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Original Research

Legal Design of Next-Generation Petroleum Contracts: Developing a Smart Contractual Framework for Integrating Sustainable Development, Risk Governance, and Value Creation in Upstream Oil and Gas Agreements

Seyed Nasrollah. Ebrahimi[1], Ashkan. Pirzadeh[2*]

[1] Associate Professor, Department of Oil and Gas Law, Faculty of Law and Politics, University of Tehran, Tehran, Iran
[2] PhD Student, Department of Oil and Gas Law, University of Tehran, Tehran, Iran

*** Corresponding author email address**: ashkan.pirzadeh@ut.ac.ir

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The transformation of the global energy sector has exposed the limitations of traditional upstream oil and gas contracts, which have generally concentrated on investment protection, cost recovery, production allocation, and fiscal benefits. Contemporary petroleum projects operate within a more complex legal and economic environment shaped by climate change, environmental and social obligations, geopolitical instability, technological disruption, market volatility, and growing expectations regarding domestic development. This article develops a legal framework for designing next-generation petroleum contracts capable of integrating sustainable development, risk governance, digital transformation, and multidimensional value creation. Using a descriptive-analytical method and a comparative legal approach, the study examines the evolution of concession agreements, production-sharing agreements, service contracts, hybrid models, and the Iran Petroleum Contract. It argues that future petroleum agreements should be reconceptualized as dynamic systems of contractual governance rather than static instruments for allocating revenues and risks. The proposed framework is structured around several interconnected components, including binding environmental, social, and governance obligations; adaptive mechanisms for addressing changes in law, hardship, force majeure, and economic disequilibrium; enforceable provisions on technology transfer and local content; institutional arrangements for joint risk management and dispute prevention; and digital systems for data governance, compliance monitoring, and contract lifecycle management. The article also evaluates the potential contribution of artificial intelligence, blockchain, and smart-contract mechanisms to transparency, performance verification, and early risk detection, while emphasizing the need for human oversight and legal accountability. The findings indicate that effective next-generation petroleum contracts must balance investor security with the host state's regulatory authority and developmental priorities. For Iran, such an integrated model can strengthen the effectiveness of upstream petroleum agreements by improving investment attractiveness, environmental protection, institutional capacity, technological learning, and long-term national value creation.

Keywords: *Next-Generation Petroleum Contracts; Upstream Oil and Gas Agreements; Sustainable Development; Risk Governance; Smart Contracts; Environmental, Social, and Governance Obligations; Technology Transfer; Local Content; Iran Petroleum Contract*

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1. Introduction

Upstream oil and gas contracts have traditionally performed a relatively defined group of legal and economic functions. They allocate exploration and production rights, determine the distribution of petroleum revenues and project costs, regulate operational authority, establish fiscal and remuneration mechanisms, allocate project risks, and provide procedures for resolving disputes arising from long-term resource-development activities. Classical petroleum-contract scholarship consequently concentrated on the structural differences among concessions, production-sharing agreements, service contracts, and hybrid contractual arrangements, particularly with respect to ownership of petroleum, operational control, investment obligations, cost recovery, production entitlement, taxation, and commercial risk (Gao, 1994). Production-sharing agreements, for example, developed partly in response to the political and sovereignty-related limitations of traditional concessions because they enabled the host state to retain ownership of petroleum resources while allowing the foreign contractor to recover eligible costs and receive an agreed share of production (Bindemann, 1999). Although these models represented important stages in the legal evolution of petroleum contracting, their principal organizing logic remained the allocation of economic rights, production benefits, and extractive risks.

That organizing logic is no longer sufficient for contemporary upstream projects. Modern petroleum developments operate within a regulatory and commercial environment characterized by climate-policy evolution, increasingly stringent environmental standards, community and human-rights scrutiny, geopolitical instability, sanctions exposure, supply-chain disruption, digital dependence, cyber risk, technological obsolescence, commodity-price volatility, and changing expectations concerning corporate responsibility. At the same time, host states increasingly evaluate petroleum investments not only by reference to government take or production volumes, but also according to their contribution to domestic technological capability, employment, industrial development, infrastructure, environmental protection, research capacity, and long-term economic diversification.

The result is a qualitative expansion in the regulatory function of the petroleum contract. Sustainable development is no longer an external policy objective that can be addressed solely through legislation or voluntary corporate programs. Contractual provisions themselves can influence the environmental, social, fiscal, technological, and developmental consequences of an extractive project over several decades. Investment contracts may determine the degree to which a host state can respond to environmental harm, protect local communities, impose new climate-related standards, secure technology transfer, develop domestic suppliers, and modify project requirements as economic and scientific conditions change (Cotula, 2010). Accordingly, the contemporary petroleum contract should be analyzed not merely as an exchange instrument, but as an institutional framework through which long-term public and private interests are coordinated.

This transformation generates a fundamental problem of contractual design. Upstream projects remain capital intensive, technologically complex, geographically immobile, and exposed to geological and political uncertainty. Exploration and development may require substantial sunk investment years before commercial returns become available. Investors therefore continue to require a predictable legal and contractual framework capable of protecting the investment against arbitrary state intervention, discriminatory treatment, opportunistic modification, and measures that destroy the economic basis of the agreed project. International energy-investment law has accordingly placed substantial emphasis on stability, legal security, and the protection of legitimate investment expectations (Cameron, 2021).

Stability, however, cannot rationally be equated with legal immutability. Petroleum projects may remain operational for several decades, during which environmental science, climate obligations, safety standards, fiscal conditions, technologies, and social expectations may change substantially. A contractual mechanism that financially penalizes every subsequent regulatory development may constrain the host state's ability to discharge legitimate public functions. Conversely, unrestricted regulatory discretion may expose the investor to unpredictable costs or to regulatory measures functioning as indirect methods of contractual revision. The more precise legal-design question is therefore how the agreement can distinguish among ordinary regulatory evolution, non-discriminatory public-interest measures, project-specific regulatory interventions, discriminatory or arbitrary state action, and measures that fundamentally alter the economic assumptions on which the investment was made.

