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International Boundary Disputes: An unfinished tale of Geology, Technology, Money, Law, History, Politics and Diplomacy

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Abstract

This paper provides an overview of the history of global marine boundary issues, mechanisms to resolve existing boundary disputes and the economic potential that can be unlocked by maritime coastal States by the exploitation of hydrocarbons trapped in areas currently unavailable for exploration and production operations.

Vast hydrocarbon reserves are tied up in areas, either underlying waters greater than 200 nm offshore or disputed by Coastal States. In the former case technology in the form of deepwater drilling has made testing the potential feasible whilst in the latter case many of the 311 or so areas in dispute are able to be tested and developed using conventional techniques.

Anything that appears to show a sovereign entity ceding control of land or sea to another country inevitably has a high profile in the countries concerned that in the worst case can lead to war. It is a credit to many States that embody the principles of the United Nations Charter and the United Nations Law of the Sea they have reached an agreement on how the economic potential trapped in disputed areas may be divided or shared.

High-profile, high-stakes disputes relating to offshore oil and gas deposits underscore the importance of the modern law of the sea, and international law generally, to the peaceful settlement of boundary disputes affecting the energy industry. Yet boundary disputes form an overlooked area of investment risk management in the energy sector.

This paper will introduce the technical and legal principles behind the solutions reached by States and will demonstrate some of the areas with the greatest hydrocarbon potential that have yet to be exploited and the areas of risk that require mitigation before investors will advance risk capital.

Introduction

The focus of this paper is on the status of access to maritime waters for hydrocarbon exploration and exploitation, the state of play in the development of regulatory rules governing access to these areas and challenges in opening up disputed maritime areas. Prior to the exploitation of a nation's subsoil resource potential, the rights to the maritime zones must be established if peaceful resource management is to be conducted. The remaining potential for offshore hydrocarbon exploitation remains huge. Globally, there are 155 Coastal States with bordering Exclusive Economic Zone waters covering in excess of 169 million square kilometers (Geodetic) (Figure1). Oil and gas blocks, issued, open or allocated for future bid rounds cover roughly 11.4% of this area in 137 countries. This means that three-quarters of the potential acreage remains to be explored and/or exploited. This is great news for Coastal States, contractors and oil and gas companies. However, there are technological, commercial, legal, policy and political hurdles to be overcome. The offshore seismic and engineering industry has by necessity risen to the challenge of overcoming these challenges as countries begin to explore and exploit deeper and deeper waters. About 14% of the areas available for exploration cover deep and ultra deep waters of the Extended Continental Shelf or 'ECS'. Article 76 of the 1982 United Nations Law of the Sea ("UNCLOS") provided a mechanism that countries could apply for a continental shelf extension of up to 350 nautical miles from a country's 'normal' or 'straight' baselines and/or 100 nautical miles from their 2500 depth isobath contour. Scientific data would need to support these claims and be proven to show the continent and its affinities does reach out this far, however this would add dramatically to the already existing Exclusive Economic Zone ("EEZ") maritime waters currently extended into the offshore for the 155 Coastal States. This would encompass the up to 200 nautical miles of EEZ available to bordering Coastal States under UNCLOS.

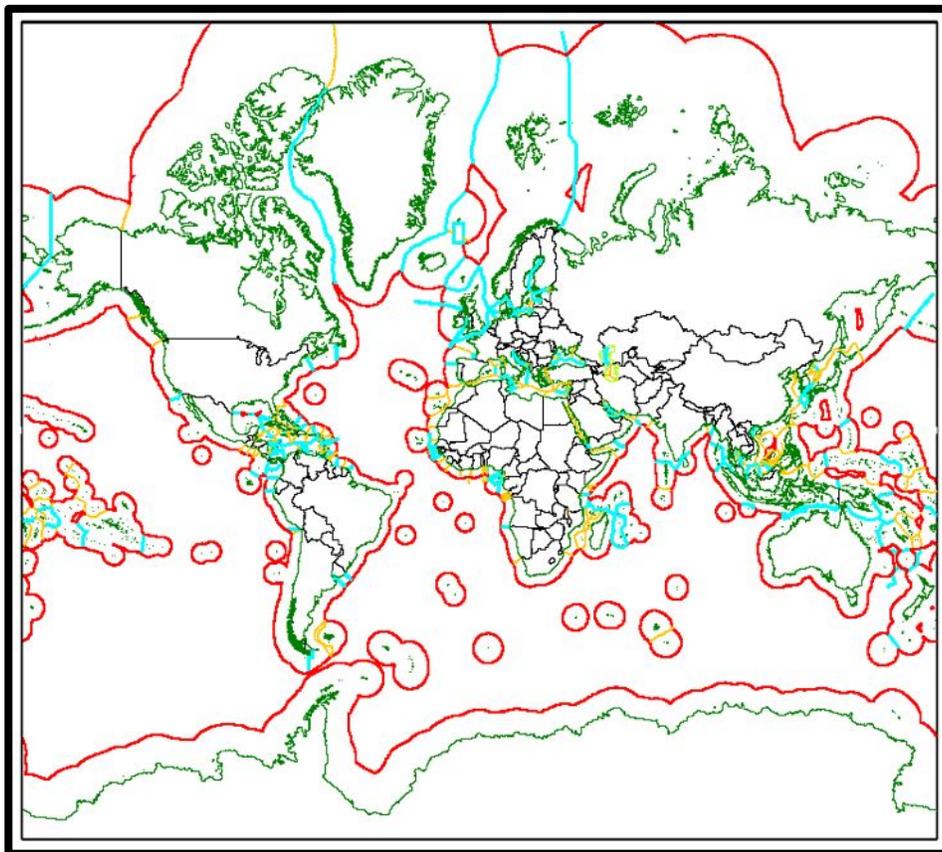


Figure 1, Exclusive Economic Zones of the World (Red Lines), Treated Maritime Boundaries (Blue Lines) and interpreted "Strict Equidistance Lines" (in locations where no current agreed upon Maritime Boundary exist) (Orange Lines)

Although a Coastal State can lay claim to its bordering continental shelf and designate them as either internal

waters, Territorial Sea, Contiguous Zone, Exclusive Economic Zone and Outer Limit of the Continental Shelf Extension or Extended Continental Shelf under UNLCOS, if a neighboring Coastal State with an adjacent or opposite coastline claims all or part of the same area claimed by the first Coastal State then a dispute arises which in the best of cases, where if restraint is exercised this will lead to a “friendly” joint problem solving exercise. However, if it is NOT friendly in the worst of cases this could lead to military action. The authors recognize 209 maritime boundaries agreed or in-force with 311 boundaries not-agreed and/or disputed.

Drivers in Agreeing Sovereignty and Sovereign Rights Offshore

The primary driver in resolving which Coastal State exercises control over adjacent waters is security. Running a close second in importance is the ability to access and exploit the “living” and “non-living commodities” offshore. The value of the mineral resources is enormous. In the year 2000, the International Seabed Authority estimated that in the offshore areas covered by EEZ and ECS waters was valued at US\$12,000 trillion.

Maritime Boundaries - Historical Context

The development of thinking on who controls or owns the world’s sea in terms of security of transit, trade, commercial rights to the living and non-living resources has developed over the last six hundred years culminating with the United Nations Law of the Sea signed in 1982. In parallel a body of case law in the form of judgments from the International Court of Justice (“ICJ”), the International Tribunal for the Law of the Sea (“ITLOS”) and State practice has been produced providing guidance to the resolution of disputes. The continued development of maritime law follows the development of technology or in some cases predicts the ability of future technology to access the seabed unavailable at the time the laws were enacted. For example the concept of an Exclusive Economic Zone, as a development of the Continental Shelf under the 1958 Convention and the ability to make an Extended Continental Shelf claim under Article 76 of UNCLOS are examples of laws keeping pace with technology and the desire to access the mineral wealth located offshore.

Excluding the ancient maritime trading laws of Rhodes (Lex Rhodia) that existed some 800 BC, the first evidence of legal claims to the seas adjacent to a country were provided by John Selden a Scottish Professor of mathematics and Law at St. Andrew’s University in Scotland who in 1635 wrote the *Mare Calusum, the Right and Dominion of the Sea* which depicted a map depicting the “British Sea”. Selden wrote other treatises on maritime trade law and had his work summarized and developed by William Welwood whose books were published widely throughout Europe. His Abridgement of all Sea Lawes published in Latin ‘*upheld the English pretensions to supremacy in the narrow seas*’. Welwood’s works would have been read by Hugo Grotius (aka Huid de Groot) and vice versa. Grotius, a jurist in the Dutch Republic took a contrary view to Welwood to the concept of State maritime sovereignty. He is widely credited with laying the foundations of international law. Apart from his works on the legality of piracy and booty, he formulated the principle that the sea was freely available to the use by all people, in other words it was international territory for the use by all nations for seafaring purposes. Cornelius van Bynkershoek in the early 1700s in his book “*De lure Ac Pacis*” developed the idea that coastal states have right to adjoining water, the width of which corresponded to the capacity to exercise control. An Italian by the name of Ferdinand Galiami calculated that coastal weapons had a range of 3 nautical miles, thus establishing a proto territorial sea.

