The Royal Academy for Overseas Sciences

Permanent International Association for
Navigation Congresses
The World Association for Waterborne
Transport Infrastructure

INTEROCEANIC CANALS AND WORLD SEABORNE TRADE: PAST, PRESENT AND FUTURE

Guest Editors: J. CHARLIER, C. DE MEYER & H. PAELINCK

Financially supported by

The Belgian Science Policy Office

Fondation Sefacil

Fonds de la Recherche Scientifique

2015

The Royal Academy for Overseas Sciences

Port of Antwerp

Permanent International Association for Navigation Congresses
The World Association for Waterborne Transport Infrastructure

International Colloquium

INTEROCEANIC CANALS AND WORLD SEABORNE TRADE: PAST, PRESENT AND FUTURE

(Brussels, 7-9 June 2012)

Guest Editors: J. CHARLIER, C. DE MEYER & H. PAELINCK

Financially supported by

The Belgian Science Policy Office

Fondation Sefacil

Fonds de la Recherche Scientifique

2015

ACADEMIE ROYALE
DES
SCIENCES D'OUTRE-MER

Avenue Louise 231
B-1050 Bruxelles (Belgique)

Tél. 02.538.02.11
Fax 02.539.23.53
E-mail: kaowarsom@skynet.be
Web: www.kaowarsom.be

KONINKLIJKE ACADEMIE
VOOR
OVERZEESE WETENSCHAPPEN

Louizalaan 231
B-1050 Brussel (België)

Tel. 02.538.02.11
Fax 02.539.23.53
E-mail: kaowarsom@skynet.be
Web: www.kaowarsom.be

ISBN 978-90-756-5257-4
D/2015/0149/4

CONTENTS

International Colloquium
Interoceanic Canals and World Seaborne Trade: Past, Present and Future
Royal Academy for Overseas Sciences
Port of Antwerp
World Association for Waterborne Transport Infrastructure
Brussels, 7-9 June 2012
pp. 5-9

Introduction

by

Jacques CHARLIER*, Christian DE MEYER*
& Honoreus PAELINCK*

On June 7-9, 2012 the Royal Academy for Overseas Sciences organized an international conference in Brussels about "Interoceanic Canals and World Seaborne Trade: Past, Present and Future", the proceedings of which are published hereafter at a particularly interesting time, *i.e.* a few months after the opening of a new section on the Suez Canal, and also a few months before the inauguration of new locks on the Panama Canal. These two canals are the most important artificial waterways ever built, and they had at the time dramatic consequences for the world seaborne trade, which is still highly constrained by these interoceanic canals; however, they are not the only maritime canals built and other artificial waterways are also considered nowadays, which future impact might also be significant. When the conference took place, no firm decision had been taken yet about the planned Nicaragua Canal, but the green light to this major project was announced recently, and interoceanic canals are more than ever a subject of scientific and geopolitical interest.

A Typology of Maritime Canals

As figure 1 shows, there are two major types of choke points where ships engaged into oceanic and regional trades converge: natural straits and man-made canals. On the one hand, straits were given to seafarers by nature and at least one of these, namely the Malacca Strait, is even more important nowadays than the above-mentioned Suez and Panama Canals for the world

* Members of the Academy.

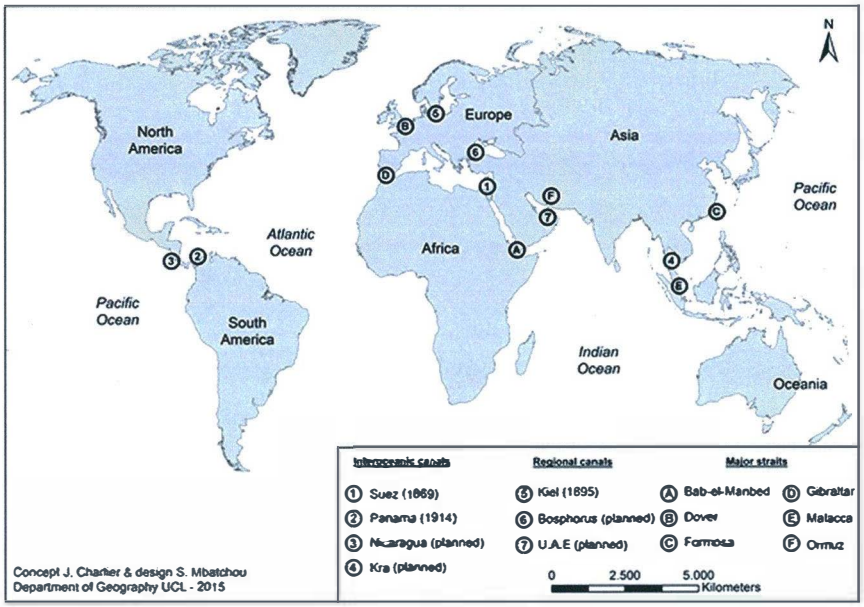


Fig. 1. — The world's most important maritime canals and straits.

seaborne trade. On the other hand, artificial waterways, built with or without locks according to the local topographical conditions, were or will be added to the world shipping network in order to offer other significant shortcuts on interoceanic or regional routes.

The Malacca Strait became the world's most important natural strait as a consequence of the economic rise of Asian Pacific Rim in the last sixty years (first with Japan, then the newly-industrialized countries and more recently China). Besides being affected to a certain extent by piracy, it is suffering a physical limitation because of its depth, and a series of very large tankers or bulkers avoid it by sailing instead around Indonesia. Further to the north, the Formosa Strait is also a major strait in maritime geography, not only because of its commercial importance but also because of its geopolitical dimension, with the threats of a conflict between China and Taiwan.

Another two Asian straits, located for their part in the Indian Ocean, are also well documented because of their commercial and geopolitical importance, *i.e.* the Ormuz and Bab-el-Manbed Straits. The first one is often referred to first of all because it is the gateway to the Persian Gulf and its oil resources, whereas the second one also plays a capital role for the container traffic between Europe and Asia via the Suez Canal; piracy is a significant

contemporary problem in this area as well. And finally in Europe, there are two other straits to be mentioned in this short list of the world's most important straits, *i.e.* the Gibraltar Strait in between Europe and Africa, and the Dover Strait in between Western Europe and Britain. There are of course many other straits used nowadays by commercial shipping, but they are more of the regional type, and listing them here would be out of scope; some might, however, draw a lot of attention in the future, with the development of Arctic shipping through the North-East and North-West Passages.

There are currently two major interoceanic canals, through the Suez and Panama isthmuses; by offering a large range of alternatives to the shipping lines, they are more complementing each other than competing each other. On the contrary, the planned Nicaragua Canal will be in frontal competition with the Panama Canal if and when this ambitious project materializes. The same can be said if another interoceanic canal project, namely the Kra canal through the Kra isthmus in Thailand (fig. 2), materializes as well. In the latter case, the idea behind this project is also to offer a shortcut between two oceans, by bypassing the Malacca Strait, especially for the container ships (bypassing thus also the port of Singapore) and for very large tankers; however, in this case, a pipeline might be a much cheaper alternative, and there is much debate in Thailand about this, including — as for the Nicaragua Canal — about the environmental impact of such a gigantic artificial waterway.

Our survey of maritime canals would not be comprehensive without mentioning the more regional canals connecting seas rather than oceans, such as the Kiel canal in between the North and Baltic Seas (with also a military background as for the Panama Canal) or the much smaller Corinth canal bypassing the Peloponnesian peninsula in Greece.

Two more regional canals might be built in the future, respectively in Turkey to the north of the Bosphorus Strait (to avoid the risk of a major accident for tankers when transiting this strait on both sides of which the Istanbul metropolis is located) and in the United Arab Emirates to the south of the Ormuz Strait (to avoid any military threat from Iran, but this is the least realistic project among all those listed here).

General Structure of the Proceedings

Twelve of the papers given at the conference, whose speakers kindly provided a final manuscript (in English or French), have been included in these proceedings. They have been divided as follows into three separate sections:

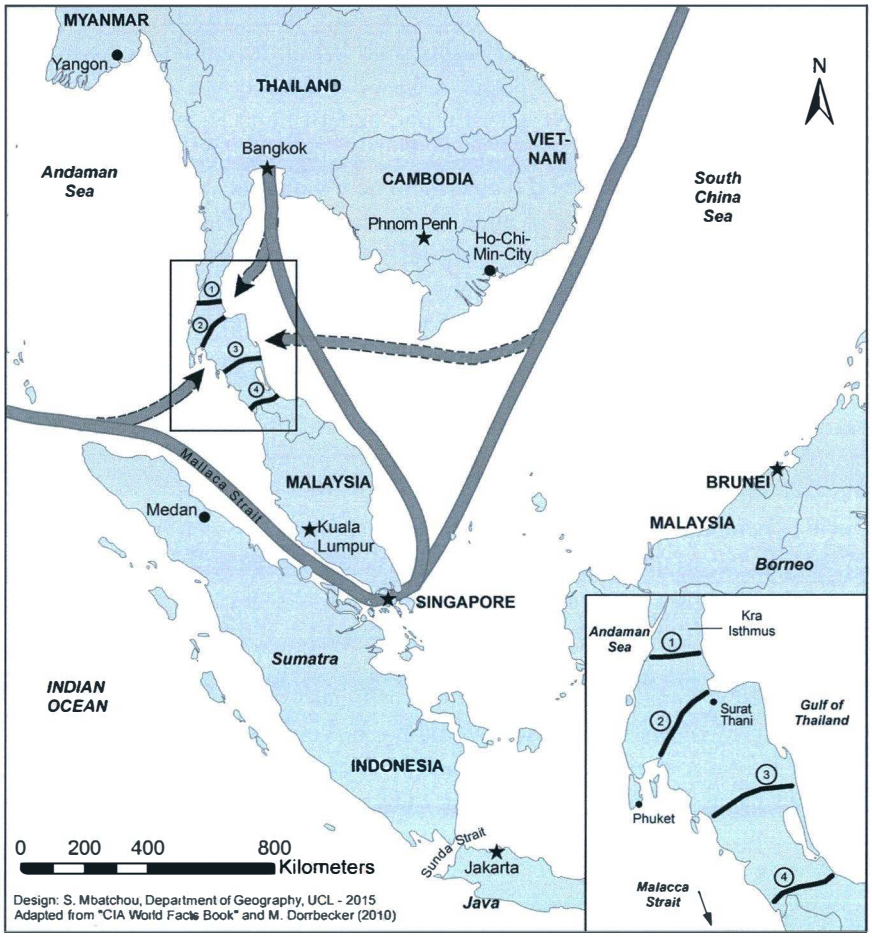


Fig. 2. — The planned Kra canal in between the Indian and Pacific Oceans.

— Section one (Interoceanic Canals in Context) includes five papers about (1) the role of an international organization, such as PIANC, in the design of a major new navigation project (by Geoffroy CAUDE); (2) the polarization of global container flows by interoceanic canals (by César DUCRUET); (3) the planned overseas connections of China through the maritime Arctic (by Petra DRANKIER); (4) ethnosociological considerations about the unifying role of the world ocean (by Danielle DE LAME); and (5) cedar ships in the Medieval Mediterranean (by Sara RICH).

— Section two (The Suez Canal in between the Gibraltar and Malacca Straits) includes three papers about (1) the Suez Canal itself and its role for container traffic (by Nora MAREI & Jacques CHARLIER); (2) the new geopolitical challenges around the Gibraltar Strait (by Nora MAREI); and (3) piracy in the Indian Ocean (by Eric CARREY).
— Section three (The Panama and Nicaragua Canals) includes four papers about (1) the transition from *panamax* to *new panamax* dimensions for ships in connection with the two generations of locks at Panama Canal (by Yann ALIX & Jacques CHARLIER); (2) how a port like Vancouver was eagerly waiting for the Panama Canal more than one century ago (by Peter HALL); (3) the past, present and future Nicaragua interoceanic projects (by Donald BOSCO); and finally (4) the current Grand Canal of Nicaragua project (by Manuel Coronel KAUTZ).

We trust that the readers will find useful material for their own research or information about interoceanic canals and/or world seaborne trade in this diversified collection of essays with different perspectives in time and space. First we would like to thank all the participants of the conference and especially the authors of these scientific contributions. And we thank also very much PIANC, the port of Antwerp (including for the tour organized after the conference), and the Belgian National Fund for Scientific Research for their respective support, as well as the SEFACIL Foundation for its additional financial assistance to the publication of the proceedings. Our warmest thanks again to these individuals and organizations, and also to the staff of the Academy for their efficient support during and after the conference!

INTEROCEANIC CANALS IN CONTEXT

International Colloquium
Interoceanic Canals and World Seaborne Trade: Past, Present and Future
Royal Academy for Overseas Sciences
Port of Antwerp
World Association for Waterborne Transport Infrastructure
Brussels, 7-9 June 2012
pp. 13-25

Le rôle de l'AIPCN dans la conception des projets majeurs d'infrastructure de navigation maritime et fluviale et dans l'orientation de ses travaux au bénéfice des pays émergents

par

Geoffroy CAUDE*

MOTS-CLES. — AIPCN-PIANC; Canal de Suez; Canal de Panama; Coopération COPEDEC; Grandes infrastructures de navigation.

RESUME. — L'AIPCN est née en 1885 de la convergence entre une nécessité, celle d'unir les efforts d'ingénierie au plan international pour la conception des grands ouvrages de navigation maritime ou fluviale après l'échec de la solution technique proposée par Ferdinand de Lesseps de réaliser un canal de Panama initialement prévu sans écluses, notamment avec le déroctage du passage de la Culebra, et la volonté du roi des Belges, Léopold II, d'ouvrir à la navigation le fleuve Congo. Cette double orientation de l'AIPCN comme réseau d'expertise international tirant parti des expériences acquises par chaque pays et comme lieu de débat pour trouver les réponses les plus adaptées aux questions nouvelles spécifiques posées dans les pays émergents demeure bien actuelle.

La présente communication retrace à la fois la contribution constante de l'AIPCN aux deux grands canaux interocéaniques de Suez et de Panama et les travaux les plus récents portant sur le recensement mondial des infrastructures majeures entrepris au sein de l'AIPCN, comme aujourd'hui l'élargissement du canal de Panama, la grande écluse maritime d'Anvers, le système de protection contre les cyclones de la Nouvelle-Orléans, le projet Mose en Italie, l'aménagement de la partie aval du Yang Tse-Kiang et, en amont, celui du franchissement du barrage des Trois-Gorges par un ascenseur à bateaux ou le canal Seine-Escaut.

Elle évoque aussi les travaux de la commission de coopération avec les pays en développement et l'expansion géographique attendue de l'AIPCN ainsi que les conférences Copedec (*Coastal and Port Engineering in Developing Countries*), lancées en 1983, et les conférences Smart Rivers, véritable conjugaison d'efforts internationaux pour promouvoir une «Plateforme stratégique de recherche pour le système fluvial du XXI^e^ siècle (**S**trategic **M**aritime **A**sset **R**esearch and **T**ransformation for **21**st Century **River S**ystems).

---

* Président international AIPCN (*Permanent International Association of Navigation Congresses* – PIANC).

1. Introduction

L'AIPCN est la plus ancienne association internationale technique qui s'intéresse aux grandes infrastructures du transport maritime et fluvial. Elle s'est mise en place en 1885, seize ans après l'inauguration du canal de Suez le 17 novembre 1869 (fig. 1) et près de trente ans avant celle du canal de Panama, inauguré le 15 août 1914. En fait, elle résulte de la convergence entre la nécessité d'unir les efforts d'ingénierie au plan international pour la conception des grands ouvrages de navigation maritime ou fluviale après l'échec de la solution technique proposée par Ferdinand de Lesseps de réaliser un canal de Panama initialement prévu à niveau, c'est-à-dire sans écluses, et la volonté du roi des Belges, Léopold II, d'ouvrir à la navigation fluviale le fleuve Congo.

Fig. 1. — Vues de Port-Saïd (photographies d'Hippolyte Arnoux, Bibliothèque d'Alexandrie, numérisées et librement accessibles grâce au soutien de l'Unesco).

Ferdinand de Lesseps a bien sûr attaché sa forte personnalité à chacun de ces deux grands canaux interocéaniques. Le prodigieux artisan de la réalisation du canal de Suez échouera à Panama, en partie parce qu'il préconise de réaliser un canal sans écluses avant de s'apercevoir de son erreur en 1887, lors des exceptionnelles difficultés rencontrées dans le passage de la Culebra.

En fait, sa haute figure [1]* éclipse ses contradicteurs lors du Congrès Interocéanique de mai 1879 qui se tient à Paris au siège de la Société de Géographie avec vingt-deux pays participants: il fait adopter au comité technique la veille du vote du Congrès la déclaration suivante:

* Les chiffres entre crochets [ ] renvoient aux notes et références, p. 25.

> Le congrès croit que le creusement d'un canal interocéanique au niveau de la mer, si souhaitable dans l'intérêt du commerce et de la navigation, est possible et que pour profiter des installations indispensables à l'accès et au fonctionnement qu'un canal de ce type doit fournir avant tout, le canal devra s'étendre du Golfe de Limon à la baie de Panama.

Il annonce aussi, lors du vote du Congrès du 29 mai, qu'il est prêt à prendre lui-même la tête de l'entreprise! Le vote est éloquent: cent trente-six délégués avec septante-quatre voix pour, huit contre, seize abstentions et trente-huit absents qui ont quitté la salle. Sur les septante-quatre voix pour, on ne compte que dix-neuf ingénieurs.

Pourtant, un ingénieur avait vu juste: il s'agit de Joseph de Lépinay. Il préconise en effet deux jeux d'écluses alimentées par le lac Gatun, solution qui précisément ne sera mise en œuvre par les Américains, qui vont reprendre les travaux à partir de 1904, qu'en 1906 lorsque le Congrès adopte un canal avec écluses...

Six ans plus tard, le 26 février 1885, lors du Congrès de Berlin, le traité de fondation du Congo est signé par le roi Léopold II pour la Belgique avec des clauses particulières affirmant la liberté du commerce et de la navigation (fig. 2).

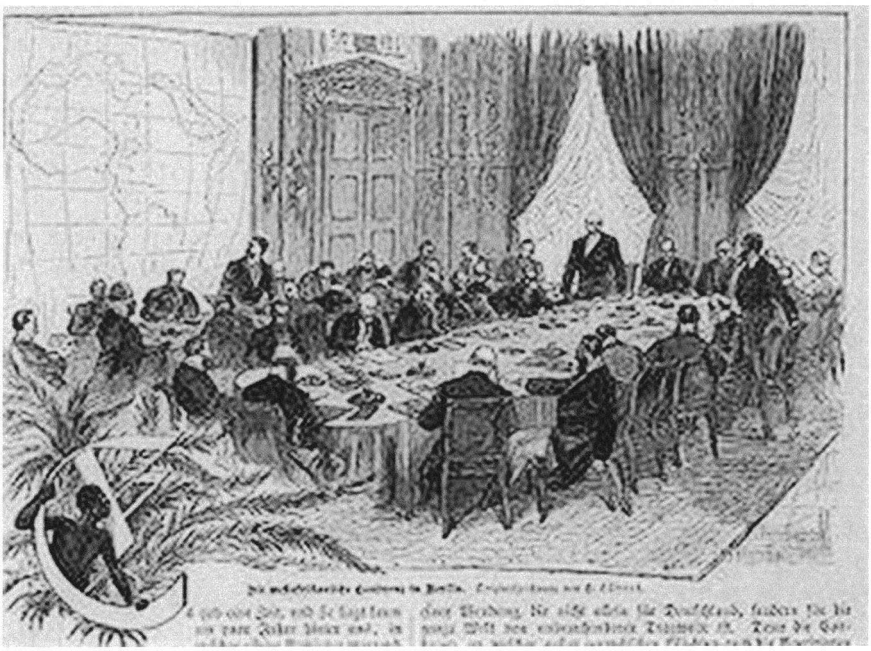


Fig. 2. — Illustration du Congrès de Berlin.

C'est donc bien du double constat d'une insuffisance de débat technique sur les grands projets de navigation et de la nécessité de rendre le Congo navigable que se met en place l'AIPCN à partir de 1885 [2].

Le premier congrès de navigation se tient à Bruxelles le 25 mai 1885 dans le hall du Palais des Académies, à l'endroit même où a lieu cette conférence: quatre cents participants en provenance de treize pays y assistent et, bien entendu, de nombreuses questions surgissent qui sont encore d'actualité comme les conditions d'utilité d'un canal maritime, le choix des meilleures machines pour creuser des canaux, les avantages des différents systèmes d'écluses ou encore la nationalisation ou la gratuité des canaux...

Cette double orientation de l'AIPCN comme réseau d'expertise international tirant parti des diverses expériences acquises par chaque pays et comme lieu de débat pour les réponses aux questions nouvelles spécifiques posées dans les pays émergents demeure bien présente aujourd'hui.

Nous nous proposons donc, dans le cadre de cet exposé, de donner successivement un bref aperçu de la présence des membres de l'AIPCN pour ces deux canaux interocéaniques et de faire état des travaux récents qui visent à faire bénéficier les pays émergents du savoir-faire acquis lors des travaux et de l'exploitation des grandes infrastructures de navigation maritime et fluviale.

2. L'AIPCN et les deux grands canaux interocéaniques

Les deux grands canaux interocéaniques conçus dans la seconde moitié du XIX^{e} siècle ont largement configuré par leurs caractéristiques propres le transport maritime international, et ce n'est pas fortuitement que les navires aptes à les franchir se sont qualifiés de Suezmax ou de Panamax.

Leurs caractéristiques se sont constamment améliorées et des systèmes de gestion en ont augmenté aussi la capacité. Dans les deux cas, l'AIPCN a su à la fois mobiliser son réseau d'experts et tirer parti des choix techniques opérés pour mieux les faire connaître au plan international.

Commençons par un bref résumé des caractéristiques comparées des deux canaux en question (tab. 1) [3]:

Tableau 1
Les canaux de Suez et Panama en chiffres

	Panama	Suez
Ouverture/Création	1914	1869
Longueur voie d'eau en km	76,9	163
Temps de transit en heures	8 à 10	11 à 16
Revenus 2004-2005 en milliards US$	1,2	3,3
Coût de passage porte-cont. 4 250 evp	246 000 US$	245 000 US$
Coût de passage porte-cont. 8 200 evp	—	453 000 US$
Nombre navires/an (2004)	12 515	16 850
Tonnage net en transit/an (2004)	266,5 Mt	621,1 Mt
dont porte-conteneurs	38,90 %	45,70 %
dont tankers	12,50 %	23 %
dont vraquiers	34,10 %	16,70 %
dont cargos	14,50 %	14,60 %
Part du commerce maritime mondial	6 %	14 %
Longueur maximale navire	294,1 m	
Largeur maximale navire	32,3 m	
Tirant d'eau maximal navire chargé	12 m	16 m
Types de navires chargés au maximum	Panamax	Suezmax
Fin travaux et aménagements	2014	2010
Longueur maximale navire	386 m	
Largeur maximale navire	49 m	
Tirant d'eau maximal navire	15 m	22 m
Types de navires chargés au maximum	Suezmax	VLCC

Sources: d'après CMA CGM, *Lloyds Shipping Economist, Lloyd List Daily.*

2.1. Le canal de Suez

Dès le 12e Congrès de Philadelphie en 1912, de nombreuses communications sont consacrées à l'amélioration des caractéristiques du canal, qui, effectivement sans écluses, se prête particulièrement bien à des agrandissements progressifs. La Compagnie universelle du Canal maritime de Suez, fondée à l'origine pour réaliser le canal, est alors un membre actif de l'AIPCN.

Mais c'est surtout le 14e Congrès, qui se déroule au Caire en 1926, qui permet de mieux appréhender ces travaux d'amélioration. L'idée de tenir un congrès au Caire fut émise dès 1913, mais n'avait pas pu se concrétiser: lors de la réunion de la Commission internationale permanente (CIP) à Londres en 1923, M. Quellenec, délégué de la Compagnie universelle du Canal maritime de Suez, propose de se faire l'interprète de la CIP auprès du Gouvernement égyptien qui accepte par télégramme du 23 juin 1924. S. M. le roi

Fouad 1[er] accepte donc le haut patronage du Congrès qui se déroule du 9 au 14 décembre 1926 et reçoit les congressistes dans son propre palais.

Un ingénieur en chef de la Compagnie universelle du canal, M. Solente [4], y retrace les travaux successifs: la Compagnie œuvre en vertu de deux actes de concession des 30 novembre 1954 et 5 janvier 1856 et, au terme de dix années de travaux, le canal, inauguré le 17 novembre 1869, est établi avec une profondeur de 8 m et une largeur au plafond de 22 m, sur une longueur de 164 km.

Les travaux d'amélioration ultérieurs sont confiés à une commission consultative internationale des travaux constituée de douze experts qui siège à Paris.

En 1876, la largeur est portée à 28 m, puis en 1908 à 45 m avec 10 m de profondeur, et en 1924 à 60 m pour 12 m de profondeur, ce qui permet de faire naviguer sur une voie à double sens des navires de projet de 220 m de longueur, de 28 m de largeur et de trente-trois pieds de tirant d'eau.

La programmation des travaux futurs pour la fin de l'année 1934 devait permettre de faire naviguer des navires de 265 m de longueur, de 29 m de largeur et de trente-six pieds (10,97 m) de tirant d'eau.

Si l'activité de l'AIPCN s'estompe pendant le second conflit mondial, puisque le seizième congrès de Bruxelles de 1935 ne sera suivi du dix-septième qu'en 1949 à Lisbonne, et si le conflit anglo-français de 1956 conduit à la nationalisation du canal par les autorités égyptiennes, le Congrès de Londres en 1957 est l'occasion de revenir sur ce sujet et de développer une série de considérations fondatrices pour l'AIPCN sur les conditions de navigation des pétroliers.

On trouve en effet en substance dans une communication de M. E. J. Burgess [5] les propos suivants:

> Immédiatement avant la nationalisation du canal par les autorités égyptiennes, le maximum autorisé pour le tirant d'eau était de 35 pieds mais on espérait que le 8[ème] programme d'amélioration permettrait de passer à des navires de 36 pieds, soit un port en lourd de 38 à 40 000 tonnes. Des considérations théoriques avaient montré qu'à l'époque des pétroliers de 100 000 tonnes passeraient chargés par le Cap et reviendraient lèges par le canal. La Compagnie Shell Tankers fait des essais sur modèle pour déterminer le pied de pilote de navires de 65 000 tonnes (laboratoire de Wageningen).

Enfin, ultérieurement, en 1967 et en 1973, une commission spécifique sur la navigation des pétroliers *(International Oil Tankers Commission)* produira un certain nombre de recommandations. Ainsi, cette commission a-t-elle recommandé l'utilisation de bras de déchargement installés à bord des pétroliers (*manifolds*).

2.2. Le canal de Panama

Pour le canal de Panama, l'implication originelle de l'AIPCN se poursuit après Lesseps: les Etats-Unis obtiennent du Panama un accord leur donnant le contrôle perpétuel de la zone du canal si bien qu'ils créent alors la *Isthmian Canal Commission.* Le canal de 77 km de longueur réduit de quelque 12 875 km la distance maritime entre New York et San Francisco! Composé de trois jeux d'écluses doubles, l'escalier d'eau permet de passer de l'Atlantique au Pacifique en huit à dix heures, en franchissant successivement les écluses de Gatún (25,5 m de chute), puis, après avoir traversé le lac Gatún sur 24 km et franchi le passage en alternat de la Culebra sur 15 km, de rejoindre les écluses de Pedro Miguel (9,5 m de chute), puis de Miraflores (16,5 m), sachant que les deux niveaux océaniques sont un peu différents (fig. 3). Chaque écluse mesure 300 m de long, 33 m de large et 12 m de profondeur: elle peut accueillir des navires jusqu'à cent six pieds pour une largeur totale de cent dix pieds, ce qui ne laisse que deux pieds de chaque côté pour manœuvrer.

Pour accroître la capacité du canal et faire circuler plus vite les navires dans la traversée des écluses où l'effet piston est d'autant plus vigoureux que la section transversale des navires est proche de celle de l'écluse, un système de locotracteurs est installé le long des parements horizontaux situés au droit des bajoyers d'écluse et dans leur prolongement, ce qui permet d'accélérer les passages tandis que la proportion de navires Panamax (d'une largeur comprise entre cent et cent six pieds) atteint plus de 45 % du nombre des navires (fig. 4).

Le transfert du canal aux autorités panaméennes, suite à l'accord Carter/Trujillo de 1972, sera réalisé en 1995.

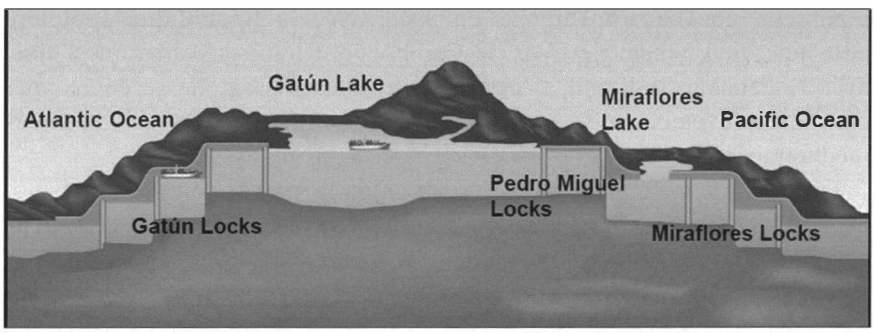


Fig. 3. — Coupe schématique du canal de Panama [6].

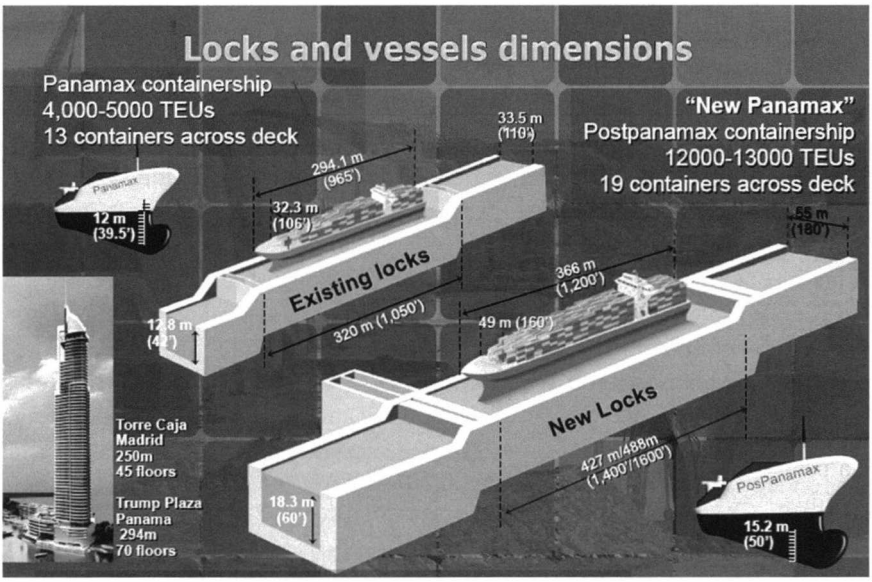


Fig. 4. — Dimensions actuelles et futures des écluses et des navires (*cf.* note 6).

Les travaux d'accroissement de capacité du canal, qui vont définir une nouvelle largeur de Panamax en cours, sont engagés dès 2005 et seront achevés en 2015: en dix ans ils auront mobilisé dans la durée de très nombreux experts de l'AIPCN ainsi que ses publications de référence.

3. Croissance géographique de l'AIPCN

Au cours des vingt dernières années, notre association a vu arriver de nombreux nouveaux membres: en Asie, avec la République populaire de Chine, le Vietnam, le Laos, le Cambodge, l'Iran; en Amérique latine, avec le Panama, le Brésil, l'Argentine. Et elle envisage de se développer dans de nouveaux pays: en Afrique, par exemple, grâce aux journées méditerranéennes.

Forte de son expérience dans l'organisation de grands congrès internationaux, l'AIPCN utilise les réflexions d'une commission spécifique, celle de la coopération avec les pays émergents (CoCom) qui joue pleinement de la synergie entre pays fondateurs de l'association et pays émergents, et ce, grâce à trois types de manifestations: d'une part, deux initiatives externes à l'AIPCN mais qui lui ont récemment été rattachées, à savoir les conférences COPEDEC

et Smart Rivers et, d'autre part, une initiative interne aux sections nationales méditerranéennes, les journées côtières et portuaires méditerranéennes.

Les conférences portuaires et côtières dans les pays émergents sont une excellente occasion de faire participer les jeunes doctorants ou post-doctorants de ces pays qui ont ainsi la chance de connaître un réseau international d'experts confirmés qui peuvent les accompagner dans leurs travaux ultérieurs: la dernière en date s'est déroulée en Inde, à Chennai, et la prochaine est prévue au Brésil en 2016.

Les conférences Smart Rivers sont plutôt issues des échanges croisés entre les Etats-Unis et les pays d'Europe centrale (Autriche notamment): elles s'ouvrent à une coopération entre autorités gérant les grands bassins qui pourront ainsi bénéficier des travaux techniques des autres commissions de l'AIPCN. La dernière a eu lieu à La Nouvelle-Orléans en septembre 2011 et la prochaine est prévue à Liège et à Maastricht en 2013. Enfin, les journées méditerranéennes, lancées par les sections italienne, espagnole, française et portugaise, sont destinées à ouvrir l'association aux membres riverains de la Méditerranée, de la Turquie au royaume du Maroc, en passant par ceux qui bordent la mer Noire.

Cet exposé s'attachera également à montrer, parmi les très nombreuses publications de référence de l'AIPCN, celles qui peuvent bénéficier aux pays émergents ou qui s'appliquent à la conception des grandes infrastructures de navigation maritime et fluviale.

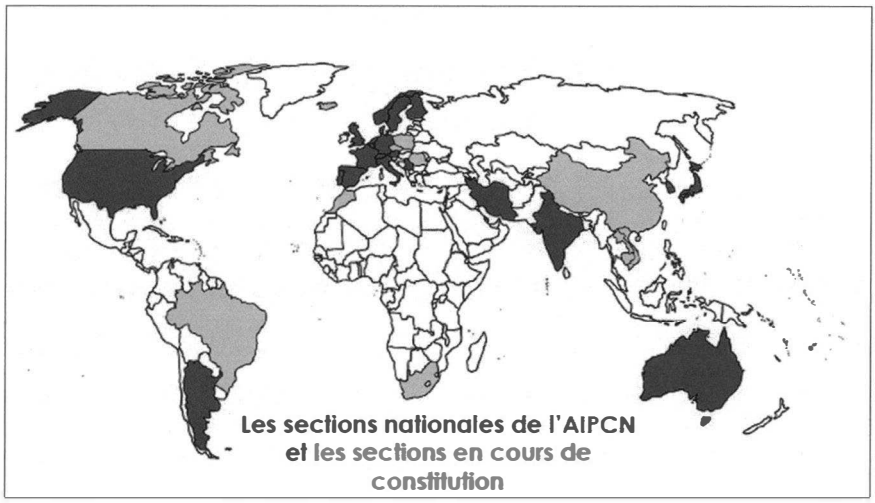


Fig. 5. — Pays membres de l'AIPCN (sections nationales constituées ou en cours).

4. Les récents travaux de recensement des infrastructures majeures entrepris au sein de l'AIPCN

Plus récemment, nous avons proposé de renouer avec cette tradition, d'une part, en demandant à chaque section nationale de l'AIPCN de recenser les travaux majeurs engagés dans les pays respectifs et, de l'autre, en essayant de choisir quels sont les plus grands projets actuels analogues aux grands canaux maritimes cités: l'élargissement du canal de Panama, la grande écluse maritime d'Anvers, le système de protection contre les cyclones de La Nouvelle-Orléans (fig. 6), le projet Mose en Italie, l'aménagement de la partie aval du Yang-Tse-Kiang et, en amont, celui du franchissement du barrage des Trois-Gorges par un ascenseur à bateaux, ou encore le canal Seine-Escaut sont autant de projets majeurs qui mobiliseront l'expertise des ingénieurs de l'AIPCN.

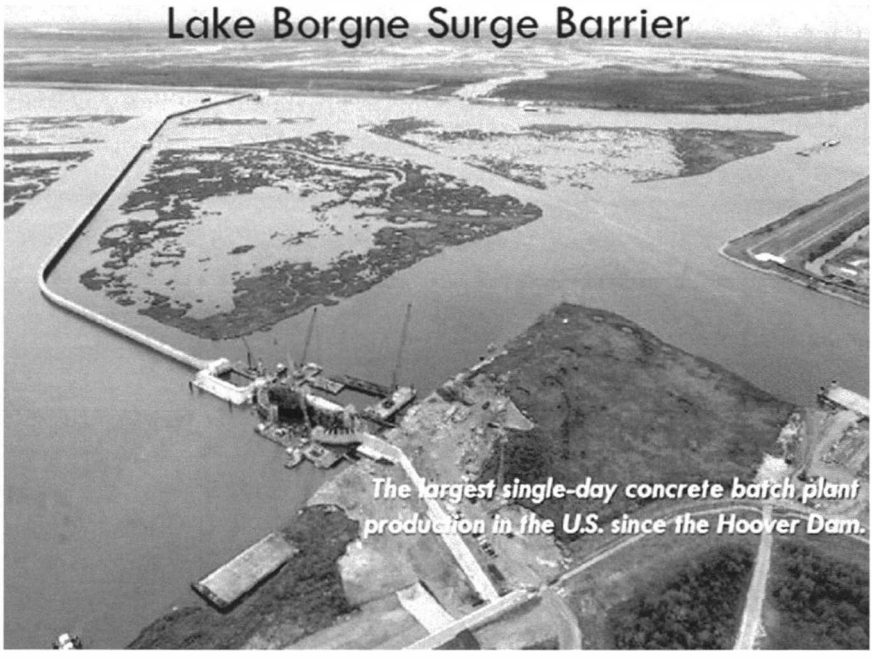


Fig. 6. — Un des ouvrages du système de défense de La Nouvelle-Orléans (*cf.* présentation Smart Rivers 2011).

5. Les travaux de la commission CoCom et l'expansion géographique attendue de l'AIPCN

La Commission de coopération avec les pays émergents, appelée CoCom, qui a succédé à la Commission permanente des pays émergents, est présidée conjointement par un membre représentant un pays développé et un pays émergent et poursuit deux objectifs. Le premier est de produire des publications dédiées aux problématiques des pays émergents: ainsi, en 2008, le rapport 97 traite-t-il de la construction de ports dans les petites îles, tandis qu'un second groupe de travail s'intéresse aux méthodes de stabilisation du trait de côte. Le second objectif est plus lié à la recherche de nouveaux membres dans les pays émergents. Lors de sa dernière réunion à Chennai, en Inde, la commission CoCom a proposé de s'intéresser plus particulièrement aux pays suivants: en Amérique latine, le Chili et la Colombie ainsi qu'un effort à destination du Mexique, ancien membre; en Afrique, l'Algérie, le Cameroun, l'Egypte, la Libye, le Maroc, le Sénégal et la Tunisie, ainsi que certains pays d'Afrique australe (Angola, Namibie et Mozambique); en Asie, le Bangladesh, l'Indonésie, les Philippines, les pays riverains du Mékong (Cambodge, Laos, Thaïlande et Vietnam) ou, plus proches de l'Europe, la Turquie, avec son projet de percement du Bosphore, et la Russie, ancien membre très actif jusqu'en 1990; enfin l'Océanie à partir des pays actifs que sont l'Australie et le Japon.

6. Bref historique des conférences COPEDEC

Les conférences COPEDEC (*Coastal and Port Engineering in Developing Countries*) ont été lancées en 1983 à Colombo, au Sri-Lanka, et se déroulent tous les quatre ans dans un pays émergent. Elles se veulent une occasion privilégiée de contacts entre ingénieries, universités et entreprises de travaux pour faire progresser le savoir-faire des pays émergents en ingénierie côtière et portuaire, voire fluviale, et favoriser la participation de jeunes doctorants ou de jeunes professionnels à l'AIPCN. C'est ainsi que diverses sections nationales financent les frais de participation de jeunes doctorants des pays émergents qui présentent des communications à ces conférences. Elles ont été intégrées au sein de l'AIPCN en 2003, suite à une décision prise à l'AGA de Paris en 2000, et la précédente édition en 2008 à Dubai a été la première à être appelée PIANC-COPEDEC. En 2012, COPEDEC s'est tenue à Chennai grâce à l'Institut technologique de Madras

qui est l'un de ces instituts indiens créés par Nehru en 1952 œuvrant dans le génie côtier et portuaire, tandis que la huitième conférence se déroulera en 2016 au Brésil.

7. Bref panorama des conférences Smart Rivers

Les conférences Smart Rivers sont les dernières initiatives à avoir été intégrées à l'AIPCN puisque la fusion entre Smart Rivers et l'AIPCN date de la conférence de La Nouvelle-Orléans en septembre 2011.

Smart Rivers est une conjugaison d'efforts internationaux pour promouvoir une Plateforme stratégique de recherche pour le système fluvial du XXIe siècle: ***S**trategic **M**aritime **A**sset **R**esearch and **T**ransformation for **21**st Century River Systems.* Ces efforts proviennent de la FEPI (Fédération européenne des Ports intérieurs), de Via Donau (le gestionnaire autrichien des infrastructures fluviales du Danube), de TINA Vienne (une entité gérant le corridor intermodal associé au Danube), de la Commission du port de Pittsburgh et d'ORBITTS (*Ohio River Basin International Trade and Transportation*).

Six conférences se sont déroulées successivement à Pittsburgh en 2005, à Bruxelles en 2006, à Louisville en 2007, à Vienne en 2009, à La Nouvelle-Orléans en 2011. La septième est co-organisée par les sections belge et néerlandaise et se déroulera à Liège et à Maastricht en 2013.

Les thématiques de prédilection de ces conférences sont les suivantes: développer les corridors fluviaux; améliorer le transport fluvial de conteneurs; accroître les performances aux passages d'écluses, notamment grâce au déploiement du concept de voie d'eau intelligente; mieux insérer le transport fluvial dans les chaînes logistiques internationales.

8. Conclusion

Comme on peut le constater, l'AIPCN reste non seulement fidèle aux ambitions de ses fondateurs en ne perdant pas de vue les grands canaux interocéaniques du transport maritime mondial et en sachant maintenir un regard historique grâce à une commission historique, Hiscom, qui a produit deux publications en 1885 et en 2010 et qui semble s'intéresser au projet Océanides lancé récemment en France, mais elle sait aussi s'ouvrir aux enjeux logistiques, comme le montrent les conférences Smart Rivers, ainsi qu'aux pays émergents et à leurs problématiques avec les conférences

COPEDEC, avec les travaux de sa commission CoCom et avec une initiative concertée visant à améliorer sa croissance géographique qui est bien nécessaire quand on mesure les enjeux des projets à venir dans nombre de pays émergents.

NOTES ET REFERENCES

[1] M. de Banville, *Canal français*: *l'aventure illustrée des Français au Panama*, éd. Canal Valley SA, 2004.
[2] PIANC 1885-2010, Livre du 125e anniversaire.
[3] Source CMA-CGM, *Lloyds Shipping Economist*, *Lloyds List*, in ISEMAR (Institut supérieur d'Economie maritime), note de synthèse n° 91, 2007 (Les nouvelles échelles du transport maritime).
[4] Actes du 14e Congrès du Caire, 1926, 1re communication sur les canaux maritimes.
[5] Actes du 19e Congrès de l'AIPCN à Londres.
[6] J. Wong (ACP), Présentation des travaux du canal à AGA de l'AIPC de Valence, mai 2012.

International Colloquium
Interoceanic Canals and World Seaborne Trade: Past, Present and Future
Royal Academy for Overseas Sciences
Port of Antwerp
World Association for Waterborne Transport Infrastructure
Brussels, 7-9 June 2012
pp. 27-44

The Polarization of Global Container Flows by Interoceanic Canals

by

César DUCRUET*

KEYWORDS. — Container Shipping; Maritime Transport; Networks; Ports; Vulnerability.

SUMMARY. — It is widely acknowledged that the two major interoceanic canals of Suez and Panama play a central role in global shipping flows. However, this role has rarely been measured with precision both in terms of the geographic coverage and network topological properties of canal-dependent flows. Based on vessel movement data for container ships, this research clarifies the weight and share of canal-dependent flows globally and at the level of world regions, routes, and ports. It also estimates and maps the effects of removing canal-dependent flows from the network by means of graph-theoretical methods. While main results converge in showing a decreasing importance of canal shipping in the context of growing south-south trade exchanges, certain areas remain more dependent than others, such as Asia, Europe, and North America.

1. Introduction

The main goal of the two interoceanic canals has been to avoid a deviation from the main trading routes connecting the principal economic centres of the world economy, namely Europe, Asia, and North America. It is estimated that Suez and Panama canals together concentrate about 15 % of world seaborne trade, thus giving them high strategic importance. Thus, those two canals are considered to be critical infrastructures raising issues of transport security (SALTER 2008), notably since many studies have investigated the

* French National Centre for Scientific Research (CNRS), UMR 8504 Géographie-Cités, rue du Four 13, F-75006 Paris (France).

economic potential of alternative routes due to congestion, cost, time, and piracy problems around the transoceanic canals (VERNY & GRIGENTIN 2009, FU *et al.* 2010, LIU & KRONBAK 2010, NOTTEBOOM 2012).

However, rare studies have gone deeper into the measurement and implications of such vulnerability for canals, ports, and shipping networks. For instance, BERLE *et al.* (2011) as well as ANGELOUDIS *et al.* (2007) provided a rich discussion on the failure modes in the maritime transportation system, but without providing empirical evidence about the precise role of canals. Throughout the research field of network vulnerability and critical infrastructures, more likely are studies of the worldwide energy supply, including some maritime elements (RODRIGUE 2004, ZAVITSAS & BELL 2010), the Internet network (GRUBESIC *et al.* 2008), the airline transportation network (DERUDDER *et al.* 2007), and road networks (JENELIUS *et al.* 2006). One first attempt to measure the centrality of interoceanic canals in the global maritime network was performed by KALUZA *et al.* (2010) as well as DUCRUET & NOTTEBOOM (2012a) in their analysis of worldwide maritime container flows, thus implicitly claiming the overall vulnerability of the network. Other works on maritime networks have eluded vulnerability issues except the one of GUERRERO *et al.* (2008) on supply chain disruption and vessel rerouting and the one of DUCRUET *et al.* (2010) on hub dependence as a measure of vulnerability for ports. Instead, other works on liner shipping networks focus on the overall topological structure of flows (DENG *et al.* 2009, HU & ZHU 2009), the interdependence with airline networks (PARSHANI *et al.* 2010), or the geographic coverage of ocean carriers such as Maersk (FREMONT 2007).

The main goal of this chapter is to offer novel empirical evidence about the respective and combined influences of interoceanic canals in global maritime flows. It takes its inspiration from a wide array of methods and applications in network analysis in general. Its ambition is to measure and map the vulnerability of the global maritime network in relation to interoceanic canals at various geographic levels, from individual nodes to global sea routes. The case of container flows is explored through exploiting a global database of vessel movements in 1996 and 2006. After introducing the data and overall methodology, one first section describes the geographic coverage of the canals' influence on global vessel circulations and an estimation of their traffic weight in total container flows. The second section further discusses the topological importance of the canals and its evolution with regard to optimal network configurations and flow structures. A discussion about the local and global implications of the results is provided in the last section to conclude the chapter and identify further research pathways.

2. Data and Methodology

Daily vessel movements are reported by Lloyd's List on a regular basis. Extracting all movements of fully cellular container vessels in 1996 and 2006 allowed to build a port-to-port matrix including both Suez and Panama canals as well as all ports connected by those vessel calls. The resulting network is weighted by the sum of vessel capacities in TEUs (Twenty-Foot Equivalent Units) passing through links and nodes during one year of movements, while it is kept undirected for simplicity. The analysis distinguishes between two dimensions of the network: the adjacency matrix of chains and the adjacency matrix of complete graphs. In the matrix of chains, ports are considered connected when a vessel performs a direct call between them during its circulation. In that configuration, the matrix is only made of adjacent calls between ports. In the matrix of complete graphs, all ports connected by one same vessel are considered connected with each other. It thus corresponds to the matrix of chains plus all indirect calls between ports. Those two dimensions exhibit rather distinct topological properties in terms of network density and size (DUCRUET & NOTTEBOOM 2012a).

One first method has been to identify the trajectory of vessels passing through each and/or both canals defined by their full voyage within each year of observation. The analysis of freight circulations through trajectories rather than segments provides better results as it catches the overall patterns of moving objects (GUO *et al.* 2010). Such an approach allows for considering the geographic coverage of canal-dependent shipping and its weight regarding world shipping in general. The share of canal-dependent traffic can be calculated at every port, range, and continent. The method can be applied to total traffic, but also to intra- and interregional traffic. Two drawbacks of the data and methodology should be underlined, however. First, in some cases, vessel movement data does not fully inform about the true origin and destination of containers. Because many containers are transshipped at intermediate hub ports, it is impossible to track each of them being embarked from one vessel to the other. Vessel movement data is thus not trade data. Yet, all flows not passing through intermediate hub ports still overlap to a large extent trading routes, while transit flows better reflect upon logistics systems and carrier decisions in designing their networks. Great care must be inferred in interpreting the geographic coverage of canal-dependent traffics since a significant share is transiting through hub ports at certain regions. Second, the same vessel and its capacity in TEUs are counted as many times as the number of its calls during the period considered. Depending on the case, this might overestimate the traffic intensity of some links at the expense of

others, such as in the case of multiple calls within certain port ranges. The true number of containers handled at each port is also not known from the data, as some port calls may only relate with bunkering, but this is impossible to verify.

Secondly, we measure the vulnerability of the network through two complementary approaches. On the one hand, average eccentricity and average transitivity are calculated on the level of the entire network before and after removing canals and canal-related circulations. Such measures indicate how much canals do influence the overall farness and connectedness of the network. We distinguished between links having more than 50 % of their traffic being canal-related and all the links carrying canal-related traffics. This allows for comparing differences in link removal since some inter-port links carry both canal-related and other traffics. Eccentricity is a common measure of geodesic distance in graph theory and can be labelled Koenig number, Shimbel distance, and closeness centrality in the literature (DUCRUET & RODRIGUE 2012). It corresponds for each node to the number of links needed to reach the most distant node in the network. Averaging all local measures provides one single measure at network level ranging from 0 (nodes are distant to each other) to 1 (nodes are close to each other). Average eccentricity has been used in network vulnerability studies to measure the global impact of node or link removal (SHIMBEL 1953, GLEYZE 2005). Transitivity is a measure of connectedness proposed by social network analysis (WASSERMAN & FAUST 1994) and labelled clustering coefficient in the literature on complex networks. It corresponds to the probability that the adjacent neighbours of a given node are also connected to each other: the number of existing triangles (or triplets) is divided by the number of possible triangles (or triplets), thus ranging from 0 (no triangles) to 1 (all triangles). Low values often correspond to nodes having dominant functions while its adjacent neighbours are poorly connected (*cf.* hub-and-spoke pattern) while high values depict tightly connected and more homogenous patterns. With reference to studies of cascading failures in networks, we also compare the effects of canal removal on the centrality of individual ports (ALBERT *et al.* 2004, GORMAN *et al.* 2004, WANG & RONG 2009).

On the other hand, the optimal or maximum capacity route is extracted from the original network using the minimum spanning tree algorithm proposed by KRUSKAL (1956). The latter method belongs to a family of studies on the search for the optimal or shortest path on the level of the entire network (ROY 1959, WARSHALL 1962, FLOYD 1962, JOHNSON 1977) and/or for a given node or link in the network (BELLMAN 1958, DIJKSTRA 1959, FORD & FULKERSON 1962). The Kruskal algorithm is chosen for its simplicity and

due to the fact that it remains a widely accepted reference in graph theory. We apply the algorithm to the inverse of traffic weight (TEUs) by link in order to extract the maximal weight spanning tree, *i.e.* the optimal route connecting all ports and carrying the maximum traffic volume. Based on this simplification of the network, we measure for each node its Strähler stream order (*i.e.* level of ramification) to reveal the branching property of ports and canals in the optimal route, as well as their degree centrality (*i.e.* number of adjacent neighbours). The Strähler index is well adapted to tree-like networks and has been used extensively in the case of river networks (HAGGETT & CHORLEY 1969, TAAFFE & GAUTHIER 1973).

3. Geographic Coverage of Canal-dependent Flows

On a world level, the share of canal-dependent flows in total container flows was calculated on the basis of direct and indirect vessel calls between ports (tab. 1). Results first confirm the high share of canal-dependent flows at both years (*i.e.* over 40 %) which stands much higher than available estimations for all commodity traffics. However, this combined share has noticeably dropped between 1996 and 2006 from 44.2 % to 40.7 %. This reduction stems from several factors such as the emergence of alternative routes (*e.g.* Cape of Good Hope) as a response to vessel size limitations and passage costs. The combined share of the two canals is slightly lower than the sum of their individual importance since some vessels have used both canals during their line-bundling and round-the-world services (DUCRUET & NOTTEBOOM 2012b). This confirms that true round-the-world services occupy a very limited portion of global container flows (*i.e.* 6.8 % in 1996 and 3.4 % in 2006) since most liner services occur through pendulum routes between two main poles (FREMONT 2007). Yet, the combined share of the two canals in total interregional traffics has remained stable around 64 %. The drop is thus mostly explained by a reduction of canals' weight in intraregional flows. The main explanation relates with the reinforced concentration of flows within certain regions around intermediate hub ports ensuring either (or both) interlining and hub-feeder functions (RODRIGUE & NOTTEBOOM 2010). This means that vessels using the canals have tended to limit the number of calls within regions, notably large vessels selecting a few dominant hub ports along the route. Another result is the higher share of Suez compared with Panama in all aspects since the Europe-Asia route accounts for the majority of world container flows (27.7 million TEUs in 2007), followed by the Asia-USA route (20.3 million TEUs) and the Europe-USA route (7.2 million TEUs)

(*Containerisation International*). The relative drop is felt relatively equally at the two canals, except for interregional traffics where the share of Panama Canal has decreased more than for Suez Canal. This also is in accordance with the higher technical limitations of the Panama Canal in terms of vessel size, but it is not compensated by an increase of its intraregional function.

Table 1
Importance of canal-dependent flows in global container flows (% TEUs)

	Panama Canal		**Suez Canal**		**Panama & Suez Canals**	
	1996	2006	1996	2006	1996	2006
Total traffic	17.0	13.3	34.0	30.8	44.2	40.7
Intraregional traffic	10.7	8.0	24.6	21.8	31.8	27.8
Interregional traffic	26.8	23.1	48.8	47.6	63.7	64.4

Source: own calculation based on Lloyd's List.

Another approach is to measure the weight of canal-dependent flows by geographic entity at the world region level and port level. Among world regions (fig. 1), the largest economic poles of the world are the most dependent upon the canals, but this dependence varies according to the level of flows (intra or interregional) and to the canal considered. In both years, North America is the most canal-dependent region and this has increased from 55 to 58 % during the period for all flows. It is followed by Europe, but its canal-dependence has slightly dropped from 51 to 49 %. Asia and Latin America exhibit similar dependence levels and their respective share has also dropped from 42 to 36 %. While Africa's dependence remains stable at the lowest level (20 %), Oceania has witnessed the highest increase from 17 % in 1996 to 29 % in 2006. A complementary picture is obtained when distinguishing between interregional and intraregional flows. In fact, Europe and Asia are the most canal-dependent regions since about 75 % of their external traffic relies on the canals, and this share has remained stable between 1996 and 2006. Their overall drop in canal-dependence thus better reflects the decrease of intraregional canal-related flows for the aforementioned reasons (*i.e.* growth of transshipment at intermediate hub ports, such as in the Mediterranean and South-East Asian ranges). In comparison, North America's canal-dependence is lower externally and higher internally (inter-coastal flows), but both shares have increased significantly, reaching 59 % of interregional flows and 54 % of intraregional flows in 2006. The growing dependence upon canals (here Panama) might be explained by congestion issues at West Coast ports, making land bridge connections less beneficial to shippers

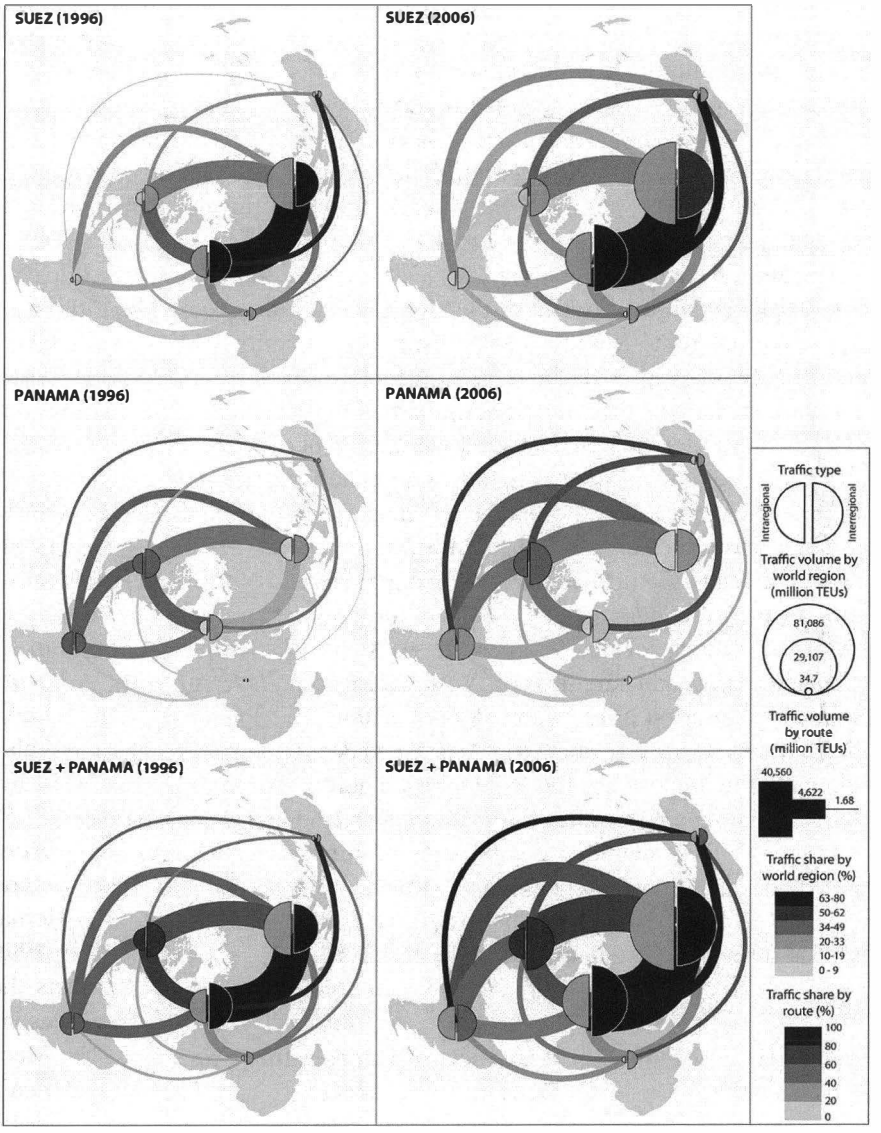


Fig. 1. — Canal-dependent traffic by route and region in 1996 and 2006 (*source*: own elaboration based on Lloyd's List data).

than canal shipping (HALL 2004). Latin America has a lower canal-dependence than North America, but both interregional (–3 %) and intraregional (–8 %) canal-dependence have lowered, which indicates a diversification of its connections.