The environmental dimension of this problem is particularly significant because upstream petroleum operations can affect land, groundwater and surface water, biodiversity, air quality, ecosystem services, community health, and greenhouse-gas emissions. The interaction between foreign-investment protection and environmental regulation has repeatedly generated legal tension where subsequently adopted environmental measures increase costs, restrict operations, or require additional mitigation (Viñuales, 2012). A legally sophisticated petroleum agreement should therefore protect the investor against arbitrary or discriminatory interference while expressly preserving the host state's authority to adopt proportionate, non-discriminatory, and scientifically justified environmental and public-health rules.

Environmental provisions must also move beyond generic obligations to comply with applicable law. The contract should define, where appropriate, environmental baselines, environmental and social impact assessment procedures, methane and flaring controls, waste-management obligations, water-use standards, biodiversity safeguards, monitoring methodologies, incident-reporting requirements, remediation duties, decommissioning obligations, and financial-security mechanisms. Iranian and comparative analyses of petroleum-company obligations demonstrate the increasing importance of translating environmental responsibility into defined monitoring, prevention, remediation, and liability mechanisms within the contractual instrument itself (Shahbazi, 2022).

The social dimension of upstream development presents a corresponding legal-design challenge. Petroleum projects may generate employment, infrastructure, procurement opportunities, and public revenue while simultaneously producing displacement, environmental disruption, pressure on local services, occupational risks, and unequal distributions of costs and benefits. Contemporary standards of responsible business conduct increasingly require enterprises to identify, prevent, mitigate, monitor, and account for adverse impacts connected with their operations and business relationships (Oecd, 2023). These expectations can be translated into contractual duties relating to stakeholder engagement, human-rights due diligence, community health and safety, grievance procedures, labor protection, supply-chain oversight, and transparent community-development programs.

Technology transfer and local content constitute additional dimensions of petroleum-sector value creation. Host states frequently seek to use foreign petroleum investment to increase domestic technological capability, strengthen national oil companies, develop specialized human capital, support domestic engineering and service firms, and reduce long-term dependence on foreign expertise. Effective contractual design requires specification of the relevant technological fields, intended beneficiaries, learning mechanisms, measurable capability outcomes, reporting duties, and verification processes. Iranian scholarship concerning foreign-investment contracts emphasizes that technology-transfer duties must be legally structured rather than left to general expressions of cooperation (Ahmadi, 2019). Local-content obligations require comparable precision. Their developmental effectiveness depends on whether they create sustainable domestic capabilities rather than merely increasing temporary participation in procurement and employment (Yazdani, 2021).

The widening spectrum of uncertainty also requires movement from static risk allocation toward dynamic risk governance. Traditional petroleum agreements allocate identifiable risks such as exploration failure, cost overruns, production shortfalls, taxation changes, expropriation, and force majeure. Contemporary projects are additionally exposed to climate regulation, carbon pricing, sanctions, cyberattacks, technological obsolescence, supply-chain interruption, pandemics, extreme weather events, geopolitical confrontation, and shifts in global energy demand. Contractual risk governance therefore requires ex ante procedures for identifying, assessing, allocating, monitoring, mitigating, and responding to uncertainty. The normative principle governing allocation should remain functional: responsibility should ordinarily be placed on the party with the superior capacity to control, prevent, insure, mitigate, or absorb the relevant risk (Rahimi, 2020).

Digital transformation adds a further dimension. Petroleum projects generate substantial quantities of geological, engineering, production, financial, procurement, environmental, and logistical data. Artificial intelligence may assist with anomaly detection, production forecasting, predictive maintenance, cost analysis, compliance monitoring, and dispute prevention. Blockchain-based systems may strengthen the traceability of selected records, while smart-contract functions may automate objectively verifiable processes such as milestone notifications, payment calculations, or reporting triggers. The concept of a smart petroleum contract should not, however, be confused with replacement of the legally binding agreement by executable code. Smart contracts remain subject to questions concerning interpretation, mistake, authority, modification, jurisdiction, remedies, and the relationship between coded execution and legally expressed intention (Werbach & Cornell, 2017). Digital systems should therefore support rather than displace legal judgment and institutional accountability.

The Iranian petroleum sector provides a particularly significant setting for this analysis. Iran possesses substantial hydrocarbon resources and has repeatedly sought contractual forms capable of combining foreign capital and technology with public ownership, national sovereignty, domestic control, and constitutional restrictions concerning natural resources. The Iran Petroleum Contract (IPC) represented an attempt to address some weaknesses of earlier arrangements by extending contractual cooperation, linking remuneration more closely to field characteristics and production performance, and strengthening continuity between development and production (Hosseini, 2019). Nevertheless, sanctions, international financing restrictions, regulatory risk, institutional fragmentation, and domestic legal requirements continue to affect foreign participation and project implementation (Mousavi, 2020).

Accordingly, the objective of this article is to develop a legal model for next-generation upstream petroleum contracts based on five interconnected elements: sustainable-development obligations, dynamic risk governance, multidimensional value creation, institutionalized lifecycle management, and digitally supported monitoring and implementation. The central thesis is that the petroleum contract should be reconceptualized as a dynamic governance system rather than a static exchange instrument. Methodologically, the study adopts a descriptive-analytical and comparative legal approach integrating petroleum-contract theory, general contract law, international investment law, environmental regulation, sustainable-development scholarship, responsible-business standards, and emerging literature on digital contracting. The proposed framework is designed to remain adaptable across petroleum regimes while being particularly relevant to the continuing development of Iranian upstream contractual arrangements.

2. The Evolution of Petroleum Contracts and the Rise of Contractual Governance

2.1. From Classical Concessions to Hybrid Petroleum Contracting

The historical evolution of international petroleum contracts reflects changing relationships among resource sovereignty, foreign capital, technological dependence, operational authority, and state participation. Early concession agreements frequently granted foreign enterprises extensive territorial and operational rights for long periods in return for royalties, taxes, or fixed payments. These arrangements were closely associated with the limited technical and financial capacity of many resource-producing states during the formative period of the petroleum industry.

The asymmetrical allocation of rights under classical concessions contributed to renegotiation, nationalization, and the emergence of alternative contractual forms. The evolution of petroleum contracting may therefore be understood as a continuing attempt to reconcile the host state's permanent sovereignty over natural resources with the investor's need for secure access, operational predictability, and commercially viable returns (Gao, 1994). The decline of classical concessions did not eliminate foreign participation; it transformed the legal structure through which foreign capital and expertise were employed.