In 1930, the international legal community attempted via The Hague Codification Conference to create rules for maritime delimitation focusing on territorial waters between opposite States¹. The sub-committee report noted that under ‘normal’ circumstances in delimitation that a median line would be appropriate although for historical, geographical and other reasons a deviation might be justified². With respect to adjacent boundaries it was suggested that the boundary could be constructed by drawing lines perpendicular to the general configuration of the coastline thus potentially creating the precursor principle of creating equidistance lines as used in Law of the Sea Applications (described later). However, in addition to the exclusion of draft articles for delimitation, the

¹ Report of the Sub-Committee of the Committee of Experts for the Progressive Codification of International Law as cited in Tanja, G.J. (1990) *the legal determination of international maritime boundaries*, Par. 2.3. P.6

² Dundua, N. (2007) *Delimitation of Maritime Boundaries between adjacent States*, United Nations

Experts decided not to include any proposal for delimitation of the boundary between adjacent States.

In more modern times, in 1942 Great Britain and Venezuela concluded the Gulf of Paria Treaty that divided seabed areas located beyond 3 nautical miles creating not only the first continental shelf claim but also the first maritime boundary (Figure 2). Subsequently Great Britain annexed the Gulf of Paria east of the boundary line and attached it to the territory of Trinidad for administrative purposes via the Gulf of Paria Annexation Order. The desire to resolve the sovereignty of the Gulf of Paria was driven by the ability to access the hydrocarbon deposits lying in shallow water adjacent to proven discoveries in the southwestern waters of Trinidad. Trinidad was a key supplier of oil for the war effort during the Second World War and it was imperative to access the reserves.



Figure 2, the Gulf of Paria Treaty Boundary, February 1942

Perhaps the greatest change in thinking regarding the maritime waters adjacent to Coastal States came from the proclamation made by President Harry Truman of the United States on 28 September 1945. He unilaterally extended US jurisdiction over the offshore resources of the “subsoil and seabed of the continental shelf” placing them under the control of the Secretary of the Interior. The proclamation introduced and echoed several important concepts being argued at the time reflected in subsequent related laws, namely:

- Concept of natural prolongation in the recitals to the proclamation – *“the continental shelf may be regarded as an extension of the land-mass and thus naturally appurtenant to it”*
- Extending the practice used in legislation onshore by States of the USA of the management of conservation and utilization of natural resources
- boundary disputes between bordering nations might occur the “Truman Proclamation” noted that competing boundaries would be negotiated with other nations – *“In cases where the continental shelf extends to the shores of another State, or it is shared with an adjacent State, the boundary shall be determined by the United States and the State concerned in accordance with equitable principles.”*
- The Proclamation recognised that notwithstanding or aspects of the proclamation that the waters covering the continental shelf would not impede the right of free navigation.

Truman's edict was codified by the Outer Continental Shelf Lands Act of 1953 which affirmed the exclusive jurisdiction by the USA over its continental shelf and gave the Department of the Interior the authority "to encourage discovery and development of oil" through a leasing program.

Other nations were either keen on capturing their adjacent waters or opposed to the idea since it appeared to restrict their otherwise free rights of access globally. In pursuit of globally acceptable maritime laws covering rights to maritime zones contiguous to maritime States, the International Law Commission undertook a ten year study on the use of the sea and maritime zones. In 1956 it submitted its report to the United Nations General Assembly. The report contained draft treaty articles. The consequence was the 1956 UNGA Resolution No. 1105 (XI) that requested the Secretary General of the UN to convene a conference dedicated to the Law of the Sea known as UNCLOS I (in this case the acronym meant the United Nations *Conference* of the Law of the Sea). The conference was held in 1958 in Geneva and resulted in four treaties instead of the single treaty originally intended. These were the:

- Convention on the Territorial Sea and Contiguous Zone of 10 September 1964 (entry into force): note that the Convention left open the important issue of the breadth of the territorial sea,
- Convention on the Continental Shelf of 10 June 1964 (entry into force),
- Convention on the High Seas of 30 September 1962 (entry into force), and
- Convention on Fishing and Conservation of Living Resources of the High Seas of 20 March 1966 (entry into force).

Following the 1958 Geneva Conventions, the United Nations held a second conference in 1960 in Geneva ("UNConferenceLOS II"). However, in this conference there were no new agreements. This was in part because many countries had not yet become independent and participating as observers preferred to wait until independence was gained. Latin American countries were pushing for an extended territorial sea and had claimed 200nm continental shelf rights. The UN ignored their pleas to extend their rights to adjacent waters and thus support for UNConferenceLOS II. A proposal to establish the width of the territorial sea to 6nm coupled with a contiguous zone of a further 6nm failed to gain approval by a single plenary vote.

A further set of meetings and negotiations on the law of the sea ("the third conference") covered a period of nine years from 1973 to 1982. Compared to the 86 participating in the second conference 165 States participated in the third conference³. This resulted in the signing, on 10 December 1982 in Montego Bay, Jamaica of the United Nations Convention on the Law of the Sea. The Convention became customary international law upon the Guyana's ratification on 16 November 1994. UNCLOS contained a number of innovations, chief among them being the ability of a Coastal State, under Article 57 of the Convention to extend the limits of its maritime waters out to 200nm from its normal or straight baseline.

As the petroleum industry developed technology to enable exploration and extraction of hydrocarbons to extend into deeper waters overlapping maritime claims became more evident. In parallel with the law of the sea conferences legal arguments were being made as to the basis of delimitation. Arguments fell into two camps, those that favored the equidistance-special circumstances rule as exemplified in the 1958 Geneva Convention on the Continental Shelf and the Equitable Principles-Relevant Circumstances approach as declared under the 1969 North Sea Continental Shelf cases. These latter cases decided at the International Court of Justice ("ICJ") appeared to create rules for delimitation of the continental shelf. The debate between the use of the two concepts colored proceedings of UNCLOS III. During UNCLOS III the equidistance concept was supported by Norway, Denmark, Canada and Japan amongst others stating that the equitable principle was vague and subjective⁴. Furthermore they argued that using equitable principles did not necessarily lead to an equitable result. It was argued that delimitation based on the equidistance method under Article 6 of the 1958 Convention on the

³ The official text of the 1982 UN LOS Convention with annexes and index is repr. In UN Sales Publ. No. E.83.V.5 (1983)

⁴ Adele, A.O. (1979) Towards the formulation of the rule of delimitation of sea boundaries between States with adjacent or opposite coasts, Virginia Journal of International Law 19, p214 as cited in Dundua, N. (2007) *Delimitation of maritime boundaries between adjacent States*, United Nations

Continental Shelf had been established as a key concept under international law. Proponents of the equitable approach included Libya, Turkey, Kenya and Poland. The two principles could produce quite different results as illustrated in the resolution of the Tunisia-Libya boundary case, and shown below, that utilized the Equitable Principles approach. As discussed below, today, the ICJ and International Tribunal in Hamburg (“ITLOS”) are iterating to towards a stepwise approach in the creation of a single maritime boundary by initially creating a provisional equidistant line and then subsequently adjusting the line in the light of the ‘relevant circumstances’. This was the approach taken in both the Guyana-Suriname case (Figure 3) by the ICJ and the Bangladesh-Myanmar case (Figure 4) heard by the ITLOS. In these two cases there was an imperative to resolve the boundary to enable exploration for hydrocarbons to commence. In the Guyana-Suriname case it had long been known that potentially a large undrilled structure lay under the overlapping area claimed by both Suriname and Guyana. In 1988 Guyana awarded Lasmo a block in the offshore overlapping area which conducted a seismic survey. Subsequently the Suriname and Guyanese proposed a Joint Development Zone and negotiations ensued. Guyana again unilaterally awarded a concession to Maxus, CGX and Exxon. In 2000 CGX commenced drilling in the overlapping area and the Suriname Government evicted the rig stating that the waters belonged to Suriname and the drilling violated a Memorandum of Understanding executed in 1989⁵. Subsequently the two countries agreed to resolve their dispute via arbitration with the resulting boundary.

