sizes were determined by the structure and volumes of the iron ore trades. Capesize vessels had largely remained at a size of approximately 200,000 dwt with some notable exceptions like the 364,767-ton *Berge Stahl*, which had been the largest bulk carrier in the world since it was built in 1986. It was only 25 years later in 2011 that the first Valemax (or Chinamax) vessel of around 400,000 dwt entered service on dedicated runs from the Brazilian ore port of Terminal Marítimo de Ponta da Madeira to China and other Far Eastern destinations. As of today, 35 such vessels have been built. Ore transportation costs between Brazil and China are estimated to have been reduced by 20 to 25 per cent as compared to 'traditional' Capesize vessels.

Containerization of liner trades

Technological developments have been more pronounced in the liner sector and gone along with organizational changes, both of which have profoundly changed the nature of the industry.

The 1970s and 1980s saw the transfer from conventional general cargo (break bulk) shipping to containerization and multimodal transport. This emerging trend has continued up to now with general cargo vessels largely carrying such trades as regional trades, project cargo or residual trades.

The development of fully cellular containerships took off in the late 1960s and early 1970s and was reflected in ship 'generations'. First-generation ships had a capacity of 600 to 900 20-foot equivalent units (TEUs), second generation of about 1,200 TEUs and third generation of 2600 to 3000 TEUs. It was only about 10 years later that more fuel-efficient fourth-generation ships of about 4,300 TEU entered into service reflecting the increasing fuel oil prices. Today, in further efforts to reduce unit costs, maximum ship sizes have increased to above 21,000 TEU. These vessels are employed in the Far East to Europe trade.

Diversification of liner shipping into multimodal transport and logistics services

As early as 1974 the secretariat studied the introduction of containerization and changing practices in shipping, particularly the economic and social implications of new technologies in the emerging transport system (multimodal transport) that integrated shipping and inland transport.

The UNCTAD secretariat introduced the term 'multimodal' into the lexicon of transport and defined it as the carriage of goods in more than one mode of transport under a single contract. From that point onward, the Committee on Shipping addressed questions of multimodal transport on a recurrent basis.

The basic objective of multimodal transport based on containerization is to facilitate the movement of goods under continuous supervision and responsibility of a single operator, thus relieving shippers of the need to approach modal carriers directly or through intermediaries, and to increase overall transport efficiency by aiming at optimum modal split within the transport process. Unlike traditional transport, it primarily takes account of the needs of the cargo rather than the transport mode by ensuring an integrated transport process between the consignor and consignee. As far as the requirements of the cargo are concerned, there is, except in special cases, no particular affinity to any individual mode or combination. What is important is that goods get to their destination on time and in good condition and in a manner that, through the integrated process of physical distribution, allows the goods to be marketed

at the most competitive price. As long as these conditions are met, it matters little by which modes the goods were actually transported. It is the physical concept of containerization that enables these cargo requirements to be satisfied. The intermodality, i.e., the ability of all modes of transport to move containers linked with relatively simple transfer operations, allows for an optimum modal split, making use of the advantages of each mode to the benefit of the cargo.

This holistic approach to logistics also implies that traditional ways of optimizing transport subsystems in an isolated manner at the expense of other subsystems, even if unintended, have been abandoned and replaced by an integrated approach to problem-solving aimed at total systems optimization.

Developments in such marketing-logistics concepts were initiated by cargo interests. In contrast, the transport industry tended to maintain the relatively conservative approach of restricting its services to pure unimodal movements (or to handling operations) and started only in the early 1970s to offer on a larger scale total distribution services geared to the interests of the cargo. Consequently, not only unimodal carriers, but also freight forwarders, diversified into total distribution services and became multimodal transport operators (MTOs).

Modal carriers, particularly shipping lines, diversified into auxiliary services like terminal services, into multimodal transport and consequently into logistics not only because of the business opportunities offered but also as a differentiation strategy supporting their core modal operations. Economies of scale in shipping could only be realized by ensuring access to cargo⁶ and commercial control over freight movements from origin to destination. Hence the move into what is clearly asset-based logistics operations.

The strategies adopted by the shipping companies were, however, by no means uniform. The general point of departure was the realization that port-to-port container transport had become a commodity service, with resulting pressure on freight rates forcing liner companies to cut costs to an absolute minimum. Strategic responses to this challenge ranged from the maintenance of a port-to-port approach aiming at achieving large transport volumes on a low-price basis, on the one side, to an outright direct involvement in land transport operations aiming at providing a quality logistics service, on the other extreme. In general, it can be observed that this latter approach has prevailed. Major container shipping lines restricting their services to port-to-port have disappeared from the market.

The freight forwarding industry has gradually moved from a traditional agency business to a carrier status based on the concept of a non-vessel operating carrier (NVOC or NVOCC). This was carried out either as unimodal or MTO and gave rise to the differentiation between 'contractual carrier' and 'actual carrier'. As a next step, forwarders moved into logistics operations. Similar to the modal carriers, freight forwarders sought to broaden their business base and move into operations with a high earning and growth potential. Unlike modal carriers, however, freight forwarders generally did not have any asset constraints and could more easily establish themselves as they were moving between knowledge-based industries. In general, it can be established that major third-party Logistics operators (3PL) have their roots in freight forwarding.

⁶ This also explains the overriding interest in codified global market liberalization arrangements.

For liner operators extending into multimodal transport and logistics operations, sea transport generally remains the dominant subsystem, largely owing to the much higher investment requirements as compared to those of inland transport, the latter very often being subcontracted in any case. Consequently, multimodal transport is often considered as a way of ensuring a return on the shipping investment through tighter cost control as well as by improvement of potential revenues. This can basically be achieved by the following:

- improved control over container movements (optimization of inland container movements),
- control over inland transport links,
- realization of economies of scale in inland transport,
- concentration of cargo flows through a limited number of ports, i.e., optimization of vessel routing,
- offer of complex distribution services, and
- increased flexibility in the establishment of tariffs.

Trade facilitation

In terms of international logistics operations, two policy areas are of overriding importance for the development of a thriving logistics sector, namely, market access and trade/transport facilitation. These two policy areas need to be addressed in a coherent manner and can under no circumstances be considered as trade-offs but rather as complementary policies. Similarly, it is important to also see facilitation as incorporating both trade and transport facilitation rather than separating the two as is done from time to time.

RMT has dealt with trade facilitation issues on an ad hoc basis. Already in the mid-1970s the UNCTAD established the Special Programme on Trade Facilitation (FALPRO) with a view to setting up an institutional facilitation infrastructure and streamlining trade and transport documentation. This very specific approach was widened in the early 1990s with the outcome of the 1994 United Nations International Symposium on Trade Efficiency, held at Ministerial level, in Columbus, Ohio (UNCTAD, 1994). The Columbus Recommendations and guidelines not only laid the foundation for the comprehensive work of UNCTAD in trade facilitation and its link to logistics services but also spelled out elements of a global trade facilitation agenda, parts of which are reflected in the WTO Trade Facilitation Agreement of 2013 (TFA).

Trade facilitation is a critical element in any country's economic infrastructure. It aims at developing a widely accepted, consistent, transparent and predictable environment for international trade transactions.

In an age of 'just-in-time' manufacturing and distribution, such a facilitative environment for imports and exports not only benefits a country's trade but has also become an increasingly important factor in the investment decisions of the private sector. Trade facilitation encompasses internationally accepted customs and practices resulting from the simplification of formalities and procedures, the standardization of physical facilities and means, and the harmonization of applicable trade and transport laws and regulations, the most recent one being the WTO TFA. UNCTAD has played an instrumental role in supporting developing countries negotiate the TFA and is continuing to assist countries implement the Agreement and the principles contained therein. These cooperative activities are regularly reported by the secretariat through *RMT* and other publications.

The effective implementation of trade facilitation measures will help to lower transaction costs and improve the capacity of traders to supply competitive goods and services in global markets, giving due consideration to varying levels of development in countries along the supply chain. Trade facilitation can contribute to a nation's development, and its benefits should not be limited to a given sector. The occurrence of this broader impact depends to a large extent on the ability of trade facilitation programmes to construct an institutional and managerial international trade capacity, which could sustain global approaches to trade practices, and consequently avoid an ever-increasing proliferation of widely varying requirements based on national rules and regulations or even on company-based procedures. At any rate, the systemic, end-to-end perspective of international logistics may help design and adjust trade facilitation solutions to suit both the general requirements as well as the specific needs of trading channels and logistics operations related to specific products' trade transactions.

Adapted technologies

The shift from conventional general cargo to container shipping was a process that took decades and was by no means a smooth one as far as developing countries were concerned. Essentially, the introduction of containerization entailed a process of labour substitution, hence increasing capital intensity of transport systems. In the late 1960s and early 1970s, two considerations were impacting on the technological choice to be made by developing countries. First, technological developments were initiated in countries with different relative prices of labour and capital than in developed countries, and secondly, the improvements in service quality, such as speed, cargo damage, etc. were more important in the trades typically generated in developed countries than in developing countries. The delayed implementation of containerization in developing countries is also reflected in Table 2.3 showing containerized trades in 1971. Similarly, plans for containerization up to 1974 were basically also limited to trades between developed countries (UNCTAD *RMT*, 1971, pp. 42–46).

For developing countries' ports, adapting to containerization was consequently a slow process as they generally had an abundant unskilled labour force available to them.

It was recognized from the beginning that the full advantages of containerization could only be reaped if at the same time door-to-door container services could be offered. While recognizing the need to look at the factor endowment of developing countries, *RMT* tended to take a skeptical view on the issue of adapted technologies without, however, ignoring them. In the long run, the view prevailed that 'adapted technology' should not be 'second-class technology' neither in the carriage nor in port handling. In the short run, following the advent of containerization, shipowners, in general, showed a certain preference for more versatile ship types, thus responding to the fact that handling capacities of different ports (in developing or developed countries) differed widely.

Thus, the 1974 edition of *RMT* noted:

*Adopting a flexible attitude in the use of unit load transport systems helps to reduce the amount of capital required for investment in infrastructure for one particular method as against others, until the stage is reached when it becomes clearer which method is the most economical and beneficial to developing countries in the light of their particular transport requirements and their socio-economic conditions (UNCTAD *RMT*, 1974, p. 50).*

Table 2.3: Container services by full container ships as at end of June 1971

Trade	Number of operators	Number of vessels	000 dwt	TEU capacity	Sailings per week	Year Inaugurated
East Coast US and Canada to Western Europe	12	67	1040	47000	15.5	1966
East Coast US and Canada to Australia and New Zealand	1	1	24	1200	0.2	1971
East Coast US to Japan/Far East	2	11	214	11000	1.5	1970
West Coast US and Canada to Japan/Far East	15	22	308	18000	10.6	1968
West Coast US and Canada to Australia and New Zealand	1	1	26	1200	0.3	1971
West Coast US and Canada to Western Europe	1	1	14	900	0.5	1970
West Europe to Australia	6	13	379	18100	1.5	1969
Japan to Australia	7	8	134	6800	1.7	1969
Total	45	124	2139	104200		

Source: UNCTAD. Review of Maritime Transport 1971.

The uncertainty that prevailed at the time regarding future technology developments is also reflected in the versatility of the unit load tonnage on order in the early 1970s. Owners simply did not know which way developments would turn and while there certainly was a preference for 'full' containerization, Table 2.4 clearly reflects the cautious approach prevailing. With hindsight we know, of course, that certain technologies like, for example, barge carriers and hybrid technologies like bulk/container vessels were short-lived and constituted commercial failures.

External shocks

A number of external shocks have significantly impacted the development of ocean freight rates and, in the longer term, shipping market structures.

In the context of this paper, reference is being made to the closure of the Suez Canal in 1967 and its reopening in 1975 as well as to oil shocks, particularly the one of 1974.

Suez Canal closure

The closure of the Suez Canal in June 1967 had considerable impact on freight costs and consequently also on the trading opportunities of developing countries. The developing regions that were the hardest hit were those of the Middle East, South Asia and East Africa trading with Europe and North America.

Table 2.4: Unit load vessels on order mid-1973

Full container ships	69
Bulk-container ships	29
Container/part refrigerated ships	44
Container trailer ships	58
Part container ships	393
Barge carriers	10
Container barge carriers	4
Pallet vessels	1

Source: UNCTAD. Review of Maritime Transport 1972–1973.

Table 2.5 provides data on the Suez Canal surcharges (Deviation surcharges) imposed by liner conferences serving trades of the mentioned regions/ports with the United Kingdom and Continent. While the nature of surcharges is normally a transitory one, in some cases they were quickly reduced but incorporated in the general tariffs (UNCTAD *RMT*, 1971) and hence made a permanent feature. The table clearly shows that the regions that were closest to the Canal itself suffered the most in terms of increased trade costs. While this was to be expected, the data also show a large impact on rates from regions like South Asia. The greatest effect of the Suez Canal closure, so far as freight rates are concerned, was shown in the tanker voyage charter market, where rates rose sharply immediately after June 1967. An indication of the sharp response of voyage charter freight rates for tanker was given by *RMT*, which showed dramatic movements of tanker freight index during 1967. The Norwegian Shipping News Tanker Index tripled from 49 points in May to 145 points in June and to 187 points in August 1967.

The tendency to increase the dwt capacity of tankers was already observed after the brief closure of the Canal in 1956 but acquired a completely new dimension since June 1967. The increase in freight rates and the desire to reduce unit costs led to considerable newbuilding ordering particularly in the tanker sector. In October 1969 about 75 million dwt tanker and

combined tonnage were on order, amounting to about 60 per cent of the existing tanker fleet. At the same time ship sizes exploded, with the biggest having a carrying capacity of about 560,000 dwt. However, these ULCCs were short-lived as their economic viability was called in question after the oil shocks of 1974 and 1979 as well as the reopening of the Suez Canal in 1975.

Apart from the effects on the volume of their exports, countries formerly using the Canal also suffered losses due to a decline in the profitability of their exports, if, to maintain the relative position in foreign markets, they had to absorb wholly or in part the extra costs involved in taking the Cape of Good Hope route. Loss of competitiveness and adjustments of sources of supply affected exports of primary commodities from Eastern African countries to Europe, of oil from sources of supply east of Suez to Europe and North America, of minerals from India to European markets—which incidentally never picked up again—as well as to some extent exports of European countries to markets east of Suez.⁷

Table 2.5: Suez surcharge imposed on tariffs applying to trades between United Kingdom/Continent and selected other areas

Trade	Percentage increase on gross tariffs
India, Pakistan and Ceylon	17.5
Persian Gulf	25
Aden	35
Djibouti, Assab, Massawa	40
Jeddah	45
Port Sudan	50
Far East	10
Aqaba	50
East Africa	15
Madagascar, Comoros, Reunion, Mauritius	15
Red Sea	20
Indonesia	10
Australia	5

Source: *Journal pour le transport international* (Basle), 16 June 1967, p. 2485 quoted in UNCTAD *Review of Maritime Transport* 1971, TD/B/C.4/92/Rev.1, New York 1973, Table 27.

⁷ For the effect of the Suez Canal closure on bilateral trade relations see also Feyrer (2009).

Oil shock of 1973

Of the various 'oil shocks' it is worthwhile to single out the one of 1973/1974 as it had considerable impact on shipping markets.

In 1973, an embargo was imposed by the Organization of the Petroleum Exporting Countries (OPEC) Member States on the US, the Netherlands and partially on selected European Economic Community (EEC) Member States. At the same time, production cuts were decided and set to 5 per cent per month. The first cut was implemented late in 1973, while the second reduction was introduced in March 1974. The embargo and the production cuts were the first oil-supply disruption to have resulted in major price increases and a worldwide energy crisis. The embargo caused the US and western European countries to reassess their dependence upon Middle Eastern oil. It also led to far-reaching changes in domestic energy policy, including increased domestic oil production in the US and a greater emphasis on improving energy efficiency. The embargo was lifted in March 1974 (*Encyclopedia Britannica*, ND).

The embargo and production cuts led to an increase in oil prices from about \$3.10 pre-October 1973 to \$12 in early 1974. The price increases, together with the US and European energy policy adjustments, had an adverse effect on global oil trade that made itself felt in 1974/1975. Between 1974 and 1975 trade in oil declined by some 23 per cent from 1,867 million tons to 1,438 million tons while the tanker fleet increased by 15.9 per cent in the same period. At the same time, the reopening of the Suez Canal led to further reductions in trade distances and hence to reduced demand for shipping space. Consequently, tanker rates dropped from worldscale 357 in the third quarter of 1973 to WS80 in the second quarter of 1975 despite a dramatic increase in lay-up from 0.1 per cent to 11.2 per cent of world tanker tonnage. All in all, a historic 'pig cycle' that continues to be characteristic of the shipping industry of today.

In relation to these developments *RMT* 1975 states (and proposes what industry sources have also put forward in later structural crises):

The depressed market situation for tankers and the likelihood that an imbalance in tanker supply and demand may exist for a number of years have given rise to considerable discussion of possible ways of bringing the tanker tonnage more into line with expected demand. Among measures considered in this connection are continued slow steaming, further cancellations of orders for new building, accelerated scrapping, use of tankers for storage, the retroactive introduction of segregated ballast systems for tanker vessels over 70,000 dwt, and/or a change in the load line regulations under the International Load Line Convention, 1966 and a coordinated lay-up scheme (UNCTAD RMT, 1975, p. 33).

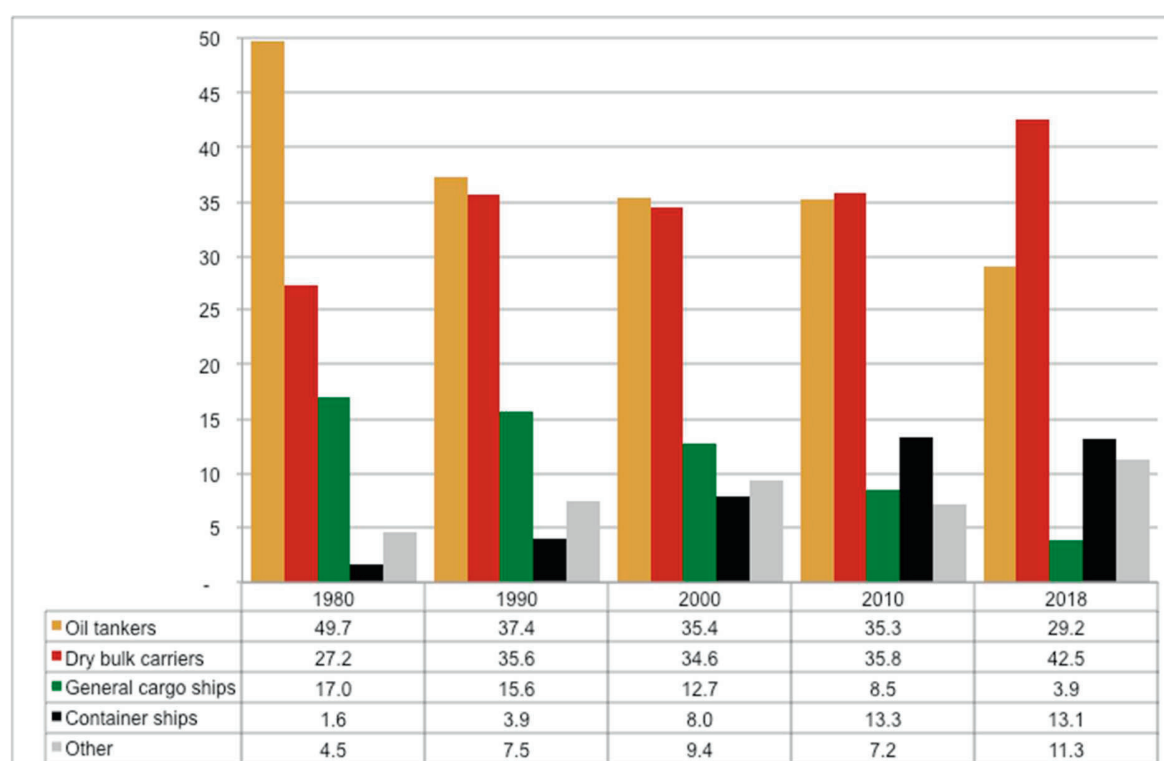
Fleet development

The total world fleet in 2017 stood at 93,100 ships with 1.86 billion dwt. This compares to a fleet of 1.28 billion dwt in 2010, 800 million dwt in 2000, 680 million dwt in 1980 and 320 million dwt in 1970. Hence the 1970s and the two decades of the new millennium were decades with the highest fleet growth. These decades were also characterized by overcapacity in the shipping markets and consequent downward pressure on freight rates.

