WHAT IS PETROLEUM?

The word petroleum is derived from a combination of two words - 'petra' or rock (Greek word) and 'oleum' (Latin word for oil).

Petroleum is a composite, natural liquid mixture derived from deep beneath the Earth surface; it is a unique mixture of combustible hydrocarbon compounds. It is made up of hydrocarbons, oxygen, nitrogen and sulfur.

Petroleum is often referred to as the crude oil or black gold. Its colour ranges from clear to black. It can be in liquid or solid form. The predominant hydrocarbons contained in crude oil are Aliphatics, Alicyclics, and Polycyclic Aromatic Hydrocarbons (PAH). The extraction process is sophisticated, involving blasting of rocks, drilling, seismic shocks, and pumping. The refinement process involves filtering, addition of additives, and complex separation processes which create specific crude oils and crude oil products such as paraffin and other various form of lubricants. One of the internationally accepted statutory definitions of crude oil is contained in 34 Texas Administrative Code Sec. 3.692 as follows:

“Any naturally occurring liquid hydrocarbons at atmospheric temperature and pressure coming from the earth, including condensate. (a) Crude oil includes, but is not limited to, crude oil: (i) as it exists at atmospheric pressure and temperature when it is produced; (ii) as it exists after initial gas separation and/or stabilization; or (iii) as it exists after

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1 David M. Ong, Joint Development of Common Offshore Oil & Gas Deposits, 93 AM. J. INT'L L. 771, 797 (1999)
treating and/or conditioning for the removal of water and/or other impurities, and is sold, shipped, or purchased as crude oil; and, (b) Crude oil does not include any product which has been physically separated from crude oil.\textsuperscript{2}

The Petroleum Act\textsuperscript{3} defines petroleum as a “mineral oil (or any other related hydrocarbon) or natural gas as it exists in its natural state in strata, and it does not include coal or bituminous shales or other stratified deposits from which oil can be extracted by destructive distillation.” The same Act defines “crude oil” as “oil in its natural state before it has been refined or treated (excluding water and other foreign substances)”. Also, it defines “natural gas” as “gas obtained from borehole and well consisting primarily of hydrocarbon.”

The commercial quantity of petroleum in the soil usually contains porous, holey rock configuration containing crude oil of a commercial gravity. The gravity is determined by the standards set by the American Petroleum Institute thus, known as the (API gravity index). The API gravity index is used to measure the weight of crude oil liquid in comparison to water. Where the API gravity of crude oil is higher than 10 degrees, the crude oil will float on water; where it sinks in water then the API gravity is less than 10 degrees. Four key components are often considered prior to extraction of crude oil namely:

(a) Reservoir Traps - Underground deposits, encouraging the accumulation of oil and gas. The reservoir can be in either stratigraphic strata or structural traps.

(b) Form – It must be gaseous, solid or liquid state.

(c) Viscosity (thickness) – The compound should be measurable to establish that its liquid form can flow. If it is extremely thick, then its ability to flow easily is difficult; but the less viscous it is, the better its mobility.

(d) Gravity or Density - the ratio between the weights of equal volumes of water and another substance measured at a standard temperature must be ascertained by way of API gravity indexing.


\textsuperscript{3} 1969 (Nigerian legislation)
**AD COELUM DOCTRINE**

The common law concept of *ad coelum doctrine* ("heaven to hell" principle) implies that the owner of real property maintains the right to the property as it extended from the heavens all the way to the earth beneath it.\(^4\)

In a nutshell, the owner of the package of rights that are known as land “ownership” includes the ownership of everything from the heavens above the surface of his land to the core of the earth below it. **Prior to the enactment of the Petroleum (Production) Act in Britain in 1934, petroleum *in situ* belonged to the surface owner under the common law doctrine of *ad coelum.*

This doctrine is subject to various interpretations. For example, in a British case of *Bernstein v. Skyviews & General Ltd*,\(^5\) Bernstein sued the defendant because they *flew over his and neighbouring properties and took aerial photographs.* The claimant contended that the defendant’s act was a gross invasion of privacy, and that the defendant had invaded his airspace. The plaintiff hence, invoked the contentious doctrine of *Ad Coelum Doctrine* and the maxim: *Cujus est solum ejus est usque ad coelum et ad inferos.*\(^6\) **The claim was rejected by the court.** The court also explained that, it would be wrong as a matter of public policy to find the defendant liable in that, "**If the Latin maxim were applied literally it would lead to the absurdity of trespass being committed every time a satellite passed over a suburban garden.**"