Production-sharing agreements became one of the most influential alternatives. Under a conventional production-sharing structure, the host state retains ownership of petroleum resources, while the contractor finances exploration and development and assumes substantial geological and commercial risk. If commercial production is achieved, the contractor ordinarily recovers eligible costs from an agreed portion of production and receives a share of profit petroleum. The effectiveness of this model depends heavily on the legal definition of recoverable costs, cost-recovery ceilings, ring-fencing, production measurement, profit-sharing formulas, taxation, auditing rights, and cost-disallowance procedures (Bindemann, 1999). Poor design may encourage inefficient expenditure or delay host-state revenue, whereas excessively restrictive fiscal provisions may weaken incentives for investment, technological improvement, or enhanced recovery.

Service contracts modify the ownership-remuneration relationship further. The contractor ordinarily performs exploration, development, or production functions in return for a fee without acquiring title to petroleum. This form may be especially compatible with jurisdictions that restrict foreign proprietary interests in natural resources. Nevertheless, a rigid service fee may inadequately reflect geological complexity, capital exposure, reservoir performance, or operational risk. Performance-based remuneration can improve incentive alignment, but it also reduces the practical distinction between service contracts and other risk-sharing arrangements.

The contemporary trend is therefore toward functional hybridization. Petroleum agreements increasingly combine elements of service contracting, state participation, performance remuneration, risk sharing, and long-term operational cooperation. Their legal quality should consequently be assessed by examining how they allocate ownership, capital exposure, decision-making power, remuneration, regulatory risk, performance incentives, and developmental obligations rather than by relying exclusively on formal contract labels.

Iranian petroleum contracting illustrates this broader evolution. Earlier buyback arrangements allowed foreign contractors to finance and implement development projects while receiving repayment and remuneration after completion. However, relatively short contractual periods and restricted contractor involvement during production weakened incentives for long-term reservoir optimization and continuing technological engagement. The IPC sought to address some of these deficiencies through longer contractual periods, closer continuity between development and production, and remuneration linked more directly to field conditions and production performance (Hosseini, 2019).

The IPC consequently reflects recognition that sophisticated petroleum developments require sustained technical cooperation throughout exploration, appraisal, development, production, reservoir management, and enhanced-recovery stages. Nevertheless, contractual architecture alone cannot neutralize external constraints. Sanctions, financing restrictions, constitutional requirements, foreign-investment regulations, institutional competence, and political-risk perceptions continue to influence the effectiveness of petroleum agreements in Iran (Mousavi, 2020).

2.2. Petroleum Contracts as Relational Governance Instruments

The evolution of petroleum contracting demonstrates that an upstream agreement cannot adequately be conceptualized as a one-time exchange between a resource owner and an investor. It establishes a long-term institutional relationship among actors whose interests overlap but are not identical. The investor seeks an acceptable risk-adjusted return, legal protection, operational efficiency, financing security, and protection from arbitrary intervention. The host state seeks revenue, resource conservation, domestic development, environmental protection, technological upgrading, employment, and political legitimacy. National oil companies, regulators, lenders, insurers, subcontractors, local communities, and public agencies introduce additional interests and constraints.

Investment contracts consequently have a public-governance effect because they determine how economic benefits, environmental responsibilities, information rights, development obligations, and regulatory risks are distributed over time (Cotula, 2010). The petroleum agreement therefore functions not merely as a commercial instrument but as a form of institutional and economic governance.

Contractual governance can be defined as the organization of continuing cooperation through substantive obligations, decision-making procedures, monitoring mechanisms, information systems, review processes, adaptation rules, and dispute-prevention institutions. This conception is particularly appropriate for petroleum projects because complete contingent contracting is impossible. At the time of signature, the parties cannot identify and price every future geological, technological, environmental, regulatory, fiscal, social, or political contingency.

A governance-oriented petroleum contract must therefore regulate processes as well as outcomes. It should establish annual work programs, budget procedures, management committees, technical committees, reporting systems, audit rights, environmental-management plans, procurement controls, risk registers, data-sharing mechanisms, and escalation procedures. These mechanisms are not secondary administrative details; they structure how the contractual relationship operates throughout the project lifecycle.

General contract law remains central to this governance model. Binding force, legal certainty, good faith, lawful purpose, capacity, causation, responsibility for breach, and remedies constitute the doctrinal basis of enforceability. Iranian contract-law scholarship emphasizes that contractual obligations derive legal force from recognized agreement subject to mandatory law and public-order restrictions (Katouzian, 2004). The law of obligations also distinguishes the creation of contractual duties from questions concerning non-performance, impossibility, delay, and the consequences of altered circumstances (Safaei, 2013).

This doctrinal foundation is especially important for sustainability and developmental obligations. A provision requiring a contractor merely to "support sustainable development" or "promote technology transfer" is difficult to administer unless it specifies the required conduct, applicable standard, performance period, documentary evidence, verification method, exceptions, and consequences of non-performance. Next-generation contractual drafting must therefore convert policy objectives into legally measurable obligations.

Contractual freedom nevertheless remains subject to statutory, constitutional, regulatory, and public-order limitations. Civil-law doctrine recognizes that private intention cannot override mandatory law and that contractual validity and enforcement remain conditioned by the applicable legal system (Emami, 2010). This principle is especially significant in petroleum contracting because natural resources, environmental protection, taxation, national security, public health, and intergenerational resource management are matters of substantial public interest.

The host state should therefore not be presumed to have surrendered all future regulatory authority through the petroleum contract. At the same time, regulatory powers should not be exercised opportunistically to circumvent specific contractual commitments. The legal-design objective is to distinguish the state's sovereign regulatory functions from its contractual obligations and to provide structured procedures when the exercise of one materially affects the other.

2.3. Stability, Adaptability, and the New Concept of Contractual Equilibrium

Traditional stabilization clauses were designed to protect investors against adverse legislative or regulatory change. Their principal forms included freezing provisions and economic-equilibrium mechanisms. These clauses addressed a genuine structural concern because petroleum investment involves substantial sunk capital that cannot easily be relocated once committed. Investors may therefore become vulnerable to opportunistic changes in the legal or fiscal framework after investment has occurred. Stability continues to be an important concern within energy investment law (Cameron, 2021).