Figure 2.6 shows the development of the world merchant fleet by main vessel types from 1980 to 2018. The fleet development confirms the structural changes that took place in global trade. The share of tankers in the world fleet declined from nearly 50 per cent to less than 30. At the

same time the share of dry bulk carriers increased from 27 to 42 per cent primarily reflecting the development of demand for ore and coal. The share of container tonnage is nearly 10 times what it was in 1980. At the same time and as expected, advances in transport technology resulted in a general cargo tonnage decline, from 17 to 4 per cent. Further reductions can be expected but at a slower pace as the process of containerization of conventional general cargo trades is more or less accomplished.

Figure 2.6: World fleet by principal vessel types (1980–2018)



Source: UNCTAD. Review of Maritime Transport 2018.

As far as the major shipowning developing countries are concerned, *RMT* 2017 shows that four of them are featured among the 10 major owning countries. These were China, Singapore, Hong Kong and Republic of Korea. While on average the share of tonnage flying a foreign flag among the 10 major owning countries stood at 68 per cent, that of China was 54 per cent, of Singapore or Hong Kong only 39 and 24 per cent respectively. Only the Republic of Korea uses a foreign flag for the majority (82 per cent) of the tonnage beneficially owned, as is generally the case for developed countries within the top 10 (UNCTAD *RMT*, 2017). Without passing judgement on this development, two major observations are to be made. First, developed countries continue to be major owners but to a much lesser extent than in the early days of *RMT* and, secondly, the assumption maintained in intergovernmental discussions and negotiations of the 1980s that tonnage flying flags of convenience is beneficially owned in developed countries no longer holds true. The situation has become much more complex particularly with owners from middle income developing countries

increasingly resorting to foreign flags, even if still to a lesser extent than their fellow owners from developed countries.

In the context of fleet ownership, it is interesting to note that the argument for fleet development prevailing up to the 1980s was linked to the ability of countries to generate cargo.

By doing this, the policy debate was following the shipping practices particularly in conference shipping as well as the heavy involvement of multinationals in dry and liquid bulk shipping through concepts of industrial carriage. The question of competitive advantage was not really at the forefront. However, looking at what has happened since from the 1990s, which also coincided with the removal of the negotiating mandate from UNCTAD at UNCTAD VIII in Cartagena in 1992, some interesting observations are to be made. First, as was already apparent during the Second Development Decade (the 1970s), fleet ownership by developing countries remained concentrated in a few countries. Secondly, with few exceptions, major shipowning developing countries are also among major trading nations, something that, incidentally, also applies to developed countries. The positions are shown in Table 2.6, which confirms again the policy stances already formulated in the 1960s and early 1970s at various UNCTAD fora and recurrently addressed in the various editions of *RMT*.

Table 2.6: Fleet ownership of 10 major exporting nations, 2017

Country	Export value	Share of world export	Cumulative share	Tonnage owned ('000 dwt)	Share in world tonnage	Cumulative share
China	2263	12.8	12.8	183 094	9.6	9.6
United States	1547	8.7	21.5	68 930	3.6	13.2
Germany	1448	8.2	29.7	107 119	5.6	18.8
Japan	698	3.9	33.6	223 615	11.7	30.5
Netherlands	652	3.7	37.3	18 116	1.0	31.5
Korea, Republic of	574	3.2	40.5	77 277	4.1	35.6
Hong Kong, China	550	3.1	43.6	97 806	5.1	40.7
France	535	3.0	46.6	12 141	0.6	41.3
Italy	506	2.9	49.5	19 750	1.0	42.3
United Kingdom	445	2.5	52	49 989	2.6	44.9

Source: World Trade Organization (2018). Trade Statistics and Outlook. Strong trade growth in 2018 rests on policy choices. Press Release 820. 12 April; UNCTAD (2018), *Review of Maritime Transport 2018*.

Table 2.7 features the development of the world fleet by countries of registration. It clearly shows the development away from flags of developed countries while the position of developing countries is not quite clear from the data given. The proliferation of open and international registries has not been consistently documented in more recent editions of *RMT*. This particularly refers to the position of Asian developing countries. What is clear, however, is the continued marginalization of African countries as well as the position of developing countries of America that have not really shown a growth in registration, something which is also reflected in ownership positions of these regions.

Beneficial ownership / Flags of convenience

In the 1970s and 1980s large parts of the UNCTAD membership was also concerned with the phenomenon within the shipping industry of the increasing use of flags of convenience. The root of the problem was the ineffective exercise of jurisdiction and control over flags of convenience ships due to the absence of a 'genuine link' between a vessel and its country of registration. While the need for such a link was also recognized in the 1982 United Nations Convention on the Law of the Sea, it failed to provide a definition or a more concrete deliberation of the concept. The open registry (flags of convenience) fleet had expanded at an increasingly fast rate, reaching 28 per cent of the world shipping fleet by 1971. There was concern within governments particularly—but not only—of developing countries and the industry that one-third of the world's dead-weight tonnage, mainly dry bulk carriers and tankers, were outside effective government jurisdiction. Furthermore, there was a general conviction that the growth of flags of convenience fleets had detrimental effects on the expansion of fleets of developing countries.

Table 2.7: World fleet by countries of registration

Flag	1968	1980	1990	2000	2010	2017
Developed Countries	67.1	51.3	33.3	25.4	17.8	22.8
Developing Countries	7.4	10.0	21.2	19.2	25.2	34.5
of which						
Africa	0.4	1.0	1.1	0.7	0.7	0.9
America	2.7	3.2	3.9	4.2	1.8	6.4
Asia	4.3	5.7	13.6	14.0	22.4	26.7
Oceania	n.a.	0.0	0.5	0.1	0.4	0.5

Note: Data for 1968 on the basis of gross tonnage, later years on dwt; 2017 data for developing regions are deduced by subtracting the flags of Panama, Liberia and Marshall Islands from the respective regional shares.

Source: UNCTAD *Review of Maritime Transport*. Various issues.

In 1977, the secretariat issued a report on the economic consequences of the existence or lack thereof of a genuine link (UNCTAD, 1977a). The report argued that open registration enabled the traditional maritime countries to maintain their domination in world shipping despite the increasing labour costs of operating under their own flags. This argument, as well as the need to prevent abuses, has supported the case for the phasing out flags of convenience. However, agreement on phasing out could not be reached and the issue was refocused on the establishment of a genuine link between the vessel and the country that accepts it on its national shipping register.

After difficult negotiations the United Nations Convention on Conditions for Registration of Ships was adopted in February 1986 under the auspices of UNCTAD. The Convention established the minimum elements of the genuine link in terms of ownership, management and manning. The Convention never entered into force and, consequently, did not play the anticipated role in determining registration conditions. On the contrary, today more than 50 per cent of the world fleet is flying flags of convenience.

Market access

Because shipping market access has always been a concern for developing countries, it was addressed in *RMT* as well as in ad hoc secretariat publications. In a long-term perspective there have been two different approaches that have characterized the market access discussion. First, at the beginning of deliberations on shipping at UNCTAD that took place in the 1960s and 1970s, market access was part and parcel of the fleet development discussions. It was clearly recognized that fleet development could not proceed without market access. The comprehensive approach linked fleet development with elements of ship financing, market access and access to services. Discussions and negotiations leading up to the adoption of the United Nations Convention on a Code of Conduct for Liner Conferences and to some extent also the Convention on Registration of Ships reflect the comprehensive approach.

After 1992 UNCTAD maintained the comprehensive approach, even though there were no more negotiations on the issue. Furthermore, the question of market access had taken a different twist. In the 1970s and 1980s there were two major market characteristics that adversely affected the ability of developing countries to participate in shipping. In liner shipping there was the system of closed conferences to which new entrants from developing countries did not have access. This barrier to entry was removed in the trades that were subject to the provisions of the Code of Conduct. There was also the advance of containerization that had led to the demise of the conference system in the 1990s and hence to a dismantling of market access restrictions.

The widespread resort to industrial carriage in dry bulk and tanker shipping, where multinational oil companies as well as trading arms of steel producers were major tonnage owners, considerably narrowed the market segment open to exporting developing countries. Thus, it was noted in the 1970s that in major oil trades, multinational oil companies would directly control the carriage of about 90 per cent of their trades, half based on own tonnage and half based on long-term chartering. These arrangements were seen by developing countries as major impediments to their entry into bulk shipping markets. Again, however, the situation changed in the 1980s and 1990s when oil companies reduced their transport involvement by reducing or even relinquishing their fleet ownership positions. Today this argument is no longer relevant.

In today's environment the issue of market access presents itself differently and is no longer one of particular relevance to developing countries but one that concerns all suppliers of shipping services.

Regulatory policies affecting market access in international shipping operations came under scrutiny in the WTO in the 1990s under GATS and continue to be considered there. As GATS only deals with 'international' trade in services, cabotage shipping and transport is not the subject of negotiations, and it is to be noted that practically all countries restrict access to cabotage trades in one way or another.

Judging by the GATS negotiations and the specific commitments made by WTO members, it can be generally stated that port-to-port shipping does not constitute a problem as far as access is concerned. The issue is more complex when it comes to multimodal transport and logistics. As mentioned before, to be able to fill ever larger container ships, shipping companies must gain commercial control over cargo flows at as early a stage as possible. Additionally, shippers are increasingly looking for total door-to-door transport and logistics

solutions. Consequently, shipping companies from developed or developing countries are increasingly engaging in the provision of downstream services in ports/terminals, inland transport, Inland container depots and logistics services. Expansion into these services requires an enabling regulatory environment which the international community has attempted to create over the last 15 years or so by, first, extending maritime transport services to cover multimodal transport and, secondly, attempting to find generally accepted solutions towards the codification of liberalization of market access to logistics services. Hence, in the latter area, access is being granted to individual services within a logistics package, but not to logistics as a whole.

As to multimodal transport, shipping companies seek the possibility to actually provide inland and domestic coastal container transport services in the context of international moves. Solutions adopted so far by WTO member countries generally stop short of that and limit multimodal to an issue of 'access to and use of', meaning that shipping companies and international MTOs have the opportunity to subcontract domestic legs of international multimodal container moves.

Fleet development in United Nations Development Decades

Fleet development needs by developing countries have figured prominently in policy discussions of the 1970s and 1980s. The policy objectives are reflected in two development decades proclaimed by the United Nations. The Second Development Decade called for a wider participation by developing countries in fleet ownership by the end of the 1970s. The Second Development Decade Program was quite embracing and covered a large variety of measures relating to adequacy of shipping services, support services and fleet development. As to fleet development, the Resolution states the following:

- a) In order that the developing countries may have an increasing and substantial participation in the carriage of maritime cargoes, and recognizing the need to reverse the existing trend whereby the share of the developing countries in the world merchant fleet has been declining instead of increasing, developing countries should be enabled to expand their national and multinational merchant marines through the adoption of such measures as may be appropriate to permit their shipowners to compete in the international freight market and thus contribute to a sound development of shipping.*
- b) It is also necessary that further improvements be made in the liner conference system, and all unfair practices and discrimination where such exist in liner conference practices should be eliminated (United Nations, 1970).*

Developing countries operationalized these more general objectives by formulating the development target of 10 per cent of ownership of the world fleet by the end of the decade. Similarly, at UNCTAD III a resolution was adopted reaffirming the general objectives of the second development decade as well as the subsequent G77 target (UNCTAD, 1973 Res 70 III).

In comparison to the Second, the Third Development Decade was less comprehensive, stating specific objectives of fleet development, i.e., an ownership position of 20 per cent to be attained by the end of the 1980s.

In the transport sector, national and international action will promote the development of world sea-borne trade and other transportation systems and the increase in the

participation by developing countries in world transport of international trade and, to this end, appropriate structural changes will be carried out where necessary. The international community will continue to take the necessary steps to enable developing countries to compete more effectively and to expand their national and multinational merchant fleets to increase their share substantially with a view to reaching as close as possible to 20 per cent of the dead-weight tonnage of the world merchant fleet by 1990 (United Nations, 1980).

These were internationally accepted development objectives even though doubt could be raised, particularly for the 1980s, as to their usefulness as they were not subject to criteria of economic and commercial viability.

The rate of implementation of the objectives of the development decades was clearly reflected in *RMT* thus providing a constant indicator of policy implementation. In 1980, *RMT* noted that

Taking the long-term Development Decade period (1971–1980), the tonnage share owned by developing countries declined in the early part of the Decade, but subsequently, between 1974 and 1980, their fleet recorded higher growth rates than the fleets of the other groups and, as a result, their share increased from 5.4 per cent in 1974 to 10 per cent in 1980. However, most of this growth was confined to a few developing countries (UNCTAD RMT, 1980).

This way, *RMT* also drew attention to one of the problems always encountered in the development discussion—the heterogeneity of the group. It was already apparent in the 1970s but became more striking in the years following. Today, some developing countries figure among major world tonnage owners while others continue to be marginal players (UNCTAD *RMT*, 1980).

The objectives of the Third Development Decade were met with 21 per cent of the world fleet owned by developing countries. However, by 1990, the underlying concepts of the Decade relating to shipping had lost importance. While size was still related to cargo generation, this argument was not really pursued as seriously as in the 1970s, at the time of cartel-type organization of liner shipping and the predominance of industrial fleets in the bulk sectors. Similarly, the issue of heterogeneity was again prevalent. In 1990, 10 of the 20 major shipowning countries were developing countries. These 10 countries contributed more than two-thirds of the group's tonnage (UNCTAD *RMT*, 1990).

In absolute terms these figures might have appeared impressive, but when set against the qualitative changes that had taken place in the industry through the adoption of new technologies by established traditional carriers, the effective performance and productivity of developing countries' tonnage was considerably reduced.

2.4 Ports

The development of ports has been a regular feature of *RMT* since 1989. Prior to that, port issues were dealt with sporadically on an ad hoc basis and seen primarily from a shipping perspective. Issues covered include technological developments, congestion and waiting times and resulting surcharges on liner conference freight rates. This reflects *RMT* being initially perceived as a policy support document adding rationalism to multilateral shipping discussions and negotiations. As 'port developments' was never a separate subject of policy deliberations in UNCTAD but rather subject to technical assistance and capacity building, its

coverage in *RMT* was cursory in the beginning but picked up in scope and depth in the late 1980s. This, of course, does not mean that port questions were not covered in Secretariat publications. A large number of technical documents were issued dealing with improving port performance in developing countries in the widest sense. These were pioneering publications that decisively influenced port development in many developing countries (e.g., UNCTAD, 1975, 1976, 1977b, 1985).

Since the introduction of 'Port Developments' as a regular feature in 1989, *RMT* has primarily dealt with container port developments. From a developing country perspective this was largely a question of technological development and the inevitable changeover from labour-intensive to capital-intensive handling.

While coverage in the late 1980s and early 1990s was still relatively timid, it has picked up since and provides a mirror and dependable source of information particularly (but not exclusively) for container port and terminal developments in developing countries.

Table 2.8 shows the 20 major container ports and the number of TEUs handled. The figures provide a clear case for the trade and shipping developments that took place since the large-scale containerization in the 1990s. The comparison of figures for the years 2000 and 2017 highlight the container shipping dynamics as well as of some of the trade and shipping dynamics referred to above.

- Trade dynamics are very much centred on developing countries in the Far East, particularly China. This is also reflected in the analysis of manufactures' trade flows and trade in intermediate goods.
- The changing 'geography of trade' also points at an increasing participation of Far Eastern countries. The growing importance of trade of Malaysia and Vietnam is shown under the 2017 data.
- Transshipment, which was already an important phenomenon in the year 2000, is further gaining in importance, even if at growth rates that do not always match load centre or logistics ports. Typical Asian trans-shipment ports like Hong Kong, Singapore, Dubai or Tanjung Pelapas witness the growing extent to which container operations are integrated into global transport and logistics networks.

Table 2.8 also reflects rapid growth in the container ports of developing Asia. In 2000, 6 of the top 10 and 10 of the top 20 container ports were in Asian developing countries. In 2017, the top 10 and 16 of the top 20 ports were in Asian developing countries. Changes in trade pattern are also reflected in the concentration processes observed in Table 2.8. These trends support the earlier statement of special dynamics of trade from, to and within the Asian region. The same concentration process can be observed when considering the combined share of the top 20, which increased from 31 per cent (2000) to 44.8 per cent (2017).

The turnover of the top 20 container ports has been a recurrent feature of *RMT* only since 1998. Thus, the earlier development of containerization in developing countries, particularly in China, is only partially reflected in *RMT*. From ad hoc information it follows that container handling in all ports of China in 1993 amounted to a mere 2.7 million TEUs. Up to that year no information was contained in *RMT* on container handling in Chinese ports. Today 200 million TEUs are handled in China's ports.

Table 2.8: Top 20 container ports 2000 and 2017

2000		2017	
Port	000 TEU	Port	000 TEU
Hong Kong	18,100	Shanghai	40,230
Singapore	17,040	Singapore	33,670
Busan	7,540	Shenzhen	25,210
Kaohsiung	7,426	Ningbo-Zhoushan	24,610
Shanghai	5,613	Busan	21,400
Rotterdam	6,275	Hong Kong	20,760
Los Angeles	4,879	Guangzhou (Nansha)	20,370
Shenzhen	3,994	Qingdao	18,260
Hamburg	4,248	Dubai	15,440
Long Beach	4,600	Tianjin	15,210
Top 10	79,715	Top 10	235,160
World share in %	35	World share in %	31
Antwerp	4,082	Rotterdam	13,600
Port Kelang	3,206	Port Klang	12,060
Dubai	3,558	Antwerp	10,450
New York	3,006	Xiamen	10,380
Bremerhaven	2,721	Kaohsiung	10,240
Felixstowe	2,800	Dalian	9,710
Manila	2,868	Los Angeles	9,340
Tokyo	2,960	Hamburg	9,600
Qingdao	2,120	Tanjung Pelepas	8,330
Gioia Tauro	2,488	Laem Chabang	7,760
Top 20	109,524	Top 20	336,630
World share in %	48.6	World share in %	44.8
World	225,294	World	752,714

Source: UNCTAD. *Review of Maritime Transport* 2002 and 2018.

Another important issue is growth of container handling. In the 1990s and the first decade of the new millennium, annual two-digit growth rates were quite common and growth of up to 50 per cent per annum for individual ports not unusual. Today, rates of growth are generally one digit with two-digit growth as well as negative growth being observed, even if more rarely. Reduced growth rates are a clear indication that the process of containerization, i.e., the shift

from conventional to container transport, has largely been concluded with minor exceptions, such as the transport of certain agricultural commodities in containers rather than in bulk. Similarly, the transition in operational practices to trans-shipments from direct calls, which led to multiple handling and thus to 'inflated' port TEU handling numbers, is largely complete. Hence, rates of growth that are being observed today primarily reflect trade growth and, to some limited extent, changes in trade structures.

