# ECO

## Economic Cooperation Organization
# ECONOMIC JOURNAL

Volume 10 , Issue 1 , 2025

ISSN: 3005-2696

ECONOMIC COOPERATION ORGANIZATION

# ECONOMIC JOURNAL

**Publisher**

*Economic Cooperation Organization*



*The Economic Journal has been a publication of the Economic Cooperation Organization since 2009.*
*The journal is published twice a year.*

**Baku- 2025**

ECONOMIC COOPERATION ORGANIZATION
# ECONOMIC JOURNAL

**Economic Scientific Research Institute (The ESRI)**
**(Chief Editorial Office)**
*196 Hasan Bey Zardabi Av., Baku, Azerbaijan,*
*Postal Code: AZ1122*
***Tel:*** *+994 512804335 & +994 124309618*
***Fax:*** *+994 124300215*
***E-mail:*** *office@esri.gov.az*
**Website:** *http://www.esri.gov.az & http://www.theesri.com*

**Economic Cooperation Organization (ECO)**

*No. 1, Golbou Alley, Kamranieh St., Tehran, Iran,*
*Postal Code: 19519 – 33114*
***Tel:*** *+9821 22831733-4 & 22292066*
***Fax:*** *+9821 22831732*
***E-mail:*** *Registry@ECOsecretariat.org*
**Website:** *http://www.ecosecretariat.org*

**ECO Trade and Development Bank**
Silahşör Caddesi Yeniyol Sokak No:8
Kat:14-16
Bomonti 34380 Şişli, Istanbul, TÜRKİYE
***Tel:*** +90-212-3936300,
***Fax:*** +90-212-3936301
***E-mail:*** *info@etdb.org*
**Website:** *https://www.etdb.org/*

# Volume 10, Issue 1, 2025
# Table of Contents

# Foreword

**Dear Readers,**

We are delighted to bring out the 10th edition of the ECO Economic Journal. This edition carries a number of well researched articles and offers in-depth insights into key topics relevant to advancing regional development agenda.

In an era characterized by geopolitical flux and growing uncertainties, underpinned by the emergence of threats, both traditional and nontraditional, and reinforced by the widespread impact of disinformation, access to accurate information and data is both a blessing and a necessity. Today, sound research is an indispensable tool for the policy makers to develop evidence-based plans for tackling the complex challenges facing humanity. Regional cooperation, grounded in knowledge, innovation, and collaborative research, therefore, has never been more crucial to navigating these challenges and fostering sustainable solutions.

The latest edition of the ECO Economic Journal continues its time-honored tradition of delivering evidence-based policy insights, fostering intellectual exchange, and informing forward-thinking decisions. The Journal enhances understanding of the evolving economic landscape, promotes regional cooperation, identifies shared priorities, and explores innovative solutions to advance sustainable development across the region.

Happily, this edition closely follows the recent successful convening of the historic 17th ECO Summit in Khankendi, Azerbaijan, alongside the first-ever ECO Youth and Women Forums and the 6th Business Forum, held from June 30 to July 4, 2025. These events made a substantial contribution to shaping an inclusive vision document for the post-2025 era.

At the Summit, the leaders, inter alia, highlighted the importance of full operationalization of ECO Research Center in Baku, Azerbaijan, as a regional hub for economic research and innovations. The ECO Research Center, which represents a transformative milestone in strengthening evidence-based policymaking, is poised to function as the official think tank of the ECO with the anticipated ratification of its Charter by the Republic of Türkiye, following ratifications by Azerbaijan and Pakistan. The operationalization of the Center, we are confident, would give greater relevance, outreach and effectiveness to this ECO Journal.

On behalf of the ECO Secretariat, I thank the editorial team, contributors, and partners for their dedication in bringing this publication to life. I encourage and invite scholars, experts, and institutions across the ECO region to engage with our initiative by regularly contributing to this publication. We look forward to your continued support in building a more resilient, prosperous, and sustainable ECO region.

***Dr. Asad M. Khan***

*Secretary General*
*Economic Cooperation Organization*

# From the Editor-in-Chief

We are pleased to present the latest issue of the *ECO Economic Journal*, a valuable academic platform dedicated to advancing economic thought and fostering regional cooperation among the member states of the Economic Cooperation Organization.

The articles in this edition examine a range of critical topics, including economic integration, technological transformation, climate change, labor market dynamics, trade development, and sustainable growth. Through interdisciplinary approaches and diverse methodologies, these studies aim to inform policy decisions, enhance regional dialogue, and support inclusive economic development across the ECO region.

This issue is being released at a particularly important moment for the ECO community. On July 4, 2025, the **17th ECO Summit** was held in Khankendi, located in the Karabakh region of Azerbaijan. This marked the third time Azerbaijan has hosted the Summit, following earlier events in 2006 and 2012. The Summit convened high-level representatives from all 10 ECO member states under the theme ***"A New Vision for a Sustainable and Climate-Resilient Future in ECO."*** The discussions emphasized cooperation in areas such as trade, green transformation, energy, science, tourism, education, and culture.

The adoption of the **Khankendi Communiqué** reflected the member states' shared commitment to sustainable development and regional collaboration. Key outcomes included the agreement to develop a Strategic Action Document for ECO 2035, the full operationalization of the ECO Clean Energy Center, a proposal to establish an ECO Artificial Intelligence Center, and the decision to double intra-regional trade by 2035 through the implementation of regional initiatives and investment facilitation mechanisms.

In parallel, **ECO Week** was celebrated from July 1–2, 2025, with a series of high-level events organized in the liberated territories of Azerbaijan under the initiative of the President of the Republic of Azerbaijan, H.E. Mr. Ilham Aliyev, and in cooperation with the ECO Secretariat. The program featured the **ECO Youth Forum** in Aghdam, focused on empowering youth in building a green and climate-resilient future; the **ECO Women Forum** in Lachin, highlighting the critical role of women in sustainable development; and the **6th ECO Business Forum** in Shusha, which brought together regional business leaders and investors to foster economic cooperation and explore new opportunities.

We would like to express our sincere appreciation to all authors, reviewers, and contributors whose valuable efforts have made this issue possible. We hope that the insights presented here will contribute meaningfully to ongoing academic discussions and policy development across the ECO region and will inspire further collaboration in pursuit of shared prosperity.

***Arzu Huseynova***

*Editor-in-Chief of the ECO Economic Journal*
*First Deputy Chairman of the Board*
*The ESRI, the Republic of Azerbaijan*

# 17th ECO Summit

**July 4, 2025 / Khankendi, Azerbaijan**

On July 4, 2025, the **17th Summit of the Economic Cooperation Organization** was held in the city of Khankendi, located in the Karabakh region of Azerbaijan. The summit brought together heads of state, government leaders, and ministers from all 10 ECO member countries. This marked **Azerbaijan's third time hosting** an ECO Summit. The previous summits were held in **Baku** in **2006** and **2012**.

The participants of the summit were introduced to the reconstruction and redevelopment efforts underway in the liberated territories of the Republic of Azerbaijan and commended these efforts highly.

The summit was dedicated to the theme **"A New Vision for a Sustainable and Climate-Resilient Future in ECO,"** in line with the organization's future strategic objectives. **Economic resilience** and **climate change adaptation** were identified as key areas at the core of ECO's future agenda. In their statements, **ECO leaders** expressed a **shared commitment** to strengthening **regional cooperation**, particularly in the areas of **trade, green transformation, tourism, science, energy, education, and culture**.

As a conclusion to the 17th ECO Summit, the **Khankendi Communiqué** was adopted. According to the communiqué, it was agreed to develop a Strategic Action Document for ECO for the year **2035**, aimed at mobilizing the region's rich human capital and natural resources for the sake of shared prosperity. The ratification process enabling the establishment and full operationalization of **the ECO Clean Energy Center** has also been completed.

It was decided to **at least double intra-regional trade by 2035** through the implementation of initiatives such as **"ECO Invest"**, the **ECO Council of Chambers of Commerce and Industry**, and the creation of a unified **ECO**

**information space**, as well as by enhancing the mandate of **the ECO Trade and Development Bank** to facilitate trade, promote investment, and attract capital to the region. The establishment of an **ECO Artificial Intelligence Center** was also proposed. The importance of enabling the **ECO Research Center** to operate fully as a regional hub for economic research and innovation was highlighted.

It was proposed to hold the **next – 18th ECO Summit** in the **Islamic Republic of Iran** in **2027**.

# STATEMENTS AT THE 17TH ECO SUMMIT

**Speech by President of the Republic of Azerbaijan, Ilham Aliyev**

Distinguished Heads of State and Government,

Dear Summit participants,

Welcome to Khankendi - to the ancient Azerbaijani land of Karabakh, for the participation in the 17th Summit of the Economic Cooperation Organization.

*Azerbaijan has always been actively involved in the ECO's activity. Our relations with the ECO member states have been developing successfully.*

***Ilham Aliyev***

I express my gratitude to Kazakhstan for the successful chairmanship of the ECO.

Azerbaijan is hosting the ECO Summit for the third time. The previous two summits of 2006 and 2012 were held in the capital city of Baku.

Organization of today's Summit in Karabakh, in Khankendi, holds particular symbolism. Several significant international events have already been held in our lands liberated from Armenia's occupation. I would like to mention the ECO Council of Ministers held in Shusha in 2023, the first informal Summit of the Organization of Turkic States held in 2024, and the Trilateral Summit of the leaders of Azerbaijan, Türkiye and Pakistan held in Lachin this May.

