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Nuclear Proliferation Risks in Selected Turkic States: Türkiye, Kazakhstan, and Uzbekistan

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Abstract

Objectives: This study investigates the nuclear legacies, ongoing developments, and proliferation risks in three Turkic states: Kazakhstan, Uzbekistan, and Türkiye. Although these countries have not been at the centre of global non-proliferation debates, recent geopolitical changes, regional instability, and growing interest in nuclear energy have made them increasingly relevant. The research seeks to understand the motivations behind each state's nuclear ambitions, including security concerns, economic opportunities, and geopolitical positioning. Additionally, it describes nuclear proliferation-related threats present in these country, and provides actionable solutions to mitigate those risks.

Methods: The research is based on a qualitative, document-based approach. It analyses open-source materials such as reports from international organizations (e.g., the IAEA), government policy papers, and publications from respected think tanks. The focus is on each country's nuclear history, current policy trajectory, and the broader strategic context affecting proliferation risks.

Results: Kazakhstan and Uzbekistan, as major uranium producers, face risks primarily associated with material security and regulatory oversight. Türkiye, although lacking large uranium reserves, poses distinct challenges due to its expanding civilian nuclear program and strong political ambitions to become dominating power in the region. The study identifies that recent dynamics in global order destabilize security environment within and around Turkic States, which may cause intensification of arms race. Currently there are no sufficient international, oversight mechanisms to control it.

Conclusions: The paper recommends improved regional cooperation and the establishment of a dedicated nuclear supervising body under the Organization of Turkic States (OTS). Such a framework would promote transparency, mitigate proliferation risks, and ensure that nuclear developments in the region align with peaceful and internationally accepted standards.

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Introduction

The global rise in interest in low-emission and stable energy sources has led many world leaders to increase the share of nuclear power in their countries' energy mix. This trend is also reflected in the regions of West and Central Asia. The risks of nuclear proliferation in that part of the world may not seem significant at first glance, and the Turkic countries remain largely outside the spotlight of the global non-proliferation debate. However, several internal and external factors such as the shift in the global order, rising international tensions, the nuclear renaissance, and regional instability are contributing to a gradual increase in risk. As a result, the Turkic states may soon become a critical area of concern.

The region's large uranium deposits and a well-established excavation industry may give Central Asia new importance as a major source of fissile material. While this development presents an opportunity for economic growth, it also increases the threat of proliferation. If not addressed, these risks could become a serious challenge to international stability. Simultaneously, Türkiye's openly expressed regional ambitions, followed by actions, add another layer of complexity to the region’s security landscape.

Previous research on the proliferation risks in Kazakhstan and Uzbekistan has mostly focused on terrorism, illicit trafficking, and smuggling of nuclear materials (Kassenova, 2004, pp. 170–192). In recent years, the global non-proliferation discourse has paid little attention to the Turkic region. This is partly due to gradual improvements introduced by national regulators, often in cooperation with the International Atomic Energy Agency (IAEA). It is also because global attention has shifted toward other nuclear challenges, such as North Korea, Iran, the full-scale war in Ukraine, and a general increase in global militarization, including nuclear weapons modernization.

In contrast to its Central Asian partners, Türkiye presents a different proliferation landscape. Existing studies rightly point to the politically unstable situation in its neighbourhood (Altunışık, 2020). However, the country’s limited uranium reserves and modest nuclear industry have so far reduced the likelihood of rapid nuclear weapons development. Türkiye is also a NATO member and participates in the alliance’s Nuclear Sharing initiative (Bulletin of the Atomic Scientist, 2023). Nevertheless, recent changes in the global security environment may reshape Türkiye’s stance on acquiring nuclear weapons. The gradual U.S. withdrawal from its global leadership role (National Post, 2025), President Erdoğan’s consolidation of power (Jerusalem Center for Security and Foreign

Affairs, 2025), and Türkiye's growing involvement in the civilian nuclear sector (World Nuclear Association, 2024a) raise concerns that the country may pursue nuclear latency in the near future.

A review of the literature reveals a gap in up-to-date analysis. Global non-proliferation discussions have largely ignored the growing risks in the Turkic states. Yet, today's rapidly changing geopolitical context makes this a critical issue. There is a lack of comprehensive research that connects historical legacies with current developments and future prospects.