Over the years, *RMT* has not only reported on quantitative developments in port handling but has also been an observer and an analytical tool in assessing qualitative port developments. Port performance and structural changes were two of the topics considered and that can serve as example here for brief consideration.

The latter is also—but not exclusively—reflected in the growing involvement of the private sector in general and international operators in particular. Terminals are increasingly linked through common operators with the expansion of management by international terminal operators and by shipping lines. Global alliances of container shipping lines have resulted in the use of larger ships, the development of feeder networks with hub ports and a permanent demand for higher productivity and lower rates. Hub and feeder networks with the associated trans-shipment activities have also led to the emergence of multi-port operating companies, such as PSA Corp, Hutchinson Port Holdings or DP World, which operate a multitude of terminals around the world. Advances in communications and information technology allow terminal operators to increase their productivity through better planning, standard facilities with common operating and administrative systems leading to increased productivity and reduced dwell times for ships and cargo. In 2015 the top 10 global and international terminal operators handled about 40 per cent of global container volumes (UNCTAD *RMT*, 2017).

Container port performance has been regularly monitored in *RMT*. Performance progress has generally been more marked in developing than in developed countries. Today it can be observed that, based on berth productivity, Asian container terminals attain higher performance than their counterparts in Europe and the United States. Some observers attribute the differences to ports and gates being open 24 hours a day, a high level of automation and large trans-shipment volumes in Asia. While differences in vessel size and call volumes affect and amplify differences in port productivity, operational models and costs per move also play a role (UNCTAD *RMT*, 2017).

In Africa and developing American performance is lower but the gap is gradually narrowing down. Technological development and improved operational practices have greatly contributed to port performance. Another issue that has recently emerged is the increased awareness of the role of administrative practices and barriers on port performance. Trade facilitative measures reducing administrative barriers have a general positive impact on transport and logistics performance, including port performance. Streamlining procedures will reduce ship and cargo dwell times in ports thus freeing both shore- and sea-side capacities. This not only has an immediate impact on the cost and time of port transit but also contributes to an optimum use of existing facilities and to pushing back new infrastructure investment requirements. The awareness of these links is gradually developing and will help to give a further boost to the performance of ports and transport systems.

2.5 Sustainable and Climate-Resilient Maritime Transport

UNCTAD is a pioneer in recognizing the strategic importance of maritime transport for trade and development as well as in acknowledging maritime sustainability as a policy priority area. The 1996 Port Management Monograph on Sustainable Development Strategies for Cities and Ports provides a good example of how UNCTAD's earlier work integrated sustainability considerations into maritime transport.

From UNCTAD's perspective, sustainable maritime transport entails, among other features, a sector that is economically efficient, affordable, energy saving, environmentally-friendly, low-carbon, climate resilient, enables shipping connectivity, offers quality services, and ensures social inclusiveness and progress.

The need to promote sustainable maritime transportation was heightened over recent years with the unfolding of the Global Economic Crisis of 2008–09, the growing concerns over the sector's heavy reliance on oil for propulsion and its heavy carbon and environmental footprint.

Together, these factors underscored the need to balance the economic, environmental and social sustainability dimensions of maritime transport by moving away from unsustainable patterns including in terms of production, consumption, energy use and resource exploitation.

Following the economic downturn, maritime transport experienced a structural change with the shipping industry increasingly ordering large container vessels to leverage economies of scale. Additionally, the sector adopted slow steaming, almost permanently, to cut costs and manage excess capacity resulting from high bunker fuel costs, reduced global trade and a slowdown in the world economy. In addition to developments in the global economy, the adoption of the 2030 Agenda for Sustainable Development (ASD), the Sustainable Development Goals (SDGs) and the Paris Climate Agreement in 2015 added further momentum to the sustainability imperative in the sector. UNCTAD's latest mandates, namely, UNCTAD XIII in Doha and UNCTAD XIV in Nairobi have also emphasized sustainable and resilient transport as priority action areas and established "Sustainable and Climate Resilient Maritime Transport" as an important thematic area in UNCTAD's work programme and *RMT*.

Consequently, over recent years *RMT* has been paying more attention to maritime sustainability and climate resilience concerns. Work was informed by research and analytical work carried out by UNCTAD as well as insights gained through relevant involvement in various consensus-building activities and technical cooperation work.⁸ By mainstreaming the concept of sustainability and climate resilience in *RMT*, UNCTAD aims to help developing countries make informed policy choices to address the economic, environmental and social challenges affecting their maritime transport and trade.

Various editions of the annual *RMT* highlighted some key issues that lie at the interface of maritime transport, sustainability and climate resilience. Relevant thematic areas spanned, among others, energy use and fuel consumption, fuel and transport costs, environmental sustainability in shipping and ports, sustainable finance for transport, climate resilience in

⁸ Additional information about UNCTAD's work in the field of sustainable and resilient maritime transportation is available at <https://unctad.org/en/Pages/DTL/Trade-Logistics-Branch.aspx>.

seaports and coastal transport infrastructure, greenhouse gas (GHG) emission reduction in shipping, maritime security and piracy, and marine pollution (e.g., oil and hazardous substances). *RMT* underscored the role of the sector in helping implement a workable international sustainable and climate-driven development agenda.

In 2017, world seaborne trade reached an estimated 10.7 billion tons, following an annual growth rate of 4.0 per cent. Looking ahead, UNCTAD projects global maritime trade to grow at a compound annual growth rate of 3.8 per cent between 2018 and 2023. At this rate, volumes can be expected to double in about two decades. In view of projected growth in shipping activity, it will be important for the maritime transport sector to decouple its expansion from the associated negative externalities that may arise due to unsustainable maritime transport practices. A case in point is the projected growth in international shipping carbon emissions. Shipping is widely recognized as a relatively green mode of transport when its carbon emissions are measured in tons of cargo carried per nautical mile. However, the sector has also the potential to undermine the sustainability objectives if such emissions were to be left unchecked. If no carbon emission mitigation action is taken, GHG emissions from the sector could increase by a factor of five between 2012 and 2050. To put things in perspective, international shipping emissions were estimated at 796 million tons in 2012, or about 2.2 per cent of the global emissions of carbon dioxide (IMO, 2014).

UNCTAD will continue to monitor developments relating to the sustainability and climate resilience of maritime transport and reflect relevant considerations in its annual *RMT*.

Special attention will be paid to the needs of small island developing states (SIDS), and other coastal developing states, including in respect of shipping connectivity, market access, transport affordability, oceans and resource preservation, green shipping and ports, and the effective implementation of relevant international law, in accordance with SDG 14. It will also be important to identify options and mechanisms aimed at further mobilizing finance including through private-public partnerships to enable transport infrastructure and services development in accordance with the SDGs, as well as climate change adaptation and disaster risk reduction for coastal transport infrastructure and services.

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3.0 Invited Essays and Reflections by Distinguished Persons

3.1 *The Perspective of a Global Maritime Transport Regulatory Agency*

Future Developments in Maritime Transport

By Kitack Lim, Secretary-General, International Maritime Organisation (IMO)

All around us we are encountering radical new models for the way we live, usually driven by innovative digital technology or artificial intelligence. The only certainty is that nothing will look the same in the future.

Significant transformation will also arrive in the shipping world very soon. The next 10 or 20 years will see as much change as we have experienced in the past 100 years.

As the international regulator of the shipping industry, IMO's focus is on ensuring that shipping's regulatory framework meets evolving expectations within global society around issues like environmental performance, safety and security. As such, it is crucial that we also look into the future and are prepared to address the coming challenges.

Last year IMO addressed its future in a new strategic plan for 2018 to 2023. It refers to a number of vital areas that will underlie our work in the coming period. These include the needs of developing countries, especially Small Island Developing States and Least Developed Countries, the competence and professionalism of personnel in the maritime sector, the needs and wellbeing of seafarers, the promotion of gender equality and the empowerment of women, achieving the SDG's and collaboration with other bodies in the United Nations system.

A continuing thread within IMO's regulatory agenda has been to steer shipping towards a greener and safer future, and the industry of tomorrow will have to transform to reflect this. Among many recent examples is our work to cut GHG emissions, to reduce the sulphur content of ships' fuel oil and to require strict ballast water management. You could also add to these the adoption of the Polar Code—which helps protect the polar environment, and ships and people aboard them in the waters surrounding the two poles—our involvement with the Global Partnership on Marine Litter, and our leadership role in several global projects designed to promote green technologies.

Of these, the historic adoption, earlier this year, of an Initial Strategy for reducing GHG emissions from international shipping is likely to have a resonance far beyond the industry itself. For the first time, there is a clear commitment to a complete phase-out of GHG emissions from ships, a specific linkage to the Paris Agreement and a series of clear levels of ambition including at least a 50 per cent cut in emissions from the sector by 2050.

Another key IMO measure that is helping shipping secure its environmental sustainability is the forthcoming reduction in the global sulphur content in ships' fuel oil, referred to as 'Sulphur 2020'. The 1st of January 2020 has been set as the date for a reduction in the sulphur content of the fuel oil used by ships, from the 3.5 per cent limit currently in place to 0.5 per cent. This is a landmark decision for both the environment and human health. It demonstrates a clear commitment by IMO to ensuring shipping meets its environmental obligations.

As I referred to earlier, there are several technology-driven trends now rapidly approaching that will affect both IMO and shipping. The so-called fourth industrial revolution will have an impact on shipping very soon. Big data, artificial intelligence, robotics and the availability of new energy sources are central to this vision. New players are getting involved and new alliances are being formed, developing 'smart ship' concepts that could revolutionise how ships are designed, built and operated.

But technological advances present challenges as well as opportunities, so their introduction into the regulatory framework needs to be considered carefully. We need to balance the benefits against safety and security concerns, the impact on the environment and on international trade, the potential costs to the industry and, not least, their impact on personnel, both on board and ashore.

So how we incorporate new technology into the regulatory framework is a key issue for IMO. For example, our Maritime Safety Committee, which deals with all matters related to maritime safety and maritime security under the scope of IMO, has future-orientated items on its agenda such as cybersecurity, e-navigation, the modernization of the maritime distress and safety communication as well as the rapidly emerging prospect of autonomous vessels.

IMO regulations can provide a tangible focus for developing innovative, game-changing technical solutions for shipping. In response to IMO regulations, new technologies have already brought significant beneficial changes in how ships are designed, constructed and operated, contributing to a more interconnected and efficient global supply chain. By driving technology and encouraging innovation, IMO's global regulatory framework enables the industry to thrive while still serving society's changing demands and expectations.

In a wider context, IMO and the maritime community have important roles to play in achieving the 2030 Agenda for Sustainable Development and the associated Sustainable Development Goals. This is the most ambitious United Nations initiative to date, which sets out clear goals and targets to protect the planet, its people and to ensure global peace and prosperity.

Amongst our responsibilities, we must ensure that ships and the people aboard them are safe. We must proactively engage in emerging environmental issues, such as efforts to control and eradicate microplastics. We must ensure that the opportunities presented by the digital revolution to improve efficiency in shipping are incorporated effectively into the regulatory framework.

The maritime industry is a crucial part of the global supply chain, which billions rely upon. IMO needs to ensure shipping continues to make its contribution to sustainable growth in a way that meets modern society's expectations about safety, the environment and social responsibility. Increased communication and collaboration between the shipping, port and logistics industries will be vital to enhance the efficiency and sustainability of shipping.

Thanks to the opportunities afforded by new technology, shipping is on the brink of a new era. The technologies emerging around fuel and energy use, automation and vessel management, materials and construction and so many other areas, will lead to new generations of ships that bring substantial improvements in all the areas that IMO regulates. Technology and the use of data hold the key to a safer and more sustainable future for shipping.

3.2 The Perspective of Trade and Cargo Interests

A Shippers' Perspective

By Chris Welsh, MBE, Former Secretary General, Global Shippers' Forum

Since its origins, UNCTAD has played a pivotal role in assisting shippers from less developed nations in being able to fully participate in world trade. It has recognised that shippers' councils can be a key agent in the attainment of that goal and has been hugely instrumental in the establishment of shippers' organizations throughout the developing world. The historical mission of UNCTAD has been, as it is today, to equip shippers in developing regions with the know-how and expertise to expand their trade with the rest of the world.

Enabling international trade, transport and the wider logistics system, including the development of ports and transport infrastructure, has been an essential feature of UNCTAD's work from its inception.

For example, by the 1960s, UN Member States saw the control exerted by carriers from developed nations, largely through the liner conference system, as a barrier to developing countries', and their shippers', participation in world trade. The adoption of the *UN Convention on a Code of Conduct for Liner Conferences* in 1973 (UNCTAD Code), in particular the 40/40/20 cargo sharing provisions, was seen as way of redressing the balance of power in favour of developing nations and their shippers' ability to access world markets.

While aspects of the UNCTAD Code proved to be controversial, especially the cargo-sharing provisions, it shone a light on the conference system and the negative economic impacts on shippers everywhere. Eager to neutralise the threat of the UNCTAD Code, especially its cargo-sharing provisions, and under strong pressure from the Consultative Shipping Group (a group of leading European shipping nations and Japan) and the findings of the 1970 UK Rochdale Report on liner conferences, European and Japanese shipowners quickly made concessions to cargo interests and governments that wished to limit the power of conferences. The subsequent introduction of the CENSA voluntary Code of Practice in 1971 was a shrewd move by Western carriers, as the CENSA Code substantially influenced the final outcome and provisions of the UNCTAD Code.

Whilst Western carriers had averted the very real prospect of international regulation of liner conferences, the UNCTAD Code provided shippers with new consultative and negotiating mechanisms to influence the cost of transport services and other tariff features, which impeded their ability to compete in world trade. There was a flourish in the development of shippers' organizations in developing regions; most notably, the Union of African Shippers' Councils, established in 1977, was desirous of the chance to exploit the opportunities presented by the Code.

While the impacts of liner conferences have diminished due to the repeal of the EU liner conference block exemption, and other competition and maritime regulatory reforms elsewhere, the main focus for shippers today is the impact of alliances and consolidation in the container shipping market. Since April 2017, three global alliances have dominated the global container market. The 2M, Ocean and The Alliance, in which all the world's main carriers are represented, control approximately 80 per cent of the overall container market and operate about 95 per cent of the total ship capacity on East–West trade routes. The combined effect of market concentration and development of the global alliances has been a

reduction in competition, in services available to shippers, and the market has experienced poor service quality and significant price increases in regions most affected by market concentration and the reduced number of services resulting from consolidation.

The problem is not confined to East–West trades. As UNCTAD's 2018 *Review of Maritime Transport* shows, the effect of enhanced market power resulting from concentration can be greater on trades involving developing countries, and in particular in the trades like South Africa to North America and the Latin American trades, both of which are served by only two carriers. The UNCTAD *Review of Maritime Transport* also draws attention to the potentially adverse effects on the economies of SIDS.

In November 2016, I published a Global Shippers' Forum report entitled *The Implications of Mega-Ships and Alliances for Competition and Total Supply Chain Efficiency: An Economic Perspective*.¹ The report examined in depth the wider supply chain cost implications of alliances and the competition challenges presented by concentration of the liner market. The report also questioned whether the current regulatory and competition law frameworks were equipped to deal with the market power presented by alliances. The report made a range of recommendations aimed at strengthening existing competition law approaches, including a more interventionist approach to preserve competition by regulators.

Going forward, I would like to see UNCTAD play a more influential role in the competition policy and regulatory arena, building on its excellent analytical work, like *Review of Maritime Transport*, and with further development of its range of maritime, port efficiency and liner shipping connectivity indicators. I believe the latter connectivity indicators could be expanded to measure the level of competition and price competitiveness on key trade lanes. This would greatly enhance transparency for shippers in developing regions and provide valuable insight for maritime and competition policymakers within UNCTAD and among member states' representatives about future regulatory changes needed to deal with the impacts of concentration of the container market. Time perhaps for a new UNCTAD Code?

¹ <https://www.globalshippersforum.com/media/1267/gsf-mega-ships.pdf>, last accessed 6 August 2018.

L'évolution des transports maritimes dans les prochaines années

By Maître Serigne Thiam Diop, Conseiller en transport maritime et internationaux,
et ancien Secrétaire général de l'Union des Conseils des Chargeurs Africains (UCCA)

1.0 – Rappel historique

1.1 - La situation des transports maritimes mondiaux avant l'adoption du Code de Conduite des Conférences Maritimes

L'organisation maritime, avant l'élaboration du code se caractérisait par des déséquilibres flagrants générateurs de préjudices de toutes sortes pour les pays africains. En 1974, par exemple, année d'adoption du code par la CNUCED, les pavillons nationaux des pays sous – développés ne représentaient qu'une faible part dans la flotte mondiale exprimée en tonne de port en lourd 5,9%. Ainsi 80% du commerce maritime de l'Afrique subsaharienne était transporté par les armements européens au vu de la faible capacité des flottes marchandes de la sous-région.

A l'époque seuls quatre compagnies nationales africaines de navigation: Black Star Line (BSL) (Ghana), Nigérien National Shipping Line (NNSL) (Nigeria), Société Ivoirienne de Transport Maritime (SITRAM) Côte d'Ivoire) et Compagnie Maritime Zaïroise (CMZ) (Zaïre) participaient au trafic. Les flottes africaines étaient insignifiantes 0,3% par rapport à celles des pays développés, alors que le continent avait engendré dans la même année 11,2% des cargaisons embarquées et 2,5% des cargaisons débarquées.

Les factures de fret ont ainsi pesé lourdement sur la balance des paiements des pays en développement à cause des hausses fréquentes et abusives des taux de fret. Ces hausses s'expliquent par l'absence d'une moralisation des pratiques du commerce maritime et par la domination sans partage des armements des pays développés sur les lignes maritimes. Préoccupées par ces inégalités le caractère abusif et unilatéral de la tarification des transports maritimes, les pays en développement ont engagé des actions concertées dans le but de remplacer l'ordre maritime existant par un nouvel ordre plus juste.

1.2 - Les tentatives pour instaurer un nouvel ordre maritime international avec l'adoption du code de Conduite des Conférences Maritimes

Au vu de la situation décrite ci-dessus la CNUCED a pris certaines initiatives:

- 1964, création de la Commission des Transports Maritimes chargée de réformer le système de conférences maritimes,
- 1968, l'adoption de la recommandation de la CNUCED, encourageant les pays du tiers monde à défendre leurs intérêts maritimes ;
- 1972, la 3ème CNUCED a demandé la convocation d'une conférence pour l'adoption d'un code de conduite des conférences maritimes ;
- 1974, l'adoption du « Code de Conduite des Conférences Maritimes » qui a permis aux armements des pays de la sous-région de participer au trafic par le biais des systèmes de répartition des cargaisons maritimes ;

1.3 - La création de la conférence Ministérielle des Etats de l'Afrique de l'Ouest et du Centre sur les Transports Maritimes (CMEAOC/TM)

Suite à l'augmentation vertigineuse des taux de fret la CMEAOC a été créée en mai 1975 pour répondre de façon efficace à la situation qui était créée par la pratique des conférences maritimes en position de quasi-monopole. L'OMAOC et ses organes spécialisés, l'UCCA et l'AGPAOC ont mis en place plusieurs stratégies pour défendre les intérêts maritimes de l'Afrique.

2 – La situation actuelle

Qu'en est-il des armements qui desservent les ports africains?

Depuis la dissolution des comités armatoriaux en 1992, qui a entraîné la dislocation des conférences maritimes, phénomène accentué par la libéralisation des transports maritimes, les armements des pays du Nord opèrent librement dans la côte occidentale d'Afrique.