Today, the ECO Summit is taking place in Khankendi, at the newly built Congress Center.

At present, large-scale reconstruction and development efforts are underway throughout the entire liberated Karabakh and East Zangezur regions.

Armenia had held nearly 20 percent of Azerbaijan's territory under occupation for almost 30 years, conducting ethnic cleansing and expelling over one million of our fellow Azerbaijanis from their native lands.

The state of Azerbaijan and its people have never come to terms with the occupation. On numerous occasions, we made it clear to Armenia and the states supporting it that if Armenia failed to withdraw voluntarily from our occupied territories, we would resort to military force to restore our territorial integrity. Unfortunately, Armenia and its patrons did not take our warnings seriously - and eventually came to regret it.

In the course of a 44-day Patriotic War of 2020, Azerbaijan had crushed Armenia on the battlefield, and liberated over 300 cities and villages. Armenia had to sign the capitulation act on 10 November 2020.

During the occupation, Armenia razed our cities and villages to the ground, along with our cultural and religious sites. Armenia had demolished 65 of the 67 mosques; the remaining two were severely damaged and used as barns for cows and pigs. This was a clear act of disrespect and insult toward the Islamic faith and Muslims around the world.

Cemeteries, too, were vandalized - destroyed, and tombstones were looted and taken to Armenia.

A commission composed of state agencies, with the involvement of foreign experts and drawing on international experience, estimated that the damage caused to Azerbaijan as a result of the occupation amounted to nearly $150 billion.

Armenia planted more than one million mines on our territory. Since the Patriotic War, nearly 400 of our citizens have been killed or seriously injured by mine explosions.

Today, in the lands devastated by Armenia, new cities and villages are being built. The "Great Return" program is underway. So far, we have facilitated the return of former internally displaced persons to 16 cities and villages. More than 50,000 people now live, work, and study in the liberated territories.

Ensuring the rights of Azerbaijanis deported from Armenia is also a matter of significant importance. We highly appreciate a resolution affirming the right of return of Azerbaijanis forcibly displaced from Armenia, adopted by the unanimous decision of all 57 members at the Council of Foreign Ministers of the Organization of Islamic Cooperation in Istanbul, last month.

The Istanbul Declaration, adopted alongside the resolution during the Council of Foreign Ministers session, reaffirms the right of Azerbaijanis displaced from present-day Armenia to return, and condemns Armenia's refusal to engage in dialogue with the Western Azerbaijan Community.

The efforts to ensure the peaceful return of the Western Azerbaijanis to their ancestral lands in Armenia will continue.

Ladies and Gentlemen,

Azerbaijan has always been actively involved in the ECO's activity. Our relations with the ECO member states have been developing successfully.

Last year, COP29 conference was held for the first time ever within the ECO region. This conference brought together participants from 197 countries, welcomed 70 heads of state and government, and recorded a total of 77,000 registrations.

Conference's primary achievements included increasing the financial commitment from $100 billion to $300 billion, to support the developing nations, operationalizing Loss and Damage Fund, and reaching consensus on carbon markets.

This year, for the first time, ECO Week is being held at Azerbaijan's initiative. The ECO Business Forum in Shusha, the Youth Forum in Aghdam, and the Women's Forum in Lachin have taken place. The representatives who took part in the Forums will report to the Summit on their outcomes today.

Work is underway to ensure the launch of ECO's Research Centre and Clean Energy Centre to be hosted by Azerbaijan.

I am grateful for the declaration of the city of Shusha as the ECO Tourism Capital for 2026.

The issues to be discussed today are of particular importance for deepening economic cooperation. Azerbaijan enjoys a very favorable investment climate. Over the past 20 years, approximately $350 billion has been invested in Azerbaijan's economy, with foreign investments accounting for half of that amount.

Today, Azerbaijan ensures the energy security of several countries and exports natural gas to 12 countries through various pipelines. Based on this indicator, we hold top positions worldwide.

East-West and North-South transportation corridors run across Azerbaijan and most ECO member states use these corridors.

Dear friends,

I am confident that our today's discussions will be fruitful and contribute positively to the further development of relations between our countries.

Thank you.

***

**Speech by the President of the Republic of Uzbekistan, Shavkat Mirziyoyev:**


Distinguished heads of delegations!

It is a great pleasure to meet you in the ancient land of Karabakh, in the beautiful city of Khankendi, which embodies a unique historical and cultural heritage. As true brothers, we are delighted to witness this region becoming a place of peace and development. I would like to express my deepest gratitude to His Excellency, Ilham Aliyev, the President of the Republic of Azerbaijan,

for the high-level organization of the Economic Cooperation Organization's Summit on this land and warm hospitality.

I would also like to draw your attention to another important issue. It is essential that our countries coordinate and combine their efforts on the global climate agenda. We firmly support the full implementation of commitments and agreements reached at the successfully held COP29 Global Climate Summit in Baku. We propose developing a Transboundary "Green Initiative" within the Organization aimed at planting forests in desert areas and establishing recreational zones.

Distinguished heads of delegations!

We appreciate the High-Level Committee's efforts to enhance the activity of our Organization. I believe you will support the idea of assigning the Committee to develop by the next Summit proposals and recommendations to reform and boost the Organization's functions. These reforms will undoubtedly elevate our collaboration to a new level, strengthen the Organization's international prestige and influence, and improve its work to meet modern requirements.

I am convinced that today's Summit will give a new impetus to achieve our commitments and plans in elevating multifaceted and practical cooperation to a new level.

Thank you for your attention!

***

**Speech by the President of the Republic of Türkiye:**


I express my gratitude to my brother, President Ilham Aliyev, all official representatives, and the Azerbaijani people for their warm hospitality in hosting us in this beautiful city. The organization of this Summit in the liberated city of Khankendi lends special significance and meaning to the event. I wholeheartedly believe that, thanks to my brother Ilham's visionary approach, this ancient city will become a new hub of development and peace in the Caucasus.

I hope that today's discussions, as well as the women's, youth, and business forums held since July 1, will bring benefits to our countries and our region.

Dear brothers, I believe it is entirely appropriate that this Summit of our organization, which holds vast potential in fields ranging from trade to transport, environment to energy, is dedicated to addressing climate change. I would also like to inform you that the process of approving documents for the establishment of Clean Energy and Research Centers in Azerbaijan is in its final stages in our country.

On the occasion of Shusha's declaration as the Economic Cooperation Organization 'Tourism Capital' for 2026, I extend my congratulations to all our Azerbaijani brothers, through my friend, President Ilham Aliyev.

***

**Kazakhstan's Prime Minister Olzhas Bektenov stressed the importance of adopting the ECO 2035 Strategy and noted that hosting the Summit in Khankendi reflects Azerbaijan's commitment to peace and development:**


First and foremost, I would like to express my heartfelt gratitude to His Excellency Mr. Ilham Aliyev, President of the Republic of Azerbaijan, for his warm hospitality and for the excellent organization of this significant Summit in the historic and beautiful city of Khankendi. We consider it important that this Summit is being held in this city. At the same time, I convey the greetings of the President of the Republic of Kazakhstan Kassym-Jomart Tokayev to you. We view the hosting of this event here as a shining example of Azerbaijan's commitment to peace, development, and regional integration. Undoubtedly, the 17th Summit of the Economic Cooperation Organization, held under Azerbaijan's chairmanship, will provide a new impetus to the further development of regional partnership.

***

**Iran's President Masoud Pezeshkian emphasized the importance of establishing a Free Trade Zone among the ECO member states and expressed gratitude to Azerbaijan for hosting the 17th ECO Summit:**


Your Excellency, Honorable President of the Republic of Azerbaijan Ilham Aliyev, I would like to express my gratitude to you and the esteemed Azerbaijani people for hosting the 17th Summit of the Economic Cooperation Organization and for your generous hospitality.

**Kyrgyzstan's President Sadyr Zhaparov underscored the significance of advancing cooperation in renewable energy, digital technologies, and transport-logistics connectivity. He also addressed the impact of climate change on economic diversification and highlighted the importance of holding the ECO Summit in Khankendi:**

The holding of our meeting in the historic city of Khankendi, located in Azerbaijan's Karabakh region and a symbol of peace, carries special significance. Dear Ilham Heydar oglu, I express my heartfelt gratitude to you and the brotherly Azerbaijani people for your traditional warm hospitality and for the excellent organization of this event.

***

**Pakistan's Prime Minister Muhammad Shehbaz Sharif praised the excellent organization of the Summit and specifically commended Azerbaijan's efforts to strengthen the ECO:**


First, allow me to congratulate my dear brother, Mr. Ilham Aliyev, President of the Republic of Azerbaijan, for successfully chairing the 17th Summit of the ECO. We are also grateful to him for the warm hospitality extended to us in the historic and beautiful city of Khankendi. Ladies and gentlemen, I would also like to note that I highly value the efforts you have made to deepen cooperation among the member states of our organization.

***

**Tajikistan's President Emomali Rahmon called for enhanced cooperation in trade, transport, energy, industry, and agriculture. He emphasized that broad and coordinated collaboration could effectively address modern challenges and expressed confidence that the Summit in Azerbaijan would contribute to the comprehensive development of relations:**


I would like to first express my gratitude to Esteemed Ilham Aliyev, President of the Republic of Azerbaijan, for the organization of today's meeting and the warm reception. At the same time, dear Ilham Heydar oglu, I congratulate you on your election as the chair of our organization's 17th Summit.

