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Fair and Equal Exploitation of Transboundary Natural Hydrocarbon Based on International Law and Standards

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Abstract

Cross-border shared resources have always been one of the legal and economic issues, since they are highly important to governments. Because of the inherent characteristic of governments and their willingness to exercise their sovereignty over the land, resources, and protection of these common cross-border resources, have always been challenging and a subject of disagreement between stakeholder countries, in the legal, economic, and political. These challenges become more serious when it comes to valuable and strategically shared cross-border resources such as oil, and gas. The case in this study is located on the common border between Iran and Iraq, which is the confluence of a valuable oil resources. This region is recognized as Azadegan and Majnoon oil fields. The importance of exploring this area is because it is regarded as one of the largest cross-border oil resource interconnections in the world in a single area. The existence of a huge and common underground oil reservoir, which is very valuable, is the reason for the conflict of interests between the two governments of Iran and Iraq. However, this conflict of interests has not only been created for governments, but it has interfered with the economic interests of international and multinational companies and the rights of present and future generations of human beings (collective/group rights). The escalation of this conflict of interest occurs when governments face shared oil resources onshore or offshore, which may jeopardize the rights of human generations and the environment due to political and economic competition.

Keywords: Cross-Border Shared, Fair and Equal Exploitation, Sovereignty, Transboundary Natural Resources

1. Introduction

With the emergence of new structures of government, new players in the international arena have emerged through the creation of new international organizations and the adoption of laws and new international principles. Such as making the new status of international and multinational corporations In the arena of international trade with governments, and the creation of a new position for the concepts and rights of present and future generations of human beings (Collective/Group Rights) has emerged as a new player in the international arena through the resolution of the 1972 Stockholm Declaration of the United Nations Conference on the Human Environment, the 1992 Rio Declaration on Environment and Development as Third-generation human rights. Among them are players (Governments, International oil companies, and the rights of human generations) who have Global

Interdependence, as well as challenges and Conflicts of rights and interests. The escalation of this conflict of interest occurs when governments face shared oil resources onshore or offshore, which may jeopardize the rights of human generations and the environment due to political and economic competition. Many conflicts of interest and rights in the right of exploitation and extraction from resources offshore are resolved in accordance with the Convention on the Law of the Sea. But there is still no universal international law on the right to exploitation and extraction from common onshore oil fields. The best solution to reach a logical agreement and contract between two neighboring states that have shared cross-border resources is to pay attention to the type of Common exploitation and operation called by the author of this research, “fair and equal exploitation of transboundary natural hydrocarbons according to international laws and standards.” As well as adherence to the concept of global interdependence and respect for common and collective rights in these resources by governments. Shared cross-border resources are one of the most important causes of challenges for legal, political, economic, and military sciences. Another factor creating challenges in cross-border oil resources is the intrinsic special features of governments, their willingness to exercise their sovereignty over the land and strategically shared cross-border, and their legal duty to protect these resources. The case in this study is located on the common border between Iran and Iraq, where the confluence of valuable oil resources is recognized as Azadegan oil field and Majnoon oil field. The importance of exploration in this region is because of the huge oil layers; as one of the most significant connections of cross-border oil resources in the world, it is located in a single region between two neighboring countries. Fair and equal use and standard extraction of common fluid resources for neighboring countries based on international law documents are achieved by examining the technical factors and the location of transboundary oil reservoirs. The dominance of natural fluid resources as valuable fluids on earth has always been the basis for forming international disputes and challenges from the beginning of new human civilization to the present day. Countries need to expand and maintain their sovereignty over natural resources to survive and thrive economically and socially in their home countries, whether these resources are within their inside borders or located in the area of shared cross-border. In some cases, this expansion of the scope of sovereignty by states leads to the formation of legal, political, and even military challenges. One of the most important areas of logic in the Middle East is rich in oil and gas resources.

The objectives of this study are:

- Examining the legal nature and applicable rules of international law on fluid, natural resources of petroleum;
- Examining the position and Technical Specifications of transboundary natural fluid resources between several countries and the challenges ahead, including politics, economic and legal challenges ;
- Investigating the effects of unilateral and multilateral behavior in the withdrawal of fluid, natural resources by governments and the impact of these behaviors on the environment.

Therefore, for fair and equal use of common fluid resources based on international law documents, it is necessary to know the factors affecting the amount of extraction from oil fields and the factors affecting the relationship between the governments that own the reservoirs.

2. Cross-Border Oil Resources

Geographically, Iran and Iraq have 1629 km of shared border. Iran and Iraq have 12 shared oil fields along their shared border, including Naft Shahr field next to the Naft khaneh oil field, Dehloran field beside Abu Ghraib field, and Paydar field next to the Falake field, Azadegan field alongside Majnoon field, and Yadavaran field next to Sanbad field. Azadegan field in the southwest of Iran is located 80 km away from the west of Ahvaz, near Susangerd, and by the Iran-Iraq border (AOGC, 2019).

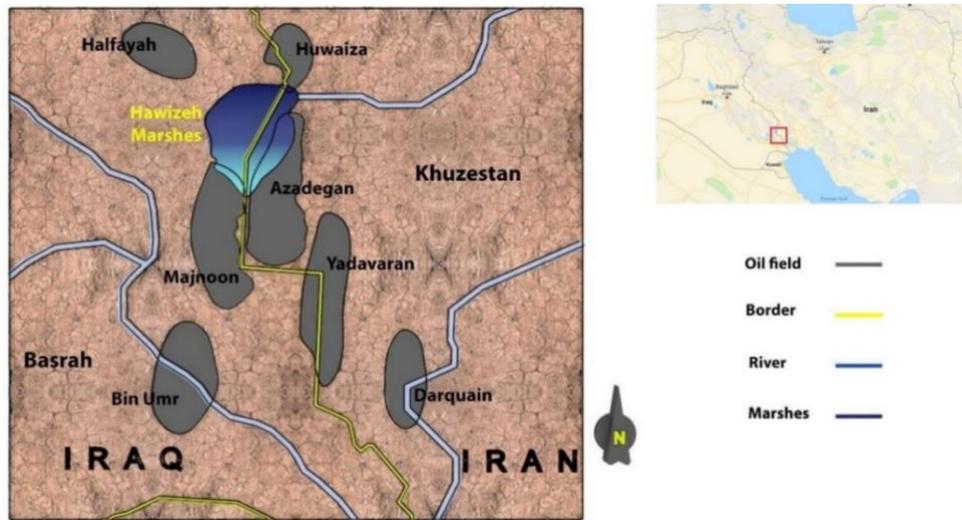


Figure 1: Political border between Iran and Iraq (Du et al. 2015)

3. Investigating the Factors and Technical Specifications Affecting Increasing Production of Oil and Gas in Shared Cross-Border Fields

The world oil exploration process is declining, and many of its oil reserves are at the bottom of its production model. The importance of correcting and improving the harvest increase methods is that in many oil reserves around the world, about two-thirds of the oil reservoirs remain unused and cannot be extracted by conventional methods. Countries use various techniques to increase harvesting, such as directional drilling techniques or the injection of particular materials into the oil field reservoirs. The International Energy Agency (IEA) predicts that energy demand will increase by 1.4% until 2040, while oil and natural gas provide about half of their demand. The use of Enhanced Oil Recovery (EOR) techniques is expected to increase significantly worldwide to maximize economic recovery from existing oil and gas fields (Figure 2) (MarketWatch, 2019).