Les armements africains (COSENAM au Sénégal, SITRAM et SIVOMAR en Côte d'Ivoire, COBENAM au Bénin, SOTONAM au Togo et CAMSHIP au Cameroun ont disparu surtout à cause de la libéralisation des transports maritimes survenu en 1995. Les conséquences de ce phénomène sont l'impossibilité pour nos Etats d'enlever le quota de 40% alloué à leur pavillon du fait de la disparition des armements nationaux.

Qu'en est-il des ports?

Les ports sous équipés, dépourvus d'infrastructures modernes:

- Faible tirant d'eau ne pouvant pas accueillir les navires de 3ème génération,
- Infrastructures obsolètes et inadaptés au trafic,
- Concurrence féroce, ils se livrent une véritable guerre des tarifs sur l'instigation des grands armements du nord,
- Concession à des opérateurs européens qui sont les seuls à tirer des profits.

Qu'en est-il des taux de fret?

Si les taux de fret s'étaient stabilisés au cours des premières années de la libéralisation, ils ont subi des hausses régulières par la suite. Au lieu de connaître une baisse comme promis, les taux de fret ont connu ces dernières années des augmentations fulgurantes et incontrôlées. Que faire face ces nombreuses difficultés qui entravent le développement du secteur maritime de la sous-région ?

Quel avenir pour le transport maritime dans le monde en général et en Afrique en particulier?

Il est possible d'affirmer que le trafic maritime dans le monde, particulièrement en Afrique va augmenter d'une façon appréciable au cours des prochaines années. Les raisons fondamentales sont:

- les prévisions d'accroissement exponentielle de la population africaine, contrairement au reste du monde, notamment l'Europe qui verra sa population déclinée,
- l'existence de matières premières non encore exploitées, s'y ajoutent d'autres non encore découvertes (pétrole, gaz, autres minerais),
- le besoin d'infrastructures et d'équipements en Afrique,
- la plupart des industries en occident seront délocalisées en Afrique.

Questions particulières qui pourraient façonner le transport et la logistique maritime court, moyen et long terme.

- La gestion des ports confiée à des privés et non à des fonctionnaires,
- Modernisation des équipements, infrastructures et installations portuaires,
- Développement et modernisation des corridors de transport,
- Simplification et facilitation des formalités,
- Développement de l'informatique dans tous les modes de transport.

3.3 *The Perspective of the Shipping Industry*

Backwards and Forwards – Emerging from a 10-Year Shipping Downturn?

Peter Hinchliffe, Former Secretary General, International Chamber of Shipping (ICS)*

The UNCTAD *Review of Maritime Transport* is a definitive source of statistics for international shipping, which is widely used by the global shipping industry—as represented by its global trade association, the International Chamber of Shipping (ICS)—in addition to government policymakers and regulators.

The primary function of ICS is to represent the global industry with governments, which may not always fully appreciate the very difficult economic circumstances in which many shipping companies continue to operate.

That said, economic prospects for shipping are starting to seem a little brighter. Ten years after the beginning of the major shipping downturn, which followed the 2008 financial crisis, there is a growing perception in many shipping sectors that the worst might finally be over.

Shipping companies have worked hard to ensure their survival by delivering impressive efficiency improvements, dramatically slashing fuel consumption and using the latest information technology to further improve the quality of their service. There has also been considerable consolidation through mergers, particularly in the containership sector. There were around 20 major containership operators in 2016, and this number will decrease to about 12 during 2018, with further mergers anticipated. While there is still far less market concentration in other trades, there have also been mergers in the tanker and dry bulk sectors.

The fortunes of shipping are inextricably linked to the global economy, which, despite increasing political uncertainty, appears to be enjoying one of the best years of the past decade. The outlook for the next five years, therefore, appears to be positive for the main segments of the industry—dry bulk, tankers and containerships—with the important caveat that shipowners must avoid their tendency towards overordering new tonnage. In many trades there is still surplus capacity.

The good news is that a number of important regulatory uncertainties, which have complicated decisions about when best to dispose of older ships, are finally being resolved. This includes the entry into force of the International Convention for the Control and Management of Ships' Ballast Water and Sediments in September 2017 and the clarity now provided with regard to its implementation dates (although the new treatment systems that ships are required to install will have an estimated total cost to the industry of as much as \$100 billion). While the precise cost of compliance with new IMO sulphur regulations is still unknown, the situation should become clearer after January 2020 now that IMO has confirmed that the implementation date of the global sulphur cap is irrevocable. (The implementation in 2020 of this global requirement for ships to use low-sulphur fuel, rather than the heavy fuel oil, which most currently use, is expected to increase fuel costs for many ship operators by over 50 per cent, and much of this cost will be passed to consumers, with particular impacts on developing nations).

Although shipping has not yet fully recovered from the impact of the 2008 financial crisis, sluggish growth in many OECD economies was partly compensated for by the impressive growth in demand for shipping from China and other emerging nations.

However, while gross domestic product (GDP) growth in China during 2017, at almost 7 per cent, was a slight improvement on 2016, this is still significantly below the average growth of around 10 per cent per annum recorded since 1989. Moreover, as the Chinese economy continues to mature, an increasing proportion of this GDP growth is actually due to the expansion of service industries, rather than manufacturing or infrastructure development, which does not generate the same demand for shipping. Prior to 2008, the industry had become accustomed to increases in maritime trade being a significant multiple of global GDP growth, but this ratio between demand growth and GDP is now much smaller.

Setting aside, for a moment, current concerns about a burgeoning trade war initiated by the USA and the significance of the Chinese Belt and Road Initiative (BRI), there are some clear indications of what will most clearly influence the nature of the shipping industry.

Shipping is irreplaceable as the carrier of world trade, and while this guarantees a role for shipping, it does not help to smooth out the cyclical nature of shipping fortunes. The main feature for shipping for the next 20 years will be the costly implementation of regulations focused on environmental protection, notably reduced air emissions, ballast water treatment, safer recycling of ships and, most likely, reduced emission of noise into the ocean. The capital and operational cost of these measures, and the accompanying burden on crew time, will be very significant and likely to continue to drive the reshaping of the industry. Looking beyond 2050, the dominant cost feature will be implementing the recently agreed IMO Strategy to transform the industry into a carbon-free transport means. This dramatic aspiration will take the industry beyond its normal comfort zone and into an era of closer cooperation with cutting-edge technology and government-led initiatives to find the holy grail of a fossil-free propulsion system. It will provide a further cost driver to reshape the industry in a manner just as significant as the transitions from sail to coal-fired steam and on to diesel.

Whatever transpires in the future, I am sure that the global shipping industry will continue to value greatly the UNCTAD *Review of Maritime Transport* for another 50 years. I hope very much that the good relations between UNCTAD and the International Chamber of Shipping will similarly continue.

- * Peter Hinchliffe was ICS Secretary General from 2010 to August 2018, when he was succeeded by Guy Platten.

3.4 *The Perspective of the Port Industry*

What Will Shape the Port Sector in the Next 50 Years?

By Patrick Verhoeven, Managing Director, International Association of Ports and Harbors

Looking ahead 50 years from now is, in many respects, a challenging task, given the rapid pace of evolution in our society. A complex mixture of geopolitical changes, commercial strategies, digitalization and automation, decarbonisation and professional development will shape the future of the port sector. To help ports prepare for that future, IAPH established earlier this year the World Ports Sustainability Program, a platform for leadership and collaboration in such diverse areas as resilient infrastructure, energy transition, safety and security, community outreach and governance. With this programme, we hope to firmly establish the leadership of ports to deliver value to their communities in the years and decades to come.

Geopolitical changes and the rise of Asia, the Indian Subcontinent and Africa

Short-term, the impact of tariff barriers, WTO rule-breaking and political upheaval on world trade should not be underestimated in terms of their influence on the maritime industry in 50 years' time. Nonetheless, continued exponential growth in intra-Asian trade and the trades between Asia and the Indian Subcontinent as well as the expansion of Chinese interests across continents with its ambitious BRI vision will transform the geopolitical map by the second half of this century. Population growth in these regions will redraw principal seaborne trade lanes. For example, of 1.03 billion people living in Africa, 50 per cent are under 20 years old and 40 per cent live in cities. By 2020, 504 million Africans will form the continent's workforce. China has already made its mark on the continent with its infrastructure investments in Africa's ports and hinterland connections along with negotiating favourable trade accords resulting in a subsequent steep rise in trade between China and the African continent.

Rationalization and consolidation

Nearly every segment of the global supply chain seeks to rationalise its operations through mergers or strategic alliances. This includes shipping lines, terminal operators and shippers. Port authorities remain the one notable exception to far-reaching cooperative arrangements, at least in relative terms, vis-à-vis other economic actors in the supply chain.

More consolidation of port authorities will become inevitable in future, given the search for scale and scope economies, but also environmental and societal pressures. Land is a scarce good and competition for land use is therefore very high.

Examples of consolidation at the port authority level have started emerging. The Belgian ports of Ghent and Zeeland merged into the North Sea Port last year with other recent mergers including those of Hamina and Kotka in Finland, and the state-owned port companies of Ningbo and Zhoushan in China. A far-reaching cooperation agreement, as opposed to a merger, was reached between the ports of Seattle and Tacoma in the United States; it joined the two marine cargo operations. These are examples of bottom-up cooperation. In contrast, the recent reform of the Italian port system, which reduced the number of port authorities from 25 to 14, is a top-down case.

What currently complicates far-reaching forms of cooperation between port authorities are public ownership and related institutional impediments. An important precondition for successful cooperation projects therefore lies in ensuring the autonomy of port authorities from government.

Digitalization and automation

In 50 years, what the industry is currently describing as disruptive technologies and innovations will have become widely adopted and transform the way cargo and passenger traffic is handled by ports and their operators. Digitalization will most likely be the catalyst for efficiency improvements in terms of vessel arrival planning, time at berth and loading/discharge productivity.

Automation will emerge, albeit less rapidly with the construction of highly sophisticated greenfield operations like the APM Terminals facility in Maasvlakte in Rotterdam. Capital expenditure and the challenges of fully automating brownfield sites located near port city centres will take much longer to change.

A point may be reached where automation and real time data handling between port players converge with the application of artificial intelligence and predictive forecasting using big data collated from devices throughout the port, i.e., the 'Internet of Things' (IoT). Speed of development will depend on the readiness of the port and logistics players themselves to share sensitive data, and the willingness of the port authorities and their governing bodies to encourage or even impose this transparency.

Decarbonization and the push towards the circular economy

The IMO's 2020 sulphur cap and 2050 target for GHG reductions heralds the start of a structured approach towards capping harmful emissions that will ensure a very necessary adjustment to shipping status as a significant GHG emitter. With UNCTAD's *Review of Maritime Transport* predicting compound annual growth of 3.2 per cent for seaborne trade between now and 2022, the industry will be forced to act.

After an initial surge of interest four years ago that then waned, the use of liquefied natural gas (LNG) as an alternative to heavy fuel oil for bunkering has now seen genuine advances with the first offshore and cargo vessels operating on LNG, with ultra-large containerships and gas carriers now being ordered with dual fuel engines. The emergence of alternative, clean, non-carbon fuels like hydrogen and methanol will also power the ships of the future within 50 years. How fast that transformation takes place will depend on the willingness of owners and the preparedness of oil and gas majors and innovators alike to invest in fuel cell technology and infrastructure in ports. It will also depend on container shipowners de-escalating the fight for size based on alleged economies of scale, where 80 per cent of energy is consumed by 20 per cent of the largest cargo vessels.

A growing number of initiatives in the field of the 'circular economy', whereby port authorities work together with their industrial clusters to generate their own energy and give new economic purpose to waste products, can be expected; one example is waste water being used to cool industrial installations, which can be deployed for urban heating purposes.

Port professional development and attracting new young talent

Education and the development of young port professionals in the next 50 years will determine success in transforming the industry. The quality of accelerated skills development will have to aim at changing an age and gender demographic, which currently shows 89 and 91 per cent of positions occupied by males at respective directorship and C-levels,² and a skew towards seniority versus performance-based promotion and job rotation. The World Ports Sustainability Program is guided by the 17 UN SDG's and its core objectives are to coordinate future sustainability efforts of ports worldwide and foster international cooperation with partners in the supply chain. For more information, please visit <http://www.iaphworldports.org/www.sustainableworldports.org>.

² C-level executives are the highest-level executives in senior management of an organization, called such because they usually have titles beginning with 'chief'; three examples are the chief executive officer (CEO), chief operations officer (COO), and chief financial officer (CFO).

3.5 *A Maritime Transport Economist's Perspective*

Are We Smart Enough to Build a New Future for Maritime Transport?

Martin Stopford, President, Clarkson Research Services Limited and Director, MarEcon Ltd

Where we were 50 years ago

In 1968, the maritime world was in transition. The colonial system, which dominated global trade until the 1950s, had been replaced by free trade through the General Agreement on Tariffs and Trade, the World Bank and the International Monetary Fund. The powerful economies of North America, Europe and Japan were investing heavily in rebuilding after World War II and they controlled three-quarters of seaborne imports (Figure 3.1). The result was 50 years of global growth.³

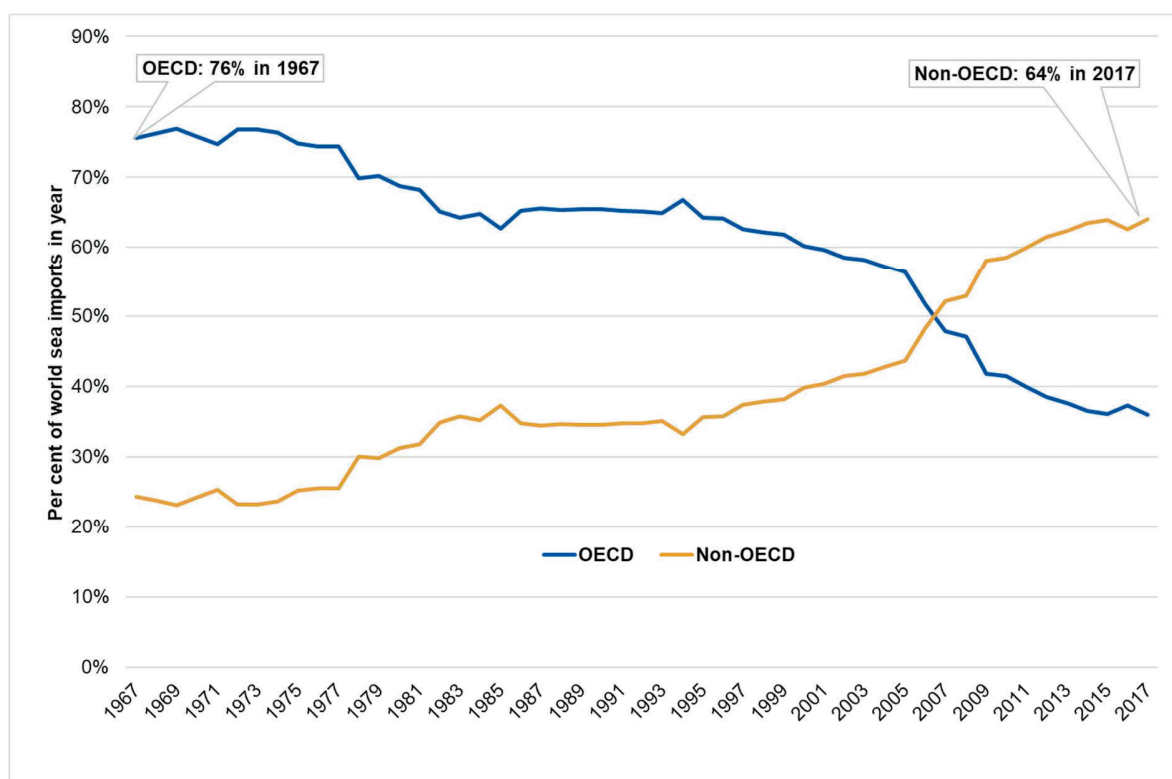
Crude oil played a major part in this 'globalization.' Until World War II, industry was mainly fuelled by coal, a good source of energy, but with severe limitations as a fuel for transport vehicles. The author Christopher Tugendhat (1968, p. 294) concluded his authoritative study of the oil industry with the observation that "[t]he oil age is still only just beginning; both as a fuel and as a raw material for chemicals. Oil's prospects are now brighter than ever before. There is no substitute for fuelling cars and aeroplanes, (...) By the end of the next decade it will play a part in almost all man's activities. He will move by it, build with it, wear it and even eat it. Oil is the philosopher's stone of the 20th century."

Tugendhat was right. Motor vehicle production grew from 19 million units in 1967 to 99 million in 2017. In 1969, the Boeing 747 jumbo jet transformed a business trip across the world from a couple of months to a couple of days. The number of air passengers increased from 74 million in 1966 to 4 billion in 2017. In sea transport, the first interregional container service was launched on the North Atlantic in 1967. Containers revolutionized trade, allowing emerging exporters like China to access distant markets at negligible freight costs.

Without crude oil, the containership would have been impractical. For example, the 2013-built *Emma Maersk*, the first super-containership, was designed to carry 11,000 containers across the ocean at 24 knots, with a 106,000 HP engine and a crew of 13. For comparison the *Mauritania* (1906), had 70,000 HP coal-fired steam turbines using 1,000 tons of coal per day, handled by 192 firemen and 120 coal trimmers!⁴ Diesel engines made fast, reliable transport of general cargo viable and thus played a major part in changing the shape of world trade over the next 50 years.

³ The average growth of sea imports between 1965 and 2015 was 3.7 per cent pa.

⁴ Note also that the *Emma Maersk*'s engine consumes energy equivalent to 3 million manpower. They would need a city the size of Los Angeles to sleep in and a couple of Panamax bulk carriers to carry their food!

Figure 3.1: The changing world of regional seaborne imports 1967–2017

Source: United Nations, UNCTAD and Clarkson Research.

Where we are today

Today the global economy faces a very different future. Burning oil and other fossil fuels has dire consequences for the climate. However, as Tugendhat predicted, oil now plays a part in almost everything we do. We move by it, build with it, wear it and even eat it. Building a new future without oil will be challenging and painful.

This is particularly true in maritime transport. Naval architects and marine engineers admit that they have no technology capable of significantly reducing emissions, without reducing performance.⁵ Maybe fuel cells in a few years, but technical innovation of this sort is unpredictable.

Where we must go next

Conventional ship design technology cannot solve the problem, but an emerging technology—information management—looks promising. This solution is not about ship design, though that will need to change, but about better management of transport, door-to-door. Some people

⁵ For example, *The Naval Architect*, “Meeting the Challenge”, January 2018, p. 20, quotes MAN Diesel & Turbo “we are close to what is theoretically possible for high performing two and four stroke engines”.

call this the fourth industrial revolution.⁶ Better information can contribute in three ways. First, by identifying the problems management must address. Second, information analysis can reveal ways to deal with these problems. Third, monitoring progress teaches and motivates, so that management learns from mistakes. Nobody wants to be the worst performer. ‘Smart Shipping’ technology can help achieve the IMO’s goal-based standards and the carbon footprint goal set for 2050.

Can Smart Shipping make B2BT work?

But this is only half the story. There is more. Adam Smith’s vision in *The Wealth of Nations*, one of the most influential economics books ever written, was that “by means of water carriage a more extensive market is opened to every sort of industry”.⁷ Today, we are only halfway to Smith’s vision of sea transport. Innovative Business to Business (B2B) transport systems can make manufacturing clusters possible in remote parts of the world, by providing them with access to wider markets. This B2B commerce will need a super-efficient maritime logistics system. Providing this advanced door-to-door transport is the challenge facing the maritime industry in the coming decades.