Without an informed diagnosis of the risks, there are no meaningful policy recommendations to prevent proliferation while still supporting nuclear energy development in the region. This paper aims to address that gap by offering a structured assessment of Türkiye, Kazakhstan, and Uzbekistan. It presents a summary of their nuclear histories, outlines key motivations and potential proliferation paths, and concludes with policy recommendations aimed at the regional level.

Methodology

This study relies on document-based analysis as the primary method for data collection. The sources include official reports from international organizations (e.g., the IAEA), government policy documents, and publications from research institutes and internationally recognized think tanks. These materials provide insights into the mining, production, and trade of fissile materials in the three Turkic countries analysed Türkiye, Kazakhstan, and Uzbekistan. Based on these findings, the author proposes organizational regional-level policy recommendations aimed at improving regional cooperation and reducing proliferation risks.

The methodology consists of two main components. First, the paper offers brief overviews of each country's historical background related to nuclear development. Introducing the nuclear legacies of the Turkic states is essential for placing their current actions and motivations in context. These sections aim to give the reader an understanding of how the past has shaped each country's present nuclear stance.

The second component involves an analysis of current trends in domestic politics and the energy sectors of the three countries. Using open-source documents, official statements, and trade data, the study explores present-day geopolitical challenges and energy-related developments. After identifying each country's primary motivations, risks, and opportunities, these are analysed in the broader context of international security dynamics. Special attention is given to the potential proliferation risks arising from observed policies and behaviours. Finally, the paper proposes

regional policy recommendations that aim to prevent the spread of nuclear technologies and materials for non-peaceful purposes.

Because the topic of nuclear threats in Central Asia and Türkiye remains underrepresented in current literature, special care was taken to ensure the reliability and relevance of the data. Efforts were made to maintain methodological integrity by verifying information across multiple sources and considering diverse expert perspectives. The analysis is positioned within the wider academic discussion on nuclear proliferation (Trinkunas, 2006, pp. 617–625). The selection of materials and reliance on expert input reflect established qualitative research standards and align with methods commonly applied in related scholarly works (Moltz, 2006, pp. 591–604).

1. Republic of Kazakhstan – Nuclear Legacy & Security Concerns

As the site of Soviet nuclear tests, Kazakhstan inherited both a physical legacy and a strong normative opposition to nuclear weapons. At the time of its independence in 1991, the country held a significant stockpile of weapons-grade fissile material and vast uranium reserves. Despite having the technical means and strategic incentive to develop nuclear weapons – given its challenging security environment bordered by Russia and China – Kazakhstan chose disarmament. This decision was reinforced by international support, including aid and security assurances from the United States, Russia, and China. The U.S. also helped remove and down-blend highly enriched uranium, making it unsuitable for weapons but viable for civilian energy use (Yim, 2024).