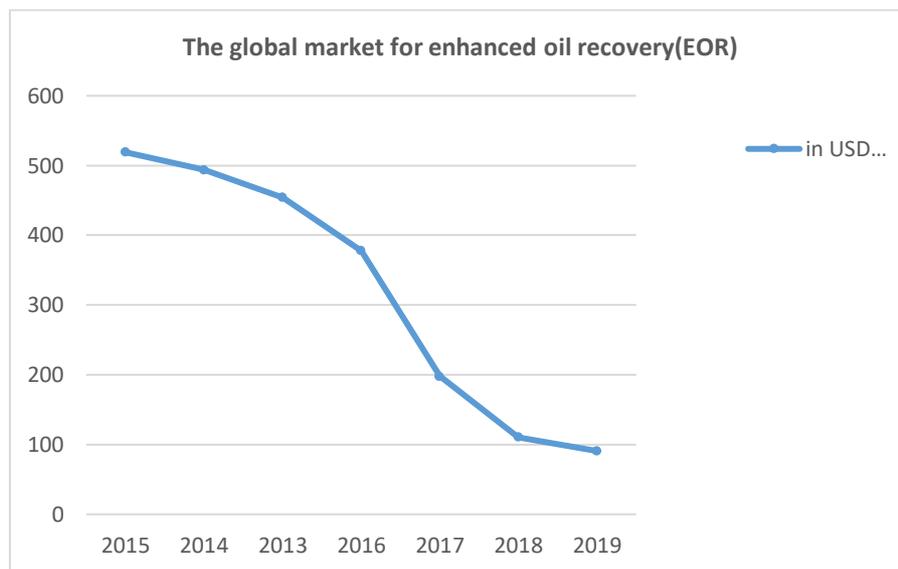


Figure 2: the global market for enhanced oil recovery (EOR) (Bloomberg, 2019; Radiantinsights, 2015)

The recovery coefficient is the ratio of the final recovery to the total in situ oil of the field. In other words, it is the percentage of primary in situ oil that can be extracted by primary, secondary, and tertiary recovery methods. The initial recovery coefficient is a percentage of its reserves extracted by natural pressure. The secondary recovery coefficient includes increasing the number of wells drilled, directional and inclined drilling, and improving on-site equipment to extract more oil from reservoirs, water and gas injection, etc. However, it can be held that what is generally understood as secondary recovery is a part of the reservoir production during its production life that is

created as a result of the process of injection of water or gas. Secondary recovery methods are called (IOR), and tertiary methods are referred to as (EOR) (Matin and Jafari 2016). Oil-producing countries have intense competition for early investment information and reservoir recognition in a cross-border shared oil field. In this competition, the winner provides a country that performs oil and gas extraction operations through reservoir recognition and better understands the affecting factors on the border flow of fluid through engineering design, more advanced technologies, and more investment. One of the technical, economic, and legal challenges in harvesting the cross-border shared oil field is balance maintenance in harvesting these shared oil fields considering the Principle of Equitable Utilization and the challenge of oil and gas flow migration. Considering a few points are essential:

3.1. The Impact of Distance and Number of Wells between Two Countries from Neighboring Country Borders

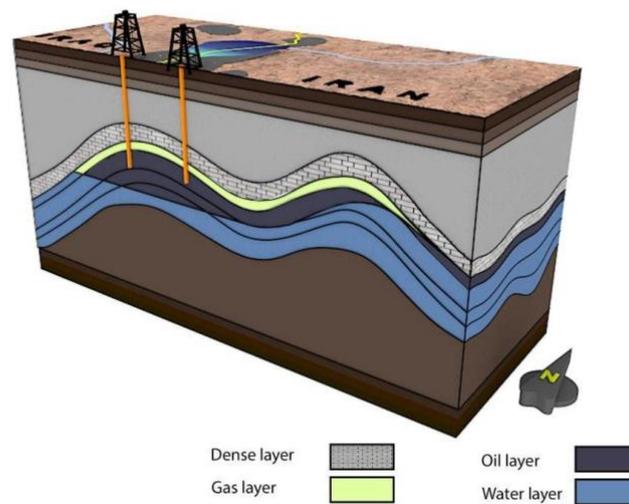


Figure 3: Geological structure of oil wells between two neighboring countries (Iraq Abdollahie et al., 2015)

The location of the wells on a cross-border shared oil field has a direct effect on its production. The location of production wells and their directionality impact the flow of fluid across the borders of the stakeholder countries. The closer the wells are to the boundary; the more possibility would be for fluid to flow from the other side to its boundary (Figure 3). In these circumstances, countries would prefer to produce non-stop and at the highest production rate from the shared reservoir to direct cross-border fluid flow toward themselves. It should be noted that the pressure drop movement in the reservoir is a kind of wave motion. This pressure wave in the reservoir is known as the wave's superposition rule. Accordingly, when two beneficiary countries begin to produce oil and gas on both sides of the border equally, the fluid in the boundary regions would have the same potential on both sides and flows equally toward the two neighbors. Eventually, fluid flow from one country to another would be zero (Shokrolahzadeh-Behbahani, Zeinali-Hasanvand, and Ahmadi 2015). When oil migrates to the neighboring country from the cross-border shared reservoirs below the political boundaries of a stakeholder country, this country will suffer from two aspects; firstly, concerning the loss of its share of hydrocarbon resources, and secondly, due to the well's pressure drop. As a result, the countries concerned in the cross-border shared reservoir attempt to drill and produce from wells in an area of the reservoir with more appropriate permeability and less porosity because a more substantial compressive wave is sent to the boundary, and this wave moves more rapidly to another side of the reservoir to maximize the productivity of the reservoir's pressure drop in addition to transferring fluid from the border towards themselves (Shokrolahzadeh-Behbahani, Zeinali-Hasanvand, and Ahmadi 2015). Governments usually impose legal restrictions on the prevention of drilling and construction of wells over certain distances to avoid conflicts of rights and challenges that result from exploitation concessions to contractors operating in the vicinity of common oil fields (Campbell Nicholas J 1956). On this basis, it can be pointed out in the United Kingdom Regulations that it is "*forbid without the Minister's consent, the location of the any well about 125 meters from a license boundary line*" (United Kingdom, 1966; Worris, 1968).

The concept of "*the more wells, the more oil*" (Morris 1968) has many fans, countries, or concessionaires trying to make more money by building many wells. Some countries build multiple wells to compensate for lagging production compared to neighboring countries. Especially where there was competition for maximal harvests, such as in the joint oil and gas field. This might cause the reservoir pressure to drop and the oil and gas fluid migration.