The court was conscious of the floodgate claims that its decision would have caused in the future. This is because, if the case was to weigh the scales of the rights of a land owner to enjoy his land against the rights of the public to take advantage of the use of airspace. The best way to strike that equilibrium in the society was to limit the rights of the land owner in the airspace above his land to such altitude as is necessary for the common use and pleasure of his land and the structures upon it, and to affirm that above that height he had no greater rights in

\(^4\) *Del Monte Mining v. Last Chance*, 171 U.S. 55 (18 S.Ct. 895, 43 L.Ed. 72) Decided: May 23, 1898

\(^5\) [1978] 1 QB 479

\(^6\) He who owns the land owns everything, “up to the sky and down to the centre of the earth” a phrase extracted from the ancient rulings in *Corbett v. Hill* (1870) L.R Eq. 671 at 673
the airspace than any other member of the society.\textsuperscript{7} Though this case is not related to oil rights, it illustrates the limits of the doctrine of \textit{ad coelum}.

It is noteworthy that, there are no rights permitting the owning of airspace, to disallow aircrafts from flying above private lands. However, in the United Kingdom, there are statutory rules governing the use of airspace. For example, the Air Regulations\textsuperscript{8} provide that no aircraft may fly closer than 500 feet to any person, vessel, vehicle or structure. In other words; airspace itself can exist as an independent unit of real property as stated in \textit{Macht v Department of Assets of Baltimore City}.\textsuperscript{9}

In \textit{Del Monte Mining v. Last Chance},\textsuperscript{10} there were some more exceptions made to the rules of \textit{ad coelum}. The court acknowledged that hard rock minerals such as coal formed a part of the doctrine but oil and gas were excluded from the \textit{ad coelum} principle because of the migrating nature of liquid and gaseous minerals. This is because the owner of a piece of land hosting an oil and gas reservoir has the right to extract all the oil and gases through wells located on his own property, even though the oil may be drained from his neighbour’s tract. \textbf{There are three reasons why the \textit{ad coelum} doctrine does not apply to oil and gas:}

(a) \textbf{Oil and gas are produced for energy reasons; they compel the economy of the host countries.} The argument seems to be that the strict application of the doctrine may hinder government licensing policies and reduce investment in oil and gas.

(b) Because of the \textbf{migrating nature of oil and gas, it would be impossible to determine whose molecules were extracted from entire land, especially where the extraction of oil is situated within the confine of several private properties.}

(c) \textbf{The rule of capture}

\textsuperscript{8} 1996 (SI 1996/1393) Schedule 1, Regulation 5(1)(e)  
\textsuperscript{9} 296 A2d 162 at 168 (1972)  
\textsuperscript{10} ibid
THE RULE OF CAPTURE OF OIL AND GAS

The rule of capture states that the owner of a piece of land can acquire title to the oil and gas exploited from the wells drilled on his own land, even though it may be shown that some quantity of the oil and gas extracted from the Earth are from the adjoining neighbours’ lands. Under the rule of capture, there is no liability for “capturing” the oil and gas that migrate and drains from another person’s land.

The rule of capture explicitly states that, he who extracts the oil and gas has ownership, hence; there is no liability for capturing the minerals that drains from another’s lands. A landlord therefore, can extract the crude himself by drilling a well to counterbalance and intercept the flow of the crude draining to his neighbours’ lands. This is the only alternative to stemming the flow of the crude oil from beneath his private land to his neighbours’ lands. However, the rule of capture seems to support extravagant drilling and the rakishness of pressure.

Despite its widely acclaimed nature in common law, government regulations, and statutory provision of territories modifies the rule of capture and narrows the scope of its applications. For example, in the United States, some of the states, including Texas, restrict the application of the rule through state regulatory agencies. In Ohio State, the rule of capture has been replaced by rules based the correlative rights of the land owners over the common source of oil and gas supply.

THE DOCTRINE OF CORRELATIVE RIGHTS AND SLANT DRILLING

The doctrine of correlative rights (the fair share rule) redefined the rule of capture. Oil and gas must migrate naturally; however, slant drilling into another’s land is actionable in tort of trespass and conversion.