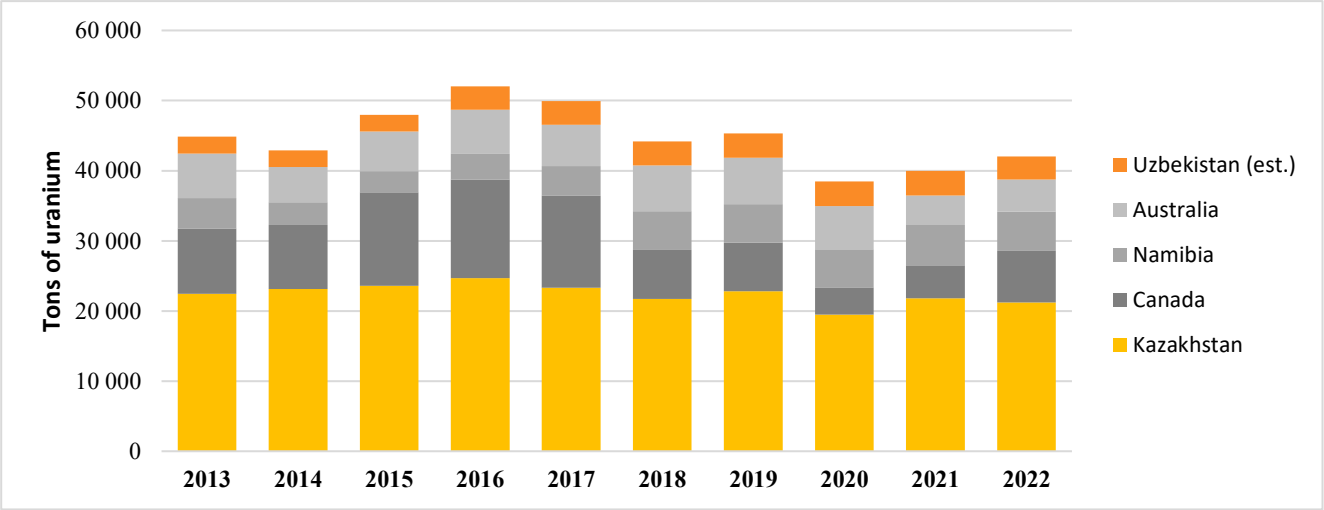

Fig. 1. Uranium production by five main global suppliers

Sources: (World Nuclear Association, 2024d)

Kazakhstan completed its denuclearization by 1994, returning all warheads to Russia. The Mangyshlak reactor, a key facility, ceased operation in 1994 and closed permanently in 1999 with

the end of spent fuel production. Despite this shift away from weapons, Kazakhstan emerged as a global leader in peaceful nuclear activities. Since uranium exploration began in 1943, the country has steadily advanced its capabilities, and by 2011, it became the world's largest uranium producer – a position it still holds (Figure 1) – supplying nuclear fuel to civilian reactors worldwide (World Nuclear Association, 2024b).

Kazakhstan is situated in a region with significant geopolitical challenges, bordering with two world powers, but on the same time tightening relations with European Union. The proximity to conflict-prone areas, such as Afghanistan, makes its environment even more complex and volatile. Kazakhstan's security concerns may motivate its future pursuit of nuclear proliferation. The country seeks to enhance its energy security and ensure a stable power supply. Collaborating with advanced nations can help mitigate these concerns by providing the necessary technology and expertise to develop a robust nuclear infrastructure. Existing partnerships with Russia and China demonstrate Kazakhstan's commitment to this goal. Engaging with South Korea or other advanced countries could further ensure Kazakhstan's energy security, technological capabilities, and international standing, ensuring a secure and prosperous future. Exploration and advancement of pursuit for nuclear power capabilities are one of the greatest economic opportunities for country with large uranium reserves, but also it pose justified risk of proliferation.

Fig. 2a Main uranium trade partners of Kazakhstan in years 2013-2023

Fig. 2b Main uranium trade partners of Uzbekistan in years 2013-2023

Source: (United Nations, 2024)

2. Republic of Uzbekistan – Nuclear Industry & Regional Instability

Uzbekistan, is the world's fifth-largest uranium producer (Figure 1). It presents a potential proliferation risk mainly due to its uranium reserves and export activities. While the country is a party to the NPT and cooperates with the IAEA, challenges remain in enforcing strong export controls, securing borders, and improving transparency in uranium trade. Weak regulatory frameworks and the risk of illicit trafficking raise concerns about the spread of fissile

material. Export data (Figure 2a, Figure 2b) shows that, unlike Kazakhstan, Uzbekistan relies less on China as a trade partner. However, with the global shift toward nuclear energy, both countries are likely to find increasing demand from diverse buyers.

Uzbekistan plans to generate 15% of its electricity from nuclear power by 2030 (Uzbekistan Ministry of Energy, 2020). Two Russian-built VVER-1200 reactors are to be constructed near Lake Tuzkan. Historically a key uranium supplier to the Soviet Union, its current mining activity takes place in the Navoi region (World Nuclear Association, 2024c). Supported by the IAEA and partnerships with firms like Rosatom and Orano, Uzbekistan seeks to modernize its energy sector and expand uranium production. Security threats – such as terrorism and regional instability – motivate the government to pursue energy independence (Orano, 2024).