The power to take this step is not carbon-based; it is about a clear vision of the next generation of global trade, using information to achieve commercial and social goals. It is not theory; it works in practice. For example, information technology is used by Formula 1 racing teams to win races:

*In Formula 1, if you’re not innovating you’re going backwards... McLaren Racing produces an upgrade to its Formula 1 car every 17 minutes... We strive to do things better and lead by example right across the Group, understanding that even the smallest, most seemingly insignificant details matter. Before we embark on any activity, we must know why we are doing it and then be able to measure its impact and evaluate its success. If we can’t measure something, we don’t know if we have improved. Data equals knowledge, and with knowledge, we can win.*⁸

Information brings awareness, awareness brings motivation, and motivation leads to achievement. Information technology can empower new maritime trade clusters, whether in the North Atlantic, South Atlantic, Indian Ocean or along the Maritime Silk Road. Regional super-clusters driven by intellectual energy will be the future, but they must be built. Are we SMART enough to do it?

Finally, a word of thanks. Carefully selected information about the present can help us prepare for an uncertain future. For 50 years *Review of Maritime Transport* has informed the maritime industry on regional seaborne trade, the shipping fleet, vessel flag and ownership, and other key information. It has been a great help to many crystal-ball gazers, during an era of amazing changes. Keep up the good work!

⁶ McKinsey & Company (2015). Industry 4.0 How to Navigate the Digitalization of the Manufacturing Sector, <https://www.mckinsey.com/business-functions/operations/our-insights/industry-four-point-o-how-to-navigate-the-digitization-of-the-manufacturing-sector>.

⁷ Smith, A. (1776). *An Enquiry into the Nature & Causes of the Wealth of Nations*. Oxford World Classics (Ed. 1993), p. 27.

⁸ McLaren (2018), Approach, <http://www.mclaren.com/technologygroup/about/approach/>, last accessed 19 July 2018.

3.6 *An Academic Perspective*

Maritime Trade and Transport – An Outlook on the Issues and a Reflection on the Implications for Education and Research

By Dr. Cleopatra Doumbia-Henry, President, World Maritime University (WMU)

Since 1968, UNCTAD's *Review of Maritime Transport* has been a highly respected and relied-upon reference for the maritime industry, providing authoritative statistical data and a yearly analysis of structural and cyclical trends impacting seaborne trade, ports and shipping. This essay for its 50th anniversary, written from my perspective as the President of WMU—an international academic institution of the United Nations (UN) dedicated to advancing maritime education and research—provides a reflection on the outlook for maritime transport over the short, medium and longer term.

There are several major groups of issues that currently affect maritime trade and transport and will continue to shape it for the foreseeable future, particularly in connection with regulatory and policy activity. Many of these are articulated in the UN's SDGs for 2030, particularly in connection with improving ocean governance and tackling the widespread impact of climate change, as well as addressing poverty and improving the role of women. Related to these topics are specific impacts which themselves create 'issues', for example, the melting of polar ice, which will change shipping routes and trading patterns, or the impact of desertification triggering human migration, often by sea. One other key group of issues relates to impact of technological change. Finally, what appears to be changing trading relationships and patterns is likely to have a significant impact on maritime trade and transport. These issues will all shape employment, and the education and training needs of the maritime transport and wider oceans sector. This brief essay can only highlight a few of these.

What has been described as 'The Fourth Industrial Revolution'⁹(4IR) is with us and is characterised by the introduction of artificial intelligence, including self-learning robotics and the Internet of Things. For the maritime sector, over the short term, new technologies such as automation, maritime safety and security concerns, including cybersecurity, as well as innovations in technology responding to marine environmental and climate change issues, will loom large on the maritime agenda and change the maritime industry as a whole. Technological developments on the way include autonomous ships and automation of port and other transport chain operations. These developments will have implications for policy setting, finance, insurance, environmental issues, energy, technology and geopolitical developments. They will have consequences for society at large and for developing countries in particular. The regulatory and legislative challenges facing the industry are expected to be wide-ranging and far-reaching.

New regulations or amended regulations will be required through the International Maritime Organisation (IMO), the World Trade Organization (WTO), UNCTAD and the World Customs Organization, and the International Labour Organization (ILO). Cooperation and coordination among agencies and with the industry will be necessary to facilitate the implementation of trade and transport facilitation reforms.

⁹ Klaus Schwab, *The Fourth Industrial Revolution* (World Economic Forum, Geneva, Switzerland, 2016).

Certainly in the next five to 10 years, the 4IR is expected to be a disruptive element in shipping. It is anticipated that commercial shipping processes will be digitalized, and connected and automated transport will be operational, with increased automation of processes and data and greater integration of the supply and transport chain. It is predicted that by 2020, there will be remotely operated local vessels and by 2025, there will be autonomous vessels.¹⁰

For example, already now and over the next 20 years, IMO Conventions will need to be evaluated to determine whether they need to be updated and whether new instruments are needed to ensure safe, secure and environmentally sound Maritime Autonomous Surface Ships. A range of issues will need to be taken into account, including policy and regulatory frameworks, digital and smart ships, digital and smart ports, smart shipping, maritime safety and security, cybersecurity and anti-terror safeguards, and human resources and education. A number of other issues have also been identified relating to *inter alia* jurisdiction, navigation and prevention of collisions at sea, protection of the marine environment, liability, compensation and insurance, seafarers of the future, construction requirements and the technical conditions of these ships.

In light of 4IR there are also important questions about employment relating to both ships and ports that will have an impact on seafarers and port workers. While technological developments may reduce administrative burdens, it is expected that the size of crews and the number working in ports will continue to decline while administrative burdens increase, which could lead to greater stress and occupational safety and health concerns for seafarers and port workers. In this respect, the ILO will need to consider the implications for the Maritime Labour Convention, 2006 as amended and other maritime labour instruments in order to ensure effective protection of seafarers and port workers.

In connection with the UN SDGs for 2030, there are too many issues to address in this brief essay; however, I note, as an example, the response to the issue of climate change. Already numerous decisions have been made by the IMO adopting decisions relating to climate change that have had a significant impact on maritime transport. Most recently on 13 April 2018, the IMO adopted an Initial IMO Strategy on reduction of GHGs from ships. The strategy confirmed IMO's commitment to reducing GHG emissions from international shipping and, as a matter of urgency, to phase them out as soon as possible in this century. A target has been set to reduce the total annual GHG emissions by at least 50 per cent by 2050, i.e., in 32 years. Will this be possible? Much will depend on progress made, including technological innovations concerning energy-efficient measures and solutions. The strategy adopted by the IMO will send a strong signal to the shipping industry and will stimulate investment in the development of low- and zero-carbon fuels and innovative energy-efficient technologies.

With so many developments on the horizon, and the targets for the achievement of the UN SDGs by 2030 as well as the impact of 4IR and changing trading and economic relationships, I see a period of perhaps unprecedented change and challenges for medium- and long-term maritime trade and transport, at least in terms of the speed of that change, and this change will be on many fronts affecting both ships and ports. It is also clear that there will be an even more important role for maritime education and training and research institutions.

They will be required to provide programmes and research to help in responding to all these changes. For example, in response to the impact of these issues on its constituency (IMO,

¹⁰ <http://www.imo.org/en/mediacentre/meetingsummaries/mepc/pages/mepc-72nd-session.aspx>.

governments, especially of developing economy countries and the maritime industry), in addition to revising its academic programmes, WMU has specifically focused on developing its research capacity. May 2018 saw the inauguration of the WMU–Sasakawa Global Ocean Institute that, *inter alia*, will serve as a convergence platform where policymakers, the scientific community, regulators, industry actors, academics and representatives of civil society can meet to discuss how best to manage and use ocean spaces and their resources for the sustainable development of present and future generations. WMU has also developed a research strategy for the next five years to specifically respond to the above-mentioned issues and trends, in particular the maritime and ocean-related UN SDGs and IMO's strategic directions. The following areas for research focus have been identified: Maritime Energy Management; Maritime and Marine Technology and Innovation; Maritime Economics and Business; Maritime Social and Labour Governance; Maritime Law, Policy and Governance; Maritime Safety; and Environmental Impact of Maritime Activities. Research and activities, such as symposia or workshops to promote discussion and dissemination of information, will in turn contribute substantively to the content of the courses offered in WMU's Master of Science degree programme. I have no doubt that the data and analysis published in *RMT* will continue to be an invaluable resource for WMU faculty research in these and many other areas.

4.0 How is the Future of Maritime Transport Expected to Evolve?

Reflections by Mary R. Brooks, Professor Emerita, Dalhousie University

4.1 Introduction

Human beings have considerable difficulty predicting events more than a generation from their current experience, and, as noted by Martin Stopford, President of Clarkson Research Services Limited, in his invited essay, can often get the predictions wrong. As this chapter looks forward to the future, both in terms of overall developments affecting the maritime transport sector and in terms of the *Review of Maritime Transport (RMT)*, the starting point was: What did the industry look like 50 years ago. While Chapter 2 has provided a taste of time travel through *RMT*'s past, transformative change for maritime transport came as a result of global factors including population growth, wealth generation, multilateral regulatory efforts to address continuing challenges, and the disruptive change brought by containerization. The world population at 7.54 billion in 2017¹ is almost double what it was in 1974, only six years after *RMT* was launched, and per capita income has grown steadily in constant dollars over the period.

A little more than 60 years ago, Malcolm McLean, an American trucker, had the idea that a sealed box carried to a port on a 35-foot long truck chassis could be loaded directly onto a ship and off-loaded at the other end of the voyage with its cargo intact. The first container voyage was deck cargo on the tanker *Ideal X* from Newark to Houston in 1956. The success of containerization was driven mainly by the economies accruing from minimal handling of the cargo and by the insurance industry; cargo theft in ports was rampant globally, and a sealed box provided cargo owners a measure of greater security for their goods and reduced their insurance costs significantly. This disruptive technology changed the face of shipping intermediate and finished goods about as long ago as this chapter is to look forward and predict for the future of *RMT*. A challenging task to say the least has been set for this chapter.

In 2013, the WTO examined how trade will grow in future by looking at the growth 1990–2011, and at how much the growth of trade outpaced the growth in the GDP leading up to the Global Economic Crisis of 2008–09. The share of global trade attributed to the three most important bilateral trade relationships of the 1990s, as a group, declined from 26.1 per cent to 21.4 per cent; the transpacific (Asia–North America) decreased from 10.2 per cent in 1990 to 7.8 per cent in 2011, Asia–Europe grew from 8.1 per cent in 1990 to 8.8 per cent in 2011, and the transatlantic (Europe–North America) fell from 7.8 per cent in 1990 to 4.8 per cent in 2011 (WTO, 2013: 77). On the other hand, the intra-Asian trade growth was nothing short of dramatic. Based on statistics from WTO (2013, Appendix B), while world trade grew by 649 per cent (from \$739 billion in 1990 to \$5,538 billion in 2011), intra-Asian trade grew by 2,925 per cent (from \$311 billion in 1990 to \$2,926 billion in 2011), and accounted for 52.8 per cent of world trade by 2011.² Not only has the way manufactured goods are transported changed, but trade share has clearly grown for Asian developing countries.

¹ <http://wdi.worldbank.org/table/WV.1#>.

² All dollars are US dollars, unless otherwise specified.

Other than reveal the diminished share of trade accruing to developed country main trades, trade value in dollars does not reflect what has happened over the last three decades in shipping. It is here that *Review of Maritime Transport* has played a particularly strong role in helping the industry identify the reality of its markets. By focusing on goods loaded and unloaded by cargo type, the demand for shipping has been examined and dissected, and those responsible for investment, policy and planning decisions have been able to view a larger, global picture. Furthermore, by exploring ownership and vessel supply, a very different story has emerged than is told by trade numbers. Most obvious here is the incredible change in the ratio of trade between countries of the (OECD) and non-OECD countries, as seen in Figure 3.1.

In the bulk trades, growth in demand has been slow and steady, reflecting population growth and the growth in per capita wealth over the past 50 years. As noted in Chapter 2, the true growth in bulk traffic has been more on the dry bulk side than for liquid bulk, reflecting efforts to reduce fossil fuel consumption after the oil shock of the 1970s and the growth in dry bulk inputs to manufacturing, and the ever-present growth in grain trades. *RMT's* efforts in support of developing countries and their efforts to achieve prosperity through fleet development, trade facilitation, and greater participation in liner shipping have really been forward-focused as this is where the opportunity is the greatest. Why?

In the last 30 years, globalization grew world trade faster than its wealth-creating capabilities. Manufacturers have been deconstructing the global value chain for goods in order to optimize profitability through labour cost reductions and technology-driven productivity gains. The key has been to retain high value activities (R&D, marketing, financing) for educated, high-cost labour in developed countries, moving low-value activities to countries where labour costs are low. This takes advantage of economies of scale in maritime transportation, deregulation in landside transport, financial services and telecommunications, and the informational advantages granted by the Internet to generate wealth for shareholders and owners.

In order to obtain a sense of direction on where the future might take maritime transport, a survey exploring the opinion of some UNCTAD staff, selected UNCTAD collaborators and partners, as well as IAME members (introduced in Chapter 1) was constructed. Sections 4.2-4.4 of this chapter report on the findings of the opinion survey and a literature search undertaken on the topics selected or identified by the respondents as being important.

Section 4.2 begins by looking at technologies as drivers of future change. One critical uncertainty going forward is whether the trade advantages acquired from new technologies to this point have matured sufficiently that there will be less to be gained in the future, or if there are new disruptive technologies that will propel trade growth through further value chain restructuring and additional disintermediation of trading relationships. Martin Stopford asks readers in his invited essay to consider whether our capacity to extract more from what we have already in place is possible through smart shipping. To contemplate his request of readers, section 4.2 focuses on the specific technologies identified in the opinion survey, and the opportunities they offer, exploring both the feedback received from the respondents to the survey and the literature on the topics identified. Extracted quotes from the invited essays found in Chapter 3 reinforce the personal reflections on the opinion survey findings and literature review.

Using a similar format to that in section 4.2, section 4.3 then moves to a second key driver of the future: regulation, be it multilateral or regional. Future regulatory developments will shape the maritime transport operational landscape and influence UNCTAD's role and mandate. The

opinion survey gauges information on which areas of regulatory development may become relevant and several of these are examined in more detail. Section 4.4 then explores the third driver, which are factors beyond control of government and business, again as identified by the respondents to the opinion survey, and discusses what is expected. As all three drivers will exert pressure on the possible future differently, section 4.5 examines the literature on scenario building, and discusses what a few of the published scenarios provide as insight into the possible future for maritime transport. The chapter then closes with some final thoughts on that future.

4.2 Technologies, Existing and in Development

The opinion survey began by exploring respondents' thoughts on technologies and their likely impacts on the future of maritime transport. It provided very interesting results. Participants were asked to identify, from a list of eight technologies, the four most important to be reviewed in this Special Issue (Table 4.1). Certainly, these four are also the ones most prevalent in the literature review, and so will be the focus of this section.

Table 4.1: Technologies for RMT

Top 4 Response Rate

1. Alternative fuels to bunker / traditional fossil fuels (LNG, etc., plus alternative fuel standards)
2. Increased port automation, Internet of Things (IoT)
3. Autonomous vessel technology (MASS)
4. Blockchain technology
5. 3-D printing (reduced need for transport of basic manufacturing bulk products and intermediate parts and machinery)
6. Robotics in manufacturing resulting in near-shoring
7. Hyperloop and alternative methods of dealing with landside cargo transport
8. Cryptocurrencies

Participants were asked three additional questions about those technologies:

- 1) Which of the following technologies are likely to have a significant impact (no, very limited, some, significant) on future trading patterns (and trade facilitation efforts)?
- 2) Which of the following technologies are likely to have a significant impact (no, limited, some, significant) on the provision of shipping services to developing countries and small island developing states?
- 3) Over what time frames do you expect these technologies to be realized?

The significance of the four technologies identified by respondents for UNCTAD's *Review of Maritime Transport* and the time frame over which they are estimated to have impact are presented in Table 4.2.

Table 4.2: Impacts and time frames for new technologies (percentage of respondents)

Technology	Impact on Trade Patterns				Time Frame		
	Significant impact	Some impact	Very limited impact	No impact	Within next 5 years	5–19 years	20+ years
Alternative fuels to bunker / traditional fossil fuels (LNG, etc. plus alternative fuel standards)	52	33	7	7	56	40	4
Increased port automation, Internet of Things	52	35	7	6	57	43	0
Blockchain technology	53	36	8	4	50	50	0
Autonomous vessel technology (MASS)	35	39	20	6	9	65	26
3-D printing (reduced need for transport of basic manufacturing bulk products and intermediate parts and machinery)	26	50	22	2	22	61	17
Robotics in manufacturing resulting in near-shoring	28	52	19	2	26	61	13
Hyperloop and alternative methods of dealing with landside cargo transport	13	4.3	36	8	11	39	50
Cryptocurrencies	14	31	46	10	45	35	20

Note: The number of participants varied between 50 and 55, depending on the technology, as each respondent was asked to only respond about those technologies they felt able to evaluate and assign a time frame.

Alternative fuels and standards

Given concerns about the impact of bunker and traditional fossil fuels on ship air emissions, in particular GHG emissions and therefore climate change, there has been much written about the concept of 'decarbonizing shipping.' However, it is much more complex than just addressing fuels. The focus throughout much of the last decade has been directed towards sulphur oxide (SOx) reduction, through caps on allowable sulphur content in marine fuel and the development of Emission Control Areas as mandated under the IMO as well as at country and regional level such as North America. These are only two planks in the deck of the ship

of the future. Concerns have been raised that many vessels may simply not be ready for the IMO's 2020 required global change in ships' fuel systems, contracting for fuels or installing scrubbers or other technologies to enable continued use of the current fuels or future new fuel blends. Concerns have also been raised about refinery readiness and compliant fuel availability. Beyond 2020, what other fuel options exist? Liquefied natural gas (LNG) is only one way to move the industry towards reduced emissions from shipping operations but then methane emissions become a factor landside in getting the LNG to port. While exhaust scrubbers serve as an interim measure, they may contribute to increased ocean acidification, further jeopardizing the long-term health of the planet. The desire for regulators to set alternative fuel standards and even compliance protocols is growing. The wicked challenge of reducing emissions comes at a time when trade by sea is growing, driven by population growth and increased economic prosperity in developing countries, and will only become more difficult to achieve if multilateral solutions are not found.

The primary means of decarbonization is to consider ways to reduce freight demand. 3-D printing, for example, is an option that was not seen as significant in the opinion survey. The challenge is that there are not many substitutes for the long haul of dry bulk or tanker traffic to serve the needs of a growing global population. On the container side, there are many improvements that can be made at ports through a combination of automation, e.g., new equipment investment, and electrification of energy used in ports. Wilmsmeier and Spengler (2016) have spent considerable time investigating energy emissions and energy use in ports in Latin America, and it is possible to benchmark improvement here. Of course, the electrification of ports is only a suitable pathway to decarbonization if the energy source is not a fossil fuel. Problematically, coal-fired electricity generation is still well entrenched in some parts of the world. Over time, ports and governments look for alternative ways to generate electricity from wind or geothermal options. The speed of adoption will depend considerably on whether equipment has reached the end of its useful life and is in need of replacement or whether it is ageing gracefully.

Returning to shipping itself, there have been recent, positive developments. As noted in the invited essay by the IMO Secretary-General Kitack Lim, there has been considerable progress in the last few years on the 'decarbonization' of shipping. The IMO's Marine Environment Protection Committee adopted a resolution, at its 9–13 April 2018 meeting, codifying an initial GHG emissions strategy for shipping. This strategy is a major step forward in establishing GHG reduction targets through to 2050 and implies that shipping will be able to reduce its impact on the environment through near-term policies to significantly improve on the GHG impact of the existing fleet. It is planned that the strategy will be revised in 2023 and reviewed again in 2028.