Figure 1: Example of slant drilling

11 Source: www.geology.com accessed 10th October 2016. Slant drilling is also known as directional or horizontal drilling.
In *Kelly v. Ohio Oil*, Kelly applied to the court for injunction and damages against Ohio Oil Company for drilling of oil and extracting crude oil along his personal property. The court considered the implications of the rule of capture which means that the land owners can extract oil or gas from beneath the land of another, where all operations for the extraction are lawfully conducted without slanting. However, the court also, considered that, if Ohio Oil Company had the legal rights to drill the wells on its property, then any alleged motives for the placement of the wells were immaterial. It also, went further to apply the general common law rule, that a person has the right to utilize his property as he wishes, as long as in the exercise of the rights he does not infringe upon the rights of others. In the absence of substantial evidence to prove Kelly’s claims, the court

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12 Source: www.rigzone.com accessed 10th October 2016
13 49 N.E. 399 (Ohio 1897)
held that, the drilling did not amount to such an infringement of the claimant’s right.
The court further states that:

(a) Oil does not automatically become property until it is extracted from the land, before it can be claimed as the personal property of the person that extracted it.

(b) It is irrelevant where the oil came from originally so long as it was naturally drained into the owners well.

(c) Kelly could have protected his rights to property by drilling his own oil wells along the property lines.

Similarly, in Elliff v. Texon Drilling Co.,¹⁴ Elliff was the owner of a piece of land and some degree of royalty interests in the oil and gas reservoir beneath the property. Texon Drilling Co drilled along an adjoining land caused the well to blow out and crater. As a result, a large quantity of oil and gas drained and distillate from under Elliff’s land. Elliff sought damages and remedy for negligence and for loss of oil and gas. Texon Drilling Co invoked the rule of capture in its defence, stating that Elliff had lost his property rights in the gas, which had migrated and drained from his lands.

The Texas court held the landowner is the absolute title holder to the oil and gas in beneath his land. Nonetheless, the rule of property ownership should often be considered in relation to the rule of capture. That being the situation, a land owner, acquires, title to the oil and gas which, drained onto his property as the result of reasonable production. In the event of reasonable production, no liability for should be imposed for legitimate drainage from a common pool of oil and gas. However, there was substantial evidence to sustain Elliff’s claim of negligent waste and destruction of oil and gas by Texon Drilling Co. Texon Drilling Co actions were thus, not a legitimate drainage of oil and gas hence; Elliff did not lose his right in them when they drained to the defendant’s land.

Elliff’s case reinforced the correlative rights doctrine which stresses that, each land owner has the rights to a fair and equitable share of the oil and gas under his land including the rights to safeguard against negligent harm to the producing structure.

¹⁴ 210 S.W.2d 558 (Tex. 1948)
There are many cases that reinforce the fair share or correlative rights doctrine. For example, in *Browning Oil Company, Inc. v. Luecke*, it was held that, the proceeds of oil extracted from well bore that produces from several drained tracts should be shared on the basis of the amount that is produced from each tract. In the same vein, in *Humble Oil & Ref. Co. v. West*, the Texas Supreme Court said:

> [T]he burden is on the one commingling the goods to properly identify the aliquot share of each owner; thus, if goods are so confused as to render the mixture incapable of proper division according to the pre-existing rights of the parties, the loss must fall on the one who occasioned the mixture. ... Stated differently, since Humble is responsible for, and is possessed with peculiar knowledge of the gas injection, it is under the burden of establishing the aliquot shares with reasonable certainty.

The fair share rule was also considered in *Wrongski v. Sun Oil Co.*, in this case, Defendant leased property, which had oil wells on it. The property was subject to an order by the Michigan Department of Natural Resources, which limited production to seventy-five barrels of oil per well per day. The Defendant is accused of overproducing 180,000 barrels of oil and draining oil from beneath the Plaintiffs’ land. The Plaintiffs sued for an accounting, or in the alternative, for compensatory and exemplary damages. The trial court found that Defendant had intentionally and illegally overproduced 150,000 barrels of oil and, that 50,000 barrels of this oil had been drained from Plaintiffs’ lands. The nature of the violation of Defendant was stated in the appellate court as being a tort of conversion of the Plaintiffs’ oil. Conversion is defined as any distinct act of dominion wrongfully exerted over another’s personal property in denial of or inconsistent with his rights therein. The Defendant appealed from the trial court. The central issue before the court was, whether the Defendant was liable in conversion for the overproduction of oil, some

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15 38 S.W.3d 625  
16 508 S.W.2d 812, 818 (Tex. 1974)  
17 22 Ill.89 Mich. App. 11, 279 N.W.2d 564 (Ct. App. 1979)  
18 See, Bloomberg Law
of which was found to have been removed from underneath the Plaintiffs' land?\textsuperscript{19}

The decision of the trial court was affirmed by the Appeal court thus, it was held that the Defendant was liable in conversion for the overproduction of oil, some of which was found to have been removed from underneath the Plaintiffs' land. The court viewed the matter under the existing Michigan law known as “ownership in place” doctrine, which states that the nature of the interest of the landowner in oil and gas contained in his land is the same as his interest in solid minerals. As a result of the migratory nature of oil and gas, the jurisdiction developed the rule of capture.