3.2. Impact of Using Directional and Horizontal Drilling Technology on Harvesting

In a vertical well, the pressure drops of the well begin at a central point, while in a directional or horizontal well, the pressure drop is dispersed along a line. This pressure drop line can be parallel with or perpendicular to the country border (Shokrolahzadeh-Behbahani, Zeinali-Hasanvand, and Ahmadi 2015).

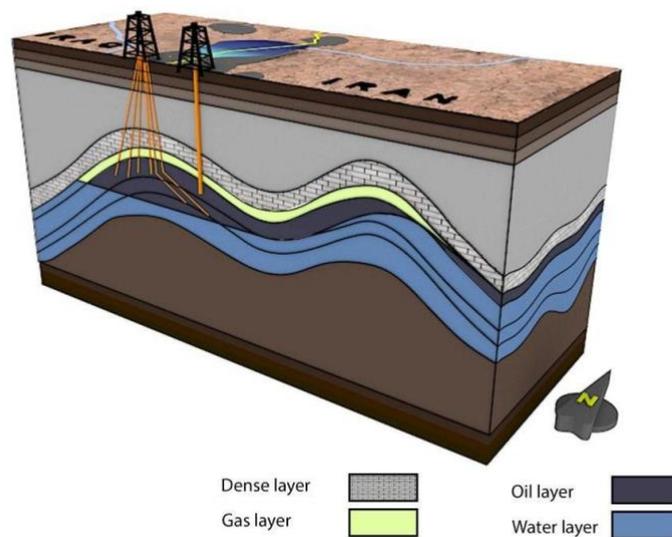


Figure 4: Directional and horizontal drilling (Iraj Abdollahie et al., 2015)

Directional and horizontal drilling is a technology and technique that allows easier access to shallow directional and horizontal wells. Countries utilize nanotechnology and Nano-composite in drilling rigs for drilling an oil well, directional drilling, and angular drilling to increase harvesting oil reservoirs. Bendable Flexible Pipe technology and drill bits in drilling oil reservoirs allow faster and easier access to many oil and gas reserves (Figure 4). Most of southern Iraq's new oil and gas wells use directional and horizontal drilling technology. Given that Iraq has many fields and the oil recovery coefficient varies in each field; however, generally, the average oil recovery rate in Iraq is 34%. The recovery coefficient of 22 oil fields out of 28 producing oil fields in Iraq is between 15 and 42 %, while its total average is above 30%. The methods of increasing the Iraq recovery coefficient are mainly (EOR) and (IOR) water injection. The average growth of Iraq's extractable reserves increased to 60% (1.6-fold) between 2001 and 1981 (Matin and Jafari 2016).

- Legal Challenges of Directional Drilling at Cross-Border Oil Fields

One of the features of oil and gas extraction through directional drilling is that it is possible to enter neighboring and beneficiary countries in a cross-border shared source through the underground, which provokes legal challenges and violations of countries' rights as follows:

- 1- Violation of the principle of territorial integrity by illegal extraction beyond the borders of countries, mainly through directional drilling (Bastida et al. 2006).
2. The states' unilateral and directional drilling in the cross-border shared field violates the obligation of non-material damage to the other government. (Bastida et al. 2006)
- 3- According to Art 3 of Resolution 3281 of the Charter of Economic Rights and the Duties of states, unilateral drilling of cross-border shared resources violates the obligation to exchange information and consult with another

government on matters relating to shared resources, which is a commitment based on the resolutions of the (UNGA).

4- Unilateral and directional drilling of cross-border shared resources might create and spread hostilities between governments, which is also a violation of the purposes of the UN Charter and international norms.

5- Beneficiaries would enjoy mutual and equitable rights regarding the extraction of cross-border shared oil resources (Onorato 1977), and governments would violate the mutual and equitable right use by directional and unilateral drilling.

6- The exploitation of a shared cross-border resource only happens by mutual agreement between all the States concerned, while directional drilling permits access to the border part of the neighboring state concerned underground, which practically violates the reciprocal agreement.

7- Directional drilling in cross-border oil fields might violate the principle of *leitmotiv* (Tanaka, 2011).

8- Directional drilling at shared oil fields by one of the beneficiaries would violate the Principle of Equitable and Reasonable Utilization.

3.3. The Impact of Using the Oil or Gas Injection Technology of Oil or Gas Injection into the Oil Field

The first projects were carried out in the 1930s using hydrocarbon gas injection techniques at Oklahoma City and the Cunningham Pool fields in the United States (Muskat 1949). Water, gas, carbon dioxide, chemical Alkaline Surfactant Polymer (ASP), injection into the field as well as microbial techniques Enhanced microbial oil recovery (MEOR) are other advanced techniques and technologies to increase oil harvesting and improve oil recovery (Mirei and Ali Akbar Dehghan 2014).

Fluid flow control is one of the most critical factors in extracting hydrocarbon fluids (Adelzadeh 2004). In this case, the frontal infiltration front of injected fluid must move as smoothly as possible to fit within the formation. To improve this process, the researchers have successfully produced non-permeable surface agents to enhance flow rates in extraction and production operations (Khoshmardan, Huormozi, and Mohammadian 2014). According to experts, most of Iran's large oil reserves are now in the second half of their lives and need gas injection. The purpose of gas injection into the oil reservoirs is to increase the oil recovery coefficient of the reservoirs and build the capacity to convert in situ oil into extractable oil from the reservoirs (Matin and Jafari 2016).

3.4. The Legal Challenges of Water Injection, Gas Injection, and into the Oil Field

Fluid flow control also generates hydrocarbon migration across the field. The basis for this method is that during the migration process, the light crude oil element first migrates, and its heavy content remains in the reservoir. This method would likely cause a country to invade and encroach on a neighboring country's subsurface/underground oil reservoirs at shared oil fields, and hence conflicts of interest would occur. Besides, unilateral drilling and the use of techniques, which cause migration of fluid across the field, would result in more economic coalition and capital loss for non-beneficiary counterparts who don't use this method due to competitive drilling through pressure drop of the field on the neighboring side which reduces production volume and also oil and gas field life in the long term and the neighboring beneficiary country is forced to invest more in increasing field pressure to increase production volume to compensate for this loss and backlog. If two countries use the system in a shared development system for shared common cross-border reservoirs, their extraction costs would be reduced, achieving the maximum production rates (Lagoni 1979). The competitive and unilateral drilling by governments also creates severe physical damage to the shared oil and gas field (Bastida, et al., 2016).

4. The Necessity of Using Shared Exploitation Method or Development Integration, Exploitation, and Production in Natural Cross-Border Resources

One of the critical issues in determining the legality and ownership of natural resources, especially mineral resources, is the determination of their location. Accordingly, there are two categories:

4.1. Solid Natural and Mineral Resources

To determine the sovereignty and ownership of solid natural resources, because they are within a particular region and boundary, they can easily be assessed and determined in terms of their ownership, and the fundamental principle of territorial sovereignty is applied to them (Lagoni 1979).

4.2. Fluid Natural and Mineral Resources (Oil and Gas)

There are three theories for harvesting fluid cross-border natural resources.