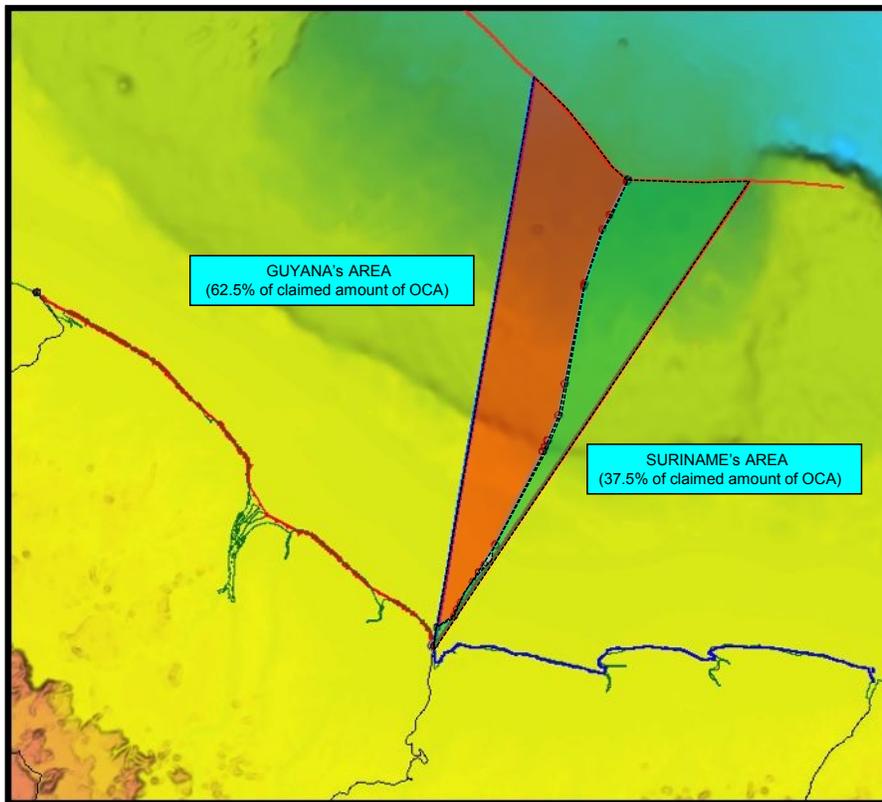


Figure 3, Guyana-Suriname Maritime Boundary

⁵ Donovan, T.W. (2003) Suriname-Guyana Maritime and Territorial Disputes: A legal and Historical Analysis, *Journal of Transnational Law & Policy* 13:1 p41

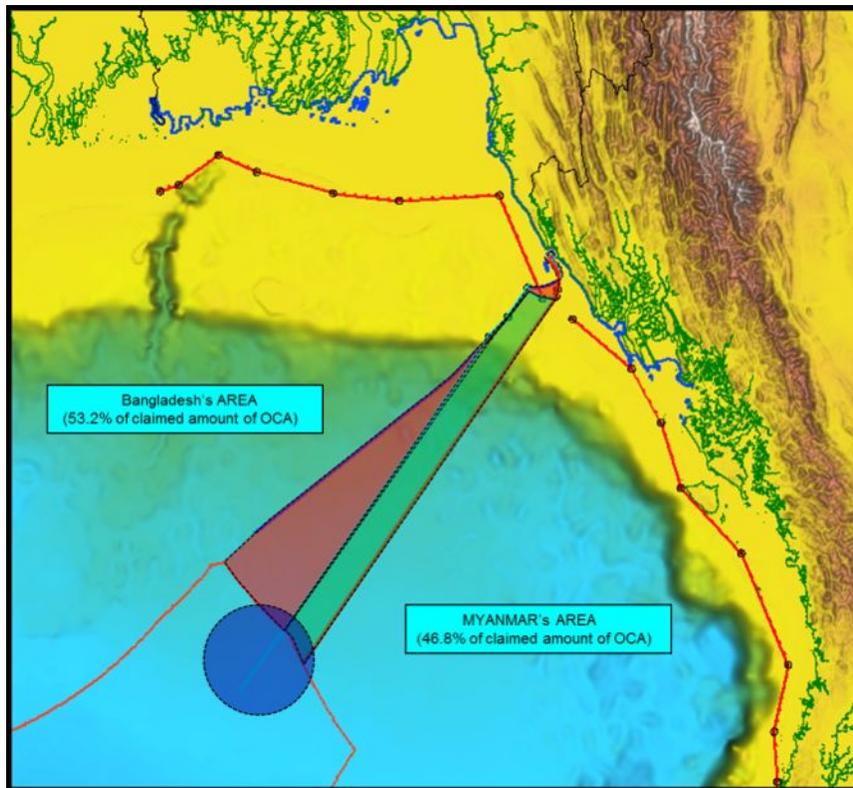


Figure 4, the Bangladesh-Myanmar ITLOS Boundary Ruling (note the Blue circle denotes the judgment establishing a boundary (subject to an Indian claim) in the ECS)

Although, the USA has signed UNCLOS it has not ratified the Convention. At the time the US objected to Part XI of the Treaty dealing with maritime waters extending more than 200nm from a country's baselines. The US Objections led to a 1994 amendment that satisfied the USA enabling it to join the International Seabed Authority. UNCLOS instruments include the International Maritime Organization, the International Whaling Commission and the International Seabed Authority. Following Ronald Reagan's decision not to ratify UNCLOS every US President has expressed a desire to ratify and in practice the USA follows many of the principles embodied in the Convention. In the Conference negotiations the US delegates argued for and promoted many of the principles in the Convention.

Adjudicating Maritime Boundaries

Before bidding for blocks or negotiating rights to hydrocarbon or gas reservoirs, prudent investors will investigate whether there might be a risk to the investment because it covers an area that is disputed between countries with adjacent or opposite coasts⁶.

Where the disputing countries fail to reach a friendly settlement of their boundary dispute following multiple rounds of bilateral negotiations that can easily span a decade and usually do not include industry, an adjudicated solution to a disputed boundary is often unavailable due to the lack of jurisdiction of international courts and tribunals. Third-party delimitation of boundaries is dependent upon the sovereign parties' willingness to entrust their dispute to a competent court or tribunal. States can express such willingness in various ways both in advance of a dispute and after a dispute has arisen, as described below. Once a competent court or tribunal is in possession of a dispute, the outcome likely will become more predictable through application of a well-established methodology for fixing boundaries, discussed below.

Third Party Adjudication - the Options: Third-party settlement of boundary disputes is a consensual instrument, with jurisdiction of a competent court or tribunal depending on the agreement of the disputing States.

⁶ See Pieter Bekker, "Maritime Boundary Disputes Risk Investment in Offshore Energy Projects," 21 *Natural Gas & Electricity* 10 (June 2005).

If parties to a maritime boundary dispute have ratified the 1982 United Nations Convention on the Law of the Sea (UNCLOS), they are under a treaty obligation to “proceed expeditiously exchange of views regarding its settlement by negotiation or other peaceful means”⁷. Failing such settlement, they must resort to the compulsory dispute settlement procedures set out in Section 2 of Part XV of UNCLOS. Section 2 refers to four types of compulsory procedures entailing binding decisions:

1	The International Tribunal for the Law of the Sea (ITLOS), a judicial body comprising 21 independent members, seated in Hamburg, Germany, and established under UNCLOS to adjudicate disputes arising out of its interpretation and application. ⁸
2	The International Court of Justice (ICJ), the principal judicial organ of the United Nations comprising 15 independent members, based in The Hague, The Netherlands. ⁹
3	A special arbitral tribunal constituted for marine environment and fisheries disputes under Annex VIII of UNCLOS.
4	An <i>ad hoc</i> arbitral tribunal constituted in accordance with Annex VII of UNCLOS.