In the absence of any state regulation of drilling practices, a landowner is not liable to adjacent landowners whose lands are drained as a result of drilling. However, the rule of capture with regard to oil and gas is not absolute. The harshness of capture has been mitigated with the “fair share” principle. Fair share means that each owner of the surface is entitled only to his equitable and rateable share of the recoverable oil and gas in the common pool. The rule of capture is modified to exclude operations that are in violation of valid conservation orders. The Supervisor of Wells Act in Michigan (Act), under which the Michigan Department of Natural Resources makes orders, is an Act designed to provide for rations of a fair share of oil and gas. The rights to have a reasonable opportunity to produce one’s just and equitable share of oil in a pool are the common law right that the trial court found that Defendant violated. If it can be said that Defendant's overproduction deprived Plaintiffs of the opportunity to claim and take the oil under their respective properties, then Defendant will be liable for conversion.

In a similar correlative rights issue, was the case of \textit{Pickens v. Railroad Commission},\textsuperscript{20} which was about multiple owners of lands in an oil field. In this particular case, the Plaintiff and others argued that pro-rationing the quantity of oil that can be produced by each land owner was unreasonable because it failed to protect their correlative rights and would allow uncompensated drainage. It was also contended that the pro-rationing was not supported by substantial evidence and discriminated against those with the most oil under their lands. The Defendant

\textsuperscript{20}387 S.W.2d 35:1
argued that the drainage was actually towards the Plaintiff’s tract and that the 50-50 formula actually allowed all the owners equitable rights to produce their in-place oil reserves.

The 50-50 formula has two elements: (1) Number of surface acres in the production unit on which there is a well; and (2) Number of acre-feet of productive sand or rock which are within, or below, the 160 surface acres. The Plaintiff and others contended that the formula should have been based 100% on acre-feet of productive sand in that the 50-50 formula gave undue advantages to those having the same surface acreage over the oil but fewer acre feet of oil in place. This is because, those that owned a larger piece of land were not favoured by the formula.

In *Pickens*, the court looked at the Substantial evidence to ascertain whether there is any evidence to substantiate the parties’ claims. It was held that, the arguments of the Defendant make its formula reasonably supported by substantial evidence. One of the reasons for limiting the amount of production is that when oil is removed too rapidly, the water which takes its place prevents recovery of some of the oil, and pro-ration is usually set at an amount determined to provide for the most efficient recovery of oil in the field.

The strict adherence to the common law, emphasises that the owner of the land can convey his ownership rights and interests in oil and gas beneath the surface without surrendering his title to the surface. However, there is the possible fact of a separation between the ownership of the surface and the ownership of oil and gas beneath that surface, growing out of the terms of the lease contract, in no manner reduced the broad intention that the owner of the surface owned all beneath. Apart from the United States and Canada, which has distinctive and wide-ranging private and state ownership rules pertaining to land and minerals, many countries in the world, vests in the government, the title to all valuable mineral reservoirs, including deposits located beneath what should be privately owned lands.21

“Virtually all mineral ownership regimes are based on the jurisprudential theory of state sovereignty. The sovereign of a

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21 Rodman R. Bundy, Natural Resource Development (Oil and Gas) and Boundary Disputes, in PEACEFUL MANAGEMENT OF TRANSBOUNDARY RESOURCES at 23, 24 (Gerald H. Blake et al. eds., 1995)
defined geographical area has an exclusive legal domain over the area, including its natural resources...the most common global regimes places ownership of resources in the government ...Energy resources are subject to government ownership in virtually all the countries except for North America ... Private ownership of natural resources is possible only in the United States of America, Canada and perhaps a few other countries. Even in the United States and Canada, the bulk of the mineral reserves are owned by the government.

In the Islamic oil producing countries, the property ownership is strictly guided by the provisions of the Holy Qur’an which permits private ownership of land with due regards to the associated rights thereof. Islamic laws also provide guidelines for Aqd (contractual) relationship between various level of contractual relationships including land transactions. However, there is no uniform interpretation of the Islamic laws due to the existing variations among diverse Islamic groups. For example, the four schools of Islamic jurisprudence notably Hanbali, Shafie, Maliki and Hanafi interprets the Qur’an differently on certain issues. Those that subscribes to the Maliki and Hanbali doctrine believe that minerals found in lands are the property of the general public hence cannot belong to private individuals. Shafie doctrine detects that, the minerals found within the confines of the state are subject to sovereign ownership and control, hence, royalty for dealing in the minerals should be paid to the sovereign head. Hanafi doctrine states that, the owner of land owns the mineral found on or underneath it.