... the historic adoption, earlier this year, of an Initial Strategy for reducing greenhouse gas emissions from international shipping is likely to have a resonance far beyond the industry itself. (Kitack Lim, invited essay)

What is particularly heartening is that the measures included in the IMO's initial GHG strategy, as summarized by The International Council on Clean Transportation (2018), has targets for both new and in-service vessels in the short term (to 2023), and contains measures to address both methane and volatile organic compounds (VOCs) in emissions from engines and other sources onboard ship. While alternative low carbon fuels are seen as the way forward from 2023 to 2030, the strategy also considers market-based measures that may be used for in-service vessels but leaves new fuel developments until 2030 and later. The key uncertainty will be how governments decide to implement national policies and processes for their own

fleets, and whether international targets can be achieved. McKinnon (2018b) projects that a new fleet of low-carbon vessels will not be available for at least 20 years, and that shipping will be much later in the timeline of global efforts in the decarbonization of logistics.

Naval architects and marine engineers admit that they have no technology capable of significantly reducing emissions, without reducing performance. (Martin Stopford, invited essay)

The International Transport Forum (ITF, 2018a) report on decarbonizing shipping points to a number of technical ship-design measures (slender designs, lighter materials, propulsion improvements and the like) that might allow small gains to be made in reducing GHG emissions. Larger gains will be possible from changing the ships' fuel. Alternatives like nuclear and hydrogen can achieve up to 100 per cent of carbon dioxide (CO₂) emission reductions; it is highly unlikely there will be a return to the age of sail, which would deliver up to a 32 per cent reduction in CO₂ emissions. Particularly interesting is that LNG, the current social media favourite, does not have as strong an impact on GHG emissions as some other options; it still is a fossil fuel and produces CO₂ when combusted, but it is the cleanest of the fossil fuel options. Do the other options have industry acceptance? Biofuels are at least being looked at, according to the ITF report, but there are significant challenges with both hydrogen and methane, and growing concerns about methane slippage.

An important part of the decarbonization process will be the incentives for the industry to make changes. It was suggested by *The Economist* (2017) that financial incentives were one way of making sure that 'dirty' ships had a reduced life cycle in the shipping world. Noting that 15 of the biggest ships emitted more nitrous oxide (NO_x) and SO_x than all the world's cars together, *The Economist* suggested that fuel savings achieved under green-lending arrangements should share the benefits between the shipowner and the charterer over longer-term contracts, providing the shipowner with an incentive to upgrade vessels to be less polluting.

Another example of industry-led initiatives comes from the ship chartering industry. BetterFleet is a tool that allows charterers to investigate the ships they may choose to charter; it provides free-to-access efficiency data (at ShippingEfficiency.org) to allow stakeholders to understand the comparative energy efficiency of different vessels and make pro-environment decisions when chartering a vessel (*Maritime Executive*, 2016). This type of tool is particularly important, as Acciaro and McKinnon (2015) have found. By regressing carbon emissions from container shipping on particular trade routes against independent variables, such as vessel age, size and average speed, they found that among carriers accounting for approximately 65 per cent of total world deep-sea container traffic in 2012, significant differences exist in terms of carbon intensity and energy efficiency. Their research, and a more recent effort by McKinnon (2018a), have provided input to shipping lines and landside partners considering carbon-reduction plans, and to governments seeking to devise appropriate policies to incentivize the decarbonization of shipping and not just relying on freight deceleration as a path forward (McKinnon, 2016).

In addition to these, Becqué et al. (2018) examined industry-led initiatives to 'green' shipping, and government policies to incentivize such efforts by industry. Becqué et al. (2018) identify four industry-initiated green shipping incentive schemes, two of which are discussed below, that UNCTAD might consider reviewing as a possible approach to future monitoring efforts aimed at improving shipping service quality in developing countries. The first of these is the environmental ship index (ESI), introduced in 2010 for ports in the Le Havre–Hamburg range,

and now used to evaluate ships' emissions performance in 35 ports in Europe, four in Asia, four in North America and four in other parts of the world. Given that it is a standard approach, it would be worth considering whether the adoption of this approach is suitable for *RMT*.³ The second is the clean shipping index (CSI), an online tool that scores each registered ship for its performance. It is used by cargo owners and forwarders looking to purchase cargo-carrying capacity and monitors directly the more than 2,250 ships that have a CSI rating and whose owners are focused on improving their environmental performance. Unlike the ESI, based on data reported by ports, CSI provides perspective to trading interests; therefore, two options for *RMT* emerge: (1) Since *RMT* Appendices report vessel dead-weight tons and gross registered tons by flag and country of ownership, it might be possible to consider adding the number of CSI-rated vessels to this database.⁴ (2) *RMT* might track, through its port performance scorecard process, the count of vessels with a CSI rating of 4–5 out of all vessel calls in a year.⁵ Becqué et al. (2018) provide food for thought as to what *RMT* might choose in future to measure the development of greener shipping, something not currently possible with existing data reporting. The question that might be considered: Are these two indices relevant for evaluating developing country shipping environmental performance, and, if so, how could it/they be incorporated into *RMT*?

Decarbonization does not just happen onboard ship. While 'reduced emissions from port operations' was not on the list of topics in the opinion survey, it is part of the same alternative energy discussion. ITF (2018b) identifies the practices that port operators might contemplate to reduce the impact of vessel emissions on port communities, including concepts such as green port fees, berth allocation policies and carbon pricing charges, to name just a few. ITF concludes that there is the potential to achieve even greater GHG emission reduction through wider and more broadly harmonized approaches by the port community. In his essay, Patrick Verhoeven, Managing Director of the IAPH, argues that the circular economy will give new life to waste product usage in ports. ITF (2018a) suggests that ports could 'nudge' shipping companies along the decarbonization pathway; this makes considerable sense given that ports are where citizens feel the air pollution impact locally, and they may withdraw the social license that allows the port to continue operations supporting trade.

Digitalizing the supply chain through blockchain technology

Leviäkangas (2016) argues that digitalization is the most significant technological trend the trade and transport world face today, arguing that the key challenge for both businesses and regulators is identifying and codifying global standards for global multimodal moves. Standards for shipping cannot be isolated from those for other modes of transport. That said, shipping carries the majority of global trade, and so it is on the frontline of discussions about international standards for trade transactions, and specifically bills of lading. While the opinion survey questionnaire only contained three items within digitalization technologies (blockchain, cryptocurrencies, and port automation and the IoT) the respondents clearly indicated that cryptocurrencies were of less priority for *RMT*, and used the open-ended text part of the opinion survey to include a wider range of digitalization issues. Therefore, this subsection will

³ The ports appear to be predominantly developed country ports and so this may not be a suitable option.

⁴ On the other hand, this rating process is expensive and may not be appropriate; much will depend on the vessel coverage.

⁵ The challenge here is acceptance by ports in adding this administrative burden to existing port performance activities, when they may be focusing efforts on efficiency improvements as a priority.

focus primarily on blockchain technology and a later section will explore port automation and the IoT.

A continuation of digitalization, and specifically blockchain technology, will disrupt traditional documentation and trading relationships. The critical uncertainty is specifically how this will happen. Blockchain technology, on the one hand, offers greater security to the two trading parties—buyer and seller—as they seek to strengthen their relationships. On the other hand, it challenges third-party interests—bankers, freight forwarders and other service providers—with the threat of disintermediation and alternative business models. Third parties are vulnerable as they do not necessarily provide a large-margin, trusted, value-added service to importers and exporters and so may not survive blockchain introduction by large global players. While cryptocurrencies and blockchain are complementary technologies, cryptocurrencies are expected to be niche players in currency markets (Evans et al., 2016), while blockchain is likely to be more widely adopted, once pilot projects work out the ‘bugs.’

The blockchain technology as a whole is about trust in transactions and contracts in a shared ledger framework where digital identity can be confirmed and will be used where there is a clearing or settling function to be undertaken, as is the case in any trade and transport transaction. Blockchain, like cryptocurrencies, will have a scalability challenge and the Boston Consulting Group (Evans et al., 2016) predicts that the corporate strategies of market players, the tenacity of ‘killer app’ builders, the focus of regulation and the energy intensity of these technologies all raise doubts about how widespread blockchain use will become and whether its adoption will ultimately be realized.

In the media, new entrants experimenting with blockchain are noted weekly; a recent example is CargoX, which is now offering a blockchain bill of lading solution, payable in US dollars or Bitcoin, and replacing the role of the buyer’s and seller’s financial institutions in the ‘trusted third party’ process for securing trade (Port Technology, 2018a). Carson et al. (2018) note that large investments are being made in blockchain technology and question its likelihood of adoption across many industries. The transportation and logistics sector is ‘in the low middle’ of a low–high impact scale and in a similar location on a low–high feasibility scale, leading to the conclusion that blockchain may not deliver the incredible benefits that are projected for it in the transportation press. In their exploration of ‘hype’, the authors argue that blockchain will succeed in permissioned relationships (like those between related companies), will begin with cost reductions before transforming business models, and is “still three to five years away from feasibility at scale, primarily because of the difficulty of resolving the ‘coopetition’ paradox to establish common standards”.⁶ They argue that blockchain is more suited to government services, financial services and healthcare, and this is where the early uses will likely be. Roubini and Byrne (2018) are more outspoken; they believe that blockchain is an overhyped technology that does not have a future. In the middle is ITF (2018c) report that identifies transaction speeds and scalability problems as keys to mainstream implementation, but concludes that there will likely be some middle ground with different distributed ledger models developing.⁷

⁶ Carson et al., 2018, p. 2.

⁷ The distributed ledger concept is seminal to a functioning blockchain. ITF (2018c, p. 39) notes the frequently cited statistic of Visa handling 24,000 transactions a second (tps) while many of the cryptocurrencies handle only 7–12 tps.

Distributed ledgers in various forms are early in development, and how they will evolve and who will control that evolution are very much unknown at this time. This leaves a future that is highly uncertain. On the other hand, moving from paper-based and manual processes to digital and automated means of booking container shipments is well along the path to widespread adoption. INTTRA's Ocean Trade Platform⁸ is well developed and has a large network of partners, customers and users while its C-FAST platform provides services to shipping lines to support container forecasting.⁹ The Maersk–IBM partnership (Maersk, 2018) for the development of blockchain uses in shipping is the tip of the iceberg, and in August Maersk announced that they were first to market with TradeLens, a blockchain solution (Port Technology, 2018b). There will be other players exploring blockchain uses and securities, and ultimately there will be developments in setting blockchain standards for the shipping transactions. The Boston Consulting Group (Egloff et al., 2018) argues that the future will belong to container carriers who seize the competitive advantage that arises from digitization, and that those who do not take action put their future commercial success at risk by becoming dependent on others. Third parties like freight forwarders are most at risk. The guidance, therefore, for this technology is one of monitoring; the views expressed in the opinion survey suggested that monitoring should begin in about five years from now when the situation is clearer. Much sooner appears more compelling as TradeLens is expected to be fully operational by January 2019.

So far, the technology has made the greatest advances in securities trading, but can it expand beyond the few largest trading platforms to the global trading arena? Where parties have a prior relationship, they can maintain the existing relationship through proprietary databases and encryption; where they do not, a system to provide trust in contracting is needed. To illustrate, more than half of world trade is argued to be between companies that are related (i.e., parent and subsidiary or franchise/exclusive dealer), and therefore a waybill can be used because a bill of lading for transport documentation is not necessary (there is no need to use the negotiable instrument nature of a bill of lading). That same volume of trade might be the first to use alternative processes, while those relying on bills of lading are the parties with the greatest incentive to seek alternative databases and encryption technologies for trusted trading, given the sheer volume of complexity and delay associated with handling the paper-based bill of lading system. Time and delay have inventory carrying costs that traders are anxious to reduce. Drewry Supply Chain Advisors (2018) suggests that there is plenty of scope for disruption of the documentary processes and that financial solutions are possible that will build trust and eliminate the need for 'Cash against Documents' in trade transactions. Proposed are globally accessible platforms, as exist in the airline industry, for available shipping capacity; these would reduce costs to lines from ghost bookings and rollovers, and costs to shippers in terms of transaction costs and cumbersome payment processes.

It is clear that the future use of this technology in both shipping and trading contracts could be a potential theme for *RMT*'s monitoring and reporting function. Issues worth monitoring include how governments implement blockchain-enabling legislation. Identifying the protocols that would assist developing countries with realizing the benefits through education and common approaches would also of relevance.¹⁰

⁸ https://www.inttra.com/shipper-solutions/ocean_trade_platform/, last accessed 3 July 2018.

⁹ <https://www.inttra.com/c-fast/>, last accessed 3 July 2018.

Increased port automation, Internet of Things

The opinion survey suggests that port automation and the IoT¹¹ may become key priorities to consider in future.

In recent years there has been considerable ‘hype’ about automated ports, but as noted by Brooks (2017), this is really only relevant for greenfield operations, and for developing country ports able to attract the large investments needed. Some of these can be expected over the coming years as more ports are encouraged by local governments to move out of the urban core of cities, as population grows and citizens desire ports to be ‘out of sight.’ Some of this will also be driven by the opportunity afforded by China’s Belt and Road Initiative. More likely, however, is increasing automation at existing terminals, particularly for cargo-handling activities, and, as noted in Patrick Verhoeven’s invited essay, predictive analytics of ‘big data’ will harness IoT to secure greater efficiencies in port operations. How quickly all of this is implemented over the next 50 years will depend on the quality of port authority management and the appropriateness of the governance model applicable to them.

Chapter 4 of *Review of Maritime Transport 2018* has a section on port automation and tracking for container ports. The conclusion drawn is that very few ports have been fully automated and the adoption of automation is at a very early stage.

On the shipping side, IoT can assist not only in automating vessel bridge and cargo-handling operations, it can assist with route-planning, fuel-planning and many other vessel operations. As digitalization and the IoT opportunities progress, it will be very important to monitor these impacts. The challenge is that there are so many possible combinations of IoT interfaces, all with the potential to be disruptive. How *RMT* will continue to monitor the impacts, particularly for developing countries, is a fruitful area for discussion.

Autonomous vessel technology

Both Norway and Japan are at the forefront of Maritime Autonomous Surface Ship (MASS) development, with Kongsberg leading in Norway and Mitsui OSK as the shipping line partner in the Japanese research consortium. According to Liu (2018), the primary driving forces for autonomous ships are not to just reduce operating costs and reduce the incidence of human error accidents and incidents but to create a real transformation in the industry. While the MASS technology captures the imagination of futurists, what is happening in the field of autonomous ships is of greater relevance to the IMO, the ILO, the classification companies and marine insurers than to UNCTAD’s core audience. Each government and associated regulatory body will be monitoring the development of the technology, and Liu provides a brief overview of the operational, safety and regulatory challenges for consideration. He concludes that until there is an international regulatory regime for MASS, they will be relegated to national waters where allowed. While Levander (2017) of Rolls Royce, one of the key research and development investors in MASS, suggests that it is more likely this technology will first be implemented in coastal areas, for ferries and tug boats, than on the high seas for ocean-going

¹¹ The ‘Internet of Things’ or IoT refers to the machine-to-machine connection of devices with embedded or attached connectivity and data sensing, sending, reception and analysis and or reception possibilities using Internet technology.

vessels, which he sees as more likely to be 30 years in the future. By 2050, whether the trade is carried on an autonomous vessel or a manned one is less relevant than whether the country has adopted the necessary regulation to protect its waters and ensure that both manned and unmanned vessels can operate in national waters safely.

Other technologies

There are many other trends that will influence demand and so are relevant to what is traded and what routes and modes will be used. Predicting future demand, 50 years out, may be entertaining but will be speculative. What is clear is that demand will evolve over time, that trade will develop where population and per capita wealth grow fastest, and that the growth will be moderated as wealthier populations buy more services and fewer goods. The demand for tanker traffic will be moderated somewhat as new energy sources come on-stream in a world focused on climate change and 'decarbonization.' Some of those new energy sources will possibly alter ships' propulsion systems. Dry bulk demand will grow with population growth as well, but the pace may be different, and the routes may alter with near-shoring, and alternative means of transporting food and agricultural inputs, for example, for the world. Some technologies, like 3-D printing, will alter the demand for shipping of basic manufacturing bulk products and intermediate parts and machinery but will also accelerate the evolution in goods development (as models can be tested in-market sooner), while others, like robotics in manufacturing, may result in near-shoring and affect labour supply in traditional source markets. New technologies will also change the face of landside transport that serves seaborne trade as well; for example, hyperloop and alternative methods of dealing with landside cargo transport may change container standards and cargo interchange processes. As noted by Martin Stopford in his essay, UNCTAD has done 'good work' in preparing industry, policymakers and others for the future by monitoring the present in the context of the past, and by identifying new topics in each annual issue.

Impacts, timelines and conclusions about technologies

As noted at the beginning of this chapter, the concern is not just about which technologies are of relevance for the purposes of monitoring and review, but also their impact on both the trade promotion efforts of developing countries and on the provision of shipping services to developing countries and small island developing states. Then there is also concern about the timeline for those impacts. While Table 4.2 only presents the results of the opinion survey for impacts on trade, the pattern of responses was similar for the second question on supply of shipping services, although not quite so strong. It is not surprising that the four most important technologies identified as relevant for the Special Issue to review are the same as those expected to have the most significant impact. The difference was that MASS was seen as having less impact than the other three discussed above, and its impact is much later in the time horizon of the next 50 years.

From the above literature review focused by the survey direction and subsequent discussion, it is clear that there are two simultaneously developing technological streams; the first is related to climate change and how the shipping industry and regulators respond to efforts to reduce vessel emissions, and the second is how digital technologies and automation affect both the provision of shipping and port services and how regulators will choose to address those changes. On the emissions stream of research, there are two paths forward, one industry-led and one for regulators hopefully working with industry. As the next section discusses regulations and a possible role for *RMT*, that discussion will be left to section 4.3. As for the digitalization of supply chain transactions, the automation of ports, and the evolution

of new IoT technologies, the extent of technological disruption to existing trade and shipping relationships from information and communications technologies (ICT) is one of the great uncertainties that UNCTAD faces. This is exacerbated as disruptive ICT is often introduced in developed countries for productivity enhancement and developing countries lag in the adoption curve unless existing infrastructure is so poor that technological leapfrogging happens. As an example of this, mobile phone technology was adopted very quickly in many developing countries because landline phone supply was so poor, and installation wait times so long. A second illustration comes from the adoption of micropayments made possible by mobile phones in locations where financial services infrastructure is lacking. As automation unlocks technical efficiencies in port management, we can expect that some developing countries will approach the potential for automation with trepidation; employment may be more important than labour cost savings.

Chapter 5 of *RMT 2018* explores technologies related to cybersecurity, digitalization, blockchain, autonomous vessels and alternatives to existing fuels in considerable detail and highlights the importance of monitoring these in the future.

What is traded, and how it is moved, is expected to evolve over time, and maritime transport and air cargo will always serve international trade with a minimal overlap. Attempting to forecast the impacts of developing technologies on both supply and demand for maritime transport may be an intellectual challenge for policymakers, but does not alter the continuing requirement for monitoring and reporting on trade and maritime transport as is currently undertaken by *RMT*. A critical focus is that artificial intelligence (AI), big data and predictive analytics all open opportunities for those in the industry. However, as intelligence (relevant knowledge) is not the same as wisdom (knowing what to do with that intelligence), there is still scope for technologies to be implemented in ways that cannot be predicted by businesses in the industry, and which will have further disruptive potential. It is this uncertainty that will need to be taken into consideration the future.

4.3 Regulatory Policies and Changes Anticipated

The invited essay by Secretary General of the IMO, Kitack Lim, demonstrates that there has been significant progress made in the last few years in the leadership needed for achieving progress in meeting both United Nations climate change goals and SDG's. There has been exceptional progress in addressing ballast water issues, sulphur emissions from ships, and vessel safety over the past two decades.