A State party to UNCLOS may designate one of these forums.¹⁰ They in principle have no territorial limitation—meaning they can deal with disputes anywhere in the world. Where designations submitted by UNCLOS Member States (currently numbering 166) do not match, the fall back is *ad hoc* arbitration under Annex VII of UNCLOS.¹¹

Section 3 of Part XV of UNCLOS provides for optional exceptions to mandatory dispute resolution covered by Article 298. Such exceptions may cover “disputes concerning the interpretation or application of articles 15, 74 and 83 relating to sea boundary delimitations.”¹² A State may file a written declaration stating that it does not accept any one or more of the above mandatory dispute resolution procedures. If a State does not accept mandatory dispute resolution, it must still submit to conciliation under Article 284 of UNCLOS.¹³

As **Table 1** below shows, the majority of maritime boundary cases have been adjudicated by the ICJ. The ICJ has jurisdiction only over States having standing before it (personal jurisdiction, or jurisdiction *ratione personae*)¹⁴ and having consented, in one form or another, to its jurisdiction. The requirement of material jurisdiction, or jurisdiction *ratione materiae*, reflects a fundamental principle governing the settlement of international disputes by the ICJ, i.e., the Court’s jurisdiction depends in the last resort on the consent of the sovereign States involved. Generally speaking, States may express their consent to ICJ jurisdiction in one of three ways, each establishing what is formerly called a “basis of jurisdiction:”

1	By the conclusion between or among States of a “Special Agreement,” or <i>Compromis</i> , whereby they jointly express their consent to submit their dispute to the ICJ. ¹⁵
2	By virtue of a jurisdictional or “compromissory” clause in an existing bilateral or multilateral treaty to which the disputing States are parties. ¹⁶

⁷ Art. 283(1), UNCLOS.

⁸ See Annex VI, UNCLOS. For more information, see the ITLOS’ Web site, www.itlos.org.

⁹ For more information, see the ICJ’s Web site, www.icj-cij.org.

¹⁰ Art. 287, UNCLOS.

¹¹ *Id.*, Art. 287(3) (“A State Party, which is a party to a dispute not covered by a declaration in force, shall be deemed to have accepted arbitration in accordance with Annex VII.”).

¹² *Id.*, Art. 298(1)(a)(i).

¹³ *Id.*, Art. 297(3)(b).

¹⁴ Only sovereign States may apply to and appear before the Court. See Art. 34(1), ICJ Statute. All the Member States of the United Nations, currently numbering 193, are automatically parties to the ICJ Statute.

¹⁵ See Art. 36(1), ICJ Statute.

3	Through the reciprocal effect of voluntary (optional) declarations made by some of the States parties to the ICJ Statute whereby one such State has accepted the Court’s jurisdiction as compulsory in the event of a dispute with another State having made a similar declaration (so-called “Optional Clause” acceptance of the Court’s compulsory jurisdiction). ¹⁷
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Maritime Boundary Delimitation Methodology and Case Law: Starting with the ICJ’s landmark decisions in the *North Sea Continental Shelf* cases in 1969, some 20 maritime boundary disputes have come before the ICJ and other international tribunals.

In those cases that rely on a non-consensual basis of jurisdiction, i.e., where the disputing States did not refer the dispute jointly to a court or tribunal, the respondent State invariably will contest the jurisdiction of the court or tribunal being seised, thereby prolonging the proceedings. For example, in the ICJ case between Cameroon and Nigeria, the ICJ did not uphold its jurisdiction until four years and two-and-a-half months after Cameroon filed its Application instituting proceedings against Nigeria.

As is shown in **Table 1**, ICJ boundary cases have taken an average of 68.9 months, or five years and 9 months, to conclude, while the initial two UNCLOS Annex VII cases lasted between 26 and 43 months, respectively. The only boundary case to have come before ITLOS at the time of writing took only 27 months to conclude.¹⁸

When charged with maritime boundary delimitation, international courts and tribunals tend to follow a multi-stage process comprising defined stages or steps after satisfying themselves that they have jurisdiction to adjudicate the dispute. This process can be summarized as follows:

Stage	Maritime Delimitation Methodology
1	Construction of a provisional delimitation line, usually based on the principle of equidistance
2	Examination of the provisional (equidistance/median) line in the light of equitable factors (“relevant circumstances”) so as to determine whether it is necessary to adjust or shift that line in order to produce an “equitable solution”
3	Application of a final proportionality check

As a preliminary step in the delimitation process, the adjudicatory body will determine the relevant maritime area, i.e., the geographical context of the maritime delimitation to be undertaken. This step involves identification of the relevant coasts abutting upon the area to be delimited, as well as any islands and other relevant geographical features.

Next, a provisional delimitation line is established “on strictly geometrical criteria on the basis of objective data,”¹⁹ usually representing an equidistance line²⁰ (where the relevant coasts are adjacent) or a median

¹⁶ *Id.* For maritime boundary disputes between UNCLOS Member States, UNCLOS constitutes an example of a multilateral treaty, except that UNCLOS’ compromissory clause requires the expression of a separate consent by each of the disputing States, namely, through a written declaration issued pursuant to Article 287(1) of UNCLOS.

¹⁷ See Art. 36(2), ICJ Statute. For the status and text of the Optional Clause declarations in force at any given time, see the *I.C.J. Yearbook* and the ICJ’s Web site, www.icj-cij.org. The declarations of more than 60 States are in force at present, a number of them having been made subject to reservations excluding certain categories of dispute. Through the principle of reciprocity, the narrower of two declarations dictates the ICJ’s jurisdiction. This means that the Court’s jurisdiction in a particular case based on Optional Clause declarations is restricted to those classes of dispute that are not excluded by way of any reservation attached to the declarations of the States involved and only insofar as the declarations coincide or overlap. Reservations can be of a wide variety and may exclude from the ICJ’s jurisdiction disputes involving certain treaties, States, hostilities situations or categories such as boundary disputes.

¹⁸ Because of their consensual nature and smaller composition, *ad hoc* boundary tribunals have decided cases considerably faster than the ICJ.

¹⁹ *Romania-Ukraine* (2009), para. 118. All case references in italics relate to cases listed in **Table 1**.

line (where the relevant coasts are opposite), by reference to appropriate base points (*Stage 1*). The provisionally constructed line is then examined by the adjudicators in the light of equitable factors, called “relevant circumstances,” so as to determine whether it is necessary to adjust or shift that line in order to achieve an equitable result (*Stage 2*). The last stage in the delimitation process involves the application of a final proportionality check to verify the equitableness of the tentative delimitation (*Stage 3*).²¹

In a recent decision, the ICJ observed that “[t]he three-stage process is not, of course, to be applied in a mechanical fashion and the Court has recognized that it will not be appropriate in every case to begin with a provisional equidistance/median line.”²² Sometimes, the geographical context calls for the application of a different delimitation method, such as the parallel of latitude method, the weighted line method,²³ the perpendicular line method, the enclave method, and the bisector method.²⁴ While the case law is in agreement that there is no single obligatory method of delimitation and that several methods may be applied to the same delimitation, construction of a provisional line based on equidistance is generally considered “a practical starting point.”²⁵ The equitableness of the equidistance method of delimitation is considered particularly apt for States with opposite coasts,²⁶ but less so in situations involving adjacent coasts.²⁷

As part of this process, courts and tribunals have endorsed the practice, developed in State practice, of establishing a multi-purpose or all-purpose single maritime boundary line covering the maritime areas containing the Exclusive Economic Zone and continental shelf, and sometimes also the territorial sea,²⁸ of the disputing parties “either by means of the determination of a single boundary line (Gulf of Maine, I.C.J. Reports 1984, p. 246; Guinea/Guinea-Bissau, 77 I.L.R. p. 635; Qatar v. Bahrain, I.C.J. Reports 2001, p. 40) or by the determination of lines that are theoretically separate but in fact coincident (Jan Mayen, I.C.J. Reports 1993, p. 38)”²⁹ in the absence of explicit agreement by the parties. With one or two exceptions, this practice has become standard in maritime delimitation cases since the ICJ’s 1984 ruling in *Gulf of Maine*.

The next step consists of considering whether there are case-specific factors or circumstances calling for the adjustment or shifting of the provisional line (typically an equidistance line) in order to achieve an equitable result. In this context, neutral criteria of a geographical nature, especially the length and the configuration of the coastlines of the respective coastal States, are generally accepted as prevailing over socioeconomic considerations and area-specific criteria such as geomorphological aspects or resource-specific criteria such as the distribution of fish stocks.³⁰ While geographical configuration is not in itself an element open to modification, the disparity between the length of the parties’ coastlines (if significant), the distance between the relevant coasts and concavity of coastlines—i.e., the geographical context—within the area to be delimited are regularly considered as “relevant circumstances” which may dictate an adjustment of a provisional delimitation line.

²⁰ I.e., a line every point of which is equidistant from the nearest points on the baselines from which the breadth of the territorial seas of the disputing States is measured.

²¹ See *Nicaragua-Colombia* (2012), paras. 190-193.

²² *Id.*, para. 194.

²³ In *Nicaragua-Colombia* (2012), the ICJ applied a simplified weighted line, i.e., a line that was constructed using a 3:1 ratio between Nicaraguan and Colombian base points and adjusted by reducing the number of turning points and connecting them by geodetic lines. See *ibid.*, paras. 234-235.