***

**Afghanistan's Deputy Prime Minister Abdul Ghani Baradar expressed his gratitude to Azerbaijan for organizing the 17th ECO Summit, adding that Afghanistan is interested in establishing strategic relations with ECO member states:**


I sincerely thank the President of Azerbaijan for the hospitality shown to us and the excellent conditions provided. This prestigious Summit took place here. The Summit is a significant historical moment and serves as a guide for us. It is an event that promotes regional cooperation, mutual understanding, and progress.

***


**Turkmenistan's Deputy Chairman of the Cabinet of Ministers and Minister of Foreign Affairs Rashid Meredov emphasized that the Economic Cooperation Organization serves as a vital platform for developing multilateral cooperation and thanked Azerbaijan for the invitation:**

First, allow me to express my gratitude to the President of the Republic of Azerbaijan, Mr. Ilham Aliyev, for the invitation sent to the leadership of Turkmenistan to participate in today's Summit.

Taking this opportunity, I would like to convey the greetings and deep respect of the President of Turkmenistan, Serdar Berdimuhamedov, and the National Leader of the Turkmen people, Chairman of the Halk Maslakhaty of Turkmenistan, Gurbanguly Berdimuhamedov, to the heads of the ECO member states, the heads of government, and the President of Azerbaijan. On behalf of the Turkmen delegation, I wish to sincerely thank the Azerbaijani side for the excellent organization of the ECO Summit and the warm hospitality.

***

**President of the Turkish Republic of Northern Cyprus Ersin Tatar expressed satisfaction with the successful reconstruction of Azerbaijan's liberated territories and praised the organization of such a prestigious Summit in the historic and ancient Azerbaijani city of Khankendi:**


First of all, I would like to express my gratitude to my brother, Mr. Ilham Aliyev, President of the Republic of Azerbaijan, for hosting this important Summit, as well as to the Economic Cooperation Organization, represented by Secretary General Mr. Asad Majeed Khan.

We are especially pleased that this meeting is being held in the historic and ancient city of Khankendi, in the brotherly country of dear Azerbaijan. The revival of these native lands in just five short years under the leadership of the Conqueror of Karabakh, Mr. Ilham Aliyev, and through unparalleled national unity, makes us proud as well. Karabakh is Azerbaijan, and Azerbaijan is Karabakh!

***


**Abubakar Atiku Bagudu, Minister of Budget and Economic Planning of the Federal Republic of Nigeria, thanked Azerbaijan for its warm hospitality as the Summit host:**

I express my gratitude to the Government and people of the Republic of Azerbaijan for the invitation and sincere hospitality. I would like to thank Mr. Ilham Heydar oglu Aliyev, President of Azerbaijan, for hosting

this important Summit at a time when the global community stands at a critical crossroads amid economic uncertainty. In addition, we thank His Excellency for granting accreditation to the Embassy of Nigeria in the Republic of Azerbaijan 20 years ago.

***

**Armida Salsiah Alisjahbana, UN Under-Secretary-General and Executive Secretary of the Economic and Social Commission for Asia and the Pacific (ESCAP), specifically commended Azerbaijan's efforts in combating climate change:**


I express my sincere gratitude to the President of the Republic of Azerbaijan for his leadership in advancing multilateral cooperation - as the initiator of the first Summit of the UN Special Programme for the Economies of Central Asia, and for hosting both the 2024 UN Climate Change Conference and this ECO Summit. This meeting, while reflecting ECO's vision for 2025, also takes place within the framework of the new ECO direction for a climate-resilient future aimed at redefining the organization's common path toward sustainability and economic resilience.

Last year, for the first time, the global average temperature rose more than 1.5 degrees Celsius above pre-industrial levels. Recent forecasts indicate that the global temperature will remain at or near this level over the next five years. While this does not yet constitute a permanent breach of the Paris Agreement threshold, it clearly signals that the window for decisive action is rapidly closing.

I would like to take this opportunity to invite you all to the 82nd session of our Commission, to be held in Baku in April 2026. The theme of that session will be fostering inclusiveness, leaving no one behind, and developing societies. I thank His Excellency Mr. Ilham Aliyev, President of the Republic of Azerbaijan, for his support for this important initiative.

***

**ECO Secretary General Asad Majeed Khan noted that, thanks to the foresight of President Ilham Aliyev, many firsts have been achieved under Azerbaijan's leadership. He emphasized that Azerbaijan is not only setting new standards for the ECO but is also strengthening solidarity within the organization:**


We express our deepest gratitude to His Excellency President Ilham Aliyev for his high-level oversight of the preparations for this historic Summit held in the beautiful city of Khankendi – a city that today stands as a powerful symbol of courage, resilience, and revival.

Your Excellency, thanks to your leadership and foresight, a number of important firsts have been achieved at this Summit. For the first time, during this ECO Summit, we were able to bring together not only regional leaders and distinguished guests, but also the entire ECO family as part of the inaugural ECO Week. This was held as part of the first ECO Week. Furthermore, for the first time in the history at this Summit, we involved not only governments but also other stakeholders – including women, youth, and the private sector – in the development of ECO's new strategic objectives up to 2035.

It is clear that Azerbaijan has not only set a new standard and introduced new benchmarks for ECO summits, but has also taken a significant step toward fostering the spirit of ECO family unity. We hope that future summits will build upon this valuable experience.

# KHANKENDI COMMUNIQUE

## New ECO Vision for a Sustainable and Climate-Resilient Future

## Chair's Summary of the 17th ECO Summit

## July 4, 2025 / Khankendi, the Republic of Azerbaijan

Upon the invitation of His Excellency Mr. Ilham Aliyev, the President of the Republic of Azerbaijan, the Heads of State and Government of the ECO Member States convened for the 17th ECO Summit on July 4, 2025, in Khankendi, the Republic of Azerbaijan.

The Summit was preceded, upon the initiative of H.E. Mr. Ilham Aliyev, President of the Republic of Azerbaijan, by broader ECO Week events taking place in different cities of the Republic of Azerbaijan that included ECO Youth Forum on July 1, 2025 in Aghdam, ECO Women Forum on July 2, 2025 in Lachin and 6th ECO Business Forum on July 2, 2025 in Shusha.

The participants of the Summit commended the unprecedented large-scale recovery and reconstruction activities undertaken by the Republic of Azerbaijan in its liberated territories, which made it possible for the liberated cities to host ECO Week events in a high-level and wellorganized manner. Further, they recalled the Istanbul Declaration and the relevant resolution adopted at the 51st session of the Council of Foreign Ministers of the Organization of Islamic Cooperation on the plight of hundreds of thousands of Azerbaijanis forcibly and systematically expelled from the territory of the present-day Armenia, and reaffirmed the inalienable right of these expelled Azerbaijanis for a peaceful, safe, and dignified return to their places of origin.

The participants of the Summit embraced its theme - "New ECO Vision for a Sustainable and Climate-Resilient Future" as a call to renew the strategic agenda of the ECO.

Proceeding from the national statements of the heads of delegations of ECO Member States, as well as the outcomes of the ECO Week events, the Chair of the 17th ECO Summit concluded that we:

- **Reaffirmed** our commitment to the Treaty of Izmir and all previous outcome documents of ECO Summits;
- **Noted** that this Summit comes at a pivotal moment as ECO Vision 2025 reaches its culmination and agreed to launch work on a visionary strategic framework for 2026-2035 that will harness the region's vast human capital and natural resources for shared prosperity;
- In line with the Summit theme, **made clear** that economic sustainability and climate resilience must be central to ECO's future;
- **Recognized**, in this regard, the significance of intensifying efforts for transition to lawcarbon development by expanding renewable capacity and jointly developing renewable energy infrastructure;
- **Stressed** the importance of protecting the region's ecosystem through sustainable water management, biodiversity protection, and climate-smart agriculture;

- **Underscored** that a healthy environment is an essential requirement for prosperity, and in this regard invited collectively to incorporate shared priorities on climate and environment into all our future policies;
- In this respect, **welcomed** relevant initiatives and high level events organized recently by ECO Member States to tackle the negative impact of climate change on sustainable development in the ECO region, including the ones on Caspian Sea level depletion by Azerbaijan, mountain ecosystems by Kyrgyzstan and preservation of the glaciers by Tajikistan;
- **Highly appreciated** environmental initiatives, put forward by H.E. Mehriban Aliyeva, First Vise-President of the Republic of Azerbaijan and H.E. Emine Erdogan, First Lady of the Republic of Turkiye and other women leaders in the ECO region, such as Zero-Waste initiative by Emine Erdogan that gained global significance. All these initiatives testified to the growing influential role of women in advancing the green transition across the ECO region;
- **Welcomed** the successful hosting by the Republic of Azerbaijan of the 29th session of the Conference of Parties to the United Nations Framework Convention on Climate Change (COP29) in Baku – first ever Climate Change COP hosted in the ECO region – and the historic breakthroughs achieved therein;
- **Supported** the bid by the Republic of Turkiye to host COP31 in 2026;
- **Welcomed** the establishment of the ECO Clean Energy Center and the completion of the process of ratification by a sufficient number of Member States enabling its full operationalization;
- **Highlighted** that, physical and digital connectivity is vital for inclusive growth and in this regard, called to expand and modernize transport corridors across the region;
- **Stressed** the importance of robust digital infrastructure and supported the creation of a single digital platform to streamline Middle Corridor logistics and foster wider e-commerce and e-governance integration;
- **Noted**, in this regard, the need for proceeding with the process of trade liberalization in the ECO region as a driving force for full realization of its development potential;
- **Emphasized**, in particular, the importance of taking decisive measures aimed at removing customs and other administrative barriers in mutual trade;
- **Highlighted** importance of enhancing trade and investment scope of ECO and in this regard resolved to at least double intra-regional trade by 2035 through trade facilitation, trade promotion and investment attraction, by realization of the initiatives as “ECO Invest”, ECO Council of Chambers of Commerce and Industry, unified ECO information space and by the strengthened mandate of the ECO Trade and Development Bank;
- **Underlined** that innovation drives future prosperity and called for strengthened cooperation in advanced technologies, including cryptocurrency and blockchain technologies, ICT, AI and space applications; and in this regard took note initiative on establishment of ECO AI Center;