However, broad stabilization provisions may interfere with legitimate regulation in fields such as environmental protection, labor, taxation, safety, public health, and climate policy. Next-generation stabilization should therefore operate selectively rather than absolutely. A balanced clause can distinguish between general and project-specific measures, establish a materiality threshold, impose mitigation duties, exclude defined categories of non-discriminatory public-interest regulation from automatic compensation, and prioritize consultation and contractual adjustment over monetary compensation.

A sophisticated economic-equilibrium mechanism might require an affected investor to establish a qualifying legal change, direct causation, a net material adverse economic effect above an agreed threshold, and reasonable mitigation. If those conditions are satisfied, the parties may first consider adjustments to remuneration, cost-recovery treatment, investment schedules, production obligations, or other economic terms. Monetary compensation would become a secondary rather than automatic remedy.

The rise of sustainable development also changes the meaning of contractual equilibrium. A purely financial analysis asks whether a subsequent event changes the investor's projected economic position. A governance-oriented analysis recognizes that project viability also depends on environmental legitimacy, community acceptance, regulatory compliance, technological adaptability, and institutional cooperation. Sustainable development in investment law requires economic, environmental, and social considerations to be integrated rather than treated as mutually exclusive concerns (Cordonier Segger & Gehring, 2011).

A project that remains profitable while generating severe environmental degradation, repeated social conflict, or persistent regulatory non-compliance cannot reasonably be regarded as stable in a meaningful long-term sense. Regulatory intervention, reputational damage, community opposition, and political pressure may eventually undermine the investment itself. Contractual equilibrium should therefore be understood as the continuing viability of the broader project relationship.

Responsible-business standards reinforce this governance-oriented interpretation. International standards increasingly expect multinational enterprises to conduct risk-based due diligence, disclose material impacts, engage affected stakeholders, and address adverse consequences associated with their operations and supply chains (Oecd, 2023). Petroleum agreements can incorporate such expectations through specifically defined contractual processes while controlling how evolving external standards affect existing obligations.

The transition toward next-generation petroleum contracting consequently involves more than adding several modern clauses to a conventional petroleum agreement. It entails a movement from transactional allocation toward lifecycle contractual governance in which commercial rights, public obligations, adaptation mechanisms, information systems, institutional decision-making, and continuing performance review operate within an integrated legal structure.

3. Sustainable Development, Risk Governance, and Value Creation in Next-Generation Petroleum Contracts

3.1. Contractualizing Environmental and Social Sustainability

The first substantive pillar of a next-generation petroleum contract is the conversion of sustainable-development objectives into enforceable project obligations. Sustainable development should not be confined to preambles or broadly formulated cooperation clauses. It should influence project objectives, investment decisions, operational standards, annual work programs, environmental management, monitoring, remuneration, risk allocation, and remedies. Petroleum development generates multiple categories of value and externality. Potential benefits include fiscal revenue, employment, infrastructure, technological capacity, domestic procurement, and foreign exchange. Potential adverse effects include greenhouse-gas emissions, water consumption, ecosystem damage, pollution, community disruption, health effects, and future abandonment liabilities. Investment-contract scholarship demonstrates that contractual design can materially influence how these benefits and burdens are distributed (Cotula, 2010). Sustainable legal design therefore requires material externalities to be incorporated into project governance rather than treated exclusively as costs borne by the public.

Environmental obligations should operate through a hierarchy of standards. The first level is compliance with mandatory domestic law. The second consists of project-specific contractual standards supplementing domestic legislation where additional technical precision is required. The third includes approved environmental-management plans, monitoring protocols, and performance indicators.

The contractor should ordinarily be required to establish environmental baseline data, undertake environmental and social impact assessment before major development decisions, maintain environmental-management systems, monitor relevant emissions and ecological indicators, report material incidents within specified periods, and prepare remediation and decommissioning plans. Environmental expenditures should be incorporated into annual work programs and budgets so that compliance becomes part of project planning.

Iranian and international analyses support the use of contractual mechanisms to define prevention, monitoring, remediation, and liability duties of petroleum companies (Shahbazi, 2022).

Climate-related obligations require additional specificity. Contemporary agreements may need to address methane emissions, routine and emergency flaring, energy efficiency, carbon intensity, and future carbon-pricing requirements. The operator may be required to establish a verified greenhouse-gas inventory, use agreed measurement methodologies, disclose methane and flaring data, and prepare emissions-reduction plans. Where quantitative targets are included, the contract should identify the baseline, calculation methodology, verification process, review interval, and circumstances permitting adjustment.

This structure is particularly important because environmental and climate regulation may interact with investment protection. New standards can increase operating costs or alter production plans (Viñuales, 2012). Instead of treating every environmental requirement as a compensable legal change, the contract should require examination of its generality, legitimacy, non-discriminatory character, materiality, and economic effect.

Environmental enforcement should also be graduated. Minor non-compliance may trigger corrective-action notices and enhanced monitoring. Material violations may result in remediation plans, cost consequences, or financial penalties. Serious violations involving substantial environmental harm may justify suspension of affected operations, increased financial security, or replacement of responsible subcontractors. Repeated or intentional non-compliance may constitute material breach. Such differentiation strengthens proportionality and reduces incentives to conceal minor problems.

The social dimension of sustainability likewise requires continuing contractual governance rather than one-time assessment. Contemporary responsible-business standards emphasize ongoing risk-based due diligence (Oecd, 2023). Contractors should therefore identify affected communities, evaluate material project-related risks, conduct consultation before significant operational decisions, record mitigation commitments, and periodically examine their effectiveness.

A project grievance mechanism should specify the channels through which concerns may be submitted, acknowledgment periods, investigation procedures, response deadlines, escalation mechanisms, confidentiality safeguards, and reporting requirements. Social provisions may additionally address community health and safety, labor conditions, cultural heritage, land access, and resettlement where relevant.

Community-development obligations should be designed to prevent arbitrary spending, patronage, duplication of public functions, and unsustainable local projects. Rather than imposing an open-ended duty to fund community initiatives, the agreement should establish a transparent development plan linked to project impacts and verified needs. A contractual framework may specify annual funding, stakeholder participation, project-selection criteria, procurement rules, maintenance obligations, reporting, and independent audit. The purpose is to secure traceable benefits for project-affected populations without converting the contractor into a parallel public administration.