²⁴ For a recent example of a bisector line, see *Nicaragua-Honduras* (2007), p. 659.

²⁵ *Barbados-Trinidad & Tobago* (2006), para. 242. See *id.*, para. 306. According to settled jurisprudence, no privileged status should be assigned to any particular method of delimitation and there is no presumption in favor of the principle of equidistance. See *Tunisia/Libya*, para. 110; *Guinea/Guinea-Bissau* (1985), para. 102 (“the equidistance method is just one among many and ... there is no obligation to use it or give it priority, even though it is recognized as having a certain intrinsic value because of its scientific character and the relative ease with which it can be applied.”); *Cameroon-Nigeria* (2002), para. 293 (citing *Libya/Malta* (1985), para. 63); *Nicaragua-Honduras* (2007), para. 272 (“[T]he equidistance method does not automatically have priority over other methods of delimitation ...”).

²⁶ See, e.g., *Libya/Malta* (1985), p. 13, at 47.

²⁷ See, e.g., *Western Approaches* (1977-78); *Guinea/Guinea-Bissau* (1985). In the case of delimitation between adjacent coasts, “an equidistance line will be drawn unless there are compelling reasons that make this unfeasible in the particular case.” *Romania-Ukraine* (2009), para. 116 (referring to *Nicaragua-Honduras* (2007), para. 281); *Barbados-Trinidad & Tobago* (2006), para. 306.

²⁸ See, e.g., *Qatar-Bahrain* (2001), *Guyana-Suriname* (2007), and *Nicaragua-Honduras* (2007).

²⁹ *Barbados-Trinidad & Tobago* (2006), para. 235.

³⁰ See *Guyana-Suriname* (2007), para. 356 (citing *Barbados-Trinidad & Tobago* (2006), para. 228); *Guinea/Guinea-Bissau* (1985), para. 89.

Judicial and arbitral bodies have adopted a cautious approach with regard to oil wells/concessions, considering them only where the parties expressly or tacitly agreed on their location.³¹ In other words, wells and concessions are not in themselves considered as relevant circumstances justifying the adjustment of a provisional delimitation line.

The last stage of the test of equity of a delimitation consists of the application of a final proportionality check to verify the equitableness of the tentative delimitation. This check is applied by judicial and arbitral bodies alike to ensure that the final result is not tainted by some form of gross disproportion.

In this context, the presence of one or more islands in the relevant area constitutes one of the most controversial aspects in maritime boundary delimitation. While there are no hard-and-fast “rules,” as such, and therefore no *jurisprudence constante*, concerning the treatment to be given to islands, this final step in the delimitation process in practice has caused international courts and tribunals to prevent small islands from having a disproportionate and inequitable effect upon maritime boundaries. This has resulted in eliminating the disproportionate effect of uninhabited islands³² or in giving partial—usually one-half or three-quarters—effect,³³ or even no effect,³⁴ to islands, depending on, *inter alia*, whether the island concerned falls under the sovereignty of the parties or belongs to third States, the size of the island involved, and the island’s relationship to the coastline.

Finally, it is settled practice for international tribunals to effect a maritime delimitation “without prejudice to the position of any third State regarding its entitlements” in the area to be delimited.³⁵

The practice of courts and tribunals charged with adjudicating maritime boundary disputes demonstrates that they by and large adhere to a uniform delimitation methodology and routinely invoke earlier decisions, including those rendered by other bodies, in support of their findings, thereby enhancing the predictability of adjudicated maritime boundary delimitation.³⁶ What remains unpredictable, however, is the time needed to reach an adjudicated result. In the end, the best decisions are those enabling the experts of the disputing countries to demarcate the disputed areas without any difficulties and enabling geodetic experts and other interested persons to “reverse-engineer” the adjudicated outcome in order to understand and explain its basis.

Table 1
ADJUDICATED MARITIME BOUNDARY DELIMITATION CASES, BY FORUM (1969-2013)

International Court of Justice (10) ³⁷	International Tribunal for the Law of the Sea	UNCLOS Annex VII	<i>Ad hoc</i> tribunal (6) ⁴⁰
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³¹ While the ICJ in *Tunisia/Libya* (1982)(para. 118) acknowledged that the parties’ conduct regarding oil concessions may determine the delimitation line, it has subsequently pointed out that oil wells and concessions are not in themselves to be considered as relevant circumstances justifying the adjustment or shifting of a provisional delimitation line unless based on express or tacit agreement between the parties. See *Cameroon-Nigeria* (2002), para. 304. See also *Romania-Ukraine* (2009), para. 198; *Nicaragua-Honduras* (2007), paras. 254-56. For arbitral precedents, see *Eritrea/Yemen* (1999), paras. 75-86; *Barbados-Trinidad & Tobago* (2006), paras. 241 (“Resource-related criteria have been treated more cautiously by the decisions of international courts and tribunals, which have not generally applied this factor as a relevant circumstance”), 363; *Guyana-Suriname*, paras. 380-90. Earlier arbitral decisions also declined to take oil concessions into account. See *Cameroon-Nigeria* (2002), para. 304 (citing *Guinea/Guinea-Bissau* (1985), para. 63, and *St. Pierre & Miquelon* (1992), paras. 89-91).

³² See, e.g., *Libya/Malta* (1985).

³³ See, e.g., *Tunisia/Libya* (1982), *Qatar-Bahrain* (2001), *Western Approaches* (1977-78).

³⁴ See, e.g., *Dubai/Sharjah* (1981).

³⁵ See, e.g., *Romania-Ukraine* (2009), para. 114.

³⁶ See, e.g., Pieter H.F. Bekker, “Taking Stock Before ITLOS Takes Off: A Citation Analysis and Overview of the Maritime Delimitation Case Law,” paper presented at the Sixth ABLOS Conference, Monaco, 27 October 2010, *text available at* http://www.iho.int/mtg_docs/com_wg/ABLOS/ABLOS_Conf6/ABLOS_Conf6.htm.

³⁷ See www.icj-cij.org/docket/index.php?p1=3&p2=3. In *Maritime Dispute* (Peru v. Chile), a final decision is scheduled for January 27, 2014, meaning the case will have taken 72 months to conclude. In September 2013, Nicaragua instituted proceedings against Colombia asking the ICJ to “definitively determine the question of the delimitation of the continental shelf between Nicaragua and Colombia in the area beyond 200 nautical miles from the Nicaraguan coast.” Moreover, in November 2013 Nicaragua brought another case against

	(1) ³⁸	tribunal (2) ³⁹	
<i>North Sea Continental Shelf</i> (Germany/Denmark; Germany/Netherlands) (1969) [24 months]	<i>Dispute concerning delimitation of the maritime boundary between Bangladesh and Myanmar in the Bay of Bengal</i> (Bangladesh v. Myanmar) (2012) [27 months]	<i>Barbados v. Trinidad and Tobago</i> (2006) [26 months]	<i>Arbitration between the United Kingdom of Great Britain and Northern Ireland and the French Republic on the Delimitation of the Continental Shelf [Western Approaches]</i> (Great Britain/France) (1977-78) [23 months]
<i>Continental Shelf</i> (Tunisia/Libya) (1982) [39 months]		<i>Guyana v. Suriname</i> (2007) [43 months]	<i>Dispute between Argentina and Chile concerning the Beagle Channel</i> (Argentina/Chile) (1977) [65 months]
<i>Delimitation of the Maritime Boundary in the Gulf of Maine Area</i> (Canada/USA) (1984) [35 months]			<i>Dubai-Sharjah Border Arbitration</i> (Dubai/Sharjah) (1981)
<i>Continental Shelf</i> (Libya/Malta) (1985) [35 months]			<i>Delimitation of the Maritime Boundary between Guinea and Guinea-Bissau</i> (Guinea/Guinea-Bissau) (1985) [24 months]
<i>Maritime Delimitation in the Area between Greenland and Jan Mayen</i> (Denmark v. Norway) (1993) [58 months]			<i>Delimitation of the Maritime Areas between Canada and the French Republic [St. Pierre & Miquelon]</i> (Canada/France) (1992) [38 months]
<i>Maritime Delimitation and Territorial Questions between Qatar and Bahrain</i> (Qatar v. Bahrain) (2001) [116 months]			<i>Eritrea-Yemen Arbitration (Second Stage: Maritime Delimitation)</i> (1999) [38 months]
<i>Land and Maritime Boundary between Cameroon and Nigeria</i> (Cameroon v. Nigeria; Equatorial Guinea intervening) (2002) [103 months]			
<i>Territorial and Maritime Dispute between Nicaragua and Honduras in the Caribbean Sea</i> (Nicaragua v. Honduras) (2007) [94 months]			
<i>Maritime Delimitation in the Black Sea</i> (Romania v. Ukraine) (2009) [53 months]			
<i>Territorial and Maritime Dispute</i> (Nicaragua v. Colombia) (2012) [132 months]			

Risk Mitigation: Geodetic Desktop Studies, the modern approach

Colombia with regard to alleged violations of Nicaragua's sovereign rights and maritime zones declared by the ICJ's Judgment of 19 November 2012.