The first theory: The “Rule of Capture,” states that the first person starting to extract has the right to exploit the entire resource.

The definition of the rule of capture is:

“The right to drill for and produce oil and gas from a particular tract of land even though doing so would drain the hydrocarbon concerned from beneath the land of another party (Muskat 1949).

One of the disadvantages of exploiting the shared cross-border oil resources independently, based on the rule of capture, is that it leads to competitive drilling and probable over-harvesting, ultimately damaging it and imposing additional economic costs in production to the beneficiaries. This view is based on the idea of using the “*Prior Appropriation Rule.*”

In other words, the nature of the right to extract from the cross-border shared oil fluid resources is “An Affirmative, Vested Interest in Situ” (Lagoni 1979).

The second theory: Applying the rule of sovereignty over the subsoil based on the view of Juraj Andrassy, who states that this rule should be applied in the absence of a shared international agreement for cooperation and division of production of a shared cross-border field (Andrassy 1951).

The third theory: Shared exploitation of cross-border fields

The co-development and integration methods include two methods, the first is co-development, and the second is integration. Its purpose is to prevent competitive drilling and prevent its harm. Proponents of this theory argue that competitive drilling is contrary to international law.

Integration is another way of exploiting shared cross-border oil resources. Accordingly, an agreement is made between the stakeholder parties to the shared cross-border fields to determine the manner of allocating the benefits and costs associated with exploiting the cross-border shared field, and a single exploiting company is determined as the operator of the whole shared oil fields by the agreement of the stakeholder parties. The first method has become a common practice in some legal systems, and the latter method is also more popular due to securing the interests of both parties and preventing damage to the oil field in joint fields. Except in cases where two or more countries conflict or their preference is essentially based on a unilateral extraction, in other cases, governments enter into bilateral or multilateral agreements by using one of the oil contracts models.

5. Investigating the Conflicts of Interest of States Concerned in Cross-Border Shared Natural Resources

The Conflicts of Interest of States Concerned in Cross-Border Shared Natural Resources are including:

5.1. Political issues

By looking at the structure of a cross-border natural resource, particularly the shared oil reservoir, it is easy to find out that the reservoir surface/underground has one or more pieces that can be described as a cylinder filled with oil, gas, and condensate. This reservoir can be within two or more countries' territorial or maritime water territories on both political territorial and marine boundaries. Therefore, there is always more than one state claiming ownership of these shared fields. One of the reasons for conflict between neighboring countries is the pressure to

find and exploit cross-border petroleum reserves located in disputed areas and the lack of united management to perform extraction operations in the shared field and absence of cooperation and coordination between neighboring countries (Bastida et al. 2006), for instance, the Iraq-Kuwait war (the 1991 Gulf War) (The Associated Press 2005) is an excellent example of in this case (Szekely, Utton, and Carmen Pedrazzini 1991).

Therefore, it can be stated that the level of political relations of the partners would affect the possibility and ease of cooperation in the management of the shared fields. If the two countries had close political relations, there would be less sensitivity to negotiation and agreement; subsequently, the circumstance would be easier to increase the cooperation between the two countries to develop the field.

5.2. Investment Issues

Some of the advantages of increased cooperation in the exploitation of common cross-border resources are establishing political peace on the common borders of neighboring countries and establishing a stable and strong economic relationship between those countries. These advantages of increased cooperation between countries prevent disputes between neighboring countries and lead to economic stability for countries and economic zones on the borders of two or more countries.

Among the benefits of increasing cooperation between countries are eliminating lengthy border disputes between countries, increasing the economic profits of countries, and creating more stability on the borders of two or more neighboring countries. Therefore, each beneficiary country considers its long-term economic benefits to be achieved by providing a peaceful environment on the border with its neighbors. In the integrated and shared development of cross-border natural resources, costs such as gathering the required information, clearing the cross-border shared resources if needed, and developing and exploiting the field would also be significantly reduced (Ghanbari 2011). Integration and development, co-production and exploitation of cross-border shared resources are the most important ways to invest in resources that require governments' cooperation and are the best ways to extract water, oil, and gas resources. The economic and investment reasons that cause the countries to select shared integration, development, production, and operation are:

- 1- Countries have a strong desire to exploit the cross-border shared resources of the region at the earliest time.
- 2- Countries have realized that alternative approaches, such as border delimitation, are likely to lead to a significant delay in operation and potentially have a severe negative impact on bilateral relations (Bastida et al. 2006).
- 3- Countries have recognized that existing agreements can be useful for codifying new agreements and new shared cooperation (Art. 6(1)) (United Nations 1958).

Implementation of the optimal operation pattern requires access to information and performing operations on the oil reservoir's ground terrain. In shared repositories, this access would not be possible without the cooperation and coordination of partners or integrated management of reservoirs.

5.3. Legal Issues

The legal issues affecting the decision about shared fields depend on legal factors such as international law as well as the domestic legal system and countries' views on the sovereignty and ownership of natural resources and shared fields (ownership of public or private natural resources).

5.3.1. International Law

To better understand the rules of international law, this section will examine the rules of shared natural resources onshore and then the rules of shared natural resources at sea.

5.3.1.1. A Brief Overview of the Rules of International Law in the Shared Natural Resources of Onshore

Understanding and executing the principles and rules of an international oil law regarding the common natural

resources of the sea is always a challenge for governments onshore and offshore or deep underground. Because every country is thinking of maximizing the use of these resources, the consequence of this approach of governments is the cause conflict and disagreement between governments in the use of these resources. Secondly, it is to cause damage to the environment. Fluid and natural resources have been classified into three categories:

- 1-Surface water reserves (watercourses);
- 2-Aquifer;
- 3-Natural oil and gas resources

Resources of oil and gas fluids and underground water (aquifers) have many similarities and differences: One of the similarities is the potential for migration of gas and oil resources, which is a common feature of underground water. Therefore, each of these sources follows a different legal regime. The International Law Commission (ILC) has made great efforts to establish integrated rules for shared onshore resources. However, the governments have several views on whether underground water aquifers with underground oil and gas resources onshore can follow a unit legal regime.

The commission has tried to prepare and establish legal systems, rules, and regulations for natural resources in three categories: surface water (watercourse) resources, transboundary aquifers, and oil and gas resources. But, we can generally say that these principles are applied to these resources according to all the differences of opinion of the governments, including the principles of fair and equal utilization and reasonable manner, and non-harm in the exploitation of these common natural resources and creating and applying formal norms such as the general obligation to cooperate, and regular exchange of data and information (*Wronski v. Sun Oil Company*, 22 Ill.89 Mich. App. 11, 279 N.W.2d 564 (Ct. App. 1979) 1979).

It is important to note that, according to the International Law Commission, some countries believe that the natural resources of transboundary oil and gas are similar to aquifers in terms of fluidity and migration. Therefore, the provisions adopted by the International Law Commission in 19 Arts would apply to oil and gas resources. Thus, in the opinion of these countries, regarding oil and gas resources, each country's exploitation and extraction should be done fairly and reasonably and based on the relevant characteristics and factors.