The distribution of canal-dependent flows among major shipping routes underlines, unsurprisingly, the chief role of the Suez Canal for Europe-Asia traffics (95 %), the rest being shipped via the Cape route. It is the largest and most canal-dependent traffic segment. The Europe-Oceania route also mostly passes through Suez, although one-third of those traffics use Panama Canal instead.

The analysis at port level allows for a clearer observation of traffic impacts (fig. 2). The combined traffic of the two canals is distributed along the circumterrestrial route linking the three main economic poles. A noticeable number of ports appears to be highly vulnerable in the pattern of flows since a dominant share of their traffic is explained by the canals. The distribution of vulnerability rests upon a subtle combination of distance and scale: on the one hand proximity to the canals foster related traffics, and on the other, larger hubs and gateways, often despite distance to the canals, generate high volumes and shares of canal-related traffic. In general, Asian ports appear to be less dependent on canals than their European and North American counterparts, probably due to higher levels of intraregional traffics. The vulnerability is thus much localized in certain areas: the US Northeastern seaboard (Panama traffic) and a number of West-European ports (Suez traffic) such as Southampton and Gioia Tauro at both years. The Panama Canal, which is often seen as a key node for Asia-North America trades, has in fact a relatively low importance for Asian ports. The share of Suez traffics at Asian ports has notably decreased for Singapore and a number of Northeast Asian ports. Thus, there is a combination of liner service reconfiguration and trade reorientation in the changing geographic coverage of canal traffics. The appendix 1 provides a list of the top thirty ports based on canal-dependent traffics for a more detailed view.

4. Topological Impacts of Interoceanic Canals

4.1. Canal Removal and Cascading Failures

Average eccentricity and transitivity were calculated at both years on the level of the entire network before and after removing partly and fully each or both canal's related circulations, while also comparing effects for the two

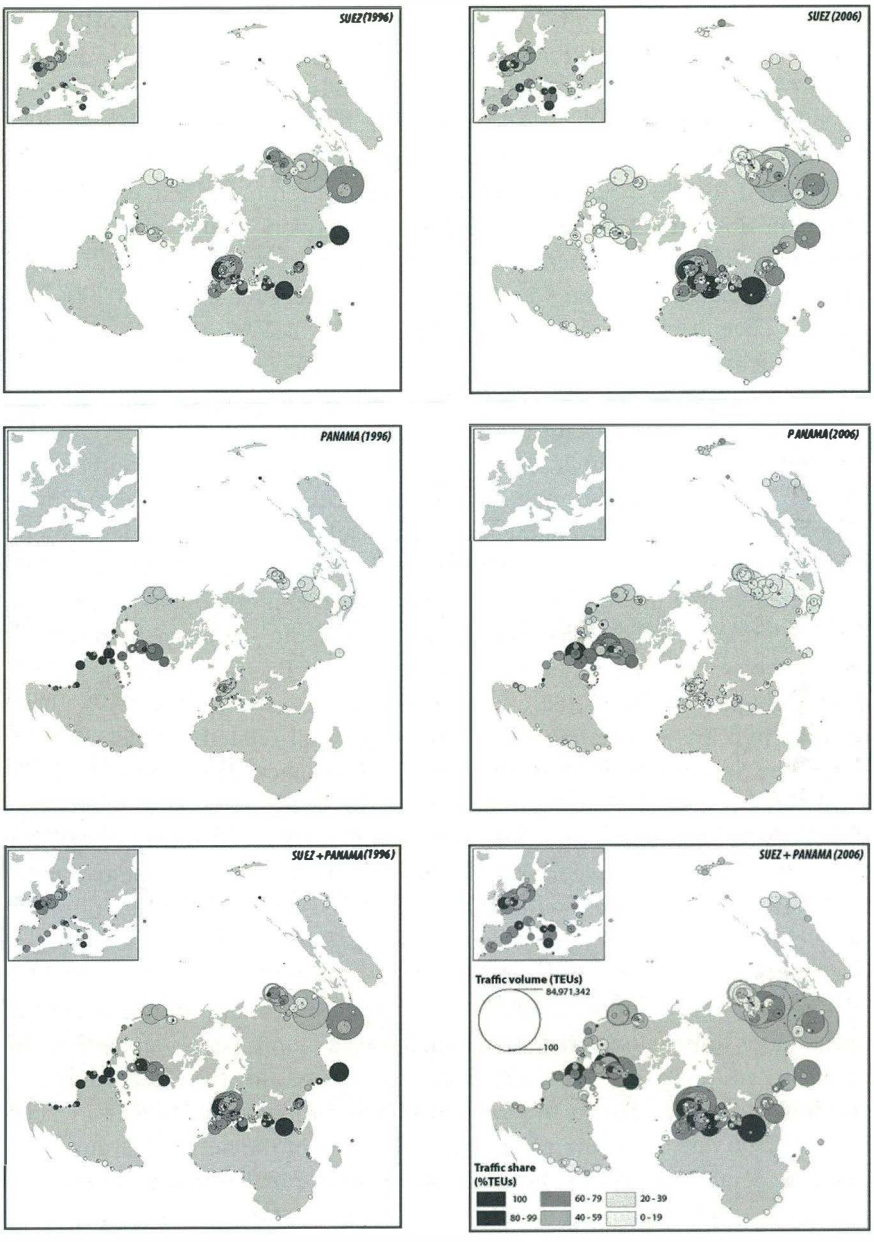


Fig. 2. — Canal-dependent traffic at world ports in 1996 and 2006 (*source*: own elaboration based on Lloyd's List data).

dimensions, chains and complete graphs (tab. 2). In the matrix of chains, results in 1996 confirm the crucial role of canals in bringing world ports closer, as eccentricity decreases after removals compared with the original value (0.765). The combined effects of the two canals is not clearly visible since it is equal to Suez deletion impacts (for largest flows) and inferior than Suez deletion impacts (for all flows). The largest difference in eccentricity is observed for the Suez Canal (0.674) whereas removing Panama Canal's links and flows does not much influence the network's structure. This confirms previous results where the geographic coverage of Panama Canal's flows remained much narrower than the one of the Suez Canal. In 2006, the original eccentricity is significantly lower than in 1996 (0.644), which in itself indicates a dramatic increase in the size and geographic coverage of the liner shipping network (DUCRUET & NOTTEBOOM 2012a), thus making ports relatively more distant from each other than previously. One notable difference with 1996 is that removing canal-related circulations, either individually or in combination, increase the eccentricity thus making ports closer to each other. This counter-intuitive result can be explained by crucial trends occurring along the period. In 1996, remote regions remain poorly connected so that the role of the canals is central and few bypasses do exist. The progression of South-South flows within the southern hemisphere, namely between Latin America, Africa, and Asia-Pacific as well as the relatively stagnant share of the canals in total flows (from 50 to 56 %) have resulted in a less sparse network. Removing canal-related circulations thus reveal the strength of those new transversal linkages among world economies. This is why the Suez Canal has the highest impact on making ports closer: Asia and Europe are closer outside the Suez canal when considering the expanding links between Asia, Africa, and Latin America, the two latter being still well connected with Europe. The role of canals in an era of growing South-South trades appears more as a bottleneck than a facilitator of exchanges.

In the matrix of complete graphs, the impact of canal removal is similar to the latter dimension. Transitivity increases as more canal-dependent circulations are removed, while the impact is stronger for the Suez Canal and combined canals. Like in the case of chains, impacts are bigger in 2006 than in 1996 due to the increasing centralization of the network around hub ports. Eccentricity always increases along with canal removal, due to the fact that complete graphs allow for the existence of many alternative paths outside the canal nodes. Thus, removing canal-dependent circulations brings ports closer to each other rather than dismantling the network's structure.

Table 2
Topological effects of removing interoceanic canals in 1996 and 2006

		Matrix of chains				Matrix of complete graphs			
		Eccentricity		Transitivity		Eccentricity		Transitivity	
		1996	2006	1996	2006	1996	2006	1996	2006
Original network		0.765	0.644	0.527	0.517	0.623	0.628	0.747	0.737
Without links > 50 % canal-related traffic	Panama	0.762	0.666	0.489	0.492	0.728	0.629	0.723	0.714
	Suez	0.698	0.742	0.444	0.476	0.730	0.635	0.683	0.684
	Both	0.698	0.739	0.417	0.436	0.734	0.723	0.465	0.453
Without all canal-related links	Panama	0.749	0.707	0.451	0.394	0.733	0.762	0.638	0.598
	Suez	0.674	0.731	0.399	0.413	0.726	0.762	0.571	0.550
	Both	0.688	0.720	0.349	0.267	0.767	0.803	0.375	0.345

Source: own calculation based on Lloyd's List data and TULIP software.

In terms of transitivity, one same trend was observed in 1996 and 2006, that is the increasing polarization of the network after removing canal-related circulations. A complementary result is provided in figure 3 where we map the centrality of ports before and after canal removal. The whole network of direct links (left side) heavily depends on two central nodes (interoceanic canals) being the connectors between an Euro-Mediterranean-Atlantic group and an Asia-Pacific group. Each group in both years is polarized by a few ports. Rotterdam and Singapore are the most central ports of their belonged group, followed by Antwerp, Hamburg, Hong Kong, and Busan respectively. In 2006, Bremerhaven and Shanghai emerge as complementary hubs. The removal of all canal-related circulations, since it does not disconnect the global network, confers a very high centrality to other intermediate nodes. Those are South African ports in 1996 (Durban, Cape Town) and Brazilian ports in 2006 (Santos, Sepetiba). Removing canal-related circulations had the effect of increasing the centrality of established ports within their belonged group, notably Singapore and Rotterdam. In parallel, the multiplication of transshipment ports and hub-and-spoke strategies serving liner shipping operations contributed to this phenomenon. This also explains why the impact of canal removal has been much bigger in 2006 than in 1996 despite comparable transitivity levels in the original network. In addition, the combined removal had stronger impacts than individual removals.

4.2. Optimal Routes and Ramification

After extracting the optimal route from the original matrix, we map the centrality and ramification level of ports and canals using a Gem-Frick

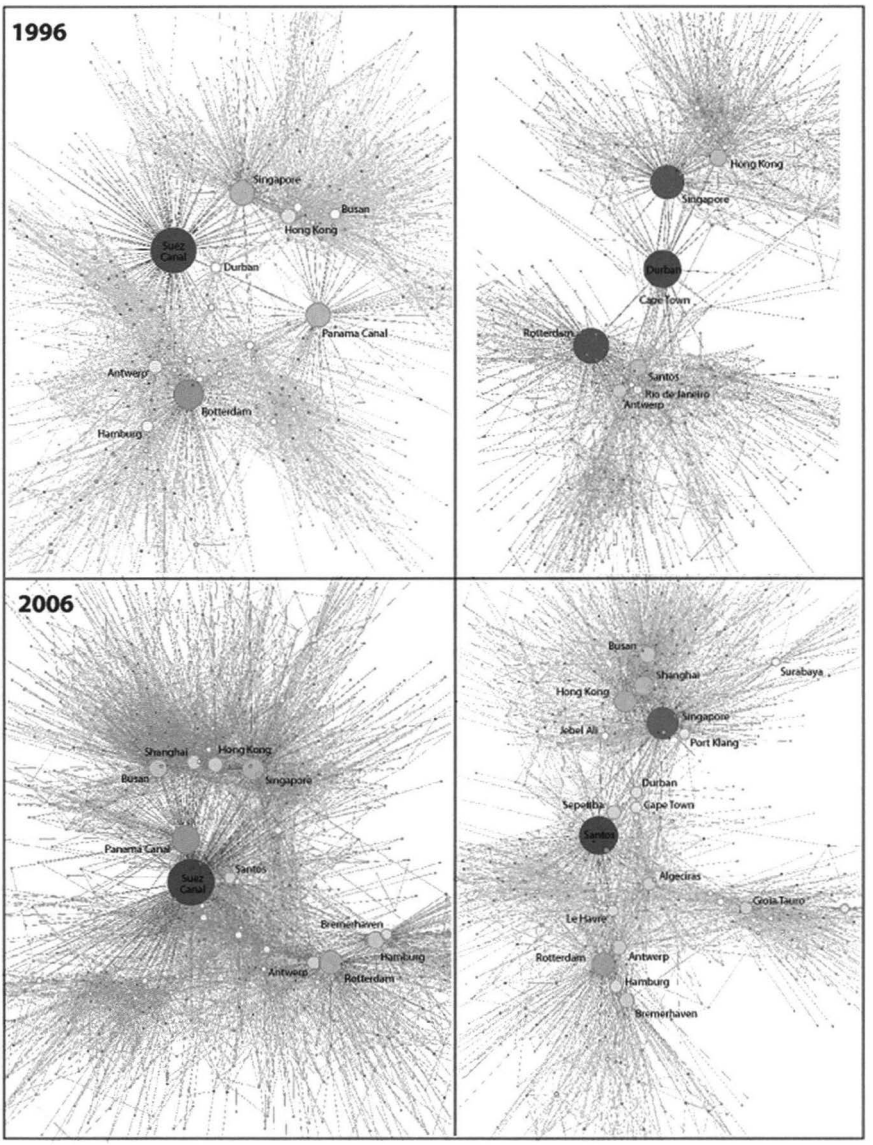


Fig. 3. — Visualization of canal centrality and impacts in 1996 and 2006. *N.B.*: left figures show the whole network; right figures show the network without canals and their related links (*source*: own elaboration based on Lloyd's List data and TULIP software).

visualization algorithm (fig. 4). The design of the optimal route confirms the existence of two large subsystems or sub-trees each polarized by Rotterdam and Singapore, which have the largest number of adjacent neighbours (degree) and a high level of ramification (Strähler). In 1996, the Suez Canal has the highest ramification level as it stands, together with Djibouti, Reunion, and Aden at the source of the global tree. The gravity centre of the global maritime system is thus clearly around the Suez Canal but it has shifted to other locations in 2006. Singapore as well as a number of Latin American ports (*i.e.* Vitoria, Santos, Paranagua, Port of Spain, Kingston, etc.) took over the Suez Canal at the source of the optimal route. This corroborates previous results since Asian traffics have increasingly penetrated the Atlantic through direct calls bypassing the Suez Canal, *i.e.* around the Cape of Good Hope. Many African ports have shifted under Asian influence due to the fast development of Asian Foreign Direct Investment (FDI) in Africa (Chaponniere 2010). Asian terminal operators have also multiplied terminal concessions in many African ports such as in the Maghreb (Mohammed-Cherif & Ducruet 2011) and West-African ranges (Debrie 2012) during that period. Emerging economies such as Brazil have generated increasing volumes of flows linking not only Asia but also traditional partners such as Europe and the US (Guy 2003), thus becoming a new gravity centre for global shipping. Notably, the interlining function of Algeciras that appeared clearly in 1996 for connecting East-West and North-South flows considerably reduced in 2006 since Durban in South Africa appears as a new relay hub between West Africa and Asia. Overall, we observe a significant shrink of Rotterdam's influence in the network as an effect of the aforementioned factors. The sub-network including New York, Houston, Casablanca, and a number of Atlantic European ports is in 2006 connected to Hong Kong via Itajai, a Brazilian port. Although the method has removed many links that connect ports in more complex ways, the resulting pattern is by no means revelatory of profound changes in network configurations.

The same method applied to the matrix of complete graphs provides complementary results although many indirect and long-distance links between ports would not have existed without canals, such as Rotterdam-Tokyo. Due to the existence of many alternatives in this dimension of the network, canals appear to have a relatively minor role at both years on the optimal route. Interesting configurations and evolutions are, nevertheless, observable. In 1996, European ports were clearly dominant in terms of both centrality and ramification levels, together with Asian ports that appeared more to the fringe of the figure. In 2006, it was the opposite: Asian ports dominated the optimal route while European (and other) ports were relegated to the semi-periphery.

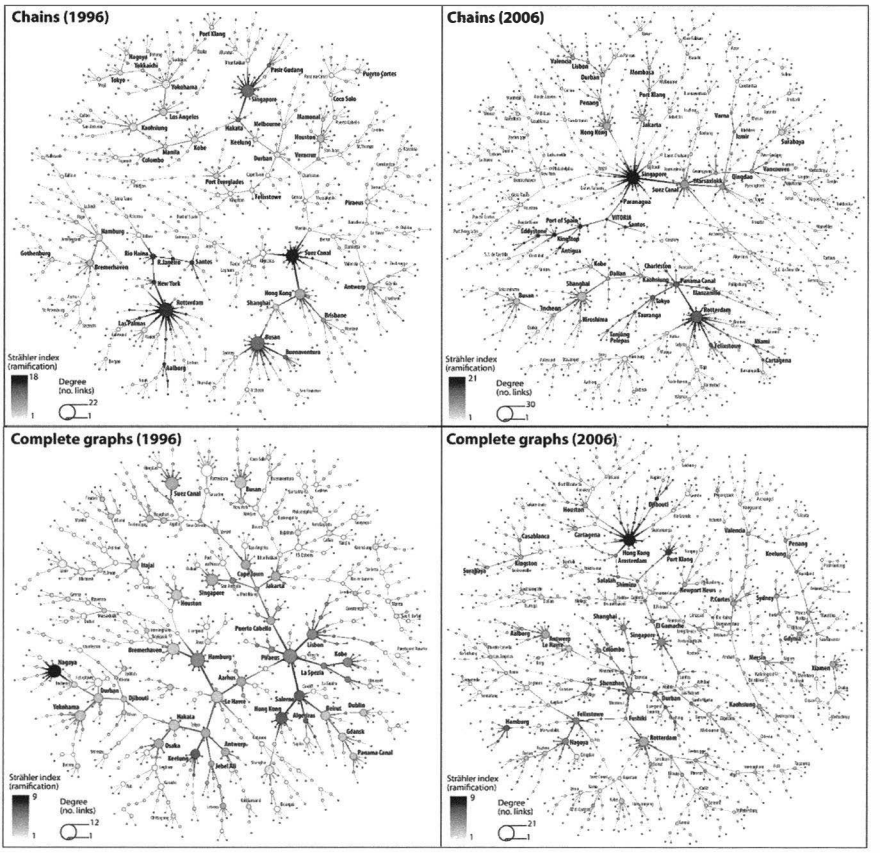


Fig. 4. — Situation of ports and canals on the optimal traffic route in 1996 and 2006 (*source*: own elaboration based on Lloyd's List data and TULIP software).

Conclusion

The application of several network analytical methods to the global matrix of inter-port vessel movements provides many clues about the changing role of canals and ports in liner shipping flows. As such, it informs us better about the way shipping networks both reflect and shape the world economy and its components (Ullman 1949, Vigarie 1968). As a complement to studies of network vulnerability, this research provides several evidences about the distribution of canal-related flows and their wider significance for ports and shipping. After providing a novel estimation of the importance of canal traffic in global container flows, the research revealed the uneven geographic coverage of the canals' influence at different levels of analysis. While canal

traffic concentrates at the vicinity of those major infrastructures, it reveals the higher vulnerability of the "old Atlantic world" compared with emerging countries such as in the Asia-Pacific and South Atlantic regions. The role of the canals in global shipping has thus shrunk during the period under study (1996-2006) as an effect of growing South-South trades and Asia's expansion across the Cape of Good Hope. Former structures, such as Rotterdam's prominence as the main hub of Europe-Atlantic networks, are thus currently losing ground since Latin American ports play a new role in network interlining. Yet, there is a permanency of a bipolarization of the world organized by Singapore and Rotterdam, which remain the main pivotal nodes. Drastic changes are better felt for smaller ports such as Algeciras which interlining function has declined. Further research will test the continuity of such trends by applying these methods to other commodity types (*e.g.* bulks, general cargo) and to more recent data, as a means taking into account, too, the likely impact of the 2008 financial global crisis on network configurations. Untangling the respective influence of carrier decisions and territorial factors will remain a difficult challenge to tackle.

REFERENCES

ALBERT, R., ALBERT, I. & NAKARADO, G. 2004. Structural vulnerability of the North American power grid. — *Physical Review E*, **69** (2): 1-4.

ANGELOUDIS, P., BICHOU, K. & BELL, M. G. H. 2007. Security and reliability of the liner container-shipping network: Analysis of robustness using a complex network framework. — *In*: BICHOU, K., BELL, M. G. H. & EVANS, A. (Eds.), Risk Management in Port Operations, Logistics and Supply Chain Security. London, Informa, pp. 95-106.

BELLMAN, R. 1958. On a routing problem. — *Quarterly of Applied Mathematics*, **16** (1): 87-90.

BERLE, O., RICE, Jr. J. B. & ASBJORNSLETT, B. E. 2011. Failure modes in the maritime transportation system: A functional approach to throughput vulnerability. — *Maritime Policy and Management*, **38** (6): 605-632.

CHAPONNIERE, J. R. 2010. Le basculement de l'Afrique vers l'Asie: enjeux pour les ports africains. — *Afrique Contemporaine*, **234** (2): 25-40.

DEBRIE, J. 2012. The West African port system: Global insertion and regional particularities. — *EchoGeo*, **20** [http://echogeo.revues.org/13070 (access October 2012)].

DENG, W. B., LONG, G., WEI, L. & XU, C. 2009. Worldwide marine transportation network: Efficiency and container throughput. — *Chinese Physics Letters*, **26** (11): 118901.

DERUDDER, B., DEVRIENDT, L. & WITLOX, F. 2007. Flying where you don't want to go: An empirical analysis of hubs in the global airline network. — *Tijdschrift voor Economische en Sociale Geografie*, **98** (3): 307-324.

DIJKSTRA, E. W. 1959. A note on two problems in connexion with graphs. — *Numerische Mathematik*, **1**: 269-271.

DUCRUET, C. & NOTTEBOOM, T. E. 2012a. The worldwide maritime network of container shipping: Spatial structure and regional dynamics. — *Global Networks*, **12** (3): 395-423.

DUCRUET, C. & NOTTEBOOM, T. E. 2012b. Developing liner service networks in container shipping. — *In*: SONG, D. W. & PANAYIDES, P. (Eds.), Maritime Logistics: A Complete Guide to Effective Shipping and Port Management. Kogan Page, pp. 77-100.

DUCRUET, C. & RODRIGUE, J. P. 2012. Graph theory: Measures and Indices. — *The Geography of Transport Systems* [http://people.hofstra.edu/geotrans/eng/methods/ch1m3en.html (access October 2012)].

DUCRUET, C., LEE, S. W. & NG, A. K. Y. 2010. Centrality and vulnerability in liner shipping networks: Revisiting the Northeast Asian port hierarchy. — *Maritime Policy and Management*, **37** (1): 17-36.

FLOYD, R. W. 1962. Algorithm 97: Shortest path. — *Communications of the ACM*, **5** (6): 345.

FORD, L. R. & FULKERSON, D. R. 1962. Flows in Networks. — Princeton University Press.

FREMONT, A. 2007. Global maritime networks: The case of Maersk. — *Journal of Transport Geography*, **15** (6): 431-442.

FU, X., NG, A. K. Y. & LAU, Y. Y. 2010. The impacts of maritime piracy on global economic development: The case of Somalia. — *Maritime Policy and Management*, **37** (7): 677-697.

GLEYZE, J. F. 2005. La vulnérabilité structurelle des réseaux de transport dans un contexte de risques. — University of Paris 7 (unpublished PhD Dissertation in Geography).

GORMAN, S. P., SCHINTLER, L., KULKARNI, R. & STOUGH, R. 2004. The revenge of distance: Vulnerability analysis of critical information infrastructure. — *Journal of Contingencies and Crisis Management*, **12** (2): 48-63.

GRUBESIC, T. H., MATISZIW, T. C., MURRAY, A. T. & SNEDIKER, D. 2008. Comparative approaches for assessing network vulnerability. — *International Regional Science Review*, **31** (1): 88-112.

GUERRERO, H., MURRAY, D. & FLOOD, R. 2008. A model for supply chain and vessel traffic restoration in the event of a catastrophic port closure. — *Journal of Transportation Security*, **1** (2): 71-80.

GUO, D., LIU, S. & JIN, H. 2010. A graph-based approach to vehicle trajectory analysis. — *Journal of Location-Based Services*, **4** (3-4): 183-199.

GUY, E. 2003. Shipping line networks and the integration of South America trades. — *Maritime Policy and Management*, **30** (3): 231-242.

HAGGETT, P. & CHORLEY, R. J. 1969. Network Analysis in Geography. — London, Edward Arnold.

HALL, P. V. 2004. 'We'd have to sink the ships': Impact Studies and the 2002 West Coast Port Lockout. — *Economic Development Quarterly*, **18** (4): 354-367.

HU, Y. & ZHU, D. 2009. Empirical analysis of the worldwide maritime transportation network. — *Physica A*, **388** (101): 2061-2071.

JENELIUS, E., PETERSEN, T. & MATTSSON, L.-G. 2006. Importance and exposure in road network vulnerability analysis. — *Transportation Research Part A*, **40** (7): 537-560.

JOHNSON, D. B. 1977. Efficient algorithms for shortest paths in sparse networks. — *Journal of the ACM*, **24** (1): 1-13.

KALUZA, P., KOLZSCH, A., GASTNER, M. T. & BLASIUS, B. 2010. The complex network of global cargo ship movements. — *Journal of the Royal Society Interface*, **7** (48): 1093-1103.

KRUSKAL, J. B. 1956. On the shortest spanning subtree of a graph and the traveling salesman problem. — *Proceedings of the American Mathematical Society*, **7** (1): 48-50.

LIU, M. & KRONBAK, J. 2010. The potential economic viability of using the Northern Sea Route (NSR) as an alternative route between Asia and Europe. — *Journal of Transport Geography*, **18**: 434-444.

MOHAMMED-CHERIF, F. & DUCRUET, C. 2011. Les ports et la façade maritime du Maghreb, entre intégration régionale et mondiale. — *Mappemonde*, **101** [http://mappemonde.mgm.fr/num29/articles/art11103.html (access October 2012)].

NOTTEBOOM, T. E. 2012. Towards a new intermediate hub region in container shipping? Relay and interlining via the Cape route vs. the Suez route. — *Journal of Transport Geography*, **22**: 164-178.

PARSHANI, R., ROZENBLAT, C., IETRI, D., DUCRUET, C. & HAVLIN, S. 2010. Inter-similarity between coupled networks. — *Europhysics Letters*, **92**: 68002.

RODRIGUE, J. P. 2004. Straits, Passages and Chokepoints. A Maritime Geostrategy of Petroleum Distribution. — *Cahiers de Géographie du Québec*, **38** (135): 357-374.

RODRIGUE, J. P. & NOTTEBOOM, T. E. 2010. Foreland-based regionalization: Integrating intermediate hubs with port hinterlands. — *Research in Transport Economics*, **27**: 19-29.

ROY, B. 1959. Transitivité et connexité. — *C. R. Acad. Sci. Paris*, **249**: 216-218.

SALTER, M. B. 2008. Political science perspectives on transportation security. — *Journal of Transportation Security*, **1** (1): 29-35.

SHIMBEL, A. 1953. Structural parameters of communication networks. — *Bulletin of Mathematical Biophysics*, **15** (4): 501-507.

TAAFFE, E. J. & GAUTHIER, H. L. 1973. Geography of Transportation. — Englewood Cliffs NJ, Prentice-Hall.

ULLMAN, E .L. 1949. Mapping the world's ocean trade: A research proposal. — *The Professional Geographer*, **1** (2): 19-22.

VERNY, J. & GRIGENTIN, C. 2009. Container shipping on the northern sea route. — *International Journal of Production Economics*, **122** (1): 107-117.

VIGARIE, A. 1968. Géographie de la Circulation. — Paris, Genin.

WANG, J. W. & RONG, L. L. 2009. Cascade-based attack vulnerability on the US power grid. — *Safety Science*, **47** (10): 1332-1336.

WARSHALL, S. 1962. A theorem on Boolean matrices. — *Journal of the ACM*, **9** (1): 11-12.

WASSERMAN, S. & FAUST, K. 1994. Social Network Analysis: Methods and Applications. — Cambridge University Press, Structural Analysis in the Social Sciences, 8.

ZAVITSAS, K. & BELL, M. G. H. 2010. A Simulation Model and a Vulnerability Assessment of the Worldwide Energy Supply. — *In*: BELL, M. G. H., HOSSEINLOO, S. H. & KANTURSKA, U. (Eds.), Security and Environmental Sustainability of Multimodal Transport. NATO Science for Peace and Security Series C: Environmental Security. Dordrecht, Springer, pp. 227-246.

APPENDIX 1

Canal-dependent traffics at largest ports of the world in 1996 and 2006

1996				2006			
Port	P+S	PAN	SUEZ	Port	P+S	PAN	SUEZ
Singapore	57.9	6.8	57.4	Hong Kong	56.3	15.1	45.6
Hong Kong	52.5	11.9	47.4	Suez Canal	100.0	7.0	100.0
Suez Canal	100.0	9.9	100.0	Panama Canal	100.0	100.0	19.3
Panama Canal	100.0	100.0	31.0	Singapore	49.0	4.2	47.8
Kaohsiung	53.6	17.4	45.3	Shenzhen	72.0	21.2	56.3
Rotterdam	67.9	17.7	60.7	Busan	47.5	20.8	32.1
Los Angeles	54.3	41.9	31.5	Shanghai	53.5	18.8	40.8
Hamburg	75.7	17.6	71.8	Kaohsiung	49.8	14.5	37.7
Busan	53.7	20.1	45.4	Rotterdam	74.1	11.4	66.8
Le Havre	74.2	26.2	67.3	Ningbo	64.3	15.7	55.0
Colombo	87.1	18.9	87.1	Hamburg	76.4	6.9	73.6
Kobe	37.8	14.3	25.5	Port Klang	50.7	7.8	50.1
Tokyo	47.1	17.5	38.8	New York	76.8	58.9	28.8
Jeddah	98.3	4.3	98.3	Savannah	92.9	86.1	27.3
Felixstowe	65.9	20.6	56.6	Jeddah	89.8	5.7	89.5
New York	76.3	63.3	38.0	Manzanillo (PAN)	94.0	94.0	14.6
Yokohama	33.4	14.7	20.7	Tokyo	45.7	24.8	23.7
Nagoya	38.3	13.2	30.2	Colombo	67.1	9.3	66.6
Antwerp	63.3	25.8	54.9	Qingdao	57.6	15.1	46.0
Osaka	49.5	24.0	39.3	Xiamen	57.9	7.8	54.3
San Francisco	44.2	29.9	26.1	Oakland	51.9	28.6	26.8
Southampton	96.6	2.3	96.5	Yokohama	37.0	22.9	16.6
Port Klang	45.6	5.3	45.6	Felixstowe	68.4	6.8	65.7
Bremerhaven	57.1	32.1	40.6	Kobe	43.0	23.0	22.0
Manzanillo (PAN)	95.4	95.4	13.5	Jebel Ali	52.2	4.6	51.6
Keelung	26.9	10.3	21.9	Los Angeles	54.2	28.5	32.0
Savannah	92.8	89.3	28.3	Tanjung Pelepas	77.0	8.0	74.6
Charleston	64.4	46.7	35.3	Long Beach	53.2	27.1	30.8
Cristobal	95.1	95.1	61.9	Charleston	64.0	50.7	24.7
Shimizu	61.6	12.2	61.3	Bremerhaven	61.0	18.6	46.6
Barcelona	65.0	18.8	49.0	Nagoya	37.6	17.1	22.5
Buenaventura	90.4	88.4	3.1	Antwerp	59.2	14.1	47.4

Source: own elaboration based on Lloyd's List data (*N.B.*: ports are ranked in decreasing order based on total canal-dependent traffic at each year).

International Colloquium
Interoceanic Canals and World Seaborne Trade: Past, Present and Future
Royal Academy for Overseas Sciences
Port of Antwerp
World Association for Waterborne Transport Infrastructure
Brussels, 7-9 June 2012
pp. 45-59

Connecting China Overseas through the Marine Arctic: Legal Implications and Geopolitical Considerations for Arctic Shipping

by

Petra DRANKIER*

KEYWORDS. — China; Arctic; Sea Route; Navigation; International Law of the Sea.

SUMMARY. — The increased melting of the summer icecap in the marine Arctic may lead to a longer navigation season and improved accessibility for shipping. This article introduces the main Arctic shipping routes and highlights the opportunities and weaknesses for the emergence of a new global route for maritime trade, in particular for China. The main part of the article deals with the regimes of navigation, as provided by the international law of the sea (UNCLOS). The various national claims and regulations of Canada and Russia demonstrate the different views on interpretation and implementation of the relevant UNCLOS provisions. Finally, with an increasing variety of activities, the Arctic Council is exploring its own role as well as the future role for stakeholders such as China.

Introduction

On the occasion of World Oceans Day, 8th June 2012, the Empire State Building was lit in white, blue and purple. White at the top represented "the shallowest, sunlit waters and also the polar ice cap" (United Nations 2012). In reality, the polar icecap of the Arctic Ocean is thinning and breaking up. Although the winter sea ice cover of the Arctic Ocean is not expected to disappear during this century, the multi-year ice will probably disappear. Research models predict increasingly longer nearly ice-free summer seasons through the 21st century (Arctic Council 2009, pp. 16-35). This may provide

* The presentation was held while the author was affiliated as research associate to the Netherlands Institute for the Law of the Sea (NILOS), Utrecht University, Faculty of Law, Economics and Governance, Achter Sint Pieter 200, N-3512 HT Utrecht (The Netherlands).

opportunities for several human activities, such as access to mineral and hydrocarbon resources, the undertaking of scientific research on climate change, and a longer navigation season with improved accessibility for shipping. As referred to by various commentators, the Bering Strait has the potential of becoming "the next Panama Canal", due to its strategic location providing access to the Arctic Ocean and the presence of six commercial ports nearby (ROGOFF 2010; ROTHWELL 2012, p. 272).

Besides practical obstacles for navigation through the Arctic waters, shipping nations (flag States) have to deal with regulatory restrictions from Canada and Russia. This paper will explore the rights and obligations of the coastal States and flag States with respect to navigation in the Arctic, as developed under the international law of the sea. What are the options for China, as a non-Arctic State, to safeguard its Arctic navigational interests, in particular within the context of the Arctic Council? During the Arctic Council Ministerial Meeting of May 2011, new guidelines concerning the admission of observers were adopted. The decision on the application of China, and others, for permanent observers, will be taken in spring 2013.

The next section of this article starts with an introduction on the various Arctic shipping routes and will highlight the opportunities as well as the weaknesses for transit shipping via the Arctic Ocean. In particular, the interests of China will be explored. The main part of the article is dedicated to the regimes of navigation, as provided for by the international law of the sea, applicable to the marine Arctic. Specific attention will be paid to the rights and obligations of flag States, such as China, versus the coastal States in the Arctic. Also, the various claims of Canada, Russia and the US will be addressed. Furthermore, attention is paid to the regulation of Arctic vessel source pollution. Next, the option for China to safeguard its Arctic navigational interests by permanent observer status in the Arctic Council will be assessed. Finally, the paper concludes with some comments on the way forward.

China's Navigational Interests in the Arctic

ARCTIC ROUTES

Shorter sailing routes save time and fuel, in other words, save money. The distance between China and Europe is much shorter when sailing the Northern Sea Route instead of using the Suez Canal or sail around Africa. The same goes for the North-West Passage, which provides a shorter route between East Asia and the United States. Moreover, there are other benefits

in this respect, such as the current absence of piracy in the Arctic, less dependency on the Malacca Strait and other "choke points", and geopolitical considerations for shipping nations. Access to (alternative) sea routes, such as in the Arctic, seems also an important condition for safeguarding China's strategy of peaceful development in the future (MOE & JENSEN 2010, pp. 4-8; PERRY & ANDERSEN 2012, pp. 6-12). Sailing the Transpolar Route (also called the Central Arctic Shipping Route), the third possible international route, does not seem to be a viable option in the short term (MAKKI 2012).

Of course, there are also disadvantages. Ice free does not mean 'no ice', as there would be increased frequency of broken ice and icebergs in certain waters. This means there are costs involved related to shipping safety and reliability. Currently, there are inadequate search and rescue facilities; a modern system of navigational aids is lacking; and one needs expensive pilotage and icebreaker services (DNV 2010, p. 6; MOE & JENSEN 2010, pp. 9-11; PERRY & ANDERSEN 2012, pp. 6-12; SPEARS 2011).

The Northern Sea Route is the most developed one of the Arctic routes, but still, there is mainly regional traffic based on exports from the Russian north. The Northwest Passage is far less developed, because the ice conditions are more complicated and it has far less infrastructure than the Northern Sea Route. Canadian authorities are not actively promoting international use of the route, partly because of legal controversies over the status of the passage (as will be explained later in this paper). On the contrary, Russia actively advertises its Northern Sea Route (HEADLAND 2010, DNV 2010).

However, the commercial conditions remain uncertain and it lacks investment in more technologically advanced icebreakers and infrastructure. A shipping assessment of 2004 showed four types of vessel activities as most significant in the Arctic: community re-supply, fishing, tourism and transport of bulk cargo. Furthermore, it was demonstrated that nearly all voyages took place on the periphery of the Arctic Ocean (Arctic Council 2009, pp. 72-73). Nevertheless, the marine Arctic region has the potential for becoming a new global maritime trade route. Indeed, many trial voyages have been made, new initiatives have been started by companies, and governments are developing ideas about increasing transit use. Three types of Arctic shipping can be identified:

— Intra-arctic shipping: between ports located within the Arctic;
— Arctic destination shipping: between ports inside and outside of the region;
— Transit shipping: between ports in the Pacific and the Atlantic Oceans via the Arctic Ocean (Ocean Futures 2010).

With regard to the Arctic port infrastructure, the initiative has been taken within the context of the Arctic Council to identify the strengths and gaps in a guidance document, and moreover a conference will be organized. The study, under the umbrella of the Arctic Maritime and Aviation Transportation Infrastructure Initiative (AMATII), will be completed in May 2013 (SDWG 2012, University of the Arctic 2012). The availability of more deepwater ports and related facilities and services could lower the risk with transiting the marine Arctic (Arctic Council 2009, p. 175).

Interests of China

China has no Arctic coastline or any sovereign rights to the continental shelf in the Arctic Ocean. However, the possible future polar shipping routes are important to China, since it is heavily dependent on international trade (Jakobson 2010, p. 1). China will continue to be the main destination of goods shipped along the Northern Sea Route. This concerns transhipments, but also Russian goods shipped from Russian Arctic ports. As observed by Staalesen (2010), it is likely that a significant part of oil and gas produced in the Russian Arctic will be transported to China. Russian and international companies are investing billions of dollars to develop the hydrocarbons located in the offshore areas on the continental shelf.

Access to sea routes, and diversification in trade routes (including trans-continental rail freight corridors), seem to be an important condition for safe-guarding China's strategy of peaceful development in the future. It would mean, *inter alia*, less dependency on the Straits of Malacca and other "choke points", such as the Taiwan Strait.

Besides State interests related to scientific research and exploitation of natural resources such as oil and gas, navigation is of great importance to non-Arctic States. So far, no Asian state has officially noted a geopolitical interest in the Arctic. However, the main interest of South Korea is the new market for ice-capable vessels since this country hosts the world's largest shipyards. Japan has a strong interest in diversifying its supply of rare earth material. Greenland, in particular, is rich in mineral resources useful for the production of electronics and other high-value goods (CIC 2011, Perry & Andersen 2012). As highlighted by Jakobson (2010, p. 2), China has adopted a 'wait-and-see' approach to Arctic developments, so far.

However, in recent years, Chinese officials and researchers have started to assess the commercial and political implications for China of a seasonally ice-free Arctic region. The director of the department of Strategic Studies at the Polar Research Institute of China stated that "since the contest over the Arctic has entered into a stage of strategic preparation, non-Arctic countries

should also make preparations on how to use the Arctic" (*Global Times* 2011). According to the director these countries should actively participate in discussing the issue of free navigation (*Global Times* 2011). Also, the Chinese scholar Li argued that given the importance of the Arctic sea routes to Chinese economic development, China should participate in discussions before international mechanisms are getting established (CURTIS WRIGHT 2011). In any case, the Chinese government is increasing its investment in Arctic research and has commissioned a second polar high-tech icebreaker (MAKKI 2012, MURTHY 2012).

Furthermore, various commercial developments go ahead. There is increasing cooperation between companies, in most cases partly state-owned, from China and Russia. For example, end of 2010 the China National Petroleum Corporation signed an agreement with Sovcomflot about shipping along the Northern Sea Route with regard to transportation of oil and gas extracted at Russian Arctic offshore fields. The agreement is part of a long-term partnership strategy, which include the building of tankers by Sovcomflot and cooperation on quality and safety standards (STAALESEN 2010).

Arctic Navigation

INTERNATIONAL LAW OF THE SEA

The international law of the sea originated with the use of the seas by humans as a medium of transport. Coastal States sought to restrict access to certain areas of the sea close to their coasts, while flag States were anxious to limit restrictions on such access to the minimum and tried to secure the maritime routes that led to areas of economic importance to them. Navigation rights are indispensable not only to flag States, but to all States engaged in international trade and manufacturing. Moreover, the supply of energy, including the shipping of oil, is gaining more and more importance for the prosperity of States. Since the adoption of the United Nations Convention on the Law of the Sea (UNCLOS) in 1982, the world has seen enormous changes. State practice reflects a lack of uniformity in several ways, as well as conflicting views on which and how particular navigational regimes should be applied (MENSAH 2000, pp. 7, 13). For example, most coastal States explicitly or implicitly adhere to the right of innocent passage. However, several States make the right of innocent passage of foreign ships in certain categories subject to prior notification or authorization, while a few other States grant it on the basis of reciprocity (YANG 2006, p. 172).

UNCLOS is often referred to as the 'constitution of the oceans'. It contains fundamental rules concerning the exercise of jurisdiction of States at sea and sets out the rights, duties and responsibilities for States. Part of the balance between the rights and interests of coastal States and flag States, as aimed for by UNCLOS, is achieved through the division of the seas and oceans into maritime zones.

Maritime Zones and Regimes of Navigation in the Arctic

All States enjoy the freedom of navigation on the high seas. States also enjoy freedom of navigation in their Exclusive Economic Zones (EEZs), although, there, they will have due regard to the rights and duties of the coastal State and will comply with the laws and regulations adopted by the coastal State, for example those related to the protection of the marine environment. However, the Arctic shipping routes are not entirely located in the high seas and EEZs. Only some high seas pockets exist in the Arctic. As highlighted by Brubaker (2000, p. 221), about sixty straits and channels link a series of individual seas that provide passage through the Northern Sea Route. The Arctic consists of an ocean surrounded by coastal States. A large portion of the Arctic Ocean is part of the maritime zones of these coastal States. For example, sailing the Northern Sea Route is not possible without navigation through Russian territorial and internal waters. This means that shipping activity in the Arctic could encounter certain restrictions from Arctic coastal States, especially from Russia and Canada. Most shipping restrictions are to be expected in the internal waters of a State, where a coastal State can exercise full sovereignty.

The so-called 'baseline' is the starting point for the measurement of the seaward extent of all coastal State's maritime zones. A normal baseline is the low-water line along the coast. However, in some circumstances, UNCLOS allows coastal States to determine 'straight baselines'. For instance, across the mouths of rivers and bays and where the coast "is deeply indented and cut into, or if there is a fringe of islands along the coast" (UNCLOS 1982, art. 7(1)). Canada has drawn straight baselines around its Arctic islands, with the consequence that large parts of the Northwest Passage would be located within Canada's internal waters. Like Canada, Russia has made use of straight baselines (Kraska 2007, pp. 270-271; Moe & Jensen 2010, pp. 12-15; Pharand 2007, p. 13).

A coastal State also has sovereignty over its territorial sea (which extends up to a limit of 12 nm from the baseline), but this is subject to the right of innocent passage by foreign vessels.

Another navigation regime relevant for the Arctic situation concerns transit passage in straits used for international navigation. This regime of transit passage is applicable to straits which are used for international navigation between two high seas or EEZs, in those areas of the strait narrower than twenty-four nm. The Bering Strait is an example of such an international strait with a transit passage regime (ROTHWELL 2012, p. 274). Transit passage allows less coastal State control over passing ships than innocent passage does and is thus more liberal as regards navigation. However, designation and prescription of sea lanes and traffic separation schemes (art. 42(1) (a)) is still possible, although only the IMO may adopt such sea lanes and schemes (art. 41(4), UNCLOS). Finally, States bordering straits may not hamper or suspend transit passage (art. 44, UNCLOS) (KRASKA 2007, pp. 274-276).

In case of straits wider than 24 nm, a navigation channel might exist in the EEZ or high seas of the strait, where freedom of navigation applies. Examples are the Davis Strait, the Fram Strait and the Denmark Strait (ROTHWELL 2012, pp. 275-277). Furthermore, article 36 of UNCLOS excludes straits from the transit passage regime if there exists a high-sea route or a route through the EEZ of similar convenience with respect to navigational and hydrographical characteristics. In case of the marine Arctic it could be invoked that the 'traditional' sailing routes are even more convenient, but the geographical scope of this provision is unclear. Finally, views differ if the transit passage regime only applies to straits 'used for international navigation', as referred to in article 37 of UNCLOS, which are actually used (and since when and how intensive such navigation takes place) or also to straits with potential usage (KRASKA 2007, pp. 274-276; MOLENAAR 2009, p. 304). The Nares Strait is an example of a strait with only a few reported passages, but meeting the geographic criteria of an international strait as provided by UNCLOS (ROTHWELL 2012, p. 275).

Canada

The Canadian government consider the Northwest Passage to be internal waters (instead of straits used for international navigation) and argue that foreign ships should ask for permission before entering these waters. The United States and the EU Member States lodged formal protests, regarding the Canadian claim as inconsistent with international law. To avoid a serious dispute over this issue, the United States and Canada have concluded the 1988 bilateral Arctic cooperation agreement, which suspends the question of sovereignty while allowing American icebreakers to transit the Northwest

Passage. However, this agreement does not cover other vessel types (European Union 2010, p. 7; GERHARDT *et al.* 2010, p. 995; HUEBERT *et al.* 2012, p. 27; KRASKA 2007, pp. 259-262).

Russia

The Russian Federation opened the Northern Sea Route to foreign shipping in 1991. Similar to the Northwest Passage, the Northern Sea Route is not a single linear route: a ship has to pass various straits that link the five seas that provide passage through the Northern Sea Route; and the best course for shipping will vary depending on the ice conditions. Russia claims that parts of the Northern Sea Route lie within its internal waters. So, the route includes Russian EEZ, territorial sea as well as internal waters. According to Russian regulations, vessels must ask for permission to navigate the NSR and navigation could be temporarily suspended by Russia. Both provisions are not in accordance with UNCLOS (BRUBAKER 2000).

Currently, the Russian Ministry of Transport is preparing a bill in order to regulate commercial shipping along the Northern Sea Route. The bill proposes to give the Northern Sea Route Administration the responsibility to organize shipping in the area. The Administration will also regulate pilotage and icebreaker services and the level of fees for the use of these. Transit fees do already apply, although the payment of these does not guarantee Russian services to provide for a speedy and safe passage (KITAGAWA 2001, p. 89; LIU & KRONBAK 2010; NILSEN 2010). Moreover, the fee level is generally considered as "far too high" and not transparent (Arctic Council 2009, p. 117).

Alaska/United States

Alaska is located on the eastern side of the Bering Strait, which must be used for any passage of the Northern Sea Route or the North West Passage. Given the importance that the United States attach to the freedom of navigation and their view that the Arctic Ocean should not be treated differently from any other ocean, the United States have not adopted stricter rules that go beyond the generally accepted international rules and standards.

REGULATION OF ARCTIC VESSEL SOURCE POLLUTION

Article 234 of UNCLOS specifically deals with coastal State regulation on marine pollution of vessels in marine waters within the EEZ that are ice-covered for most of the year. The words 'ice-covered for most of the year'

imply that with decreasing ice-coverage fewer coastal States will be able to rely on article 234 in fewer areas.

Both Canada and Russia rely on article 234 for prescribing standards that are more stringent than generally accepted international rules and standards. For example, Canada has established the Canadian Arctic Shipping Pollution Prevention Regulations. Russia enacted the Regulation for Navigation on the Seaway of the Northern Sea Route, which governs navigation not only in Russia's EEZ, but also on the high seas beyond it (European Union 2010, p. 11; KITAGAWA 2001, pp. 86-87).

The IMO tools to protect certain areas of the marine environment from vessel-source pollution, such as the so-called special areas and the Particularly Sensitive Areas (PSSAs), have not been established yet in the Arctic. However, with regard to maritime safety and pollution prevention, IMO adopted in 2002 recommendatory guidelines for ships operating in Arctic ice-covered waters. End of 2009 these guidelines were replaced by the 'Polar Shipping Guidelines' (IMO 2012a). IMO is currently developing a mandatory code for ships operating in polar waters. In 2010 it was decided that a mandatory Polar Code should be developed to replace the existing voluntary guidelines. Although it is foreseen that the Code will address the possible impact of shipping operations on the environment in a comprehensive manner, its provisions will mainly have a technical character (IMO 2012b).

China's Application for Permanent Observer Status in the Arctic Council

ARCTIC COUNCIL

What are the options for China, as a non-Arctic State, to safeguard its navigational interests in the Arctic? Should it only rely on the provisions developed under UNCLOS and IMO? Would it be at China's advantage to be admitted as a permanent observer to the Arctic Council? Or would it be sufficient to invest in good bilateral relations? Or should new structures be created? This section will focus on the Arctic Council option (GRACZYK 2012, p. 279).

The Arctic Council is a high-level intergovernmental forum which addresses issues faced by the Arctic governments and the indigenous people. The eight Arctic Council States include the United States, Canada, the Russian Federation, Iceland, Denmark, Norway, Finland and Sweden. In addition, six organizations representing Arctic indigenous peoples have status as

permanent participants in the council. The chairmanship of the council rotates every two years among the eight member states. Currently, Sweden holds the chairmanship until 2013, when Canada will take over (Kingdom of Sweden 2012).

It is the intent of the Arctic States to ensure that the Arctic remains a region of cooperation. The commitment to the principles of international law is expressed in many of their statements on a peaceful and cooperative development of the Arctic. Even though all Arctic States emphasize in their policy statements that there is no military threat in the Arctic, most policy statements also mention that the individual States will take steps to protect their core interests in the regions. These core interests may be different for each State, including freedom of navigation and security for the United States, sovereignty for Canada, regional stability for Norway, and the economic potential of oil and gas reserves for Russia (HUEBERT *et al* 2012, p. 18).

Moreover, most Arctic States have begun to modernize their military capabilities in the region, although this can take many years, *inter alia*, because of investment postponements due to budget cutbacks. An example of such infrastructure modernization is the new Canadian military and civilian deep-water resupply facility that is being constructed on Baffin Island (operational date of 2016), as well as an Arctic training centre in Resolute Bay to support military and civilian emergency operations. Canada is also in the process of establishing a 'Northern Watch' system, which uses both land-based and underwater sensors to detect vessels passing through choke points in the Northwest Passage. Moreover, new space-based surveillance systems are being designed to monitor the ocean approaches of the Arctic (BENNETT 2012; HUEBERT *et al*. 2012, p. 28).

Although the agenda of the Arctic Council mainly dealt with cooperation on environmental issues in the past twenty years, it could potentially talk about anything. A recent example is the signing of a search and rescue treaty by all eight Arctic Council members in May 2011. It is the first legally binding treaty to be negotiated through the Arctic Council. Views differ on the future of this forum; should it be decision-shaping and act as coordinator, or should it develop to decision-making, and what does this mean for non-Arctic States? (Arctic Council 2011; HUEBERT *et al*. 2012, pp. 17-18; IMO 2011; KAO *et al*. 2012, p. 832)

OBSERVER STATUS IN ARCTIC COUNCIL

The primary role foreseen for observers is to observe the work of the Arctic Council, but observers should also continue to make relevant

contributions through their engagement, primarily at the level of working groups. In meetings of these bodies, observers may, at the discretion of the chair, present statements and submit documents and views. Observers may also submit written statements at ministerial meetings. Finally, observers may propose projects through an Arctic State or a permanent participant, but financial contributions from observers to any given project may not exceed financing from Arctic States, unless otherwise decided by the Arctic officials.

Observers are non-voting and generally silent on policy decisions, although usually one of them is allowed to speak on behalf of the group of observers at ministerial meetings. Every four years, observers should reconfirm their continued interest in observer status. The ad hoc observer status is no longer granted, except to the present applicants for observer status until the ministers have decided upon their application.

Observer status in the Arctic Council is open to non-Arctic States (currently: France, Germany, The Netherlands, Poland, Spain and the UK), and other organizations, such as NGOs (Arctic Council 2011). Today the Arctic Council has twenty-six permanent observers and it has received ten new applications for observer status. Applicants include the European Union, Italy, China, South Korea, Japan and Singapore. A decision on observer applications will be taken at the ministerial meeting in 2013 (Arctic Council 2012; HUEBERT 2012; HOLTHE 2012; LEAHY 2012; Nunatsiaq News 2012; SAO 2011, p. 4).

Traditionally, Russia and Canada have been opposed to the admittance of new permanent observers (KEIL 2011). Possibly in order to find some support in the Arctic region, China is building strong ties with Denmark, Iceland and Sweden now. The Premier of China paid state visits to the latter two in April 2012, and to Denmark in June 2012 (SIPRI 2012).

The Nuuk meeting of the Arctic Council in 2011 tried to solve the question of whom to accept as formal observers and what role such observers should play, while maintaining the key role of the Arctic States and permanent participants. It was stated that participation by observers is valuable because of their provision of scientific and other expertise, information and financial resources. So, in the determination by the Arctic Council of the suitability of an application for observer status, the Council will take into account the extent to which observers, *inter alia*:

— Recognize Arctic States' sovereignty, sovereign rights and jurisdiction in the Arctic;
— Have demonstrated their Arctic interests and expertise relevant to the work of the Arctic Council;

— Have demonstrated a political willingness and financial ability to contribute to the work of the permanent participants and other Arctic indigenous peoples (SAO 2011).

The first requirement might be a problem for the position of China, because it considers the Arctic as global commons that must be accessible to all interested in the Arctic. The second requirement should be no problem for China, because of their scientific research programme. Finally, the investment requirement provides opportunities for China, although financial contributions from observers to any given project may not exceed financing from Arctic States, unless otherwise decided by the Arctic officials.

The Way forward

Within the framework of the Arctic Council's Arctic Marine Shipping Assessment (AMSA) about one hundred and twenty factors and forces were identified that could shape the future of Arctic navigation by 2050. The list of critical factors included, *inter alia*: world trade patterns; climate change severity; global oil prices; the emergence of China, Japan and Korea as Arctic maritime nations; transit fees; legal stability of marine use in the Arctic Ocean; and the safety of other global maritime trade routes (Arctic Council 2009, p. 93).