The opinion survey indicated some potential priorities for regulatory focus in future, and suggested some topics that may be considered as part of *RMT*. Participants were asked to identify, from a list of 18 regulatory policies/activities, devised by the author, the eight most important to be considered in this Special Issue (Table 4.3). The list of regulations identified in the opinion survey reflected the type of regulation-related issues that fell under UNCTAD's scope of intervention and *RMT* coverage in the past, as noted in UNCTAD (2004), but is illustrative only and not comprehensive or fully reflective of recent and emerging developments. By 2004, UNCTAD had served an effective role in dealing with the arrest of ships, the liner code of conduct, the registration of ships and the 'genuine link', multimodal transport rules for carriage of goods, and its emphasis over time on trade facilitation efforts and technical cooperation support were successful.

Table 4.3: Regulatory importance for RMT**Focus of Regulation**

Government or port focus on reduced emissions from vessels (CO ₂ , NO _x , SO _x , PM)
Government regulations regarding the use of alternative vessel fuels (new fuel standards)
Access to major international markets (connectivity)
Government regulation and competition policies with respect to liner shipping
Greater interest in trade facilitation and economic development initiatives
Policies on the measurement, monitoring and management of port performance
Regulatory policies on the use of blockchain technology
Technical cooperation in maritime transport
Closer cooperation on port state control with tighter focus on global compliance/enforcement
Declarations of Marine Protected Areas/vessel traffic restrictions
Cabotage support for national flag fleets
Regulation on carriage of goods (bills of lading, waybills and similar carriage documents)
A common port state control data platform or a focus on 'ship' (as opposed to 'lists' or countries)
Further adjustments to ballast water regulation
Technical cooperation in customs management
Regulatory policies on the use of cryptocurrencies in international trade and transport transactions
Vessel/cargo handling noise in ports
Policies on arrest of ships

Some of the items on the list of 18 regulations were likely seen by respondents as of secondary importance either because they have already been addressed, and, therefore, are no longer priorities for future coverage (like arrest of ships) or because they appear in an alternative form reflective of current thinking. For example, with the move to confidential contracting in liner shipping following the revision of the Ocean Shipping Reform Act of 1998

in the US, and the EU's rejection of conferences, emphasis for many respondents has shifted from rules for conferences to the regulation of consortia. This has direct implications for the liner code of conduct, which, for developing countries, remains an important instrument as reiterated in the contributed essay by Serigne Thiam Diop, Former Secretary General of the UASC.

After identifying topics of potential regulatory importance (see Table 4.3), participants were asked:

- (1) Which of the following regulatory policies are unlikely to change, and if they change are likely to have a significant impact (no, very limited, some, significant) **on future trading patterns** (and trade promotion efforts)?
- (2) Which of the following regulatory policies are unlikely to change, and if they change are likely to have a significant impact (no, limited, some, significant) on the **provision of shipping services to developing countries and SIDS**?

This section will discuss the top ones as suggested by respondents to the opinion survey, and examine the associated literature. It will then focus on the potential relevance of these from the perspective of developing countries and SIDS (Table 4.4).

Finding the way forward on reducing vessel emissions and the use of alternative fuels

... implementing the recently agreed IMO Strategy to transform the industry into a carbon-free transport means. This dramatic aspiration will take the industry beyond its normal comfort zone and into an era of closer cooperation with cutting-edge technology and government-led initiatives to find the holy grail of a fossil-free propulsion system. (Peter Hinchcliffe, invited essay)

The opinion survey suggests that potential top priorities for future regulatory policies may include both 'Government or port focus on reduced emissions from vessels (CO₂, NO_x, SO_x, Particulate Matter)' and 'Government regulations regarding the use of alternative vessel fuels (new fuel standards)', reflecting the importance of regulation as a pathway to decarbonizing global supply chains and reducing the impacts of other types of air emissions from ship's engines. This was explored in considerable depth in section 4.2 from the technological perspective, and now regulatory efforts are a focus of future work.

McKinnon (2018b) asks if regulatory approaches will lag or match the technological possibilities in carbon reduction?

Table 4.4: Regulatory policies

Regulatory Policies (1)	Impact on Trade Patterns (2)			Impact on Supply to DCs and SIDS (3)		
	Significant impact	Some impact	Very limited impact	Significant impact	Some impact	Very limited impact
Government or port focus on reduced emissions from vessels (CO ₂ , NO _x , SO _x , PM)	38	48	10	32	50	16
Government regulations regarding the use of alternative vessel fuels (new fuel standards)	40	40	15	34	42	22
Access to major international markets (connectivity)	36	43	21	33	48	13
Government regulation and competition policies with respect to liner shipping	24	38	29	7	52	26
Greater interest in trade facilitation and economic development initiatives	30	48	21	29	46	17
Policies on the measurement, monitoring and management of port performance	20	35	25	18	40	13
Regulatory policies on the use of blockchain technology	24	39	22	18	40	11
Others of relevance to DCs						
Technical cooperation in customs management				34	26	26
Declarations of Marine Protected Areas/vessel traffic restrict				29	51	15

Notes: (1) This table contains only those policies in the Top 8 plus the others where the response for developing countries and small island developing states was worth discussing.

(2) Between 0 and 3 respondents expected that there would not be any change in trade patterns, and the percentage expecting no impact was low. These two response options do not appear in the table. The percentage is a share of the respondents selecting the option, with the remainder bringing the number to 100 per cent.

(3) Between 0 and 3 respondents expected that there would not be any change in supply of shipping services to developing countries or small island developing states, and the percentage expecting no impact ranged from 2 to 23 per cent. These two response options do not appear in the table. The percentage is a share of the respondents selecting the option, with the remainder bringing the number to 100 per cent.

In trying to understand the fuels and emissions future, Lloyd's Register (2014) in conjunction with University College London undertook a scenarios-building process to examine global marine fuel use to 2030 based on three futures: (1) Status Quo, (2) Global Commons, and (3) Competing Nations—the difference between these being whether 'business as usual' continues, or greater globalization or localization happens. Even in the best case, the conclusion to the exercise is that the global community does not get where it needs to be in the decarbonization of shipping. The research concludes that HFO (residual marine fuel) will still be very much a part of the fuels mix available for marine propulsion in 2030, accounting for 47–66 per cent of the fuel mix, depending on the scenario. As a result, the study sees emissions abatement technology as being the solution commonly chosen by shipowners.

Furthermore, in this prediction, LNG will only achieve an 11 per cent share of the fuels mix, with most of the uptake from smaller ships in short sea services. The status quo sees a doubling of emissions by 2030 because carbon policies will not make a sufficient impact given that vessels have a significant life span, and there is insufficient time to mature new propulsion technologies.

What can be concluded from the discussion in section 4.2? Industry and governments are at the beginning of a concerted effort to focus on improvements to levels of GHG emissions, and there is a very long list of options available to the industry to reduce its GHG impact, although not eliminate it entirely. The challenge will be to make sense of what can be done, and to determine if it will need to be monitored.

Monitoring progress at the port (as opposed to the ship level) might form a new part of UNCTAD's existing port performance programme: tracking incentives offered at the ports participating in UNCTAD's port performance scorecard programme. Becqué et al.'s (2018) report on the experience of country-led programmes suggests that a programme that covers all ports in a country and offers sufficient savings to the shipowner could accelerate the adoption of clean fuel and technologies in national waters. They also note that for vessels that travel between countries, a country-led programme is less attractive than an incentive scheme that covers multiple ports on the shipping routes that are visited most often. This indicates that reporting where port incentive schemes exist will be most effective if a standard reporting process can be developed.

Connectivity and trade facilitation remain keys to economic development

Access to major international markets (connectivity)' was also a critical regulatory priority suggested in the opinion survey. The issue of liner connectivity, which is critical to ensuring that trade facilitation and transport resources are used to promote developing country economic prosperity, is foundational in Chapter 2 above.

Connectivity and trade facilitation supported by adequate infrastructure and equipment, technology, and private sector participation in port management have been underscored as important for developing countries:

...Questions particulières qui pourraient façonner le transport et la logistique maritime court, moyen et long terme.

- *La gestion des ports confiée à des privés et non à des fonctionnaires,*
 - *Modernisation des équipements, infrastructures et installations portuaires,*
 - *Développement et modernisation des corridors de transport,*
 - *Simplification et facilitation des formalités,*
 - *Développement de l'informatique dans tous les modes de transport*
- (Serigne Thiam Diop, invited essay)*

Fugazza and Hoffmann (2016) explored how connectivity is measured and the resulting LSCI is a key indicator in measuring market access for country regulators. Looking forward, specific data element availability in table or query format would go a long way to helping individual countries understand where they are relative to comparator countries they choose, and benchmark leaders identified by UNCTAD. Currently, top pairs are reported but there is a need to understand at a local scale; establishing benchmarks by level of development would be an obvious next step.

Also noted in the opinion survey was ‘Greater interest in trade facilitation and economic development initiatives.’ This is a core activity of UNCTAD and the LSCI is a key performance measure of its success.

Competition policies with respect to liner shipping

The opinion survey noted as a potentially high priority ‘Government regulation and competition policies with respect to liner shipping’. In view of the mergers and acquisitions of liner shipping companies in the last five years, and the current dominance of the main trades by a mere three alliances, this is not surprising.

With the exception for some developing country signatories adhering to the United Nations Liner Code of Conduct, there is no uniformity in the international regulation of liner shipping competition. The attempt by OECD countries to align in the 1998–2004 period resulted in widespread acceptance of confidential contracting as a pro-competitive feature. Fusillo (2004) argued that this sounded the death knell for collective ratemaking agreements (conferences). With the removal of anti-trust exemption for conferences by the EU in 2008, conferences disappeared from most main trades. Since 2008, pure conferences (as opposed to discussion agreements) have vanished from a number of non-EU countries, including Australia and Hong Kong, and few discussion agreements remain. With the recent changes to legislation in both Hong Kong and Australia, coupled with the absence of pure conferences in Canada and the United States (except for government-impelled cargoes), conferences only remain in some intra-Asian and South–South trades.

On the other hand, the treatment of consortia, alliances and vessel-sharing agreements, while variable in the specifics, are, in general, still deemed by many governments to be adequately competitive by allowing for efficiencies that serve shippers and carriers alike. The OECD (2015, summary, para 58) concluded that sailing frequency was the reason why, as vessel sharing enabled more port-to-port pairs to be available to shippers. In Canada, Japan and the US, these non-rate-making agreements are entitled to immunity from antitrust law with the act of filing (notifying or registering). The EU will continue to allow this activity until 2020, and Hong Kong (Hong Kong Competition Commission, 2017) and Australia¹² have recently decided to support them, but implementation details are in development and not yet available.

Premti (2016) undertook an examination of the state of liner shipping competition policy for UNCTAD and noted the importance of monitoring it, given alliance formation and the instability of alliances at the time. Given recent re-examinations of liner regulation by a number of governments, and encouraged by the detailed discussion by Chris Welsh in his essay for this Special Issue, there is clearly a future role for UNCTAD in ensuring that developing countries are adequately served in the existing liner market. This suggests continued support for the LSCI and, indeed, its further development as a monitoring tool.

I would like to see UNCTAD play a more influential role in the competition policy and regulatory arena, building on its excellent analytical work, like Review of Maritime Transport, and with further development of its range of maritime, port efficiency and liner shipping connectivity indicators. (Chris Welsh, invited essay)

¹² The Competition and Consumer Amendment (Competition Policy Review) Act 2017 was passed by the Australian House of Representatives and the Senate on 18 October 2017 and received assent from the Governor General on 27 October 2017.

For consideration, there are serious limitations in the existing system of national filings in terms of understanding and regulating liner shipping alliances. The liner shipping industry has made it difficult for regulators to monitor competitive policies on liner shipping, and therefore, there is a need for a multilateral information-sharing site on vessel-sharing agreements. Liner agreements have differing names, conditions and the like, depending on which country they are filed with, so standardization with a multilateral data platform site offers an opportunity for improving transparency.

Furthermore, given the current review of consortia regulation by the EU, and the focus by Australia, Hong Kong and others on competition policy in the last 3–4 years, it is suggested to remain a critical element in *RMT* monitoring of liner shipping in the near term. In *Review of Maritime Transport 2018*, there was an overview of three of the largest container shipping lines, and the past several years of *RMT* have reported statistics on the Top 20 carriers. A review of which countries continue to allow price-fixing, in the context of liner conferences and discussion agreements, proved useful. Brooks (2000, pp. 218–219) wrote: “The key element to monitor will be alliance strength. ... It is important for regulators to view the strongest alliances as substitutes for mergers and monitor them accordingly.” This still remains as strong a conclusion today as it was almost 20 years ago.

In thinking further about a future role for *RMT*, while continuing to monitor connectivity and alliance capacity share is critical, the impact is most significant on transport costs, and the transport costs faced by developing country shippers is not captured in existing indices supplied by industry. Chapter 3 of *Review of Maritime Transport 2017* examined the output from shipping supply competition—transport costs. The chapter noted that for the least developed countries, transport costs represented 21 per cent of the value of imports in 2016, and 22 per cent for SIDS, as opposed to 11 per cent in developed economies. How should transport costs be measured? This chapter introduced the new ConTex Index for measuring freight rates in the container trades. Is this the latest transport cost index or just an interesting development? There may be a merit to work with specialized maritime transport consultancies such as Drewry Maritime Research, or similar data providers and analysts, to develop a new index suitable for monitoring freight rates for specific South–South routes and more reflective of the situation of developing countries, including in particular SIDS and landlocked developing countries.

Assisting in port performance in support of trade

Without strong ports, the best efforts to promote economic prosperity through trade facilitation will wither. Along that path, as noted in Chapter 2, UNCTAD’s long standing port management programme has assisted developing countries since the 1970s, and more recently developed a Port Performance Scorecard (UNCTAD, 2016), reporting the efforts to date in Chapter 4 of *Review of Maritime Transport 2018*. The key, on a go-forward basis, will be to (a) bring in more ports and countries, and (b) provide greater data access so that the impact of port management can be better assessed at the individual port level for each of the ports participating in the programme. An excellent long-term effort has been made and an on-line best practice report could be the logical next step.

How should ‘blockchain technology’ be regulated?

‘Regulatory policies on the use of blockchain technology’ were clearly an issue for the respondents to the opinion survey. Section 4.2 examined blockchain technology and its likely adoption timing. It is early in the pilot stages but there will clearly be a future need to discuss,

with other multilateral agencies, how it should be regulated. Given the use of blockchain, in conjunction with bills of lading, one should ensure that developing countries are not merely followers of developed country blockchain standard-setting.

We must ensure that the opportunities presented by the digital revolution to improve efficiency in shipping are incorporated effectively into the regulatory framework.
(Kitack Lim, invited essay)

4.4 Factors Beyond Business and Government Control

In looking at the future, respondents to the opinion survey suggested that two factors out of six were the most important. These are 'greater use of AIS [Automatic Identification System] and Big Data Analysis', and 'restructuring of trade routes due to China's BRI'. For developing countries and SIDS, the respondents believed that the 'restructuring of trade routes due to the impact of sea-level rise' (Table 4.5) and China's BRI are of particular importance.

Table 4.5: Impacts of Top 3 factors on trade patterns and supply of shipping to developing countries and SIDS

Impacts on	Significant impact	Some impact	Very limited impact	No impact
Trade Patterns (n=43–47)				
Greater use of AIS and big data analysis	43	38	17	2
Restructuring of trade routes due to China's Belt and Road Initiative	25	60	15	0.0
Restructuring of trade routes due to increasing e-commerce	32	45	21	2
Restructuring of trade routes due to sea-level rise (melting ice caps)	19	50	25	6
On supply of shipping services to DCs and SIDS (n=46–48)				
Restructuring of trade routes due to China's Belt and Road Initiative	35	33	28	4
Restructuring of trade routes due to sea-level rise (melting ice caps)	33	35	28	4

Greater use of AIS and ‘big data’ analysis

AIS technologies in conjunction with the use of predictive analytics have enabled many countries to contemplate new shipping service opportunities and make strategic investments in trade-serving infrastructure. Harrington (2018) polled nearly 350 supply chain and operations professionals, finding that respondents ranked big data analytics as the most important information solution; 73 per cent reported investing in this technology, more than in cloud-based applications (63 per cent), the IoT (54 per cent), and blockchain (51 per cent). As noted by one anonymous survey participant: “In 50 years from now, global AI systems may be in charge of planning and automation far beyond what humans could ever do.”

The most obvious use of AIS data is modelling for planning; one example is the use of AIS for GHG emissions modelling (c.f. Johansson et al., 2017). However, AIS data can be used for many applications relevant to *RMT* readers; it can be used to examine global, regional or local trade patterns, traffic patterns between port pairs, within a port, and the like for port managers. It can be used for evaluating trade lanes against other uses (like fishing vessels) or overlaid on other ‘big data’ sources (like marine mammal migratory and feeding patterns for the designation of traffic lanes and marine protected areas). While the availability of AIS and the use of predictive analytics on ‘big data’ are technologies, they will also change the way that the shipping industry, ports and governments assess the impact of other trends, like sea-level rise, Arctic transit, and climate change, and make policies for the future that will affect all *RMT* readers.

Restructuring of trade routes

The role of UNCTAD in monitoring linkages, understanding modal splits, and the resulting impact on supply and demand in trade is extremely important on a go-forward basis. Where are the efficiency gains? Who will benefit? China’s BRI will alter infrastructure with some switching to rail, for example, from sea transport. It is quite clear that there will be a dynamic future when it comes to trade routes and flows, as trade changes over time, but there will also be some changes driven by new infrastructure investment. For example, China’s BRI is intended to promote economic development and integration across countries in Asia, Europe and Africa with outward foreign direct investment from China increasing significantly after the launch of the BRI from \$28.6 billion in 2003 to \$183 billion in 2016 (World Bank, 2018).

China has already made its mark on the continent with its infrastructure investments in Africa’s ports and hinterland connections along with negotiating favourable trade accords resulting in a subsequent steep rise in trade between China and the African continent. (Patrick Verhoeven, invited essay)

Last but not least, the most important future impacts will result from geopolitical changes and ongoing political global realignment. Furthermore, as noted by one respondent to the opinion survey: “Urbanization, growth of population and rising income will continue to drive growth in demand for transport, and demand for shipping. Trends in 3-D printing and near-shoring will dampen that rise for container shipping. In the short term, tariffs on raw inputs will alter bulk demand and will likely alter trade routes if the rise in anti-trade agreements takes hold and container trade demand will face reduced demand.”

The uncertainty of the future of trade agreements, and which governments will remain open and transparent, will be very influential in determining the geopolitical future. With so many factors at play, and so much uncertainty, the next section of this chapter will focus on

published scenario studies to explore the trade and transportation environment *RMT* might face.

4.5 Future Scenarios for Consideration

The following scenarios may provide an indication of how to assess the possible issues *RMT* may be facing in the next 50 years and highlight the uncertainty associated with any effort to predict the distant future.

Every few years since the 1970s, Shell undertakes a scenario planning process¹³ to attempt to understand the trade-offs the global energy environment presents to the company and test alternative corporate strategies against the possible futures envisioned. Shell Global scenarios¹⁴ in the 1990s recognized that there are three dominant actors influencing the future—markets, states and civil society—and that the resulting ‘trilemma’ of trade-offs made between market incentives, the rules of governance, and the social cohesion of civil society will result in two winners and one loser through time. The assessment of the three is dynamic and, therefore, it is the assumptions about uncertainty that become critical in how *RMT* views the future, and chooses to reflect it in *Review of Maritime Transport* in the coming 50 years. Shell perspectives are multilevel; that is, the high-level ‘Jetstream’ perspective helps us understand our global world while the ‘bird’s eye’ opportunities that businesses may take, rules governments may impose and actions at the community level impact the balancing of the three forces in tension at the ground level.