Common features of underground water, oil, and gas resources include physical properties (migration and fluids) in both of them. Second is human societies' need and demand for access to water resources and oil and gas.

Third, the principle of permanent sovereignty of governments over natural resources is usable of underground water, oil, and gas sources. Therefore, considering the above characteristics, it can be concluded that the principle of fair and harmless use in the exploitation of water, oil, and gas resources underground can be extended following the principles of international law.

According to this premise, if an oil and gas reservoir is shared between two or more countries, the first way should be to use the principle of fair and harmless use to the countries adjacent to the reservoir. Because this principle was created and generalized on the assumption that it was not the origin of common reserves, but its crossing and flow should be shared between several countries. This has led to the acquisition of internationally acquired rights to these reserves. However, in oil and gas fields where the reservoir is shared, the same commonality in the origin of creation can lead to the creation and formation of international acquired law for the country that owns the reservoir. Of course, it should be noted that the issue of oil and gas reserves has not yet been addressed in customary international law. Therefore, according to the provisions of Arts 155 and 160 of the Convention on the Law of the Sea, states with a shared field must also act fairly on a non-discriminatory basis to distribute the resources and other economic benefits of their activities in the common area through any appropriate mechanism. In other words, sharing and exploitation must be fair and non-discriminatory. Of course, as mentioned in the exploitation of other natural resources, this harvesting of resources must be done in a way that without damage to the field and also execution of international standards (*Wronski v. Sun Oil Company*, 22 Ill.89 Mich. App. 11, 279 N.W.2d 564 (Ct. App. 1979) 1979). Therefore, the possibility of exploiting and enforcing recognized rights for the neighboring government is not ruled out or accompanied by difficulties. In support of this view, Art 142 of the Convention on the Law of the Sea states that the exploitation of shared resources in the territorial sea and the high seas must not

prejudice the legitimate interests of the coastal state. As set out in Art 3 of United Nations General Assembly Resolution 3281 (xxix), the Charter of Economic Rights and Duties of States exploits natural resources shared between two or more countries. Each country must cooperate based on the information system and prior consultation to achieve the maximum use of such resources without harming the legitimate interests of the other parties (UNGA, 1962). Also, in the discussion of the common heritage of humanity, this kind of interpretation of natural resources has been specified. States have asserted in the Convention on the Law of the Sea, under Art 137, that resources and reserves outside the territorial sea and the (EEZ) and continental shelf of states are not sovereign of any country and belong to all humanity.

Art 140 of the Convention on the Law of the Sea sets out fair rules for the sharing and allocation of resources from areas in which all human beings have a right and are parts of the common heritage of humankind. Accordingly, it can be stated that assuming that all humanity is jointly entitled to and benefiting from natural resources, the rules of fairness have prevailed in the sharing of its benefits and revenues; thus, in the first case, assuming that a small number of human beings, through their governments, are entitled to reserves and resources, they must observe and adhere to the rule of fair operation in the exploitation and allocation of resources. When there is a reservoir or reservoirs of oil and gas at the intersection of the two countries, to use the shared reservoir more efficiently and less costly, they can set up a unitization or unification agreement in some cases. If concluded between two states, such an agreement is called an international unification agreement. According to the above, unitization is the joint and coordinated operation of exploration and extraction in an oil or gas reservoir by the rightful owners in separate parts under which such a joint reservoir or reservoirs are located. As the international community has not yet succeeded in establishing uniform rules and procedures for the exploitation of the shared natural resources of oil and gas on land, it is possible to extend and use the rules of the Convention on the Law of the Sea and other international customs for cases on shared oil and gas resources on land or onshore.

5.3.1.2. A Brief Overview of the Rules of International Law in the Shared Natural Resources of Offshore

The principle of national sovereignty over the territorial land guarantees the right to exploit the shared oil reserves within the country's borders for each country. The first question to be considered from international law is the international legal system. The countries concerned should cooperate either in the shared hydrocarbon resources and international standards and principles controlling them. International solutions should be sought to prevent political hydrocarbons tensions in the area where there are shared cross-border resources, such as the oil zone of Azadegan and Majnoon oil fields. The 1982 UN Convention on the Law of the Sea (UNCLOS) Convention on the Law Sea has provided a way to exploit cross-boundary oil resources by establishing rules on (EEZ) and the continental shelf (Ong, 1989).

The (UNGA) also adopted various resolutions, such as the Charter of the Rights economic Responsibilities of Governments (3281), the Environmental Cooperation Resolution on Common Natural Resources (3219), and the (UNGA) Res on the Guidelines for the UN Environmental Program for Joint Natural Resources (186/34), the (UNGA) Res on the Declaration of the UN Conference on Human and Global Environment (2994), has emphasized the cooperation principle of concerned governments for the exploitation of shared cross-border natural resources and avoidance of environmental damage overexploitation of cross-border resources. However, there is no rules or guidelines in international rules and custom to prevent unilateral shared oil and natural resources harvest or to require the establishment of regional or international agreements. However, the 1982 Convention on the Law of the Sea has urged the governments to take temporary measures or good faith to cooperate for reaching an agreement on marine delimitation concerning resources under the seabed and, in the absence of a bilateral agreement, and request all the parties to refrain from any unilateral action which could disrupt the final settlement process. In the absence of a treaty between states, resolutions, binding obligations, and international customs, the general principles of law accepted by civilized nations can be the source of arbitration. Currently, in the absence of agreement between governments, the common rule for exploiting shared fields is the "Rule of Capture." This rule, which has been applied to international and internal nation's law from an internal civilized nation's law and has international legitimacy, considers underground oil and gas just as wild animals that go into anybody's land; the landlord would find ownership over that animal. (*"He who owns the soil also owns the skies above and the depths below"*) (United Carbon Co. v. Campbellsville Gas Co., 230 Ky. 275, 18 S.W.2d 1110 (Ky. Ct. App. 1929);

Roughton, 2008). Therefore, ownership of oil is obtained from the extraction and practical possession regardless of how much oil is located on which side of the border, and either side would be the owner of the captured amount of oil. Hence, if the border of the neighboring country does not exceed during drilling, the court's vote would probably be based on the Rule of Capture and would ignore the issue of fluid immigration. Accordingly, the English case *Acton v. Blundell* noted that the court cited the rule of capture in the case of a dispute over groundwater rights. The court stated that the mine owner had no responsibility for the drying up of water and damages to a miller well and the migration of water that belonged to the mill and the well owner. There was a preclusion of tortious liability (Weems, 2012; Roughton, 2008). The Pennsylvania Supreme Court (1889) has interpreted in its ruling the right to own immigrated underground hydrocarbons:

"If an adjoining, or even a distant owner, drills his own land and taps your gas so that it comes into his well and under his control, it is no longer yours, but his." (Becker-Weinberg and IMPRS, 2014).