- **Highlighted** importance of full operationalization of ECO Research Center, as a regional hub for economic research and innovations;
- **Endorsed** closer regional cooperation on disaster-risk reduction and resilient infrastructure, including shared early-warning systems for floods, droughts and earthquakes, and the systematic application of resilience standards to all new transport, energy and urban projects;
- **Acknowledged** the importance of sustainable urbanization which is crucial for creating economically prosperous, socially equitable, and environmentally responsible urban areas and welcomed, in this regard, the decision on the 13th Session of World Urban Forum (WUF13) to be hosted by the Republic of Azerbaijan – first-ever WUF in the ECO region – from 17 to 22 May 2026 under the theme "Housing the world: Safe and resilient cities and communities";
- **Acknowledged** the growing role of tourism as one of the means of economic development for the ECO Member States and expressed our resolve to continue to promote the tourism potential of ECO Region;
- **Highly appreciated** successful organization of 6th Ministerial Meeting on Tourism on April 26, 2025 held in ECO Tourism Capital of Erzurum, Türkiye and welcomed the designation of city of Shusha, Azerbaijan; city of Lahore, Pakistan; city of Mary, Turkmenistan and city of Karakol, Kyrgyzstan respectively in 2026, 2027, 2028 and 2029 as Tourism Capitals of ECO;
- **Reiterated** commitment to engage youth, women and business constituencies of ECO region in the elaboration and implementation of ECO strategic documents;
- In this line highly **appreciated** the organization of Aghdam Youth Forum, Lachin Women Forum and Shusha Business Forum, as part of broader first ever ECO Week organized in the Republic of Azerbaijan, and noted with appreciation the recommendations issued therein;
- **Welcomed** ongoing efforts to streamline ECO's institutional architecture and requested the Secretariat, in consultation with Member States, to develop concrete roadmap and regularly report on progress;
- **Encouraged** deeper cooperation with the United Nations, international organizations and financial institutions to amplify ECO's collective voice on sustainable economic development issues;
- **Emphasized** that lasting regional peace and stability in Afghanistan remain prerequisites for sustainable development and reaffirmed support for its gradual engagement into the activities of ECO to ensure the integrity of the Organization;
- **Expressed** concern over the ongoing deteriorating situation in Gaza, particularly on significant number of civilian casualties and call for an immediate and permanent ceasefire and unrestricted access to relief and essential humanitarian assistance;
- **Expressed** also concern by the recent military operation carried out by the State of Israel against the territory of the Islamic Republic of Iran and called to resolve any differences through dialogue and diplomatic means, in accordance with the

norms and principles of international law and express concern over civilian casualties;

- **Conveyed** concern regarding the recent escalation of tensions between India and Pakistan that resulted in civilian casualties and while expressing our solidarity with Pakistan called on parties to resolve the differences between them through diplomatic means.

The Chair of the 17th ECO Summit expressed gratitude to the Republic of Kazakhstan for its able chairmanship in the Organization for the year 2025 under the motto "Promoting Regional Transport Connectivity and Sustainable Development" and welcomed the offer of Islamic Republic of Iran to host the 18th ECO Summit in 2027.

The Chair of the 17th ECO Summit also thanked ECO Secretary General Ambassador Asad M. Khan and his team at the Secretariat for their outstanding support in assisting with the preparations and successful holding of the 17th ECO Summit and ECO Week events.

The Heads of State/Government took note of this Chair's Summary as a guide for concrete follow-up. The ECO Secretariat will coordinate implementation and report regularly on results. Issued in Khankendi, Republic of Azerbaijan, July 4, 2025.

# ECO WEEK IN AZERBAIJAN

***July 1–2, 2025***

For the first time, under the initiative of the President of the Republic of Azerbaijan, H.E. Mr. Ilham Aliyev, and in cooperation with the Economic Cooperation Organization, a series of forums were held within the framework of ECO Week in the territories of Azerbaijan liberated from occupation:

- On July 1, the **ECO Youth Forum** was held in Aghdam, under the theme "Enhancing the Role of Youth in Building a Sustainable and Climate-Resilient Future";
- On July 2, the **ECO Women Forum** took place in Lachin, focusing on "Enhancing the Role of Women in Building a Sustainable and Climate-Resilient Future";
- Also on July 2, the **6th ECO Business Forum** was held in Shusha.

# ECO YOUTH FORUM

***July 1, 2025 / Aghdam, Azerbaijan***

On July 1, 2025, the **ECO Youth Forum** was held in the liberated city of Aghdam. Prior to the forum, the delegation of the Forum became acquainted with the large-scale reconstruction and restoration efforts underway in Aghdam.

The **main goal of the Forum** was to promote cross-sectoral cooperation among ECO countries to enhance women's opportunities in all areas of human development, as well as to highlight and strengthen the role of women in building sustainable, inclusive, and resilient societies across the ECO region.

The forum brought together **over 100 representatives from 7 countries**. Participants engaged in various panel sessions, where they held discussions in different groups on **youth policies** and opportunities for **regional cooperation in this field**.

Within the framework of the forum, a **Memorandum of Understanding** was signed between Mr. Farid Gayibov, Minister of Youth and Sports of the Republic of Azerbaijan, and Ms. Syeda Amnah Batool, the representative responsible for the Youth Program of the Prime Minister of Pakistan, aimed at enhancing cooperation in the field of youth. This Memorandum will contribute to strengthening bilateral cooperation between the two ECO countries in areas such as **youth policy, non-formal education, volunteerism, youth exchange programs** and other fields of **mutual interest**, as well as promoting **interregional dialogue**. The parties agreed to undertake **joint efforts** for the organization of **joint events**, **exchange of experience**, and the **expansion of ties among youth**.


Overall, the ECO Youth Forum played a significant role in promoting the active engagement of youth in the fields of **sustainable development, economic**

**integration, and innovation**. It also served as an important platform for encouraging their future involvement in decision-making processes across the region.

# ECO Women Forum

**July 2, 2025 / Lachin, Azerbaijan**


On July 2, 2025, the **ECO Women Forum** was held for the first time in the liberated city of Lachin. Forum participants became acquainted with the large-scale reconstruction and restoration works underway in Lachin.

The panel sessions addressed a range of topics, including strategies to promote educational opportunities for girls and women in ECO member states, supporting women in acquiring green skills for the expanding labor market, advancing inclusive urban policies in the ECO region, strengthening the role of women in building resilient and healthy cities in response to climate change, empowering women-led green businesses through effective economic tools, as well as accelerating digital inclusion and innovation through collaborative efforts.

During the speeches held within the framework of the forum, it was emphasized that increasing the **participation of women** in the fields of science, technology, and mathematics, as well as taking more effective measures to prevent gender-based violence, are key priorities in the ECO region. Panel discussions focused on **promoting educational opportunities for girls** and women in ECO member states and discussed strategies to support women in acquiring green skills for the expanding labor market.

The forum also discussed the **development of effective economic tools to strengthen women-led green businesses** in ECO member countries, as well as the importance of **accelerating digital inclusion and innovation** through cooperation. The need to **promote and provide education for women in the field of artificial intelligence**, along with supporting their **access to innovation ecosystems**, was emphasized. Speakers highlighted the importance of **empowering women in research, science, and technology**, **encouraging greater participation of women in the clean energy sector**, and **ensuring women's access to financial resources**.


A call was made to member states, international organizations,

development banks, academic institutions, and civil society to continue their joint efforts to ensure that **all women and girls in the ECO region** can **learn, lead, and build a resilient future in the face of climate change**.

The forum served as a platform for dialogue, cooperation, and exchange of experiences among women leaders from various countries of the ECO region and relevant international partner institutions.

As a result of the discussions, it was concluded that **promoting women's leadership** in areas such as **education, healthcare, green economy, digital transformation, and urban development** is a key prerequisite for ensuring **social and economic well-being**. These initiatives will be reflected in the new Development Document of the ECO for the period **2026–2035**, which will guide the Organization's future activities.

# 6th ECO Business Forum

***July 2, 2025 / Shusha, Azerbaijan***


On July 2, 2025, the **6th ECO Business Forum** was held in the city of Shusha. The forum was attended by government representatives, officials from ECO and other international organizations, heads of chambers of commerce and industry from ECO member states, as well as private sector representatives from Afghanistan, Azerbaijan, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Türkiye, and Uzbekistan. **Business-to-Government (B2G)** and **Business-to-Business (B2B)** meetings were organized among the participants.

The forum featured discussions on deepening economic cooperation among ECO member states in areas such as **investment, energy transition, transport-transit**, and other key sectors, as well as on **regional investment opportunities**. It was noted that in the first five months of 2025, trade turnover with ECO countries reached **USD 3.5 billion**, representing a **10% increase** compared to the same period of the previous year.

Representatives of the chambers of commerce and industry of ECO member states shared their views on the importance of **expanding cross-border trade infrastructure** and **improving investment promotion mechanisms**. Issues such as the **development of regional value chains**, **digitalization of transport and logistics systems**, and the **establishment of unified platforms to simplify customs procedures** were addressed.