Where the law permits private ownership of land and minerals, there are situations where several land owners in the same neighbourhood jointly agree to combine a lease to permit the Lessee to extract oil and gas from a central well (pooling).

POOLING AND COERCIVE STATUTES

Pooling can be both voluntary and compulsory. Voluntary pooling is done through negotiated contracts between the land owners and the Lessee. There are three basic approaches involved, namely: by execution of community lease agreement; by individual separate pooling agreement with each Lessor; and, by exercising an oil and gas lease pooling clause. The compulsory pooling rights are often enshrined in statutes. In some countries such as the United States, the statutory framework of some states, allows pooling to be done by force. In 1935, New Mexico and Oklahoma became the first states in the United States to implement the compulsory pooling statutes. The statutes provide that: “… any person seeking a drilling permit may force the inclusion of the necessary adjacent tracts . . . to meet the minimum requirements for a drilling permit.”

Behrens,²⁴ explains that, “compulsory pooling statutes generally share four key attributes: (1) They expressly presuppose the existence of an established drilling or spacing unit; (2) [t]hey permit the owners of separate tracts in the unit to pool their respective interests on a voluntary basis; (3) [t]hey require notice and public hearing before pooling can be required; and, (4) They are based on the proposition that each separate owner shall receive his just and equitable share of production."

The statutes authorise the government to either obtain the consent of the private land owners through negotiation and where the owners refuse to accept the reasonable offer, force pooling can take place. Nonetheless, the non-consenting land owner gets compensation when the tracts from their lands produces oil in the pooled well and when the products are sold. The payment is only as a share of the total pay-out, but no land owner receives royalties. In some cases, the non-consenting owner may be forced to pay their own share of the cost of drilling; such costs may be deducted from the pay-out share of each landowner.

²⁴ Ibid, p. 1068
UNITISATION AND CROSS BORDER JOINT PRODUCTION

The concept of unitisation is derived from the word ‘unit’. It is a mechanism devised by the combination of numerous oil wells to produce from a specified pool of reservoir. There are circumstances that arise which the unit operator (Oil Company) may find out that the crude oil reservoir which they intend to exploit stretches into that of another adjoining land not covered by the exploration and production contract. The Oil Company may thus seek legal protection to sustain its interest. This means that, of course, such foreseeable event should be covered by the license, lease or concession agreement with due care to accommodate the doctrine of capture where possible.25

Unlike the rule of capture, the unitisation involved the joint development of crude oil from reservoirs that extends across individual boundaries. For example, if Crude oil is found in the lands of a small town called New Kingston and a neighbouring community called Ayayi Town both share a boundary. Where the reservoir of the crude oil spans across both communities and can be captured from a drilled well from either communities, the doctrine of unitisation can eliminate capture, if both communities agree to exploit the crude oil jointly from a single well irrespective of which town the well is drilled. The net gain to each community is calculated as a unit of the total production. Each community gets a unit of the profits known as unit interest or unit percentage. Both communities also share the costs.

In the early stages of crude oil field’s development, a reservoir that stretches beyond the licensed boundaries will not be properly delineated in that the stratigraphic trap that forms the entire reservoir may have been known solely by data obtained from the seismic activities. It is the mixture of the data from the wells that can be used to ascertain the degree of crude deposits. The Oil Company may thus, conduct further drilling to further explore and evaluate the wells to accurately assess the reservoir this is because, “the where? And how much? Questions are best answered by well data, the location of that well and all

subsequent appraisal and development wells will prove critical to the final assessment of each unit interests.”

It is important to note that unitisation occurs within a national setting. Where the unitisation involves international boundaries of at least two nations, it is called *cross border unitisation*.

> “If countries share a common hydrocarbon reservoir across an established border, and are unable to agree on a definitive unitization agreement after making reasonable efforts to cooperate, international law does not require them to unitize the reservoir. Further, there is support among leading international scholars and practitioners for the proposition that a country may, if it is unable to reach a unitization agreement with a neighboring country, unilaterally exploit a cross-border reservoir, though it should be noted there is no international convention or court decisions directly upholding such proposition. Most countries, however, prefer a cooperative approach rather than unilateral approach for economic and political reasons, not necessarily legal reasons.”