⁴⁰ Pursuant to an Arbitration Agreement dated 4 November 2009, Croatia and Slovenia submitted their territorial and maritime dispute to an *ad hoc* tribunal for which the PCA is acting as Registry. Representatives of both parties convened for a first procedural meeting at The Hague in April 2012, and the case is ready for hearing following the exchange of written pleadings. For more information, see the PCA's Web site, www.pca-cpa.org.

³⁸ See www.itlos.org/index.php?id=108.

³⁹ A case between Bangladesh and India concerning delimitation of the maritime boundary between them in the Bay of Bengal is pending, for which the Permanent Court of Arbitration (PCA) in The Hague is acting as Registry. Another pending PCA case between the Philippines and China, while brought under Annex VII, strictly speaking is not a maritime delimitation case, but involves a narrower request for declaratory relief relating to principles of maritime boundary delimitation. The same applies to a PCA-administered case between the Republic of Mauritius and the United Kingdom, pending since December 2010, which concerns the legality of the establishment by the UK of a Marine Protected Area around the Chagos Archipelago. For more information, see the PCA's Web site, www.pca-cpa.org.

A key part of any investigation by a State wishing to claim maritime waters, challenge competing claims or extend its maritime boundaries under Article 76 of UNCLOS is to undertake a desktop study that assembles all the available charts, land maps and other data including past claims, asserted rights under treaties and information published in national gazettes. From this data a series of “what if” analyses may be made using ‘Law of the Sea Applications’. The use of the term ‘*Law of the Sea Applications*’ is a shorthand way of summarizing mapping software applications that includes codified procedures based on legal and scientific principles developed under UNCLOS. At its most basic level the UNCLOS is really a global set of rules of procedure that set out to allow for any and all situations that could be encountered by any of the applicable 155 Coastal States in that have agreed to abide by the contained principles. Although it is possible to undertake calculations for EEZ and ECS manually, and this may be a reasonable test that the software is doing what it is required; it is only really practical to undertake a manual system on very limited subsets of data. EEZ and ECS Applications allow multiple sets of data to be stored and retrieved digitally, to create multiple ‘what-if’ analyses and to incorporate new data. Ultimately computer produced calculations are more reliable in the hands of a knowledgeable operator.

Only member states of the United Nations can ratify and become a signatory to UNCLOS. At the time of writing, there are 194 member States of the United Nations. Of these, 166 have formally ratified UNCLOS. However, there are only 155 Coastal States today out of the 194 members of the United Nations, including three additional States that the United Nations does not list at present, and as Law of the Sea applications were designed to be implemented by Coastal States only, UNCLOS applications will only be followed by these 155 Coastal States. The additional 11 States that formally ratified UNCLOS are not considered Coastal States.

Although originally planned as being applicable to the world’s oceans, the principles of Law of the Sea have been used or are being considered for inland seas and lakes. Russia has used the principles encompassed within UNCLOS for its exercises to delimit the Caspian Sea following separation of the entities that made up the Soviet Union. A good use of the Law of the Sea Application is to test of rational solutions in such situations. In this case the break up the Soviet Union resulted in three independent countries bordering the Caspian Sea that asserted claims to the offshore waters - Azerbaijan, Turkmenistan and Kazakhstan. The same may also be said for Canada vs the USA and also now for many of the larger African lakes as well.

Law of the Sea Applications may be subdivided into two distinct applications. In this paper, these are referred to as Exclusive Economic Zone Law of the Sea Applications (EEZ Applications) and Extended Continental Shelf Law of the Sea Applications (ESC Applications).

All 155 Coastal States are responsible for reviewing, analyzing and implementing all Law of the Sea Applications for their respective EEZ waters.

This requirement may be broken down on a technical basis as follows:

- i) *Territorial Sea Baseline Model;*
Good practice in the service of their nations requires that all 155 Coastal States they produce, create, analyze, review, survey and gazette geographic coordinates that detail their Territorial Sea Baselines (“TSB”). These can be either as normal baselines (such as, low water lines along the coastlines, nearshore and foreshore features such as reefs, sand spits, islets and rocks) and/or as straight baselines. In some cases, modifications of straight baselines as archipelagic baselines may be used by some of Coastal States;
- ii) *Legal Limits Models;*
All 155 Coastal States will use these TSB models to compute their respective Legal Limits. The Limits are most commonly the twelve nautical mile territorial sea, the twenty-four nautical mile contiguous zone and the two hundred nautical mile EEZ with all measurements arising from the TSB.

iii) *Maritime Boundaries*

The 155 Coastal States are likely to have one or more maritime boundaries either neighboring and/or opposing other Coastal States. The TSB model is used for both Legal Limits calculations and also for Maritime Boundary Calculations

The second distinct Application for Law of the Sea is for analyzing and creating the Extended Continental Shelf or ECS solutions. This software solution arose as a direct result of a request from the United Nations with strong support of the International Seabed Authority. This would thus produce accurate tangible results to implement Article 76 of UNCLOS. The principle behind the ECS is “*to transfer entitlement, management and environmental responsibility*” of the extended seafloor back to the Coastal State with the nearest applicable proximity. Although UNCLOS provides an excellent example of both a timely legal solution and solutions predicting the advancement of technology for deepwater drilling and hydrocarbon production, a practical tool is required to calculate the ECS available to affected countries. Where disputes occur the use of ECS Applications allows public international lawyers, their geographer advisers and the judges sitting at the ICJ or on tribunals to test legal theory and create practical solutions and in certain cases new case law. That UNCLOS predicted that advance of exploration and exploitation technology for hydrocarbon extraction is evident in that applications for claims of ECS waters were to be made by 2010 although UNCLOS was signed in 1982.

At the time of writing some 78 individual Coastal States have deposited claims to the ECS, with a possibly an additional seven more claims to be made. Thus, in total some 85 Coastal States will have made applications for ECS waters, far exceeding industry estimates of the applications expected. Many of these applications do overlap. This mountain of applications will be resolved by several means including rejection by the CLCS as not being in accordance with the ECS rules (as was the case for the United Kingdom Claims for ECS extensions surrounding Ascension Island) bilateral negotiations amongst Coastal States or more likely by submission to third party adjudication as described above. In this case it behooves the affected Coastal States to have thoroughly tested their claims using ECS Applications.

The claims by the 85 Coastal States will follow a very specifically derived set of rules of procedure to lay claim to extensions to their offshore Limits. The ECS Application encompasses inputs from geology including oceanic crust models, plate tectonics, sediments eroded off adjacent continental crust and deposited far offshore. These inputs provide factors how successful an individual Coastal States will be in making its claim. The information may be combined in complex combinations in support of ECS claims. Real geophysical and other data have to be obtained to support applications. Such data includes bathymetric data (Multibeam) used to pin-point the foot of the continental slope, 2D and 3D seismic data and subsequent interpretation to prove how far out sediments extend from their adjacent continental crust source into the adjacent deepwater. Additional combinations of magnetic and gravity data as well as geochemical analysis provides additional support to ECS claim by a Coastal State in laying claim to the furthest reaching limits allows in accordance with the rules of procedure as modeled in an ECS Application.

Case Histories

The Malaysia-Thailand Joint Development Area

The Malaysia-Thailand Joint Development Area (“MTJDA”) (Figure 5) lies in the Gulf of Thailand covering 7,250 km² of overlapping maritime claims by Vietnam, Thailand and Malaysia. The MTDJA is a practical interim solution that allows hydrocarbon exploration and exploitation to proceed whilst the legal claims by the affected countries are resolved. The MTJDA does not take into account the claims of Vietnam. However, Malaysia and Vietnam recognize an area of the MTJDA as being claimed by Vietnam (the Tripartite Overlapping Claims Area or “TOCA”). It is understood that no exploration or exploitation activities take place within the TOCA. Thailand and Malaysia established the joint development area in a Memorandum of Understanding signed on 21st February 1979. This was followed eleven years later by an agreement, signed in Kuala Lumpur, constituting the Malaysia-

Thailand Joint Authority (“MTJA”) in 1990⁴¹. An administrative line runs NE-SW down the middle of the MTJDA to allocate jurisdiction for civil and criminal matters although it is often claimed that no such activities are known to have occurred in this area.