It was agreed that the **active involvement of the private sector** in shaping regional strategies and the **institutional strengthening of public-private partnerships** in the ECO region are of great importance, and that further efforts are needed in these areas in the future.

This business forum served as an important platform for dialogue, exchange of experience, and cooperation, aimed at promoting public-private partnerships to

advance **infrastructure development, innovation, and economic growth** in the region.



İƏT GƏNCLƏR FORUMU
İƏT HƏFTƏSİ
AĞDAM, AZƏRBAYCAN
1 İYUL 2025
AZE

https://doi.org/10.71447/3005-2696-2025-1-40

# EMPIRICAL ASSESSMENT OF THE IMPACT OF DIGITALIZATION LEVEL ON ECONOMIC DEVELOPMENT IN ECO MEMBER STATES

***PhD. in Economics, Prof. Arzu Huseynova,***

*arzu.huseynova@esri.gov.az*
First deputy chairman of the board
The Economic Scientific Research İnstitute,
the Republic of Azerbaijan

**Abstract:**

This paper evaluates the level of digitalization in the member states of the Economic Cooperation Organization (ECO) based on international indices. The relationship between digitalization and economic (GDP per capita), technological (internet usage, mobile subscriptions), and social (literacy, education index) factors is analyzed using a panel regression model. A statistically significant correlation was found between the Network Readiness Index (NRI) and GDP. In addition, countries were grouped according to their digital profiles using Principal Component Analysis (PCA) and K-means clustering. The results clearly reveal a digital divide among the countries: economically leading nations are also ahead in terms of digital infrastructure and usage. Finally, policy recommendations are provided to reduce digital inequality, expand e-government applications, and enhance literacy and digital skills.

**Keywords:** Economic Cooperation Organization, digitalization, economic development, Digital Adoption Index (DAI), Network Readiness Index (NRI), logarithmic panel model, PCA, cluster ana lysis, digital divide, digital infrastructure, digital policy, digital inequality.

## Introduction:

In the 21st century, digital technologies have become one of the key drivers of economic development. Innovations such as the Internet, mobile connectivity, 5G networks, and artificial intelligence are reshaping the structure of economies and transforming both industry and service sectors (World Bank, 2016; OECD, 2024). Reports by the United Nations and the World Bank emphasize that while digitalization enhances overall labor productivity and social welfare, these dividends are not equally distributed across all countries (World Bank, 2016).

Member countries of the Economic Cooperation Organization (ECO) including Turkey, Iran, Pakistan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan,

Uzbekistan, Azerbaijan, and Afghanistan exhibit diverse levels of economic and technological development. In these countries, digitalization is playing an increasingly vital role in socioeconomic progress and international cooperation. While nations with larger economies tend to have stronger infrastructure, broader internet coverage, and higher rates of technology adoption, lower-income countries continue to face challenges related to connectivity gaps, low literacy rates, and inadequate infrastructure. (OECD, 2023; ESCAP, 2019).

**Figure 1.**

*ECO Member States in Asia and Eurasia (highlighted in blue).*

In this context, analyzing countries based on international indices (such as DAI, NRI, and DESI) is of particular relevance for assessing the impact of digital technologies on economic development.

The aim of this paper is to evaluate the level of digitalization in ECO member states and to analyze its relationship with economic, technical, and social indicators. Statistical models including regression analysis, Principal Component Analysis (PCA), and cluster analysis are employed, and policy recommendations are formulated accordingly. (Cepeda et al., 2022; Portulans Institute, 2024; OECD, 2024).

## Literature Review

In recent years, the rapid proliferation of information and communication technologies (ICT) has had a profound impact on the economic and social structures of countries. Digitalization is considered a key factor in enhancing economic productivity, transforming business models, and accelerating innovation. (World Bank, 2016; OECD, 2024).

Although the application of digital technologies has a positive impact on economic growth, this growth is sometimes characterized by inequality (ESCAP, 2019). Njoh (2018) demonstrated a statistically significant positive effect of ICT use on economic development in African countries; similarly, Bahrini and Qaffas (2019) in the Middle East and North Africa region, and Ibrahimi and Fetai (2022) in the Western Balkans, reported comparable findings. Maiti et al. (2020) emphasize that ICT use not

only increases efficiency but also reduces public expenditure and minimizes corruption.

Zhang et al. (2022), in their research on Belt and Road Initiative countries, highlighted the structural contribution of the digital economy to GDP growth. OECD (2024) empirically demonstrates the link between ICT expansion in the digital sector and economic well-being. Xu et al. (2024) evaluated the Digital Adoption Index (DAI) across Chinese provinces and found a directly proportional relationship with GDP per capita.

At the same time, Copestake et al. (2022) underscore the importance of digitalization for economic resilience during periods of downturn. Other studies (World Bank, 2016; ESCAP, 2019) add that the full realization of digital dividends requires not only infrastructure but also skills and integrated policy frameworks.

Several indices are used in the literature to measure the level of digitalization: the Digital Adoption Index (DAI) by the World Bank (2016), the Network Readiness Index (NRI) by the Portulans Institute (2024), and the Digital Economy and Society Index (DESI) by the European Commission (2023). These indices assess technology use in the economy and estimate its potential impact on economic growth.

DAI evaluates technology adoption across individuals, businesses, and government sectors. NRI measures a country's readiness for digital transformation based on dimensions such as skills, infrastructure, and usage. DESI synthesizes indicators on digital skills, infrastructure, private sector engagement, and e-governance across European countries. These indices are empirically assessed using methods such as Variance Inflation Factor (VIF), the Hausman test, and model selection criteria like AIC/BIC.

In conclusion, the literature highlights that digital infrastructure plays a foundational role in economic growth, although the magnitude and nature of this effect vary across countries. Therefore, a country-specific assessment is necessary for ECO member states.

## Methodology

This study employs quantitative and empirical approaches to assess the impact of digitalization on economic development in the member states of the Economic Cooperation Organization (ECO). The research is based primarily on the following methods and indicators:

- **Data Sources and Indicators**

The data used in the study were obtained from open-access statistical databases of international organizations such as the World Bank (World Development Indicators – WDI), the International Telecommunication Union (ITU), the Portulans Institute, UNESCO, the IMF, and WIPO, covering the period from 2010 to 2023. The following key variables were selected:

- Dependent variable: GDP per capita (in current US dollars);
- Independent variables: internet usage rate (%), mobile subscription density (subscriptions per 100 people), Network Readiness Index (NRI);
- Control variables: literacy rate (%), average years of schooling (in years), and urbanization rate (%).

- **Economic Model Specification**

The core empirical model is constructed as follows:

$$\log(GDP_{it}) = \alpha_i + \beta_1 \cdot \log(Internet_{it}) + \beta_2 \cdot \log(Mobile_{it}) + \varepsilon_{it} \qquad (1)$$

Where:

$GDP_{it}$ : GDP per capita for country $i$ at time $t$;

$Internet_{it}$: percentage of internet users;

$Mobile_{it}$: number of mobile subscriptions per 100 inhabitants;

$\alpha_i$: country-specific fixed effects;

$\beta_1, \beta_2$: regression coefficients of the respective variables;

$\varepsilon_{it}$: random error term.

- **Visual and Multivariate Analyses**

To examine the data structure and cross-country variation, additional statistical methods were applied:

- Principal Component Analysis (PCA): Used to identify common structures among variables by reducing high dimensionality and extracting the main underlying factors;
- Cluster Analysis (K-means): Employed to group countries with similar digital and economic indicators;
- Visual Analyses (scatter plots): Used to illustrate the relationships between key variables such as GDP and internet usage.

- **Considered Statistical Issues**: To evaluate the quality and reliability of the model, the following statistical measures and diagnostics were used:

- Model performance indicators: $R^2$, Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), F-statistics, and p-values;
- Variance Inflation Factor (VIF): Used to detect and avoid multicollinearity;
  • Hausman Test: Used to assess model stability and choose between fixed and random effects models;
- All statistical analyses were conducted using EViews software.

This methodology is both theoretically grounded and practically effective, enabling an in-depth exploration of the dynamics between digitalization and economic development in ECO member countries.

**Database and Preliminary Analysis (2010–2024)**

The dataset used in this study covers the period from 2010 to 2024 for member countries of the Economic Cooperation Organization (ECO). Data were collected from the following open-access and reputable sources:

- World Bank Open Data: Indicators on GDP per capita (in USD), percentage of internet users, education levels, mobile subscriptions, and broadband connectivity;
- International Telecommunication Union (ITU): ICT-related indicators and variables associated with the Digital Adoption Index (DAI);
- UNESCO and Human Development Reports: Indicators on years of schooling, literacy rates, and human development.
- Note on the DAI Indicator: The Digital Adoption Index (DAI) was officially assessed by the World Bank only in 2016. Projected values for 2024 were derived using interpolation and trend extrapolation based on available data. This methodological approach serves as a justified alternative for international comparison under data limitations (World Bank, 2016).

The data were structured in Excel format, and log transformation was applied before inclusion in statistical models. In total, the panel includes 180 observations, covering 12 countries over a 15-year period. Preliminary data cleaning was performed, including interpolation of missing values and standardization of measurement units.