In the end, developing the economic potential of the marine Arctic in a peaceful and sustainable manner will require cooperation between States. Not only on a regional level, but also on a global level for sectoral issues such as shipping safety and vessel source pollution within the IMO framework. And, the bilateral level is still a very important one for resolving various issues related to navigation, such as maritime boundary agreements and foreign access to (claimed) national waters. The position of the Arctic indigenous people is secured, being permanent participants in the Arctic Council. However, the involvement or non-(equal) involvement of other stakeholders, such as Arctic subnational governments, non-State actors (NGOs, industry), international organizations (European Union) and non-Arctic States (varying from the Netherlands to China) may give rise to some tensions in the future. It might be wondered if all stakeholders should have access to the high-level forum where coordination and decision-making take place, or that cooperation on certain (practical) issues would be sufficient. It will be challenging enough to reach consensus among the permanent participants of the Arctic Council, and possibly also between the five Arctic coastal States (Canada,

Russia, United States, Denmark, Norway) and the three Arctic States not bordering the Arctic Ocean (Sweden, Finland, Iceland). The so-called 'Arctic Five' or 'A5' has already had several closed meetings. Finally, new forums and (voluntary or legally binding) instruments related to navigation in the Arctic might be developed in the future, which could provide an extra incentive as well as an alternative way for stakeholders to stay or get involved in this strategically important issue.

REFERENCES

Arctic Council 2009. Arctic Marine Shipping Assessment 2009 Report, second printing.

Arctic Council 2011. Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic, adopted 12 May 2011 in the 7th Ministerial Meeting of the Arctic Council in Nuuk, Greenland.

Arctic Council 2011. Observers, 27 April 2011, available at http://www.arctic-council.org/index.php/en/about-us/partners-links (last access 5 June 2012).

Arctic Council 2012. Recommendation of the Arctic Council Deputy Foreign Ministers, 14 May 2012.

BENNETT, M. 2012. Canada's ice-capable Arctic patrol ships delayed 3 more years. — *Alaska Dispatch*, **20**.

BRUBAKER, R. D. 2000. Regulation of navigation and vessel-source pollution in the Northern Sea Route: Article 234 and state practice. — *In*: VIDAS, D. (Ed.), Protecting the polar marine environment. Cambridge, Cambridge University Press, pp. 221-236.

CIC 2011. Interests and Roles of Non-Arctic States in the Arctic (Seminar presented by the National Capital Branch of the Canadian International Council and the Munk-Gordon Arctic Security Program, Ottawa, October 5, 2011). Report, p. 4.

CURTIS WRIGHT, D. 2011. The Dragon Eyes the Top of the World. Arctic Policy Debate and Discussion in China. – Center for Naval Warfare Studies. — Newport (Rhode Island), Naval War College Press, China Maritime Study, No. 8, p. 15.

DNV 2010. Shipping across the Arctic Ocean. A feasible option in 2030-2050 as a result of global warming? — Position Paper 04-2010 of Det Norske Veritas, p. 6.

European Union 2010. Legal aspects of Arctic shipping. Summary Report. Legal and socio-economic studies in the field of the Integrated Maritime Policy for the European Union, pp. 7-13.

GERHARDT, H., STEINBERG, P. E., TASCH, J., FABIANO, S. J. & SHIELDS, R. 2010. Contested Sovereignty in a Changing Arctic. — *Annals of the Association of American Geographers*, **100** (4): 995.

Global Times 2011 (2 August). Arctic nations should warm to other powers.

GRACZYK, P. 2012. The Arctic Council inclusive of non-Arctic perspectives: Seeking a new balance (originally presented at the conference 'The Arctic Council: Its place in the future of Arctic governance', 17-18 January 2012).

HEADLAND, R. K. 2010. Ten decades of transits of the Northwest Passage. — *Polar Geography*, **33**: 1-13.

HOLTHE, T. 2012. Adresssing challenges with integrated policy. — *Korea Times* (4 June).

HUEBERT, R. 2012. North is North and East is East and never two shall meet? Paper for the Institute of the North, p. 2.

HUEBERT, R., EXNER-PIROT, H., LAJEUNESSE, A. & GULLEDGE, J. 2012. Climate Change & International Security: The Arctic as a Bellwether. — Arlington (Virginia), Center for Climate and Energy Solutions, pp. 17-18; 27-28.

IMO 2012a. Polar Shipping Safety, available at http://www.imo.org/ourwork/safety/safetytopics/pages/polarshippingsafety.aspx (last access 27 April 2012) & IMO 2010. Guidelines for Ships Operating in Polar Waters, 2010 Ed., pp. 1-15.

IMO 2012b. Implications of the United Nations Convention on the Law of the Sea for the International Maritime Organisation, Study by the IMO Secretariat. LEG/MISC.7 (19 January), p. 24.

JAKOBSEN, L. 2010. China prepares for an ice-free Arctic. — SIPRI Insights on Peace and Security, No. 2010/2, pp. 1-16.

KAO, S. M., PEARRE, N. S. & FIRESTONE, J. 2012. Adoption of the Arctic Search and Rescue Agreement: A Shift of the Arctic Regime toward a Hard Law Basis? — *Marine Policy*, **36**: 832.

KEIL, K. 2011. A potential Arctic conflict. II: Insiders vs. outsiders. — The Arctic Institute – Center for Circumpolar Security Studies (25 October).

Kingdom of Sweden 2012, Arctic Council Fact Sheet. Arctic Council Swedish Chairmanship 2011-2013. Brochure (16 January).

KITAGAWA, H. 2001. Technological Aspects of NSR Navigation. — Tokyo, Ship and Ocean Foundation, The Northern Sea Route. The shortest sea route linking East Asia and Europe, pp. 86-89.

KRASKA, J. 2007. The Law of the Sea Convention and the Northwest Passage. — *The International Journal of Marine and Coastal Law*, **22** (2): 259-266; 268-277.

LEAHY, S. 2012. Melting ice makes Arctic access a hot commodity. — IPS Inter Press Service (16 January).

LIU, M. & KRONBAK, J. 2010. The potential economic viability of using the Northern Sea Route (NSR) as an alternative route between Asia and Europe. — *Journal of Transport Geography*, **18**: 436-440.

MAKKI, M. 2012. China's quest for Arctic access and resources. — *Journal of Energy Security*, **19**.

MENSAH, T. A. 2000. Preface. — *In*: ROTHWELL, D. R. & BATEMAN, S. (Eds.), Navigational Rights and Freedoms and the New Law of the Sea. The Hague, Kluwer Law International, pp. 7, 13.

MOE, A. & JENSEN, O. 2010. Opening of new Arctic shipping routes. European Parliament. Directorate-General for External Policies. Policy Department. Standard Briefing carried out within framework agreement EXPO/B/AFET/FWC/2009-01/Lot 2/03, pp. 4-15.

MOLENAAR, E. J. 2009. Arctic Marine Shipping: Overview of the International Legal Framework, Gaps, and Options. — *Journal of Transnational Law & Policy*, **18** (2): 304.

MURTHY, R. 2012. China, India enter heating-up Arctic race. — *Asia Times Online* (25 January).

NILSEN, T. 2010. Russia drafts law on Northern Sea Route. — BarentsObserver.com (8 December).

Nunatsiaq News 2012 (23 August). PM Harper: Nunavut MP Aglukkaq will chair the Arctic Council (Canada assumes council chairmanship in May 2013).

Ocean Futures 2010. Shipping in Arctic Waters, available at http://www.ocean-futures.com/About%20Shipping%20in%20Arctic%20Waters.pdf (last access 8 October 2012).

PERRY, C. M. & ANDERSEN, B. 2012. New Strategic Dynamics in the Arctic Region. Implications for National Security and International Collaboration. — Washington, DC, The Institute for Foreign Policy Analysis, pp. 6-12; 155-165.

PHARAND, D. 2007. The Arctic waters and the Northwest passage: a final revisit. — *Ocean Development & International Law*, **38** (1-2): 13.

ROGOFF, A. 2010. Melting Arctic: Think of the Bering Strait as the next Panama Canal. — *Alaska Dispatch* (28 February).

ROTHWELL, D. R. 2012. International Straits and Trans-Arctic Navigation. — *Ocean Development & International Law*, **43** (3): 272.

SAO 2011. Senior Arctic Officials (SAO) Report to Ministers. — Nuuk (Greenland), pp. 3; 50-51.

SDWG (Sustainable Development Working Group) 2012. Senior Arctic Officials SDWG projects (powerpoint presentation on AMATII, Stockholm, 28-29 March 2012).

SIPRI (Stockholm International Peace Research Institute) 2012. China now calls itself a 'near-Arctic state' (10 May).

SPEARS, J. 2011. A snow dragon in the Arctic 2011. — *Asia Times Online*, 8 February (originally published by The Jamestown Foundation).

STAALESEN, A. 2010. China's new foothold on Northern Sea Route. — Barents-observer.com (26 November).

UNCLOS (United Nations Convention on the Law of the Sea) 1982. Article 7 (1).

United Nations 2012. World Oceans Day, available at http://www.un.org/Depts/los/reference_files/worldoceansday.htm (last access 8 October 2012).

University of the Arctic 2012. SAO meeting highlights – Specific implications to SDWG (5 April 2012).

VAN NIEUWSTADT, M. 2007. Rusland: Noordpoolgebied is van ons. — *NRC* (2 August).

YANG, H. 2006. Jurisdiction of the Coastal State over Foreign Merchant Ships in Internal Waters and the Territorial Sea. — Berlin/Heidelberg, Springer, p. 172.

development of technologies, but also to the ideologies and social experiences that lay behind them.

One such experience is the dominant view of travelling as a displacement between two places, a view that has been fostered by commerce and the more recent type of tourist transportation by air. The progress and the ongoing adaptation of the traveller to changing conditions became overshadowed by the notion of goods and people being transported between a point of departure and one of destination, with little interest in the process itself. Long-distance travel that would not fit with our view of ourselves as the spearhead of cosmopolitism has been dismissed until not so long ago. On the one hand, new ideas, such as the representation of the world as globalized, with potentially huge markets opening in the wake of the rise of new economic powers based on opportunities such as low-cost labour, projected our imagination onto the past — justifying the move towards, for example, China and India by recalling their ancient civilization — but also to the future of an absolute connectedness. While, on the other hand, connectivity is very much idealized under the cybersky and its incumbent satellites, the materiality of the connecting process seems to have fallen into oblivion. Some unexpected reminders help us come to terms with links that existed long ago in the past, links that were based on other techniques and produced different experiences of space.

In April 2012, tuna fish known to have come from Japan tested radioactive in California. The fish were declared edible in spite of their contamination by the leaks of radioactive materials at the Fukushima plant, more than a year before. A BBC commentator rightly remarked that these radioactive traces reminded us of long travels we tend to forget about as we mainly adopt a ground-based, possibly pedestrian, approach. A more fluid, less clumsy view of human endeavours on waters has been promoted over the recent decades. Numerous books have been published on the "first" great travellers and new research has been launched on the peopling of continents and oceanic travels. While, in the past, the question was mainly as to whom first, among Europeans, arrived on the American continent, this question has recently shifted towards the peopling of the American continent and the origin of native Americans. New hypotheses currently point to a peopling of the Americas, combining land and sea travel as early as between twenty-four thousand and fourteen thousand years ago, with coastal paddling an important way of travelling. Ocean sailing was tested earlier on, on the Pacific Ocean, by the Norwegian physician Thor Eyerdahl [2] who, in 1947, demonstrated that it was possible for a primitive raft, which he named *Kon-Tiki* after the Inca Sun god, to sail the Pacific with relative ease and safety, especially to the west (with the wind), in this case from Peru to Polynesia. More than twenty years

later, Eyerdahl tried a similar journey from Egypt to Barbados, in an attempt to demonstrate the possibility of ancient, oceanic connections between the old and the new world. The supernatural claims of Eyerdahl eventually, and unfortunately, discredited his whole enterprise. Early contacts between what is now Indonesia and Africa have long been subject to supposition, then, briefly, to a seminar at the School of Oriental and African Studies (SOAS) (London, prof. Roland Oliver and John Fage, 1959-60), to be academically abandoned as a subject for study, due to the difficulty in proving any fact beyond the presence of Indonesian elements in the culture of Africa and Madagascar, and to the urgency to write the history of Africa. As funding went to area studies, Robert Dick-Read made of his transcontinental, self-funded, research a lifetime hobby and recently achieved recognition from academics for his work on contacts between Indonesia and Rome at the turn of our era, as well as between Indonesia and Africa. The subject is extremely complex, based on archaeological and linguistic evidence as much as on the study of ancient texts and numerous studies on specific areas. In this respect, the book entitled "The Phantom Voyagers" is a convincing compilation raising plausible hypotheses, but also an invitation to reconsider scattered sources and enlarge our vision of the human enterprise and produce knowledge that will put European travelling into perspective. Travelling was certainly more common in the ancient past than is currently assumed, and was very much part of everyday life in the Greco-Roman antiquity, even if it is best remembered today when it was part of military endeavours. The famous "Thalassa! Thalassa!" shouted by the six thousand surviving mercenaries coming back through barbarian lands under the leadership of Xenophon (394 BC), as they rejoiced at the end of a long march over land, has been brought over to us through centuries. The Black Sea (also named "Euxin Bridge") then embodied the end of a painful journey, step by step through stony landscapes, and possibly a smooth crossing over to Greece. For centuries, lakes, seas and oceans have been connecting surfaces, appealing to the imagination as well as to curiosity and discovery. Pliny and Herodotus documented more mercantile travels and hinted at products that testify to contacts with Indonesia.

Travels of less antiquity, however, are even better documented and illustrious accounts have resurfaced recently among the general public, with new attention given to ancient travellers, such as Marco Polo (13th century) or Ibn Battuta (14 th century) [3]. Both combined travel by land and by sea, covering vast distances over very long periods of time. What is most striking, is perhaps their willingness to travel, with respectively trade and Islamic law providing them with a culture common to all people they were dealing with. Cultural elements that would differentiate them from their transient places would for

the time of their travel be put aside or adjusted to the needs of their survival and of their pursuit. This attitude, centred as it is on travel as such, was certainly common to all long-distance travellers, but developed to the extreme on vessels cut off from the world for long periods of time and, frequently manned by mariners who had only that journey in common and communicated among themselves in spite of their different languages thanks to a shared sailing culture that would dissolve and recompose with each new shipment.

To explorers such as the Polo or Ibn Battuta, wealth and celebrity were, to an extent, a side effect of the enterprise that mattered most to them: exploration and knowledge. Progress and movement were opportunities to gather the means to pursue their travel further on, but as opportunities to gather information, they were at least as important as the places where they stopped, as the travellers were constantly negotiating their way with their fellow humans as much as with the natural elements. In their accounts, however, locations take a pride of place as they not only offered the most interesting subjects to portray back home, but also provided the travellers with the necessary assets to their own travels. The reading of their accounts contrasts the slow pace on land, with encounters made in the relatively openness of a caravan, and the small world that is a crew faring at sea at a tempo that was usually faster. The thorough calculations by French historian Fernand Braudel confirmed that, though highly variable, the time for news and goods to spread was much shorter by sea than by land and that this has been so for centuries. Travelling by sea, on several occasions, appeared to travellers as swifter, with land an area of many human hazards and temptations. In some respects, however, the mental representation of travel at a time when vast spaces separated cities and villages from one another might not have been very different from the representation of navigation, especially along the coasts. Long-distance faring had a rhythm of its own, and relied on specific knowledge that often corresponded to cultural choice, as MACK 2011 illustrated in the case of dhow navigation on the Indian Ocean.

Quite different from the experience of travels motivated by exploration and long-term trade [4] was the quest for land, treasures, and people to convert which was launched in the 15th century, with Christopher Columbus currently shunned as a paragon of colonial ambitions. The Atlantic and its infamous triangular trade have made Columbus less popular among the general public than the two individual voyagers of the 13th century, emblematic, one could say, of the spirit of free enterprise, of adventure and discovery for the sake of it. Interest for the Atlantic has also become outdated, lacking at the same time in novelty and antiquity when it goes about supporting trade contacts with rising economies in the East that nowadays draw our attention.

It is then the Indian Ocean that takes pride of place, with the Mediterranean Sea joining in the production of the image of a pre-globalized world as effectively as, for centuries, it connected the Far East with Europe, in spite of the Suez isthmus. "The History of the Mediterranean Sea under Philip the Second (XVIth C.)" by Fernand Braudel is certainly the most consistent and best-known work on seaborne trade. He very much aimed at demonstrating what has been called "the long term of history", but also, in spite of banditry, wars and cultural differences, the "commonality of destiny" of Mediterranean people. In spite of its Eurocentric fragrance and the production of an image of a Mediterranean world somehow closed upon itself, the theoretical model emerging from Braudel's study, with its emphasis on large-scale socioeconomic factors in the making and writing of history, appeals to our present-day preoccupations with an integrated world. Politicians may wish to highlight the similarities more than the differences along the shores of the Mediterranean, a sea that Braudel did not present as a peaceful cultural pool, without, however, presenting it as a constant battlefield as did the amateur historian, John Norwich [5].

The idea of an integrated inland sea that privileged contacts for millennia, has subsequently been applied to the Indian Ocean where, amazingly enough, currents and monsoons circumscribe navigation in a way not dissimilar to the coastline of the Mediterranean.

Once the coasts have been reached, travel on land connects with more remote areas, inland. Along these shores, since the spread of Islam, a common culture favouring navigation and trade has developed, creating cosmopolitan societies in East Africa, Arabia and India [6]. Early cosmopolitism appeals to current imagination, and quitting Eurocentric approaches is certainly very much the order of the day. The book by the Zanzibari scholar, Abdul SHERIFF (2010), endeavours to apply the Braudelian *longue durée* to this coastal cosmopolitanism. Its title, "Dhow Cultures of the Indian Ocean", relates the book to contemporary representations of connectivity and cultural cosmopolitanism with an obvious accent on the Ummah, the community of Islam (SHERIFF 2010).

The title refers, more generally, to a culture of navigation. As far as the dhows are concerned, this culture, and the self-reliance of the mariners who were part of it, has been strong enough to support a continuation of trade along the old routes and following the old practices until very recently, as another author, Eric Gilbert, has shown [7]. Until the introduction of steamers, the old culture of navigation persisted in the margins. Its history, not restricted to that of the dhows, drew the attention of archaeologists, historians and social anthropologists as much as that of a more general public interested in the history of people and everyday life.

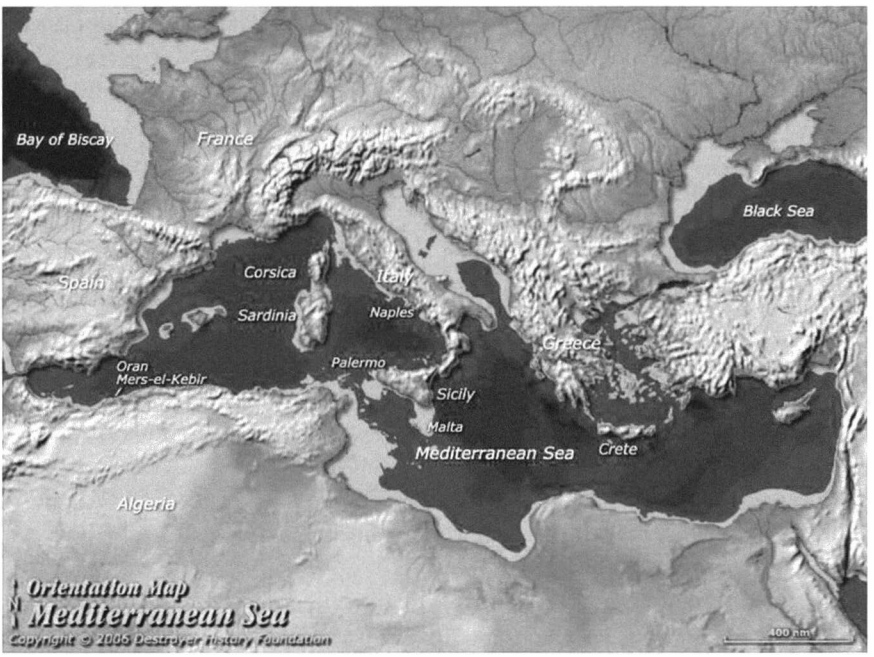


Fig. 1. — The routes on the Western Indian Ocean in the 11th century (map 8.1., SHERIFF 2010).

John Mack, professor of cultural history and curator of African art at the British Museum, in his book "The Sea. A cultural history" opened new paths to our apprehension of the sea. The originality of his work resides in a perspective centred on the sea as an experience of a particular element at different times in history. I shall not try to sum up the history and fictions of travels John Mack recalled in his book. In an anthropological vein stressing the variety of embodied experiences, he suggested we apprehend the sea from a marine perspective quite different from the terrestrial standpoint of Braudel, while also stressing the universal links between sea and land and their cultural elaborations. What kind of experience was "being at sea" premodern era? Navigation techniques always influenced the experience of navigation and its mental representation, but innovations were not adopted by all at the same time, depending on their perception and their local comparative advantages. Different practices on different seas were related to the use of different instruments, and a choice to use them or not. The compass, for example, was not adopted by all in premodern times. It is not possible to do justice to this book in a few sentences. Its author, however, has made his

motivation plain, namely to help understand the cultural process of globalization through the study of the sea as a connecting space and as a creator of specific cultures. It becomes interesting to recall aspects of the book that pertain to current studies of cultural globalization and hybrid cultures. While coastal cosmopolitanism can be seen at once as a first, difficult to date back in time, hybrid culture resulting from trading contacts, other aspects underlined by John Mack appeal much more to current researchers in social sciences. Among these, there is the flexibility of cultures, with circumstances appealing to related sets of behaviours. There are sociocultural practices at sea, others on land, with people switching codes according to circumstances. Between land and sea, there are liminal spaces, such as ports and beaches where two worlds briefly meet before returning to their respective codes and manners. Today's interest of anthropologists for borderlands finds an echo in descriptions of transit areas between sea and land, with people the bearers of various systems of norms that are highly adaptable. At sea, however, coordination is paramount and hierarchy is the rule in an almost exclusively masculine world. This coordination is, in itself, linked to the professionalism of mariners who, as a rule, do not know each other before sailing, and will not be partners in the same crew again. Observation and the use of a minimal common language often aided by musical tempo make it possible for "motley crews" to navigate and then, disperse again. These images of temporary and purposeful connections between very diverse people cannot but appeal to contemporary imaginations in the representation of our globalized world. They also appeal to present-day historians eager to include all actors in their representation of the past. A book by Rediker and Linebaugh, "The Many-Headed Hydra: Sailors, Slaves, Commoners, and the Hidden History of the Revolutionary Atlantic", describes the often forced collaboration against the natural elements as cementing resistance, as Shakespeare had pointed out much earlier in "The Tempest". Oceans, connected with each other as they now are, also appeal to our idea of a globalized world within the scope of the more political imagery of free trade, with the circumstantial nationality of vessels detached from the constraining representation of nation-states. In a way, navigation materializes free trade in the global representation, and the sea takes the status of an agent in the building of human connections.

The perception of a boundless sea that mariners of the past may have experienced in the absence of an overhead view is not without analogy with our perception of cyberspace: navigating is about the experience of movement. Similarly, the internauts surf without any perception of the whole cyberspace, and they connect to fluid locations. The ideology of a global village and of a boundless connectivity can feed itself as well on the sensory

experience of a boundless sea with islets of companionship, as on the mythical 3 Ws. There is, indeed, an ocean of experiences yet to further explore. Learning from past, partly forgotten experiences of space and connectedness may project us towards a better understanding of aspects of our societies, of their relation to diversity, and their new experience of space. The study of navigation in the past and in the present is rich with illustration of the coexistence of technologies with culturally bound choices and constraints.

NOTES

[1] See DICK-READ 2005.
[2] The book relating the expedition was immensely popular, and was translated in sixty-seven languages.
[3] See DUNN 2005.
[4] The travel of the Venitian M. Polo, together with his father and his uncle, lasted twenty-four years (1271-1295), with a homeward journey by sea, via Sumatra and India.
[5] See NORWICH 2006.
[6] See, for example, the case of the well-integrated Western Indian Ocean described by NICOLINI (2004).
[7] GILBERT 2004.

REFERENCES

BRAUDEL, F. 1949. La Méditerranée et le monde méditerranéen à l'époque de Philippe II. 2. Destins collectifs et mouvements d'ensemble. — Paris, A. Colin.

DICK-READ, R. 2005. The Phantom Voyagers. Evidence of Indonesian Settlement in Africa in Ancient Times. — Winchester, Thurlton Publishing, 251 pp.

DUNN, R. E. 2005.The Adventures of Ibn Battuta. A Muslim Traveler of the 14th Century. — Berkeley/Los Angeles/ London, University of California Press, XX + 359 pp. (rev. ed. with new preface).

EYERDAHL, T. 1980. Early Man and the Ocean. A Search for the Beginnings of Navigation and Seaborne Civilizations. — London, Vintage Books.

GILBERT, E. 2004. Dhows and the Colonial Economy of Zanzibar, 1860-1970. — Oxford, James Currey, XIII + 176 pp.

MACK, J. 2011. The Sea: A Cultural History. — London, Reaktion Books, 272 pp.

NICOLINI, B. 2004. Makran, Oman and Zanzibar. Three-Terminal Cultural Corridor in the Western Indian Ocean (1799-1856). — Leiden/Boston, Brill, 179 pp.

NORWICH, J. J. 2006. The Middle Sea: A History of the Mediterranean. — New York, Doubleday.

REDIKER, M. & LINEBAUGH, P. 2001. The Many-Headed Hydra: Sailors, Slaves, Commoners, and the Hidden History of the Revolutionary Atlantic. — Boston, Beacon Press.

SHERIFF, A. 2010. Dhow Cultures of the Indian Ocean: Cosmopolitanism, Commerce and Islam. — New York, Columbia University Press.

International Colloquium
Interoceanic Canals and World Seaborne Trade: Past, Present and Future
Royal Academy for Overseas Sciences
Port of Antwerp
World Association for Waterborne Transport Infrastructure
Brussels, 7-9 June 2012
pp. 69-80

"Shiver Me Timbers!" No Cedar Ships in the Medieval Mediterranean?

by

Sara A. RICH*

KEYWORDS. — Byzantine-Arab Wars; *Cedrus libani*; Levant; Mediterranean Sea; Shipbuilding.

SUMMARY. — This paper explores the mysterious disappearance of cedar ships in the medieval Mediterranean. In the ancient eastern Mediterranean, the Cedar of Lebanon (*Cedrus* Trew) provided shipwrights' wood of choice because of its unique physical properties. It was used in such diverse maritime roles as Egyptian funerary vessels, Phoenician merchantmen, and Roman warships. However, after centuries of naval peace, the Byzantine-Arab wars erupted across the eastern Mediterranean and the cedar forests should have served at the front line, as they had in ancient times. Instead, there is no evidence, neither historical nor archaeological, that the ship-timber *par excellence* was used for maritime pursuits at all during the medieval period. This paper addresses the interrelated economic, philosophical, and technical changes that made cedar ships obsolete in the Middle Ages, and the woods and resins that comprised the new merchant and military fleets.

*
* *

This paper stems from a question that arose during the research for the sixth chapter of my book, *Cedar Forests, Cedar Ships: Allure, Lore & Metaphor in the Mediterranean Near East* (RICH, forthcoming 2016). In the process of investigating the cedar tree's place in the Middle Ages, I stumbled upon the mysterious disappearance of cedar ships in the medieval Mediterranean. This struck me as highly peculiar because in the eastern Mediterranean, the famous Cedar of Lebanon (*Cedrus* Trew) had long since provided the shipwrights' wood of choice (among many other uses in carpentry and construction).

* Near Eastern Studies Department, Katholieke Universiteit Leuven, Blijde Inkomstraat 21, BP 07.15, B-3000 Leuven (Belgium).

The oldest historical account is that of Gilgamesh's rafts of cedar that brought him back down the Euphrates from the Sacred Cedar Forest in the Amanus Mountains. Shortly afterward, ancient Egyptian funerary and commercial seagoing vessels were being built from cedar wood. Pharaohs such as Khufu (*ca.* 2500 BC) and Senwosret III (*ca.* 1850 BC) were buried with full-scale cedar ships to transport them through the sky, just as the sun god Amun-Ra traversed the heavens in a watercraft made of cedar. The Phoenicians, or Canaanites, notoriously masterminded Mediterranean commerce in merchantmen primarily made of cedar, as archaeology has demonstrated with the excavations of the shipwrecks at Uluburun (a large, high-status ship, *ca.* 1330 BC) and Cape Gelidonya (a smaller, more quotidian vessel, *ca.* 1200 BC). The trend continued from the Bronze Age even into the Roman period, as evidenced by the Athlit Ram (*ca.* 200 BC) discovered off the coast of Israel — this is the name for the iron ram of a Roman trireme which was found still attached to the ship's cedar stern (MEIGGS 1982, THIRGOOD 1981, MIKESELL 1969 & BROWN 1969 for these and many other examples, and RIVAL 1991, pp. 34-36, for cedar's properties and usage in the Roman navy).

From Mesopotamia to Rome, bloody battles were fought to secure cedar forests in the Levant, Cyprus, and southern Anatolia. To cite one notorious example, Marc Antony's greatest gift of love to Cleopatra was a cedar forest in Pamphylian Anatolia north of modern Alanya in Turkey — he gave her the forest not for a romantic trysting spot, but so that the Egyptian navy would have sufficient cedar ship-timbers to combat Octavian in the fated naval battle at Actium (Strabo, *Geography*, 14.5.3). Within just a couple of centuries, however, the role of ship-timber would be completely changed, and traditional shipbuilding techniques permanently lost (PURCELL 1969, p. 111; UNGER 1980, p. 24).

True cedars grow in the mountains of five different regions: the Hindu Kush and western Himalayas (Pakistan and Afghanistan: *C. deodara* (Roxb.) G. Don) [1]*, the northwest African Rif and Atlas Mountains (Morocco, Tunisia and Algeria: *C. atlantica* (Endl.) Manetti) [2], and finally in the eastern Mediterranean: southern Anatolia, the northern Levant, and Cyprus. For this study, we are focusing only on the areas in the eastern Mediterranean: the western Taurus and Amanus in modern Turkey, the Ansariyah in coastal Syria, Mount Lebanon in Lebanon (*C. libani* A. Rich), and the Troodos in western Cyprus (*C. brevifolia* A. Henry) (fig. 1).

* Numbers in brackets [ ] refer to the notes, pp. 77-78.

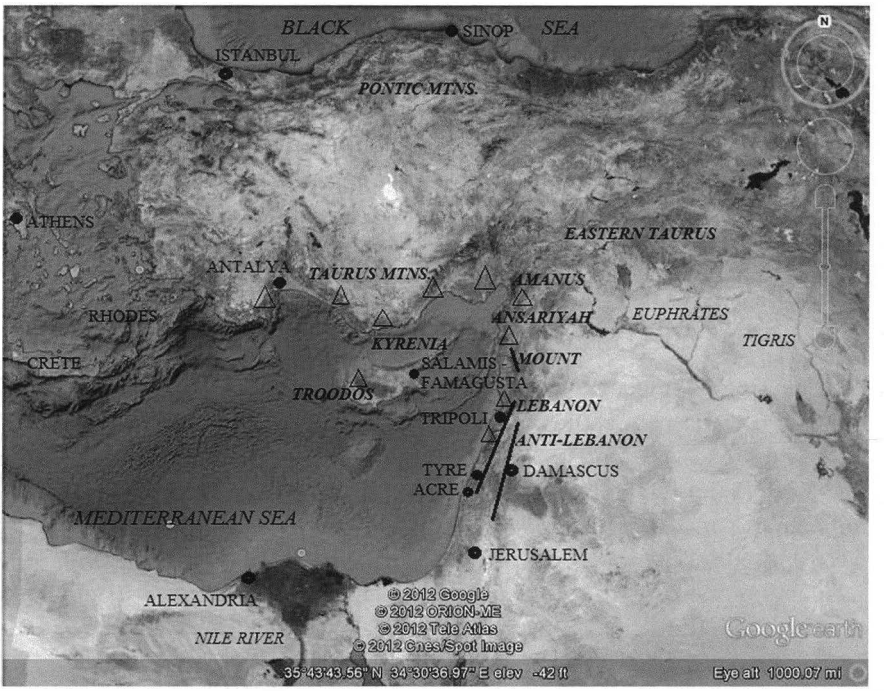


Fig. 1. — Map of eastern Mediterranean and Middle East during the medieval period with relevant place names and geographical features labelled. The triangles represent areas home to cedar forests.

Cedar wood was the preferred ship-timber most desired by ancient shipwrights for four main reasons: 1) it naturally repels wood-boring teredo worms and other ravenous parasites; 2) its resinous sap doubles as a sealant against water and rot; 3) the alternating levels of compression and softwood make for a medium that is strong, flexible, and easily workable; 4) forest trees tend to grow very tall (40 m) and vertical with long horizontal branches, thereby producing near-perfect planks, keels, and masts (fig. 2).

These practical attributes made cedar the most coveted wood for ship timbers in the ancient world (MEIGGS 1982). Naturally, other woods such as acacia (*Acacia nilotica* (L.) Willd.), terebinth (*Pistacia palaestina* Boiss.), oak (*Quercus* sp.), pine (*Pinus* L.), fir (*Abies cilicica* Ant. & Kotschy Carriére), juniper (*Juniperus* sp.) and cypress (*Cupressus* L.) were also used in shipbuilding, but cedar was by far the most valued timber for seagoing vessels in the eastern Mediterranean. The Classical Greek philosopher Theophrastus (*Enquiry into Plants*, IV, 5.5) wrote:

> Again it is only a narrow extent of country which produces wood fit for shipbuilding at all, namely in Europe the Macedonian region, and certain parts of Thrace and Italy; in Asia Cilicia, Sinope and Amisus, and also the Mysian Olympus, and Mount Ida [Crete]; but in these parts it is not abundant. But Syria has Syrian cedar, and they use this for their galleys [3].

Then, some time after Emperor Hadrian (138 AD), who declared forest conifers on Mount Lebanon as imperial property for the Roman navy (BROWN 1969, pp. 153-154; MEIGGS 1982, p. 86; THIRGOOD 1981, p. 99; MIKESELL 1969, pp. 19-20; ABDUL-NOUR 2001; ABDUL-NOUR *et al.* 2009), cedars seem to have disappeared from the maritime historical and archaeological records altogether.

Beginning with Octavian's *Pax Romana* there were nearly seven hundred years of friendly mercantile waters; so, after the Battle of Actium in 31 BC, the naval scene was more or less dead calm until 652 AD when the Byzantine-Arab wars erupted across the eastern Mediterranean. Because of their millennia of maritime experience, Syro-Palestinian sailors and shipwrights were drafted for the new Arab navy, while the Byzantines relied upon Greek seamen. For the Arab navy, Levantine and Cypriot cedar forests should have served at the front line, as they had in ancient times. Instead, there is no

Fig. 2. — Example of a cedar (*Cedrus brevifolia* Hook. f.) in the Troodos' Cedar Valley (Pafos Forest, Cyprus) demonstrating the species' capacity for producing long, straight timber ideal for shipbuilding (photo: S. Rich, 2009).

evidence, neither historical nor archaeological, that the ship-timber *par excellence* was used for maritime pursuits in the medieval period at all. The question is: why not? How could the cedars — as entire forests, as individual trees, or as the commodious timber inextricably bound to ancient history — have become all but excluded from medieval maritime history?

There are three main reasons as to why I think cedars ceased being used for shipbuilding:

— A downfall in wartime economy signified a decrease in the quality of ships, and at the same time, an increase in quantity;
— As a result of the shifting economy, the philosophy of seafaring changed, as did the philosophy of shipbuilding;
— Technological advancements were developed to compensate for the altered attitudes toward ships and shipbuilding.

All seven hundred years of relative peace in east Mediterranean waters changed almost overnight. Between 635-640 AD, a wave of Arabs and their new religion of Islam swarmed onto the Levantine coast, taking the cities one by one with nary a battle. But unlike the citizens and local rulers, the grand Byzantine military would not surrender the long coastal strip without a fight, and both fists were raised for over five centuries during the Byzantine-Arab Wars (7th-12th centuries).

With good reason, the famous naval commander Mu'awiyah transformed some of the old Phoenician port cities into Arab naval bases. In 649, the first Islamic fleet was built at Acre, which was complete with dilapidated Byzantine shipyards that just needed some restoration to function again. Although the Arabs had little to no experience with open water marine ventures, they had direct access to those who did. Ships were built by Levantine shipwrights, manned by Levantine sailors, and carved with wood from the forests behind Acre (Hitti 1957, pp. 241-242). For around two hundred and fifty years after these initial battles, semi-permanent naval war, bordering on sanctioned piracy, was rife between Muslim and Christian forces. The watery battlefields of the east Mediterranean created a hostile environment for sailors of all varieties, and maintaining systematic trade routes to the west was rendered almost impossible.

Therefore, the economy declined even further, while ships continued being built in ever-increasing numbers (Ashtor 1976, pp. 103-104; Unger 1980, p. 41). During this period of alacritous shipbuilding, Arab historians made no records of shipwrights having used cedar wood specifically — only the forests behind Acre, or the forests behind Tyre are mentioned, and neither of these areas has ever been home to great numbers of cedars, if any at all. That

being said, the lack of conveniently located cedar forests certainly never stopped the ambitious shipbuilders of Mesopotamia, Egypt or Rome! At any rate, the Arab commander Abdulla ibn Saad took that fleet from Acre and drove the Byzantine forces out of Cyprus, where the Arab navy would now have had access to cedar forests on the Troodos mountains as well as those on Mount Lebanon. At the same time, the Byzantine navy had access to the cedar forests of the Taurus and Amanus Mountains — so again, why were they not used?

On the other hand, why would either party exert such great effort to build ships from cedar wood, if most were morbidly destined for the bottom of the sea? Piratical attacks and shipwreck were so common that merchants systematically split their merchandise between several smaller ships, mixing the luxury items with the mundane, so that losses would be minimized in the likely event of disaster (JACOBY 2009, p. 382; ROSE 1999, p. 568; UNGER 1980, pp. 40-42). Seafarers during this period were not the intrepid heroes of modern — or Homeric — imagination, and even naval commanders were often slaves, prisoners, or other members of the lowest ranks in society (ROSE 1999, p. 569; UNGER 1980, p. 36). Consequently, this existential perspective on the philosophy of seafaring also exerted itself on the philosophy of shipbuilding.

Indeed, while the quantity of ships being built drastically increased, the quality dramatically decreased. Cedar forests were located at the extreme upper heights of the mountains, however, neighbouring and fast-growing pines and cypresses were easily accessible all along the lower slopes of the Lebanon range and — importantly — the hills to the south. If navy and merchant vessels were construed as even remotely expendable, pine and cypress ships would have offered an adequate compromise between the grandeur of ancient history and the star-crossed Middle Ages. Although cypress tends to splinter, it was the second choice for ship-timber after cedar. Pine, however, is dangerously prone to rot, which means that medieval shipbuilders were constructing ships that, assuming they survived the maiden voyage (only an estimated 70 % of ships did), would have to be patched upon returning to port. Shipowners were investing more in repairs than in the initial construction because the ship mortality rate was so high (UNGER 1980, pp. 41, 110).

Furthermore, although pine, oak and cypress do not share all the same characteristics of cedar, technological changes made in 6th and 7th century Palestine negated the absolute necessity of cedar's unique properties in marine pursuits. For one, early medieval Palestinian shipwrights replaced treenails with iron ones, but while expediting the shipbuilding process, iron

nails in submerged oak wood will result in a chemical reaction termed "iron-sickness", which causes the nail to rust away completely and the wood surrounding it to rot (MORELAND 1939, p. 192). Shipwrights during this period also developed the less labour-intensive frame-first (skeleton) hull construction technique, which also expedited shipbuilding, but tended to result in shoddy labour (see below). To keep up with rapid production rates and compensate for its haste-makes-waste consequences, shipwrights also began sealing and caulking hull planks and joints with inches-thick coats of pine-based tar and pitch, and petroleum-based bitumen. These extraordinarily thick layers of sealant and caulk ensured that the ship's most assailable wood was impervious to the detrimental effects of the sea (KINGSLEY 2009, pp. 323-326).

In Antiquity, pine and cypress hulls had been used when and where (and by whom) cedar was not available, and these timbers had been coated with lead sheathing, pine resin, wax and even whale blubber to compensate for the wood's susceptibility during sea-borne ventures (Pliny, *Natural History*, XVI, 56; *Anthologia Palatina,* XI, 248). In the Middle Ages, however, changes in ship construction had less to do with timber availability than they did with the need for speedy production: it was simply cheaper, faster and easier to coat wood and nail holes with tar and caulk the slack joints of the planks than to hike up into the mountains to fell cedars, and run the lumber through a series of riverine courses down to coastal shipyards — even if it could mean less work at sea level [4].

Although wood is a rare survivor in marine archaeology, the only two excavated examples of Levantine ships wrecked on the Levant during this period testify to the above observations. Both wrecks come from the same site, the Tantura Lagoon in Dor (modern Israel): the Dor 2001/1 (mid-5th to early 6th century) and the Tantura B (early 9th century). Neither of the archaeological excavations yielded cedar wood. The Dor 2001/1 was constructed primarily of cypress (*Cupressus sempervirens* L.), with pine (*Pinus brutia* Tenore), oak (*Quercus cerris* L. and *Q. coccifera* L.) and tamarisk (*Tamarix* sp.) comprising the majority of the frames (MOR & KAHANOV 2006). The Tantura B, an Arab ship representing the only documented wreck from the 9th century Mediterranean, was also constructed of oak and pine wood, and the joints had been thickly caulked (WACHSMANN *et al.* 1997, KHALILIEH 2005). All of these tree species grew plentifully — and conveniently — in lower elevations closer to coastal shipyards.

As suggested by the examples of medieval shipwrecks off the Levantine coast, the more extensive Anatolian marine archaeological record also demonstrates that shipwrights were thinking of convenient and rapid

production. The late Roman wreck at Yassiada on the Turkish Aegean coast yielded a hull constructed of cypress and a keel of white oak (either *Q. ilex* L., *Q. robar* L., or *Q. petraea* (Mattuschka) Liebl.). The shipwright had also spaced the loose-fitted mortise and tenon joints further apart, so the joints and timber were both relatively weak, as evidenced by the vessel's dire fate (BASS & VAN DOORNINCK 1971, p. 33; UNGER 1980, pp. 41-42). The mid-fifth century wreck at Sinop on the Black Sea coast had a hull made from fir, which is local to the Pontic range, instead of employing cedar timber shipped from the other side of the Anatolian peninsula (BALLARD *et al.* 2001). The wrecked Byzantine cargo ship at Yassiada from the seventh century shows little change in preferred ship-timbers, with a cypress keel, pinewood planking, and other wooden parts of elm (*Ulmus* sp.) and white oak. This wreck is the first evidence of the frame-first (or skeleton) hull construction technique, but when combined with small and very widely-spaced mortise and tenon joints, and nails that barely penetrated the frames, one can see how it came to rest at the bottom of the sea (BASS & VAN DOORNINCK 1982; UNGER 1980, pp. 41-42).

Of particular interest is the eighth-century Tantura F shipwreck. Although discovered in the Levant at Dor, the Tantura F originated from the cedar-rich Antalya region in southern Anatolia, but the ship was constructed with tamarisk frames and longitudinal timbers, a black and Calabrian pine (*P. nigra* J. F. Arnold and *P.* brutia, respectively) keel, and Calabrian pine was also used for the stringers, frames, and mast-step (BARKAI & KAHANOV 2007). So, even when it was clearly geographically convenient, cedar timber was still eschewed in favour of slathering multiple layers of pitch onto both sides of the hull planks, as is archaeologically evident in this case.

Inching forward in time, surviving wood from the ninth century wreck at Bozburun (southwestern Turkey) suggests that oak comprised the majority of the timbers (including the keel and planking) and oak was used together with pine for the floorboards (HARPSTER 2009). The wrecked Fatimid merchantman off Serçe Limani (Turkish coast north of Rhodes) from ca. 1025 had an elm keel and of the 20 % of the hull that survived, all of it was pinewood (MATTHEWS & STEFFY 2004). Perhaps the ongoing excavations at the silted harbour of Yenikapi (Istanbul) will yield surprising results, but so far excavations have produced only oak, walnut (*Juglans* sp.), chestnut (*Castanea* sp.), ash (*Fraxinus* sp.) and hornbeam (*Carpinus* sp.), all of which are native to the Bosporus region, where, as expected, the majority of the shipyards were also located during the Byzantine and Ottoman periods (KOCABAS 2008).

Conclusions

For almost five hundred years of nearly incessant warfare and piracy that temporarily hampered maritime trade routes to the west, Arab and Byzantine shipbuilders may not have been thinking on such ambitious lines as those of the ancient pharaohs, kings and caesars. Instead, the shipwrights hired by the early medieval caliphs, emperors and the later sultans, knew that most ships were destined for Davy Jones' locker. In Antiquity, seafarers relied upon an artisanal seaworthy craft, whether it had a commercial, religious, or militaristic function, and seemingly regardless of its status. In the Middle Ages, however, water transit was more reliant, not on the ship, but on the sealants.

Proffering a cheaper but adequate substitute, pine forests have always been much more prevalent and virile than cedar forests, and these woods were conveniently located in the low hills behind the first Arab naval bases at Acre and Tyre in the Levant. They were also located in the Kyrenia mountains north of the ports of Salamis and Famagusta on Cyprus, and around the main Byzantine and later Ottoman shipyards in the vicinity of Constantinople/ Istanbul. Last but not least, sixth and seventh century Palestinian developments in the art of shipbuilding — particularly the use of corpulent layers of tar to protect cheaper timbers, iron nails and shoddy seams to the detriment of seawater — made the illustrious cedar ship completely obsolete after over three thousand years of glory.

NOTES

[1] Diodorus Siculus (*World History*, 17.89.4) and Strabo (*Geography*, 15.1.29) recorded that Alexander's easternmost conquests placed him in the vicinity of the Himalayan cedar (*C. deodara*). Apparently, he (or more likely, one of his officers) recognized the trees and their maritime potential, along with accompanying firs and pines, and his troops commenced cutting them down to build ships. Before being thwarted, his plan was to move his ships down the Indus, subduing along the way, come out into the Indian Ocean, and sail back to the west either through the Persian Gulf (to Babylon) or the Red Sea (to the Mediterranean). This account is the only known example of *C. deodara* having been used in Antiquity, but it seems highly likely that these eastern forests were accessed by earlier Near-Eastern empires, however the evidence has not yet surfaced.

[2] Unlike its eastern Mediterranean cousins, *C. atlantica* may have had a place in the naval history of the medieval Mediterranean. Between the Second and Third Crusade from 1171-1187 AD, Saladin's armies covered North Africa from Egypt to Morocco, requisitioning ships and experienced sailors along the way.

This effort gave him the advantage of a long coastline with established ports to battle the Frankish navy, but just as importantly, his shipbuilders had access to the relatively untouched forests of the Atlas and Rif Mountains (EHRENKREUTZ 1955, p. 105; HAMBLIN 1986, pp. 77-83; MCNEILL 1992, pp. 83-84, 99-101). The Atlas cedar forests (as well as fir, oak and pine) were very possibly utilized by his shipwrights if the tradition there was still running off that of the Phoenician colonizers of Carthage and other Punic ports, who may have still employed their familiar cedar wood in ship construction.

[3] Theophrastus (371-287 BC) continued in V.7.1-3 to describe which wood types were used in which region for which part of the ship. Of course he was speaking from a Greek perspective, where there were no cedars and very limited timber trade with lands that did have it (only in 307 BC were cedars implied as having been imported to Athens from Cyprus (Diodorus Siculus, *Library of History*, 20.46.4)). Instead, Greek ships had long since been constructed using local pine and oak. Therefore, he wrongly assumed that "In Syria and Phoenicia triremes are made of cedar because of the lack of pine". There has never been a lack of pine in Syria or Phoenicia, but rather a lack of motivation to use pine extensively because of the accessibility of superior-quality cedar (not to mention fir and cypress).

[4] Worth mentioning is that by using riverine hydropower to transport timber, the rushing water agitated and flushed out the organisms that could potentially produce rot while the wood was curing; so, using riverine systems to move lumber actually served the dual function of transport and treatment (BECHMANN 1990, pp. 219-220).

REFERENCES

ABDUL-NOUR, H. 2001. Les inscriptions forestières d'Hadrien: mise au point et nouvelles découvertes. — *Archaeology and History in Lebanon*, **14**: 64-95

ABDUL-NOUR, H., AKHRASS, C. & GEZE, R. 2009. Quatre nouvelles inscriptions forestières d'Hadrien dans le Mont Liban. — *Archaeology and History in Lebanon*, **27**: 87-92.

ASHTOR, E. 1976. A social and economic history of the Near East in the Middle Ages. — London, William Collins Sons & Co Ltd., 384 pp.

BALLARD, R. D., HIEBER, F. T., COLEMAN, D. F., WARD, C., SMITH, J. S., WILLIS, K., FOLEY, B., CROFF, K., MAJOR, C. & TORRE, F. 2001. Deepwater archaeology of the Black Sea: The 2000 Season at Sinop, Turkey. — *American Journal of Archaeology*, **105**: 607-623.

BARKAI, O. & KAHANOV, Y. 2007. The Tantura F shipwreck, Israel. — *International Journal of Nautical Archaeology*, **36**: 21-31.

BASS, G. F. & VAN DOORNINCK F. H. (Jr.) 1971. A fourth century shipwreck at Yassi Ada. — *American Journal of Archaeology*, **75**: 27-37.

BASS, G. F. & VAN DOORNINCK F. H. (Jr.) 1982. Yassi Ada I: A seventh century Byzantine shipwreck. — Texas A&M University Press, College Station, T. X, XVI + 349 pp.

BECHMANN, R. 1990. Trees and man: the forest in the Middle Ages (transl. by Kathryn Dunham). — New York, Pargon House, X + 326 pp.

BROWN, J. P. 1969. The Lebanon and Phoenicia. Ancient texts illustrating their physical geography and native industries. The physical setting and the forest (vol. 1). — Beirut, American University of Beirut, XXXIX + 220 pp.

EHRENKREUTZ, A. S. 1955. The place of Saladin in the naval history of the Mediterranean Sea in the Middle Ages. — *Journal of the American Oriental Society*, **75**: 100-116.

HAMBLIN, W. 1986. The Fatimid navy during the early Crusades: 1099-1124. — *The American Neptune*, **46**: 77-83.

HARPSTER, M. 2009. Designing the 9th-century-AD vessel from Bozburun, Turkey. — *International Journal of Nautical Archaeology*, **38**: 297-313.

HITTI, P. K. 1957. Lebanon in history from the earliest times to the present. — London, Macmillan & Co Ltd., 548 pp.

JACOBY, D. 2009. Venetian commercial expansion in the eastern Mediterranean, 8th-11th centuries. — *In*: MANGO, M. M. (Ed.), Byzantine trade, 4th-12th centuries: the archaeology of local, regional and international exchange. Papers of the thirty-eighth spring symposium of Byzantine studies (St. John's College, University of Oxford, March 2004), pp. 371-391.

KHALILIEH, H. S. 2005. The enigma of Tantura B: historical documentation and the lack of circumstantial documentary evidence. — *International Journal of Nautical Archaeology*, **34**: 314-322.

KINGSLEY, S. 2009. Great voyages, great ocean-going ships? — *In*: MANGO, M. M. (Ed.), Byzantine trade, 4th-12th centuries: the archaeology of local, regional and international exchange. Papers of the thirty-eighth spring symposium of Byzantine studies (St. John's College, University of Oxford, March 2004), pp. 323-352.

KOCABAS, U. (Ed.) 2008. The 'old ships' of the 'new gate' (vol. 1) / Yikapı'nin eski gemileri (cilt I). — Istanbul, Ege Yayinlari/Zero Books Ltd., XIX + 223 pp.

MATTHEWS, S. & STEFFY, J. R. 2004. The ship and its anchorage, crew and passengers. — *In*: BASS, G., MATTHEWS, S., STEFFY, J. R. & VAN DOORNINCK F. H. (Jr.) (Eds.), *Serce Limani*: an eleventh-century shipwreck (vol. 1). Texas A&M University Press, College Station, T. X, pp. 81-122.

MCNEILL, J. R. 1992. The mountains of the Mediterranean world: an environmental history. — Cambridge, Cambridge University Press, XVII + 423 pp.

MEIGGS, R. 1982. Trees and timber in the ancient Mediterranean world. — New York, Oxford University Press, XVIII + 553 pp.

MIKESELL, M. W. 1969. The deforestation of Mount Lebanon. — *Geographical Review*, **59**: 1-28.

MOR, H. & KAHANOV, Y. 2006. The Dor 2001/1 Shipwreck, Israel – A summary of the excavation. — *International Journal of Nautical Archaeology*, **35**: 274-289.

MORELAND, W. H. 1939. The ships of the Arabian Sea about A.D. 1500. — *Journal of the Royal Asiatic Society of Great Britain and Ireland*, **2**: 173-192.

PURCELL, H. D. 1969. Cyprus. — New York, Praeger, 416 pp.

RICH, S. A. (forthcoming, 2016). Cedar forests, cedar ships: Allure, lore & metaphor in the Mediterranean Near East. — Oxford, Archaeopress.

RIVAL, M. 1991. La charpenterie navale romaine: matériaux, méthodes, moyens. — Paris, Editions du Centre National de la Recherche Scientifique, 333 pp.

ROSE, S. 1999. Islam versus Christendom: the naval dimension, 1000-1600. — *Journal of Military History*, **63**: 561-578.

THIRGOOD, J. V. 1981. Man and the Mediterranean forest: a history of resource depletion. — London, Academic Press, x + 194 pp.

UNGER, R. W. 1980. The ship in the Medieval economy 600-1600. — London, Croom Helm, 304 pp.

WACHSMANN, S., KAHANOV, Y. & HALL, J. 1997. The Tantura B shipwreck: the 1996 INA/CMS joint expedition to Tantura Lagoon. — *INA Quarterly*, **24**: 3-15.

THE SUEZ CANAL IN BETWEEN THE GIBRALTAR AND MALACCA STRAITS

International Colloquium
Interoceanic Canals and World Seaborne Trade: Past, Present and Future
Royal Academy for Overseas Sciences
Port of Antwerp
World Association for Waterborne Transport Infrastructure
Brussels, 7-9 June 2012
pp. 83-107

Le canal de Suez à l'heure de la conteneurisation

par

Nora MAREI* & Jacques CHARLIER**

MOTS-CLES. — Passages maritimes internationaux; Canal de Suez; Circulations marchandes; Conteneurisation; Transport maritime; Europe; Asie; Moyen-Orient.

RESUME. — L'analyse des trafics du canal de Suez et son adaptation aux évolutions des échanges marchands internationaux sont de formidables sources pour comprendre la mondialisation des échanges. Dans cette contribution, les auteurs mettent en évidence les enjeux géoéconomiques et géostratégiques autour de cette artère autant égyptienne qu'internationale et s'efforcent de donner un panorama complet des trafics contemporains du canal de Suez. A l'heure de la conteneurisation, la voie d'eau s'impose et consolide son rôle sur la scène maritime internationale.

1. Introduction

A propos du canal de Suez, André Siegfried écrivait en 1940 qu'«il y a quelque chose comme un caractère de nécessité dans l'existence de cette voie d'eau qui, par la Méditerranée, conduit vers l'Asie: il se peut qu'on la délaisse mais on y revient toujours» (SIEGFRIED 1940). La réintégration de ce canal maritime sur les routes du commerce mondial, après quasiment dix années de non-utilisation suite à la guerre israélo-arabe des six jours (DESSOUKI 1982), fait ainsi sonner les mots de Siegfried comme une prophétie. Ce n'était pourtant pas gagné d'avance. Pendant cette longue mise entre parenthèses du canal (1967-1975), les lignes maritimes mondiales se sont réorganisées et, avec elles, les navires ont pris plusieurs tailles pour obtenir des économies d'échelle malgré des trajets redevenus circumafricains (TOURRET 2007). Cette réorganisation complète, suite à la fermeture de Suez,

* Chargée de recherches CNRS, UMR 8586 PRODIG (Pôle de Recherche pour l'Organisation et la Diffusion de l'Information Géographique), rue Valette 2, F-75005 Paris (France).
** Membre de l'Académie; prof. émér. Université catholique de Louvain.

montre à quel point cette voie d'eau artificielle était devenue un objet central du système circulatoire mondial.

Ce sont cette dépendance du canal à la vie maritime et ses «étonnantes facultés d'adaptation aux mutations techniques et à la géographie changeante du commerce international» (CHARLIER 1990) qui ont passionné les géographes de la mer. Dans la lignée d'André Siegfried qui les considérait comme «des feuilles de températures de la planète», ces derniers se sont intéressés aux passages stratégiques, naturels ou artificiels, de la géographie des circulations maritimes, les détroits et les canaux interocéaniques. André VIGARIE (1979, 1995) a souligné leur dimension géostratégique et leur importance pour les flux marchands et Jacques MARCADON (1999) a décrypté les enjeux économiques et stratégiques de ces «pertuis maritimes». Jacques CHARLIER (1990, 2008) et Jacques GUILLAUME (1999) se sont intéressés plus précisément au canal de Suez, relevant, pour le premier, son caractère presque incontournable à l'heure d'un «monde en boîte» (FREMONT 2007a) et, pour le second, sa participation à «tous les événements majeurs de la vie maritime. Sans être responsable des innovations, il les a accélérées et imposées». L'innovation en question étant la conteneurisation, Jacques Charlier a consacré les porte-conteneurs comme les «nouveaux rois de Suez». Ces espaces terraqués, qu'il s'agisse des détroits ou des canaux, abritent désormais des ports d'envergure internationale par leur trafic et surtout par leur ancrage à un réseau mondialisé d'échanges conteneurisés.