3. Republic of Türkiye – Geopolitical Environment & Motivations

Türkiye's nuclear energy ambitions have raised concerns about potential proliferation risks due to the country's uncertain long-term goals for expanding nuclear infrastructure. Since the 1970s, Türkiye has pursued nuclear power to diversify its energy sources and reduce dependence on imported natural gas, especially from Russia. Its most advanced project is the Akkuyu Nuclear Power Plant, being built by Russia's Rosatom under a Build-Own-Operate model. This arrangement gives Russia full control over plant operations and introduces risks related to technology transfer and nuclear material oversight. Akkuyu will consist of four VVER-1200 reactors, with the first unit expected online by the end of 2025 (World Nuclear Association, 2024a).

Türkiye also plans a second nuclear facility in Sinop, developed by a consortium including Mitsubishi Heavy Industries and Areva, and a third project in East Thrace involving Chinese partners. The integration of technologies from multiple international suppliers creates a complex environment for regulation and increases the need for strong oversight. Additionally, Türkiye's interest in domestic uranium mining and processing, such as the planned Temrezli ISL mine (IEA, 2021), signals intent to advance along the nuclear fuel cycle, which adds further proliferation risk. These developments require close monitoring by the IAEA and technology providers to ensure peaceful use and compliance with non-proliferation commitments.

Among the three states examined in this study, Türkiye is the one with greatest geopolitical ambitions, with multiple factors driving its nuclear development. Its motivations can be analysed through the prestige, security, and domestic politics models. Türkiye faces a challenging security environment, marked by tense relations with neighbours and ongoing territorial disputes. In this

context, pursuing nuclear technology – whether for energy or latent weapons capability – could serve to balance regional rivals such as Iran and Israel, while enhancing Türkiye's status as a major Middle Eastern power. Developing nuclear infrastructure may also grant greater strategic autonomy, reducing reliance on NATO and traditional security partners. On the domestic front, nuclear advancement could boost national pride, signal scientific progress, and be leveraged by the government to strengthen political legitimacy and rally nationalist sentiment.

4. Organization of Turkic States (OTS)

The OTS is an international body uniting Turkic-speaking countries to enhance cooperation in diverse areas, including politics, economics, culture, and education. The OTS operates within a robust cooperation framework grounded in mutual respect, shared heritage, and collective progress. It facilitates collaboration through a structured system of regular summits, ministerial meetings, and specialized working groups addressing key areas such as economic integration, trade, education, science, technology, and security. The organization also prioritizes sustainable development, environmental protection, and regional stability by coordinating policies and initiatives across member states. Additionally, the OTS engages in active dialogue with international partners to boost global cooperation and ensure that the region's development aligns with international standards. Through these concerted efforts, the OTS aims to foster unity, prosperity, and a shared vision for the future among Turkic nations (Organization of Turkic States, 2024).

Despite its significance in tightening international relations and cooperation among Central Asian states, the OTS requires further legal and diplomatic reinforcement to achieve globally significant impact. There are still obstacles that hamper the unification of the region, such as territorial disputes and mutual distrust among member states. Truly meaningful strategic cooperation has yet to be realized, but foreseeable global shifts in power may facilitate the emergence of a deepened regional partnership. Such changes could encourage Central Asian states to focus on consolidation, reinforcement of local capabilities, and introducing stronger regional ties.

Table 1. Motivations for pursuing nuclear proliferation

Country	War & Military Security	Deterrence	Prestige & Influence	Autonomy	Domestic Politics	Other countries	Coercion & Compellence	Regime Security	International crisis	Economic Gains
USA	x	x							x	
Russia	x	x				x				
UK	x	x	x							x
France			x	x		x				x
China		x	x	x						x
Israel	x	x	x							
India		x	x		x	x				
Pakistan	x	x			x	x				
DPRK		x	x	x			x	x		
Kazakhstan	x	x				x				
Uzbekistan					x	x		x		
Türkiye			x	x			x			

Source: (Han, 2022, pp. 45–46)