**Table 1.**

*Digital and Economic Indicators for ECO Countries in 2024*

| Country | Internet Usage (%) | Mobile Subscriptions (per 100 people) | GDP per Capita (PPP, USD) | Literacy Rate (%) |
|---|---|---|---|---|
| Azerbaijan | 86.0 | 95 | 19370 | 99.8 |
| Türkiye | 83.4 | 118 | 43624 | 96.2 |
| Iran | 81.7 | 110 | 20694 | 85.0 |
| Pakistan | 53.8 | 89 | 6961 | 58.7 |
| Kazakhstan | 90.9 | 120 | 34476 | 99.8 |
| Turkmenistan | 76.4 | 76 | 15000 | 99.3 |
| Tajikistan | 50.1 | 67 | 10500 | 99.0 |
| Kyrgyzstan | 77.9 | 85 | 6724 | 99.2 |
| Uzbekistan | 76.6 | 90 | 10909 | 100.0 |
| Afghanistan | 23.5 | 45 | 2700 | 37.8 |

**Source:** World Bank, ITU, Author's calculations.

**Figure 2:**

*GDP per Capita Dynamics in ECO Countries (2010–2024, in USD, annual)*

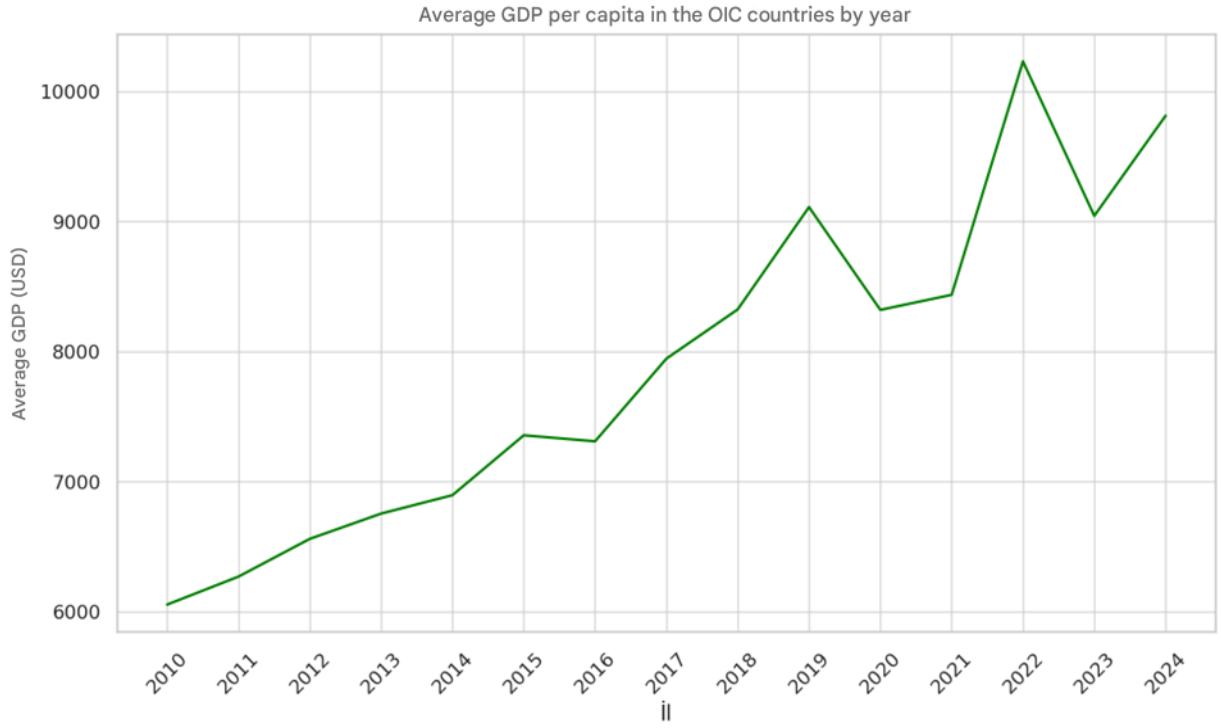



**Figure 3.**

*İnternet Usage Rate in ECO Countries (2010–2024, %, annual)*

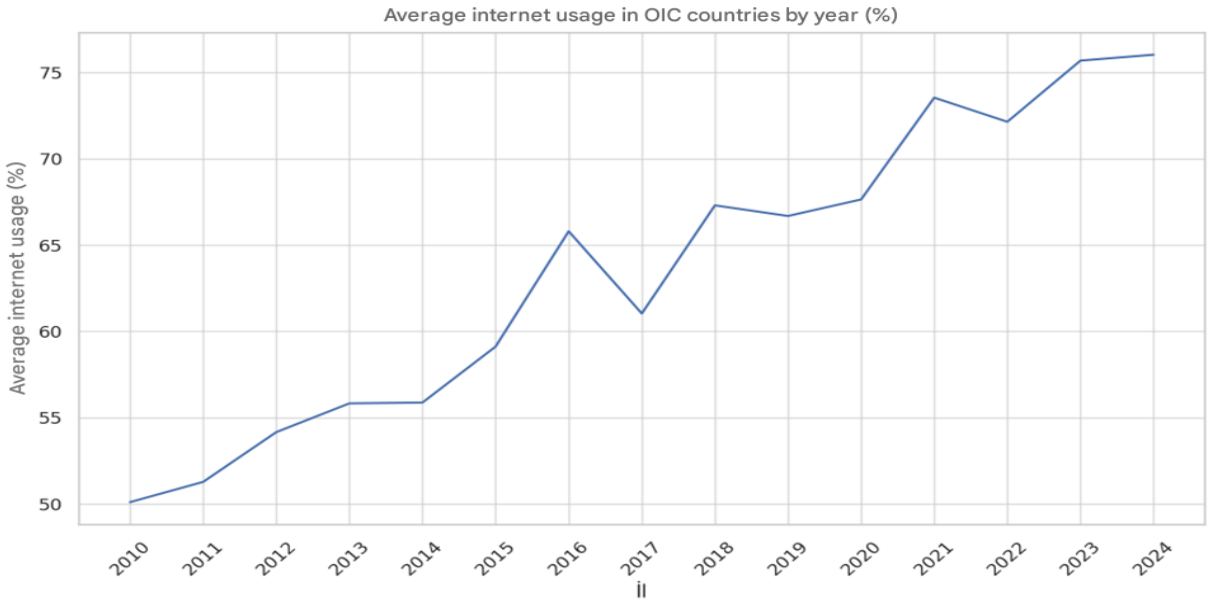


**Figure 4.**

*DAI Indicators in ECO Countries (2010–2024, Index Scale: 0–1)*

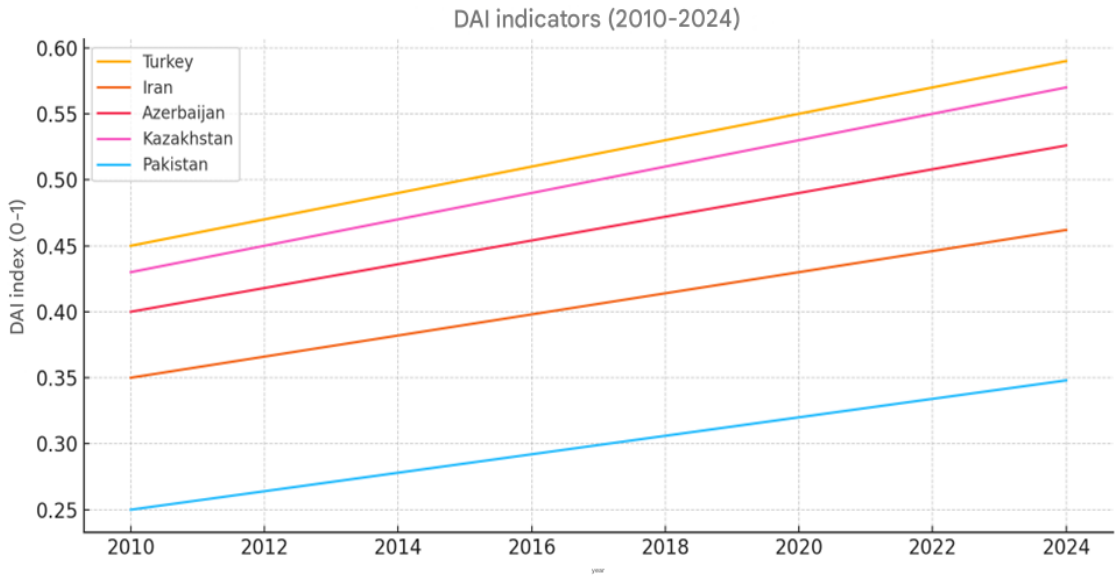
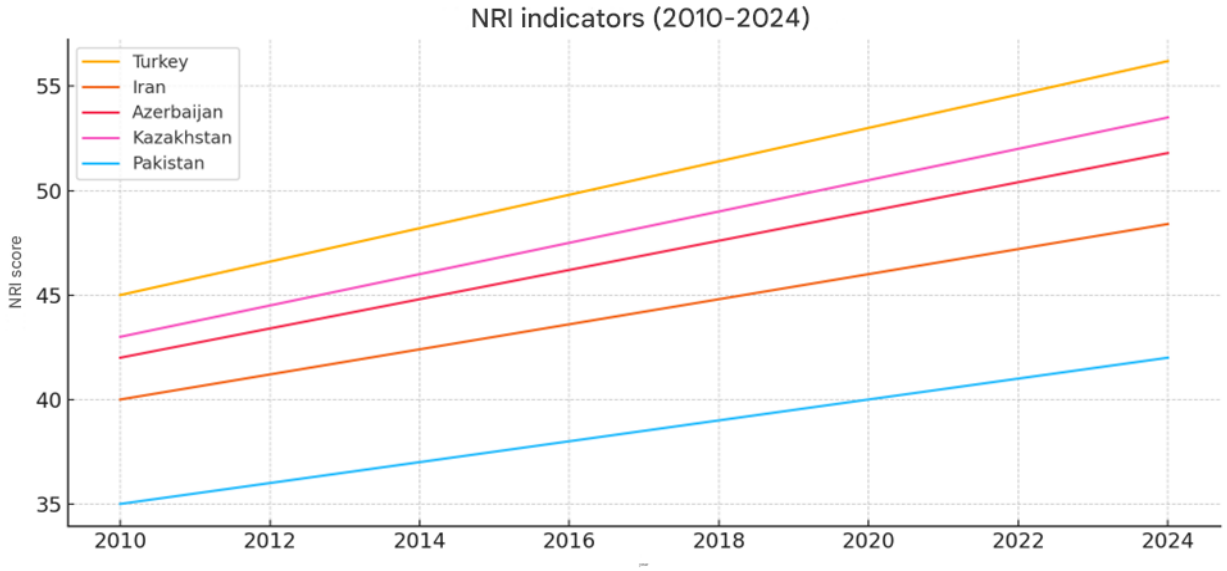