Le premier objectif de cette contribution est de montrer (sections 2, 3 et 4) que cette dernière étape dans la vie post-pétrolière du canal de Suez offre un rôle géoéconomique et géostratégique renouvelé à un vaste ensemble maritimo-terrestre entre l'Europe et l'Asie. Son second objectif est plus factuel et vise à donner (section 5) un panorama aussi complet que possible des trafics contemporains du canal, dominés par les conteneurs mais au sein desquels les hydrocarbures semblent jouir d'un second souffle; ces deux types de trafic devraient continuer à dominer et seront les premiers à bénéficier du recalibrage récemment entrepris pour doubler la capacité du canal (section 6, où nous montrons qu'il ne s'agit pas d'un «second canal de Suez» mais d'une nouvelle évolution technique *in situ* d'une artère aux capacités évolutives surprenantes).

2. La naissance de «la grande route du commerce du Monde»

«Il faut faire disparaitre le seul obstacle laissé par la providence sur la grande route du commerce du Monde», disait Ferdinand de Lesseps afin de

convaincre l'opinion européenne et les investisseurs potentiels de l'intérêt du percement de l'isthme de Suez (DE LESSEPS & SABBATIER 1867). Malgré les oppositions anglaises, la jonction des eaux a lieu le 15 août 1869, au terme d'une dizaine d'années de travaux constituant une prouesse technique pour l'époque (MONTEL 1999). A l'issue de ceux-ci, qui ont coûté la vie à des milliers de travailleurs forcés égyptiens, le canal de Suez traverse de part en part l'isthme éponyme; sa longueur est de 164 km pour 54 m de largeur et 10 m de profondeur, des dimensions considérables pour l'époque. Ce projet a contribué à l'aménagement du territoire égyptien, occupé en grande partie par le désert. Des sables sortiront des villes nouvelles: Port-Saïd du côté méditerranéen, Suez sur la mer Rouge et Ismaïlia à mi-chemin, à proximité du débouché d'un petit canal d'eau douce s'embranchant sur le Nil à el Zagazig (fig. 1). Celui-ci était et demeure nécessaire pour le réapprovisionnement en eau de la partie centrale du canal en raison de l'évaporation; il a aussi permis l'acheminement d'une partie des matériaux du chantier ainsi que la fourniture d'eau potable pour les travailleurs et son rôle demeure essentiel pour la mise en valeur agricole de la rive ouest du canal (CHARLIER 1990).

Le plus long canal maritime sans écluse du monde est ainsi inauguré et ouvert à la navigation commerciale le 17 novembre 1869. Les Anglais reconnaissent alors rapidement son importance stratégique et économique pour leur Empire et finissent par montrer un intérêt financier pour cette nouvelle voie maritime. Ils prennent en 1876 une option certaine sur le canal en rachetant les actions du vice-roi d'Egypte et occupent le pays de 1882 à 1952. En 1914, l'Angleterre s'assure le contrôle de la voie d'eau en faisant officiellement de l'Egypte un protectorat de la couronne britannique, mais c'est curieusement une compagnie privée de droit français qui continuera à exploiter le canal jusqu'à sa nationalisation en 1956, avec du personnel expatrié essentiellement français (PIQUET 2008).

En 1880, il faut compter une cinquantaine d'heures pour traverser le canal. Comparé à la route du Cap, ce nouveau trajet est une aubaine et le trafic du canal de Suez ne cesse d'augmenter jusqu'à sa fermeture en 1967 suite à la guerre israélo-arabe des six jours (tab. 1). Le trafic total avait alors atteint un record historique en 1966 avec près de 242 Mt de marchandises, dont 182 Mt d'hydrocarbures, essentiellement du pétrole brut *northbound* (CHARLIER 1990). A l'époque, le canal n'était accessible qu'à des pétroliers de 55 000 tpl à pleine charge et des unités de plus fort tonnage avaient commencé à prendre la route circumafricaine; au retour, elles pouvaient cependant emprunter lèges le canal de Suez *southbound* et le transit d'un «monstre des mers» (pour l'époque) de 150 000 tpl avait été enregistré dans cette direction avant la fermeture de juin 1967 (DESSOUKI 1982).

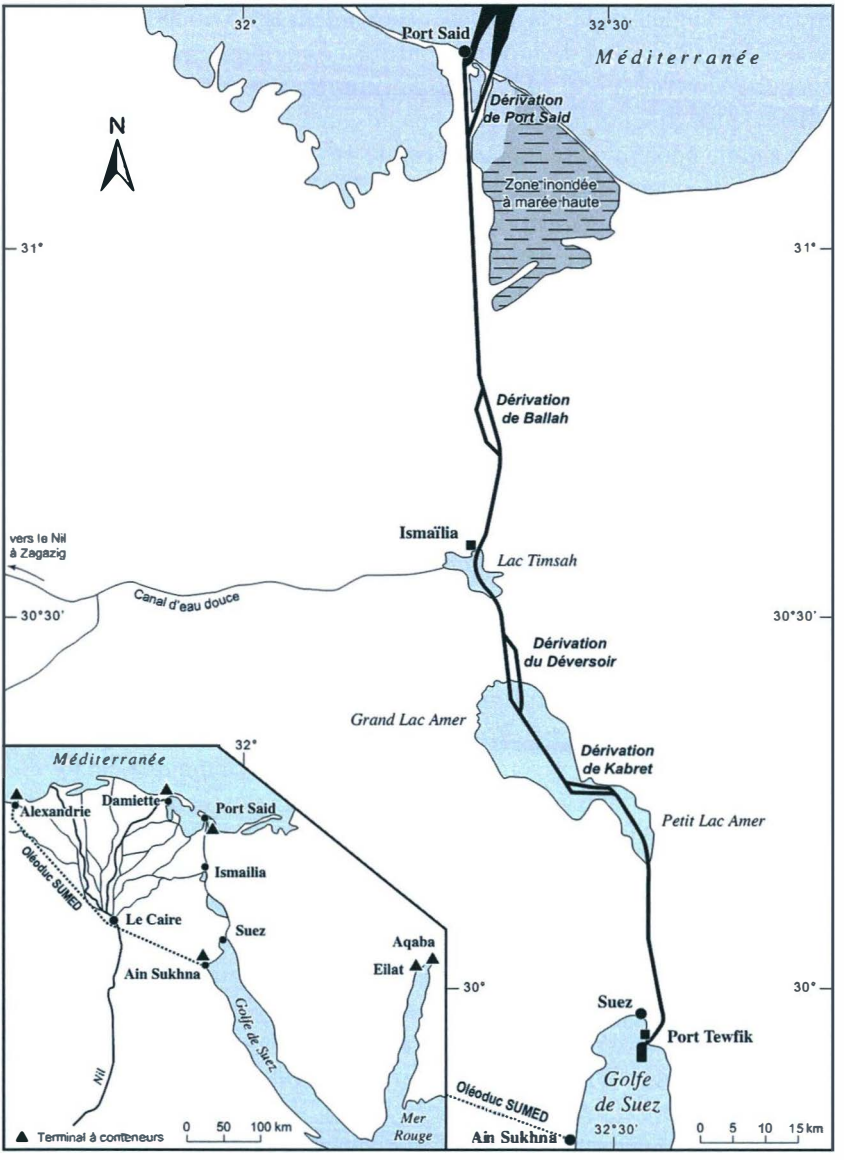


Fig. 1. — Le canal de Suez dans son contexte régional (conception personnelle des auteurs et réalisation du service de cartographie de l'Université de Paris-Sorbonne).

Tableau 1
Les premières décennies d'activité du canal de Suez: un trafic déjà important

Années	Nombre de navires	Tonnage (000 tjb)
1870	486	400
1880	2 026	3 000
1890	3 389	6 900
1900	3 441	10 000
1910	4 533	15 582
1920	4 009	17 575
1930	5 761	31 669
1940	2 589	13 536
1950	11 751	81 796
1960	18 734	185 222

Elaboration de N. Mareï (2012) d'après des données de la *Suez Canal Authority*.

Avec un raccourcissement des distances de près de 45 % en moyenne sur les trajets entre la Méditerranée et l'Asie, le percement du canal permet de réaliser des économies de temps, de consommation et d'exploitation des navires. Il autorise ainsi l'épanouissement des relations entre l'Europe et l'Asie par la voie la plus courte (tab. 2). Les ports méditerranéens ont bénéficié encore davantage de ce raccourci que ceux d'Europe du Nord-Ouest (avec un gain de 58 % entre Gênes et Bombay, contre seulement 42 % entre Liverpool et Bombay). Inversement, ce sont eux qui ont le plus souffert de sa fermeture temporaire en 1956-1957 et, surtout, de la longue parenthèse des années 1967-1975 (VERLAQUE 1975, DESSOUKI 1982).

Tableau 2
Distances comparées depuis Algeciras entre la route de Suez et la route du Cap et gains obtenus entre les deux routes

Segments	Cap de Bonne-Espérance (milles)	Canal de Suez (milles)	Gains (%)
Algeciras – Tokyo Yokohama	13 800	9 850	28,6
Algeciras – Shanghai	13 300	9 200	30,8
Algeciras – Bombay	9 800	4 900	50,0
Algeciras – Aden	9 150	3 350	63,4

Elaboration de N. Mareï (2012) d'après des données de l'Autorité portuaire de la Baie d'Algeciras.

En marginalisant la route du Cap, l'ouverture du canal de Suez recentre la Méditerranée par rapport aux grands axes de la circulation maritime. L'Extrême-Orient se rapproche de l'Europe et un des segments les plus actifs de ce qui deviendra la route maritime Est-Ouest est ainsi créé. Dès son inauguration, le canal est sillonné par les navires à vapeur des plus grandes compagnies européennes (fig. 2). En 1909, entre l'Europe et l'Asie, cinquante et une lignes régulières, sous l'égide de compagnies principalement européennes, passent par le canal de Suez avec une fréquence mensuelle ou bimensuelle (tab. 3).

Tableau 3
Quelques lignes de navigation entre l'Europe et l'Asie en 1909

Compagnies	Régions concernées	Fréquence	Escales
Hamburg Amerika Linie (HAPAG)	Europe du Nord / Asie	1 / mois	Hambourg, Lisbonne, Naples, Port-Saïd (14), Suez (15), Colombo (27), Penang (32), Singapour (35), Hong-Kong (42), Shanghai (47), Kobe (52), Yokohama (57)
Peninsular and Oriental Steam Navigation	Grande-Bretagne / Asie	2 / mois	Londres, Gibraltar (4), Marseille (7), Port-Saïd (12), Aden (16), Colombo (22), Penang (28), Singapour (29), Hong-Kong (35), Shanghai (39 ou 41 selon les saisons)
Chargeurs Réunis	France / Asie	1 / mois	Dunkerque, Le Havre, Bordeaux, Pauillac, Marseille, Port-Saïd, Colombo, Saigon, Haiphong
Navigazione Generale Italiana	Italie / Inde	1 / mois	Gênes, Naples, Messine, Port-Saïd (5), Aden (11), Bombay (17)
Nippon Yusen Kaisha	Europe du Nord-Ouest / Asie	2 / mois	Anvers et Londres, Port-Saïd, Colombo, Singapour, Hong-Kong, Kobe, Yokohama

Elaboration de N. Mareï (2012) d'après la «Carte du monde indiquant les pays et leurs colonies, les principaux moyens de transport, etc», publiée par la Cie Scarnorough (Paris, France, 1909). ( ) = durée du voyage en jours.

Cette orientation Est-Ouest des échanges est renforcée par le percement de l'isthme de Panama, ouvert à la navigation en 1914, et la naissance, dans les années 1950, de services «tour du monde», comme ceux des Chargeurs Réunis utilisant les deux canaux interocéaniques pour relier les ports d'Europe, d'Asie de l'Est et du Sud-Est et d'Amérique du Nord. Les bases d'une artère maritime puissante, alimentée essentiellement par les chargeurs et transporteurs de la triade, sont ainsi jetées. Cette organisation a généré un trafic très varié et a mis en évidence les potentialités de l'axe maritime

Est-Ouest. La fermeture du canal de Suez en 1967 viendra néanmoins le bouleverser. L'obstruction de ce canal, considéré parfois comme la route de l'or noir, affectera essentiellement les échanges d'hydrocarbures, qui pouvaient constituer plus des trois quarts du trafic jusqu'à la fermeture (CHARLIER 1990).

Fig. 2. — Cargo des Messageries Maritimes dans le canal au tournant du XX^{e} siècle (carte postale non datée issue de la collection personnelle de N. Mareï).

3. Le canal de Suez dans les réseaux mondialisés du transport maritime

Dans «L'homme au robinet» (fig. 3), le caricaturiste néerlandais Fritz Behrendt, au lendemain de la nationalisation du canal de Suez par Nasser, ironise sur les menaces qui pèsent sur l'approvisionnement en pétrole des pays occidentaux. Anglais et Français, en tête de la file d'attente, ont perdu avec cette nationalisation la domination sur un objet garant de la fluidité de leurs réseaux maritimes. Un objet qui a contribué à leur donner l'image de puissances mondiales, les plus savantes, les plus mobiles, les plus maritimes, etc. En retournant dans le spectre de l'Etat égyptien, au bénéfice d'une

jeune nation qui entendait financer ainsi le barrage d'Assouan, le canal a finalement retrouvé un rôle plus normal, celui de «commutateur de réseau» (MAREI 2012). Cette fonction est particulièrement avérée en ce qui concerne les réseaux maritimes conteneurisés entre l'Europe et l'Asie où le passage par Suez, dès la réouverture de 1975, est une condition de fluidité et de rapidité des circulations.

Fig. 3. — L'homme au robinet (F. Behrendt, 1956).

Les nouvelles pointes de trafic (de trois cents millions de tonnes dans les années 1990 à plus de sept cents millions en 2008 et, après un creux dû à la crise de 2009, sept cents quarante millions en 2012) se sont construites sur des cargaisons de marchandises sèches dans lesquelles s'observent de plus en plus de conteneurs, ainsi qu'on y reviendra (GUILLAUME 1999, CHARLIER 2008). La mesure du trafic sur le canal se fait en réalité de deux façons (fig. 4), avec des courbes qui évoluent de manière fortement corrélée dans le temps: d'une part, il y a la formule privilégiée dans la suite, qui consiste à exprimer, dans une perspective de géographie économique, le trafic en tonnes métriques de marchandises transitées, mais le passage des unités lèges

(surtout des pétroliers *southbound*) est alors occulté; d'autre part, il y a l'optique de l'exploitant du canal, qui fait aussi payer des droits de passage aux dites unités lèges et pas seulement à celles en charge (il est alors question de jauge nette Suez, avec une formule combinant le port en lourd et la jauge nette des navires, sur laquelle sont assis les péages).

Si un porte-conteneurs transitait par jour en moyenne lors de la réouverture, ils ont culminé à 7 178 en 2011, soit plus de 40 % des navires passant alors par le canal. Ce changement radical dans l'utilisation du canal de Suez est le signe de nouvelles formes d'exploitation des routes maritimes, rendue possible grâce à une adaptation remarquable de la norme *Suezmax* qui a gagné 210 000 tpl depuis 1956, permettant ainsi la mise en place d'un nouvel ordre maritime basé sur les échanges conteneurisés, sans restrictions de taille pour les navires (tab. 4). Cette entrée dans l'ère des conteneurs entraîne des restructurations dans l'environnement portuaire du canal afin de profiter d'une situation de passage obligé.

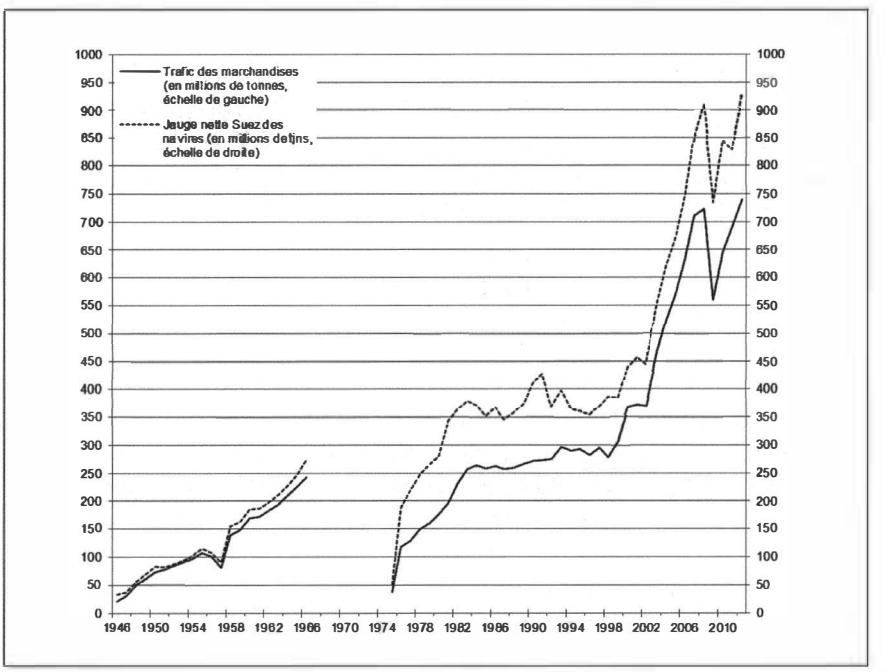


Fig. 4. — Evolution d'ensemble du trafic du canal de Suez entre 1946 et 2011 (élaboration de J. Charlier (2013) d'après les statistiques annuelles de la *Suez Canal Authority*).

Tableau 4

Evolution des caractéristiques physiques du canal de Suez entre 1869 et 2009

Caractéristiques	1869	1956	1962	1980	1994	1996	2001	2009	Gain
Longueur totale (km)	164	175	175	190,25	190,25	190,25	190,25	190,25	16 %
Chenaux dédoublés (km)	—	29	29	78	78	78	78	78	
Largeur maximale (m)	44	60	90	160	180/210	180/210	200/210	220	400 %
Profondeur (m)	10	14	15.5	19.5	20.5	21	22.5	24,5	145 %
Tirant d'eau (pieds)	22	35	38	53	56	58	62	66	200 %
Surface mouillée (km^2)	304	1 100	1 800	3 600	3 800/4 300	3 900/4 500	5 000	5 200	1611%
Tonnage maximal (tpl)	5 000	30 000	60 000	150 000	180 000	185 000	220 000	240000	4 700 %

Elaboration de N. Mareï (2012) d'après des données de la *Suez Canal Authority*.

Une étude des lignes régulières conteneurisées empruntant le canal de Suez, réalisée en 2006, a permis de montrer qu'en 2004, il y avait cinquante-huit lignes de fréquence hebdomadaire qui passaient par le canal, totalisant quatre cent soixante-deux porte-conteneurs (d'une taille moyenne de 5 000 EVP), soit une capacité de 2,2 M EVP hebdomadaire (MAREI 2006). La majorité de ce trafic est à affecter à la partie euro-asiatique de la route maritime Est-Ouest. Sur ce tronçon enserré par trois des grands continents de la planète, la globalisation du réseau maritime conteneurisé prend tout son sens. De nouveaux ports seront même établis pour le bon fonctionnement du réseau. En fonction des contraintes économiques, commerciales ou géographiques, la place de ces «ports-réseau» est choisie puisque «l'escale d'un porte-conteneurs ne se justifie que si 10 % au moins de sa capacité est manutentionnée» (FREMONT 2003). La compétition portuaire est alors sévère, en particulier sur les mers charnières entre l'Europe et l'Asie. Pour faire partie du jeu, la première condition est de posséder un site accessible à la flotte des grands porte-conteneurs; la seconde est d'être muni de l'équipement de manutention le plus moderne possible. Une fois ces critères remplis, le port peut devenir un port de transbordement, un *hub*.

Dans ce contexte, les ports égyptiens de Damiette (premier arrivé) et Port-Saïd (qui l'a désormais dépassé), situés au niveau du débouché septentrional du canal de Suez, sont devenus les *hubs* incontestés de la Méditerranée orientale. Passages obligés sur la route de Suez, ces ports ont vu leur trafic augmenter ces dernières années. Autour de Damiette et de Port-Saïd, un réseau dense de lignes *feeders* alimente les ports israéliens, libanais, syriens et turcs (fig. 5). Damiette (1,2 M EVP en 2012), utilisé comme port d'escale de la CMA-CGM, offre huit postes à quai et un tirant d'eau de 14 m. Il est également desservi par une pléiade de puissants armateurs comme *Nippon Yusen*

Kaisha, Yang Ming Line ou *Maersk* depuis le rachat de *P&O Nedlloyd*. Le port est aujourd'hui dans une phase de modernisation et d'extension, en s'équipant de nouveaux portiques, en développant les trafics rouliers et en renforçant sa fonction de plate-forme logistique afin de rester compétitif face au nouveau *Suez Canal Container Terminal* (SCCT) de Port-Saïd (4,2 Mt au total en 2012 pour ce port).

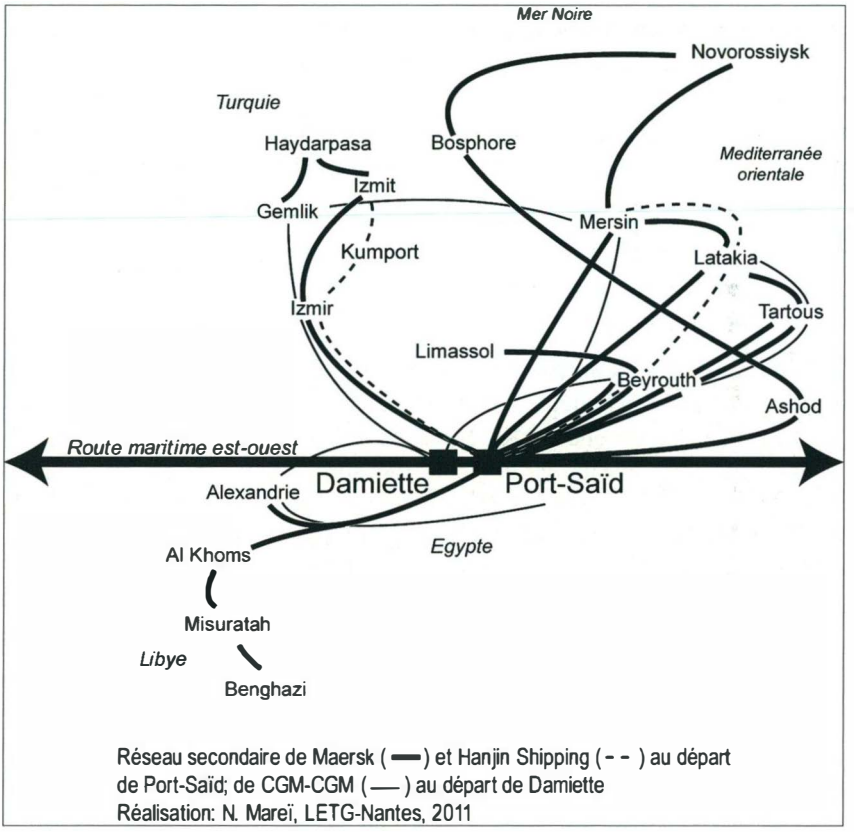


Fig. 5 – Un binôme pour les trafics en transbordement (élaboration de N. Mareï (2012) d'après *services feeders maerskline.com, hanjin.com, cma-cgm.fr*).

La société du SCCT, qui dispose d'une concession de trente ans, a été créée en janvier 2000 avec une participation à hauteur de 60 % de *European Combined Transport* (ECT, Pays-Bas, désormais aux mains d'Hutchinson de Hong-Kong) et *AP Moller Terminals*, le solde étant détenu par les Egyptiens. La première partie de ce terminal achevée en 2004 comprend un quai de 1 200 m et de 60 ha pour une capacité de 2,7 M EVP et accueille douze

portiques superpostpanamax. La seconde partie du terminal, dont les travaux étaient en cours d'achèvement en 2012, permettra de doubler les capacités portuaires. Ce nouveau port en eau profonde se hisse désormais au premier rang des ports à conteneurs de la Méditerranée et de l'Afrique. Cette plateforme d'éclatement égyptienne permet à Maersk, avec Algeciras, Tanger-Med et Gioia Tauro, de compléter un réseau régional organisé autour de ports de pertuis, ce qui vaut aussi pour plusieurs autres emplacements stratégiques en Asie et en Amérique centrale (FREMONT 2007b).

Aujourd'hui, Port-Saïd, Damiette, Malte, Gioia Tauro, Algeciras ou Tanger-Med sont indéniablement des ports de transbordement développés selon une logique de réseau. Ce statut de port au service du réseau d'un opérateur mondial en fait des places portuaires incontournables. Leur avantage comparatif se résume à une situation optimale sur la grande route du commerce maritime Est-Ouest. Ils permettent donc une déviation minimale par rapport à la route Est-Ouest et autorisent alors à pousser au maximum les économies de coût et de temps. Tout au long de la route circumterrestre, des ports bénéficiant de cette logique de réseau peuvent être identifiés (NOTTEBOOM 2012). Ils sont souvent positionnés sur un passage obligé, comme Singapour et Tanjung Pelapas sur le détroit de Malacca, Colón et Balboa au débouché du canal de Panama ou encore Kingston dans l'orbite de ce même canal. La situation de porte océanique devient alors une nodalité privilégiée dans un système de réseau mondialisé. C'est à travers cette situation de nœuds d'un réseau maritime mondial que les passages interocéaniques retrouvent une valeur stratégique sur la scène internationale. C'est dans ce contexte qu'il faut aussi interpréter la réalisation, à l'autre extrémité du canal, d'un port similaire de transbordement récemment concédé à un autre grand manutentionnaire global, DPW en l'occurrence, à Ain Shukna, près du terminal de l'oléoduc SUMED (*cf.* fig. 1 *supra*) dont il sera question plus loin (600 000 EVP en 2010, année de démarrage d'un terminal destiné à manutentionner à terme 2 M EVP).

4. Le canal de Suez, point chaud de la route maritime Est-Ouest

«Le canal de Suez à l'est et le détroit de Gibraltar à l'ouest sont les portes océanes vitales pour l'activité maritime non seulement méditerranéenne mais mondiale» (MARCADON 2002). La Méditerranée est donc reliée à l'océan global par deux des passages les plus stratégiques du monde: le détroit de Gibraltar, détroit international jouissant d'un droit de passage en transit sans

entrave comme le Pas de Calais ou Malacca, et le canal de Suez régi par la Convention de Constantinople de 1888 lui octroyant un statut international et garantissant le passage en temps de guerre comme en temps de paix. Près de cent mille navires croisent le détroit de Gibraltar chaque année et plus de dix-sept mille (dix-sept mille deux cent vingt-cinq très précisément en 2012) passent par le canal de Suez, actuellement approfondi pour accueillir des supertankers allant jusqu'à 240 000 tpl à pleine charge. Cette amélioration profitera également au trafic conteneurisé qui tend vers une norme *malaccamax* (TOURRET 2007). D'après la *Suez Canal Authority*, en 2008, le canal a enregistré un trafic record de 723 Mt (tab. 5). Après avoir fortement régressé en 2009 en raison de la crise mondiale, son trafic s'est redressé en 2010, puis en 2011 et en 2012, pour atteindre cette année-là un nouveau record de 739,9 Mt.

Tableau 5

Evolution 2000-2012 des principaux trafics du canal de Suez (millions de tonnes)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Hydrocarbures	***53,0***	***62,2***	***50,0***	***69,2***	***87,2***	***97,5***	***114,6***	***125,6***	***129,3***	***104,6***	128,1	***145,5***	***175,5***
Northbound	44,6	47,7	33,5	52,3	66,3	68,2	81,3	80,6	83,4	63,0	84,9	102,2	101,7
Southbound	8,4	14,5	16,5	16,9	20,9	29,3	33,3	45,0	45,9	41,6	43,2	43,3	73,8
Conteneurs	***143,8***	***147,3***	***165,2***	***191,0***	***220,4***	***247,1***	***276,9***	***324,6***	***344,0***	***308,9***	367,0	***397,2***	***398,0***
Northbound	69,6	72,2	81,6	95,2	112,0	128,1	150,8	181,3	188,0	159,2	187,3	203,2	197,0
Southbound	74,2	75,1	83,6	95,8	108,4	119,0	126,1	143,3	156,0	149,7	179,7	194,0	201,0
Autres march.	***171,2***	***162,9***	153,6	***197,7***	***213,4***	***226,5***	***237,1***	***259,9***	***249,7***	***145,7***	***151,0***	***149,1***	***166,4***
Northbound	95,2	92,4	73,6	108,8	131,1	130,0	144,3	162,2	142,0	41,7	55,8	51,8	54,8
Southbound	76,0	70,5	80,0	88,9	82,3	96,5	92,8	97,7	107,7	104,0	95,2	97,3	111,6
Total général	**368,0**	**372,4**	**368,8**	**457,9**	**521,0**	**571,1**	**628,6**	**710,1**	723,0	**559,2**	**646,1**	**691,8**	**739,9**
Northbound	209,4	213,3	188,7	256,3	309,4	326,3	376,4	424,1	413,4	263,9	328,0	357,2	353,5
Southbound	158,6	160,1	180,1	201,6	211,6	244,8	252,2	286,0	309,6	295,3	318,1	334,6	386,4

Elaboration de J. Charlier (2013) d'après les rapports annuels de la *Suez Canal Authority*.

L'axe Suez-Gibraltar apparaît alors comme une artère vitale de l'économie maritime et qui ne sert plus simplement à drainer le pétrole du Moyen-Orient vers l'Europe (direction historiquement dominante, mais le trafic *southbound* s'est fortement développé ces dernières années). En arrivant d'Asie, l'accès au canal de Suez implique le passage par le détroit de Bab-el Mandeb

séparant Djibouti et le Yémen et reliant la mer Rouge au golfe d'Aden, dans l'océan Indien. Ainsi trois zones maritimes, le nord-ouest de l'océan Indien, la mer Rouge, la mer Méditerranée, forment un ensemble quasi continu animé par des mouvements de matières premières, de biens d'équipement de toutes sortes et par les échanges d'hydrocarbures, amenés à s'accroître au travers des produits raffinés et du gaz naturel liquéfié (GNL). Ces échanges, essentiellement euro-asiatiques, ont connu depuis les années 1980 un essor considérable donnant à nouveau vie à la valeur stratégique de ces lieux.

La sécurisation des approvisionnements et des trafics passant par cette enfilade de mers et de pertuis devient un enjeu mondial. Une double sécurisation, militaire et politique, est nécessaire pour ce segment singulier de l'axe Est-Ouest. Ce tronçon enserré par les terres subit de ce fait des pressions et marque le territoire, selon des degrés et des modalités divers. Dans cette optique, les passages interocéaniques de cet espace sont des lieux privilégiés, car resserrés et catalyseurs des phénomènes de la mondialisation. Leur valeur stratégique est aujourd'hui incontestable et convoitée. Elle augmente même avec:

— La croissance du trafic conteneurisé entre l'Europe et l'Asie, qui a augmenté considérablement depuis que la Chine participe au «système monde» (CNUCED 2012); en 2012, la capacité nominale des unités ayant transité en charge par le canal s'établissait à 31,6 M EVP, soit 2,6 fois le chiffre recensé par la *Suez Canal Authority* pour l'année 2000.
— La part croissante de la mer Rouge (exportations égyptiennes et usage accru de l'oléoduc Petroline via Yanbu, au détriment du golfe Arabo-Persique) dans les exportations arabes de pétrole brut (RODRIGUE 2004), sans oublier l'enjeu des ressources fossiles est-africaines (Soudan et Ethiopie).
— Le retour de l'océan Indien comme enjeu géostratégique mondial en lien avec l'engagement militaire occidental dans le nord de ce dernier depuis l'opération de l'OTAN en Afghanistan et les guerres irakienne et afghane menées par les Etats-Unis (LE MARIN 2013).

Cette importance globale est en apparence menacée par les trafics illicites (migrations clandestines, drogues, armes), les dangers du terrorisme, de la piraterie et par l'instabilité politique régionale. Elle n'est pourtant pas fondamentalement remise en question et structure largement ces territoires qui évoluent selon des dynamiques propres (MAREI 2012). Dès lors, l'artère économique mondiale qui les traverse, matérialisée par cette route maritime Est-Ouest, fonctionne comme un corridor ou un tunnel, coupé des réalités territoriales environnantes, à l'instar des corridors africains dédiés au trafic de transit (LOMBARD & NINOT 2010).

Dans ce contexte, les ports de transbordement méditerranéens (Port-Saïd, Damiette, Malte, Gioia Tauro, Algeciras, Tanger-Med) ne sont pas les seuls à profiter de l'axe maritime conteneurisé entre l'Europe et l'Asie. Les ports de la péninsule arabique se développent également (fig. 6), avec des chiffres 2010, actualisés ci-dessous à 2012 pour les principaux ports): Jeddah (Arabie Saoudite, 4,7 M EVP en 2012), Salalah (sultanat d'Oman, 3,6 M EVP), Khor Fakkan et Dubaï (Emirats Arabes Unis, 3,5 et 13,2 M EVP respectivement). Ce dernier se classe ainsi parmi les dix plus grands ports à conteneurs du monde grâce au terminal de Jebel Ali. L'Iran profite également de son débouché sur le détroit d'Ormuz avec le port de Shahid Rajaee (Bandar Abbas), adossé à une zone économique spéciale, qui totalise 3,1 M EVP en 2012.

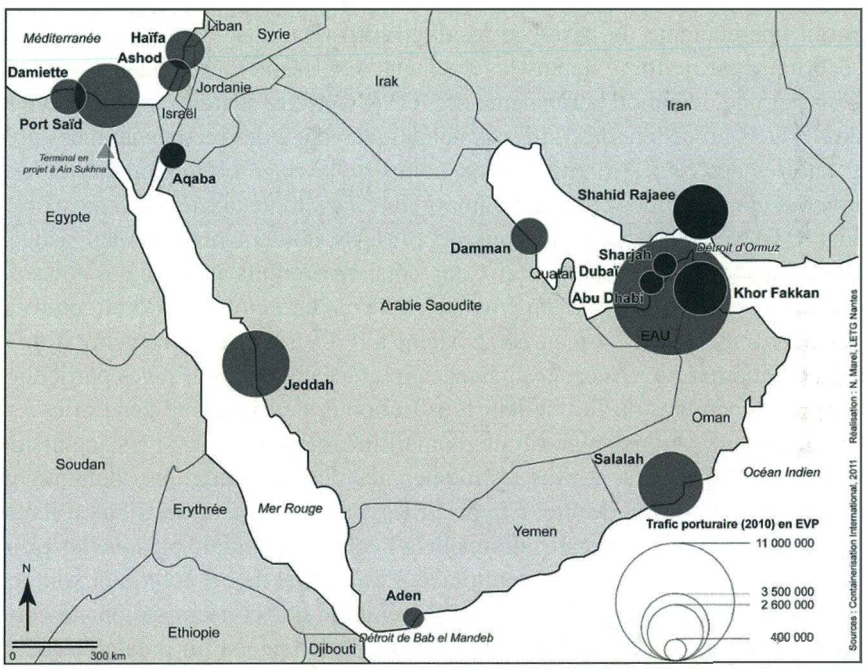


Fig. 6. — Les ports à conteneurs du Proche et du Moyen-Orient en 2010 (élaboration de N. Mareï (2012) d'après des données de l'annuaire 2011 de *Containerisation International*).

L'effervescence maritimo-portuaire qui règne autour de cette artère égyptienne grâce à l'importance croissante de la circulation maritime empruntant le détroit de Bab el Manded, le canal de Suez puis Gibraltar oblige à une sécurisation de cette région qui est devenue un maillon essentiel de l'axe Est-Ouest. Le contrôle des passages stratégiques, et plus particulièrement de la Méditerranée, considérée comme goulot d'étranglement à l'échelle

mondiale, est historiquement un enjeu stratégique et a depuis toujours mobilisé les grandes puissances. A l'issue de la Seconde Guerre mondiale, le jeu géopolitique est bouleversé. La France perd son influence sur la Méditerranée et les flottes américaine et britannique se partagent le contrôle de cette mer. La crise de Suez de 1956, en discrédidant les Anglais et les Français sur la scène internationale, marque le début du retrait des puissances européennes. La Grande-Bretagne conservera cependant Gibraltar ainsi que deux bases à Chypre (Akrotiri et Dhekelia) et la France une base à Djibouti. Parallèlement, la Seconde Guerre mondiale et la Guerre froide qui l'a suivie ont permis l'installation d'intérêts américains en Méditerranée avec la présence de le VI^{e} flotte appuyée par une dizaine de bases navales. En considérant les bases navales américaines et britanniques ainsi que celle des Etats riverains, il y aurait une centaine de bases en Méditerranée (RIDOLFI 1997). Ce dispositif sécuritaire est renforcé depuis les attentats du 11 septembre contre les Etats-Unis par une opération permanente de l'OTAN, *Active Endeavour*. Les navires de l'OTAN procèdent désormais systématiquement à des reconnaissances préparatoires des routes maritimes aux points de passage obligé ainsi que dans les couloirs maritimes et les ports importants dans toute la Méditerranée (Briefing OTAN, 2004). Ces missions de l'OTAN doivent prévenir les risques d'attentats terroristes tels que ceux qui s'étaient produits au large des côtes du Yémen contre le destroyer américain *USS Cole* en octobre 2000 et contre le pétrolier français *Limburg* en 2002. Même s'il n'y a jamais eu ce genre d'incident à Gibraltar ou à Suez, ces passages interocéaniques sont jugés particulièrement vulnérables du fait de leur localisation et de l'intensité des trafics.

Ces considérations de géostratégie maritime montrent que si les acteurs du jeu géopolitique ne sont plus les mêmes, les places stratégiques demeurent. L'Espagne, le Maroc, Malte, Chypre, l'Egypte deviennent des lieux à haute valeur économique et organisationnelle à l'échelle mondiale puisque les principaux *hubs* du réseau y prennent place. Les acteurs de cet échiquier sont les grands armateurs et opérateurs maritimes pour qui la sécurisation de cette enfilade de mers reliant l'Europe, l'Afrique et l'Asie est un préalable indispensable à la fluidité des échanges.

5. La trilogie hydrocarbures — conteneurs — autres marchandises

Dans les paragraphes précédents, l'évolution du trafic des marchandises au travers du canal de Suez n'a été présentée qu'en termes très généraux. Elle sera davantage détaillée dans cette avant-dernière section, qui propose une

analyse des mutations intervenues entre 2000 et 2012, quand ledit trafic a connu une véritable explosion par rapport aux chiffres enregistrés lors de sa réouverture en 1975 (fig. 7). Ce sont surtout les conteneurs qui furent sur le devant de la scène jusqu'en 2008 (CHARLIER 2008), avant que ne survienne une crise d'envergure mondiale qui a entraîné des changements considérables dans la structure du trafic suézien. Ils continuent à dominer (avec 398 Mt en 2012 sur les 740 Mt recensées au total) et leur part dans le trafic total a même encore augmenté (53,75 % contre 47,50 % en 2008), mais la structure directionnelle des échanges s'est inversée. Ainsi qu'il apparaît au tableau 5 *supra*, le courant *southbound* dépasse désormais légèrement le flux *northbound*, ce qui a une double explication: d'une part, le poids moyen des conteneurs en sortie d'Europe ne cesse d'augmenter, car on y trouve en proportion des cargaisons de relativement faible valeur mais plutôt pondéreuses; d'autre part, une portion croissante de ce trafic va, non pas en Asie orientale (d'où vient l'essentiel du flux *northbound*), mais au Moyen-Orient et dans le sous-continent indien (les boîtes vides étant alors repositionnées de ces deux régions en Asie orientale pour revenir en Europe ou en Amérique du Nord avec des cargaisons exportées depuis l'Asie orientale.

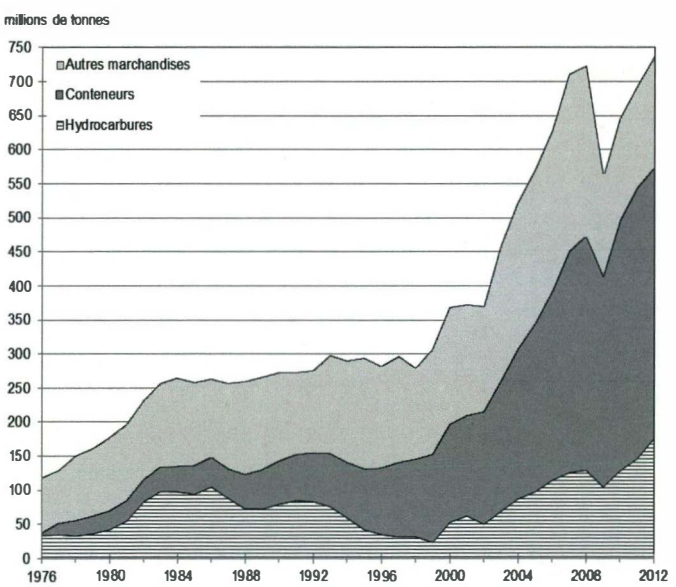


Fig. 7. — Evolution du trafic des marchandises sur le canal de Suez entre 1976 et 2012 (millions de tonnes) (élaboration de J. Charlier (2013) d'après des données de la *Suez Canal Authority*).

Bien plus spectaculaire cependant est le renforcement récent du flux d'hydrocarbures *southbound*. En 2000, ceux-ci ne comptaient que pour 8 Mt sur les 53 Mt enregistrées alors dans cette grande rubrique. En 2012, les chiffres correspondants étaient de 74 Mt sur 175 Mt, ce qui montre qu'une nouvelle géographie pétrolière est née récemment, mais qui ne se limite pas à ce sens de trafic, car le doublement du trafic *northbound* n'est par ailleurs pas un phénomène négligeable. D'une situation initiale dominée par des exportations massives de pétrole brut *northbound* (par le canal mais aussi par l'oléoduc SUMED qui le double depuis 1977 et transite depuis lors bien plus de brut que le canal), on est passé à une situation beaucoup plus complexe, que traduit le tableau 6. Celui-ci montre qu'on assiste désormais à une situation paradoxale au niveau du pétrole brut, puisque les 45 Mt enregistrées en 2012 à titre de flux *northbound* croisent un flux *southbound* de quelque 24 Mt de la même matière première! Ceci s'explique principalement par la montée en puissance des exportations de brut en provenance de la mer Noire, qui viennent désormais concurrencer dans l'océan Indien, voire à Singapour et au-delà, les exportations arabes et iraniennes.

Tableau 6

Evolution 2000-2012 du trafic des hydrocarbures sur le canal de Suez (millions de tonnes)

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Pétrole brut	***28,7***	***31,2***	***20,1***	***36,0***	***45,1***	***43,9***	***58,4***	***62,7***	***57,7***	***29,3***	***36,6***	***37,3***	***68,8***
Northbound	28,2	28,8	16,2	29,6	40,1	37,6	50,4	48,7	47,1	15,7	21,0	26,7	45,0
Southbound	0,5	2,4	3,9	6,4	5,0	6,3	8,0	14,0	10,6	13,6	15,6	10,6	23,8
Gaz naturel liquéfié	***2,0***	***2,5***	***4,4***	***2,9***	***5,3***	***5,9***	***8,4***	***10,9***	***12,2***	***17,5***	***33,1***	***43,0***	***31,3***
Northbound	2,0	2,5	4,4	2,7	5,0	5,5	5,4	6,1	6,5	16,5	30,8	38,0	25,8
Southbound	0,0	0,0	0,0	0,2	0,3	0,4	3,0	4,8	5,7	1,0	2,3	5,0	5,5
Autres hydrocarbures	***22,3***	***28,5***	***25,5***	***30,3***	***36,8***	***47,7***	***47,8***	***52,0***	***59,4***	***57,8***	***58,4***	***65,2***	***75,4***
Northbound	14,4	16,4	12,9	20,0	21,2	25,1	25,5	25,8	29,8	30,8	33,1	37,5	30,9
Southbound	7,9	12,1	12,6	13,3	15,6	22,6	22,3	26,2	29,6	27,0	25,3	27,7	44,5
Sous-total	**53,0**	**62,2**	**50,0**	**69,2**	**87,2**	**97,5**	**114,6**	**125,6**	**129,3**	**104,6**	**128,1**	**145,5**	**175,5**
Northbound	44,6	47,7	33,5	52,3	66,3	68,2	81,3	80,6	83,4	63,0	84,9	102,2	101,7
Southbound	8,4	14,5	16,5	16,9	20,9	29,3	33,3	45,0	45,9	41,6	43,2	43,3	73,8

Elaboration de J. Charlier (2013) d'après les rapports annuels de la *Suez Canal Authority*.

Autre évolution récente spectaculaire, celle du trafic du gaz naturel liquéfié, insignifiant en 2000 (2 Mt) et qui comptait en 2012 pour non moins de 31 Mt. Il s'agit d'un flux essentiellement *northbound*, principalement depuis le Qatar, confié à des unités Q-Max (pour *Qatarmax*) de 265 000 m³ qui sont tout aussi lucratives en termes de péage pour l'autorité du canal que les superpétroliers ou les mégaporte-conteneurs. Les modifications en perspective du mix énergétique européen, avec toujours plus d'autres sources que le pétrole brut, font que ce trafic est encore appelé à se renforcer. Elles rendent moins essentielle une nouvelle campagne d'approfondissement et d'élargissement du canal au profit des superpétroliers en charge, puisque le nombre de ceux-ci ne va sans doute plus beaucoup augmenter. Et ce d'autant que — autre tendance lourde du marché des hydrocarbures — les pays producteurs de pétrole privilégient de plus en plus les exportations de produits raffinés énergétiques ou pétrochimiques, qui leur procurent une valeur ajoutée supérieure si le raffinage se fait sur place plutôt que sur les lieux de consommation (même les grands majors occidentaux jouent cette carte, ainsi qu'en atteste la nouvelle raffinerie géante de Total à Jubail en Arabie Saoudite). Ceci explique le triplement enregistré au tableau 6 *supra* pour le poste des autres hydrocarbures, de moins de 25 Mt en 2000 à 75 Mt en 2012, avec là aussi des flux croisés qui s'expliquent à la fois par le souci de diversification géographique des approvisionnements de certains pays acheteurs et par la nature des produits raffinés concernés (l'Europe étant toujours davantage importatrice de diesel ainsi que de naphta et exportatrice d'essence). Et aussi un trafic *southbound* qui a dépassé le *northbound* en 2012, sans doute en lien avec des exportations massives de raffinés depuis la mer Noire (en renforcement de celles de pétrole brut mentionnées plus haut).

Le trafic suézien ne peut cependant être résumé aux hydrocarbures et aux conteneurs qui le dominent actuellement. En effet, il y a aussi la rubrique — autrefois dominante — des autres marchandises, qui est d'une incroyable diversité, que le tableau 7 ne reflète qu'imparfaitement puisqu'il se limite aux six principaux postes de trafic enregistrés actuellement ou dans un passé récent. Une analyse de détail montrerait que les cargaisons dites coloniales y ont un poids moindre que dans le passé, mais qui ne peut être négligé. En atteste le trafic des huiles végétales, qui relève évidemment désormais de pratiques industrielles post-coloniales en Asie du Sud-Est. Il s'agit d'un flux de près de 13 Mt en 2012 (essentiellement *northbound*, mais le flux inverse — d'origine récente — de 2 Mt ne manquera pas de surprendre), en forte augmentation par rapport aux 5 Mt enregistrées en 2000; il montre que le trafic des vracs liquides — à Suez et ailleurs — ne se limite pas aux hydrocarbures et qu'il y a d'autres types de navires-citernes à prendre en compte

(d'assez faible taille encore, mais là aussi la taille moyenne ne cesse d'augmenter, sans que cela devienne un problème pour les transits suéziens).

Tableau 7
Evolution 2000-2012 du trafic des principales autres marchandises sur le canal de Suez (millions de tonnes)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Huiles végétales	***4,9***	***6,3***	***6,3***	***6,6***	***7,0***	***8,5***	***9,1***	***8,7***	***9,6***	***8,7***	***10,5***	***10,6***	***12,7***
Northbound	4,4	5,9	5,9	6,2	6,7	8,2	8,8	8,3	9,3	7,7	9,3	9,4	10,7
Southbound	0,5	0,4	0,4	0,4	0,3	0,3	0,3	0,4	0,3	1,0	1,2	1,2	2,0
Céréales	***17,3***	***11,7***	***11,7***	***16,9***	***9,1***	***16,4***	***20,7***	***19,1***	***26,0***	27,7	***21,9***	***18,0***	***27,6***
Northbound	2,0	1,7	1,7	1,2	2,1	0,5	0,8	0,6	0,3	0,5	0,4	0,3	0,5
Southbound	15,3	10,0	10,0	15,7	7,0	15,9	19,9	18,5	25,7	27,2	21,5	17,7	27,1
Engrais	***15,3***	***17,1***	***19,7***	***20,1***	***19,8***	***26,0***	***23,9***	***19,7***	***21,7***	***11,2***	***12,9***	14,8	***15,4***
Northbound	1,4	1,8	2,0	3,5	3,5	3,7	2,1	2,6	3,1	0,6	1,3	2,5	4,7
Southbound	13,9	15,3	17,7	16,6	16,3	22,3	21,8	17,1	18,6	10,6	11,6	12,3	10,7
Charbon & coke	***36,5***	***38,5***	***25,5***	***49,8***	***66,4***	***58,6***	***67,5***	***74,6***	***71,1***	***13,3***	***16,1***	***11,8***	***11,1***
Northbound	36,4	38,4	25,4	49,7	64,0	56,4	66,2	73,3	67,5	11,8	14,6	9,8	7,9
Southbound	0,1	0,1	0,1	0,1	2,4	2,2	1,3	1,3	3,6	1,5	1,5	2,0	3,2
Minerais & déchets	***21,5***	***17,2***	***15,7***	***25,3***	***30,6***	***34,6***	***33,0***	***40,1***	34,1	***23,0***	***24,6***	***31,5***	***33,4***
Northbound	18,6	15,3	13,1	18,9	21,0	20,1	18,2	16,9	14,0	2,2	3,6	3,3	3,6
Southbound	2,9	1,9	2,6	6,4	9,6	14,6	17,8	23,2	20,1	20,9	21,0	28,2	29,8
Prod. métallurgiques	***31,8***	***31,9***	37,6	38,3	35,0	33,5	30,0	37,0	36,6	26,5	23,5	20,6	***23,7***
Northbound	5,2	4,4	4,1	3,6	6,5	5,0	12,6	18,8	14,2	2,8	5,0	5,5	4,6
Southbound	26,6	27,5	33,5	34,7	28,5	28,5	17,4	18,2	22,4	23,7	18,5	15,1	19,1

Elaboration de J. Charlier (2013) d'après les rapports annuels de la *Suez Canal Authority*.

Ledit tableau reprend ensuite quatre catégories de vracs solides, deux relevant de la filière agricole au sens large et deux de celle des pondéreux, avec dans le premier cas des évolutions assez linéaires et dans le second de fortes variations conjoncturelles. Pour ce qui est de la filière agricole, il s'agit principalement de céréales et d'engrais *southbound* (de respectivement 27 et 11 Mt en 2012, dans un contexte relativement stationnaire). S'agissant des pondéreux, on observe des variations récentes absolument spectaculaires. D'une part, le trafic *northbound* du charbon, qui a culminé à 71 Mt en 2008, s'est totalement effondré depuis lors, à seulement 11 Mt en 2012; cette

baisse de 60 Mt a provoqué un manque à gagner considérable pour l'Autorité du Canal (malgré les rabais qu'elle consentait) et s'explique par le basculement vers la route circumafricaine du trafic charbonnier entre l'Australie ou l'Indonésie et l'Europe, en raison de l'effondrement des taux de fret dans le secteur vraquier. D'autre part, la géographie du trafic des minerais et déchets s'est complètement inversée dans un contexte de croissance globale (en 2000, le flux *northbound* dominait largement avec 21 Mt sur 23 Mt, alors qu'en 2012, c'est le flux *southbound* qui représentait l'essentiel du trafic, avec 29 Mt sur 33 Mt). Le tableau 7 reprend par ailleurs la principale catégorie de diverses marchandises conventionnelles, les produits métallurgiques, dont le trafic reflète assez bien la conjoncture sidérurgique mondiale; dans ce cas, le flux *southbound* continue à dominer, avec 19 des 24 Mt recensées en 2012, mais les quatre dernières années furent nettement moins bonnes que les précédentes, dont trois (2006, 2007 et 2008) ont été marquées par une forte poussée du trafic *northbound*, en raison des temporaires capacités insuffisantes de production alors observées en Europe.

6. Vers un nouveau recalibrage du canal

Ce contexte de forte croissance de la plupart des trafics suéziens, en particulier d'hydrocarbures et de conteneurs, a incité les autorités égyptiennes à lancer en 2014 une nouvelle opération de recalibrage du canal. Celle-ci vise plus à augmenter la capacité de la voie d'eau, en fluidifiant la circulation des convois (avec une navigation assistée par satellite), en réduisant les délais d'attente et en permettant d'accueillir chaque jour plus de navires, qu'à accueillir des unités d'une taille supérieure aux 240 000 tpl actuels. Cette opération a été improprement nommée «second canal de Suez», car il s'agit en fait de continuer à dédoubler certaines sections de la voie d'eau, comme cela fut déjà fait antérieurement en plusieurs endroits. C'est sur le tiers central du canal que les efforts vont porter pour mettre en service à l'horizon d'août 2015 plusieurs tronçons en eau plus profonde (ce qui sera sans utilité réelle tant que le reste du canal n'est pas approfondi) et surtout plus larges encore.

Les deux convois descendants quotidiens ne devront ainsi plus jeter l'ancre (dans le Grand Lac Amer pour le premier et dans la Dérivation de Ballah pour le second) pour permettre leur croisement avec le convoi montant. La navigation pourra alors s'exercer à double sens sur un total de 72 km de part et d'autre d'Ismaïlia, avec du nord au sud (fig. 8):

— Une dizaine de kilomètres au niveau de la Dérivation de Ballah (élargie et approfondie);

— 35 km de nouvelle section à grand gabarit sur la rive asiatique entre ladite dérivation et la zone du Déversoir, avec en particulier un tracé rectiligne à hauteur du lac Timsha;
— Un nouveau chenal, à grand gabarit aussi, de 27 km dans le Grand Lac Amer juste à l'ouest de l'actuel.

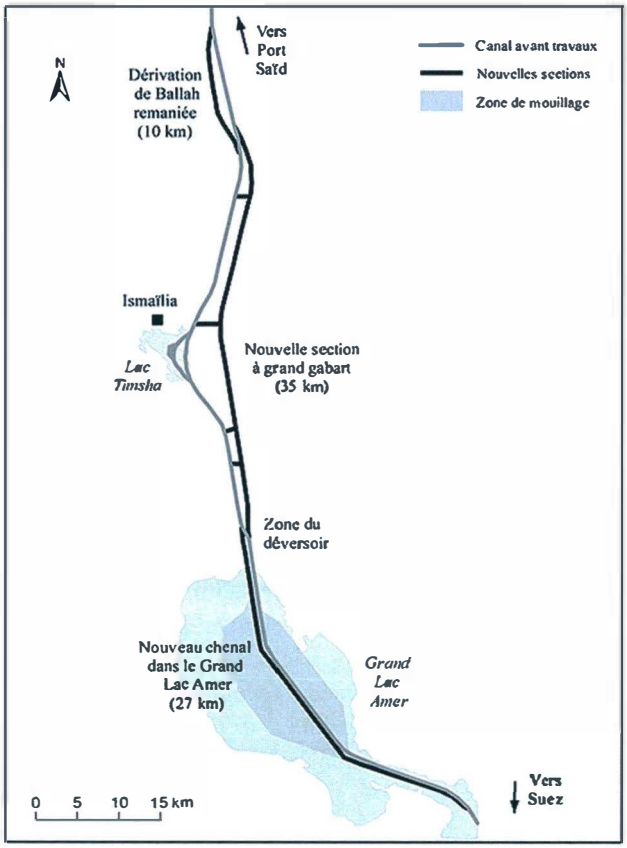


Fig. 8. — Les tronçons centraux du canal de Suez dédoublés à partir d'août 2015 (élaboration de J. Charlier et de S. Mbatchou (étudiant UCL en géographie) d'après un plan de l'Autorité du Canal de Suez).

Quatre rameaux transversaux ont par ailleurs été prévus sur la partie centrale pour faciliter la circulation des eaux entre la nouvelle section et l'ancienne, ainsi que le passage de l'une à l'autre d'unités de service (mais pas

de navires de mer, qui ne pourront changer de section qu'au sud de la Dérivation de Ballah, dans la zone du Déversoir et dans le Grand Lac Amer).