Table 2. Radioactive Source Security Assessment

Category	Question	Türkiye	Kazakhstan	Uzbekistan
NATIONAL MEASURES	Does the country/area maintain a radioactive source regulatory oversight body?	YES	YES	YES
	Are there regulations that require security measures to be in place to protect radioactive sources?	NO	YES	YES
	Does the state maintain a registry of radioactive sources?	NO	YES	NO
	Does the state have authority to inspect facilities with radioactive sources?	NO	YES	NO
	Are there licensing requirements for exporting IAEA Category 1 sources?	NO	YES	YES
GLOBAL NORMS	Has the state made a political commitment and notified the IAEA of their intent to abide by the Guidance on the Import and Export of Radioactive Sources?	YES	YES	YES
	Has the state notified the IAEA of their intent to abide by the Guidance on the Import and Export of Radioactive Sources?	YES	YES	NO
	Has the state nominated a Point of Contact to facilitate imports and exports of radioactive source material?	YES	YES	NO
	Has the state made available their responses to the IAEA Importing and Exporting states questionnaire?	YES	NO	NO
	Has the state notified IAEA of their commitment to implement the Guidance on the Management of Disused Radioactive Sources?	NO	NO	NO
	Does the state participate in the Global Initiative to Combat Nuclear Terrorism (GICNT)?	YES	YES	YES
	Is the country/area a state party to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management?	YES	YES	YES
	Is the country/area a state party to the International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT)?	YES	YES	YES
	Is the country/area a state party to the Convention on Assistance in the Case of Nuclear Accident or Radiological Emergency?	YES	YES	NO
COMMITMENT AND CAPACITY TO ADOPT ALTERNATIVE TECHNOLOGIES	Has the state subscribed to INFCIRC/910?	NO	YES	NO
	Has the country/area publicly declared a regulatory requirement, policy, or commitment to implementing alternative technology to replace high-activity radioactive sources?	NO	NO	NO

	What is the average percentage of businesses experiencing power outages each month?	LOW	LOW	MODERATE
	What percentage of the population over 25 holds a tertiary degree or higher?	HIGH	HIGH	MODERATE
RISK ENVIRONMENT	What is the risk of significant social unrest during the next two years?	HIGH	HIGH	MODERATE
	How clear, established, and accepted are constitutional mechanisms for the orderly transfer of power from one government to another?	LOW	VERY LOW	VERY LOW
	Is there a risk that international disputes/tensions will negatively affect the polity during the next two years?	VERY HIGH	HIGH	HIGH
	Is this country/area presently subject to armed conflict, or is there at least a moderate risk of such conflict during the next two years?	MODERATE	LOW	LOW
	Are violent demonstrations or violent civil/labor unrest likely to occur during the next two years?	MODERATE	HIGH	MODERATE
	How effective is the country/area's political system in formulating and executing policy?	LOW	LOW	VERY LOW
	What is the quality of the country/area's bureaucracy and its ability to carry out government policy?	LOW	LOW	VERY LOW
	How pervasive is corruption among public officials?	HIGH	HIGH	VERY HIGH
	How likely is it that domestic or foreign terrorists will attack with a frequency or severity that causes substantial disruption to business operations?	MODERATE	MODERATE	MODERATE
	How likely is organized crime to be a problem for government and/or business?	HIGH	MODERATE	MODERATE
	How many firearms were seized during the interdiction of illicit weapons trafficking?	LOW	VERY LOW	VERY HIGH

Source: (Nuclear Threat Initiative, 2024)

The set of indicators and the presented data (Table 1, Table 2) highlight the main risks related to radioactive security in Türkiye, Kazakhstan, and Uzbekistan. When evaluating national measures taken towards improving the security of radioactive sources, Türkiye receives the lowest grades. This is likely due to Türkiye's lack of a strong nuclear heritage compared to Kazakhstan and Uzbekistan. Both of these countries are major global uranium suppliers and, therefore, require robust state-controlled security systems to manage large quantities of uranium safely.

All three analysed states have scored poorly in the risk environment section. This reflects regional security tensions, territorial disputes, and frequently emerging crises. The lowest scores are associated with indicators involving potential corruption, bureaucratic quality, governmental transitions, and the effectiveness of the political system. Many of these issues could be addressed through comprehensive reforms of the political system. Some problems require attention at the state

level, while others necessitate serious consideration by the international community. From an economic perspective, increasing instability in the Central Asian region, which is responsible for producing over 56% of the world's uranium, could lead to significant disruptions in the global nuclear fuel cycle. Addressing these risks is critical not only for regional security but also for maintaining global stability in the nuclear energy sector.