Both courts seem to argue that the border of the neighboring country/person has not exceeded during drilling and harvesting from wells. However, it should be noted that this lack of exceedingly probably does not include directional drilling techniques and deliberate change of reservoir pressure that cause deliberate fluids migration. One of the fundamental concepts of the international law system in the context of cross-border hydrologic and hydrocarbon resources is the emphasis on sovereign equality, consent, and good faith. Based on these concepts, countries can design the base of their relations on cross-border resources (Cristina, 1938). Accordingly, the *Cameron / Nigerian Court 1998 (ICJ)*, in its ruling, noted the parties' consent (agreement) and good faith in the petroleum activities in the oil resources:

"...Overall, it follows from the jurisprudence that, although the existence of an express or tacit agreement between the parties on the siting of their respective oil concessions might indicate a consensus on hic maritime areas to which...In the present case, there is no agreement between the Parties/regarding oil concessions..." (ICJ, 1998; Roughton, 2008).

It is important to note that governments reduce their full sovereignty when they receive similar concessions in that cross-border shared resource from other beneficiary governments. Governments are willing to enter into negotiations based on the "Mutual Exchange of Privileges." When a regional or international bilateral or multilateral relationship is formed between governments, their legal systems adopt the principle of reciprocity based on the principles of international law. Examples of the need for agreement between countries and the mutual exchange of privileges are Art 4 of the UK-Norway Continental Shelf Agreement in 1965:

"... The Contracting Parties, in consultation with the licensees, if any, seek to reach an agreement as to the manner in which the structure or field shall be most effectively exploited, and the manner in which the proceeds deriving therefrom shall be apportioned..." (Bankes, 2014).

It can be argued that the concept of the principle of conflict in shared resources is based on limited territorial sovereignty and a legal regime based on the principles of equitable (United Nations Economic Commission for Europe, 1947), and reasonable use and the due diligence obligation (UN, 1997). The Sustainable Development Goals 2030 (SDGs) emphasize the role of sovereignty in the form of the international system and state:

"Every state has, and shall freely exercise, full permanent sovereignty over all its wealth, natural resources, and economic activity" (Art. 18) (Lipinski, 2017).

The reciprocity of cross-border issues and disputes over the shared resources between two or more countries is central (Art 2) (United Nations, 1945); it is considered a legal default and underlying condition of cooperation in shared resources (Leb, 2013). The use of the principle of reciprocity has two specific characteristics and consequences in the case of shared resources. This principle is widespread because it is referable and sable by all governments. It is also a debilitating principle because governments try to limit their claims by recognizing that other states refer to them. These two characteristics, being widespread and accessible to all governments and being debilitating, which limits claims, ensure that claims are made reasonably internationally, leading to customary

international law. Accordingly, claims-making countries must accept that their claims are generalized to other countries in the same situation. In this case, it is ensured that countries only claim cases subject to generalization (Snyder, 2004). According to the principle of reciprocity, if a country makes claims of sovereignty over a shared source, it must accept that this requires acceptance of absolute territorial sovereignty or absolute territorial integrity; that is to say, other beneficiaries might also make similar claims. One of the best solutions for cross-border resources, hydrocarbons, is to apply the principle of limited territorial sovereignty. One of the benefits of this principle for the beneficiary countries, in the common source, is the creation of equal rights and respect for other beneficiaries' rights to claim. (McCaffrey 1996) This principle is also accepted as customary international law.

The formation of bilateral or multilateral agreements on the exploitation (and integration agreements on the development, production, and exploitation) of shared cross-border resources depends on countries concluding that all stakeholders in common cross-border resources have equal rights. This collective understanding of equal rights guarantees equality in the rights of other partners and members.

It is important to note that since there is no developed law of international law governing the development and exploitation of cross-border fluid, natural resources, the program of "by analogy," relating to de facto cooperation rules for natural resources with similar physical properties with a fluid such as water, can be used for other fluid sources such as oil and gas (Onorato, 1977). On the other hand, in the event of disagreement between the interested countries, IOCs or the neighboring country shall be free to make maximum production across its borderline on the common oil reservoir, despite neighboring countries' policies (Bundy, 1995).

5.3.1.3. Factors Affecting the Fair and Equal Use of Shared Fluid Resources based on International Law Documents

Factors affecting the fair and equal use of shared fluid resources based on international law documents include:

-Geographical Boundaries and Shape of the Reservoir

One of the most important and initial criteria and characteristics that can play an important role in determining a fair extraction share is the geographical boundaries and form of a shared oil and gas fluid reservoir located within the countries' sovereign borders.

For instance, today, petroleum engineers can use three-dimensional and four-dimensional seismic technologies to estimate the length, width, height, and brief shape of the reservoir to calculate its actual reserves. Therefore, adding the coordinates of the countries' borders to the calculations and simulations would not be out of reach to know the limits of a country's reserves.

-Exploitation as Needs

Under Art 63 of the Convention on the Law of the Sea, countries that are adjacent to each other and have a common economic monopoly are strongly advised to agree on the exploitation of living resources in a renewable sense to preserve these reserves. Therefore, regarding non-renewable (non-biotic) common reserves, such as oil and gas, by exploiting them, there is no alternative to these resources. In first and foremost way, neighboring governments must agree on developing and using these resources to observe the principle of good neighborliness and the approach of unconventional and non-technical destruction and preserve it for future generations of human beings. Therefore, without a doubt, these rulings would apply to this group of natural resources. It is worth noting that the Convention on the Law of the Sea has made this provision more objective by explaining the following conditions:

1. Dependence or lack of economic dependence on the exploitation of natural resources described;
2. Geographical conditions;
3. Economic conditions;
4. The needs of the general public Exploitation of the above resources.

-Observing the Principle of Non-Harmful (Sustainable) Use of Natural Resources

In accordance with the general principles recognized in international law in the field of the environment by the Rio and Stockholm Declarations, Each State undertakes to use its natural resources and the environment of its territory in such a way that such measures, even if they are in their territory, do not cause harm to another state or to an institution which is not under the control of any state.

Nowadays, the principle of non-harmful (sustainable) use of land along with the principle of prevention and precautionary measures is necessary to protect the environment. On this basis, several international instruments have been approved. These principles have become commonplace in international law due to governments' use of these international instruments, especially the emphasis of arbitrators on the application of these principles.

Under Arts 193 and 194 of the Convention on the Law of the Sea, member states have the right to use their natural resources in accordance with their environmental policies and in accordance with their duty to protect and preserve the marine environment. According to the Protocol on Marine Pollution from Exploration and Extraction from the Continental Plateau, which is annexed to this Convention, there are complete regulations to prevent accidents and limit pollution caused by the discharge of harmful substances at sea during exploration and the exploitation of offshore resources. Under this Protocol, the Contracting States shall require that all necessary measures be taken; One of these measures is selecting the best available technology and economically justifiable by the operating companies. Each Contracting State shall also take appropriate measures to ensure that the installation is approved for safety. The equipment and tools used, mainly explosives and other safety equipment, are in good working order and tested periodically.