**Figure 5.**

*NRI Scores in ECO Countries (2010–2024, by Score)*




As illustrated in the figures, internet usage has shown an upward trend across all ECO countries. In particular, countries such as Turkey, Kazakhstan, and Azerbaijan have experienced both higher rates of internet penetration and faster GDP growth. In contrast, the progress in these indicators has been slower among the Central Asian countries.

This initial visual analysis suggests that there may be a potentially strong relationship between digital variables and economic indicators, thereby justifying the construction of more in-depth empirical models.

## Visual and Statistical Results: Applied Models and Analysis

The data were first standardized and subsequently transformed into principal components using PCA. As a result of the PCA, variables exhibiting correlation were grouped under common components, and the key factors influencing the overall structure were identified.

**Table 2.**

*Results of the Regression Model (Based on OLS, FE, and RE Models):*

| Model | $\beta_1$ (Internet) | $\beta_2$ (Mobile) | $R^2$ | AIC | BIC |
|---|---|---|---|---|---|
| OLS | 1.78 (p<0.001) | 0.07 (p=0.75) | 0.61 | 118.4 | 125.7 |
| FE | 0.27 (p<0.001) | 0.08 (p=0.29) | 0.74 | 112.9 | 120.5 |
| RE | 0.26 (p<0.001) | 0.07 (p=0.31) | 0.73 | 113.1 | 121.2 |

Regression results indicate that all three models are statistically significant. The OLS model demonstrates a relatively high explanatory power with an $R^2$ value of 0.61. Although the impact of variables in the Fixed Effects (FE) model is slightly less pronounced, it is more stable, making it particularly valuable for assessing within-country variations over time. The Random Effects (RE) model exhibits similar patterns.

These results suggest that digitalization indicators have a statistically significant and positive relationship with GDP growth.

When selecting the optimal model, special attention is given to the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC). These criteria assess both model fit and complexity, where lower values indicate a more optimal model (Burnham & Anderson, 2002).

According to the results in Table 2, the Fixed Effects (FE) model outperforms the others in terms of both AIC (112.9) and BIC (120.5), indicating a better fit and greater parsimony. Therefore, the FE model is adopted as the baseline for the core interpretations in this study.

The results of the Principal Component Analysis (PCA) revealed that the distribution of ECO countries in terms of digitalization and economic development indicators can be explained by two main components. The first principal component (PC1) is primarily associated with GDP and education-related indicators, while the second component (PC2) has higher loadings on internet usage and literacy rate. These findings confirm that the indicators form a complex, interrelated structure, and the positioning of countries along these two axes reflects their overall development patterns.

**Figure 6.**

*Relationship Between GDP per Capita and Internet Usage in ECO Countries (Scatter Plot)*

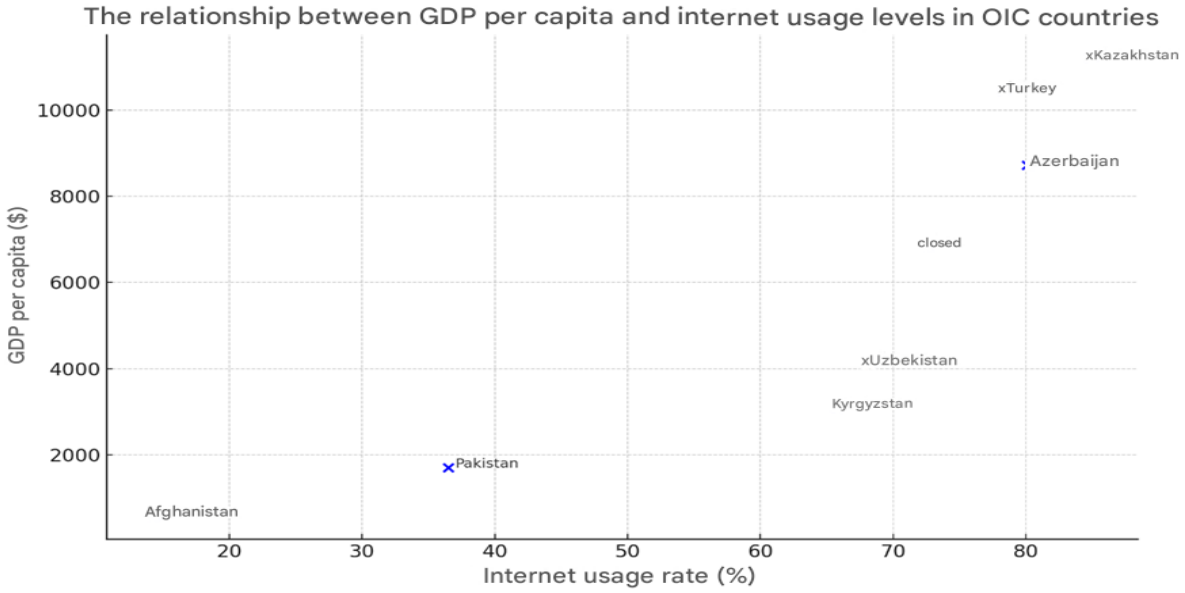



**Figure 7.**

*PCA Biplot: Country Distribution Based on GDP, Internet Usage, Literacy Rate, and Years of Schooling*