Le tout a nécessité le dégagement d'un demi-milliard de m³ de matériaux, pour moitié sous forme de dragages d'élargissement et d'approfondissement et pour moitié pour creuser à sec la nouvelle section de 35 km à l'est d'Ismaïlia. Vu la nature essentiellement sablonneuse de ces matériaux, l'opération est plus impressionnante par son extrême rapidité d'exécution (une douzaine de mois à peine) que par sa difficulté intrinsèque. Cinq lots de travaux ont été attribués à des entreprises de dragage étrangères (dont deux belges), alors que les Egyptiens se sont réservé le sixième lot. De très gros moyens techniques ont été mis en œuvre sur ces chantiers avec l'appui du complexe militaro-industriel égyptien, qui est également partiellement derrière les opérations de valorisation agricole, piscicole, industrielle, logistique et touristique qui prendront place dans la foulée du recalibrage de la voie d'eau, sur cette section centrale mais aussi aux deux extrémités du canal autour de Port-Said et de Suez/Ain Sukhna. Plusieurs tunnels sont également en cours de réalisation en marge du projet pour mieux connecter le Sinaï au reste du pays.

Le coût du recalibrage proprement dit a été estimé par la revue *Dredging Today à* $ 2,6 milliards, dont $ 2,1 milliards pour les dragages et $ 0,5 milliards pour les excavations à sec, que l'autorité du canal compte récupérer au travers des péages acquittés par les navires pour emprunter le canal. Elle espère qu'il pourra assurer une centaine de transits quotidiens à l'horizon 2023, contre une cinquantaine avant le lancement des travaux, et en retirer alors un revenu annuel supérieur à $ 12 milliards, contre moins de la moitié auparavant. Cela implique cependant que la demande rencontre cette spectaculaire augmentation de la capacité offerte pour que les Egyptiens (qui ont assuré seuls le financement des travaux, principalement au travers d'une sorte de souscription nationale) rentrent dans leurs frais au terme d'une opération qui a, au sein même du pays, ses partisans et ses détracteurs (KENAWY 2015).

7. Conclusion

Dès son percement, le canal de Suez est devenu un lieu unique de concentration des flux commerciaux entre l'Europe et l'Asie. Son gabarit évolutif, grâce à l'absence d'écluses, lui a permis de revenir sur la scène internationale malgré les difficultés géopolitiques et de s'adapter à la frénésie de grandeur du transport maritime mondial. Il est désormais un passage obligé de la route

maritime Est-Ouest même s'il ne règne pas sans partage, en particulier pour les trafics de vracs, comme le charbon, pour lesquels la route du Cap demeure parfois plus avantageuse. Il est également un formidable objet d'étude et un observatoire pour comprendre l'évolution des échanges mondiaux, tant les grands basculements se répercutent sur son trafic.

Aujourd'hui, son rôle dans le règne des conteneurs, qui est un ordre de fluidité, de grandeur, de vitesse, semble incontesté. Si ces circulations marchandes semblent survoler les territoires pour le bon fonctionnement de la mondialisation des échanges, que se passerait-il si les soubresauts de la vie politique moyen-orientale reprenaient le dessus? Cette question brûle les lèvres en raison de la diversification croissante du trafic et de l'instabilité régionale grandissante, mais les inquiétudes sont toutes relatives au regard de l'étonnante capacité d'abstraction des contextes régionaux des acteurs et des réseaux de la circulation marchande internationale.

BIBLIOGRAPHIE

CHARLIER, J. 1990. Le deuxième souffle du canal de Suez. — *Transports*, **341**: 314-321.

CHARLIER, J. 2008. Le canal de Suez à l'heure post-pétrolière. — *In*: GUILLAUME, J. (éd.), Les transports maritimes dans la mondialisation. Paris, L'Harmattan, pp. 69-78.

CNUCED 2012. Etude sur les transports maritimes 2011. — New York, Nations Unies, 252 pp. [en ligne], disponible à l'adresse <unctad.org/fr/Docs/rmt2011 fr.pdf>.

DE LESSEPS, F. & SABBATIER, J. 1867. Conférence de M. Ferdinand de Lesseps à Nantes sur le canal maritime de Suez au Cercle des Beaux-Arts le 8 décembre 1866. — Paris, Imprimerie Centrale des Chemins de Fer, 42 pp.

DESSOUKI, S. 1982. The Suez Canal. Changing World, 1956-2000. — London, Heinemann, 148 pp.

FREMONT, A. 2003. Quelles stratégies portuaires face aux armements de lignes régulières? — *In:* Actes de la 8e Conférence Internationale des Villes portuaires (Dalian, 22-25 octobre 2002). Le Havre, Association Internationale Villes et Ports, pp. 37-89.

FREMONT, A. 2007a. Le monde en boîtes: conteneurisation et mondialisation. — Arcueil, INRETS, *coll. Synthèses*, **53**, 145 pp.

FREMONT, A. 2007b. Global maritime networks. The case of Maersk. — *Journal of Transport Geography*, **15**: 431-442.

GUILLAUME, J. 1999. Le canal de Suez à la fin du XXe siècle. — *Cahiers Nantais*, **52**: 35-44.

KENAWY, E. 2015. The expected economic effects of the new Suez Canal project in Egypt. — *European Journal of Academic Essays*, **1** (12): 13-22.

LE MARIN (éd.) 2013. L'Atlas 2012 des enjeux maritimes. — Rennes, Marines Editions, 124 pp.

LOMBARD, J. & NINOT, O. 2010. Connecter et intégrer. Les territoires et les mutations des transports en Afrique. — *Bulletin de l'Association des Géographes Français*, **87**: 69-86.

MARCADON, J. 1999. Enjeux économiques et politiques des pertuis maritimes. — *Bulletin de l'Association des Géographes Français*, **76**: 293-302.

MARCADON, J. 2002. Géographie portuaire de l'espace euro-méditerranéen. — *Méditerranée*, **98**: 55-66.

MAREI, N. 2006. Un lieu d'observation de l'économie mondiale: le canal de Suez. Rôle économique de 1975 à 2005. — Mémoire de maîtrise en géographie, Université de Nantes, 109 pp.

MAREI, N. 2012. Le détroit de Gibraltar, Porte du Monde, Frontière de l'Europe. Analyse et perspectives de territorialité d'un espace de transit. — Thèse de doctorat en géographie, Université de Nantes, 412 pp.

MONTEL, N. 1999. Le chantier du canal de Suez (1859-1869). Une histoire des pratiques techniques. — Paris, Presses de l'Ecole Nationale des Ponts et Chaussées, 382 pp.

NOTTEBOOM, T. 2012. Towards a new intermediate hub region in container shipping? Relay and interlining via the Cape route vs. the Suez route. — *Journal of Transport Geography*, **22**: 164-178.

PIQUET, C. 2008. La Compagnie du canal de Suez. Une concession française en Egypte (1858-1956). — Paris, Presses de l'Université de Paris Sorbonne, 632 pp.

RIDOLFI, G. 1997. Geostrategy and naval power in the Mediterranean: Changing scenarios, continuing conflicts. — *Marine Policy*, **21**: 377-390.

RODRIGUE, J.-P. 2004. Straits, passages and choke points: a maritime geostrategy of petroleum distribution. — *Cahiers de Géographie du Québec*, **48**: 357-374.

SIEGFRIED, A. 1940. Suez, Panama et les routes maritimes mondiales. — Paris, A. Colin, 298 pp.

TOURRET, P. 2007. Les nouvelles échelles du transport maritime. — *Notes de Synthèse ISEMAR*, **91**: 1-4.

VERLAQUE, C. 1975. Géographie des transports maritimes. — Paris, Doin, 437 pp.

VIGARIE, A. 1979. Ports de commerce et vie littorale. — Paris, Hachette, 496 pp.

VIGARIE, A. 1995. La mer et la géostratégie des nations. — Paris, Economica, 428 pp.

International Colloquium
Interoceanic Canals and World Seaborne Trade: Past, Present and Future
Royal Academy for Overseas Sciences
Port of Antwerp
World Association for Waterborne Transport Infrastructure
Brussels, 7-9 June 2012
pp. 109-120

Le détroit de Gibraltar, un carrefour international réactivé

par

Nora MAREI*

MOTS-CLES. — Détroit international; Mer Méditerranée; *Hub*; Circulations marchandes; Réseaux maritimes conteneurisés.

RESUME. — La conteneurisation propulse le détroit de Gibraltar au cœur de grands circuits d'échanges de biens manufacturés et modifie en quelques décennies son organisation portuaire. Les ports d'Algeciras et de Tanger-Med deviennent ainsi des cas d'école pour comprendre les répercussions de la circulation maritime internationale sur les littoraux et sur les bassins maritimes situés en position de passage obligé. Le détroit de Gibraltar figurant aujourd'hui parmi les voies de passage interocéaniques essentielles à l'efficacité et à la fluidité de la navigation commerciale mondiale, son étude relève de la géoéconomie et de la géopolitique internationale.

1. Introduction

Espace de jonction intercontinentale et interocéanique, le détroit de Gibraltar est plus que jamais un passage stratégique pour la navigation mondiale. Depuis toujours, des places portuaires, souvent en position d'extraterritorialité, ont cherché à profiter de ce carrefour entre Europe, Afrique et Asie: Gibraltar, fermement tenu par les Britanniques depuis 1704; Tanger, qui devient une ville internationale entre 1925 et 1960; Algeciras et Tanger-Med, nouveaux rois du détroit et archétypes d'un fonctionnement portuaire au service du réseau (GUILLAUME 2002) et déspatialisé (DEBRIE *et al.* 2005).

C'est la conteneurisation, révolution des modes de transport des marchandises diverses, qui propulse le détroit au cœur de grands circuits d'échanges de biens manufacturés et qui modifie en quelques décennies sa physionomie

* Chargée de recherches CNRS, UMR 8586 PRODIG (Pôle de Recherche pour l'Organisation et la Diffusion de l'Information Géographique), rue Valette 2, F-75005 Paris (France).

portuaire. L'ascension spectaculaire d'Algeciras et la naissance du port de Tanger-Med s'inscrivent dans ces logiques de restructuration des manières de circuler en mer et demeurent des cas d'école pour en comprendre le fonctionnement.

2. Le détroit de Gibraltar dans les réseaux mondialisés du transport

En quelques décennies, le détroit de Gibraltar est devenu une plate-forme multisites d'éclatement des conteneurs, soit un nœud essentiel dans les réseaux de grands opérateurs internationaux. Cette fonction, incarnée par le binôme Algeciras – Tanger-Med, est permise par l'installation de terminaux permettant un accueil massif du trafic marchand (capacité à terme de quinze millions EVP). Associée à une fonction de soutage *(bunkering)* développée surtout aux ports de Gibraltar et d'Algeciras (ACOSTA *et al.* 2011), cette organisation nouvelle réactive le rôle du détroit sur les routes maritimes mondiales.

2.1. ALGECIRAS, LE *HUB* INTERCONTINENTAL DU DETROIT

Les premiers chiffres disponibles concernant le trafic du port d'Algeciras sont ceux de l'année 1968. Ils font état de trois types de trafic: la pêche débarquée au port, près de cinquante mille tonnes, un des chiffres les plus élevés d'Espagne à l'époque; le flux de passagers d'origine et de destination maghrébine; et des flux de vracs liquides (produits chimiques et pétroliers) qui représentent alors 97,8 % des trafics du port (6,5 Mt) et dont un tiers alimente le cabotage national. L'ouverture internationale est limitée et apportée par quelques lignes à destination de l'Amérique du Sud. C'est l'arrivée de l'armement Sealand en 1975, puis de Maersk en 1986, qui changeront radicalement la structure du trafic au point de faire d'Algeciras un des premiers ports européens de la conteneurisation.

Tout d'abord, l'arrivée de Sealand apporte une première diversification du trafic et une ouverture de l'avant-pays. L'opérateur américain déploie sept lignes régulières hebdomadaires: une ligne triangulaire entre Rotterdam, Algeciras et Elizabeth (New Jersey), deux lignes vers le golfe Persique et les quatre dernières animent un réseau ouest-méditerranéen. Maersk s'installe ensuite en 1985 avec trois lignes bimensuelles et élargit l'avant-pays à l'Afrique de l'Ouest, l'Extrême-Orient et l'Europe du Nord dont la desserte sera renforcée en 1987 par une ligne directe entre la rangée nord et Algeciras.

La figure 1 permet de voir les premiers pas de Maersk au départ de son *hub* dédié et une desserte vers tous les continents de la planète. Enfin, les ambitions de desserte globale au départ du *hub* espagnol se concrétisent réellement avec le rachat de Sealand en 1999. Dès 2000, vingt-cinq lignes régulières peuvent être dénombrées au départ d'Algeciras (lignes longues et *feeders)*, trente-huit en 2004 et quarante et une en 2011 (fig. 2) (MAREI 2012).

Le succès du port d'Algeciras a mené à la saturation des terminaux à conteneurs Juan Carlos I et de la *Isla Verde Interior* (terminal du groupe espagnol *Acciona* [1]*). Cet état de fait, associé à des prévisions de doublement du trafic conteneurisé d'ici 2025, a conduit l'APBA à s'engager dans le projet *Isla Verde Exterior*. Cent deux hectares de terre-pleins et 2 040 m de quais nouveaux, gagnés sur la mer, sont dédiés au trafic conteneurisé et exploités depuis mai 2010 par la compagnie maritime coréenne Hanjin Shipping, sur un terminal portant le nom de *Total Terminal International Algeciras* (TTI-A). Le port d'Algeciras devient ainsi «multi-opérateurs» après plus de vingt ans de règne de Maersk. Le terminal *Isla Verde Exterior* devrait permettre une nouvelle croissance rapide du trafic conteneurisé du port grâce à une capacité supplémentaire de 1,2 M EVP. Le second grand projet de l'APBA est le développement des installations portuaires de Campamento au nord-est de la baie: 74 ha de terre-pleins nouveaux et des quais de 15,5 à 18,5 m de profondeur. Ces installations sont dédiées au renforcement de l'activité maritime industrielle comme la construction d'un terminal de GNL offshore pour Exxon-Mobil en 2006.

Le succès du port d'Algeciras se traduit également spatialement par l'étalement des remblais portuaires sur la mer afin de supporter, en particulier, la hausse de l'activité conteneurisée, activité réputée pour sa consommation d'espace relative au stockage des boîtes (fig. 3).

2.2. TANGER-MED, NOUVEAU *HUB*, NOUVELLES STRATEGIES

Sur l'autre rive du détroit, le Roi du Maroc annonce, à l'occasion de son intronisation en juillet 2002, le lancement d'une opération d'aménagement d'envergure: il s'agit de construire de toutes pièces, à 40 km à l'est de Tanger, un port en eau profonde, structuré principalement autour de terminaux à conteneurs (fig. 4). La première phase du projet comprend deux terminaux à conteneurs de capacité identique (1,5 million de conteneurs chacun), avec deux fois 800 m de quais, soit quatre postes à quai pour des navires de 16 à 18 m de tirant d'eau, et 80 ha de terre-pleins en arrière des quais. Il est

* Le chiffre entre crochets [ ] renvoie à la note, p. 120.

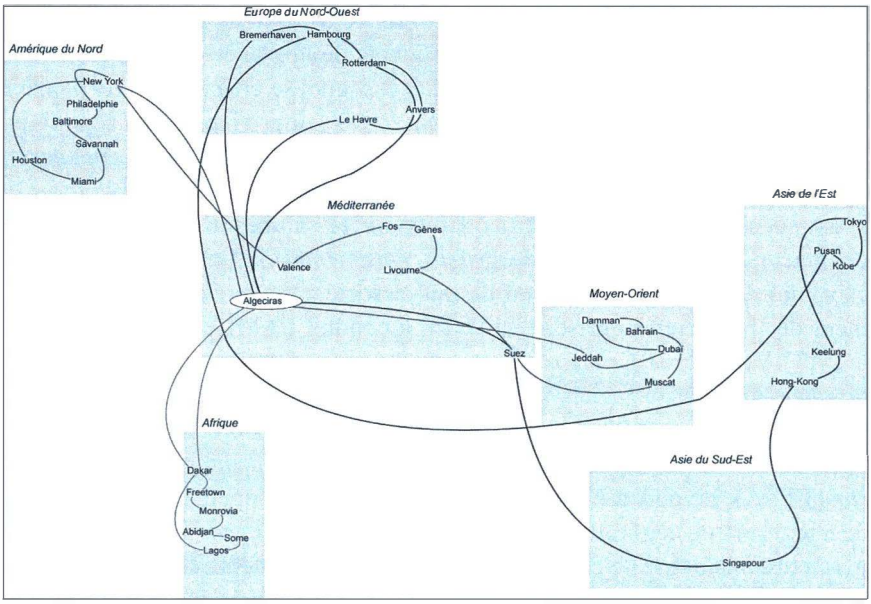


Fig. 1. — Les premières rotations de Maersk au départ d'Algeciras (fin des années 1980). Réalisation: N. Mareï d'après les archives de l'APBA.

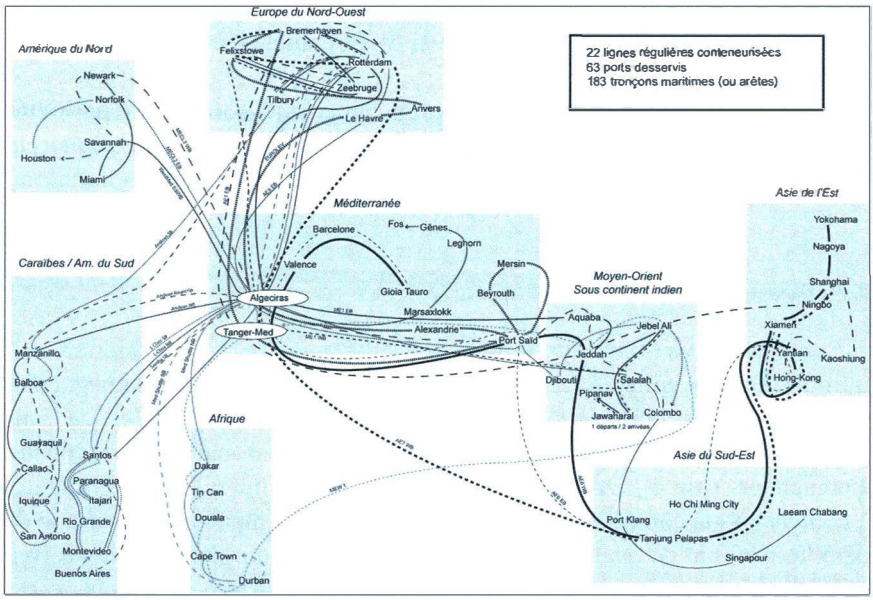
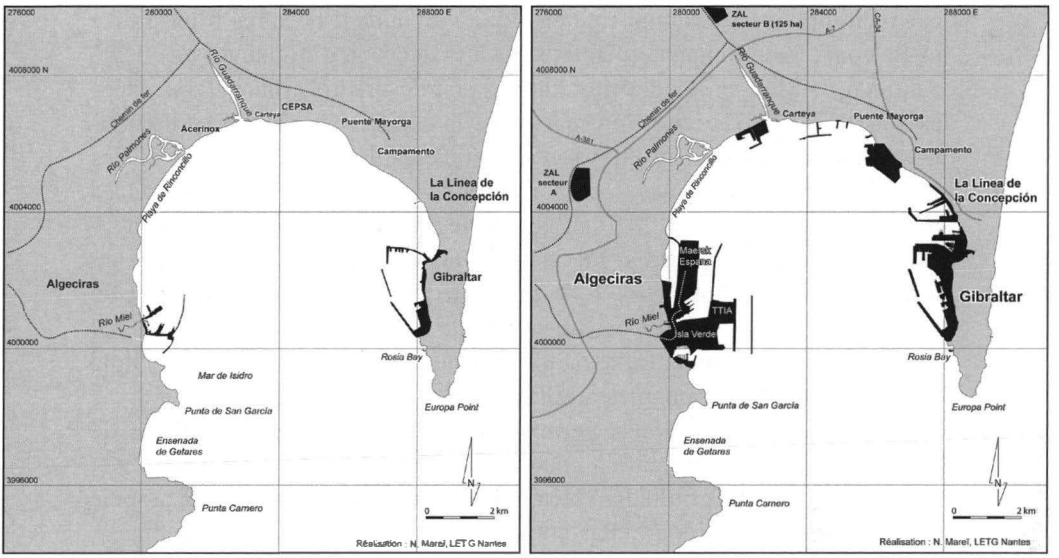


Fig. 2. — Réseau principal de Maersk faisant escale dans les ports du détroit en 2011. Réalisation: N. Mareï (mars 2011).



(a) 1956 (b) 2009

Fig. 3. — Evolution diachronique des infrastructures portuaires de la baie d'Algeciras 1956-2009, d'après Marei 2012.

Fig. 4. — Terminaux à conteneurs de Tanger-Med 1 (photo: N. Marei, avril 2008).

également prévu un terminal roulier d'une vingtaine d'hectares (dont treize ont été concédés à Renault en 2008, suite à sa décision d'implanter une usine de montage à Melloussa), des installations pour les hydrocarbures (concédées dès 2005 à HTTSA, consortium piloté par la société marocaine de distribution de produits pétroliers Akwa et des sociétés du Moyen-Orient) et des installations pour les vracs secs. Un port destiné aux ferries, avec accès propre, fonctionne depuis 2010 au voisinage immédiat du port précédent.

Le premier appel d'offres, lancé en 2004, a concerné la concession du premier terminal à conteneurs. Il est remporté par APM Terminals (filiale de Maersk), associée à Akwa, pour une durée de trente ans. Le second terminal revient à Eurogate Tanger (associant Eurogate- Contship, opérateur de Gioia Tauro, et les deux compagnies maritimes MSC et CMA CGM).

Le succès de l'opération a permis d'enclencher la deuxième phase de développement des terminaux à conteneurs (Tanger-Med 2 avec les TC3 et 4, attribués à APM Terminals-Akwa, d'une part, et à Marsa Maroc, associé à PSA et SVI, d'autre part. Par conséquent, dans sa configuration finale, Tanger-Med doit avoir une capacité de traitement de huit millions EVP (dont trois millions pour la première phase). Au regard des 2 M EVP enregistrés en 2011, l'initiative marocaine est un succès. Elle consolide le rôle du détroit dans les réseaux mondialisés du transport.

Désormais, sur les rives du détroit, les trafics conteneurisés sont orchestrés par trois des dix plus importants opérateurs mondiaux. Hanjin est venu bouleverser une situation monopolistique à Algeciras et ainsi confirmer une implantation des opérateurs asiatiques en Méditerranée et leur rôle de plus en plus prépondérant sur le grand ring Est-Ouest (Fremont 2007). CMA-CGM a conforté son rôle en Méditerranée occidentale, et en particulier au Maroc, en rachetant l'armement national CoMaNav. Et Maersk, opérateur historique du détroit, organise une plate-forme bicéphale sur ce dernier, en jouant du binôme Tanger-Med/Algeciras. Cette stratégie de multiplication des *hubs* se retrouve tout au long de la route maritime Est-Ouest qui relie les différents pôles de la Triade.

3. Consolidation des échanges Est-Ouest et restructuration des relations maritimes

3.1. Definition de la route maritime Est-Ouest

En 1661, grâce à une dot de Catherine de Bragance, princesse du Portugal, à son futur époux le roi Charles d'Angleterre, Tanger devient une ville de

garnison anglaise (MIEGE *et al.* 1992). Trente ans plus tard, c'est Gibraltar qui est prise par les Anglais et demeure aujourd'hui une sorte de territoire d'outre-mer britannique. Tanger est à nouveau l'objet de convoitises au début du XX[e] siècle et finit par devenir une ville internationale en 1925, statut qui perdure jusqu'à la pleine indépendance du Maroc en 1956, et même jusqu'en 1960, année où le gouvernement marocain abolit les derniers avantages fiscaux de la ville, à la seule exception d'une zone franche. Le contrôle naval du détroit est bien évidemment au cœur de ces luttes d'influence qui donneront naissance aux ports du détroit.

Avec l'inauguration du canal de Suez en 1869, Gibraltar devient une porte de l'Asie et verra se consolider un axe maritime supportant aujourd'hui la majorité du trafic international: la route maritime Est-Ouest (fig. 5). Cette route est remarquablement dense et sillonnée par les plus gros navires de la planète.

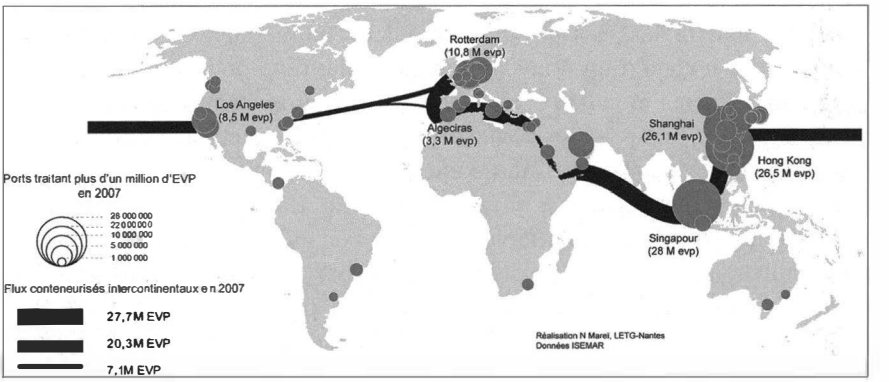


Fig. 5. — La route maritime Est-Ouest et les grands ports conteneurisés du monde, d'après MAREI 2012.

L'axe maritime Est-Ouest peut être défini selon quatre points caractérisant une route maritime: l'origine et la destination, l'itinéraire, le type et les volumes de marchandise, le type d'organisation entre les partenaires (MARCADON 2005). La route Est-Ouest peut donc être définie de la manière suivante:

— C'est une route transocéanique reliant les ports de chargement et de déchargement majeurs des trois pôles de la Triade, moteurs du commerce international;
— Elle est déterminée par l'itinéraire le plus court utilisant les passages interocéaniques que sont les canaux transisthmiques de Panama et Suez ainsi que les détroits du Pas de Calais, de Gibraltar, de Bab el Mandeb, d'Ormuz et de Malacca;

— Cette route est principalement le fait d'un transport de marchandises diverses de plus en plus conteneurisées et est empruntée par les plus gros porte-conteneurs du monde;
— Enfin, sur cette route s'exercent avec force les concepts de *hub and spokes* et de *feedering* en lien avec la restructuration du transport maritime, en particulier grâce à l'émergence d'acteurs globaux aux commandes de ces bouleversements.

3.2. Structuration de l'axe Est-Ouest

Cette grande route maritime Est-Ouest qui ceinture le globe met donc en relation l'Amérique du Nord, l'Europe et l'Asie, et incarne la réalité d'une économie maritime mondialisée qui ne cesse de croître. Héritière des routes mises en place par les Chargeurs Réunis dès 1953, la circumnavigation à but commercial a été systématisée par *US Lines* et *Evergreen* à partir de 1984. Dans ce contexte, les passages internationaux comme Suez ou Gibraltar sont devenus des nœuds d'un nouveau maillage maritime orchestré par les plus grands armements mondiaux. En créant un réseau maritime mondial et hiérarchisé par le jeu des lignes *feedering* et des lignes satellites nord-sud, l'armateur danois Maersk a ainsi initié une restructuration des logiques qui gouvernent le transport maritime mondial. Très vite, le choix de cet armement à l'ambition globale s'est tourné vers un port comme Algeciras, sur le détroit de Gibraltar, afin d'en faire un de ces ports pivots (Vigarie 1995, Guillaume, 2005, Fremont 2007). Cette localisation n'est pas le fruit du hasard; à la croisée des chemins entre Atlantique et Méditerranée et entre Europe et Afrique, le port est parfaitement placé pour devenir une plate-forme d'éclatement des conteneurs. Le détroit de Gibraltar devient ainsi un laboratoire de la restructuration des réseaux maritimes. L'arrivée du port de Tanger-Med face à Algeciras confirme cette idée.

En résonance avec Gibraltar, Malacca est l'autre grand détroit de cet axe maritime. Dans son orbite, des stratégies similaires de multiplication des *hubs* sont visibles. Ces dernières confirment l'importance des passages interocéaniques sur le ring Est-ouest et dans les processus de réticulation de la circulation maritime.

Ainsi, la partie euro-asiatique de cette route passant par l'océan Indien et la Méditerranée est une des plus dynamiques comme l'atteste la croissance du trafic conteneurisé entre l'Europe et l'Asie, qui a atteint 27,7 millions de boîtes équivalant à vingt pieds (EVP) sur plus de cinquante-cinq millions en 2007 (trafic Est-Ouest uniquement). Le maillon pacifique comptabilise 20,3 millions d'EVP en 2007, année où il est dépassé une première fois par

les échanges eurasiatiques. Enfin, les quelques 7,1 millions de la voie transatlantique sont la trace d'un certain glissement du centre de gravité économique du monde (CNUCED 2008).

L'organisation de cette route est révélatrice du nouvel ordre des échanges qui gouverne le commerce mondial: maritimisation croissante de l'économie; asiatisation des flux liée à la nouvelle place de l'Asie pacifique dans l'économie mondiale; fonctionnement en réseaux, en particulier mise en place de réseaux maritimes conteneurisés.

4. De Suez à Gibraltar, nouvelles centralités régionales et mondiales

4.1. Une nouvelle Mediterranee portuaire

Logiquement, les *hubs* sont placés sur les routes qui sont les mieux alimentées. Sur la grande route Est-Ouest qui relie les différents pôles de la Triade, on peut estimer qu'en 2008 (CNUCED 2008) circulent près de la moitié des boîtes convoyées (54,5 millions d'EVP, dont 27,2 millions dans les deux sens des flux entre l'Europe et l'Asie). C'est donc sur ce ring, et singulièrement en Méditerranée, que la compétition est forte pour le développement des *hubs*.

Algeciras, Gioia Tauro, Marsaxlokk, Valence, Le Pirée, Damiette, Port-Saïd ont connu des progressions stupéfiantes. Par exemple, Gioia Tauro, ouvert en 1995, enregistre déjà, dix ans plus tard, plus de 3,1 millions d'EVP et talonne Algeciras. Il convient cependant de rappeler que ces trafics sont fragiles, car soumis à l'instabilité des stratégies des opérateurs, de moins en moins nombreux mais de plus en plus puissants. En fait, il faut souligner que cette émergence s'inscrit dans une totale refonte de la circulation des marchandises à l'échelle mondiale: concentration des opérateurs (les trois premiers armements font déjà près de 40 % de la capacité de charge des porte-conteneurs cellulaires en 2008, les trois premiers manutentionnaires contrôlent la même année près du quart du marché portuaire); intégration verticale des métiers du transport; décloisonnement des lignes, marqué par l'effacement des conférences et l'élaboration de services pendulaires.

La Méditerranée est indéniablement au cœur de ces changements et ses ports les plus actifs sont ceux développés dans ces logiques d'économies d'échelle. Aujourd'hui, Port-Saïd, Gioia Tauro, Algeciras ou Tanger-Med sont des ports de transbordement développés selon une logique de réseau. Ce statut de port au service du réseau d'un opérateur mondial en fait des places

portuaires incontournables. Leur avantage comparatif se résume à une situation optimale sur la grande route du commerce maritime Est-Ouest (fig. 6). Ils permettent donc une déviation minimale par rapport à la route Est-Ouest et autorisent à pousser au maximum les économies de coût et de temps.

Tout au long de la route circumterrestre, des ports bénéficiant de cette logique de réseau peuvent être identifiés. Ces *intermediate hubs* (NOTTEBOOM 2012) sont souvent positionnés sur un passage obligé, comme Singapour et Tanjung Pelapas sur le détroit de Malacca, Colón et Balboa au débouché du canal de Panama, ou encore Kingston dans l'orbite de ce même canal. La situation de porte océanique devient alors une nodalité privilégiée dans un système de réseau mondialisé. C'est à travers cette situation de nœuds d'un réseau maritime mondial que les passages interocéaniques retrouvent une valeur stratégique sur la scène internationale.

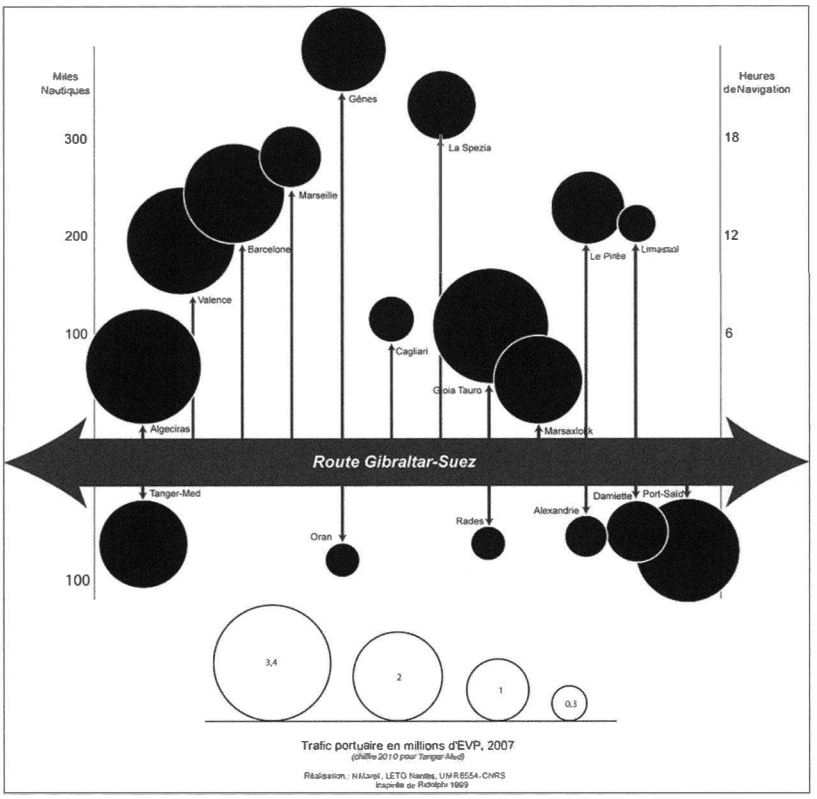


Fig. 6. — Déviation de la route directe Gibraltar-Suez vers les ports méditerranéens, d'après MAREI 2012.

4.2. Des strategies d'insertion dans la mondialisation des echanges

Un autre élément de ce contexte de mondialisation des échanges, fortement lié aux logiques de rentabilisation des manières de circuler, mérite d'être signalé. Il tient aux stratégies organisationnelles et spatiales des firmes connues sous le nom de «Division internationale des Processus de Production» (DIPP) et qui ont notoirement évolué au cours des dernières décennies du XX^{e} siècle.

La complexification récente du mouvement de DIPP permet de relativiser la notion de coûts comparés dans la mise en concurrence internationale (Moati & Mouhoud 2005). Ces auteurs mettent en avant la compétitivité des territoires comme «avantage absolu», en particulier dans le processus de division cognitive du travail. Ils montrent alors que la DIPP est affectée par des «forces de polarisation qui marquent une évolution contemporaine de la géographie économique». Ces mutations se retrouvent sur l'ensemble de la chaîne, les secteurs manufacturiers et de services compris, puisque, d'une manière générale, le renforcement des contraintes de flexibilité et de compétitivité favorise une régionalisation de la DIPP autour des principales zones de marché. S'opère alors une sélection spatiale au profit des pays combinant à la fois des avantages en termes de coûts salariaux et/ou de maîtrise technologique et une position géographique favorable par rapport aux grands courants d'échange.

On retrouve cette philosophie générale dans les choix d'investissement de la plupart des *hubs*. La décision de construire Tanger-Med s'accompagne ainsi de la délimitation d'une zone spéciale de développement, d'une surface de 550 km^2, organisée autour de différentes zones franches. La localisation sur le détroit de Gibraltar, entre les marchés européens et maghrébins, est présentée comme un avantage comparatif par les porteurs du projet. Le parallèle avec le modèle de la zone économique spéciale chinoise adossée à un port d'exportation est facile à faire, mais dans les faits et malgré l'installation de Renault à Meloussa, Tanger-Med n'en est pas là et demeure, sur la route maritime Est-Ouest, un lieu supplémentaire de triage de boîte.

5. Conclusion

Le percement du canal de Suez a joué un rôle décisif dans la réactivation du rôle de carrefour international du détroit de Gibraltar. Les deux passages interocéaniques sont donc en résonance directe, la Méditerranée n'étant ici qu'une simple zone de transit. Ainsi, cette Méditerranée devenue elle-même goulet laisse entrevoir une certaine prédisposition à l'émergence de *hubs* et à un fonctionnement au service de la circumnavigation. Dans cette logique,

l'organisation en *hub and spokes*, multiscalaires et multidirectionnelles autour des ports du détroit, apparaît comme un système performant et fait du détroit de Gibraltar un véritable observatoire des dynamiques maritimes et portuaires internationales.

NOTE

[1] Terminal qui a cependant souffert de la crise et cessé de fonctionner depuis 2009.

BIBLIOGRAPHIE

ACOSTA, M., CORONADO, D. & DEL MAR CERBAN, M. 2011. Bunkering competition and competitiveness at the ports of the Gibraltar Strait. — *Journal of Transport Geography*, **19**: 911-916.

CNUCED 2008. Etude sur les transports maritimes. — New York, Publication des Nations Unies, 214 pp. [en ligne], disponible à l'adresse <unctad.org/fr/Docs/rmt2008 fr.pdf>.

DEBRIE, J., ELIOT, F. & SOPPE, M. 2005. Un modèle transcalaire des modalités et polarités portuaires: exemple d'application au port d'Hambourg. — *Mappemonde*, **79** (3), 12 pp.

FREMONT, A. 2007. Le monde en boîtes: conteneurisation et mondialisation. — Arcueil, INRETS, *coll. Synthèses*, **53**, 145 pp.

GUILLAUME, J. 2002. Réseaux portuaires, segments de façades et recompositions régionales. — *In*: Réseaux de transport, flux et recompositions régionales (actes des journées de la commission de géographie des transports, Le Havre, 5-6 septembre 2001), pp. 7-13.

GUILLAUME, J. 2005. Les routes maritimes, leurs traces et leurs marques. Le monde en réseaux. Lieux visibles, liens invisibles. — *In*: Actes 16e Festival international de Géographie (St-Dié-des-Vosges, 30 septembre – 2 octobre 2005) [en ligne].

MARCADON, J. 2005. Les grandes routes maritimes. — *Questions Internationales*, **14**: 40-48.

MAREI, N. 2012. Le détroit de Gibraltar, Porte du Monde, Frontière de l'Europe. Analyse et perspectives de territorialité d'un espace de transit. — Thèse de doctorat, Université de Nantes, 412 pp.

MIEGE, J.-L., BOUSQUET, G., DENARNAUD, J. & BEAUFRE, F. 1992. Tanger: porte entre deux-mondes. — ACR Edition, 288 pp.

MOATI, P. & Mouhoud, E. M. 2005. Les nouvelles logiques de décomposition internationale des processus productifs. — *Revue d'Economie Politique*, **115** (5): 573-589.

NOTTEBOOM, T. 2012. Towards a new intermediate hub region in container shipping? Relay and interlining via the Cape route vs. the Suez route. — *Journal of Transport Geography*, **22**: 164-178.

RIDOLFI, G. 1997. Geostrategy and naval power in the Mediterranean: Changing scenarios, continuing conflict. — *Marine Policy*, **21** (4): 377-390.

VIGARIE, A. 1995. La mer et la géostratégie des nations. — Paris, Economica, 428 pp.

International Colloquium
Interoceanic Canals and World Seaborne Trade: Past, Present and Future
Royal Academy for Overseas Sciences
Port of Antwerp
World Association for Waterborne Transport Infrastructure
Brussels, 7-9 June 2012
pp. 121-138

Piracy in the Indian Ocean, a Strategic or a Criminal Threat?

by

Eric CARREY*

Among the six million cars in Belgium, about sixteen thousand were stolen last year. It means 0.2 % of the total amount. I have a personal thought for those who are facing such a destabilizing situation but if they want to cheer themselves up, they can have a glance at what happens over the oceans.

According to the CIA World Factbook, the world total number of one thousand or over Gross Register Tons merchant ships was roughly fifty thousand. Four hundred and forty-five attacks were reported to the International Maritime Bureau in 2010 and four hundred and thirty-nine in 2011. Overall in 2011, there were forty-five hijacked vessels, one hundred and seventy-six boarded, one hundred and thirteen fired upon and one hundred and five reported attempted attacks. Those who are interested in figures can make the astonishing comparison. Daily, two hundred merchant ships belonging to this category pass through the Strait of Malacca and fifty pass through the Gulf of Aden and the Suez Canal. In this area, from the beginning of the year, the International Maritime Bureau registered seventy attacks. So far, eleven vessels have been hijacked and one hundred and eighty-eight crew members are currently taken into hostage.

More than a comparison based on figures we have to realize that when a driver of a wagon, a cart or a carriage becomes a sailor, a cutter of roads and a car robber become pirates. So pirates are symptomatic of maritime exchanges and trade growth. And the figures are here to understand the discrepancies between "the economic pattern of the hijacked ships" and the one of stolen cars.

---

* Colonel, *Centre interuniversitaire d'Etude de la Mobilité* (CIEM), av. F. D. Roosevelt 50, CP 165/7, B-1050 Brussels (Belgium).

The building cost of a new big ship is about US$80-100M depending on market conditions and countries. The American Institute of Marine Insurers raised the concern of an increase in terms of risks. They indicated an average value of US$45,000 for every container (EVP), what makes the value of one cargo at approximately US$430 M, making a total of about US$500 M for a 9,600 EVP type. The value of a cargo is then about five times that of a ship. That makes a lot of eggs in the same basket and helps to understand why so many people would like to rob the basket!

Looking for a favourable area for their criminal actions, pirates generate turmoil in the regions where they sail. For this reason, perceived as a security additional effect or a strategic threat to world trade, pirates remain a secular concern for the States and private actors.

Piracy arouses in South-East Asia a real questioning about its nature and its shape/organization. In Asia, the Singaporean, Philippine, Thai or Malay States thus directed their efforts toward the anti-pirate fight. At the same time, the phenomenon gained in intensity in the West of the Indian Ocean, around the Somalian coast and the Gulf of Aden.

South East Asia and the Gulf of Aden, geographically speaking, are quite closed to each other/similar. They are bottlenecks easily accessible by land. They are then, to an economic point of view, arteries connecting the Asian industrial lung to the European or American consumers. These characteristics are not enough though to explain this shape of violent determinism which strikes these regions, while no such phenomenon occurs in the Strait of Gibraltar or of Bosphorus (although in the same economic and geographical characteristics). The outbreak of piracy acts led coastal states to decisive measures in order to fight against piracy: acquisition of naval equipment, implementation of automated systems for the surveillance of the straits and regional cooperation. One's state credibility is sometimes at stake. In view of the evidence from 2010, an astonishing year in terms of number of attacks by the way, the International Chamber of Trade, BIMCO, INTERTANKO and Intercargo boat signed on February 8, 2011 a common letter. It was a call to the international community on the gravity of the situation offshore, not only as far as the safety of ships is concerned, but also on the threat regarding the supplies in terms of costs, of risks in the loss of expensive/ scarce resources and consequently of the increase of price for the consumers.

The efforts made by states nevertheless reduced the acts of piracy in the Strait of Malacca. However, the structural roots on the ground still persist. Through the study of the dynamics and the dimensioning factors of the phenomenon, we shall try to figure out whether it is a real strategic threat for the

coastal states and more widely for the world trade in general or merely a matter of criminality in an out of State control area. This question leads us to consider the issue of the return of the State in front of piracy.

To deeply understand the issue of piracy in the Indian Ocean, it is necessary, first, to apprehend the legal offshore environment, then the jurisdictions and their zones of competence and, finally, the action of the State over the sea. Then, it is interesting to analyse the evolution of piracy in the Malacca Strait and, at last, to focus on piracy in the Gulf of Aden.

1. The Legal Offshore Environment

It seems easy to speak about piracy, but before using this word we need to agree on a formal definition (1.1), to drive it to a more operational aspect (1.2) and to the legal aftermaths on the prosecution of pirates (1.3).

1.1. From a Formal Definition...

Among all the approaches and so-called definitions we have to privilege one that we can find in the articles 101 to 103 of the United Nations Convention on the Law of the Sea (UNCLOS 1982). They read:

> Article 101:
> Piracy consists of any of the following acts:
> (a) Any illegal acts of violence or detention, or any act of depredation, committed for private ends by the crew or the passengers of a private ship or a private aircraft, and directed:
> (i) on the high seas, against another ship or aircraft, or against persons or property on board such ship or aircraft;
> (ii) against a ship, aircraft, persons or property in a place outside the jurisdiction of any State.
> (b) Any act of voluntary participation in the operation of a ship or of an aircraft with knowledge of facts making it a pirate ship or aircraft;
> (c) Any act of inciting or of intentionally facilitating an act described in subparagraph (a) or (b).
>
> Article 102:
> Piracy by a warship, government ship or government aircraft whose crew has mutinied.
> The acts of piracy, as defined in article 101, committed by a warship, government ship or government aircraft whose crew has mutinied and taken control of the ship or aircraft are assimilated to acts committed by a private ship or aircraft.
>
> Article 103:
> Definition of a pirate ship or aircraft:

A ship or aircraft is considered a pirate ship or aircraft if it is intended by the persons in dominant control to be used for the purpose of committing one of the acts referred to in article 101. The same applies if the ship or aircraft has been used to commit any such act, so long as it remains under the control of the persons guilty of that act.

This definition was formerly contained in articles 15 to 17 of the Convention on the High Seas signed at Geneva on 29 April 1958. It was drafted by the International Law Commission.

1.2. ...TO A GENERAL QUESTIONING...

In order to move on from this definition to more operational aspects we can try to answer the four following questions:

A. What sort of acts can be considered as piracy?

It is "any illicit act of violence or detention, or any plundering". The piracy thus aims at the properties just as much as at the persons. We have of course in our minds, the attacks led off the Somalian coast. The purpose is the misappropriation of ships and kidnapping of people. But facts such as attacking them or plundering a ship can also establish an act of piracy.

B. Against whom is the act directed?

So that the act can be qualified as piracy, it has to be directed against another ship or aircraft, either against persons or against the properties in their edge. Hence, in the international law of the sea, to define an act of piracy, it is needed at the same time a ship victim and an assailing ship.

C. Where does the act have to intervene?

The definition specifies that the act must be committed in "open sea". This is generally considered as the zone extending beyond two hundred nautical miles off a State. Indeed, after this limit, no sovereignty applied any more. It is exactly why the fight against the piracy is so difficult to implement. Below this limit is the exclusive economic zone (EEZ). It is also an area where an act of piracy can be committed. But the zone of "territorial waters" — that is the area extending until a limit of twelve nautical miles of coast — is not part of it. Within it, attacks against ships would be qualified as acts of armed robbery. They do not match the definition of piracy.

D. Why are these acts committed?

The psychological element is important in piracy. The definition of article 101 of the Convention indeed specifies that individuals who commit these acts have to be driven by private interests. There is a lack of brightness in these terms. It is sometimes difficult to confine exactly the private purposes. It is generally admitted that lucrative purposes have to be the motivation of an act of piracy. In the Convention's writers mind, I guess, this piece of information allows to distinguish piracy from terrorist acts, which have political or ideological goals. The limit seems sometimes artificial. In the Gulf of Guinea for example, the political and economic demands become confused rather widely, what makes difficult the legal treatment of these criminal acts. The indication of the criminal activity must thus be perceptible upstream to the intervention.

1.3. ...that Permits to Understand the Legal Aftermaths on the Prosecution of Pirates

A limitation of the article 101 above is that it confines piracy to High Seas. As most of the so-called "acts of piracy" occur within territorial waters, some pirates are able to go free as some jurisdictions lack the resources to monitor their borders properly.

Piracy is, for some, a lucrative activity. For others, it is a source of economic and commercial concerns. It is especially advisable to remember that it establishes a criminal act, in contradiction not only with the criminal law of States but also with the public international law. This act violates one of the most fundamental principles of the maritime law: the freedom of navigation at sea.

The seniority and the character almost crowned by this principle did not prevent the numerous infringements noticed in the past. The increase of these infringements brought the States to raise the issue of pirates legal treatment. In 75 BC, Julius Caesar was captured by Cilician pirates, who were numerous in the Mediterranean Sea. First, when the pirates demanded a ransom of twenty talents, Caesar burst out laughing. They did not know, he said, who they had captured, and he offered to pay fifty. For thirty-eight days, he joined in all their games and exercises, just as if he were their leader instead of their prisoner.

However, the ransom arrived from Miletus and, as soon as he had paid it and been set free, he immediately manned some ships and set sail from the harbour of Miletus against the pirates. He captured nearly all of them and

crucified the lot of them, just as he had often told them he would do when he was on the island and they imagined that he was joking.

O tempore o mores. No more way for such a solution today.

And the concern is so accurate. In France, on 2012, May 22nd the trial of the pirates who attacked the Ponant has been opened, *Le Ponant*, the elegant 88-metre three-master, left the Seychelles on 30th of March, 2008 with thirty crew staff and no passengers on board, headed for Yemen where it was to take on passengers for a cruise. On entering the notorious Gulf of Aden on April 4th, the ship was boarded by pirates armed with assault rifles who forced the crew to head for Somalia. A week later, the ship's owner, shipping giant CMA-CGM, confessed that he had paid a 1.7-million-euro ransom to free the crew. The pirates fled into the lawless sands of Somalia. Afterward, French special forces arrested these six men, aged from twenty-five to thirty in an airborne operation once the ransom had been paid. They intercepted their 4x4 wheel vehicle as it left a village, finding US$200,000 and weapons on board. Among the six men jailed, only one admitted being a pirate. During his trial, Ismaël Ali Samatar, asked "for forgiveness" from the crew and their families, from his own family and "from the French people". Two admitted having been aboard the elegant 88-metre three-master but only to sell cigarettes and mild narcotic that. The other three denied having set foot on the boat.

On June 16, Ismaël Ali Samatar was sentenced to ten years' prison. The two who admitted been aboard were sentenced to seven years' imprisonment. The last one is about to be freed its condemnation to four years of prison for "complicity" covering the period of custody. The other two convicted (and also the two youngest) were released after the prosecution had called for sentences of up to fifteen years.

2. Evolution of Piracy in the Strait of Malacca

As far as this narrow waterway that extends nearly six hundred nautical miles is concerned, Peter Gwin wrote in October 2007 an article in the *National Geographic Magazine* whose title was: "The Strait of Malacca, Dark Passage: Pirates Haunt It. Sailors Fear It. Global Trade Depends on It". Such a title leads us to consider the evolution of piracy in the Dark Passage.

First, we can try to understand the uprising of the phenomenon (2.1), then the *modus operandi* of pirates (2.2), and finally the initiatives to reduce piracy (2.3).

As underlined by Catherine Zara Raymond in her article "Piracy in the Waters of Southeast Asia", in *Maritime Security in Southeast Asia*, in 2007, during this period, there were several types of incidents in the Malacca Strait. The question is whether we can consider that as piracy. As underlined in the previous part, we can only take into account actions perpetrated in high seas. Given that most attacks in the Malacca Strait took place within the territorial waters of the littoral states, the correct term to use for most of these incidents is "armed robbery", and not piracy. But, because we have adopted a rather more operational approach than a juridical one, for the purposes of this article, the term "piracy" is here to mean both armed robbery against ships and pirate attacks according to article 101.

2.1. "Pirates Haunt It": 1992 / 2000 and the Uprising of Piracy in the "Dark Passage"

Piracy has certainly been a constant concern in the waterway, but it was in the beginning of the 1990s that the issue began to raise the attention of the international community.

First of all, we can only understand what we want to and what we are able to evaluate!

So, in October 1992 it was decided to create in Kuala Lumpur the Piracy Reporting Center (PRC) of the International Maritime Bureau (IMB) which was tasked with, among other things, collecting data on pirate attacks around the world.

This organization started to highlight the scale of this problem in Southeast Asia. And in 2000 it was noticed that the annual number of reported pirate attacks in the strait had gone from virtually zero to seventy-five.

Why a so drastic increase?

This occurred for two reasons.

First, in 1997 the Asian financial [1]* crisis had a harsh impact on the region. The deteriorating economic situation forced many people living in coastal areas in Indonesia and Malaysia to turn to piracy to improve their living conditions. The economic collapse also caused widespread political instability, especially in Indonesia, making it easier for people to pursue illegal activities.

Secondly, in the late 1990s, several high-profile pirate attacks took place in the region, among them the attack on the *Nagasaki Spirit* in 1992 and the *Petro Ranger* in 1998.

---

* The number in brackets [ ] refers to the note, p. 138.

On September 19, 1992, the master of the Nagasaki Spirit radioed from the Strait of Malacca that he had been fired upon. Pirates had boarded the *Nagasaki Spirit*, a cargo of 57,000 tons of oil, removed its captain from command, set the ship on autopilot and left with the ship's master for a ransom. The ship was left going at full speed with no one at the wheel. At about 23:20, the ship collided with the *Ocean Blessing* cargo vessel, killing forty-two. The collision and resulting fire took the lives of all the sailors of *Ocean Blessing*; from *Nagasaki Spirit* there were only two survivors. The fire on the *Nagasaki Spirit* lasted for six days; the fire aboard the *Ocean Blessing* burned for six weeks. An estimated 13,000 tons of oil spewed from ruptured cargo tanks, contaminating fishing grounds and beaches in Malaysia and Indonesia.

In April 1998, nine uneventful hours after leaving Singapore, the *Petro Ranger* had steamed north through the South China Sea, bound for Ho Chi Minh City. The Malaysian-registered vessel was carrying 9,600 tons of diesel petroleum and 1,200 tons of A-1 jet fuel. Shortly after midnight, Ken Blyth, the *Petro Ranger*'s Australian captain, understood that a dozen pirates had boarded his ship by hooking a ladder onto the stern deck. Like many cargo vessels, the *Petro Ranger*'s funnel created a radar blind spot at the back. Rapidly, with other members of the twenty-one-man crew, he was tied up in the mess room by three masked men. He would remain bound for the next thirteen days.

The pirates seized the bill of lading and registration documents, repainted the stern with a new name, *Wilby*, tore down the Malaysian ensign and raised the Honduran flag, turning the *Petro Ranger* into a "phantom vessel" — a stolen ship "hidden" under a false name, flag and papers. Captain Blyth realized that they wanted the ship, and not just its US$1.5 M cargo of diesel oil and jet fuel. By the sixth day, the captain noticed the weather was colder and wondered if they were headed to China. Two other pirate ships rendezvoused with the ship at sea and siphonedoff half of the estimated US$2.3 M cargo. Ten days after the *Petro Ranger* was hijacked, armed Chinese police, thinking it was smuggling goods, took over the ship. Captain Blyth managed to escape from the room where he had been tied up, and told the police what had happened. The captain noticed that the garrulous pirate chief seemed unperturbed as he and his fellow bandits were escorted to jail. All twelve pirates were freed six months later.

This may have led to an increased trend among shippers to report attacks, particularly attempted attacks and minor cases.

Before, to declare the attack was considered as a burden because the ship was stopped one or two days for the needs of the inquiry. When time means money...

Piracy became a significant issue that required urgent attention. One year after piracy incidents peaked in the Malacca Strait, al-Qa'ida launched its attack on the Twin Towers in New York, demonstrating that ordinary means of transportation can be used to carry out large-scale attacks on economic targets.

2.2. "Sailors Fear It": The Evolution of the *Modus Operandi*

At the beginning, the most common targets for piracy acts were small vessels that transited the coast of Indonesia.

Another common type of piracy took place against vessels berthed in harbours or at anchor, in Malaysia's Port Kelang to the port of Belawan in Indonesia for example. However, this kind of attack was unlikely to affect container ships passing through the strait.

Then pirates started to be interested in these container ships.

First, vessel's robbery by pirates usually takes place while the ship is under way, often at night, and most often between one and six o'clock in the morning. Pirates board the vessel using grappling hooks and then take any cash and valuables from the ship's safe and crew, including high-tech navigation equipment or whatever else they can seize quickly. In such attack, the value of stolen goods is between US$10,000 and US$20,000. The ship can be taken over for up to a few hours by from five to ten pirates, although many incidents are over within half an hour. It is in regard to such kind of piracy that the most significant improvements have taken place since 2000. This may be partially due to an increased awareness among crew members following the introduction of new maritime security requirements for vessels.

If a vessel is hijacked, it is usually seized for a significant length of time, perhaps for several days, while the cargo is unloaded at a port selected by the pirates or transferred to another vessel. Hijacking has been less common than the former type, regular robbery, because intelligence gathering and careful planning prior to the attack are required to ascertain the cargo and route of the vessel. In addition to that, a secure port to unload the stolen cargo is also needed, not to mention a willing buyer.

Then, we noticed a new kind of piracy: the "phantom ship" system which key difference is that once the pirates have disposed of the vessel's cargo, they do not abandon the vessel itself. The ship is repainted and the crew dumped or killed. The ship then sails to a new port with a false name and forged documentation. In recent years, tugs have been favourite targets of pirates, perhaps because they do not usually have Automatic Identification

System (AIS) equipment installed and yet are very valuable ships. Also, they are easier to attack, given their low freeboards. Once taken, they may be used in various maritime criminal activities, which would favour a small vessel of the kinds commonly seen in ports and international waterways.

Kidnapping has been the most serious form of piracy taking place in the Malacca Strait since 2001. During a kidnap, armed attackers take over the vessel and abduct two or three senior crew members. The kidnapped crew members are usually released unharmed following payment by their employers. Ransoms demanded can range from US$100,000 to US$200,000. However, the sum of money eventually paid to the attackers following negotiations is usually substantially lower, somewhere between US$10,000 and US$20,000.