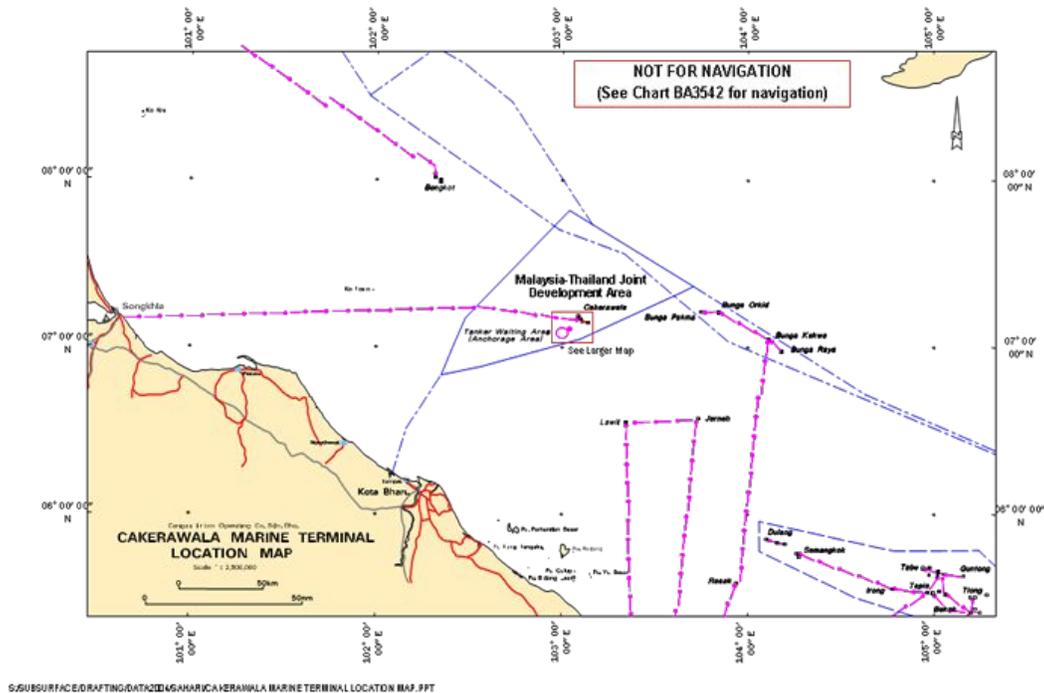


Figure 5, MTJDA & Production Facilities

Although the MTJDA was one of the earlier joint development areas with several flaws, from which lessons have been learned, and applied elsewhere in other JDAs, it may be viewed by Thailand and Malaysia as a success. By the end of 2007, some 9 tcf of gas had been discovered in twenty-two fields.

Joint Oil: Libya-Tunisia and the 7th November Block

Following the 1982 and 1985 International Court of Justice judgements regarding their *Continental Shelf* case that defined the maritime boundary between Tunisia and Libya, the two countries signed three agreements in relation to the implementation of the 1982 judgement, the creation of joint venture for hydrocarbon exploitation and financing. Although the case itself was significant in that the ICJ created a general rule that “*delimitation is to be effected in accordance with equitable principles and taking into account all of the relevant circumstances*”⁴², the decision by the Tunisian and Libyan Governments to jointly explore and exploit fields that might lie within the Joint Oil Block notwithstanding the new boundary interesting and partially redresses the potential economic loss suffered by Tunisia in losing offshore acreage through the application of a boundary based on equitable principles rather than through the calculation of an equidistance line (Figure 1). The result is a hybrid of a joint development area and unitized development. The Block is administered by a joint company owned on a 50/50 basis by the Governments of Tunisia and Libya.

The 768,000 acre Joint Oil Block (Figures 6 & 7) lies offshore, crossing the settled maritime boundary lying between Tunisia and Libya. The block lies in a rich producing area, flanked by the large El Bouri, Ashtart and Miskar fields. The acreage is held by Sonde Resources with a 100% operated working interest and is the sole contractor to the Joint Oil Block Exploration and Production Sharing Agreement (“ESPA”) signed with Joint Oil.

⁴¹ Agreement on the Constitution of MTJDA signed in Kuala Lumpur on 30th May 1990.

⁴² The ICJ undertook to “balance up the various considerations relevant to produce an equitable result”

The Joint Oil Block contains a large portion of the Zarat discovery, which is located in Tunisian waters, and five large identified exploration prospects as well as significant additional prospectivity.

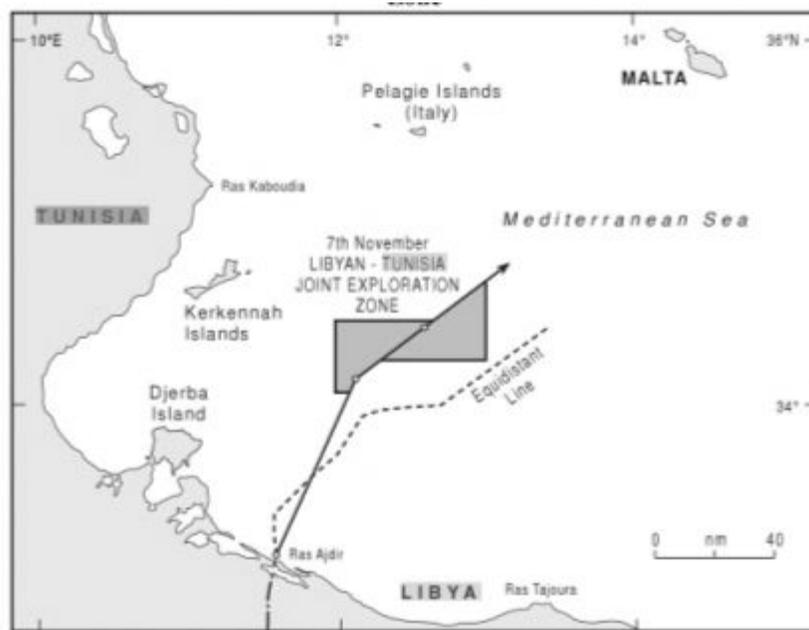


Figure 6, The Joint Blocks, the ICJ delimitation line between Tunisia and Libya compared to an Equidistant Line

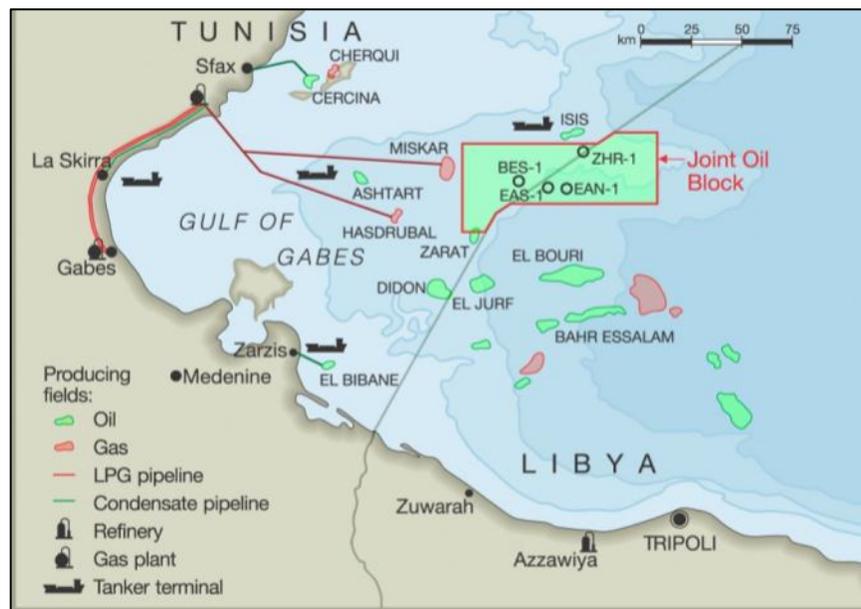


Figure 7, Joint Oil Block straddling the Tunisia-Libya Boundary

Exploration & Exploitation in the Arctic – technological challenges and innovation required

On 29 April 2003 the Danish Parliament decided to ratify the UNCLOS. This decision was later also endorsed by the Parliaments of the Faroe Islands and Greenland. The Kingdom of Denmark ratified UNCLOS on 16 November 2004. It entered into force for the Kingdom of Denmark on 16 December 2004 and from this date as

other parties to the UNCLOS the Kingdom had 10 years to put forward, an ECS claim of extending the outer limits of the continental shelf beyond 200 nautical miles.