“A Delimitation Agreement Can Require Neighboring Countries to Cooperate toward Agreements to Exploit a Common Reservoir A hydrocarbon deposit may create complex legal issues if it underlies the territory of two different countries. At the time of discovery, three different factual scenarios may exist:

a) The countries have entered into a definitive agreement, such as a joint development or unitization agreement, that governs the manner in which they jointly develop a cross-border hydrocarbon deposit;

b) The countries have entered only a delimitation agreement with respect to the boundary that addresses the contingency of cross-border hydrocarbon deposits in a nondefinitive way; or

c) The countries have no delimitation agreement in place and/or dispute the boundary.”

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28 Ibid
General Assembly Resolution 3129 (XXVIII) declares that: “it is necessary to ensure effective cooperation between states through the establishment of adequate international standards for the conservation and harmonious exploitation of natural resources common to two or more states in the context of the normal relations existing between them.”

In this situation, the two countries enter into a contract to produce crude oil and gas rather than competing for extraction via capture mechanism. The inter-state agreements may take the form of voluntary joint development agreements or by compulsory means such as a constructive trust order of a court, an existing treaty which may be imposed by an international arbitrator or the international court of Justice. Joint development agreement can also be a viable tool for the exploitation of oil and gas on a temporary basis where there is a boundary dispute between two nations; the arrangement will enable oil and gas to be produced and profits to be shared pending the settlement of the boundary delimitation disputed between the countries concerned. However, in international law, The United Nations Convention of the Law of the Sea 1982 gives countries, the absolute rights and control over mineral deposits in the seabed and subsoil of their territorial waters and Exclusive Economic Zones.

The UN Convention also authorises nations sharing common reservoir of mineral resources to be able to reach agreement regarding the peaceful settlement regarding continental shelves and exclusive economic zones, such efforts and arrangements should be in practical nature to develop the mineral deposits that are within the overlapping geographical boundaries without necessarily forgoing individual sovereign rights to the minerals. There are two methods of achieving cross border peaceful production of crude oil where the reservoir spans across two

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29 Compulsory unitisation is easier to enforce where the crude oil reservoir lies within a national boundary. In that case, there may exist an enabling law under which the government may force the individual mineral owners to agree to a unitisation plan amongst themselves otherwise, the government can imposed such a plan on all parties. Examples of the legislation are the United Kingdom Petroleum Act 1998 and the Nigerian laws namely: Petroleum (Production) (Seaward Areas) Regulations (1988); Petroleum Act (1969) and the Petroleum (Drilling and Production) Regulations (1969). The aforementioned legislation imposes obligatory statutory requirements on mineral interest owners and contractors to cooperate if and when a common reservoir must be developed in the national interest to secure maximum recovery of petroleum and to prevent time consuming competitive drilling.


31 See: Part V and Article 55 - 75 of the Convention
or more nations. The first is the cross border unitisation bilateral agreement and the second is the joint development zones bilateral agreement. Both methods share similar attributes, however, in the case of a joint development zone agreement, the development zone can be further split into separate contract areas, allowing each contracting nation to exercise some control over the zones within its boundary.\(^\text{32}\) This may occur where the parties prefer to independently handle their production affairs.

**Cross border unitisation is straightforward, however, it can only work if both nations expressly agree to co-operate in the development of the common pool of crude oil reservoir. However, it is crucial for the parties to decide on the most suitable Unit Operator (Oil Company). Usually, the appointed Unit Operator will be able to guide where wells are to be drilled and other data collection processes that will be payable by the party that owns the unit interest. Also, the Oil Company will be responsible for the development of the reservoir simulation model (RSM) showing the Oil Company’s findings, including the “shape, flow rates, porosity, permeability, oil in place or STOOIP, and IGIP, and the distribution of both across the common reservoir, thus providing an early best estimate answer to the “how much?” and “where?” questions.”\(^\text{33}\)** These services are very necessary and forms part of the Pre-Unitisation Agreement activities.

The contracting nations can achieve the joint petroleum development area and the unitisation agreement for their common purpose in two ways: (a) By signing bilateral agreement or treaty to effect the transaction; (b) By an international unitisation agreement also known as unit operating agreement. This is usually done by permitting the relevant oil companies from both countries to engage in dialogue on the best possible development processes which would be of mutual interest to the countries and the corporations. These specifics can therefore be inserted into the bilateral treaty. The bilateral treaty sets out the rights and obligations of the contracting

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countries with respect to the oil field developments, profits sharing and decommissioning of facilities etc. To fully understand how the processes work, case studies will be presented herein.