2.3. "Global Trade Depends on It" and the Initiatives to Reduce Piracy

Japan and the United States especially put pressure on littoral states, namely Indonesia and Malaysia, to address the piracy issue. In 2000, eight years after the creation of the IMB, at a time when piracy attacks peaked in the Malacca Strait, a real effort to reduce piracy started. Following the events of September 11, 2001 and the subsequent conclusions drawn about the possible insecurity of the maritime domain, these efforts have been doubled.

However, it was not until 2004 that real steps toward securing straits were made.

Despite these problems, several maritime security initiatives were introduced in the Malacca Strait between 2004 and 2007.

The first multilateral measure implemented by the three littoral states was the Trilateral Coordinated Patrol, or MALSINDO (Malaysia, Singapore, and Indonesia).

MALSINDO was launched in July 2004 and involved the navies of Malaysia, Indonesia, and Singapore patrolling in a coordinated mode in their respective territorial waters. Following this new measure, however, there was no immediate reduction in the number of pirate attacks taking place in the strait. Cross-border pursuit would have been viewed by the participating states as an infringement of their sovereignty.

On December 26, five months after the introduction of MALSINDO, an earthquake occurred off the west coast of Sumatra, Indonesia. It triggered a series of devastating tsunamis that affected most coastlines bordering the Indian Ocean. However, the worst hit areas were in Indonesia, particularly in Aceh, on the northern tip of Sumatra, an area in which many pirates were believed to be based.

Some coastal villages in Aceh are supposed to have lost more than 70 % of their inhabitants, while 44 % of the people lost their livelihood. Reports received by the IMB in the weeks after the tsunami showed that piracy attacks in the Malacca Strait had ceased. However, this event cannot explain the continued decline in piracy from 2005 to 2007, but it is clear that this climate hazard was a help in this fight against piracy along with the other initiatives such as Eyes in the Sky, the Regional Cooperation Agreement on Anti-Piracy and the International Maritime Organization Meetings (IMOM).

2.3.1. "Eyes in the Sky" (EiS)

The launching in September 2005 of joint air patrols over the strait by the littoral states may have been another factor contributing to the decline in the number of incidents. Each of the three states donated two planes for the patrols, known as the "Eyes in the Sky"(EiS) plan. The plan allowed aircraft to fly for up to three nautical miles into the twelve-nautical-mile territorial waters of the participating states; it was hoped that this measure would provide a valuable supplement to the trilateral coordinated sea patrols, which were limited to their own territorial waters.

2.3.2. The Regional Cooperation Agreement on Anti-Piracy (ReCAAP)

The most recent anti-piracy initiative to be implemented is The Regional Cooperation Agreement on Anti-Piracy (ReCAAP), which came into force in 2006. The agreement, which encompasses the whole region, was drafted in 2004 and required the signature and ratification of ten of the participating countries — all the members of the Association of Southeast Asian Nations, plus Japan, China, Korea, India, Bangladesh, and Sri Lanka — in order to come into force. The aim of the initiative, which is the first anti-piracy measure to be implemented on a government-to-government level, is to foster multilateral cooperation to fight the threat of piracy and armed robbery against ships. Its activities are, among other things, information sharing, capacity building, and cooperative arrangements.

A total of fourteen countries have now signed and ratified the agreement, and an Information Sharing Center (ISC) has been set up in Singapore to facilitate communication and information sharing between member countries. The ISC also produces regular reports on pirate attacks in the region. Information is exchanged between designated points of contact, or "focal points," within the member countries via a secure Web-based information-network system, on a 24/7 basis.

2.3.3. The International Maritime Organization Meetings (IMOM)

During this period of increased multilateral activity between littoral states, another process has been under way on an international scale, in cooperation with the International Maritime Organization (IMO), the maritime branch of the United Nations. The initiative, conceived by the IMO in 2004, aimed at promoting a comprehensive approach to security, safety, and pollution control in critical sea lanes around the world. Known as the "Protection of Vital Sea lanes" initiative, it currently focuses on the straits of Malacca and Singapore. A series of meetings were convened under the title "Straits of Malacca and Singapore: Enhancing Safety, Security and Environmental Protection", the first of them in Jakarta in 2005.

3. Somalia

Somalian region, which stands for most of the northeast shoulder of the African continent, has the second-longest coastline on the continent with nearly two thousand miles of coast around the Horn of Africa. The inner land is mostly desert, with mountains in the north and plains in the south. Except a few man-made ports, there are no natural harbours and there is little to attract cruising yachts into this country. First, a focus on the events of the last four years is necessary keeping in mind the collapse of Somalia's central government.

These last five years, pirates attacked any vessel regardless of size — from cruise ships to supertankers (3.1).

At first private security contractors tried to find toolkits solutions (3.2) but only international naval response can be effective (3.3).

The international community has taken urgent measures to remedy the situation after pirates attacked a number of United Nations' vessels carrying relief supplies. The waters around Somalia are patrolled by naval ships of various nations under the aegis of the United Nations, and a corridor has been designated that transiting vessels are advised to adhere to.

3.1. See Ships, Take Ransom, Make Millions...

Since 2008, when attacks accelerated in the Gulf of Aden, there has been a big hijacking every few months. But the hijackings of the Saudi oil supertanker *Sirius Star* in 2008 and the U.S.-manned *Maersk Alabama* in 2009 forced the international community to react.

With the *Sirius Star* attack the international community understood that a line had been crossed. The supertanker was heading for the US via the Cape of Good Hope at the southern tip of Africa. The route around the Cape of Good Hope is a main thoroughfare for fully-laden supertankers from the Gulf. With a capacity of 318,000 dead weight tons, the *Sirius Star* and its 330 m (1,080 ft) long is about as long as a US aircraft carrier. It is classed as a Very Large Crude Carrier and can carry two million barrels of oil — more than 25 % of Saudi Arabia's daily output. The South Korean-built *Sirius Star* was Liberian-flagged and owned and operated by state oil giant Saudi Aramco's shipping unit Vela. The *Sirius Star* was carrying $100 M worth of oil when it has been caught on 2008 November 15, some four hundred and fifty nautical miles (830 km) off the Kenyan coast. It has been the largest ship that has been pirated. It was held near the Somali town of Harardhere.

On January 9, coalition naval forces in Bahrain said it appeared that the pirates on the *Sirius Star* had received a ransom payment of $3 M in a container parachuted from a plane. The pirates had originally demanded $25 M. The ship's owner refused to comment.

On April 8, 2009, four pirates attacked the *Maersk Alabama,* two hundred and forty nautical miles (440 km) southeast of the Somali port city of Eyl. It was the first successful pirate seizure of a ship registered under the American flag since the early 19th century.

The ship, with a crew of twenty, loaded with seventeen thousand metric tons of cargo, was bound for Mombasa, Kenya. When the pirate alarm sounded, fourteen members of the crew came into a "secure room", then shut down all ship systems and the entire vessel "went black". The pirates captured Capt. Phillips and several other crew members minutes after boarding, but soon found that they could not control the ship. The captain offered himself as a hostage. Crew members managed to overpower one pirate and tied him up. The crew released the pirate hoping to exchange him for Phillips, but the pirates instead retreated to a lifeboat with Phillips, leaving the *Alabama* to its crew.

The *USS Bainbridge* was over three hundred nautical miles away. It was the sixth vessel in a week to be attacked by pirates. The commander of *USS Bainbridge* tried to initiate a negotiating process. A pirate came aboard the *USS Bainbridge* to negotiate Phillips' freedom. The Americans refused to discuss paying a $2 M ransom. The pirates said they would drop the demand for money and release the US captain in return for their own freedom. The Americans refused that too.

According to *The Guardian*, while working through the negotiation process, the on-scene commander from the Bainbridge assessed that the

captain's life was in immediate danger. The three pirates, who were armed with AK-47 rifles, were killed by shooters who were aboard the Bainbridge and the captain was freed.

Through these two attacks, the international community understood that the pirates were in a growing approach based on "See ships, take ransom, make millions...".

It was urgent to react at an international level, but everyone knows that much time is needed to react at such a scale. So the ship owners had to react quickly in order to protect crew members, freight and assets.

3.2. A First Step: Onboard Deterrents

Just after the hijacking of the *Sirius Star*, the UN's piracy contact group crafted and disseminated a list of "best management practices". Some of the most effective measures to fight piracy are happening on board ships. These include putting additional lookouts on the deck, pressurizing fire hoses so that they are ready for use, and using minimal lights at night. Though the number of attacks has increased since 2009, the percentage of successful hijackings has gone down. Many of the ships that have been successfully hijacked were not following the so-called best practices.

But if some practices are based on a passive behaviour, others require an active one. In May 2011, various industry associations, such as the Baltic and International Maritime Council (BIMCO), the International Chamber of Shipping (ICS), International Group of P & I Clubs (IGP&I), and INTERTANKO, along with others, submitted a set of suggested guidelines to IMO's Maritime Safety Committee (MSC) before their 89th session in the form of what is known as a "J" paper to provide assistance to the MSC 89 maritime security working group. It dealt with the use of Private Maritime Security Contractors (PMSC). Among other outcomes, the meeting resulted in the establishment of three documents:

— MSC.1/Circ.1405: Interim Guidance to Ship owners, Ship Operators and Shipmasters on The Use Of Privately Contracted Armed Security Personnel on Board Ships in The High Risk Area;
— MSC.1/Circ.1406: Interim Recommendations For Flag Sates Regarding The Use of Privately Contracted Armed Security Personnel On Board Ships In the High Risk Area;
— MSC.1/Cir. 1408: Interim Recommendations For Port and Coastal States Regarding the Use of Privately Contracted Armed Security Personnel on Board Ships in the High Risk Area.

In September 2011, IMO revised the first two documents (MSC.1/Circ.1405/Rev.1 and MSC1/Circ.1406/Rev.1) and approved all three documents. Although IMO has established these recommendations, they emphasize that the circulars should be seen as guidelines and not as an endorsement to employ armed guards.

According to the head of Maritime Security at the IMO, Armed Maritime Security Providers (AMSP) "seem to be working. There has been no successful attack on a vessel that has been carrying private armed security". Several recent reports in 2011 confirmed that on board security guards have demonstrated success in deterring Somali pirates from boarding vessels. Their presence was deterrent in an incident involving a freighter in the Indian Ocean on August 15 and a chemical tanker in the Gulf of Aden on August 29. In September, Somali pirates tried to attack a Danish product tanker. The attack aborted when warning shots were fired by the tankers' security guards. In October, an oil and gas exploration ship, *Ocean Rig Poseidon*, was able to thwart an attack with the assistance of on-board security personnel and with the support of the Tanzanian Navy. Another success story includes the container ship *MV Kota Nasrat*, which was attacked on October 6, about two hundred and twenty nautical miles southeast of Mombasa, Kenya, according to Somalia Report.

But the most astonishing story is that of the *Maersk Alabama.* For the second time in seven months (as seen earlier), Somali pirates attacked the ship and were thwarted by private guards on board the US-flagged ship who fired off guns and a high-decibel noise device.

But since armed guards had a good success rate in deterring Somali pirate attacks and preventing hijackings, a greater number of security companies are emerging on the international scene. As the head of Maritime Security at the IMO pointed out, there are "not enough qualified companies". The cost of hiring private armed guards can be expensive for shipping companies. According to an article by *The Economist*, a four-man team "can run up to US$100,000 per voyage".

With such a high price you have to take care not to attract "bad apple in the barrel". Several companies are working on establishing standards and overarching guidelines in order to mitigate some of these worries. One example of this is the Gray Page, a specialist maritime intelligence, investigation and crisis management company that provides an Armed Maritime Security Provider Vetting (AMSP) page as a resource for ship owners seeking information on potential security providers. Another example is the International Association of Maritime Security Professionals (IAMSP), which is geared towards the maritime security industry and was founded by several

companies within the industry to establish "standards of best practice". Furthermore, the International Code of Conduct for Private Security Service Providers (ICoC) is committed to setting industry standards with which its members comply. Similarly, the Security Association for the Maritime Industry (SAMI) focuses on providing guidance and standards for maritime security companies and aims to help shipping companies find the "very best maritime security providers in the industry". Finally, in order to provide certain standards for maritime security companies, the German government is looking into developing certifications to ensure that safety standards are met.

In addition to considerations of high costs, the legislation of the flag state also plays a crucial role in determining the feasibility of shipping companies using armed guards in pirate-prone areas.

In order to avoid the multiplication of AMSP, the international reaction was also necessary.

3.3. Next Step: The International Naval Response and the Regional Cooperation

Following the 2008 UN resolutions, three main naval missions have been deployed into the Gulf of Aden, including EU, NATO and US operations. There are also independent navy ships including those of Australia, China, India, and Russia.

The European Union (EU) established European Union Naval Force (EU NAVFOR) Somalia — Operation ATALANTA in December 2008. As of October 2011, the EU NAVFOR was made of six warships and three aircrafts. The area of operations is about two million square nautical miles including the Gulf of Aden (GoA), the southern Red Sea and part of the Indian Ocean. In this area, which is seven times the size of France, EU NAVFOR's mission strives to protect World Food Programme (WFP) vessels and African Union Mission in Somalia (AMISOM) shipping in addition to other "vulnerable shipping". The mission also includes the prevention and repression of piracy and armed robbery and the monitoring of fishing activities.

NATO launched Operation Allied Provider in October 2008 and followed on with Operation Ocean Shield in August 2009. At the beginning of 2012, the mission was made of five warships and one aircraft. The area of operations includes the GoA and the Somali Basin, an area of approximately one million square kilometres. The NATO Shipping Centre (NSC), located in Northwood, UK, provides "information important for shipping in the area of operation — primarily the Horn of Africa". NATO seeks to develop a comprehensive approach, offering support to "regional-state counter-piracy

capacity building", in addition to deter and disrupt piracy in the region and protecting WFP vessels.

In January 2009, the Combined Task Force (CTF) 151, a multinational force, was established. It is a mission-based task force and currently operating in the Gulf of Aden and off the coast of Somalia, "covering an area of approximately 1.1 million square miles". CTF 151 is part of the Combined Maritime Forces (CMF). Other international naval forces are operating in the region with a focus on counter-piracy.

As can be seen there are more than thirty ships patrolling in the Gulf of Aden. These ships share information with each other, but they do not have a unified command structure. Some military analysts say that the naval presence would be more effective operating in unison. However, there is a monthly coordination mechanism known as Shade (Shared Awareness and Deconfliction) that is jointly led by the EU and the US.

The international navies have adapted their counter-reaction in the past year. Whereas they used to wait for an attack before taking action, they now proactively seek out "mother ships", which pirates use for launching attacks more than a thousand miles offshore. This technique has increased the number of pirate captures, but it hasn't stopped the pirates from attacking. From January to April, there were forty-seven attacks off the east coast of Somalia, ten more than during the same period last year.

So there is a real need for regional cooperation. There has been continued discussion of the need for a regional counter-piracy centre, similar to the one located in Singapore for the Malacca Strait, as seen before. Little progress has been made so far. The African and Arab states near the Gulf of Aden have agreed on the Djibouti Code of Conduct, but analysts say it is weak and has not produced results yet. At the beginning of 2012, the UN contact group had completed a needs assessment for regional cooperation, but there has been no implementation to date. Experts on piracy and international law have suggested that regional cooperation should be modelled on the Maritime Organization of West and Central Africa. Since 2008, the organization has created four coast guard sectors with central commands; each command deals with piracy, enforcement of international treaties and illegal fishing.

Conclusion

As far as the initial question is concerned, after this survey of the legal aspects and two focuses on Malacca and Somalia, each of us ought to make tilt the balance of one quotation or of the other one.

On the one side, those who want to consider that piracy in the Indian Ocean is nothing but a criminal threat are in line with Montaigne. He wrote indeed with old French terms that "Where there is something of the man there are all the concerns linked to the man". Such people will succeed in moderating/mitigating the threat with the number of ships captured by pirates since 2008 in this area (roughly two hundred with more than three thousand people taken into hostage) compared to the crazy figures of the ships sailing in the area. They will be delighted with the reduction of piracy in the Malacca Strait.

Those who are the most undecided will notice that due to on-board deterrence and the presence of naval forces the number of hijackings has been limited, but they will note a trend toward an average lengthier captivity period, which tripled to reach one hundred and fifty days at the end of 2011.

On the other side, the last ones will remember the principle uttered by Sir Walter Raleigh in the early 17th century: "For whosoever commands the sea commands the trade; whosever commands the trade of the world commands the riches of the world, and consequently the world in itself".

Looking from this side of the balance we can see that the maritime activities stand for 90 % of the goods carried in the world every year, that is to say a turnover of 1,500 billion euros, forecasted to reach 2,000 billion in 2020. In our introduction, we underlined that fifty thousand merchant vessels are sailing across seas. Let's have a look at the trend. It means a 40 % increase in ten years. Flows of cargoes that already quintupled these last thirty years will double by 2020 to reach fifteen billion tons. One thousand six hundred billion passengers embark annually, whereas we carry one ton per man in a year on 8,000 km. As far as the Indian Ocean is concerned, 90 % of the world trade passes in transit in this area today.

So, in this zone located at the crossroads of vital seaways as regards European supply in energy resources and goods, a degradation of economic and political conditions in a lot of littoral developing countries could foster a rapid growth of piracy in the coming years and make it, more than ever, a real strategic threat.

NOTE

[1] The crisis started in June 1997 in Thailand with the financial collapse of the Thai baht after the Thai government was forced to float the baht (due to lack of foreign currency to support its fixed exchange rate), cutting its peg to the US dollar, after exhaustive efforts to support it in the face of a severe financial overextension that was in part real estate driven. At the time, Thailand had acquired a burden of foreign debt that made the country effectively bankrupt even before the collapse of its currency. As the crisis spread, most of Southeast Asia and Japan saw slumping currencies, devalued stock markets and other asset prices, and a precipitous rise in private debt.

THE PANAMA AND NICARAGUA CANALS

International Colloquium
Interoceanic Canals and World Seaborne Trade: Past, Present and Future
Royal Academy for Overseas Sciences
Port of Antwerp
World Association for Waterborne Transport Infrastructure
Brussels, 7-9 June 2012
pp. 141-172

Le canal de Panama à l'heure *new panamax*

par

Yann ALIX* & Jacques CHARLIER**

1. Introduction

Nous ne reviendrons pas ici sur les facteurs qui ont conduit Ferdinand de Lesseps, vers la fin du XIX[e] siècle, à l'échec de faire du projet qu'il avait conçu à Panama un succès technique et financier égal à celui qu'il avait rencontré à Suez (DE DIESBACH 2009). En définitive, l'ouvrage est passé de mains privées françaises (via la Compagnie universelle du Canal interocéanique de Panama) dans celles d'un organisme parapublic américain (la Commission du Canal de Panama) après avoir été finalement réalisé avec de gros moyens publics américains, dont ceux du Corps de l'Armée des Ingénieurs. Comme les Français, les Américains avaient un objectif commercial (SIEGFRIED 1940), mais ils avaient aussi une motivation militaire, qui était de permettre un passage aisé de leurs navires de guerre de l'Atlantique vers le Pacifique ou inversement (VIGARIE 1995), de façon à leur éviter le long et dangereux détour par le cap Horn (qui implique, par exemple, une traversée de 22 500 km de New York à San Francisco, contre 9 500 km via Panama). C'est pourquoi ils ont fortement surdimensionné les écluses dont ils ont doté le canal à ses deux extrémités pour assurer le passage de leurs cuirassés de l'époque et de ceux des générations suivantes, qui étaient bien plus grands que les navires de commerce d'alors, à quelques paquebots transatlantiques près. Cela s'est avéré extrêmement bénéfique quand le rôle du canal est devenu, après la Deuxième Guerre mondiale, plus commercial que militaire car une importante marge d'évolution était disponible pour rencontrer pendant un certain temps l'augmentation constante de la taille moyenne des navires de commerce.

* Délégué général Fondation SEFACIL, Le Havre (France).
** Membre de l'Académie; prof. émér. Université catholique de Louvain.

Comme nous le montrerons plus loin, ces écluses sont devenues progressivement trop petites (et le canal trop peu profond), à la fois pour les plus grands navires de guerre (dont en particulier les porte-avions géants qui sont désormais au cœur de la stratégie navale américaine) et pour toute une série de types spécialisés de navires de commerce, d'abord les pétroliers, puis les vraquiers, ensuite les porte-conteneurs et enfin les navires de croisière (TOURRET 2007); il ne sera ici question que des avant-derniers, mais l'un d'entre nous a montré ailleurs que la problématique était la même pour les derniers, parmi lesquels le nombre d'unités *overpanamax* ne cesse de croître (CHARLIER 2004).

Quelques points préalables de vocabulaire sont importants pour la suite. Les unités d'une largeur totale (hors tout) comprise entre 100' et 106' (32,3 m) pour les navires de commerce (et même 108'/32,9 m pour les navires de guerre) sont dites *panamax* car elles peuvent être sassées dans les écluses actuelles, qui datent de 1914 et font 110' (33,5 m) de large; de telles unités sont dénommées *maxipanamax* quand elles sont étirées au point de remplir aussi les écluses en longueur (avec un maximum admis de 294 m pour 305 m entre portes intérieures). Par rapport à cette norme, les *infrapanamax* présentent une largeur inférieure à 100' et les *overpanamax* une largeur supérieure à 106' pour les navires de commerce ou 108' pour ceux de guerre (CHARLIER 2000); il est fréquemment question à propos de ces derniers de *post-panamax*, mais nous rejetons ici cette dénomination qui fait référence au temps alors qu'il est question d'une norme géométrique invariable dans le temps (du moins jusqu'à présent).

Toute norme est cependant appelée à évoluer quand un ouvrage est recalibré; comme il a été montré dans une autre contribution à ces actes (NOREI & CHARLIER), cette norme a évolué à plusieurs reprises dans le cas du canal de Suez, qui est un ouvrage non pourvu d'écluses et qui pourrait de ce fait être élargi et/ou approfondi de manière continue et illimitée. Par contre, la dimension des écluses définie par les Américains au début du XX^{e} siècle a figé le canal de Panama dans un gabarit supposé très généreux mais qui n'a pas du tout évolué; de surdimensionnées, ces écluses sont progressivement devenues sous-dimensionnées, mais un spectaculaire recalibrage du canal est en cours avec la réalisation de nouvelles écluses, d'une pointure supérieure, une centaine d'années après la mise en service du canal dans sa configuration initiale. Cela va donner naissance à une nouvelle norme, dite *new panamax*, qui sera à nouveau figée pour de très longues années, alors que la norme *suezmax* a évolué à plusieurs reprises et qu'il n'y a jamais eu de ce fait de *new suezmax*.

2. Des caractéristiques techniques d'hier et d'aujourd'hui à celles de demain

Dans sa configuration de 1914 (qui est encore celle observable de nos jours, à l'élargissement récent de la tranchée de la Culebra près), le canal «américain» se présentait comme une voie d'eau totalement artificielle d'une longueur de 68,5 km (hors chenaux d'accès) entre l'océan Atlantique à Colón et l'océan Pacifique à Balboa, près de Panama City (fig. 1). Contrairement au canal de Suez, dans lequel ont été intégrés trois lacs préexistants (les Grand et Petit Lacs Amers, ainsi que celui de Timsah), celui de Panama n'a pas pu profiter d'un lac intérieur naturel (comme va le faire le canal du Nicaragua, avec le lac éponyme). Certes, il traverse un très grand plan d'eau dans sa partie centrale, le lac de Gatún, mais celui-ci est totalement artificiel et résulte de l'ennoiement d'une partie significative du territoire du Panama après la construction du barrage de Gatún sur le fleuve Chagres.

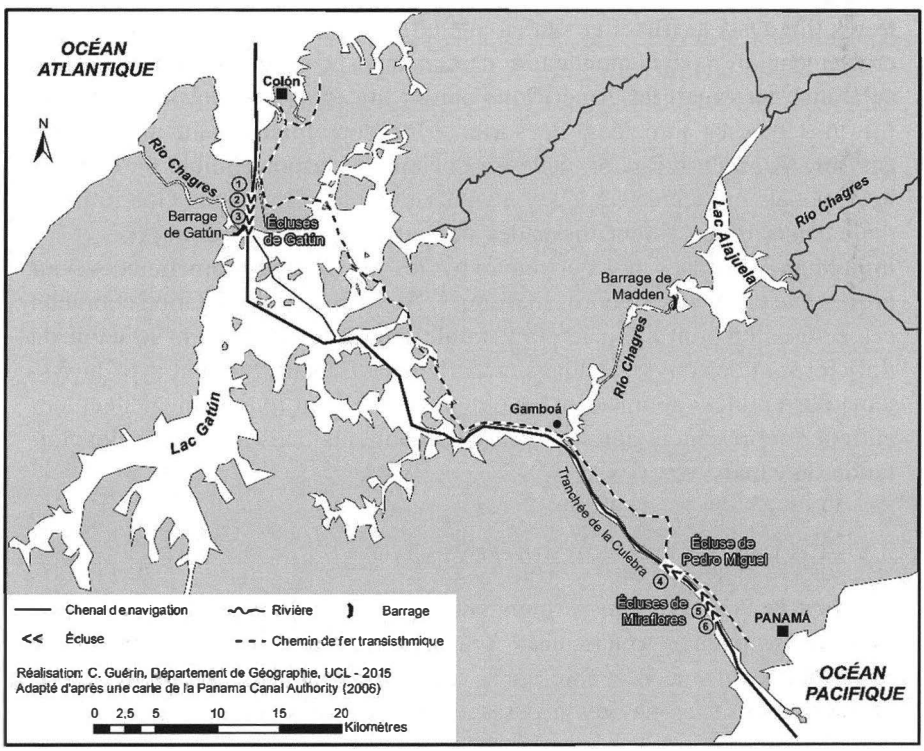


Fig. 1. — Le canal de Panama dans sa configuration actuelle.

Alors que les Français avaient initialement prévu un canal au niveau de la mer, les Américains (et finalement, mais trop tardivement, les Français avant eux) ont opté pour la formule du canal éclusé, pour réduire drastiquement les volumes à excaver en remontant de quelque 26 m le niveau du plan d'eau entre les écluses qu'ils ont réalisées de part et d'autre de la voie d'eau. Cela ne les a cependant pas totalement dispensés de beaucoup creuser dans la partie montagneuse située du côté du Pacifique, où la tranchée de la Culebra (aussi nommée entre 1915 et 2000 tranchée Gaillard, du nom d'un des ingénieurs américains ayant porté le projet) permet de rejoindre le lac de Gatún à hauteur de Gamboa.

Le système des écluses réalisées en bordure des deux littoraux (en aval desquels se trouvent à chaque fois des chenaux d'accès ayant nécessité de gros dragages) n'est pas symétrique. Du côté de l'Atlantique, un escalier triple permet un accès direct au lac de Gatún; du côté du Pacifique, le relèvement des navires aux 26 m précités s'opère par contre en deux temps, avec tout d'abord un escalier double à Miraflores, puis une écluse simple à Pedro Miguel, entre lesquels ils doivent naviguer sur le petit lac de Miraflores, lui aussi artificiel et situé à une altitude de 16 m. Pour permettre le croisement des navires montants et descendants, et assurer ainsi une capacité suffisante au canal, les Américains ont eu la sagesse de prévoir à chaque fois des écluses jumelées, de sorte qu'ils construisirent au total douze écluses! Au plan militaire, celles-ci constituent le point faible du canal et les Japonais ont envisagé de s'y attaquer durant la Deuxième Guerre mondiale, mais ils en furent dissuadés par la difficulté de l'entreprise et les importantes défenses mises en œuvre par les forces armées américaines pour protéger le canal et ses abords maritimes. Au plan de l'exploitation courante, ces écluses en sont aussi le point faible, puisqu'elles limitent le débit du trafic et sont des ouvrages longs et difficiles à franchir (surtout avec le système des «mules» remplaçant les remorqueurs); leur fonctionnement et leur entretien représentent aussi des postes importants dans le budget d'exploitation du canal.

2.1. Aux origines des unites *overpanamax*

Avant la Première Guerre mondiale, quand le projet de canal fut repris puis réalisé par les Américains, comme jusqu'avant la seconde et même encore pendant une décennie après celle-ci, les plus grandes unités marchandes étaient les navires à passagers transatlantiques, qui alliaient une grande taille (pour transporter de très nombreux passagers) et, pour certains d'entre eux, une vitesse élevée (notamment en raison du prestige lié à la détention du «Ruban Bleu» sur l'Atlantique Nord). Cette vitesse (de l'ordre

de trente nœuds, voire davantage) nécessitait une grande longueur (d'au moins 310 m pour ne pas plonger dans les creux), laquelle a obligé à conférer aussi aux *superliners* (supernavires de ligne) une largeur excédant la norme *panamax*. Ainsi qu'il apparaît au tableau 1, cinq de ces très grands transatlantiques sur sept furent construits à un gabarit *overpanamax*, dont trois avant le second conflit mondial et deux après celui-ci. Les trois premiers, le *Normandie* français ainsi que les *Queen Mary* et *Queen Elizabeth* britanniques, présentent des caractéristiques fort semblables, alors que les deux autres sont très différents: le *France* (qui connut une seconde vie sous le nom de *Norway* en tant que navire de croisière) était le plus long mais aussi le moins large des cinq, pour mieux tailler les flots, et le plus récent, le *Queen Mary 2* britannique, est le plus gros navire de ligne régulière jamais réalisé (cette fonction est cependant secondaire car il navigue principalement à la croisière, où l'on trouve de plus grosses unités encore, mais plus lentes car purement dédiées à la fonction touristique). Ce navire de ligne géant est le seul actuellement en service commercial, mais son prédécesseur, le *Queen Mary*, est toujours visible au port de Long Beach où il fait office de musée et de *floatel* depuis 1967 (fig. 2); cette longévité exceptionnelle montre bien les échelles de temps à prendre en compte dans le domaine du transport maritime!

Tableau 1
Les *superliners* de l'Atlantique Nord

	Année de construction	Longueur (m)	Largeur (m)	Jauge (tjb)
Type *overpanamax*				
Normandie[1]	1935	313,8	36,4	83 400
Queen Mary[2]	1936	310,7	36,1	81 250
Queen Elizabeth[3]	1940	314,1	36,0	83 675
France/Norway[4]	1962	315,7	33,7	66 350
Queen Mary 2[5]	2004	345,0	41,0	151 400
Type *maxipanamax*				
United States[6]	1952	302,0	30,9	53 325
Queen Elizabeth 2[7]	1969	293,5	32,0	70 325

[1] Perdu par incendie et chavirement à New York en 1942.
[2] Hors service commercial en 1967; *floatel* à Long Beach depuis lors.
[3] Hors service commercial en 1969; perdu par incendie à Hong-Kong en 1972.
[4] *France* désarmé en 1974; *Norway* exploité à la croisière entre 1979 et 2003.
[5] Est surtout un navire de croisière mais effectue encore quelques traversées transatlantiques.
[6] Hors service commercial depuis 1969; à l'abandon à Philadelphie depuis 1996.
[7] Conçu pour un usage mixte passage/croisière; hors service commercial depuis 2008; désarmé à Dubai depuis 2009 après projet non concrétisé de transformation en *floatel*.

Elaboration de J. Charlier d'après divers ouvrages historiques relatifs aux *liners*.

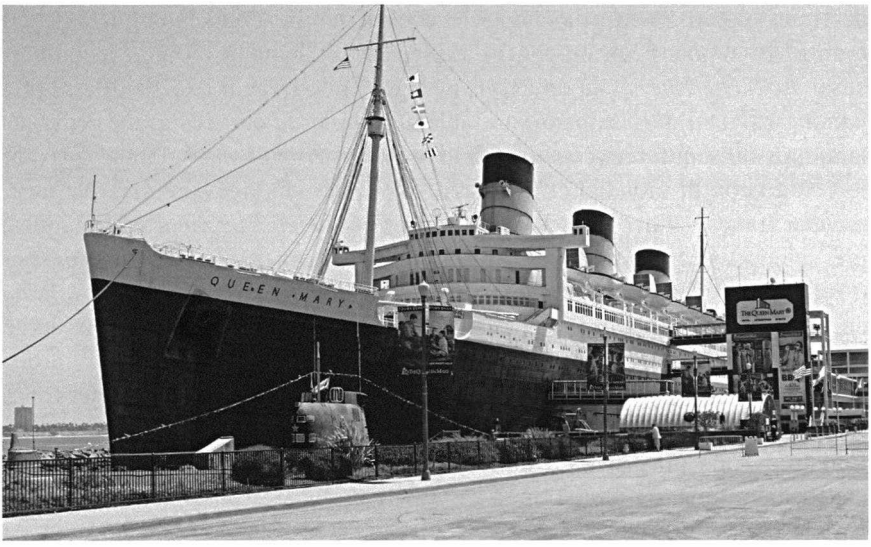


Fig. 2. — Deuxième *overpanamax* jamais construit, le *Queen Mary,* toujours visible au port de Long Beach (cliché: J. Charlier, 2012).

Deux autres *superliners* transatlantiques furent, par contre, construits en tant qu'unités *maxipanamax*. Dans le cas du *Queen Elizabeth 2* britannique, le choix de dimensions légèrement inférieures s'explique par l'usage mixte prévu pour ce navire dès sa conception, avec six mois par an à effectuer des passages transatlantiques (comme l'actuel *Queen Mary* 2 précité) et six autres à naviguer à la croisière (dont presque chaque année un périple circumterrestre impliquant de passer par Panama et souvent aussi par Suez). Le cas du *United State*s américain est différent, avec là aussi un usage mixte prévu par ses concepteurs, mais d'une autre nature. D'une part, le navire a été conçu pour assurer la présence américaine sur l'Atlantique Nord (avec succès, puisqu'il y a ravi en 1952 le «Ruban Bleu», avec des vitesses record de 35,6 nœuds *Eastbound* et de 34,5 nœuds *Westbound*); d'autre part, le gouvernement américain en a partiellement subsidié la construction pour qu'il puisse être utilisé comme transporteur de troupes en cas de crise ou de conflit (avec alors quinze mille soldats à bord, contre un maximum de mille neuf cent vingt-huit passagers en temps normal). Ceci s'explique par le fait que le *Queen Mary* (premier du nom) et le *Queen Elizabeth* (comme de nombreux autres navires à passagers d'une envergure inférieure) avaient été exploités avec succès comme *troopers* pendant la Seconde Guerre mondiale (ce qui aurait dû être le cas aussi du *Normandie*, mais il fut perdu en 1942 par incendie et chavirement pendant sa transformation en tant que *La Fayette*

américain); ces *overpanamax* furent cependant confinés à l'Atlantique et l'océan Indien, alors qu'il était impératif pour les Américains que leur *United States* puisse être redéployé rapidement de l'Atlantique au Pacifique via Panama (ce qui ne fut cependant jamais le cas).

Pour la *US Navy*, les écluses panaméennes ont constitué une contrainte tout aussi forte en matière d'architecture navale, leur emprunt devant être possible pour toutes leurs unités lourdes en service afin que les flottes de l'Atlantique et du Pacifique puissent se renforcer mutuellement le plus rapidement possible dans le cadre d'une politique navale dite des deux océans. Aussi, tous leurs *capital ships* mis en service avant 1945 ont-ils été de type *panamax*; cela s'est appliqué (1) à tous les cuirassés mis en service avant, pendant ou immédiatement après la Première Guerre mondiale, (2) aux dix cuirassés modernes qui les rejoignirent durant la Seconde Guerre (six de trente-cinq mille tonnes de déplacement standard selon la définition du traité de Washington, des classes *North Carolina* et *South Dakota*, ainsi que quatre de quarante-cinq mille tonnes, de type *Iowa*), et (3) à tous leurs porte-avions d'escadre (dont tous ceux de l'entre-deux-guerres et les vingt-quatre unités de la classe *Essex* de vingt-sept mille cinq cents tonnes livrées pendant la Seconde Guerre mondiale ou juste après).

La *Royal Navy* britannique a fait de même entre 1914 et 1945, même si une telle flexibilité opérationnelle n'était pas absolument requise pour ses grosses unités, appelées à être essentiellement déployées dans les eaux des océans Atlantique et Indien, bien plus que dans le Pacifique (ce qui ne fut finalement le cas qu'en 1944-45). La largeur de ses cinq cuirassés modernes de la classe *King George V* (36 725 t) n'excédait pas 103' et son tout dernier cuirassé, le *Vanguard* (44 250 t), commandé en 1941 mais entré en service seulement en 1946, présentait une largeur maximale de 108'. De même, les cuirassés de trente-cinq mille tonnes français, *Richelieu* et *Jean Bart*, présentaient eux aussi à leur lancement une largeur maximale de 108' (tout comme le troisième de cette classe mis en chantier, mais dont l'invasion de la France interrompit la construction); après la guerre, la largeur du second, qui n'est entré en flotte qu'en 1950, a été portée à près de 117' pour améliorer sa protection contre les torpilles, ce qui en a fait le dernier cuirassé *overpanamax* de l'histoire (tab. 2). Par contre, la norme *panamax* était sans objet pour les besoins opérationnels des Soviétiques, qui avaient choisi de s'en affranchir pour les quatre supercuirassés de soixante-cinq mille tonnes de type Projet 23 dont ils entendaient se doter pour répondre aux menaces allemande et japonaise; la construction de deux de ces bâtiments, qui auraient eu une largeur maximale de près de 120', fut amorcée en 1938 mais abandonnée dans le courant de la Seconde Guerre mondiale.

Tableau 2
Les cuirassés et porte-avions *overpanamax* de la Deuxième Guerre mondiale et de l'immédiat après-guerre effectivement entrés en service

	Pays	Type	Année	Déplacement
Bâtiments refondus				
Nagato[1]	Japon	Cuirassé	1936	32 725
Mutsu[2]	Japon	Cuirassé	1936	32 725
Tennessee[3]	USA	Cuirassé	1943	34 850
California[4]	USA	Cuirassé	1944	34 850
West Virginia[5]	USA	Cuirassé	1944	34 950
Nouveaux bâtiments				
Bismarck[6]	Allemagne	Cuirassé	1940	42 500
Tirpitz[7]	Allemagne	Cuirassé	1941	42 500
Jean-Bart[8]	France	Cuirassé	1950	42 800
Yamato[9]	Japon	Cuirassé	1941	65 000
Mushahi[10]	Japon	Cuirassé	1942	65 000
Shinano[11]	Japon	Porte-avions	1944	65 800
Midway[12]	USA	Porte-avions	1945	45 000
F. D. Roosevelt[13]	USA	Porte-avions	1945	45 000
Coral Sea[14]	USA	Porte-avions	1947	45 000

[1] Remis à la *US Navy* en 1945 et coulé lors des essais nucléaires de Bikini en 1946.
[2] Perdu par explosion accidentelle dans un port japonais en 1943.
[3] Retiré du service actif en 1947; en réserve jusqu'en 1959.
[4] Retiré du service actif en 1947; en réserve jusqu'en 1959.
[5] Retiré du service actif en 1947; en réserve jusqu'en 1959.
[6] Coulé dans l'Atlantique en 1941.
[7] Coulé dans un fjord norvégien en 1944.
[8] Retiré du service actif en 1947; en réserve jusqu'en 1970.
[9] Coulé dans le Pacifique en 1945.
[10] Coulé dans le Pacifique en 1944.
[11] Coulé au large du Japon en 1944.
[12] Retiré du service en 1992; navire musée à San Diego depuis lors.
[13] Retiré du service en 1977.
[14] Retiré du service en 1990.

Elaboration de J. Charlier d'après divers ouvrages historiques, dont principalement GARZKE & DULIN (1980, 1985) pour les cuirassés et IRELAND (2005) pour les porte-avions.

Comme celle de l'ex-URSS, les marines de l'Axe étaient beaucoup moins contraintes par la nécessité d'emprunter le canal de Panama et elles se sont donc affranchies plus rapidement de ce carcan technique que les Alliés. C'est ainsi que les cuirassés allemands de quarante-deux mille cinq cents tonnes, *Bismarck* et *Tirpitz,* conçus à la veille de la Deuxième Guerre mondiale, étaient bien trop larges (118') pour les écluses panaméennes; il s'agissait par

contre de bâtiments *kielmax*, conçus pour celles du canal de Kiel, de façon à pouvoir passer facilement de la mer du Nord vers la Baltique ou inversement, selon un raisonnement identique à celui des Américains à propos de Panama (et également antérieur à la Première Guerre mondiale). L'Allemagne a également amorcé la construction de deux unités *overpanamax* de cinquante-deux mille cinq cents tonnes de type H39 qui, comme les quatre autres exemplaires prévus mais jamais mis sur cale, auraient été plus larges encore (121'); elle fut cependant abandonnée en raison du déclenchement des hostilités, la priorité étant alors donnée à d'autres types de navires, dont les sous-marins. Ses alliés italiens se dotèrent eux aussi d'unités cuirassées lourdes, avec quatre bâtiments de trente-cinq mille tonnes de la classe *Littorio* (dont trois furent effectivement mis en service, alors que le dernier n'a pas été achevé); comme pour les Français à la même époque, ceux-ci restèrent dans le gabarit *panamax* par souci de respect du tonnage maximal imposé par le Traité de Washington pour les cuirassés.

A la même époque mais à l'autre bout du monde, trois unités de soixante-cinq mille tonnes furent construites dans le plus grand secret par les Japonais avec une largeur encore jamais vue, les cuirassés *Yamato* et *Mushahi* (121' chacun), ainsi que le porte-avions *Shinano* (119'), obtenu par transformation au départ d'une coque de cuirassé du même type que les deux précédents. Comme la paire allemande *Bismarck-Tirptiz* précitée, ces trois géants entrèrent en service dans le courant de la Deuxième Guerre mondiale et furent tous coulés pendant celle-ci. Ce ne furent cependant pas les premiers navires de guerre *overpanamax* de l'histoire; en effet, les deux cuirassés nippons de type *panamax, Nagato* et *Mutsu,* construits juste après la Première Guerre mondiale furent élargis à 111' à la flottaison en 1936 pour jouir d'une meilleure protection anti-torpilles (leur donnant 32 725 t après refonte) et c'est à eux que revient en fait ce titre.

Aux trois nouveaux bâtiments géants japonais effectivement mis en service entre 1941 et 1944 devaient s'ajouter deux autres cuirassés de la même classe, dont la construction du premier fut rapidement abandonnée et celle du second non lancée; deux «*super Yamato*» de septante et une mille tonnes (type A-150), qui auraient sans doute été encore plus larges, furent aussi étudiés, mais jamais mis sur cale non plus. Apprenant ces projets, la marine américaine réagit en commandant en 1940 cinq supercuirassés de soixante-cinq mille tonnes de la classe *Montana*, d'une largeur de 115', soit 7' en trop pour les écluses panaméennes. Leur construction fut cependant abandonnée en 1943 dans le même temps que la *US Navy* renonçait à achever deux des six *Iowa* commandés auparavant, les porte-avions ayant alors remplacé les cuirassés sur le devant de la scène en matière de guerre navale. Les

Américains ont toutefois brièvement disposé eux aussi de cuirassés *overpanamax*, après que trois unités anciennes fortement endommagées à Pearl Harbour en 1941, le *California*, le *Tennessee* et le *West Virginia*, ont été élargies à 114' entre 1942 et 1944 pour jouir, comme leurs deux contemporains japonais précités, d'une meilleure protection anti-torpilles.

Peu après les cinq supercuirassés de type *Montana,* la *US Navy* a commandé six porte-avions *overpanamax* de quarante-cinq mille tonnes de la classe *Midway* présentant une largeur de coque de 118'; elle en a effectivement reçu trois après la Deuxième Guerre mondiale (les trois autres ayant été annulés suite à la capitulation du Japon), lesquels furent les plus gros navires de guerre *overpanamax* issus de ce conflit et lui ayant survécu jusqu'au cœur de la Guerre froide. L'un d'entre eux, le *Midway*, est même toujours à flot, puisqu'il a été préservé comme navire-musée à San Diego; avec le *superliner* transatlantique *Queen Mary* évoqué plus haut, la Californie dispose donc de deux témoins fort différents des débuts de l'ère des unités *overpanamax*.

Alors qu'aucun cuirassé ne fut plus mis en service après les *Vanguard* britannique et *Jean Bart* français, le nombre des porte-avions *overpanamax* a considérablement augmenté depuis le début de la Guerre froide. D'une part, plusieurs bâtiments de ce type hérités de la Deuxième Guerre mondiale, dont en particulier quinze des *Essex* américains précités, devinrent des *overpanamax* quand ils furent refondus pour intégrer une piste oblique créant un important débordement à bâbord. D'autre part, presque toutes les unités neuves mises en service par la suite sont d'une envergure très supérieure aux écluses historiques de Panama et même aux nouvelles dont il va être question. C'est en particulier le cas de tous les porte-avions d'escadre mis en service dans la *US Navy* depuis 1955, tant de type conventionnel (quatre de type *Forrestal* et quatre autres de type *Kitty Hawk*, aujourd'hui tous hors service) que de type nucléaire (l'*Enterprise*, également hors flotte, et dix de type *Nimitz*). Ces derniers, dont le déplacement excède les cent mille tonnes, vont être progressivement remplacés à partir de 2016 par un nombre identique de porte-avions de type *Gerald Ford*, lesquels présenteront 134' (41 m) à la flottaison ainsi qu'une largeur maximale de quelque 256' (78 m) au niveau du pont d'envol et seront les plus grands bâtiments de guerre jamais construits.

2.2. D'UN PROJET DE NOUVELLES ECLUSES A L'AUTRE

Pour permettre aux cinq cuirassés *overpanamax* de la classe *Montana* commandés par la *US Navy* en 1940 de contrer la menace navale japonaise, ainsi qu'aux six porte-avions de type *Midway* initialement prévus de passer

de l'Atlantique (où étaient les chantiers) au Pacifique (où était la menace), les Américains se sont lancés à partir de juin 1940 dans la construction de nouvelles écluses à Panama, qui avait été approuvée par le Congrès le 11 août 1939. Ces travaux étaient jugés absolument indispensables en parallèle avec la construction de onze bâtiments géants pour rencontrer un des axiomes de leur politique navale dite des deux océans. Des deux côtés du canal, ils commencèrent à draguer et à excaver des chenaux et des tranchées pour permettre la mise en place de deux nouveaux jeux d'écluses triples à côté de celles de Gatún et de Miraflores, avec dans le second cas un chenal qui court-circuiterait le lac éponyme pour accéder directement à la tranchée de la Culebra. Les six nouvelles écluses qu'ils prévoyaient de mettre en service en 1945, en même temps que les cuirassés de type *Montana* et les porte-avions de type *Midway* commenceraient à entrer en service, sont généralement données dans la littérature pour 1 200' de long et 120' de large, soit une augmentation assez modeste par rapport aux ouvrages existants, en particulier en largeur. Les 10' supplémentaires prévus à ce niveau étaient certes suffisants pour les supercuirassés et porte-avions lourds précités dans leur configuration initiale, mais cela n'avait pas le caractère visionnaire du projet de 1914, sans doute en raison de l'urgence ressentie à l'époque. D'une part, l'histoire allait rapidement montrer que les ponts d'envol des porte-avions s'élargiraient considérablement avec la «révolution» liée à la généralisation d'une piste oblique à l'arrière et au centre des bâtiments de ce type, entraînant une importante surlargeur de ceux-ci (et nécessitant, pour mieux les asseoir dans l'eau, de les élargir aussi de manière significative à la flottaison). D'autre part, la vision de l'époque était purement militaire et les 10' supplémentaires évoqués plus haut n'auraient guère été intéressants pour les navires de commerce du futur (en particulier les porte-conteneurs dont il va être question plus loin et qui n'existaient pas encore).

La question d'un mauvais investissement lié à un sous-dimensionnement des nouvelles écluses panaméennes ne s'est cependant pas posée, puisque dès que la décision d'annuler la commande des supercuirassés de type *Montana* a été prise en 1943, les travaux entrepris à Panama ont été arrêtés; les sites ont été ensuite laissés en l'état jusqu'à la fin de l'administration américaine de la zone du canal qui, à une certaine époque, a imaginé de relancer les travaux mais y a de nouveau renoncé. Dès 1943, les Américains faisaient ainsi l'impasse sur la flexibilité de leurs futurs porte-avions lourds de type *Midway* ... et, sans le savoir, de tous ceux qui allaient leur succéder. Plus qu'une erreur, ce fut donc une lourde faute, mais le trop faible élargissement prévu aurait de toute façon été fortement handicapant pour la *US Navy* et les navires de commerce du futur.

Dans les années 1950, les Américains avaient aussi envisagé de recalibrer beaucoup plus radicalement le canal en revenant à la formule initialement prévue par de Lesseps. La figure 3 présente un projet dévoilé à cette époque par un organe militaire semi-officiel, le *US Naval Institute*, qui montre un canal qui aurait été creusé à niveau et pourvu d'une écluse de garde du côté du Pacifique, où le marnage est beaucoup plus important que du côté de l'Atlantique (FAHLE 1954). Cet ouvrage de contrôle n'aurait été utilisé que quand les courants auraient été trop importants et quand il aurait fallu fermer alors par une porte le chenal menant directement à la tranchée de la Culebra, dont le plan d'eau aurait été abaissé au niveau de la mer. La nouvelle tranchée, au tracé plus direct que l'actuelle, aurait été prolongée sous l'actuel lac de Gatún, qui aurait été en grande partie mis au sec, après détournement du Río Chagres par des canaux de dérivation le faisant déboucher en mer au nord-est de Colón. L'investissement aurait été bien plus considérable que celui du nouveau jeu d'écluses et on voit mal comment la continuité de la navigation aurait été assurée pendant la réalisation des travaux. L'intérêt de la formule est qu'il aurait été possible d'augmenter progressivement le

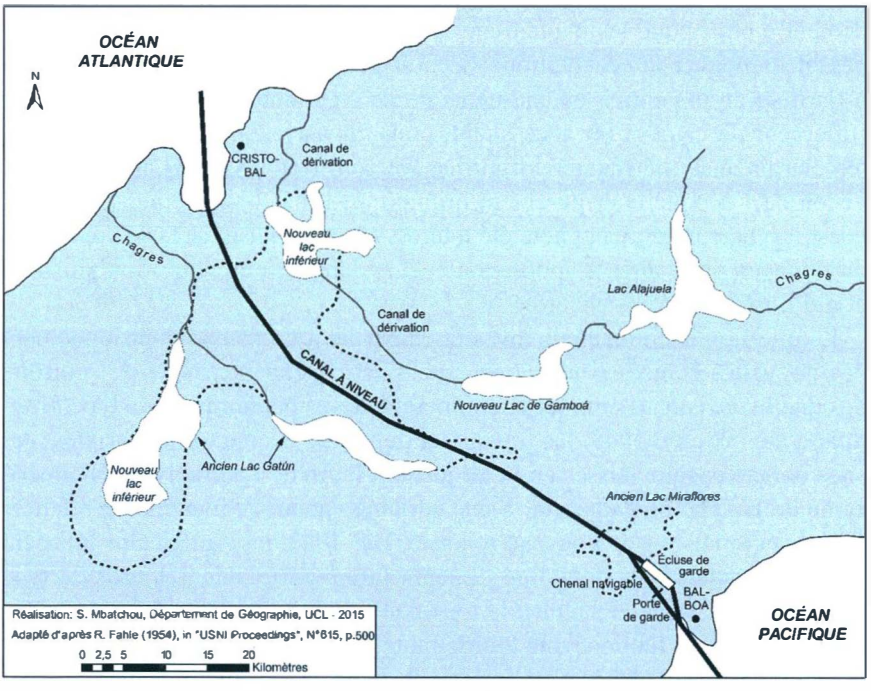


Fig. 3. — Le projet américain de canal à niveau dans les années 1950.

gabarit de la voie d'eau au fil de l'évolution de la taille des navires, comme cela s'est toujours fait à Suez, mais dans un contexte géologique bien plus difficile. Les Américains ont finalement opté pour le *statu quo*, faisant jusqu'aujourd'hui encore l'impasse sur Panama pour leurs grands porte-avions et même pour ceux de taille simplement moyenne, y compris dans les marines alliées; par exemple, le porte-avions nucléaire français *Charles de Gaulle*, de seulement quarante-deux mille cinq cents tonnes, n'a certes que 31,5 m de large à la flottaison, mais son pont d'envol a une largeur maximale de près de 64,5 m!

Les zones de travaux abandonnées par les Américains en 1943 se sont avéré une opportunité exceptionnelle pour les Panaméens depuis que le canal leur a été rétrocédé le 31 décembre 1999. Dans un premier temps, ils entreprirent toute une série de travaux de modernisation des infrastructures et d'optimisation de la capacité de transit de la voie d'eau, avec en particulier l'élargissement de la tranchée de la Culebra pour permettre à des unités *panamax* de s'y croiser et avec aussi la mise en place d'un système amélioré de gestion du trafic. Mais ils se trouvèrent rapidement confrontés aux mêmes difficultés qu'à la fin de l'administration américaine: un gabarit des écluses limitant la taille des navires, en particulier les porte-conteneurs qui s'étaient affranchis de la norme *panamax* dès 1988 (CHARLIER 2000) et des temps moyens d'attente croissants en raison d'une congestion devenant de plus en plus structurelle du fait de l'essor du commerce mondial. Il en résultait des détournements de trafic croissants, en particulier pour l'importante route conteneurisée reliant l'Asie à la façade orientale des Etats-Unis, pour laquelle les armateurs ont développé deux alternatives: les ponts terrestres mettant en œuvre des trains à double empilage au départ de la côte occidentale et les services dits *all water* via l'océan Indien, Suez, la Méditerranée et l'Atlantique. Toutes deux ont un lien avec la mise en œuvre d'unités *overpanamax* de plus en plus capacitaires; le premier de ces gros porte-conteneurs, dont des centaines sont désormais en flotte, fut mis en service en transpacifique dès 1988 par les *American President Lines* (APL). Les caractéristiques de cette unité (*President Truman*) étaient révolutionnaires pour l'époque: 4 500 EVP (avec douze boîtes en largeur en cale et quatorze en pontée, alors que pour un *panamax*, les maxima respectifs sont de onze et de treize conteneurs), 275 m en longueur, mais surtout 39 m de large. Depuis lors, une course aux économies d'échelle (et d'envergure) s'est enclenchée (CHARLIER 2004), avec des porte-conteneurs toujours plus grands pour lesquels les superlatifs finissent par manquer.

C'est pourquoi, pour regagner des parts de marché et générer des recettes plus importantes, les Panaméens décidèrent en 2006, par un referendum

national approuvé à près de 77 %, de reprendre le projet américain initial de troisième jeu d'écluses et d'adapter le canal à des normes plus généreuses. Celles-ci allaient être déterminées non plus en fonction des besoins militaires mais du maximum possible pour des navires de commerce en fonction de l'enfoncement maximal qu'il serait possible d'obtenir en approfondissant les chenaux et en relevant de 0,5 m le plan d'eau du lac de Gatún et de la tranchée de la Culebra, entre les deux nouveaux jeux d'écluses triples à construire à Gatún et Miraflores. Celles-ci sont en cours de réalisation sur les deux sites où les Américains avaient travaillé entre 1940 et 1943 (fig. 4), mais avec des dimensions supérieures: 427 m de long, 55 m de large et 18 m de profondeur, et avec des bassins d'épargne d'eau associés pour limiter les pertes en eau lors des éclusages (en réutilisant en moyenne 60 % de l'eau consommée pour chaque éclusage montant ou descendant).

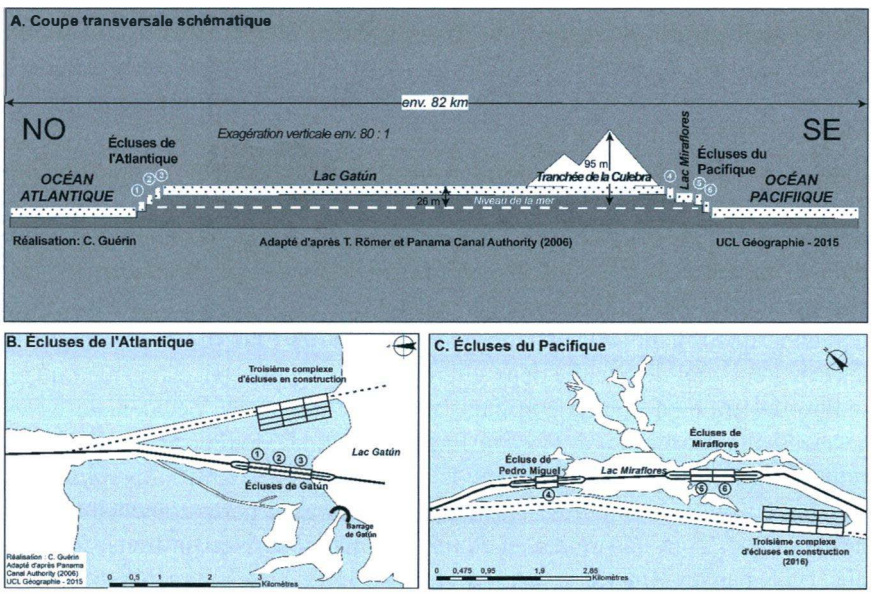


Fig. 4. — Coupe transversale du canal de Panama et position des nouvelles écluses.