3.2. Technology Transfer, Local Content, and Multidimensional Value Creation

The developmental function of next-generation petroleum contracts should extend beyond revenue distribution. Technology transfer and local content can transform petroleum investment into a mechanism for long-term national capability development when they are expressed through measurable contractual obligations.

Technology-transfer provisions should be organized around capability acquisition rather than equipment importation. Depending on project characteristics, relevant areas may include reservoir modeling, seismic interpretation, enhanced recovery, drilling engineering, digital-field management, environmental monitoring, emissions management, asset integrity, safety systems, and decommissioning. Iranian scholarship emphasizes that transfer obligations must be legally structured rather than left to the contractor's general discretion (Ahmadi, 2019).

The contractor's technology-transfer plan should therefore identify target competencies, intended institutional recipients, training hours, mentoring arrangements, access to technical documentation, software or licensing requirements, secondment opportunities, knowledge-sharing programs, and milestones for increasing domestic responsibility. Performance should be evaluated through evidence that national personnel and institutions have acquired the ability to perform defined technical functions rather than merely by the amount spent on training.

Intellectual-property and confidentiality provisions must be aligned with these objectives. The contractor should retain legitimate proprietary rights while the host state and designated national entities receive the licenses and operational access necessary to use technology transferred for agreed project purposes. Confidentiality clauses should not be drafted so broadly that they prevent public institutions from using technical information legitimately obtained through contractual transfer obligations.

Local-content provisions pursue a related but broader objective. They seek to increase domestic participation in employment, procurement, engineering, manufacturing, research, professional services, and supply chains. However, rigid numerical quotas can increase costs or encourage nominal compliance where domestic capacity is insufficient. Effective local-content regimes should therefore combine measurable targets with supplier development, professional certification, technical assistance, financing support, workforce training, and transparent procurement.

The developmental value of local content depends on whether the contract creates lasting domestic capabilities rather than temporary participation (Yazdani, 2021). A phased structure is therefore preferable. Targets may increase over time as training and supplier-development programs strengthen national capacity. Contractors should submit periodic local-content plans, document performance, explain deviations, and propose corrective measures.

The regime should also contain compliance flexibility and anti-avoidance safeguards. Exceptions may be permitted where suitable domestic goods, services, or personnel are genuinely unavailable at required technical standards, but such exceptions should be based on documented market testing. Conversely, the agreement should prevent nominal compliance through shell entities or intermediaries that add little domestic value. Definitions of local supplier, national personnel, and local value added should therefore be precise.

Technology transfer and local content form part of a broader concept of multidimensional value creation. Traditional petroleum agreements often evaluate project success through production, government take, cost recovery, and investor return. These indicators remain essential, but they do not capture the complete developmental contribution of an upstream project.

Economic value includes fiscal revenue, domestic procurement, employment, infrastructure, and industrial linkages. Technological value includes specialized expertise, research capability, digital systems, and domestic operational competence. Social value includes community benefits, workforce development, health and safety, and equitable participation. Environmental value includes emissions reduction, efficient resource use, remediation, and ecosystem restoration. Institutional value includes regulatory expertise, contract-management capacity, public-sector data systems, and improved auditing capability.

Governance-oriented approaches to Iranian petroleum contracting support using the agreement as a mechanism for coordinating investor participation with broader economic and public-interest objectives (Rezaei, 2022). These categories of value can be operationalized through a contractual performance scorecard containing measurable and auditable indicators.

Indicators may include production efficiency, recovery improvement, cost control, occupational safety, methane intensity, flaring, environmental incidents, local procurement, technical training, supplier upgrading, technology transfer, grievance resolution, remediation, and decommissioning preparedness. Performance indicators should be technically credible, independently verifiable, and resistant to manipulation.

A distinction should nevertheless be maintained between mandatory obligations and incentive-based performance. Environmental, safety, anti-corruption, and other minimum legal requirements should remain independently enforceable. Incentive mechanisms should reward performance exceeding minimum requirements rather than allowing mandatory compliance to be traded against remuneration.

3.3. Risk Governance, Adaptation, and Contractual Resilience

Risk governance constitutes the third substantive pillar of the proposed framework. Conventional risk allocation determines which party bears the consequences of identifiable events. Next-generation risk governance additionally establishes procedures for identifying emerging risks, sharing information, implementing mitigation, reassessing assumptions, and adapting contractual obligations over time.

The process should begin with a project-specific risk taxonomy covering geological, reservoir, technical, operational, environmental, health and safety, financial, market, fiscal, regulatory, political, sanctions, supply-chain, cybersecurity, force-majeure, and decommissioning risks. For each major risk, the contract should examine which party can influence probability, which party can mitigate consequences, whether insurance or hedging is available, and which party can most efficiently absorb residual loss. Petroleum-contract scholarship supports allocation according to capacity to prevent, control, insure, or absorb the relevant risk (Rahimi, 2020).

The result should be recorded in a contractual risk matrix rather than remaining dispersed across individual clauses. A joint risk register may identify risk owners, mitigation measures, monitoring indicators, reporting frequency, and escalation thresholds. An early-warning provision should require a party becoming aware of circumstances reasonably likely to cause material delay, cost increase, production loss, environmental harm, or regulatory non-compliance to provide prompt notice. A failure to give timely notice may affect entitlement to relief where that failure materially increased the resulting loss.

Change-in-law provisions should be incorporated into this risk-governance framework. A qualifying legal change should be defined by reference to enactment, amendment, repeal, authoritative interpretation, or binding administrative action occurring after an agreed baseline date. The clause should identify which categories of legal change are covered and whether environmental, tax, labor, safety, sanctions, or climate measures receive differentiated treatment.

Not every regulatory change should produce compensation. A materiality threshold should apply, and the affected party should demonstrate causation and reasonable mitigation. Energy investment law recognizes the significance of legitimate investor expectations (Cameron, 2021), but such expectations must be assessed in light of the long duration of petroleum projects and the foreseeable evolution of environmental, safety, technological, and social regulation.

The economic-equilibrium mechanism should therefore be calibrated rather than automatic. Where a qualifying change produces a material economic effect, the parties may first examine adjustments to remuneration, project schedules, cost-recovery treatment, or other terms capable of restoring reasonable balance. Compensation should ordinarily become available only when contractual adjustment cannot adequately address the effect.