5. Results

An analysis of the nuclear history, current approach, and potential future scenarios for Türkiye, Kazakhstan, and Uzbekistan reveals significant proliferation risks in Central Asia. In Kazakhstan and Uzbekistan, the primary concerns stem from large-scale uranium production. Additionally, Uzbekistan faces considerable dangers due to regional instability. Conversely, Türkiye's pursuit of regional dominance and its ambitious nuclear power program pose the highest proliferation risks for the country.

While state-level actions towards greater transparency and the peaceful use of nuclear technology are crucial for mitigating nuclear proliferation, national actions may be secondary to international events. Ongoing shifts in global power dynamics, instability, and the further deterioration of regional security could encourage these countries to develop unconventional arsenals. Although the proliferation risks in this region remain latent and do not attract significant international attention, they could escalate quickly. The global shift in power and rising tensions are likely to be the main factors influencing the nuclear future of these countries.

Discussion

6.1 Policy Recommendations

Addressing the potential proliferation risks in Central Asia requires a comprehensive approach that includes both state-level efforts and international actions. These efforts must be multi-level and target specific issues that impact nuclear safety and security in the Turkic states. The creation of a new body to coordinate nuclear cooperation between Kazakhstan, Uzbekistan, and Türkiye could be a pivotal step towards regional stabilization. This organization could be established within the existing framework of the OTS.

Proposed institution would be dedicated to address the proliferation risks among OTS Member States. The primary efforts of such a body should focus on:

- Collaboration with international partners to develop and implement stringent export control laws that align with international non-proliferation standards, including those set by the IAEA and Nuclear Suppliers Group.
- Promotion of transparency in nuclear activities through confidence-building measures, increasing public reporting, and reinforcing commitments to the peaceful use of nuclear technology.
- Diplomatic efforts to secure safety guarantees for the countries in the region from global powers to reduce the perceived need for independent nuclear deterrence.
- Coordinating efforts among national nuclear agencies and promote joint procurement of nuclear technology to reduce costs and improve efficiency in peaceful nuclear development.

Establishing such entity could mark a significant milestone in enhancing regional cooperation among Central Asian countries, reflecting their interests as major stakeholders in the global nuclear industry. Moreover, successful strategies employed by other international nuclear entities, such as the European Atomic Energy Community (Euratom), could be adapted and

6.2 OTS Nuclear Energy Committee – Concept

The proposed body could adopt an organizational structure and mission similar to that of Euratom. All tasks and goals established for Euratom are also relevant to the OTS (Szczepański, 2017). However, considering the unique economic and geopolitical circumstances of the Turkic countries, the research and development (R&D) focus should be reoriented towards deepened partnerships and market unification. The current nuclear capabilities of the Turkic countries do not yet enable the pursuit of sustainable nuclear fusion technologies. Instead, significant efforts should be directed towards greater consolidation of these countries' national nuclear agencies. Joint ventures aimed at acquiring nuclear energy technologies, shared R&D programs, and the creation of a common market for uranium products could enhance the influence of the Turkic states within the international community.

Based on the authors' projections, informed by publicly available documents on nuclear power development in the Turkic states, it is expected that within a 15-year time horizon, most of these countries will have incorporated nuclear power into their national energy mix. Recent advancements in uranium enrichment and reprocessing technologies, such as Pyroprocessing (Ryu, 2024) of Spent Nuclear Fuels and uranium laser enrichment (Snyder, 2016, pp. 68–91), have significantly reduced costs and improved efficiency. As these methods become more widely

adopted, concerns arise regarding the potential for newcomers and aspiring nations to gain greater control over the nuclear fuel cycle. To address these concerns, policy changes emphasizing transparency and mutual oversight must be implemented for all states engaged in nuclear technology development.

Recent studies examining the European Union's growing interest in Central Asian countries further strengthen the argument for the region's increasing geopolitical and economic relevance. In addition to fissile materials, assets such as rare earth elements, transport corridors, and "green" hydrogen are expected to play a key role in shaping Europe's future economy. Strengthened cooperation and deeper integration among Central Asian states could enhance their collective bargaining power on the global stage, enabling them to obtain favourable agreements. The establishment of the Central Asian Nuclear-Weapon-Free Zone in 2009 demonstrated that regional collaboration can be both effective and mutually beneficial (Muratova, Sadri, Medeubayeva, Issayeva, 2025, pp. 20–31).

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