UNITED KINGDOM AND THE NETHERLANDS TREATY (1965)

In 1965, the United Kingdom and the Netherlands signed a bilateral treaty to govern the exploitation of any oil field which crosses their international border. Article 1 treaty provides:

“Where a field extends across the border, the states shall seek to reach agreement as to the manner in which the structures or fields shall be most effectively exploited and the manner in which cost and proceeds relating thereto shall be apportioned, after having invited the licensees concerned, if any, to submit agreed proposal to this effect.”

In view of subsequent delimitation agreements signed between the Netherlands, Germany and Denmark on 28 January 1971, the United Kingdom and the Netherlands amended the treaty to accommodate certain changes. In 1985, a reservoir of approximately 700 billion cubic feet was discovered to straddle the international border under an exploration concession granted to Ultramar Exploration (Netherlands) BV.\(^{34}\)

The Markham oil field was the first cross-border reservoir unitised between the United Kingdom and the Netherlands under the unitisation treaty. The Markham field is a gas reservoir straddling between the Southern North Sea within the United Kingdom and the Netherlands continental shelves. The parties named it Markham Field Reservoirs. In addition to the treaty of 1965, a supplementary agreement was signed by the parties specifically regarding the Markham Field Reservoirs- the Markham agreement on 26 May 1992. The objectives and coverage of the agreement were summarised in the speech of Lord Harmsworth in the House of Lords on June 3\(^{rd}\) 1992 as follows:

\(^{34}\) Roggenkamp, M. (1992:194), “The Markham Field: Joint Exploitation by the Netherlands and The United Kingdom” 7 OGLTR 193
“I am pleased to be able to inform the House that negotiation of a [supplementary] treaty with the Netherlands Government covering the exploitation of the Markham gas field has been concluded and that the treaty was signed in the Hague on 26th May by the British Ambassador to the Netherlands Sir Michael Jenkins, KCMG, and by the Netherlands Minister of Economic Affairs, Dr. J. E. Andriessen. The treaty, which is the UK's fourth transboundary field treaty although the first with the Netherlands, will enable the field to be developed as an integrated unit. It provides for co-operation between the two governments on matters like safety, inspection, measurement, appointment of a single operator, approval of the fields development plan, abandonment, exchange of information and for the determination and apportionment of reserves. The treaty will in due course be laid before the House. In the meantime, I will place a copy of the treaty in the Library of the House.”

UNITED KINGDOM AND NORWAY TREATY (1965)

The United Kingdom and Norway signed a range of treaties to facilitate cross border unitisation. For example, the March 10, 1965 agreement constitutes the first detailed provision designed to foster swift actions by the parties in the event of the discovery of a cross border straddling of crude oil and gas reservoir. The treaty provided the structure for the subsequent Cross Border Unitisation agreements between the parties namely the Frigg agreement of 1976, the

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35 Hansard: HL Deb 03 June 1992 vol 537 cc67-8WA. Per The Parliamentary Under-Secretary of State, Department of Trade and Industry (Baroness Denton of Wakefield)

36 The treaty was amended in November 2009 with specific clause inter alia: “if any single geological petroleum structure or petroleum field extends across the dividing line and the part of such structure or field which is situated on one side of the dividing line is exploitable, wholly or in part from the other side of the dividing line, the contracting parties shall in consultation with the licensees, if any seek to reach agreement as to the manner in which the structure or field shall be mostly effectively exploited and the manner in which the proceeds deriving therefrom shall be apportioned.”


**NIGERIA AND SAO TOME TREATY (2001)**

In about 1998, a dispute arose between Nigeria and the Sao Tome and Principe over the intercontinental maritime boundary. Sao Tome and Principe claimed archipelagic status in accordance with Article 46 of the United Nations Convention of the Law of the Sea 1982. The government of Sao Tome and Principe relied on a 200-mile exclusion zone limited by a meridian line in the Northeast and Northwest as the actual meridian line separating Sao Tome and Principe and Nigeria. Nigeria contended that its boundary was clearly by the Exclusive Economic Zone Act (Cap 116) and therefore, that the Exclusive Economic Zone overlapped with Sao Tome and Principe's zone. The two nations decided on a peaceful settlement by way of joint development zone agreement to for the production of oil and gas. The treaty is a two level of authority framework providing for a joint ministerial council and a joint authority. For example, Article 3.1 of the Treaty expressly provides that:

“Within the Zone, there shall be joint control by the States Parties of the exploration for and exploitation of resources, aimed at achieving optimum commercial utilization. The States Parties shall share, in the proportions Nigeria 60 [units] per cent, Sao Tome and Principe 40 [units] per cent, all benefits and obligations arising from development activities carried out in the Zone in accordance with this Treaty.”