Hardship should be distinguished from force majeure. Hardship concerns circumstances in which performance remains legally and physically possible but has become fundamentally more onerous because an unforeseen event materially alters the contractual equilibrium. The clause should define the threshold, require timely notice and supporting evidence, impose a mitigation obligation, and establish structured renegotiation. General principles concerning performance, impossibility, and contractual responsibility provide the doctrinal foundation for such mechanisms (Safaei, 2013).

Force majeure, by contrast, should concern circumstances beyond reasonable control that materially prevent or obstruct performance. Economic difficulty alone should not ordinarily qualify. The clause should address causation, foreseeability, mitigation, suspension, cost allocation, and the consequences of prolonged interruption.

Sanctions deserve particular treatment in Iranian upstream agreements because they may affect financing, banking, equipment procurement, technology licensing, insurance, shipping, payments, and contractor participation. The contract should require examination of lawful alternative performance, substitute suppliers, permissible payment mechanisms, revised schedules, or other mitigation measures before termination rights arise.

Together, the risk matrix, joint risk register, early-warning system, change-in-law clause, hardship provision, force-majeure regime, sanctions mechanism, and economic-equilibrium process create a coherent architecture of contractual resilience. Their function is not to guarantee either party against every adverse development but to maintain project viability through structured adaptation.

4. Digital Transformation and the Smart Contractual Framework

4.1. Data Governance, Artificial Intelligence, and Digital Contract Management

Digital transformation provides the operational infrastructure through which sustainable, adaptive, and value-oriented obligations can be administered. Upstream projects already depend extensively on digital systems for geological interpretation, reservoir simulation, drilling, production monitoring, accounting, procurement, logistics, environmental measurement, and asset management. The legal significance of digitalization arises when data generated by these systems determine contractual rights or obligations, including production entitlements, cost recovery, remuneration, environmental compliance, milestone completion, and local-content performance.

A next-generation petroleum agreement should therefore establish an integrated digital contract-management architecture. Approved work programs, budgets, expenditures, production records, environmental indicators, procurement data, notices, approvals, and contractual deadlines can be linked through a controlled digital platform. Such systems may reduce information asymmetry and facilitate more continuous contract administration (Jalili, 2023).

A data-governance schedule should classify petroleum-project information according to its legal and operational characteristics. Categories may include raw geological data, interpreted geological information, reservoir models, production data, environmental measurements, financial records, procurement information, personal information, cybersecurity data, commercially confidential information, and intellectual property.

For each category, the agreement should define ownership or control, access rights, disclosure restrictions, permitted uses, retention periods, interoperability standards, transfer obligations, and post-termination availability. Geological and reservoir information is particularly important because it may constitute a strategic national resource while simultaneously incorporating contractor-developed proprietary tools and models.

Data quality should also be contractually regulated. Metering systems, environmental sensors, cost databases, and digital approval platforms should be subject to calibration, authentication, audit trails, access controls, and integrity testing. Where information is corrected, the system should preserve the original record, the amendment, the identity of the authorized person, and the reason for the change. Digital records may be recognized as contractual evidence, but their evidentiary status should depend on compliance with agreed verification protocols.

Artificial intelligence may further support predictive contract management. Relevant applications include detection of abnormal cost escalation, production deviations, equipment-failure risks, environmental anomalies, schedule slippage, procurement irregularities, or recurring sources of contractual disagreement. AI may also assist in analyzing notices, deadlines, historical variations, and patterns in project data.

However, AI output should not itself constitute a legally binding determination of breach, non-recoverable cost, or liability. An automated indication of abnormal expenditure should trigger human audit. An environmental-risk prediction should initiate technical assessment rather than establish liability automatically. Digitalization should therefore enhance decision-making without displacing legal judgment.

Human oversight is particularly important where automated processes affect substantive contractual rights. The agreement should provide a right to challenge inaccurate data, require authorized personnel to confirm significant legal or economic decisions, and allocate responsibility for defective models, inadequate validation, unauthorized modification, or negligent reliance. Systems used for legally significant decisions should be documented, periodically tested, and, where appropriate, independently reviewed.

Cybersecurity forms part of the same data-governance architecture. Digitally integrated petroleum infrastructure may be exposed to ransomware, hacking, data manipulation, industrial espionage, or disruption of operational control systems. The agreement should specify access-management requirements, authentication, vulnerability testing, incident-reporting deadlines, business-continuity planning, backup systems, recovery procedures, and cooperation with competent public authorities.

4.2. Blockchain, Smart-Contract Automation, and the Legal Control of Code

Blockchain and distributed-ledger systems may support selected petroleum-record functions where several authorized actors require a shared and tamper-evident history. Potential uses include recording approved expenditures, shipment data, production measurements, procurement milestones, compliance certificates, and approval timestamps.

The legal value of distributed-ledger technology lies primarily in traceability and resistance to unauthorized alteration. It does not guarantee the substantive accuracy of the original information. If an incorrect production measurement is entered into an immutable ledger, the technological system preserves the error rather than correcting it. The contract must therefore regulate the entire evidentiary chain from physical event and measurement to verification, authorization, digital entry, and subsequent audit.

Smart-contract mechanisms can be used more directly to automate defined contractual processes. Appropriate functions may include automatic reminders before deadlines, calculation of undisputed production-based remuneration, release of payments following verified milestone certification, generation of reporting alerts, and computation of agreed percentages or financial adjustments.

The legal limits of automation are important. Petroleum contracts routinely use standards such as materiality, reasonableness, best industry practice, good faith, due diligence, and force majeure. These concepts require contextual judgment and cannot always be reduced to binary coded conditions. Scholarship on smart contracts emphasizes that computational execution cannot reproduce all the interpretive and remedial functions of contract law (Werbach & Cornell, 2017).

Accordingly, automation should be concentrated on objective, repetitive, and verifiable processes rather than disputed or evaluative decisions. A smart petroleum agreement should also expressly determine the hierarchy between the legally executed text and implementing code. Ordinarily, the legal text should prevail in cases of inconsistency unless the parties expressly designate a narrowly defined automated process as determinative.