Five potential claim areas have been identified off the Faroe Islands and Greenland, potentially including the North Pole (Figure 8). The United States of America is preparing its claims in the Arctic even though it has still not ratified UNCLOS. In 2013 the Russian Federation forwarded a revised claim in respect of the Okhotsk Sea and at the time of writing is close to putting forward a revised claim regarding the central part of the Arctic Ocean. Norway submitted its claim for an ECS to the Commission on the Limits of the Continental Shelf (“CLCS”) in 2006 and received their final recommendations on 27 March 2009. Canada put forward a partial claim in respect of the Atlantic Ocean in 2013 and is preparing a partial claim in the Arctic Ocean.

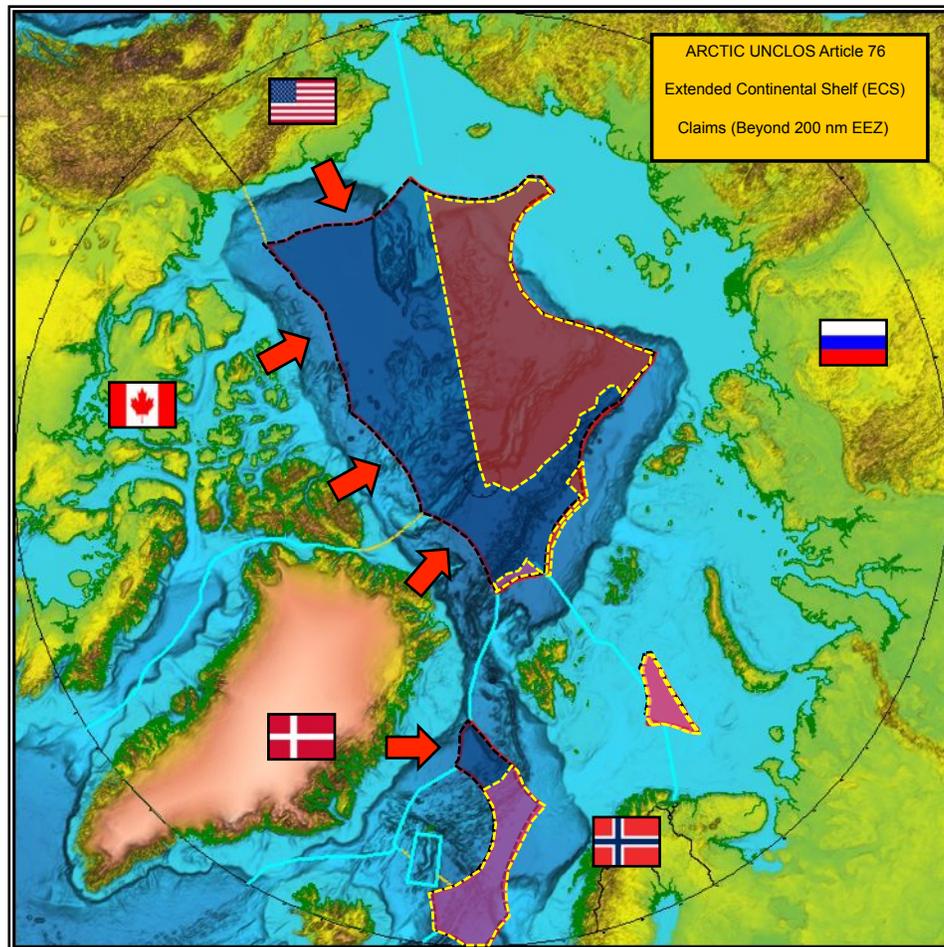


Figure 8, Arctic Maritime Waters Claims and overlaps (after Robert van de Poll)

In the spirit of the Ilulissat Declaration of 2008⁴³ by seeking a “High North – Low Tension” situation in the Arctic the Danish policy is to maintain close contact with the respective neighboring states prior to submitting claims. This policy not only avoids objections from neighboring states for a specific consideration by the (CLCS), but also paves the way for a possible peaceful delimitation process and consequently hopefully creates an environment for a sustainable and economically more attractive and secure exploitation in the given areas of interest. Norway and The Russian Federation succeeded in 2010 in agreeing a delimitation agreement in the Barents Sea. This allowed the commencement of intensive offshore oil and gas activity with a correspondingly huge investment. North of the Faroe Islands, Norway, Iceland and the Kingdom of Denmark went even further in creating a procedure for resolving possible overlapping claims from all three States through a tripartite agreement

⁴³ Ilulissat (2008) accessed at http://www.oceanlaw.org/downloads/arctic/Ilulissat_Declaration.pdf

made in 2006 prior to submission to the CLCS. The agreement sets out a procedure for handling the overlapping claims and determining future delimitation lines in the area taking into consideration the recommendations of the CLCS in regard to the submissions made by each of the States.

The Arctic Council⁴⁴ aims to play an important role in ensuring a peaceful and sustaining development of the Arctic by being a forum for general and political discussions on emerging issues concerning the development of the Arctic region. International cooperation is vital in order to keep this environmentally sensitive area intact and requires a new socio-political infrastructure so that national and international responsibilities can be observed and enforced.

Although the fraction of undiscovered, technically recoverable petroleum resources within the ECS claims put forward by the Arctic Coastal States could be relatively small compared to the resources which are located within existing territorial borders⁴⁵, it is widely recognized that the Arctic as a whole holds ample opportunities for oil and gas exploitation. Undiscovered resources in the Arctic are estimated to account for about one-fifth of the undiscovered, technically recoverable petroleum resource resources in the world with the vast majority of these resources are expected to be located offshore⁴⁶.

Given the harsh, high-risk and sensitive environment, exploitation of the petroleum resources located under the Arctic seabed poses many technological, environmental and regulatory challenges. One of the primary issues is the lack of a pre-existing comprehensive physical infrastructure which adds significantly to the potential difficulty and capital expenditure required for the commercial development of offshore oil and gas deposits in the Arctic. Many large Arctic fields remain undeveloped because infrastructure development is presently prohibitively expensive⁴⁷.

A possible way forward may be to exploit the synergies of what – inspired by Etzkowitz⁴⁸ – may be called Arctic *triple helix* infrastructure partnerships. In such partnerships government authorities, research institutions, and commercial stakeholders from different industries would collaborate on the development and implementation of innovative technological infrastructure solutions in which a number of Arctic stakeholders within commerce, government and civil society share a common interest.

Such triple helix partnerships may help mitigate the high costs and risks associated with Arctic oil and gas projects through:

- The facilitation of cost-effective and risk-mitigating technological solutions that addresses the need and challenges of an economically, regulatory and environmentally sustainable exploitation of Arctic resources, and
- helping build a business case for the required infrastructure which not only rests on the expected return on investment of individual off-shore oil and gas projects, but also on the cross-cutting interests of a number of Arctic stakeholders.

A case in point is the broadly recognized need for an efficient broadband satellite-based communications infrastructure as a general prerequisite for supporting an increasing level of activity in the Arctic – within commerce (including air and marine transportation), civil society including the research community, defense and other governmental sectors. Over large parts of the Arctic, existing geostationary communication systems have poor or no coverage. This lack of efficient communications infrastructure may be an obstacle to an increase in future activities in the region especially north of latitude 75°N where existing systems only provide unreliable

⁴⁴ Arctic Council, accessed at <http://www.arctic-council.org/index.php/en/>

⁴⁵ Wong, E., (2013) Geopolitics of Arctic Oil and Gas: The Dwindling Relevance of Territorial Claims. George Mason University, <http://journals.gmu.edu/newvoices/article/view/132/94>

⁴⁶ USGS (2008) Circum-Arctic Resource Appraisal: Estimates of Undiscovered Oil and Gas North of the Arctic Circle, <http://pubs.usgs.gov/fs/2008/3049/fs2008-3049.pdf>

⁴⁷ EIA (2009) Arctic Oil and Natural Gas Potential, <http://www.eia.gov/oiaf/analysispaper/arctic/>

⁴⁸ Etzkowitz, H. (2008) *The Triple Helix – University-Industry-Government Innovation in Action*. Routledge

and/or very limited capacity⁴⁹.

Given the capital-intensive and technologically challenging nature of a dedicated space-based Arctic communications system that can cater to the requirements of commercial as well as non-commercial stakeholders, such crosscutting infrastructure development should be based on an international partnership between government institutions, commercial stakeholders and research institutions. Such a partnership may thus also facilitate the provision of cost-efficient communications services to Arctic offshore exploration and production activities in the future.

⁴⁹ ESA (2012): The Contribution of Space Technologies to Arctic Policy Priorities, <http://www.grida.no/publications/arctic-space/>