Il faudra attendre la fin des travaux en 2016 et l'inauguration du «nouveau canal» (en fait, l'ancien canal recalibré), ainsi que le règlement des litiges financiers opposant l'autorité du canal et les sociétés auxquelles elle en a confié la realization, pour établir un premier bilan financier et économique de l'entreprise. Les 5,25 milliards d'USD initialement convenus (et couverts par un financement international) seront assurément (largement) dépassés, mais l'amortissement de tels travaux doit s'envisager à l'échelle d'une

génération (voire de deux), et on peut être raisonnablement confiant à propos de la rentabilité finale de l'opération pour le Panama. Avec cependant une grosse incertitude, qui est celle du futur canal concurrent au travers du Nicaragua, qui serait plus largement dimensionné, mais qui serait aussi beaucoup plus coûteux et difficile à réaliser, puisqu'il faudra ici faire monter les navires en transit à une hauteur de quelque 60 m; bien plus longue (259,5 km, dont 106 km pour la traversée du lac Nicaragua), la nouvelle voie d'eau présentera quatre écluses géantes successives du côté de l'Atlantique et quatre aussi du côté du Pacifique, mais en deux temps (avec d'abord deux écluses pour accéder au lac Nicaragua à 32 m et deux autres pour les 28 m supplémentaires qui permettront d'accéder à la grande tranchée centrale qui sera l'équivalent, mais en plus colossal encore, de la tranchée panaméenne de la Culebra). Seule l'histoire donnera la clé des interrogations actuelles à ce propos.

Entre-temps, en revenant à des considérations moins spéculatives, il faut noter que les futures opérations d'éclusage dans les nouvelles écluses panaméennes seront radicalement différentes de celles observées actuellement dans les écluses qui seront bientôt les anciennes. En effet, de façon à augmenter la vitesse des opérations, le recours aux «mules» utilisées depuis presque un siècle (avec de nombreuses locomotives, petites mais puissantes, tirant les navires dans les écluses et les en extrayant ensuite) sera abandonné au profit des remorqueurs. Il en résulte que, pour leur permettre de manœuvrer, la longueur et la largeur maximales admissibles ont été fixées à 366 et 49 m respectivement. Cela définit la nouvelle norme *new panamax*, qui concerne principalement les porte-conteneurs et les navires de croisière, ainsi que les vraquiers. Ceux-ci seront cependant contraints par l'enfoncement maximal, qui sera limité à 15,2 m, de sorte que ceux de type *capesize* dans la catégorie des 180 000 à 200 000 tpl (tonnes de port en lourd) devront transiter en charge partielle et que les plus grands continueront à devoir contourner l'Afrique ou l'Amérique du Sud.

Relevons que les nouvelles écluses panaméennes ne seront pas les plus grandes au monde et que c'est plutôt par leur nombre (six en deux échelles de trois) qu'elles se distinguent des autres grandes écluses mondiales. Celles-ci donnent en général accès à des ports maritimes, principalement situés entre Amsterdam et Le Havre, ainsi qu'il apparaît au tableau 3 présentant les principales caractéristiques techniques des grands ouvrages de sassement en service ou en construction dans cette zone en les comparant aux futures grandes écluses panaméennes. On y remarquera tout d'abord que, sauf pour la profondeur, ces dernières se situent plutôt dans la fourchette inférieure, en particulier par rapport aux ouvrages belges mentionnés, qui font 500 m de long, ce qui s'explique notamment par rapport à leur double fonction maritime et

fluviale (des péniches étant sassées en même temps que des navires de mer, en général derrière ceux-ci). Mais les futures écluses panaméennes seront aussi un peu moins généreusement dimensionnées en largeur que ce qui se fait ou se fera ailleurs, ce qui est un facteur plus pénalisant pour l'avenir.

Tableau 3
Caractéristiques techniques comparées des futures écluses panaméennes et de quelques grandes écluses néerlandaises, belges et françaises

Canal/port	Ecluse	Date	L (m)	L (m)	P (m)
Panama	*Futures écluses*	*2016*	*427,0*	*55,0*	*18,0*
Amsterdam	IJmuiden (Nord)	1929	400	50,0	15,0
Amsterdam	*IJmuiden (nouvelle)*	*2019*	*500*	*65,0*	*18,0*
Anvers	Zandvliet	1967	500,0	57,0	17,5
Anvers	Berendrecht	1982	500,0	68,0	17,5
Anvers	*Beveren*	2016	*500,0*	*68,0*	*18,0*
Gand	*Terneuzen*	*2021*	*427,0*	*55,0*	*16,5*
Zeebrugge	P. Van Damme	1984	500,0	57,0	18,5
Dunkerque	Ch. De Gaulle	1970	365,0	50,0	15,0
Le Havre	François I^{er}	1971	400,0	67,0	22,5

Elaboration de J. Charlier sur base des sites internet des ports européens mentionnés.

En effet, trois grandes catégories de navires de commerce sont visées par l'autorité du canal de Panama avec ces nouvelles écluses. Il y a tout d'abord les navires de croisière, pour lesquels il est fort important de pouvoir passer d'un océan à l'autre dans le cadre des nombreux repositionnements saisonniers qui caractérisent ce secteur (CHARLIER & MCCALLA 2006); par rapport à leurs caractéristiques actuelles et prévisibles, la principale contrainte sera en fait le tirant d'air sur le canal (57,9 m au niveau le plus bas des deux ponts surplombant le canal, celui dit des Amériques près de Balboa) et non les dimensions de ces écluses; une vingtaine de navires de croisière géants en service ou en construction, qui sont pourtant de type *new panamax* au niveau des écluses, ne pourront ainsi pas transiter par le nouveau canal. Il y a aussi les supervraquiers, pour lesquels la limite est plutôt celle du tirant d'eau (qui bénéficiera pourtant d'un relèvement de 50 cm du niveau du plan d'eau supérieur, mais est contraint par les possibilités d'alimentation en eau). Mais

il y a aussi et surtout les porte-conteneurs, pour lesquels le maximum en largeur (49 m) va s'avérer particulièrement pénalisant, beaucoup plus que la longueur retenue pour les futures écluses qui est très correcte (compte tenu des remorqueurs qu'il faudra positionner à l'avant et à l'arrière lors des futurs éclusages). Le recours à des «mules» comme actuellement (mais plus nombreuses encore et/ou de plus forte puissance) aurait permis de gagner de précieux mètres en largeur (au moins 4 m, voire 5), mais l'autorité du canal, en définissant les dimensions des ouvrages et leur mode opératoire, a préféré privilégier la rapidité des sassements au détriment de la capacité maximale des navires.

Il en résulte que les écluses, avant même d'entrer en service, s'avèrent trop étriquées pour les *Ultra Large Container Ships (ULCS)*, qui peuvent désormais être définis comme tout ce qui ne sera pas *new panamax*, c'est-à-dire de plus de 12 500 EVP (voire 13 000 EVP en optimisant le design). Des dizaines de grands porte-conteneurs de construction récente ou dont la construction a été annoncée sont d'ores et déjà trop larges (et pour certains aussi trop longs) pour les futures nouvelles grandes écluses panaméennes. A l'horizon 2014-2015, certains feront 400 m de long et présenteront une largeur de quelque 59 m (tab. 4), ce qui montre à quel point l'évolution s'est accélérée depuis le moment où les dimensions des écluses ont été figées et combien leurs concepteurs ont manqué de vision à long terme, même si les contraintes techniques et financières auxquelles ils ont dû faire face à l'époque étaient fortes. Cela les a poussés à faire, un peu à la légère, l'impasse sur des mégaporte-conteneurs dont personne n'imaginait à l'époque qu'ils seraient aussi nombreux et aussi grands, alors que la seule véritable limite pour ces derniers était (et demeure) d'être *malaccamax* (MARCADON 2004).

Tableau 4
Capacité maximale des écluses panaméennes
et plus grands porte-conteneurs annoncés à l'horizon 2015

Ecluses/armements	Capacité EVP	Date	L (m)	L (m)	TE (m)
Panama (nouvelles)	+/- 12 500	2016	366,0	49,0	15,2
Maersk (série *E*)	15 500	> 2007	397,5	51,5	16,0
Maersk (série *triple E*)	18 270	> 2013	400,0	58,5	15,5
CMA CGM (série Kerguelen)	17 725	> 2015	398,0	54,0	16,0
CSCL (série *océans*)	19 100	> 2015	399,5	58,5	16,0
MSC (série *Zoé*)	19 225	> 2015	395,5	59,0	16,0

Elaboration de J. Charlier sur base des sites internet des armements concernés.

3. La place actuelle et future des conteneurs dans le trafic panaméen

Comme à Suez, les porte-conteneurs constituent une clientèle importante pour l'autorité du canal de Panama, mais dans une moindre proportion et avec une dynamique de croissance inférieure, en raison des détournements de trafic évoqués ci-dessus en lien avec les problèmes actuels de gabarit et de capacité du canal. Cela explique en grande partie la mauvaise tenue du trafic du canal de Panama quand on le compare (fig. 5) à celui enregistré au travers du canal de Suez depuis la fin, en 1980, de la première phase des travaux de recalibrage de celui-ci. Les deux artères transisthmiques faisaient alors jeu égal à environ 175 Mt (millions de tonnes) et le trafic suézien a véritablement explosé depuis lors; par contre, celui de Panama n'a guère progressé et oscille ces dernières années dans une fourchette comprise entre 200 et 225 Mt.

Dans les deux cas, les chiffres du trafic maritime en transit ne donnent cependant qu'une vue incomplète du rôle des deux isthmes dans le commerce maritime mondial. S'agissant de Suez, il faut y ajouter les gros tonnages de pétrole brut transités *Northbound* via l'oléoduc SUMED (plus de 100 Mt/an), alors que la fonction de «pont terrestre» est bien moindre à Panama, ce qui en accentue la dissymétrie. Un oléoduc similaire (mais moins capacitaire) a été construit au nord du canal de Panama mais est hors service depuis plusieurs années. Parallèlement au dit canal, il y a par contre un modeste flux ferroviaire de conteneurs (380 000 EVP en 2012, soit en ordre de grandeur 5 Mt) acheminés d'une côte à l'autre par la *Panama Railway Company*; filiale de la compagnie ferroviaire américaine *Kansas City Southern*, celle-ci engage des trains blocs à double empilage en correspondance du côté du Pacifique avec des unités *overpanamax* engagées au sud de la Californie par certains armements, qui mettront sans doute fin à cette pratique de relais en 2016 quand les nouvelles écluses panaméennes entreront en service.

Contrairement à Suez, les hydrocarbures et les conteneurs ne sont pas sur le devant de la scène à Panama, ce qui pour les seconds s'explique par les détournements de trafic évoqués plus haut. Prises globalement, les autres marchandises représentaient, avec 122,6 Mt, près de 57 % du trafic du canal en 2012-2013 (55,5 % dans le sens Atlantique-Pacifique et jusque 59 % dans la direction opposée). Un très large éventail de produits s'observait à ce niveau, avec notamment d'importants flux de céréales diverses (32,5 Mt) et de charbon (16,5 Mt). De leur côté, les hydrocarbures (au sein desquels le pétrole brut ne comptait que pour moins de 5 Mt) intervenaient pour 41,5 Mt, soit 19,5 % du trafic total du canal (26,5 % de l'Atlantique vers le Pacifique,

mais seulement 8,5 % en sens inverse), ce qui ne laissait que 52,2 Mt pour les conteneurs, soit 21,5 % du total (18 % et 32,5 % respectivement) (tab. 5). Comparativement à Suez (398 Mt en 2012, soit près de 54 % du trafic total), il s'agit là d'un courant de trafic très modeste, mais l'autorité du canal espère bien qu'il augmentera très fortement une fois que les nouvelles écluses seront en service et qu'il n'y aura plus d'obstacles au passage d'une partie des porte-conteneurs qui en sont actuellement empêchés par la taille insuffisante des écluses de 1914.

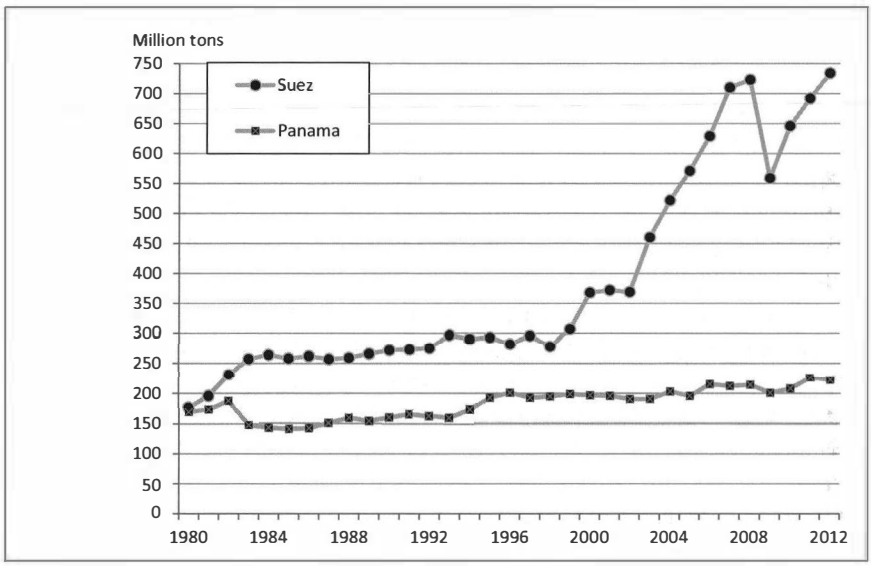


Fig. 5. — Evolutions comparées du trafic des canaux de Suez et de Panama.

Tableau 5
Structure du trafic panaméen pour l'année fiscale 2012-2013
(chiffres en 000t métriques après conversion des tonnes longues)

	Atlantique-Pacifique	**Pacifique-Atlantique**	**Deux sens cumulés**
Hydrocarbures	34 453	7 053	41 506
Conteneurs	23 662	27 556	52 218
Autres cargaisons	73 013	49 606	122 616
Total général	**131 128**	**84 215**	**215 343**

Elaboration de J. Charlier d'après le rapport annuel 2013 de l'Autorité du Canal de Panama.

Il est bien évidemment impossible d'avancer des chiffres précis sur le niveau futur des trafics conteneurisés panaméens, qui dépendront d'au moins deux facteurs: d'une part, les frais réels de route et de passage que les armateurs supporteront pour emprunter le canal avec des unités d'une pointure supérieure et la réaction qui ne manquera pas dans le chef des ports de la côte occidentale de l'Amérique du Nord et des compagnies ferroviaires transcontinentales qui les desservent (même si on peut supposer que l'arrière-pays des ports de la côte orientale s'élargira quelque peu vers l'Ouest); d'autre part, le développement (sur lequel nous reviendrons plus loin) des trafics conteneurisés vers et depuis l'Amérique latine ainsi qu'au sein de celle-ci, qui dépendra du rythme de croissance économique de cette partie du monde, laquelle ne pèse encore que pour quelques pourcents du trafic conteneurisé mondial.

Certaines des prévisions de trafic avancées pour le canal à l'horizon 2025 font état d'un doublement du volume total transité, d'environ 450 Mt, avec une très large fourchette pour la part que les conteneurs prendraient dans ce total, allant du tiers à la moitié, mais ceci est largement conjecturel. La mise en service des nouvelles écluses créera assurément un important «appel d'air», à la fois pour du trafic qui reprendra la route de Panama et pour celui que les nouvelles caractéristiques des écluses induira, mais il serait erroné de penser que la capacité du canal doublera alors brutalement et donc, potentiellement, son trafic aussi. En effet, les écluses de 1914 auront alors plus d'un siècle et l'autorité du canal a prévu de les rénover en profondeur, en mettant successivement hors service pour travaux un des deux jeux d'écluses anciennes; cela durera plusieurs années et ce n'est, au mieux, qu'à partir de 2020 que la capacité globale disponible sera effectivement le double de l'actuelle.

3.1. Les routes et marches internationaux desservis via le canal de Panama

L'isthme de Panama établit un relais maritime entre plusieurs grands marchés de production/transformation/consommation à l'échelle planétaire. Le tableau 6 montre combien les enjeux économiques et commerciaux prennent désormais le pas sur les considérations militaires et géostratégiques qui ont concouru à sa construction. La matrice des origines premières et des destinations finales des marchandises transitant par le canal de Panama renseigne sur la domination du marché américain dans les logiques circulatoires contemporaines.

Tableau 6
Origines et destinations principales des flux enregistrés
sur le canal de Panama en 2002 (en millions de tonnes métriques)

Régions	Origine	Destination	Total général
Etats-Unis	92,7	49,3	142,0
Chine	16,4	36,3	42,7
Chili	12,2	15,9	28,1
Japon	5,5	16,9	22,4
Corée du Sud	8,2	8,8	17,0
Colombie	9,7	5,2	14,9
Equateur	7,6	7,2	14,8
Pérou	6,9	7,6	14,5
Mexique	5,0	7,6	12,6
Panama	2,5	10,0	12,5

Elaboration de Y. Alix d'après des données de l'Autorité du Canal de Panama.

En premier lieu, il s'avère intéressant de constater que le canal reste largement tributaire de l'économie des Etats-Unis qui, malgré des solutions ferroviaires optimisées depuis la façade occidentale, continuent de recourir au système panaméen pour alimenter autant leurs ports de l'est que ceux du Golfe et même de l'ouest états-uniens. D'importants tonnages de vracs secs et liquides «sortent» aussi des systèmes portuaires du golfe du Mexique via le canal de Panama à destination de l'Extrême-Orient. Par ailleurs, la République Populaire de Chine, premier exportateur mondial, compte pour plus de cinquante millions de tonnes avec une route essentiellement entre les ports du nord et du centre du pays en connexion directe avec les ports du golfe du Mexique et de la côte orientale des Etats-Unis. Dans le cas présent, des produits manufacturés empruntent les écluses du canal pour rejoindre les ports de l'est américain proches des fortes concentrations de consommation à l'est du fleuve Mississippi et des Appalaches. Avec le Japon et la Corée du Sud, les volumes asiatiques dépassent les nonante millions de tonnes avec des profils d'échanges toutefois différents. Le Japon présente un déséquilibre au profit des flux d'importation qui transitent par le canal alors qu'une distribution nettement plus équilibrée caractérise la matrice des échanges avec la Corée du Sud.

Autre enseignement fort intéressant, le canal de Panama demeure une artère essentielle dans la circulation des biens en provenance ou à destination des principaux pays de l'Amérique latine. A ce niveau, les statistiques mettent en perspective deux dynamiques:

— La première, les relations commerciales maritimes des pays de l'ouest sud-américain sont largement tributaires de l'isthme panaméen, au point de constituer les deuxième et troisième routes commerciales les plus importantes avec respectivement l'Amérique du Nord côte est et l'Europe;
— La seconde, les échanges commerciaux entre pays latino-américains utilisent aussi largement le «raccourci géographique» que constitue le canal, à ceci près que l'économie brésilienne apparaît loin derrière le Chili, le Pérou et la Colombie qui cumulent à eux trois un tonnage supérieur à celui de la Chine.

Cette relative modestie des flux brésiliens dans les circulations trans-isthmiques s'avère intéressante à l'heure où les ports brésiliens se modernisent pour recevoir de plus grandes unités conteneurisées (UK Trade & Investment 2011). Bien sûr, les perspectives de croissance de l'économie du Brésil et de ses partenaires économiques sud-américains représentent de très forts potentiels de trafic avec des écluses redimensionnées (notamment dans les secteurs des vracs secs et des cargaisons générales non conteneurisées, en sus de celles qui le sont ou le seront).

Considérant cette situation des échanges, le tableau 7 propose une indication supplémentaire sur la hiérarchie des services de lignes régulières qui transitent par le canal de Panama. Les données y décrivent la situation constatée au 31 décembre 2011. Les services reliant l'Extrême-Orient et la côte orientale des Etats-Unis dominaient alors largement avec plus de trois millions d'EVP de capacité, répartis sur treize services distincts pour cent vingt navires mobilisés. La compétitivité économique et logistique des raccourcis ferroviaires nord-américains via la côte occidentale n'empêche pas la pertinence stratégique des solutions *all-water* via Panama.

Tableau 7
Distribution des principales routes conteneurisées empruntant le canal de Panama (situation au 31 décembre 2011)

Route	Services	Navires	Capacité EVP
Asie – Est USA	13	120	3 008 960
Europe – Ouest Amérique latine	8	56	1 097 730
Services pendulaires	3	41	747 626
Est USA – Ouest Amérique latine	3	18	378 975
Europe – Ouest USA	2	14	283 155
Asie – Caraïbe	1	11	239 232

Source: Panama Canal Authority, 2012.

Cela tend à prouver, dépendamment de la nature des produits manufacturés et de leur sensibilité au temps de transport, que les solutions via des ports dépourvus de grande profondeur continuent de trouver une pertinence économique pour l'alimentation des foyers de consommation de l'est du continent américain. Les *panamax* optimisés dominent la composition des flottes sur cette route maritime, l'une des plus longues du monde de bout en bout.

Par ailleurs, la route entre l'Europe de l'Ouest et la côte occidentale de l'Amérique du Sud concentre huit services réguliers pour un total supérieur au million d'EVP, auxquels s'ajoutent les trois services et les 380 000 EVP de capacité desservant les ports de la côte orientale U.S. via Panama. En complément aux flux asiatiques qui ne passent pas par Panama, ces deux flux commerciaux majeurs alimentent la croissance spectaculaire enregistrée ces dernières années par la plupart des ports latino-américains de la côte occidentale. Les investissements sur Callao au Pérou et Guayaquil en Equateur ont permis d'enregistrer des croissances supérieures à 20 % entre 2009 et 2011! L'ensemble de la zone latino-américaine a enregistré le second plus fort taux de croissance depuis le début de la crise économique mondiale derrière l'Extrême-Orient. Avec l'ouverture des nouvelles écluses, de plus grandes unités pourront densifier les rotations sur cet axe de trafic qui nourrit également les deux principaux ports chiliens (Valparaiso et San Antonio) ainsi que le port colombien de Buenaventura en premier/dernier touché des rotations empruntant le canal de Panama. L'accord commercial entre les exportateurs de l'Union européenne et ceux du Pérou (puis ceux de la Colombie) en vigueur depuis le 1er mars 2013 devrait stimuler un peu plus les échanges. Selon la Commission européenne, cinq cents millions d'euros d'économie en sont attendus rien qu'en droits de douane (Commission européenne, 28 février 2013).

3.2. La bataille du transbordement caribeen est lancee... pour desservir surtout le marche des Etats-Unis!

La perspective de voir arriver prochainement des porte-conteneurs de 12 500 EVP nourrit bien des espoirs et des projets dans l'ensemble de l'espace portuaire caribéen et nord-américain. Aujourd'hui, les transbordements se distribuent entre quelques grands ports spécialisés qui tirent profit d'une localisation géographique privilégiée dans la circulation générale des flux entrants et sortants de la zone des Caraïbes. Le tableau 8 reprend le top 5 de ces terminaux où les transbordements dominent largement les manutentions conteneurisées. Tous présentent des profondeurs d'eau très confortables et

annoncent des projets d'expansion très ambitieux pour capter les services massifiés qui devraient s'organiser sur le carrefour stratégique caribéen. Il faut rappeler que tous les rapports de consultants s'accordent pour avancer qu'à l'horizon 2030, deux tiers des capacités conteneurisées seront constituées de navires de type *overpanamax* (par rapport aux normes de 2012) et que près de la moitié d'unités d'une capacité d'emport supérieure à 10 000 EVP.

Tableau 8
Principaux ports de transbordement de la zone des Caraïbes

Localisation	Portiques	Superficie (ha)	Longueur (m)	Tirant d'eau (m)	Trafic total 2011 (EVP)	Capacité prévue (situation 2011)	Opérateur terminal conteneurs
Kingston, Jamaïque	19	185	2 455	14.5	1 800 000	5 200 000	Local
Freeport, Bahamas	10	49	1 036	16	1 200 000	3 500 000	Hutchinson Whampoa
Manzanillo, Panama	14	52	1 940	14	1 800 000	4 000 000	Local
Colón, Panama	10	74	982	15	3 300 000	1 300 000	Evergreen Group
Caucedo, République Dominicaine	7	50	922	13.5	1 000 000	–	Dubai Port World

Source: PINNOCK & AJAGUNNA 2012, ALIX 2012b.

Cette projection sur l'horizon maritime accompagne une triple dynamique économique et logistique qui justifie l'effervescence, pour ne pas dire la frénésie, des investissements portuaires actuellement envisagés dans les Caraïbes.

La première dynamique relève quasiment d'un pari: celui de l'incapacité des autorités fédérales U.S. d'accompagner les financements colossaux nécessaires à mettre plusieurs terminaux du golfe du Mexique et de la côte orientale des Etats-Unis aux «normes» des 12 500 EVP en charge pleine. Aujourd'hui, New York-New Jersey, Baltimore et Norfolk sont les trois seuls ports à prétendre disposer des fameux cinquante pieds d'eau nécessaires pour accommoder sans aucune contrainte les futurs navires. Tous se situent dans la partie la plus septentrionale du marché de l'est américain, trop loin des concentrations urbaines du sud-est et du Golfe. Au sud de Norfolk, aucun port n'est même proche de cette profondeur, même si Charleston en Caroline du Nord nourrit l'espoir d'approfondir encore son chenal actuellement à

quarante-cinq pieds. Le *U.S. Corps of Engineers* a produit un rapport en 2012 qui résume des enjeux avant tout financiers. Ce service de l'Etat fédéral américain dispose aujourd'hui d'une enveloppe globale de 1,5 à deux milliards de dollars U.S. pour construire, entretenir et développer les chenaux d'accès et les bassins en eau des ports du pays. Or, il faudrait entre trois et cinq milliards d'efforts annuels pour entrevoir des profondeurs de cinquante pieds et plus sur des ports stratégiques du golfe du Mexique et de la côte orientale des Etats-Unis. Pour le seul port de Savannah, six cent vingt-cinq millions devraient être mobilisés pour recevoir les futurs navires *post-panamax*. Lors d'une conférence en 2012 sous les auspices du port de Jacksonville, Paul J. Anderson, *Chief Executive Officer* (CEO) du port et également leader d'une association de ports maritimes de la Floride, n'hésitait pourtant pas à exhorter en tribune le pouvoir fédéral et les *congressmen* de Washington D.C. pour que l'approfondissement des terminaux floridiens soit une priorité nationale! En substance, Paul J. Anderson craignait de perdre la bataille des grands navires au détriment des terminaux spécialisés de transbordement situés dans un périmètre de deux jours de navigation des côtes floridiennes. Beaucoup d'autres portuaires américains, parmi lesquels Ricky Huntz, vice-président du port de Houston, demeurent largement plus sceptiques sur l'impérieuse nécessité de draguer les chenaux des ports U.S.:

> I've talked a lot about the expansion of the Panama Canal in the last couple of years... but the one thing I've learned is that nobody really knows what's going to happen (Ricky Huntz, Port of Houston Authority's vice president for origination, as quoted in the *New York Times*, February 18, 2012).

Sujet de discussion nationale et internationale: le glissement de la ligne de gravité économique vers l'ouest avec une extension des arrière-pays immédiats des ports de l'est et du Golfe. Calculs économiques de bout en bout, calculs logistiques des temps de transit incluant les pratiques de *slow steaming* et les ruptures stratégiques sur les hubs caribéens, calculs des fiabilités des services selon la nature des marchandises transportées: l'ensemble est soupesé et pondéré en fonction des intérêts particuliers de chacune des parties prenantes des chaînes logistiques concernées. *In fine,* force est de conclure que les facteurs clés de succès de la solution *all water* pour la desserte des marchés intérieurs nord-américains relèvent directement des solutions stratégiques et opérationnelles retenues par les grands comptes U.S. et les *super freight forwarders* qui articuleront leurs solutions consolidées en import et export. La disponibilité (et la performance!) des futurs hubs caribéens, tout comme l'opportunité de naviguer dans des chenaux approfondis sur l'est et le Golfe des Etats-Unis, entrent comme des facteurs particuliers

dans une équation finale des coûts de bout en bout. Ces donneurs d'ordre eux-mêmes communiquent très peu sur leurs intentions, comme s'ils attendaient le moment voulu de tester des solutions de part et d'autre des écluses panaméennes. Il ne faut pas oublier que les calculs économiques des intégrateurs logistiques ne s'alignent pas nécessairement sur ceux des armements, des opérateurs de manutention, et *a fortiori* des autorités portuaires américaines et caribéennes. Les forces du marché et les aptitudes à proposer des solutions intégrées compétitives constitueront le levier décisif qui dessinera les solutions nouvelles utilisées par le nouveau canal. Seule certitude aux Etats-Unis aujourd'hui: l'opportunité de passer le canal avec 12 500 EVP constitue une nouvelle alternative sérieuse quand des troubles sociaux perturbent la fluidité et la fiabilité logistique d'une façade, qu'elle soit à l'ouest, à l'est ou dans le Golfe!

En second lieu, une dynamique largement sous-estimée relève des opportunités de croissance au sein même de l'espace caribéen. Au-delà des services de collecte sous-régionaux pour alimenter les grands ports de transbordement, une vraie opportunité existe dans la stimulation économique et logistique des échanges interinsulaires caribéens. Les économies d'échelle générées par les ruptures des grandes unités conteneurisées orchestrent une noria de services sous-régionaux qui pourraient profiter autant des croissances économiques organiques de la plupart des petits Etats insulaires que des «grands pays côtiers» que sont la Colombie, le Venezuela mais aussi le Costa Rica et surtout le Mexique caribéen. Le projet costaricain du port en eau profonde de Mión porté par le Danois APMT (992 millions de dollars U.S. d'investissements) revendique le triple dividende:

— de la croissance économique du pays;
— de la croissance des échanges entre le Costa Rica et ses voisins immédiats du centre de l'Amérique;
— des opportunités de connexion avec les services en transbordement sur les terminaux spécialisés.

Même sentiment pour justifier les expansions à Cartagena en Colombie ou divers projets d'expansion au Mexique ou au Venezuela. Les efforts d'intégration économique et douanière sous-régionale constituent un défi majeur de la construction d'un véritable marché sous-régional à l'instar de celui de la mer de Chine et dans une moindre mesure de la Méditerranée. L'accompagnement politique et les négociations entre Etats restent des leviers essentiels pour transformer l'opportunité économique des nouvelles écluses pour cette myriade de petits et moyens ports insulaires qui n'ont pas vocation à devenir de grands terminaux de transbordement.

Finalement, sur cette dynamique caribéenne et sous-régionale, le Panama pourrait mettre tout le monde d'accord avec des ambitions qui dépassent largement la gestion et l'opération des transits maritimes ou des transbordements transcontinentaux. Une phrase d'Alberto Alemán Zubieta, CEO de la *Panama Canal Authority*, dans un article du *Journal of Commerce* publié le 14 mars 2011, résume l'ambition panaméenne (fig. 6).

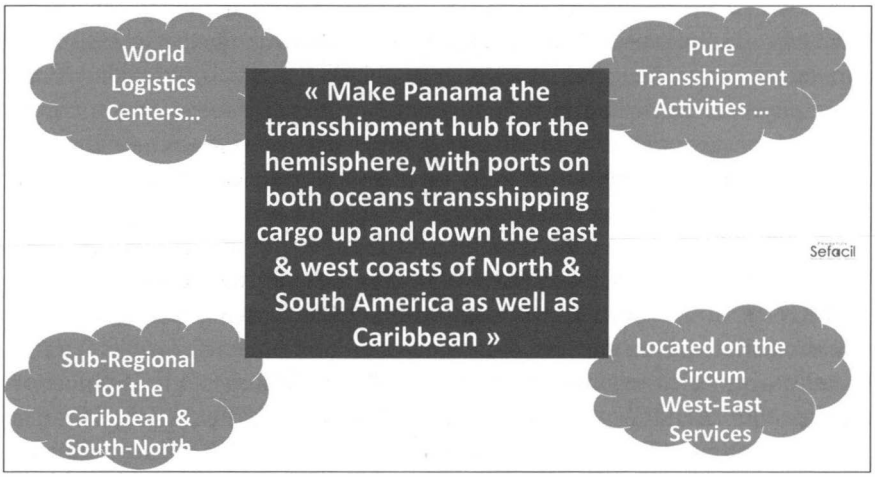


Fig. 6. — Les potentialités logistiques panaméennes avec l'ouverture des nouvelles écluses et les nouveaux terminaux conteneurisés (1) (élaboration de Y. Alix, 2012).

Facilités logistiques, traitement à haute valeur ajoutée des produits en rupture, zones sous douane à la fiscalité très avantageuse, gestion spéciale des produits sous température contrôlée: autant de services logistiques qui pourraient «habiller» les propositions de transbordement portuaire au Panama, tant sur l'entrée Pacifique que caribéenne. Le pays tout entier compte optimiser son statut d'artère essentielle du commerce mondial en devenant un nouveau carrefour de production/transformation manufacturière à l'instar de Hong Kong, de Singapour ou plus récemment de Djebel Ali à Dubaï (fig. 7). En croisant l'indice de connectivité maritime de la CNUCED et le produit intérieur brut national, les opportunités apparaissent considérables, faisant des écluses et des zones logistiques adjacentes le moteur d'une croissance économique nationale qui ne serait pas simplement basée sur les péages. D'ores et déjà, l'Etat panaméen et la *Panama Maritime Authority* ont validé le projet d'un consortium asiatique pour construire un nouveau développement logistico-portuaire à Colón sur l'entrée Atlantique des nouvelles écluses. L'inauguration de la première tranche d'un investissement de six cents millions de dollars U.S. devrait coïncider avec l'inauguration des

nouvelles écluses avec la revendication d'être la première solution portuaire et logistique de l'ère *overpanamax* au Panama.

Dernière dynamique largement sous-documentée, ce sont les opportunités de trafic entre les côtes orientale et occidentale de l'Amérique latine avec le rôle moteur de l'économie brésilienne encore largement sous-connectée par un appareil portuaire conteneurisé qui tarde à se moderniser (UK Trade & Investment 2011). Une nouvelle artère commerciale majeure pourrait voir le jour avec l'utilisation en import/export de la solution de Panama pour les économies de la côte orientale d'Amérique du Sud. Dans ce sens, une forme de «transbordement intermédiaire» pourrait voir le jour au sud du polygone de la figure 8 avec des potentialités intéressantes sur les terminaux français de la Guadeloupe et de la Martinique en concurrence directe avec celui de Port of Spain. Ces autorités portuaires et quelques autres plus modestes travaillent à évaluer la pertinence économique et logistique garantissant une rentabilité minimale face à de très lourds investissements publics. Plusieurs solutions d'investissement en coportage avec de grands investisseurs privés pourraient mitiger les risques opérationnels et financiers. Toutefois, aucun grand projet majeur n'a réellement été confirmé aujourd'hui. Les potentiels de flux demeurent encore trop incertains pour des terminaux localisés trop au sud du *main pipe* des Etats-Unis. Les croisements de lignes régulières depuis l'Europe, la Méditerranée et les côtes occidentale et centrale de l'Afrique constituent une autre dimension de l'équation des flux potentiels à capturer sur ces hubs intermédiaires méridionaux caribéens.

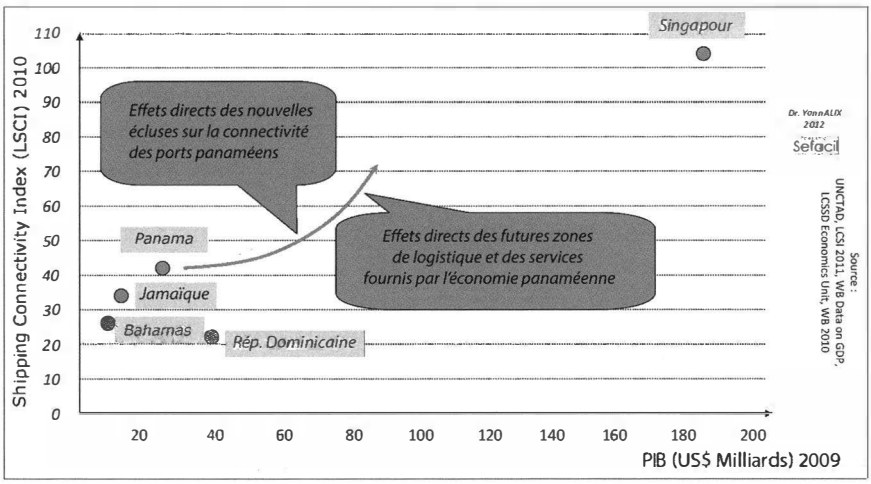


Fig. 7. — Les potentialités logistiques panaméennes avec l'ouverture des nouvelles écluses et les nouveaux terminaux conteneurisés (2) (élaboration de Y. Alix, 2012).

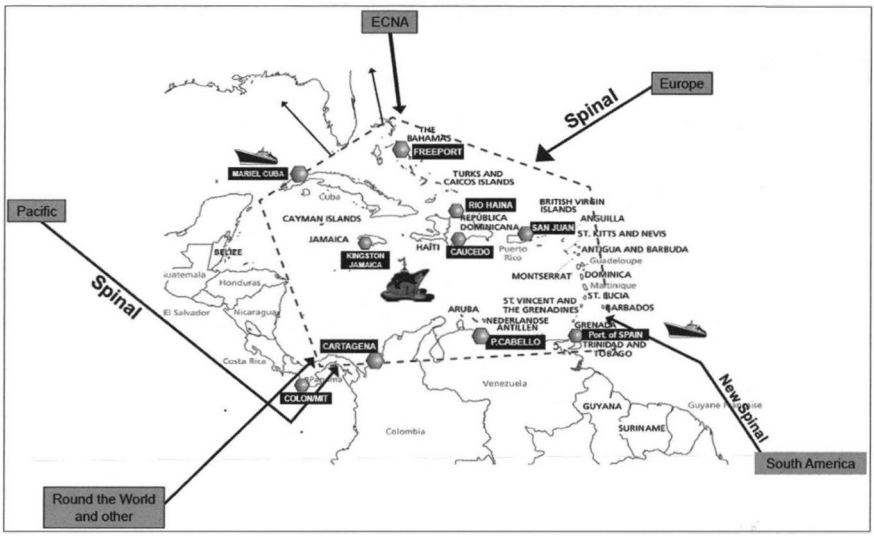


Fig. 8. — Le polygone caribéen et les nouvelles artères du commerce mondial avec l'ouverture des nouvelles écluses panaméennes (*source*: PINNOCK & AJAGUNNA 2012).

4. Conclusion

Bien des incertitudes planent sur les conséquences maritimes, portuaires et logistiques de l'ouverture des nouvelles écluses du canal de Panama aux porte-conteneurs de 12 500 EVP. Dans le cadre des travaux de prospective de la fondation Sefacil, la figure 9 vise à ouvrir les débats sur les opportunités des futures circulations maritimes planétaires via Panama.

L'émergence d'une nouvelle route circumplanétaire équatoriale pourrait profiter des nouveaux gabarits, à l'instar des initiatives pionnières de *US Lines* et d'*Evergreen* à la fin des années 1980 avec l'arrivée des générations de porte-conteneurs *panamax*. Plusieurs éminents spécialistes, parmi lesquels Ashar, Stopford ou encore Ma, avaient annoncé ces opportunités circumé-quatoriales en évoquant déjà la limitation du calibrage des écluses dans les modèles économiques de tels services. Avec des rotations articulées sur des flottes de 12 500 EVP, c'est quasiment trois fois la taille des navires de l'époque qui est à considérer, sachant que les performances énergétiques des nouvelles générations permettent de consommer moins de carburant pour emporter trois fois plus de boîtes! De surcroît, les services pendulaires continuent de subir les déséquilibres chroniques de flux, ce qui relance la pertinence économique des services «Tour du Monde» qui retrouveraient une

véritable crédibilité avec un calibrage des flottes à 12 500 EVP en réduisant le nombre de touchées portuaires et en maximisant les circulations des conteneurs vides par un maillage des routes sur plusieurs hubs majeurs.

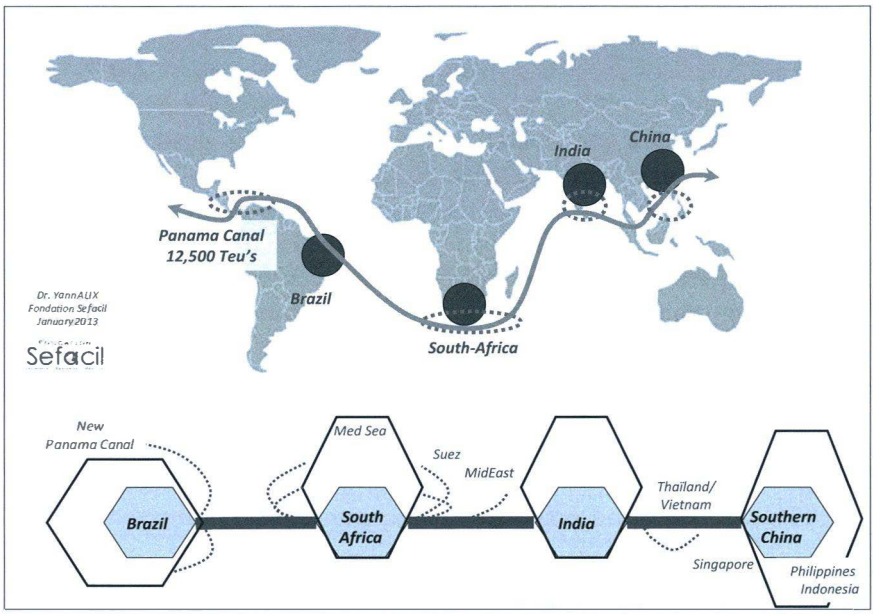


Fig. 9. — La future route circuméquatoriale et l'avènement d'une nouvelle BRICS' Route via Panama (élaboration de Y. Alix, 2013).

Et finalement, une ultime interrogation: quid de la maîtrise sur le long terme des coûts du passage de Panama, cœur de la problématique de compétitivité des futures routes et solutions maritimes par l'isthme? Début mars 2013, *Maersk Line* annonçait la réorganisation d'un important service (la ligne TP7) en transitant par Suez plutôt que par Panama pour relier le nord-est chinois et la côte est de l'Amérique du Nord. En cette période de réductions drastiques des coûts fixes et d'exploitation, les armements optent pour des solutions radicales et particulièrement volatiles. Maersk expliquait alors que les neuf mille boîtes de la route via Suez permettent un potentiel d'économie de cent millions de dollars vis-à-vis des 4 500 EVP actuellement déployés sur Panama. La concurrence entre les deux isthmes va donc s'exacerber à l'horizon 2016 avec Suez comme autre élément essentiel dans l'équation totale des coûts de bout en bout. Les 12 500 EVP devront alors être considérés face aux 18 000 EVP de la génération *Triple E* de *Maersk Line* et aux unités plus capacitaires encore qui sont annoncées, tendant désormais vers les 20 000 EVP!

BIBLIOGRAPHIE

ALIX, Y. 2012a. Is South Africa able to become the first super global transhipment area of the Southern Hemisphere? — Durban, TNPA, Transnet National Ports Authority Leadership Debate Session (1st ed.).

ALIX, Y. 2012b. From super global terminal to regional small port: which race are we talking about? — *In*: New Panama Canal opportunities for PMAC. Bridgetown (Barbados), Port Management Association of the Caribbean.

ALIX, Y. 2012c. Which innovation to drive the change in the 2020 Global Transportation Network? — *In*: The Caribbean Shipping Association Executive Conference (May, 21st & 22nd, Jacksonville. USA).

ALIX, Y. & PINNOCK, F. 2012. La expansión del Canal de Panamá: reflexiones libres sobre las oportunidades a los puertos de transbordos en los Caribes. VII reunión de la Comisión Interamericana de Puertos (CIP). — Lima, Organización de los Estados Americanos (non publié).

CEPAL 2012. Movimiento portuario contenedorizado de América Latina y el Caribe 2011. — *Boletín Facilitación del Transporte y el Comercio en América Latina y el Caribe*, **307**: 17-28.

CHARLIER, J. 2000. De la norme panamax à l'essor des overpanamax. — *Bulletin de l'Association des Géographes Français*, **121**: 102-111.

CHARLIER, J. 2004. The cruise shipping industry in the corporate mergers and overpanamax eras. A comparison with the container shipping industry. — *Belgian Geographical Journal (BELGEO)*, **4**: 433-460.

CHARLIER, J. & MCCALLA, R. 2006. A geographical overview of the world cruise market and its seasonal complementarities. — *In*: DOWNLING, R. (Ed.), Cruise Tourism: Issues, Impacts, Cases, London, CABI Publ., pp. 9-23.

DE DIESBACH, G. 2009. Ferdinand de Lesseps. — Paris, Morin, 455 pp.

DE MONIE, G. & ALIX, Y. 2012. Prospective Vision of Maritime Transports, Ports and Logistics. — *In*: Meetings Europe/Africa/America: The Sea, Maritime Transport, Ports and Development of the Economies (26th & 27th March 2012, Cascais, Portugal).

ECLAC 2012 (June). Macroeconomic Report on Latin America and the Caribbean, 80 pp.

FAHLE, G. 1954. The Panama Canal. An auxiliary of the (US) Fleet. — *Proceedings of the US Naval Institute*, **80** (5): 495-503.

FREMONT, A. 2007. Le monde en boîtes: conteneurisation et mondialisation. — Marne-la-Vallée, INRETS, *coll. Synthèses*, **53**, 145 pp.

GARZKE, W. & DULIN, R. 1980. Allied battleships in World War II. — Annapolis, Naval Institute Press, 391 pp.

GARZKE, W. & DULIN, R. 1985. Axis and neutral battleships in World War II. — Annapolis, Naval Institute Press, 523 pp.

IRELAND, B.1985. Aircraft carriers of the world. — New York, Metro Books, 256 pp.

LAM, L. 2010. The possible effects of the Panama Canal expansion on ports in the Western Hemisphere. — *In:* XIX Latin American Congress on Ports (Manta, Ecuador), 42 pp.

LEVINSTON, M. 2008. The box: how the shipping container made the world smaller and the world economy bigger. — Princeton, Princeton University Press, 416 pp.

LIM, S. 1996. Round-the-world services. The rise of Evergreen and the fall of US Lines. — *Maritime Policy and Management*, **23**: 119-144.

MARCADON, J. 1999. Enjeux économiques et politiques des pertuis maritimes. — *Bulletin de l'Association des Géographes Français*, **76**: 293-302.

MARCADON, J. 2004. De quelques conséquences de l'arrivée prochaine des mega porte-conteneurs. — *BELGEO (Revue Belge de Géographie)*, **4**: 419-431.

NOTTEBOOM, T. 2010. From multi-porting to a hub port configuration: the South African container port system in transition. — *International Journal of Shipping and Transport Logistics*, **2**: 224-245.

NOTTEBOOM, T. 2012. Towards a new intermediate hub region in container shipping? Relay and interlining via the Cape route vs. the Suez route. — *Journal of Transport Geography*, **22**: 164-178.

PINNOCK, F. & AJAGUNNA, I. 2012. Maritime Highways Corridors into the Caribbean Seas: Perspective on the impact of the opening of the expanded Panama Canal in 2014. — *In*: ALIX, Y. (éd.), Les corridors de transport. Caen, éd. EMS, *coll. Les Océanides de la Fondation SEFACIL*, **1**: 313-323.

RODRIGUE, J.-P. 2010. Factors impacting North American freight distribution in view of the Panama canal expansion. — University of Calgary, Van Horne Institute in Transportation & Logistics, 64 pp.

RODRIGUE, J.-P. 2012. A big step or a small leap? The Panama expansion and the global supply chains. — *In*: The Big Leap 2014. Challenges and opportunities for infrastructure in Colombia upon new flows of international trade. Cartagena, 28 pp.

SLACK, B. 2008. The Panama Canal: the crossroads at the crossroads. — *In*: GUILLAUME, J. (éd.), Les transports maritimes dans la mondialisation. Paris, L'Harmattan, pp. 69-78.

SOGREAH 2009. Etude de rentabilité économique et compléments financiers du projet de nouveau terminal à conteneurs de Jarry phase 1. — Pointe-à-Pitre, Port Autonome de la Guadeloupe, 35 pp.

SIEGFRIED, A. 1940. Suez, Panama et les routes maritimes mondiales. — Paris, A. Colin, 298 pp.

TOURRET, P. 2007. Les nouvelles échelles du transport maritime. — *Notes de Synthèse ISEMAR*, **91**: 1-4.

UK Trade & Investment 2011. Brazil: Opportunities for UK-based companies in the ports sector. — Accessing International Markets Series. 44 pp.

US Army Corps of Engineers 2012. U.S. Port and Inland Waterways Modernization: preparing for Post-Panamax Vessels. — Washington Institute for Water Resources, 104 pp.

VAN HAM, H. & RIJSENBRIJ, J. 2012. The development of containerization. Success through vision, drive and technology. — Amsterdam, IOS Press, 412 pp.

VIGARIE, A. 1995. La mer et la géostratégie des nations. — Paris, Economica, 428 pp.

International Colloquium
Interoceanic Canals and World Seaborne Trade: Past, Present and Future
Royal Academy for Overseas Sciences
Port of Antwerp
World Association for Waterborne Transport Infrastructure
Brussels, 7-9 June 2012
pp. 173-189

Waiting to Transit the Isthmus: Vancouver's Ports and the Panama Canal

by

Peter HALL*

KEYWORDS. — Interoceanic Canals; Megaprojects; Uncertainty; Vancouver; Panama.

SUMMARY. — Interoceanic canals, like other megaprojects with global impact, unfold over three lengthy and uncertain phases: (1) planning and financing, (2) construction, and (3) commercial experimentation as carriers and shippers respond to the route-shaping effects of the new canal. The current Panama Canal expansion, already in its construction phase, has unleashed great uncertainty and a major debate about the future of ports on the west coast of North America. A century ago, port industry actors in British Columbia were also waiting to transit the isthmus, facing the same uncertainties and engaged in similar debates. In 1911, Vancouver was a 'developing' place, gaining a port authority in 1913 and its first grain elevator in 1916 as a direct result of the Panama Canal which opened in 1914. However, trade through the canal only really took off in the 1920s. Even before then, the failed French attempt to build a Panama Canal (1876-1889) coincided with the construction of the Canadian Pacific Railway (completed in 1886). What lessons can we learn today from an historical examination of how actors debated and anticipated the original opening of the Panama Canal? Even if a megaproject is not completed or if its effects are unanticipated, these anticipatory debates are important because long lead times and uncertainty cause actors to make their own investments, and create new alliances and governance structures. This paper makes an historical analogy using data taken from Vancouver area newspapers, including reports, editorials and letters, from before 1900 until the early 1920s. First the possibility of the canal, and its eventual completion, had a profound effect on the development of the Vancouver area ports, even though this unfolded over a time period of half a century. What ideas did port developers in

* Professor, Urban Studies Program, Simon Fraser University, Vancouver Campus, Harbour Centre, 515 West Hastings Street, Vancouver, BC (Canada). The insights and assistance of Dr Pamela Stern are gratefully acknowledged, as is the financial support of the Social Sciences and Humanities Research Council of Canada.

Vancouver put forward, what role did the Panama Canal proposal and then construction play in the development of the port? What lessons does this hold for port developers today?

*
* *

A debate is currently raging about the impacts on world shipping patterns of the Panama Canal expansion, slated for completion in 2014; how will the expanded canal affect trade between Asia, Europe and the Americas? In North America, the debate is dominated by concern with competition between ports on the west and east coasts and the future of the land bridge, and amongst East and Gulf coast ports. While nobody really knows how this will play out, all along the East Coast, ports are dredging and raising bridges, building and automating terminals, improving landside connections, and renegotiating leases and labour contracts. Nonetheless, it is not clear that all investment being made actually assume that the ground will shift fundamentally; the order-book for post-super Panamax vessels continues to grow. Some of the most aggressive investors are trying to entrench the existing and emerging North-American land bridges: from Prince Rupert to Lazaro Cardenas and all points in between, freight rail is receiving considerable investment. We no longer hear doubts about whether the expansion will be completed, although we do hear that Panamanians are still debating whether the expansion can pay for itself, as well as whether the environmental impacts are worth the anticipated benefits. These debates are being aired in a variety of forums, and it is clear that the entire process of expanding the canal is associated with a lot of uncertainty.

It was not different a hundred years ago when it became clear that the Panama Canal would be completed for the first time. Indeed, from the vantage point of Vancouver, British Columbia, Canada, the historical parallels are quite intriguing, and worthy of serious comparison. For example, in both time periods, there were important port governance reforms (1912/3 and 2008), rail and infrastructure investments, and the assertion of peripheral BC ports (although we use Hayuth's term cautiously; because of the distances involved, the concept of peripheral ports has a very particular meaning in the British Columbia context). There is even a resonance to the vigorous competition between US and Canadian interests playing out in regulatory arenas; before the canal first opened there was a vibrant debate about tariffs on US coastwise shipping that pitted a coalition of British shipping and US and Canadian railroad interests against American shipping interests. In 2012, for example, the Federal Maritime Commission investigated alleged illegal port

subsidies in Canada, eventually ruling that no law was being violated. Even the broader context is eerily similar; the canal opened at the end of an era of massive global economic expansion (how else in some broad sense was it possible to assemble the resources required?), but with great geopolitical and economic uncertainties already visible on the horizon. The same might be said of the current expansion.

But of course, the historical comparison with the previous time this canal fundamentally reshaped global trade routes cannot be taken too far. Although there was a Panamanian railroad from 1855, the first canal event was an opening — a new all-water route — rather than an expansion. The location of key markets and the weight of the global economy were also different. And, the industrial organization of transportation was considerably less globally integrated than it is today. However, these differences mean that we have a different cast of actors, and a different landscape of opportunity: what remains the same is that the actors face(d) uncertainties that could only be resolved through study, learning, experimentation, planning, investment, and time.

It is this question of uncertainty, rather than the historical similarities per se, that provide a scholarly reason for studying the debates and actions in British Columbia and Canada surrounding the opening of the Panama Canal. Indeed, it may seem difficult to appreciate this today, but it is probably true that the opening was associated with greater levels of uncertainty than the current expansion. We need to appreciate the drawn-out nature of the canal's opening, from the first American proposal in the 1850s, to French failure in the 1880s, to the hesitant start made by the Americans, and then finally to the canal's opening under the geopolitical uncertainty of war. It might also be possible to argue that the ability to collect information is better today than it was then, but this argument could be specious — we delude ourselves if we think that information and communication technologies do anything more than transform uncertainties. We will show in this paper that both speculative hype and serious, incremental, corporate search characterised the anticipation of the canal's opening.

The canal was an exogenous change in the operating environment of British Columbia-based producers and exporters, carriers, merchants and importers. In this sense they faced true uncertainty from a change that was essentially beyond their control. The same may be said of most of the world's traders, though perhaps not of the American body politic in the sense that they had a say in whether to pay for the canal in the first place. MAURER & YU (2008) argued that the immediate economic benefits of the canal accrued primarily to American consumers of transportation services that became

significantly cheaper following construction of the canal, in particular producers and users of Californian oil and Pacific Northwest lumber. There is no doubt, looking back, that the canal provided considerable cost and time savings, but looking forward, this was a less certain proposition. And most importantly, looking forward, agents had to be concerned about the distribution of those benefits.

This paper, thus, presents some of the ideas, fears, and hopes that port developers, railroads, real estate developers, exporters and importers, merchants and government official put forward in anticipation of the full opening of the Panama Canal (the canal opened in 1914, but was only fully open to civilian traffic in 1922, see MAURER & YU 2008). We are guided by theoretical contributions from old and new work in economic geography in our analysis, which we summarize here.

When confronted by situations of uncertainty-generating exogenous change, economic actors engage in processes of learning, discovery and experimentation, which in turn lead to actions such as (lobbying for) regulatory and institutional reform, formation of alliances, marketing, changing their business models, etc. and perhaps in the end, new investment in equipment, infrastructure, land and other forms of fixed capital (BERK 1994). FIELDS (2004) made a similar argument about the learning routines of firms; confronted by new communications and transportation technology, they experiment with new ways of organizing production and distribution.

These processes of learning and action are shaped by existing routines and practices (NELSON 1994). There are important debates about precisely why this is the case: is it because the information that an agent has at his disposal is necessarily incomplete and selectively filtered, or is it because new facts are made meaningful in ways that are particular to the agents involved? Although that debate is beyond the scope of this paper, suffice it to note that different types of agents have different ways of confronting uncertainty. We point to Pred's insightful perspective on this question. In a brief study of the early history of the Port of Boston, he wrote: "in any becoming place certain institutional projects are dominant in terms of the demands they make upon the limited time resources of the resident population and the influence they therefore exert upon what is doable and knowable" (PRED 1984, p. 259). Note also the importance of time in Pred's perspective: we will return to the idea that the canal became understood and meaningful over time to different actors.

VANCE (1970) presented a general argument about the practices employed by one type of actor in dealing with uncertainties associated with transportation and dispersed markets. Focusing on the role of merchants in the

development of European settlements in North America, he showed how they engaged in a process of connecting producers and consumers through their particular knowledge of both sets of market conditions. His arguments provide a rich portrayal of the role played by what might be regarded as 'uncertainty-resolving specialists'.

STORPER (1997) also observed that some agents are better suited to the task of discovering the implications of global change for a particular place, though his updated perspective places more emphasis on the process of learning than the identity of the learner per se. For Storper, territorially embedded agents learn in a global era through exposure and reflexivity. Hence, for Storper, those agents active in export markets are among the first to sense opportunities and threats in a globally-connected economic system, but those who also have a disposition to learning and experimentation are more able to benefit.