The agreement should specify procedures for code development, testing, authorization, deployment, amendment, suspension, and emergency intervention. No single party should normally possess unilateral authority to alter code affecting payment, cost recovery, production allocation, or compliance status.

A manual override or emergency suspension mechanism should be available where continued automated execution would produce an unlawful, unsafe, or manifestly erroneous result. This safeguard does not contradict smart contracting. Rather, it recognizes that digital automation must remain embedded within legally accountable governance.

4.3. The Integrated Five-Layer Smart Contractual Architecture

The proposed smart petroleum contract can be organized as a five-layer legal architecture.

The first layer is the **core commercial architecture**. It regulates project scope, duration, investment obligations, annual work programs, development plans, production, cost recovery or remuneration, taxation, operational authority, ownership, termination, and core remedies. This layer preserves the traditional commercial functions of upstream petroleum contracting.

The second layer is **sustainability and value creation**. It establishes environmental, climate, social, technology-transfer, local-content, workforce-development, community, and institutional-capacity obligations. It connects petroleum extraction to measurable developmental outcomes rather than treating them as incidental benefits.

The third layer is **risk governance and contractual adaptation**. It contains the risk matrix, risk register, early-warning procedures, change-in-law mechanism, hardship, force majeure, sanctions provisions, economic-equilibrium process, insurance obligations, and structured renegotiation. This layer enables the agreement to respond to material change without abandoning contractual predictability.

The fourth layer is **institutional governance and dispute prevention**. It establishes joint management structures, technical and specialized committees, approval mechanisms, audit procedures, escalation processes, expert determination, mediation, and arbitration. A joint management committee may oversee annual work programs and major operational decisions, while specialized bodies may address environmental performance, local content, technology transfer, or digital governance.

The authority of these bodies should be defined with precision. Membership, quorum, voting requirements, reserved matters, decision periods, escalation, conflicts of interest, and the legal effect of committee decisions should be specified. The host state's sovereign regulatory authority must remain distinct from its contractual decision-making role. Participation by a public entity in a contractual committee should not prevent competent regulators from enforcing generally applicable law.

The fifth layer is **digital contract infrastructure**. It governs data ownership, digital reporting, cybersecurity, AI-supported monitoring, smart-contract functionality, access rights, audit trails, interoperability, and the evidentiary status of digital records.

These five layers should be integrated rather than drafted independently. Environmental targets require reliable monitoring systems. Technology-transfer obligations require data-access and intellectual-property provisions. Performance-based remuneration requires verifiable indicators. Change-in-law clauses require reliable economic-impact information. Smart-contract automation requires legal hierarchy and human override. Dispute-prevention mechanisms require accurate records and clear escalation procedures.

Dispute prevention should therefore operate as a primary governance function within this architecture. Many petroleum disputes develop incrementally through disputed cost classifications, inconsistent technical interpretations, delayed approvals, schedule changes, or disagreement over project data. The contract should require early notice and staged escalation through operational consultation, committee review, senior-management negotiation, expert determination or mediation, and only subsequently arbitration or litigation.

Technical disputes involving metering, reserve calculation, accounting classification, engineering standards, or environmental measurements may be particularly suitable for independent expert determination. The agreement should specify whether the expert's decision is binding, provisionally binding, or subject to review for narrowly defined errors.

Where arbitration remains necessary, the contract should identify applicable law, seat, procedural rules or institution, language, appointment process, interim relief, confidentiality, and enforcement. It should also distinguish disputes arising from contractual conduct from challenges to sovereign regulatory measures. This distinction can reduce uncertainty concerning the relationship between contractual arbitration and any additional protection available under investment law.

For Iran, effective implementation requires institutional reform alongside contractual innovation. A sophisticated agreement cannot function effectively if public agencies lack technical expertise, reliable data, digital infrastructure, inter-agency coordination, or monitoring capacity. Governance-oriented Iranian petroleum scholarship supports closer integration between contractual design, institutional competence, and public-interest objectives (Rezaei, 2022).

Contract negotiation and administration should therefore involve multidisciplinary expertise in petroleum engineering, reservoir management, economics, finance, environmental science, law, sanctions compliance, cybersecurity, procurement, and project management. Model provisions can increase consistency and reduce negotiation costs, but field-specific geological, economic, environmental, and commercial conditions must continue to shape individual agreements.

The IPC provides a foundation for further development because it recognizes longer-duration cooperation and performance-related participation (Hosseini, 2019). Future development should strengthen sustainability standards, adaptive risk governance, technology-transfer metrics, local-content capability requirements, data governance, digital monitoring, and dispute prevention. Iranian contract-law principles concerning binding obligations, lawful contractual purpose, and responsibility for breach can support these innovations (Katouzian, 2004). The decisive requirement is that modern policy objectives be translated into legally intelligible obligations compatible with mandatory domestic law and the constitutional framework governing petroleum resources.

The principal characteristic of the proposed model is therefore integration. A technologically advanced agreement without substantive sustainability standards would merely automate conventional petroleum administration. A sustainability-oriented agreement without monitoring and remedies would remain largely aspirational. A contract containing broad adaptation rights without thresholds and procedural safeguards would undermine predictability. Smart legal design requires the five layers to operate as a coherent contractual system.

5. Conclusion

The transformation of the global energy, regulatory, technological, and investment environment requires a corresponding transformation in the legal architecture of upstream oil and gas agreements. Traditional petroleum contracts were principally organized around access to reserves, investment obligations, operational authority, production allocation, cost recovery, fiscal distribution, and protection against political or regulatory interference. These functions remain indispensable, but they no longer provide a sufficient contractual architecture for projects characterized by long duration, environmental externalities, technological complexity, regulatory evolution, sanctions exposure, social sensitivity, and substantial public-development expectations.

The principal argument of this article is that next-generation petroleum agreements should be understood as governance-oriented contracts rather than static exchange instruments. Their function is not merely to preserve a fixed commercial bargain throughout the life of a field, but to establish an institutional structure capable of managing continuing cooperation under conditions of uncertainty. This requires substantive obligations, clearly allocated decision-making authority, monitoring systems, information-sharing duties, periodic review, early-warning procedures, adaptive mechanisms, and proportionate remedies.