-Observance of Interests and Intergenerational Justice

The Rio Declaration stipulates in principle three that the right to development must be exercised to equally meet the needs of the present and future generations in development and the preservation of the environment. In this regard, and according to the Stockholm Declaration, Resolution 2158 adopted in 1966 specifically emphasizes the exploitation of non-renewable resources must be planned for the development of the country and the interests of current and future generations (UN General Assembly, 1966). The New Delhi Declaration of April 2006, in the second paragraph of the first principle, obliges governments to manage their natural or territorial resources prudently and sustainably. Of course, management of natural or territorial resources prudently and sustainably must be accompanied by the development of nations and paying particular attention to the rights of indigenous people, the protection and sustainable use of natural resources, and the protection of the environment, including ecosystems. The proclamation adds that governments must also consider the wishes and needs of future generations and oblige all stakeholders or other sectors to prohibit the excessive use of natural resources (Dabiri and Pirhashemi, 2009).

-Maximizing the Economic Value of the Reservoir

IOCs have the policy of maximum production in a minimum of time as one of their main hidden goals. Therefore, they do their best to achieve this important goal. However, this action is contrary to the principles of production protection from the fields, causes severe damage to the reservoirs, and even contradicts the principles of maximizing the economic value of the reservoirs. Therefore, another feature that can be considered for the fair operation of common fields is maximizing the economic value of reservoirs, which would implicitly guarantee the conservation production and the overall non-destruction of the reservoir. According to experts, maximizing the economic value of the fields would be conceivable when the maximum withdrawal and depletion of reserves occur. This is also assumed that the operation is conservative and gradual and not sudden and with a severe pressure drop in the reservoir and is accompanied by maximizing the withdrawal coefficient from the reservoirs to improve the reservoir's life by implementing methods such as Secondary Recovery. Regarding the methods to increase the recovery factor, we can mention gas injection into oil reservoirs or water injection into reservoirs. The safe

withdrawal of reservoirs delays the IOCs in achieving profits and benefits as soon as possible, and the implementation of methods to increase the recovery factor also imposes costs on the contractor, especially without being able to reap the benefits of this increase in production capacity during its contract with the host state (Tavakol Habibzadeh and Reza Agha Tehrani 2016).

5.3.2. Domestic Law and the Terms of the Oil Contracts

According to estimates by two countries of Iran and Iraq on the shared oil fields (Azadegan and Majnoon), Iraq estimated the in-situ oil of this field as 25 billion barrels (Offshore-Technology, 2019), and Iran estimated the in-situ oil of this field as 5.6 billion barrels in the northern Azadegan (Petroleum Engineering and Development Company(PEDEC) 2019) and 25.6 billion barrels in the southern Azadegan part (Offshore-Technology, 2019; NaftEMA, 2016). According to these estimates, the concerned governments have signed a contract with foreign companies and investors in this area, based on their special contractual patterns. The first major issue in domestic law and patterns of oil and gas contracts is the ownership right of shared fields or products of these fields that depend on the legal system of countries. Some countries like the United States have adopted private ownership of resources and products, but some countries such as China, Iran, and some Arabian countries have well-known ownership of natural resources and products of public ownership. This directly impacts the negotiation stage and determination of the type of contract prevailing for shared fields. Differences in countries' legal bases and domestic laws can create legal hurdles and problems in choosing the right contract model. A part of the negotiations with the host government and IOCs is devoted to cooperation in joint oil fields and sovereignty and international relations; on this account, it is important to be familiar with the domestic laws of the HC. Accordingly, the extent of the contractor's authority in the field is determined. In case of differences in the legal systems and the type and extent of ownership of the oil field, one of the neighboring countries might give the contractor more powers in practice; however, conversely, the contractor would be given fewer powers by the second HC because of the legal system and domestic laws of the HC. This would ultimately result in differences in the contractor's mastery over the contract, the length of the contract period, and the number of profits earned by the contractor. Regarding the importance of this issue, a (JDA) between Thailand and Malaysia (1979-1990), based on which a Joint Development Zone was signed between the two countries in the Thailand Gulf in 1979 based on the Memorandum of Understanding MOU. This agreement MOU has established a powerful Joint Authority with common terms in shares and power for fifty years. This (JDZ) has all the rights and responsibilities for both countries to discover and exploit non-living coastal and underground resources. It was challenging to practice the terms of the MOU agreement to establish a finance oil regime based on (JDZ)-that is why Malaysia acted and managed based on a Production Sharing Contracts PSC, while Thailand used a tax and concession system. Resolving this issue and other problems led to a significant delay in the subsequent agreement on the establishment of the Malaysia-Thailand Joint, which was eventually signed in 1990 (David Ong, 1991). Based on the evaluation of this agreement, it is possible to understand the importance of the legal systems and the contractual regime governing each country, especially the countries that share cross-border natural resources.

5.3.2.1. Iran Laws about Shared Fields

Sharing joint oil resources with partners is not referred to in Iran's laws, and it always emphasizes state ownership of oil and gas and specifies that agreement with partner countries must be in a way that preserves the state ownership of these reserves (Parliament of Iran, 2011). The President's announcement to the Ministry of Petroleum in the Twelfth Government emphasized "the measures necessary to fully exploit all the shared fields" as the Ministry's specialized priorities. Although upstream laws and documents of oil and gas do not explicitly state how to exploit joint fields with partners, the protective exploitation and oil and gas production increase of joint fields have always been emphasized from domestic law's point of view, there are no obstacles to cooperate with neighboring countries to exploit shared resources. Therefore, this approach can be used if Iran's interests cooperate with neighboring countries to exploit the shared fields. In the third paragraph, section T of Art (3) of the Law on Duties and Authorities of the Ministry of Oil was approved in 2012. The legislature has prescribed various types of oil contracts, including partnership contracts (such as participation in production, profit participation, and participation in investment) and different types of SCs as well as any new contracts that might be drafted in the

future, following two conditions of non-transfer of ownership of the reservoirs oil and gas and protective production regulations. Paragraph 19 of Art (52) of the Constitution of the National Iranian Oil Company approved in 2016 also defined investigation, exploration, extraction, and development of the protected exploitation of oil resources and its storage and trading within the framework of the Board of Directors approvals and contracts signed with the Ministry of Oil, as National Iranian Oil responsibilities. Also, an increase in protected oil production capacity proportional to existing reserves and the country's enjoyment of economic, security, and political strength have been emphasized in the general policies of the oil and gas sector (Parliament of Iran, 2006). Furthermore, one of the quantitative goals in the Fifth Five-Year Development Plan was to "increase the amount of oil and gas production from shared resources" with neighboring countries considered in the Sixth Development Plan, and several strategies have been modified (Parliament of Iran, 2017; Parliament of Iran, 2011).