We will show how the disposition and access to resources prior to the canal allowed some actors to experiment and take 'risks' in the uncertain anticipation of the opening of the canal, and shortly thereafter. Existing routines, practices and distribution of social power all influenced who did what in the face of the uncertain potential and threat. And, if the canal was about anything, it was about an unfolding reconfiguration of a global economic system.

We do not claim that the anticipatory and reactive actions of agents based in British Columbia with respect to the opening of the Panama Canal changed the course of economic history at large, but we are going to argue that the nature and the timing of key investment decisions were framed by the social location of the agents enacting them, and the discursive understandings they each created to address the fundamental uncertainty of "What will the canal mean for us?". However, we will suggest that large capital interests and merchants in the largest cities were more likely to benefit, and so implicit in our argument is the idea that agents embedded in existing urban economies were likely to do a better job of selecting successful responses (HALL & JACOBS 2012).

Data Sources

Information about how various actors participated in and sought to shape the discourse around the opening of the Panama Canal come from a variety of sources. First, we examined the British Columbian historical newspapers that have been electronically indexed. These are mostly weekly papers from

small centres such as Bella Coola, Hedley, and Grand Forks. We were also able to electronically search back issues of the *Globe*, the Canadian paper of record and three major American dailies: *The New York Times*, *The Washington Post* and *The Wall Street Journal*. Unfortunately, the major dailies from the larger British Columbia markets have not been indexed or digitized, and so we were able to examine them only selectively. These papers include: *The News-Advertiser* (Vancouver); *The Sun* (Vancouver); *The World* (Vancouver); *The Colonist* (Victoria); *The Westminster Courier* (New Westminster, weekly) and *The British Columbian* (New Westminster). For the last of these, we did read every issue published in 1914. We conducted the search from 1906 to early 1922, but with limited search capacity (for example, we could not do the kind of bibliometric counts so common today because of the absence of appropriate search functions). In addition, there were many newspapers we were not able to find or review. Thus, our newspaper data are not complete and are not appropriate for quantitative analyses. Nonetheless, there are some things we can say based on the newspaper coverage.

Newspapers then, as now, are local boosters. They were also forums for elite debate and opinion shaping. While the story writers themselves face uncertainty, newspaper stories are good for understanding events and people, and the discourses, arguments used, around these events and by these people. They are also an ideal source for tracking the timeline of these discourses and events.

In addition to newspapers, we examined minutes of meetings and reports from the Boards of Trade in both Vancouver and New Westminster for the period 1909-1920 as well as town council minutes for the same period from New Westminster. The files of the boards of trade show that both cities possessed groups of united, tight, closely-related local merchants, traders and others who were systematic in researching how the new infrastructure could potentially affect their existing trade networks, either positively or negatively, in an incremental way. This is important: they did not approach the canal as something completely new, rather as something that might/could/would create new opportunities and threats. For example, we find evidence of the Vancouver Board of Trade carefully researching freight rates, and speaking about these in marginal terms: instead of asking what the end result of the canal would be to freight rates, they have charts and tables which show that they saw these metrics as variable. They asked, for example, what marginal change would be expected over time in freight rates, and how quickly would the differential for grains change from the prairies going via Fort William or Vancouver to eastern and European markets?

Not that the rampant speculators, promoters and hucksters were absent from the debate: indeed, it is rather more common to find these voices in the newspaper than the more reasoned ones. For example, the publisher of *The New Westminster Courier* wrote:

> When the Panama Canal becomes a great commercial highway, no province in Canada will benefit like British Columbia. ... Every other lumber producing country in the world could cease in its output, and British Columbia could supply the world for hundreds of years before the millions of standing timber in her miles of virgin forest were depleted ... consider the magnitude of the tribute Great Britain, Argentine and Africa will pay to British Columbia for her lumber when the Panama Canal throws open her harbours to the ships of the world. ... British Columbia is approaching an era of developing advancement, that will startle the world, and [New] Westminster is destined to become the greatest seaport on the Pacific Coast (*The Westminster Courier*, Feb. 17, 1912, pp. 5-6).

What did we learn from these data sources?

First, Canadian newspapers did not become especially interested in the Panama Canal until around 1911 or 1912 when the question was when the canal would open, rather than if it could be built. In the period two years before the opening, the newspapers were peppered with wild speculation and pronouncement about the possibilities for profit. These were matched by reports on investments in large infrastructure to take advantage of the canal — for example, the City of New Westminster sold $500,000 in bonds to finance port development — and workaday worries about whether Canadian (*i.e.* British ships) would be tolled as "foreign" vessels to use the canal. Not surprisingly, as the opening of the canal approached, the fantastical claims faded and the news coverage dealt with more mundane matters. Once the canal opened, stories focused on "firsts" — *i.e.*, the first load of British Columbia eggs to transit the canal — and slides in the Culebra Cut that forced temporary closure.

Secondly, there are some indications of a shift in the geographic scale of newspaper story reporting on the canal from local-provincial-national scales to the multinational and international scales as the impact of the canal became better understood. Before 1913, more stories focused on local-to-national concerns such as railroad building and land development. Later, especially after the war, stories focused more on issues of trade at the international scale.

Then, as now, Canadians see the United States as both an important trading partner and a threat to Canadian sovereignty and economic security. The Canadian press closely followed debates and votes in the US House of Representatives and US Senate regarding tariffs and tolls in the canal.

Thirdly, the railroads occupied a substantial proportion of earlier stories. This is consistent with what we know about the aggressive expansion of the Canadian rail system by existing (*e.g.*,. CPR, see INNIS 1923) and new (*e.g.*, Grand Truck Pacific, see HICK 2003) railroads. Between 1910 and 1920, single railway track mileage in Canada increased by 41 %; in Western Canada, it increased by 112 %, 201 % and 136 % in Saskatchewan, Alberta and BC respectively. [The first transcontinental railroad, CPR reached Vancouver in 1887, Port Moody in 1885]. Such was the overbuilding that by 1919, Grand Trunk and Canadian Northern railroads were under government control in the Canadian National Railway Company.

Fourthly, stories about actions by exporters and stories about specific export commodities were persistently reported and pursued. Stories about commodities that might be exported through the canal were prominent early on (before 1911), and then again in the latter part of the war and in the post-war period. Stories about actions by exporters followed a similar trajectory. As we will show, the timing of this reporting resonates with what we know about debates and actions of merchant and civic interests in the period after the canal opened.

We now turn to how the processes described here played out in a variety of forums, namely (1) the question of canal tariffs, (2) an unsuccessful attempt by the town of Bella Coola to attract a rail line that would allow it to benefit from the canal, (3) the competition between the cities of Vancouver and New Westminster for the government grain elevator, and (4) efforts by merchants in these two Lower Mainland cities to bypass the railroad monopoly on freight.

Panama Canal Tariffs Question

Even before the Panama Canal was completed, a controversy was brewing between the United States and Great Britain over the issue of canal usage tolls. The United States government under President Taft passed the "Panama Canal Act of 1912", containing within it a toll on vessels passing through the canal (JOHNSON 1938). While the toll itself was less of a problem from the perspective of the Canadians, they were angered that the Act exempted US (American-flagged) coastwise shipping from tolls. Canadians argued that existing treaties between the US and Great Britain exempted British (including Canadian) flag carriers engaged in similar coastwise shipping. In all likelihood, however, the controversy over the Canal tariff was really a controversy between North-American railroads and US coastal shipping interests;

and the British were recruited via Canadian railroad interests to speak against the proposed tariff exemption (*The Washington Post*, 1913, p. 6).

According to OLNEY (1913), the controversy over discriminatory tolls on the use of the Panama Canal had its roots in Anglo-American naval and commercial diplomacy over the preceding sixty years. Mutual agreements and formal treaties regarding canals stem back to 1850 with the Clayton-Bulwer treaty between the United States and Great Britain. This treaty was drawn up at a time when the two countries believed that financiers would more readily back the Panama Canal project if both the United States and Great Britain joined forces (OLNEY 1913). However, nearly fifty years later, as the United States decided to start the Panama Canal's construction without the assistance of a European power, a new treaty was necessary to override, in particular, the "joint construction" clause.

Ratified in 1901, the Hay-Pauncefote Treaty essentially provided a re-work of the Clayton-Bulwer treaty. According to OLNEY (1913) and the "American Society of International Law" (1914), major changes between the two treaties included recognizing the United States' ownership of the territory around the Panama Canal, the fact that the United States would be the sole builder and operator of the canal.

With the Panama Canal nearing completion, the US Congress passed and President Howard Taft signed the Panama Canal Tolls Act, fixing tolls based on ship type (commercial or warship), tonnage, and whether the ship was loaded or unloaded at the time of canal passage (JOHNSON 1938). As well, this Act specified a toll exemption for American ships engaged in coastwise shipping and transiting the Panama Canal.

Responding to the Americans' apparent neglect of the Hay-Pauncefote treaty, and prodded by Canada, the British began diplomatic negotiations with the United States. Resolution of this issue, however, did not occur under the administration of Republican Taft, but under that of his Democratic successor, Woodrow Wilson. Canadian newspapers closely followed the day-to-day actions of the US Congress with regard to the removal of tolls on Canadian vessels. *The Globe*, for example, printed an editorial congratulating the US House of Representatives for displaying good sense and national honour in repealing the toll exemption on American coastwise shipping. It goes on to predict that the vote in the Senate will reach the same result (April 14, 1914).

BELLA COOLA COURIER

Early reports about the Panama Canal in the *Bella Coola Courier* presented the canal as a threat to Canada. The paper reported the somewhat

fanciful proposition that the United States would use the canal as an excuse to force Britain to swap the British West Indies for a less-than-desirable swath of Alaska (Dec. 7, 1912). It also paid considerable attention to the tariff dispute between the United States and Canada/Great Britain.

But once the tariff issued was resolved in Canada's favour, the editor of the paper appears to have looked around, discovered that other places in British Columbia and western Canada were poised to take advantage of the opening of the canal, and cried, "we deserve goodies, too!" For example, the paper reported on the possibility of steamships locating in New Westminster (Jan. 25, 1913), on the construction of a grain-export terminal at Prince Rupert (May 3, 1913), that the government was constructing a "chain of grain elevators" in Moose Jaw, Saskatchewan; Calgary, Alberta; the Lower Mainland of British Columbia "in order to handle the grain business, which is expected to flow west when the Panama Canal is opened" (June 14, 1913). Most of these items were reported in a neutral tone, and it is only through analysis of paper's entire coverage of the Panama Canal story, that Bella Coola's own aspirations become clear.

What Bella Coola, a northern BC coastal town with neither road nor rail access, wanted was a railroad — specifically the proposed Pacific and Hudson Bay Railway. Despite support from Bella Coola's Member of Parliament, the railway was never built. And, in fact, the town was not connected to the provincial road system until 1955! A map, printed in every issue of the 4-page weekly, laid out the intended northerly route of the railroad. The newspaper, probably correctly, viewed the railroad as essential for the town to grow and for its residents to prosper economically. To this end it touted the town's propitious location vis-à-vis the grain-producing Prairies and the Panama Canal. According to the editor, shipping grain to Liverpool through Bella Coola would be sensible as the route would be some 1,300 miles shorter than through Vancouver via existing C.P.R. tracks (editorial Feb. 8, 1913). In the same editorial, the paper took particular umbrage at the perceived hubris and political muscle of Vancouver and one of its daily newspapers, the *News Advertiser*:

> The *News-Advertiser* in referring to 'the public of this province,' evidently means the public of Vancouver and district, and perhaps speaks with some truth when it says that the Bella Coola Railway project is looked upon unsympathetically by that section of the public of the province.
>
> But surely this great North whose revenues have so swelled the provincial treasury for years past; the alienation of whose natural resources has been greatly responsible for the rapid development which has taken place in the Southern portion of the province; surely the North is entitled to this railroad ...

Competition for the Grain Elevator

Vancouver Board of Trade President in his 1911-12 Annual Address felt assured that "between the railways and private enterprise sufficient elevators will be built in the next two years to provide for the *large shipments of grain that are sure to come this way on the opening of the Panama Canal*". The CPR was investing heavily and building grain elevators on the Prairies for shipments of grain through Port Arthur/Ft William (today named as Thunder Bay), but it is not clear that it was prepared to build elevators to ship through Pacific Ports. The Board president's confidence that a grain elevator in Vancouver would be built with private funds is, perhaps, a consequence of earlier government refusal to become directly involved in the elevator construction business.

In May 1912, however, George E. Foster, the federal Minister for Trade and Commerce, wrote to the Vancouver Board of Trade requesting information about current and, with an eye to the opening of the Panama Canal, future grain shipments through the Port of Vancouver. He concluded the letter:

> In making this enquiry, I do not wish it to be inferred that the Government propose to construct any or all of the elevator equipment necessary for the trade. Railway, corporate and private enterprises should, and no doubt will, increase facilities as commercial consideration render them necessary (reprinted in Vancouver Board of Trade Annual Report, 1912-13, p. 46).

By early 1914, through the efforts of the MPs from New Westminster and Vancouver, as well as the Harbour Commissions created in 1913 (STEVENS 1936, GIBB 1932), the government did agree to construct a grain elevator in the Lower Mainland to be used for shipping wheat to Europe via the soon-to-be-open Panama Canal. This appears to have exacerbated existing competition between New Westminster and Vancouver for shipping business as both vied to be the location for the Government Elevator. In fact, as early as 1908, the New Westminster Board of Trade was discussing how they might divert a large portion the grain bound for Vancouver to New Westminster. The following year, the president of the New Westminster Board of Trade shared his conviction that there would be a "revolution of Traffic Routes ... follow[ing] the completion of the Panama Canal" and the city of New Westminster needed to position itself to take advantage of the opportunity. Thus, "it only remains for the co-operation of the Board of Trade, City Council and the citizens to make [New Westminster] a National Port" (NW Board of Trade Annual Report, February 28, 1909).

The siting decision for the government elevator was ultimately the decision of the Department of the Interior. As a prior step, the applicants for the elevator made presentations in Winnipeg before the Grain Commission on April 6, 1914. There were two presentations from 1) the cities of the Burrard Inlet (Vancouver, North Vancouver, Port Moody) led by Vancouver, and 2) the cities along the Fraser River (New Westminster, Port Mann, Port Coquitlam, Ladner, Coquitlam) led by New Westminster. The Fraser River cities delegates returned from Winnipeg, convinced both that their claim to the elevator was unassailable and that the Vancouver delegates had improperly and unfairly disparaged the Fraser River ports rather than make a purely affirmative case for a Burrard location.

On April 7, 1914, Harvard-trained geographer and Vancouver resident, F. B. Vrooman presented an academic paper entitled "The Economic Effect of the Panama Canal on Western Canada" before the Royal Colonial Institute in London. In the paper, which was widely reported in newspapers in Canada and elsewhere in the Empire, Dr. Vrooman observed that the opening of the Panama Canal would allow grain and other shippers to break the monopoly of the railroads in setting freight rates (curious, since he also noted that Vancouver was served by seven different railroads — three American and four Canadian) and would thus permit grain growers to retain a greater share of their profits that had previously gone to the railroads. Vrooman also predicted that the opening of the Panama Canal would help shift the balance of economic power in Canada from the east to the west:

> There is no port in the world which will receive more benefit from the Panama canal than Vancouver. Already its challenge has met with the response that six great trans-Continental railroads, and one more with trans-Continental connections, have determined to make Vancouver their Pacific terminals, and already it is assured that at the mouth of the Fraser river there will be the largest and best-equipped single harbour and dock development in the world. This has determined for all future time that Vancouver is to be the metropolis of the British Empire on the north Pacific, if not the whole Pacific hemisphere, and the almost unimaginable era of development which awaits this city, specially favoured though it is, primarily because of the Panama canal, is likely to receive its greatest development, and British Columbia with it, not in the new relations opened through the canal with Europe, but through the new life of the Pacific, which itself has been set forward because of the tremendous stimulus of the great maritime highway (VROOMAN 1914, pp. 201-203).

Vancouver was chosen to be the site of the Government Elevator; the formal ministerial announcement was made on June 17, 1914. Within days, on June 20, 1914, *The British Columbian* (New Westminster newspaper) ran both a front-page story and an editorial describing the elevator that the town

had made such an effort to secure as merely "experimental". Both items asserted that the railroads were the key to success of grain shipments from Pacific ports and they, it was claimed, preferred a Fraser River location.

In September 1914, Victoria-based Brackman-Ker Milling Company announced plans to construct a 51,000 bushel capacity grain elevator on the New Westminster waterfront. At seven-storey high, the elevator was the tallest building in New Westminster until it was demolished in the early 1970s.

The Government Elevator in Vancouver was much delayed in its construction and did not ship any grain until October 1917. *The British Columbian* ran brief items inside the paper on December 3 and 8, 1914 to report that the construction contracts for the elevator were about to be awarded and that construction was expected to take a year. The reference to the elevator being "experimental" was not included.

As the opening of the Panama Canal approached, it was knocked off the front pages of Canadian newspapers by two events of more immediate concern to British Columbians and Canadians more generally. During the late spring and early summer, British Columbians were gripped by the arrival of a Japanese freighter, the *Komagata Maru,* carrying more than three hundred and seventy would-be Punjabi immigrants. As British subjects, all should have been permitted to legally immigrate to Canada. However, fearing racial and cultural contamination Canadians refused to allow most of the passengers to disembark. The ship and its passengers were held in the harbour for two months and finally the three hundred and fifty-six passengers were forced to return to India where many were imprisoned. The *Komagata Maru* left Vancouver harbour on July 23, 1914. Less than a week later, on July 28, 1914, the First World War was declared. The New Westminster paper, *The British Columbian*, did not even report the opening of the canal two weeks later. The *News-Advertiser*, one of the major papers from Vancouver, ran a short article about the canal's opening on page two on August 16. *The Globe*, the Ontario-based national paper-of-record, printed a short article on an inside page on opening day. The latter also printed a brief editorial "congratulating the American people on the vitality, boundless resource, and force of character that have combined to make this waterway possible". The editorial, however, concluded with a reminder that Canadians had not forgotten their earlier dispute with the United States over canal tolls (*The Globe*, Aug. 15, 1914, p. 4).

Despite pressing concerns related to the war, the opportunities presented by the Panama Canal did not disappear from the consciousness of the province's businessmen. In the fall of 1914, the Vancouver Board of Trade began studying how to take advantage of the grain trade once the government

elevator opened. The board's special committee on grain exports directed its secretary to gather information pertinent to grain handling in Vancouver. They instructed their secretary to communicate with "head of Alberta Pacific Grain Company in Calgary [to] get an expression from him as to the possibility of an early movement of grain Westward in the event of the completion of the Grain Elevator at Vancouver". They also wanted information on grain shipments from other West Coast cities, especially San Francisco, as well as comparative insurance rates (Bd of Trade Fonds 300/ 527-G-6, file 1; Vancouver Board of Trade: minutes of special committee on Grain exports). Responses to the inquiries were discussed during their meeting the following month.

On April 26, 1915, Member of Parliament H. H. Stevens was invited to a committee meeting to explain delays in the elevator construction. He placed blame with the contractors, and reported that the elevator would be open by January 1, 1916.

The first shipment of grain from Vancouver to the United Kingdom through the Panama Canal was delayed until November 1917 and was carried on an American freighter, the *War Viceroy*. The Vancouver Board of Trade hosted a celebratory luncheon at the Hotel Vancouver to honour the Captain and officers of the *War Viceroy*. The September 19, 1917 minutes of the Civic Reception Committee reported the selection of people delegated to offer toasts to the King, the Parliament of Canada and to the officers of the *War Viceroy*. This first shipment was carefully monitored to show that the tropical heat of the Canal Zone — later referred to as "the torrid temperature to which the grain would be subjected while passing through the Panama Canal" (*The Globe*, June 2, 1922, p. 7) — would not damage the grain.

Bypassing the Railroads: The Customs Officer Saga

The merchants and other business interests in British Columbia regarded the Panama Canal primarily as a mechanism to reduce freight transportation costs given that sea transport was considerably less costly than rail transport. In particular, they considered the rates for rail freight excessive and an obstacle to their own profit desires. Consequently, they sought ways to bypass the railroads as much as possible.

The "solution" they pursued was the establishment of a Canadian customs office in New York. This would permit manufacturers in Ontario and Quebec to move finished goods to New York under bond (and on American railways) where they could be loaded onto British or Canadian ships headed to British

Columbia. Additionally, they argued, grain, timber and other commodities could move from western Canada along the same route, but in reverse.

The Trade and Commerce and Transportation committees of the Victoria, Vancouver and New Westminster Boards of Trade met on October 15, 1915 and passed a joint resolution that closely tied use of the Panama Canal to Canada's economic prosperity and global competitiveness. The resolution, sent to the Prime Minister, several Cabinet Ministers, the BC delegation in Parliament and the Premier of British Columbia, read in part:

> The fact that the Panama Canal has greatly shortened the trade routes of almost all of Canada's competitors in the foreign trade make it incumbent upon British Columbia to avail herself to the utmost of that route, both in her foreign and in her inter-provincial trade.

and continued:

> It is also resolved that nothing the Railways are able to offer can justify the people of this Coast Province agreeing to anything that might prevent the securing of this Water Service.

The petition, though unsuccessful, was noteworthy because it is an example of co-operation and common purpose by the Vancouver, New Westminster, and Victoria Boards of Trade. Only eighteen months earlier, residents of New Westminster had openly complained that Vancouver maligned it by misrepresenting shipping conditions on the Fraser River during their efforts to secure the government grain elevator. The New Westminster Mayor and Board of Trade each demanded that Vancouver formally retract the part of its presentation to the Grain Commission that referred to New Westminster and the Fraser River (*News Advertiser*, April 16, 1914, p. 1 and *The British Columbian*, April 27, 1914, p. 1).

Conclusion

When did the canal, and the enormous transportation cost and time savings it represented, become a reality to BC-based economic actors? In some sense, the answer depends on where you stand. The aggressive railroad-building of the first decade and a half of the 20th century preceded the canal and was more an exercise in Canadian nation-building than a response to the canal itself. Yet, the railroads' expansion — even over-expansion — made the benefits of the canal to Canadian exporters and merchants possible. The prospect of the canal made some real estate promoters and local boosters wealthy, but in the place-based competition unleashed by the canal, there

certainly were many losers alongside the winners. Arguably, it was the urban merchants who benefited most from their methodical research and lobbying efforts which insulated them against the uncertainties the canal represented. It is no surprise that they waited until governance structures and government funding were in place, and until the canal was a known quantity before acting.

Vancouver clearly was a winner in this process, but so too was the much smaller New Westminster, which emerged in the decade after the canal's opening as an international seaport. Other BC ports — Nanaimo and Victoria — did not decline, but they failed to secure the benefits of the canal because they lacked the hinterland connections emplaced by the railroad's westward march. And what of Prince Rupert? After the flurry of construction activity to complete the railroad, the town failed to grow into the vibrant urban place promised by the Grand Trunk Pacific Railway's salesmen. Even today, with a new and rapidly growing container port that might somehow benefit from the Panama expansion, the town lacks a merchant class whose business is the expansion of trade rather than infrastructure.

Across all these stories, one conclusion is clear; the canal became a reality to each of these actors when they found a way to include it in their existing practices and routines, whether defensive (railways), aggressive (speculators) or experimental (merchants) in posture. There is every reason to expect that the current expansion of the canal will unfold in much the same way.

REFERENCES

American Society of International Law 1914. The Repeal of the Provision of the Panama Canal Act Exempting American Coastwise Vessels from the Payment of Tolls. — *The American Journal of International Law*, **8** (3): 592-597.

Berk, G. 1994. Alternative Tracks: the constitution of American Industrial order, 1865-1917. — Johns Hopkins, University Press.

Coker, W. S. 1968. The Panama Canal Tolls Controversy: A Different Perspective. — *The Journal of American History*, **55** (3): 555-564.

Fields, G. 2004. Territories of Profit: Communications, Capitalist Development and the Innovative Enterprises of GF Swift and Dell Computer. — Palo Alto, Stanford University Press.

Gibb, A. 1932. Dominion of Canada – National Ports Survey 1931-32. — Ottawa, Printer to the King's Most Excellent Majesty.

Hall, P. V. & Jacobs, W. 2012. Why are maritime ports (still) urban, and why should policy makers care? — *Maritime Policy and Management*, **39** (2): 189-206.

Hick, W. B. M. 2003. Hays' Orphan: The Story of the Port of Prince Rupert. — Prince Rupert, Prince Rupert Port Authority.

HUGILL, P. J. 2009. The American Challenge to British Hegemony, 1861-1947. — *The Geographical Review*, **99** (3): 403-425.

INNIS, H. A. 1971 [1923]. A history of the Canadian Pacific Railway. — Toronto, University of Toronto Press.

JOHNSON, E. R. 1938. The Panama Canal Tolls Problem and Its Solution. — *Proceedings of the American Philosophical Society*, **78** (4): 671-674.

MAURER, N. & YU, C. 2008. What T. R. Took: The Economic Impact of the Panama Canal, 1903-1937. — *The Journal of Economic History*, **68** (3): 686-721.

NELSON, R. 1994. The Co-evolution of technologies and industries. — *In*: ENGLAND, R. W. (Ed.), Evolutionary Concepts in Contemporary Economics. Ann Arbor, University of Michigan Press.

OLNEY, R. 1913. Panama Canal Tolls Legislation and the Hay-Pauncefote Treaty. — *Proceedings of the American Society of International Law at Its Annual Meeting*, **7** (1): 81-93.

PRED, A. 1984. Structuration, biography formation, and knowledge: observations on port growth during the late mercantile period. — *Environment and Planning D: Society and Space*, **2**: 251-275.

STEVENS, L. 1936. Rise of the Port of Vancouver. — *Economic Geography*, **12** (1).

STORPER, M. 1997. The Regional World: Territorial Development in a Global Economy. — New York, Guilford Press.

The Washington Post 1913. Canada's Canal Protest (January 4, p. 6).

VAN ALSTYNE, R. W. 1980. The Panama Canal: A Classical Case of an Imperial Hangover. — *Journal of Contemporary History*, **15** (2): 299-316.

VANCE, J. E. 1970. The merchant's world: the geography of wholesaling. — Englewood Cliffs, NJ, Prentice-Hall.

VROOMAN, F. B. 1914. The Condition and Prospects of the Panama Canal: Discussion. — *The Geographical Journal*, **44** (2): 201-203.

International Colloquium
Interoceanic Canals and World Seaborne Trade: Past, Present and Future
Royal Academy for Overseas Sciences
Port of Antwerp
World Association for Waterbome
Transport Infrastructure
Brussels, 7-9 June 2012
pp. 191-203

The Nicaragua Interoceanic Crossing: Past, Present and Future Opportunities for Nicaragua and World Commerce

by

Don Mario BOSCO*

KEYWORDS. — Nicaragua; Dry Canal; Interoceanic; *Canal Seco*; *Canal Interoceánico de Nicaragua* S. A. (CINN).

SUMMARY. — The history of Nicaragua has been punctuated with several attempts to build an interoceanic crossing. The US decision to construct the canal in Panama in the last century dashed Nicaragua's opportunity for a feasible and environmentally acceptable international transport crossing of the Isthmus, until the recent proposal for an interoceanic railroad and port project (known as the "Dry Canal") was developed by a multinational investor group in 1994 (*Canal Interoceánico de Nicaragua* S. A. or *CINN*). The project was approved into law by the National Assembly based on CINN's proof of the project viability and financing capacity, and investment in the feasibility studies and design proceeded, until it was blocked several times over the years by the internal politics of the country. During the early 2000s, a government proposal to build a "Grand Canal" (a water canal) was advanced and was abandoned as not feasible Nevertheless, the government violated its own laws and created obstacles to prevent CINN from proceeding with its Dry Canal Project to this day. Now the government is attempting a new water canal project with the help of a telecommunications company and investor from the People's Republic of China, which CINN believes is not feasible for environmental, financial and commercial reasons.

The Dream of a Nicaraguan Canal

The history of Nicaragua has been marked by the old dream of an interoceanic canal. Several historians point to 1567, when King Felipe II of Spain

* President Nicaragua Corporation *Canal Interoceánico de Nicaragua* S. A., Managua (Nicaragua); attomey-at-law, 39 Broadway, Suite 1230, New York, NY 10006 (USA). E-mail:don@boscolaw.us

ordered the study of a canal through Nicaragua. In 1850, when "gold fever" was all the rage in the United States, efforts to transport cargo from one coast of the USA to the other became focused on the San Juan River and Lake Nicaragua, encouraging the US military to study the construction of a channel through that route.

Nonetheless, the dream of such a canal evaporated, at least temporarily, when in 1902 the United States Senate decided to authorize the construction of the Panama Canal. In 1913, the US Ambassador to Nicaragua, George Weitzel, wrote: "In all cases of controversies between Nicaragua and Europe, Mexico, and Columbia, the true cause of the problem was the desire to control the interoceanic canal route" [1]*. Although the historic dispute between the Nicaraguan cities of León and Granada was in part fuelled by the idea of a canal, the planned canal was to utilize Lake Nicaragua, which is more a lake of Grenada than a lake of León. In 1913, Weitzel wrote: "In summary, it can be said that the question of the canal is the principal theme of disturbances of the affairs of Nicaragua, whether they be international [or] internal, and this is not less certain by the fact that the route through Panama was chosen years ago ..." [2].

Dr. Carlos Argüello Gomez, a prominent Nicaraguan historian and diplomat, in a presentation at the Nicaragua Historical Institute several years ago, referred to several interesting and not well-known anecdotes about the canal, including the following, which have been substantiated through research:

— As early as 1797, several of the fathers of Latin American independence Francisco de Miranda among them — tried to obtain British support to change the special transit rights for the proposed canal (GALEANA DE VALADES 2006);
— In a letter dated December 6, 1845, from León, Minister Castellón of Guatamala, San Salvador and Honduras responded to Prince Louis Napoleon stating that in 1830 a Nicaraguan canal concession was granted to a group of businessmen from the Netherlands, headed by King William of Holland (BONAPARTE 1846);
— In 1848, Prince Louis Napoleon accepted a concession to construct the "Napoleon Canal of Nicaragua" and said, "In the New World there exists a country as superbly situated as Constantinople ... We refer to the State of Nicaragua ... which is destined to reach an extraordinary level of prosperity and greatness" (MILLER 1891).

* Numbers in brackets [ ] refer to the notes, p. 203.

All through the second half of the 19th century there were many developments and false starts for a Nicaraguan canal, but in 1902 everything appeared to end with the decision to build the canal in Panama.

Fast forward to the 1990s, when the Panama Canal had been in operation for eight decades, but was rapidly reaching the point of saturation, a group of US investors had the foresight to pursue that early dream of an international trade route across Nicaragua in a modern form. Rather than the expense and environmental jeopardy that a water canal would incur, myself and the late Juan Manuel Rodríguez conceived the all-container railroad service, since East-West container movements had grown at an average annual rate of 8 % in the decade of the 1980s and continued such growth into the 1990s. We initially started the project development in Costa Rica, but local business opposition in Costa Rica and the end of the civil war in Nicaragua led us to move the project to Nicaragua, where the natural conditions were favourable. Other groups have tried to copy and modify this new approach. Since then, much has been said and written about various proposals to build and operate interoceanic canals through Nicaragua — both so-called "wet" canals, and "dry" canals. This information is at times confusing, with arguments both for and against the idea being advanced — sometimes backed by legitimate research, but often not (as we have seen with the water canal proposal for Nicaragua).

Our proposed project, the Nicaraguan Interoceanic Railroad and Ports Project, is being developed by the Nicaragua corporation named *Canal Interoceánico de Nicaragua*, S. A. (CINN), and is the only project to be advanced with a concrete plan. The project is known as the "Dry Canal". CINN pursued this proposal with determination during the past two decades, working with the government of Nicaragua and civil organizations to advance the project and create the legal foundation for such a large foreign investment in Nicaragua — all amid a swirl of disinformation and efforts to undermine or stop the project from within and outside of Nicaragua.

CINN's proposal consists of the construction of two deepwater ports, one in the Caribbean and the other in the Pacific, united by a railway to transport ocean freight containers along the approximately 377 km-long route (fig. 1).

CINN: Some Background

In view of the fact that CINN has spent many years developing this project, a review of the chronology of the principal developments during that period is in order.

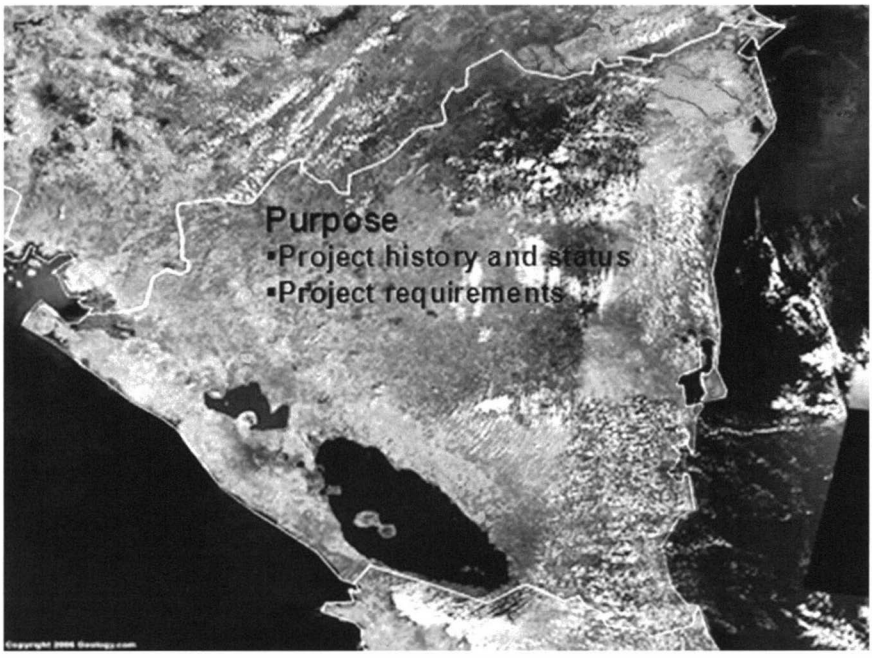


Fig. 1. — Satellite view of Nicaragua.

In the early 1990s, a group of private investors, including myself, investigated the possibility of building an interoceanic canal in Costa Rica to provide a viable alternative to the Panama Canal, which, according to international shipping industry experts, would soon reach saturation levels and, because of inherent design limitations, would be unable to accommodate the largest, newest generation of container vessels which Asian shipping companies had under construction (the "Post-Panamax" size vessels). This assessment has proven true with the massive new investment in new locks and widening of the Panama Canal underway at this time.

Moreover, it was thought that a "Dry Canal" — an overland rail route connecting two ports for the transport of containers — represented the most efficient use of land, resources, funds and modern technology. In addition to providing the most economical way to transport cargo containers across the Central-American isthmus, the Dry Canal would have a much less negative impact on local environment and indigenous inhabitants than a highway or water canal, and would present far less complex engineering and construction issues.

However, while the Costa-Rican effort was thwarted by myopic senior advisors to then President Jose María Figueres, by the early 1990s the political environment in Nicaragua had stabilized and foreign investors were encouraged by the new Administration of President Violeta Chamorro to see the new opportunities in Nicaragua for business and investment.

Our group of investors decided to investigate the natural and business conditions in Nicaragua in June 1994, and we were invited to move our Dry Canal Project to Nicaragua in late 1994.

In February 1995, we formed CINN with the same group of investors who had developed the project in Costa Rica. CINN, formed under and subject to the laws of Nicaragua, set out to develop, build, and operate the Dry Canal in Nicaragua.

From the start, CINN committed itself to respecting Nicaragua's sovereignty, environment and economy. Over the years, CINN became a joint effort between the early nucleus US investors who provided the initial funds and conceptual planning, and a larger international consortium of engineers, port designers, consulting and construction firms representing a diverse group of countries (Belgium, Canada, UK, USA, Hong Kong and China), which conducted studies and developed more detailed plans.

In 1995, the Nicaraguan government created a Joint Executive-Legislative Commission (*Comisión Mixta*), which formally received CINN's proposal and signed an accord in March 1995. This event was significant in that it was the first incidence of Liberals, former *Contras* and *Sandinistas*, to jointly act and sign an agreement, particularly one with foreign investors, since the end of the civil war. In October 1996 the Nicaraguan government approved CINN's Terms of Reference for the Feasibility Study of the Dry Canal Project.

In 1997, after a change in government, formal discussions took place to establish procedures for a Viability Study (Pre-Feasibility Study) which the new government asked CINN to conduct prior to the Feasibility Study in order to demonstrate that the project could be realized. On January 16, 1998, the Ministry of Transportation and Infrastructure directed a letter to the president of CINN, which stated that the Nicaraguan government recognized "that CINN has created and developed, in its view, a project that was worthy of being given the first option for construction".

The same letter gave CINN a timeline for the completion of the Viability Study, which was completed by CINN on time, with the promise by the government that upon successful completion of the Viability Study, the negotiations for CINN's private concession contract would take place simultaneously with the Study and would be signed between the Government and CINN.

In January 1998, the Minister of Transportation and Infrastructure wrote, "[...] CINN will continue to have the first option for the concession if the results of the Study determine the viability [of the Project] and the interests of the nation are preserved in all aspects".

With these assurances CINN began the Viability Study, and at the end of March 1998, sent an international team of experts and planners representing engineering and construction firms from around the world, to Nicaragua. The plan was to ascertain the level of information available, meet with various Nicaraguan agency officials, and perform on-site surveys of the relevant sites. On return of this group to their respective countries, the process of writing and finalizing the Viability study began. Unfortunately, the government did not act as promised on the draft concession contract CINN provided and negotiations did not start until after the completion of the Viability Study (fig. 2).

Fig. 2. — Viability Study Route.

Meanwhile, Presidential Order No. 68-98, promulgated in *Gazette* No. 63 of April 1998, provided for the establishment of the Multi-Sectorial Commission, "to study the contract of concession of the Canal Interoceánico de Nicaragua (CINN) project ...".

On August 27, 1998, CINN presented the results of the Viability Study to the president, the vice-president, and the Economic Cabinet of Nicaragua, four days before the established deadline. At the same time, CINN presented the document to the Minister of Transportation and Infrastructure, who chaired the Multi-Sectorial Commission, pursuant to the Presidential Order of April 1998. With this, CINN preserved its primary option to develop the Dry Canal, and received clearance to move on to the next stages of the project.

On October 26, 1998, in the Conference Hall of the Ministry of Transportation and Infrastructure, the Multi-Sectorial Commission was officially installed.

CINN continued negotiating the concession contract with the president's Legal Advisors Office, and the President of the Republic approved and transmitted the contract and implementing legislation to the National Assembly recommending approval in July 1998. Public hearings were held by the Commission on Transport and Infrastructure and the Commission on the Environment and Natural Resources, and both commissions approved the president's proposed legislation and accompanying concession contract.

In 2000, the plenary of the National Assembly passed CINN's Concession Law in the form of a *Decreto* A.N. 2878 with the force of law. The *Decreto* A.N. 2878 was published in the *Gaceta* on May 16, 2001, and the implementing regulations entitled the *Normativa Básica* was published in the *Gaceta* on December 5, 2001.

Since that time, CINN has undertaken the preliminary work to prepare the final Terms of Reference (TORs) for the Feasibility Study, negotiated more detailed terms with the Nicaraguan government and we continue to request that the Nicaraguan government act in accordance with its own law and regulations. CINN has continued to send engineers and environmental experts to the field and the port sites to gather information and continue with design and engineering work.

The Project

The fundamental objective of the Dry Canal Project is to provide a new route for the transshipment of commercial container cargo between a deep water port on the Caribbean coast and a second deep water port on the Atlantic coast, connected by high-speed rail.

The Dry Canal will initially support the movement of 730,000 containers par year, a number which will increase incrementally over time. The projected cost of the Dry Canal Project as conceived in the Viability Study is US$2.64 billion, but today we estimate the cost to be approximately US$4 billion.

Two Port Complexes

CINN is developing plans for two port complexes: one on the Caribbean coast, in the vicinity of Monkey Point, Municipality of Bluefields, in the South Atlantic Autonomous Region (RAAS), and one on the Pacific coast, in the vicinity of Pié de Gigante, in the western Department of Rivas.

Both port complexes will be constructed to accommodate the latest and biggest generation of container vessels — the post-Panamax class. To that end, the ports will be built to a depth of 16 m, and initially, with a docking span of 810 m. Each will be served by five cranes and a system of breakwaters to permit safe docking manœuvres.

Each port complex will be fitted with platforms for the surveillance and classification of containers and facilities for temporary storage. State-of-the-art security systems for the inspection and tracking of cargo containers will assure compliance with the highest precautionary standards in an age of heightened vigilance for terrorist and narco-trafficking activities.

In cooperation with international law enforcement agencies, including the US Department of Homeland Security and its Nicaraguan counterparts, CINN is prepared to deploy the latest antiterrorist technologies, including container screening, radio-frequency identification (RFID) and satellite tracking of container ships, to assure the transport of cargo safely to its destination — and to identify, isolate, and neutralize potential threats before they can re-enter the stream of global commerce or enter US ports.

All basic port services, including water treatment plants and power plants, will form part of each port complex, as well as adjacent Free Trade Zone activities and businesses. Both port complexes will be self-contained mini-communities, served by administrative and operations offices,

residential developments, information technology and telecommunications infrastructure, shopping, commissary, and restaurant facilities, medical clinics, commuter airports, and roadway access. To the extent possible, environmentally-conscious and "green" construction, engineering, waste-disposal and power-generation methods will be utilized, including the use of solar power, recycling, and renewable resources.

As part of its commitment to supporting Nicaragua's economic development, CINN intends to use Nicaraguan personnel wherever possible, and will provide for the training of Nicaraguans to perform specialized jobs in port administration, surveillance and security, information technology, civil engineering, maintenance, logistics, and other areas vital to the operation of the port complexes and railway. In cooperation with Nicaraguan technical schools and universities, CINN will establish a Training Center, staffed by the most qualified instructors from Nicaragua and around the world, to ensure that Nicaraguans participate and qualify for technical and administrative positions in the Dry Canal operations.

A Maintenance and Repair Facility will serve each port complex, to perform safety inspections and equipment maintenance, and to supply logistics, parts, and expertise for both Dry Canal infrastructure and for docking vessels and their crews.

Interoceanic Railway

Upon the selection of one of the alternative routes spanning from 210 to 377 km coast to coast (fig. 3), the CINN Interoceanic Railway (the "Railway") will provide a fast, safe, and cost-effective link between the Atlantic and Pacific port complexes. In the first stage of construction, the Railway will be a single-track railroad route, with switching stations and lateral bypasses to accommodate the simultaneous movement of trains in both the east-west and west-east directions. Later expansion of the Railway will supplement the route with additional parallel tracks to serve the increased traffic levels expected after the first two to three years of operation of the Dry Canal.

Electro-diesel locomotive trains, designed to haul approximately two hundred fully-loaded shipping containers, with an average speed of seventy miles per hour (mph), will provide rapid and convenient transit of containers between the port complexes.

As currently planned, the Railway will cross the following Nicaraguan departments and municipalities, from west to east (fig. 4):

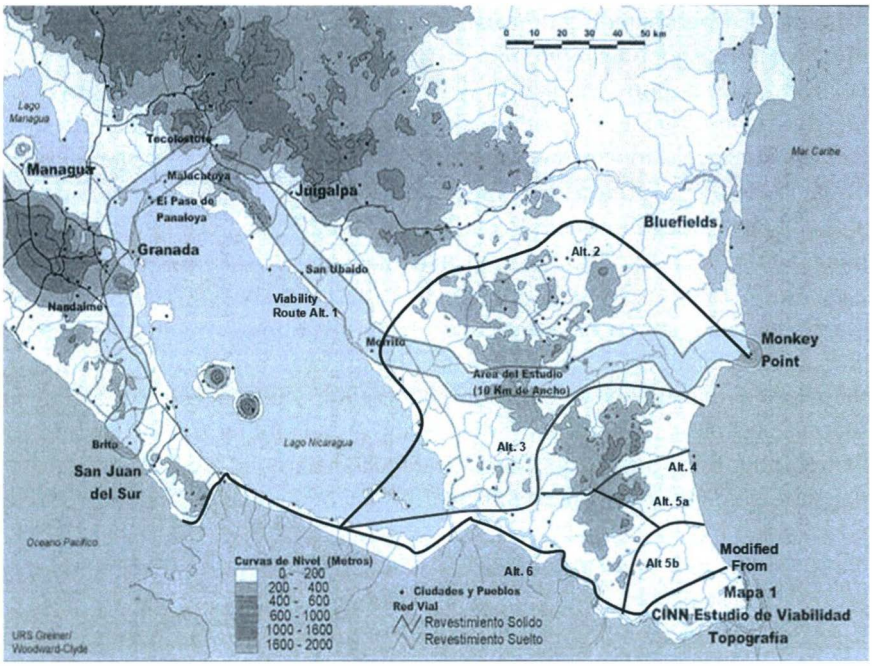


Fig. 3. — Alternative railroad routes and port locations.

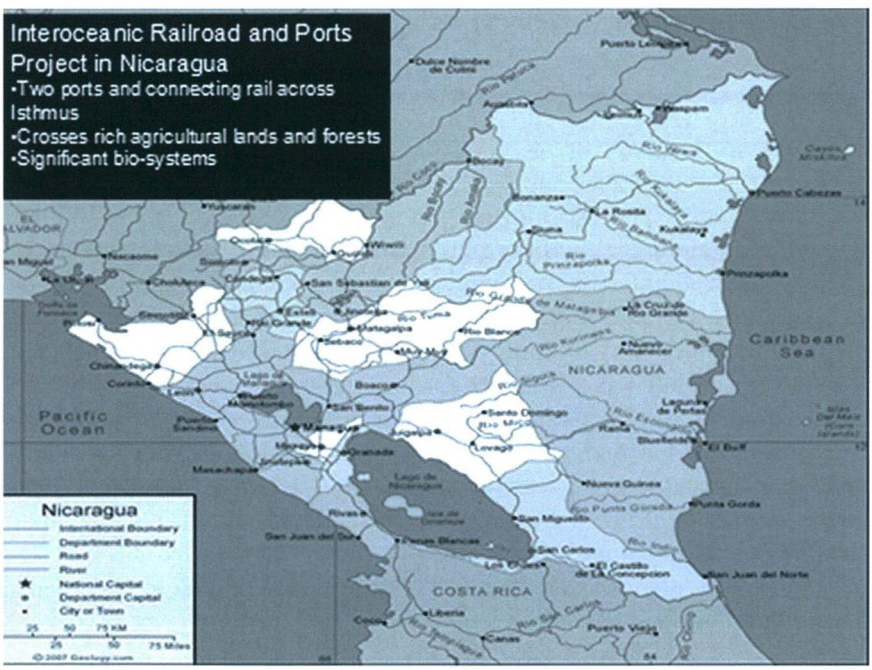


Fig. 4. — Nicaragua's political departments and major road network.

— Rivas Department: Tola, Rivas, San Juan del Sur, Belén, Buenos Aires and Postal;
— Carazo Department: Santa Teresa, La Paz de Carazo and El Rosario;
— Granada Department: Nanadaime, Diriomo, Diriá and Granada;
— Masaya Department: Niquinohomo, Catarina, Nandasmo, Masaya and Tisma;
— Managua Department: Tipitapa;
— Boaco Department: San Lorenzo;
— Chontales Department: Comalapa, Juigalpa and Acopaya;
— Río San Juan Department: Morrito, El Almendro and San Miguelito R.A.A.S., Nueva Guinea and Bluefields.

Environmental Considerations

The Viability Study concluded in 1998 included a look at important environmental considerations. Currently, a more complex investigation of environmental issues is being performed in an indepth Environmental Impact Study.

Significantly, the environmental questions under review are not exclusively restricted to the impact of the project on the natural environment, but also its potential social, economic, cultural, historic and archaeological impacts. This strategy, worked out cooperatively by CINN, the Nicaraguan government and representatives of indigenous populations of the impacted regions, takes into account the fact that every human activity, however insignificant it appears, has both positive and negative impacts on the environment as broadly conceived. What is critical is that the necessary measures are taken to mitigate the negative impacts, and that countervailing benefits are provided to the affected populations, with a view to promoting their development and economic well-being now and in the future.

In the Feasibility Study and Environmental Impact Study phases of the project, the following objectives are being pursued:

— Identification of all significant impacts which could be financially very difficult or impossible to mitigate;
— Development of a broad socio-economic overview of the project's impacts, and a process for data collection and analysis;
— Assessment of natural threats such as seismic activity and geo-engineering strategies for their mitigation.

Taking into account these broad objectives, the Environmental Impact Study is considering the following factors:

— General environmental assessment:
  – Physical and geological positioning of railway and other facilities;
  – Climate considerations;
  – Hydrological and water quality considerations;
  – Maritime ecosystems;
  – Coastal terrestrial ecosystems;
  – Forests;
  – Farmlands and agricultural issues;
  – Wetlands.
— Additional considerations:
  – Protected areas and endangered species;
  – Air quality;
  – Noise and vibrations;
  – Historical and archaeological sites;
  – Indigenous peoples;
  – Cities, towns and population centres potentially impacted by the project.
— Natural threats:
  – Hurricanes and floods;
  – Seismic disturbances;
  – Volcanic activity;
  – Forest fires.

General Considerations

The Dry Canal Project, as conceived by CINN, will provide great benefits to the economic development of Nicaragua and its population, as well as to the Nicaraguan state. CINN sees the following facts as important:

— During the construction phase (approximately five years), about twenty thousand new jobs will be created ***directly*** by the project;
— Additionally, sixty thousand new ***indirect*** jobs will be created to service and supply the project, the port complexes and the railway;
— During the operation phase, some six thousand permanent jobs will be directly provided by the CINN Dry Canal and its local subsidiaries;
— The study, design, construction, and operation of the Dry Canal system will demand the participation of a large number of graduates of Nicaraguan technical schools and universities, and will contribute to building

Nicaragua's competitive workforce of the future, as well as its resources in engineering, design and construction companies;

— CINN expects the establishment of an International Financial Center in Nicaragua, which would promote global trade through the Dry Canal and facilitate international financial and import-export transactions worldwide.

With these considerations in mind, CINN expects the Dry Canal to provide substantial, lasting and far-reaching benefits to Nicaragua and, in general, to global trade and the international shipping industry. The Nicaraguan Dry Canal will be a new, efficient and cost-effective centre of international trade, providing a viable and attractive alternative to both the Panama Canal and overland US rail and trucking routes, and will at last fulfill the dream of so many forward-thinking leaders, navigators and merchants of centuries past — to make Nicaragua a hub of global commerce.

NOTES

[1] American policy in Nicaragua: Memorandum on the convention between the United States and Nicaragua relative to an interoceanic canal and a naval station in the Gulf of Fonseca, signed at Managua, Nicaragua, on February 8, 1913 (Senate Doc.).

[2] *Idem.*

REFERENCES

BONAPARTE, N. L. 1846. Canal of Nicaragua: or, a Project to Connect the Atlantic and Pacific Oceans by Means of a Canal. — London, Mills & Son, p. IV

GALEANA DE VALADES, P. 2006. El Tratado McLane – Ocampo: la Comunicación Interoceánica y el Libre Comercio. — Mexico DF, Editorial Porrua S.A. de C.V., p. 22.

MILLER, W. 1891. The Inter-Oceanic Canal of Nicaragua – Its History, Physical Condition, Plans and Prospects. — New York, The New York Printing Company, p. 6.

International Colloquium
Interoceanic Canals and World Seaborne Trade: Past, Present and Future
Royal Academy for Overseas Sciences
Port of Antwerp
World Association for Waterborne Transport Infrastructure
Brussels, 7-9 June 2012
pp. 205-208

Project for the Construction of the Grand Inter-Oceanic Nicaragua Canal

by

Manuel Coronel KAUTZ*

KEYWORD. — Grand Inter-Oceanic Nicaragua Canal.

SUMMARY. — This conceptual paper is a guideline for the construction of the Grand Inter-oceanic Nicaragua Canal. It shows the spirit, the principles and the essence of this project, not only seen exclusively as an end by itself, but also as a means to reach our economic independence and eradicate poverty through sustainable development. Our sovereignty, our constitution and the international law are the framework of reference during and after the construction of the Grand Nicaragua Canal. The State of Nicaragua is also looking for the improvement of world trade and communication and its commitment to the *Sistema de Integración de Centro América* (SICA) and to the *Alternativa Bolivariana para las Américas* (ALBA), allowing us to open a new crossing alternative of the Americas. We know that civilization can fulfil the expected progress, but we are conscious that it cannot be completed without being in harmony with nature.

Introduction

The Government of Nicaragua has formally decided to begin the studies for the construction of an Inter-Oceanic Canal as a new complementary alternative passage through the Americas.

I shall briefly present the technical, economic, social and philosophical basic reasons concerning the "Project for the Construction of the Grand Inter-oceanic Nicaragua Canal".

* Under-Secretary of Foreign Affairs, Nicaragua.

Opening Statement

In the history of Nicaragua, there has always been the intention of building a "Canal Route", the communication between the Atlantic Ocean and the Pacific Ocean.

When the Spanish conquistadores arrived at the Central-American isthmus in the 16th century, they called the San Juan River *Estrecho dudoso* (doubtful strait) because they suspected it was the passage route to the Pacific. They were not far from the truth. For this reason, this route was the cause of wars and revolutions generating fortunes and misfortunes.

In 1914, the Government of Nicaragua signed an agreement with the Government of the United States of America that conferred to the USA the right to build and operate a canal for a period of ninety years which could be extended for another ninety years. In 1969, both countries decided that there was no need to build a new canal, and the treaty was abolished.

Currently, the transit between the two oceans is made through the Panama Canal, which was built on the basis of considerations made in the late 19th century and is now inappropriate for the current flow of heavy cargo vessels expected for the future.

The construction of a new inter-oceanic canal through Nicaragua will be designed for vessels of up to 250,000 tons capacity and will open perspectives for the creation of new transit flows between the ports of the Atlantic and the Pacific, bringing benefits to the growing international trade commerce practically without affecting the regular traffic in Panama. Several countries are making efforts with the vision to find means to reduce the increasing costs of sea transportation. Japan, due to its lack of natural resources, depends on the import of these resources which are available on the Atlantic coast; China is seeking to intensify its international commerce; the USA need to transport the oil production from Alaska to the consumption centres in their Atlantic coast; Brazil annually transports millions of tons of iron ore to Japan.

Conceptual Considerations

The Vision and Expectation of the State of Nicaragua, concerning the Construction of the Inter-Oceanic Canal for Ships

The philosophy of The State of Nicaragua behind this monumental endeavour is to bring development and sustainable progress — progress rapidly to

be perceptible and stable to continue for generations — to the Nation, to eradicate poverty for all of its people and achieve economic and political sovereignty, in accordance to the spirit and principles of its National Constitution, its commitment to the *Sistema de Integración de Centro América* (SICA) and of the *Alternativa Bolivariana para las Américas* (ALBA) — and also, very important, to open a new crossing alternative for the Americas, for the improvement of world trade and communication.

The governance principles, rights and obligations, the institutional arrangements, the financial structure and organization shall be established in adherence to the principles of international law.

The followings guidelines should serve as a framework of reference, at all times, for the studies, plans, designs and construction, concerning the Nicaragua Canal.

— The social interest;
— The preservation of the environment;
— The strategic water needs and uses for the future.

All of them are intrinsically intertwined with the environment, this being so, at this moment in time, in our universe; the human species is what gives a sense of existence to the rest of all other species, also the only one that consciously has knowledge of this fact, the only one that knows to preserve the environment, and is therefore the subject of primordial attention of that same environment in which we evolve; that has created, organized and preserved it. Consequently, for the State of Nicaragua, it is paramount to assure this endeavour fulfils the expected progress.

Concerning the Uses of Water and Other Provisions

— Provision to give priority to the transfer of knowledge, from the companies and individuals contracted for feasibility studies, to hire local companies and personnel on a 50 % basis, provided their qualifications are sufficient on the subject;
— Provision of sufficient water for the canal to handle 110 to 250 thousand dwt ships and the maximum quantity of possible two-way transits every year, for years to come;
— Provision of water for the irrigation of 600 thousand hectares in the Pacific plains of Nicaragua, according to existing plans (600 m^3/s);
— Provision of water for hydraulic, electrical energy generation of 200 MW, built on the physical structure, to serve the canal itself and the national grid;

— Provision of 50 m^3/s to supply the cities of the Pacific plains, for industry, human consumption and recreation;
— Provision of 20 m^3/s in order to open two-level small canals bypassing the locks in the Pacific and Atlantic side, for the permanent crossing of small ships and yachts;
— A design that should maintain the seasonal historical water levels of the Nicaraguan Lake, and not affect or reduce the water outflow of the San Juan River, and bringing to the basin of Lake Nicaragua a new and permanent gain of water for future different uses from presently not available sources;
— A design to ensure water provision for the needs of marshes, lagoons and canals already in existence under the proposed Atlantic side locks;
— Design and water provision for fish/ladders to permit fish to swim up and down in the Atlantic side, which has always been open;
— Expected construction time, once the necessary laws and initial studies are ready: ten years, one for feasibility studies, six for the first ship to cross and three for conclusion.