Within this model, contractual stability should be understood as managed continuity rather than legal or regulatory immobility. Investors require meaningful protection against arbitrary, discriminatory, or opportunistic state conduct, particularly after substantial sunk investment has been committed. Nevertheless, protection should not prevent the host state from introducing proportionate and non-discriminatory regulation addressing legitimate environmental, social, safety, climate, or public-health concerns. Change-in-law and economic-equilibrium provisions should therefore distinguish ordinary regulatory evolution from material interference with the specific investment framework.

Sustainable development must become an operative component of the contract. Environmental responsibilities should be expressed through defined baselines, measurable standards, monitoring obligations, incident reporting, mitigation, remediation, and decommissioning requirements. Climate-related issues, including methane emissions, flaring, energy efficiency, and carbon intensity, should be addressed where relevant through defined measurement and adaptation mechanisms. Social obligations should include structured stakeholder engagement, continuing due diligence, grievance procedures, community-impact management, labor safeguards, and transparent local-development processes.

The developmental contribution of petroleum investment should similarly extend beyond fiscal revenue. Technology transfer should produce demonstrable domestic technical capability rather than consist merely of equipment acquisition or generalized training commitments. Local-content provisions should combine realistic participation targets with supplier development, technical assistance, workforce upgrading, transparent procurement, and gradual integration of domestic enterprises into higher-value segments of the petroleum industry. In this sense, value creation should be evaluated across economic, technological, environmental, social, and institutional dimensions.

Risk allocation should be incorporated into the broader concept of risk governance. The petroleum contract should continue to determine responsibility for geological, operational, fiscal, political, environmental, and financial risks, but it should also establish processes for identifying emerging threats, sharing information, implementing mitigation, and adapting contractual obligations. A project-specific risk matrix, joint risk register, early-warning mechanism, change-in-law procedure, hardship clause, force-majeure regime, sanctions mechanism, and structured renegotiation process can collectively create a more resilient contractual relationship.

Digital transformation strengthens the practical feasibility of this governance-oriented model. Integrated digital platforms can provide continuous access to production, expenditure, environmental, procurement, and performance data. Artificial intelligence can assist with anomaly detection, predictive risk analysis, and identification of emerging contractual problems.

Distributed-ledger technology may strengthen the integrity of selected records, while smart-contract functions may automate objective and repetitive processes. These technologies should nevertheless remain subordinate to the legally executed agreement, mandatory law, authorized human judgment, procedural fairness, and cybersecurity requirements.

The proposed model therefore consists of five interdependent layers: the core commercial bargain; sustainability and value creation; risk governance and adaptation; institutional governance and dispute prevention; and digital contract infrastructure. Its defining characteristic is not the presence of any single modern clause, but the legal integration of these elements throughout the petroleum-project lifecycle.

For Iran, this approach provides an opportunity to move beyond debates centered primarily on the formal classification of petroleum contracts. The more significant issue is whether the contractual system can mobilize capital and advanced technology while preserving national control, improving reservoir management, managing sanctions and regulatory risk, protecting the environment, strengthening domestic technical capability, and generating durable public value. Existing contractual experience, particularly the IPC, can provide a foundation for further development, but future reforms should place greater emphasis on measurable sustainability commitments, capability-oriented technology transfer and local content, adaptive risk governance, digital data management, and institutionalized dispute prevention.

The petroleum contract of the future should therefore function as a dynamic legal-governance platform. It should protect investment without disabling legitimate regulation; provide sufficient contractual certainty while allowing structured adaptation; reward efficient resource development while imposing enforceable environmental and social obligations; facilitate foreign technical participation while strengthening national capability; and employ digital systems without sacrificing human accountability and legal control. Through this integrated architecture, upstream petroleum agreements can evolve from instruments concerned principally with hydrocarbon extraction and revenue allocation into sophisticated legal mechanisms for sustainable development, risk resilience, technological advancement, and multidimensional value creation.

Authors' Contributions

Authors contributed equally to this article.

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In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

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References

Ahmadi, H. (2019). Technology Transfer Obligations in Foreign Investment Contracts in Iran. *Technology and Law Studies*.

Bindemann, K. (1999). *Production-Sharing Agreements: An Economic Analysis*. Oxford Institute for Energy Studies.

Cameron, P. D. (2021). *International Energy Investment Law: The Pursuit of Stability*. Oxford University Press.

Cordonier Segger, M.-C., & Gehring, M. W. (2011). *Sustainable Development in World Investment Law*. Kluwer Law International.

Cotula, L. (2010). *Investment Contracts and Sustainable Development: How to Make Contracts for Fairer and More Sustainable Natural Resource Investments*. International Institute for Environment and Development.

Emami, S. H. (2010). *Civil Law*. Islamia Publication.

Gao, Z. (1994). *International Petroleum Contracts: Current Trends and New Directions*. Graham & Trotman.

Hosseini, S. A. (2019). Analysis of Iran Petroleum Contract (IPC) and Its Position in International Petroleum Agreements. *Iranian Journal of Energy Law Studies*.

Jalili, M. (2023). Digital Transformation and Smart Contracts in Energy Transactions. *Journal of Energy Law and Policy*.

Katouzian, N. (2004). *General Principles of Contracts*. Mizan Publication.

Mousavi, S. M. (2020). Legal Challenges of Foreign Investment in Iran's Oil and Gas Industry. *Energy Law Review*.

Oecd. (2023). *OECD Guidelines for Multinational Enterprises on Responsible Business Conduct*. OECD Publishing.

Rahimi, M. (2020). Risk Allocation Mechanisms in Long-Term Petroleum Contracts. *Journal of Legal Research*.

Rezaei, A. (2022). Governance-Oriented Approaches to Modern Petroleum Contracts in Iran. *Iranian Journal of Public Law*.

Safaei, H. (2013). *Civil Law and Obligations*. SAMT Publication.

Shahbazi, R. (2022). Environmental Obligations of Oil and Gas Companies in Iranian and International Law. *Public Law Studies Quarterly*.

Viñuales, J. E. (2012). *Foreign Investment and the Environment in International Law*. Cambridge University Press.

Werbach, K., & Cornell, N. (2017). Contracts Ex Machina. *Duke Law Journal*, *67*(2), 313-382.

Yazdani, A. (2021). Local Content Requirements and Economic Development in Petroleum Agreements. *Iranian Economic Law Quarterly*.