In 2005, Shell identified three possible futures, which they called Low Trust Globalization, Open Doors and Flags. The first envisaged a future where institutional barriers and conflicting laws drive local, short-term reactions and raise barriers to further globalization. In the second (Open Doors), regulatory harmonization, mutual recognition, voluntary best practice codes and continued trade agreement development would be seen as a means for continued economic prosperity and further globalization. Rising protectionism and anti-immigration policies (‘gated communities’), regulatory fragmentation and national preferences are seen in a Flags future. On a go-forward basis, Shell predicted that a flatter path of economic prosperity would result from the Low Trust Globalization Scenario, while the Open Doors world (growth at 3.8 per annum) had a 40 per cent greater growth rate than the Flags future (at 2.6 per annum). With hindsight, these three futures all resonate in varying ways with the post-Global Economic Crisis world of today.

In Shell’s 2013 New Lens Scenarios (their latest), there are two worlds (the ‘trilemma’ approach is no longer used): ‘Mountains’ and ‘Oceans’ are the analogies. ‘Mountains’ is a world built on barriers, where governments exercise more control over the Internet, the powerful remain powerful, institutional arrangements favour the ‘already privileged,’ and the

¹³ Scenario planning is a strategic planning tool used by business, governments and the military to combine known facts about the future (demographics, geography, military power, political beliefs, industrial information, and the like) with social, technical, economic, environmental, and political trends to view alternative possible futures reflecting decisions taken today. Diversity of participants and their expertise is a key input into the scenario planning process. Shell, as a key advocate of scenario planning, views scenarios as a means of changing mindsets about exogenous factors prior to formulating its specific strategies as a forward-thinking business.

¹⁴ If there is any misrepresentation of Shell’s scenario development process, or misinterpretation of its 2005 scenarios, that remains the responsibility of the author Mary R. Brooks. Shell (2005) is quite clear that interpretation of its scenarios is not its liability.

less advantaged face additional hurdles to acquiring prosperity as a result. Ad hoc coalitions form, bitter disputes between countries emerge and established multilateral institutions become weaker.¹⁵ ‘Oceans’ is a more open future, where a ‘rising tide’ of empowerment of the global population is based on compromise, globalization strengthens through economic and financial reform, and market incentives are used to gain success for emerging nations as reform inspires productivity improvements and gains are made from adoption of a ‘shared fate’ perspective. (Information technology is used to strengthen this perspective.) Shell argues that multilateral organizations will be hard pressed to deal with the complexity of international and transnational transactions and that mini-lateralism—the finding of the smallest number of aligned countries with the biggest impact—is the way that pro-development change can be encouraged.¹⁶

The exploration of possible futures through scenarios is not undertaken only by Shell. There have been others who have used this technique for planning. This section examines two other studies, one completed for the Australian government, and a second for the TT Club. For those interested in a broader perspective, two others are recommended for review.¹⁷

Perez-Franco’s (2018) scenario development for the Australian government envisages four scenarios for the future of Australian transport that also include a strong China in a world where automation and digitalization profoundly change the way transport is done, but it also contemplates the possibility of a world with trade wars. The four resulting scenarios are described as

- The Rise of the Machines – a world where technology dominates everything we do.
- Enter the Dragon – China is the dominant force in an increasingly fragmented world.
- Flat, Crowded and Divided – Australia’s population has soared, to the point that easy access to cheap labour has nullified any hopes of a technological revolution.
- Big Brother Goes Green – the effects of climate change are increasingly real, and both governments and savvy consumers demand that companies meet high environmental standards.

The Australian exercise in planning for the future could provide some inputs for UNCTAD as it points toward three themes for consideration in *RMT* future activities:

1. To continue to evolve data collection programmes so that timely, reliable, relevant data are gathered and shared. This past activity of *Review of Maritime Transport* will continue to be important, as decision-makers in the transport industry need to have a reliable third-party data source for context, and developing countries and scholars can examine issues, such as freight rates, port performance and liner connectivity. Which previously collected data are no longer

¹⁵ If there is any misinterpretation of the New Lens Scenarios, that remains the responsibility of the author Mary R. Brooks.

¹⁶ Shell (2013), p. 53.

¹⁷ The first is the very interesting scenario planning exercise developed by Wärtsilä (2010). While this scenario-building exercise brings an excellent framework to discussions of the future, its focus, which is built on trade agreements, power and climate change, has not foreseen the impact of digital disruption, which has been much more apparent in the past five years. The second was completed for the shipping industry by Lloyd’s Register Group Limited & UCL Energy (2014) with the intention of exploring alternative marine fuel futures in 2030; it too provides a deeper dive on the issue of fuel choice in the coming decade, a key driver for the future *RMT* faces.

critical, and which new data are needed will be important to assess for UNCTAD's *RMT* reporting and monitoring role.

2. To continue its past role of stepping in to assist developing countries with the development and implementation of new regulations for maritime trade and transportation, regulations that will harmonize, simplify and standardize regionally if not globally. Regulatory innovation cannot be left solely to the G20 countries with developing countries as followers. In this respect, future data collection for *Review of Maritime Transport* could contemplate the areas of greatest concern to its readers. In sections 4.1–4.4, these were discussed as the results of the opinion survey. A survey to examine existing and future options could be the short-term path to follow.

3. To continue to build knowledge and capacity for the future. While UNCTAD's past efforts in training, for example its port management training, have been very effective, it is clear that digitalization will continue to change the business models of those in the market, and disrupt the way trade and maritime transport are conducted. So, the role for *RMT* may need to expand into newer areas of reviewing to underpin the content of that education. Education is a key means for developing countries to achieve greater prosperity for their citizens (Lange et al., 2018) and *RMT* staff might want to consider working more closely with the WMU and contemplate new training programmes to supplement existing ones.

I see a period of perhaps unprecedented change and challenges ... It is also clear that there will be an even more important role for maritime education and training and research institutions. (Dr. Doumbia-Henry, invited essay)

Another study to understand the future was recently undertaken by the international freight transport insurer TT Club, in conjunction with global management consulting firm McKinsey (Fenton et al., 2018). Summarizing the thoughts and opinions of 30 industry leaders on what the future holds for the container industry over the next 25 years, they drew five conclusions about the future of the container industry. In addition to affirming the likelihood of digital disruption and the emergence of new industry players, the TT Club's expert opinion study saw success at rebalancing world trade as developing countries increased their share of goods trade due to rising incomes, but also concluded that the future would definitely not see a change in the physical structure of container trade in terms of the hardware deployed.

It was little more than 50 years ago that the container was a new and uncertain technology. Surely in the next 25 years, the standards of the container will evolve as disruptive technologies alter what a future 'box' may be or even if it will be a 'box' (as a box is certainly not the right shape for hyperloop transport.) An agile mindset will be needed as *RMT* faces the 'unknown unknowns' emerging from the shadows to alter the development path of new technologies and the players that succeed in bringing them to market.

4.6 What Lies Ahead for RMT?

Economic differentiation has thrown additional sand into the wheels of multilateral diplomacy. (UNCTAD, 2014, p. 121)

In 2014, UNCTAD looked back at its history and drew conclusions about where it was after 50 years (UNCTAD, 2014). The key maritime transport messages from the rear-view mirror were: (1) multilateralism is in difficulty because many countries have begun to refocus trade negotiation efforts towards bilateral and regional trade agreements, turning away from global agreements developed through the GATT process and the WTO; (2) the bilateral and regional nature of trade agreements has created a challenge in addressing the financial necessities of trade, and financial innovation has outstripped the pace of developments in safeguarding investment; (3) the potential for cybercrime has grown dramatically as the Internet has proven to be difficult to regulate; and (4) development goals have been challenged by climate change and sea-level rise. The impact of the growth of populism in a number of countries, the Global Economic Crisis of 2008–09, and the worsening income disparity between the wealthiest and the middle class have all led to increased uncertainty about the future.

On a go-forward basis, it is clear that digitalization is evolving as multiple disruptive technologies, and poses the greatest uncertainty for all goods traders (exporters and importers), shipping companies, and third-party suppliers. Governments too are grappling with the way these are to be regulated without encouraging organized crime exploitation while, at the same time, facilitating trade and economic development and resultant prosperity. The topic broadly includes blockchain possibilities for trade transactions, ship brokering and marine insurance, amongst others. Landside investments in ‘greening’ ports have also been developing quickly, and can for the most part be considered to have crossed Moore’s Chasm (Moore, 1991) in the adoption curve of disruptive technologies. As noted above, greenfield container ports have provided an interesting laboratory for the development of new landside cargo-handling technologies, and the automation of warehousing and cross-docking in goods movement is well-advanced by industry leaders like Walmart globally, and by trucking and distribution centres locally. Assisted by robotics and predictive analytics, the decarbonization path landside is better understood and further advanced, and hard work in understanding the challenge (c.f., McKinnon, 2018a; ITF, 2018a,b) has laid a solid foundation with lessons for maritime transport.

Shipping emissions, on the other hand, have been a harder ‘nut to crack’ and it is unlikely that developing countries will want to decelerate their freight growth path to economic prosperity in order to solve the challenge. Neither will they wish to cede the opportunity to developed countries, which could set standards in their favour. However, there are a number of fora for discussions on the way forward, industry initiatives aimed at reducing impacts (c.f. Becqué et al., 2018), non-governmental agencies set up to assist industry (like the Carbon War Room), and efforts by the IMO and others to carve a path towards a ‘zero emissions’ future. While it is too early to tell how effective each of these activities will be, it is clear that *RMT* research could have a role to play assisting the developing countries (1) adopt or adapt to moves towards reduced-emissions shipping, (2) to build capacity and raise competencies, and (3) accelerate research and development, and innovation. All of these will be critical so that developing countries can adjust to the impacts that will become apparent as all countries find their own paths forward on this globally important topic. Whatever the path is, the work of the last 50 years of *Review of Maritime Transport* has been exemplary and I am sure *RMT* will successfully meet the challenge of the next 50 years.

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5.0 Review of Maritime Transport: The Way Forward

By UNCTAD secretariat

UNCTAD's mandate in the field of maritime transport gives *RMT* a unique vantage point in comparison with reports produced by other institutions, industry and specialized data providers. Features distinguishing *RMT* include its coverage of maritime transport issues in the context of international trade and development, and, more importantly, its combination of short- and long-term perspectives. As noted in the historical review (Chapter 2), to understand the success of *RMT* is also to understand its role in helping improve understanding of the strategic importance of maritime transport for trade and development and supporting informed national policies and legislation as well as international deliberations.

Mandating since 1968 that a dedicated publication be released on annual basis to “present statistical evidence of developments in international maritime transport and to comment on these developments, with special reference to factors affecting the trade and shipping of developing countries”, explains the high priority that maritime transport and *RMT* occupy on UNCTAD's work agenda. At each UNCTAD quadrennial conference renewing the organization's mandate, member States have systematically reinforced relevant provisions on maritime transport. As a result, the scope of *RMT* has, over the years, either been expanded or its focus shifted to better reflect ever-changing times and priorities. By adapting to change and remaining fit for purpose, *RMT* has gained wide recognition as a critical reference in the field of maritime transport research, analysis, data compilation and as guidance material for sound policy formulation.

Over the past five decades, *RMT* annually and systematically covered key maritime transport issues, in particular seaborne trade, the world fleet, freight markets, ports, as well as regulatory and legal developments affecting maritime transport and trade. At the same time, drivers of change are numerous and varied. They raise new considerations that require further monitoring, reporting and analysis in order to improve understanding of their implications for maritime transport generally, and developing countries in particular. Consequently, *RMT* has been increasingly addressing new thematic areas, on an ad hoc basis, through dedicated special and regional chapters or by adopting themes that cut across its various chapters. These span liner shipping connectivity, market consolidation, e-commerce, the maritime transport of SIDS in the era of globalization, trade facilitation, hinterland connections, inland transport and transit, digitalization, climate change, maritime and supply chain security, energy transition, environmental sustainability, and trade policy risks. Thus, by monitoring the present in the context of the past, and by identifying new topics, *RMT* maintained its position as an invaluable source of information and guidance on maritime transport.

Today, the sector is clearly at a crossroad of various developments, many of which have been covered in recent editions of *RMT*, including the most recent 2018 issue. Factors of change are constantly at work, and with change comes an array of possibilities, solutions, but also challenges and uncertainty, especially for developing countries. The ultimate question is how *RMT* can best continue to support developing countries make informed decisions and policies, effectively deal with the uncertainty that comes with novelty, as well as seize related opportunities and face the challenges that may arise?

In this context, the 50th anniversary of *RMT* is a timely opportunity to plan for the future.

The chapters and essays contributed to this Special Issue acknowledge the great past of *RMT* and provide valuable insights into what the future might entail for maritime transport and, therefore, for the topics to be covered in future as part of the *RMT*. Looking at the past, it emerges that *RMT* has been successful in meeting its objectives and responding to its mandate. However, it also emerges from this retrospective that there is scope for UNCTAD to revisit *RMT* and build on main areas of strength to enhance its value and impact. Already, a number of priority areas are emerging as particularly important for *RMT*'s future research agenda. Many such issues are reflected in the valuable reflections contained in chapters and essays included in this publication. Some have been ongoing and become too compelling to be overlooked. Consequently, the post-2018 Issues of *RMT* will aim to address the future, along four main tracks:

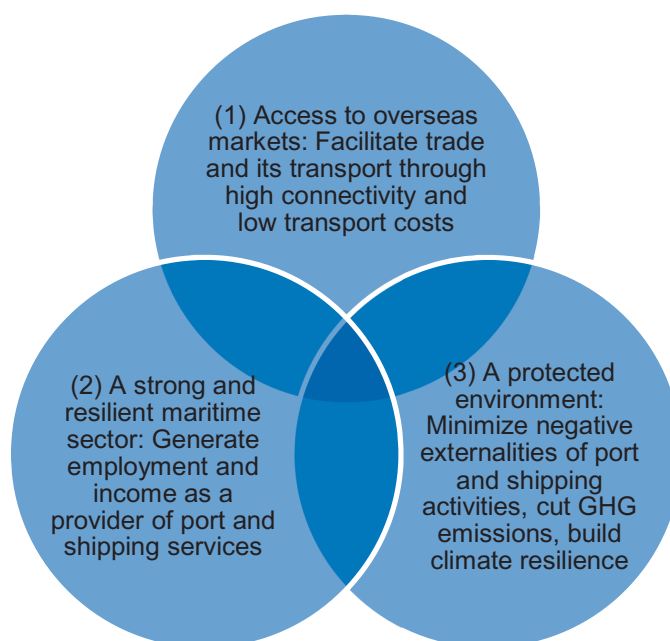
1. Maintain and strengthen consistent coverage of the core issues that have been addressed for decades, and which offer unique, long time series and information about the sector. These include fundamental supply and demand trends, markets, rates and prices, ports and legal and regulatory developments. These thematic areas constitute the mainstream *RMT* issues, and are key to understanding the sector and its role in enabling trade, growth and sustainable development.
2. Explore in more detail persistent issues that have more recently attracted coverage in *RMT*; these include the participation of developing countries in different maritime businesses, shipping connectivity, port performance measurement, and maritime transport cost determinants.
3. Expand the analysis of emerging issues that have so far been dealt with on an ad hoc basis, in line with UNCTAD's mandate and in the light of priorities for the international community's agreed priorities, as reflected in international agreements, including the 2030 ASD, the Addis Ababa Action Agenda (AAAA), SIDS Accelerated Modalities of Action (S.A.M.O.A) Pathway, and Paris Agreement. Relevant issues in this context are, for instance the implications of digitalization and related developments for developing countries, as well as sustainable and climate-resilient transport, including affordable, accessible and energy efficient and low-carbon shipping as well as ship source pollution and climate change adaptation and disaster risk reduction for key coastal transport infrastructure – a complex of issues which UNCTAD has worked on extensively for some time and which benefits from strong support of its membership. Where possible, synergies with technical cooperation and consensus-building will continue to be explored.
4. Continue and strengthen aspects that build the capacity of policy makers in the field of maritime transport and trade. This includes helping them understand the policy linkages and trade-offs that may prevail among varied and potentially competing priorities and objectives.

In this respect, a key contribution of *RMT* over the years, has been to raise awareness among policy makers about the merit of pursuing differentiated approaches to strike a balance between wide-ranging policy objectives that cut across various sectors. Certain policies may result in potentially conflicting outcomes. For example, policies that aim to protect national port operators or shipping companies from foreign competition may help generate income in the national maritime sector but also make the country's foreign trade more expensive. For other policies, synergies can help achieve several mutually reinforcing objectives. A case in point are the policies that promote investment in digital solutions that enhance transport efficiency while at the same time reducing the sector's GHG emissions.

Figure 5.1 below sets out a framework for assessing the potential synergies and trade-offs among relevant maritime policy objectives. Generally, most port and shipping policies will seek to achieve one or more of the following three objectives: (1.) Access to overseas markets; (2.) An economically strong maritime sector; and (3.) Protected environment. Assessing the impact of a new shipping and port policy will require assessing its contribution to achieving any or all of these three objectives. In Figure 5.1, each objective is represented by a circle. Ideally, sound policy making requires striking a balance between the underlying priorities.

The objectives that promote access to overseas markets and a strong maritime sector have been at the core of *RMT* since inception. The third objective focusing on minimizing externalities has gained importance over recent years, with the rise of the sustainability imperative and the growing international momentum on climate action. For example, and for illustration purposes, achieving Objective 1 calls for policies that, among others, facilitate trade and its transport through high connectivity and low transport costs. Objective 2 requires policies that help generate employment and income in the sector. Achieving Objective 3 rests on policies that minimize negative externalities of port and shipping activities.

Figure 5.1: Key objectives of national maritime policies



In conclusion, for *RMT*, reviewing maritime transport developments will increasingly need to go beyond the hardware of ships and ports, and also focus on technological developments. Recent new technologies, such as blockchain, and growing possibilities of cargo tracking and AI will be complemented by new technologies that are unknown to the world today. This is particularly important as rapid growth in digitalization will impact on an increasingly complex maritime business, where a multitude of players from various countries participate. *RMT* has a role to play in monitoring, reporting and analysing these developments.

Furthermore, as policy makers are dealing with a globalized business that entails global concerns such as sustainability, supply chain security, climate change mitigation and adaptation, as well as market concentration, *RMT*, as a United Nations publication, will continue to provide impartial analysis with a global perspective.

Finally, assisting policy makers with making informed decisions, data compilation will remain at the heart of *RMT*. There is a growing potential for this publication to play a bigger role as far as maritime transport performance indicators, monitoring, reporting, and benchmarking are concerned. This is even more important given the requirement for indicators to be developed to ensure effective implementation of global policy decisions and outcomes, such as the ASD, SDGs and the Paris Climate Agreement.

UNCTAD is already leveraging resources and technologies to expand on existing data capacity and coverage. *RMT* is expanding to include updates of on-line statistics and analytical articles, as well as national maritime profiles for 230 countries. UNCTAD is also exploring ways in which growing digital innovations and technologies (e.g. Big data, IoT, AIS, etc.) could be used to generate critical maritime transport data to be reported in *RMT*. With UNCTAD increasingly engaging with relevant data providers, research institutions and academia, *RMT* will continue to make use of the latest available information and statistics, providing unbiased analysis and advice to our stakeholders and UNCTAD members.

Whatever the path is, together, the work of the last 50 years of *RMT* and the guidance and insights derived from this commemorative publication, help to prepare the road map for UNCTAD to face up to the challenge and ensure a successful future *RMT* – the UNCTAD Review of Maritime Transport.