In general, Article 3 of the Treaty expressly provides that unitisation of crude oil and gas production should be unitised: (a) Where a single geological petroleum structure overlaps the dividing line between the zone and the exclusive maritime area of one of the State parties; (b) Where a single geological petroleum structure overlaps the dividing line between any contract areas within the zone; and, (c)
Where a geological petroleum structure overlaps the dividing line between the zone and an exclusive maritime area of a third State.  

**AUSTRALIA AND INDONESIA TIMOR GAP ZONE TREATY (1989)**

The *Timor Gap Zone Treaty* came into existence following an extensive boundary dispute between Australia and Indonesia over the sovereign rights over a common continental shelf (the Timor Gap) which separates the two nations. Australia’s rights over the disputed Timor Gap were based on the geographical projection of the territorial land as a basis for delimitation. On the other hand, the Indonesian government based its claim on the midpoint line for delimitation.

A peaceful settlement was reached by the signing of the Timor Gap bilateral treaty of 1989. The treaty provided for a three-part zone temporary co-operation, A, B and C under which agreed joint exploration of crude oil were to be undertaken. It was also a term of the treaty that a different legal arrangement would be required to practically administer the actual productions hence; the Timor Sea Treaty of 20th May, 2002 was signed by the parties to give effect to the Timor Gap Treaty. The 2002 treaty authorises a joint petroleum development area (JPDA) in Timor Sea between Australia and East Timor to mutually manage and control petroleum production in that area covering several oil and gas fields. Annex E to the Treaty provides:

“Australia and East Timor agree to unitise the Sunrise and Troubadour deposits (collectively known as ‘Greater Sunrise’) on the basis that 20.1% of Greater Sunrise lies within the JPDA. Production from Greater Sunrise shall be distributed on the basis that 20.1% is attributed to the JPDA and 79.9% is attributed to Australia.’ The 20.1% of the deposit lying within the JPDA is to be distributed in accordance with Article 4(a) of the Treaty [that is] 90% to East Timor and 10% to Australia.”

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The 2002 treaty further fashioned a three-layer structure for administering the joint petroleum development area and provided for the continuation of a Petroleum Mining Code became effective in 2004. Article 3 (b) Timor Sea Treaty states that within the JPDA, East Timor and Australia shall mutually control, manage and ease the production, exploration, development and exploitation of the petroleum resources for the profit of the people of East Timor and Australia. The joint development agreement apportions 90 (units) percent of the income to East Timor and 10 (units) percent to Australia as opposed to the previous unit shares of 50/50 divide under the Timor Gap Treaty of 1989. The 2002 treaty and the Petroleum Mining code expressly provided for the unitisation of crude oil reservoir that may migrate across the boundary of the joint petroleum development area (JPDA). The reason for the express provision was for the efficient administration of the oil field known as the “Greater Sunrise Field (GSF)”\(^{41}\) One-fifth of the GSF was within the joint petroleum development area whilst the other four-fifth was within Australian territory. On 12\(^{th}\) January 2006, another follow-up treaty was signed by the parties in Sydney, to modify at least one key aspect of the Timor Sea Treaty notably the equal sharing of revenue from the unitised field of the upstream exploitation.\(^{42}\)

**REDETERMINATION OF CRUDE OIL UNITISATION DATA**

As illustrated earlier, the decision on unit profits by the joint sharing, contracting parties depend on the data obtained by the unit operators or the third party (Oil Company). It should be noted that the initial information and data can alter in magnitude with regards to the volume of crude oil deposits and gas volume in the common reservoir. For this reason, the contract signed by the joint owners should provide for a fixed timeframe where the information should be re-validated. This process is called *redetermination*. The updated data will enable the joint owners to re-apportion the Unit Interests in accordance with the new data on the oil wells and production data. The basis of any variation in the agreement including the re-

\(^{40}\) See: Article 4(a) Timor Sea Treaty  
adjustment of unit profit of each contracting partner is subject to the calculation of hydrocarbon volumes based on the outcome of the re-determination process.\textsuperscript{43}

\textsuperscript{43} Barbara Kwiatkowska, Economic and Environmental Considerations in Maritime Boundary Delimitations, in INTERNATIONAL MARITIME BOUNDARIES 75, 87 n.49 (Jonathan I. Charney & Lewis M. Alexander eds., 1993).