5.3.2.2. Iraq Laws about Shared Fields

According to Art (111) of the Iraq Constitution, ownership of oil and gas resources is considered public property and belongs to all Iraqis in all regions and provinces (Iraqi parliament, 2005; Hosseini, 2014). Paragraph 1 of Art (112) of the Iraq Constitution also states that the federal government, accompanied by the producing provinces and regional governments, jointly manages the oil and gas extracted from oil and gas resources providing that they distribute their income fairly and proportional to the distribution of population throughout the country (Art 112 (1)) (Iraqi Parliament, 2005). Paragraph 2 of the same Art also states that the strategic policies necessary for developing oil and gas wealth are the responsibility of the Iraq federal government in cooperation with the region's governors and provinces producing the oil and gas. These policies should be based on new marketing principles and investment promotion indices to maximize Iraq's national interest (Art 112 (2)) (Iraqi Parliament, 2005). Moreover, in Art (16) of Iraqi business laws called integration, it is stated that:

"The field of exploration which is partially within one contract and partially in another contract should be jointly developed and exploited according to the Integration Contract In case the stakeholders fail to agree on how to integrate, the Federal Government's Oil and Gas Council can decide ..."

6. Investigating the Views of the Exploitation of Cross-Border Shared Natural Resources

There are two dominant theories in the exploitation of shared cross-border oil resources. First, the theory of absolute sovereignty states that the world of the state is not restricted by any of the sources of international law, such as the general or specific treaty or custom. Accordingly, governments can exploit their resources even if some products are extracted from neighboring countries. This view might lead to an international peace violation and environmental damage. The second theory emphasizes the shared exploitation of cross-border resources and that these resources are the shared property of beneficiaries, and their exploitation must necessarily be based on the cooperation of governments. One of the best solutions for cross-border natural resources under the national sovereignty of two or more independent governments is establishing a legal mechanism (single management). In this legal model, after exploring the reservoir in oil and gas resources and delimitation of water resources, the parties emphasize the principle of cross-border natural resource integrated management and determine its technical and legal requirements through an agreement. Accordingly, one or more specialist companies carry out all operations of developing and expanding the cross-border natural resources or the joint oil reservoir. In case the responsibility for development is assigned to several companies from countries owning cross-border natural resources, these companies should develop the reservoirs through a specific process and in close collaboration with each other. In case this task is assigned to one company, that company is required to proceed with the single reservoir development as a representative of the beneficiary countries.

Therefore, choosing the contractors to develop and extract the reservoir depends directly on the political and technical convergence of the countries with their own reservoirs (Weaver, F., & Asmus, 2006). Other solutions are the joint petroleum development agreement, which refers to the agreement between the two countries to develop as well as each country's joint contribution specific area of bed and basement of the continental shelf or an Especial Economic Zone (EEZ) from which both countries enjoy under international law (Smith, 1989). The

following solution is the (JDZ) agreement, which creates a definite, non-discriminatory timeframe for determining the next constraint for the two countries; however, it can be a permanent solution instead of a delimited and determined border. A (JDZ) might be considered part of the boundary solution even where the boundary is specified (Stormont, 1995). Nevertheless, Countries whose borders have been delimited tend to agree to unitization.

Table 1: Comparison of the method of unitization and Joint Development Agreement Common cross-border natural hydrocarbon source (Meybodi, et al., 2019)

Comparison of The Method Of Unitization And Joint Development Agreement Common Cross-Border Natural Hydrocarbon Source			
Joint Development Agreement		Unitization	
Disadvantages and weaknesses	Advantages	Disadvantages and weaknesses	Advantages
The need to consider the claim of ownership/ Sovereignty of the parties to the common region.	The exploitation of oil and gas resources available in the common region that is disputed between two or more countries.	The need to define the border between the two countries.	Avoid spending extra costs to produce from a common field.
The need for a strong political will in the beneficiary countries for joint development.	No need to specify the exact boundaries between countries.	Probability of unequal bargaining power of the parties to determine the share of benefits and costs of the field.	Optimal and efficient oil and gas extraction and prevention of tank damage.
The need for good political relations between the interested countries.	Preservation of the sovereignty of each country over the common area field.	The need for a high-level political agreement between the stakeholders in the common field.	Exchange of information related to the common field between the parties.
The level of need of each beneficiary country for hydrocarbon resources in the disputed field.	Helping reduce or eliminate differences between countries concerning the resources available in the common field.	Changes in reservoir/field conditions during the period of operation about the time of concluding the initial unitization contract and the need to review the contract's provisions after a certain period.	Avoiding competition between the parties in the operation of the common field to gain more benefits.

A unitization method is appropriate and suitable for developing common fields that have delimited specific boundaries, as in the case of Iran and Iraq in this study. However, in the case of developing common fields with neighbors whose borders with countries have not been determined, a joint development strategy can be adopted if agreed upon.

7. Conclusion

The Middle East region is the geopolitical center of hydrocarbons (oil and gas). It is necessary to answer this question which asks what shared responsibility means, countries create a rule or rules for a cross-border shared natural resource or stabilize the life and creation of that resource, whether that resource is in the territorial or non-territorial confines of that country, or that resource attachment to the soil and its territorial boundaries or its critical components have crossed over or originated from that country, that resource is considered as a shared resource and creates a cross-border responsibility for all the countries concerned .The level of responsibility of each country should be assessed on the extent to which each country has access to and impact on the elements, constituent, or

continuative and preserving elements of that source life, and according to the extent of economic potential and the technology of each country. These elements can be considered constant, fluid and variable, permanent or occasional, seasonal, and periodically but repeatable. These resources can be identified underground or above ground, in rivers, seas, oceans, or in the air. According to this theory, related countries with a shared interest in cross-border natural resources must establish a common cross-border regime to manage and control this shared resource. This cross-border shared regime would have a shared commission or a region management committee, with a source of controversy. According to this theory, all governments involved in this issue (Iraq and Iran in the case) are responsible for the consequences of their decisions on the environment, human rights, current, and future generations, indigenous rights, and sustainable development. A region or a shared natural resource with a cross-boundary regime identifies the extent of each country's sovereignty based on the extent to which that resource is within the country's territory or the influence of factors that create and maintain that resource; however, the right to control that source is not left to the individual states and is assigned to the shared regime and the shared cross-border commission. Establishing a shared regime or the shared cross-border commission for natural fluid resources such as oil and gas and the appropriate environmental impacts can also contribute to countries' economic growth with common borders on these resources. This common economic relationship will also lead to positive political development and reduce regional conflicts and challenges. Another positive effect of establishing a joint regime and a joint cross-border commission is that it prevents unhealthy competition for maximum extraction from a common oil reservoir without regard to reservoir protection principles, which will increase the oil field's life. As was found in this study, paying attention to the technical and situational conditions of the reservoir and harvesting techniques in fair and equal use of common fluid resources based on international law documents directly impacts economic, political, and environmental conditions in the use of shared reservoirs. Neighboring countries can be imagined to share each country in a cross-border oil reservoir by examining the technical condition of an oil reservoir and choosing the extraction methods based on the volume and amount of oil in the reservoir. Also, countries can reasonably expect extraction from a common transboundary reservoir based on the data obtained from each reservoir. However, reservoir pressure changes extraction techniques or the amount of investment in a field can directly impact the harvest of each beneficiary country. Countries can contribute to a fairer share of the field's production and help protect the environment and extend the life of the field with (JDA), or unitization methods are chosen in common harvesting fields.

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