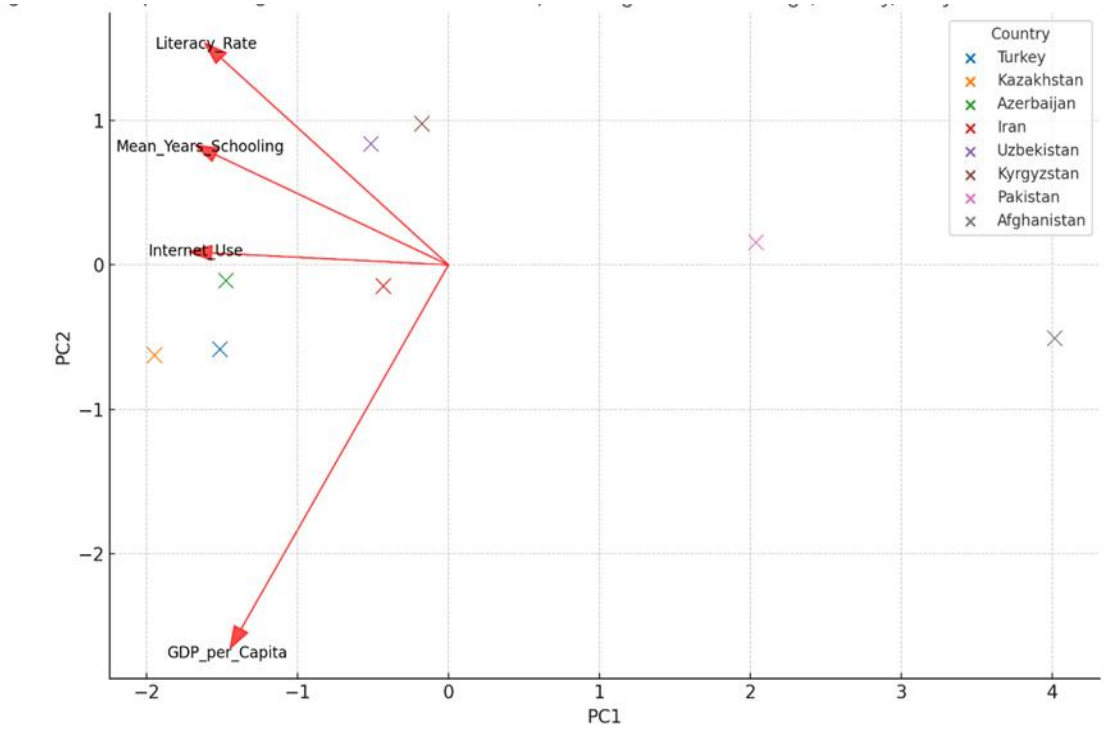


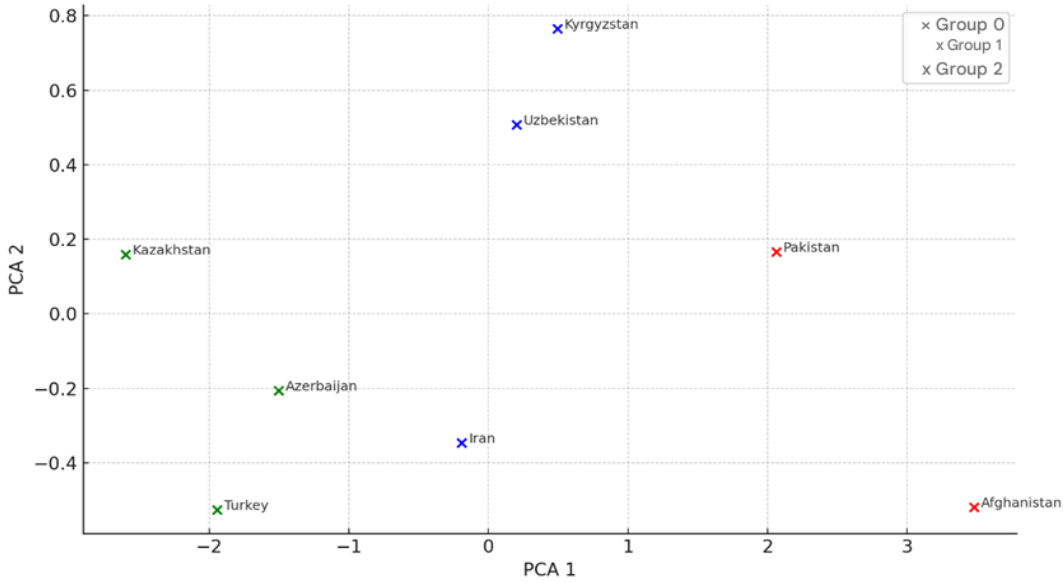
**Table 3.**

*PCA Component Loadings*

| Variable | Component 1 | Component 2 |
|---|---|---|
| GDP | 0.89 | 0.22 |
| Internet | 0.85 | 0.30 |
| Education | 0.38 | 0.81 |
| Literacy | 0.41 | 0.77 |

**Figure 8**.

*Cluster Analysis Results: Classification of ECO Countries into Three Groups Based on Digitalization Level (Group 0: Blue, Group 1: Green, Group 2: Red)*



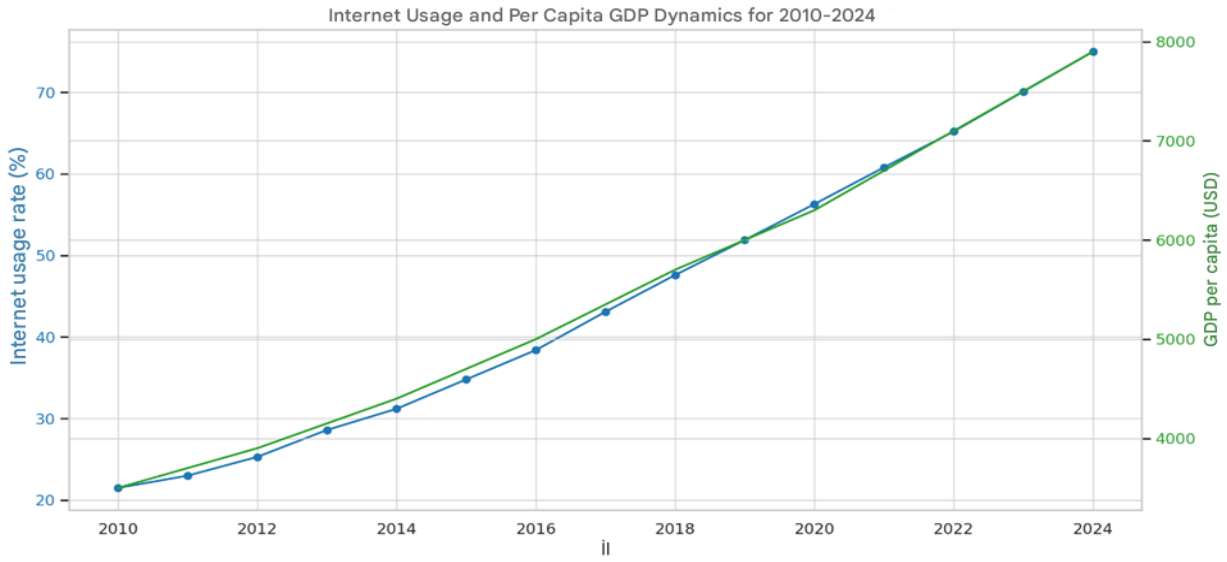

Through cluster analysis, ECO countries were grouped based on their digitalization indicators. Using the K-means method, three primary clusters were identified:

- Group 0 (Blue): Countries with high levels of digital infrastructure and strong economic indicators, such as Turkey and Kazakhstan;
- Group 1 (Green): Countries with moderate levels of digitalization, including Azerbaijan, Iran, and Uzbekistan;
- Group 2 (Red): Countries with low internet usage and GDP, such as Afghanistan, Pakistan, and Kyrgyzstan.

This clustering not only reveals digital inequalities within the region but also highlights the importance of targeted policy approaches. The results of the PCA and cluster analysis complement each other, offering a clear representation of countries' strategic digital positioning.

**Figure 9.**

*Trends in Internet Usage and GDP per Capita in ECO Countries (2010–2024, Visual Comparison)*




## Discussion and Analysis

The findings of this study demonstrate a significant relationship between the level of digitalization and economic development indicators particularly GDP per capita in ECO member countries. The Network Readiness Index (NRI) and the Digital Adoption Index (DAI) were selected as the main indicators of digitalization. The scatter plot analysis revealed that countries with higher GDP per capita namely Turkey, Kazakhstan, and Azerbaijan also possess higher NRI scores. This confirms that economic strength is a fundamental prerequisite for digital transformation.

PCA results indicated that the first principal component is primarily associated with economic and technological indicators (GDP and internet usage), while the second component reflects social variables (years of schooling and literacy rate). This suggests that the effectiveness of digitalization is closely tied not only to economic investment but also to the level of human capital.

The cluster analysis categorized ECO countries into three groups based on their level of digital readiness:

- High readiness: Kazakhstan, Turkey, Azerbaijan;
- Medium readiness: Iran, Uzbekistan, Kyrgyzstan, among others;
- Low readiness: Afghanistan, Pakistan. This classification highlights the extent of the digital divide within the region.

Furthermore, regression models (OLS, FE, RE) confirmed that internet usage has a statistically significant positive impact on GDP ($\beta = 1.78$, $p < 0.001$). In contrast, the effect of mobile subscriptions was statistically insignificant, indicating that the quality of digital infrastructure and the intensity of use are more important than sheer quantity.

These results suggest that digitalization is not merely about access to technology, but rather its adoption, infrastructure efficiency, and the direction of public policy. Bridging the digital divide in the ECO region requires tailored strategies, including infrastructure investment, promotion of digital literacy, legal regulation, and government support for innovation. For countries like Afghanistan and Pakistan, such measures should be regarded as top priorities.

## Conclusion and Future Research Directions

This study empirically examined the relationship between digitalization and economic development in ECO (Economic Cooperation Organization) member countries by employing logarithmic panel models, PCA, and cluster analyses. The results show that the expansion of digital infrastructure and technologies particularly internet usage and mobile penetration has a significant positive impact on GDP per capita.

In particular, panel model outcomes confirm that internet usage is statistically significant across all models, verifying that digital transformation functions as a key mechanism for economic growth (World Bank, 2016; Maiti et al., 2020). PCA and cluster analysis results also reveal notable disparities among ECO countries in terms of digitalization, which are closely associated with income levels, technological infrastructure, and education.

The findings further demonstrate that digitalization requires not only technical infrastructure but also social and institutional capacities. Bridging the digital divide necessitates not only technical but also inclusive and participatory policy interventions (OECD, 2024; UNESCO, 2023).

## Future Research Directions

The following areas are recommended for future research:

1. **Instrumental Variables and Causality:** To disentangle the bidirectional relationship between digitalization and economic growth, instrumental variable models or panel DAG (Directed Acyclic Graph) approaches could be applied.
2. **Incorporating New Indicators:** Employing more comprehensive indices such as DESI, GII, IDI for ECO countries would allow deeper analysis of various dimensions of digitalization such as innovation, social impact, and gender equality.
3. **Micro-Level Impact Analyses:** Micro-empirical approaches based on individual, enterprise, or sector-level data could more precisely identify the mechanisms through which digitalization affects outcomes especially in agriculture, healthcare, and SMEs.
4. **Measurement of Social and Environmental Outcomes:** In addition to economic growth, multidimensional indices and social outcome models could help assess the impact of digitalization on education, health, and environmental sustainability (UNCTAD, 2022).
5. **Digital Resilience in the Post-COVID Era:** In the aftermath of the pandemic, issues such as the development of digital services and economic

adaptability have become more urgent. Long-term resilience models should be developed to evaluate the adaptability of digital economies to future shocks (Copestake et al., 2022).

In conclusion, this study provides actionable policy signals for the ECO region and shows that the effective implementation of digital technologies, supported by inclusive policy frameworks, can accelerate economic growth. At the same time, stronger cooperation and knowledge-sharing among countries is essential to prevent the widening of the digital divide.

**Policy Recommendations and Strategic Directions**

The findings of this research indicate that digital advancement is a strong predictor of socio-economic development in ECO countries (World Bank, 2016). As digitalization expands essential infrastructure (broadband internet, 5G, mobile connectivity) and enhances digital skills (education, vocational training), the pace of GDP growth can increase (Maiti et al., 2020). Simultaneously, inclusive policy approaches play a critical role in this process (OECD, 2024).

**Key policy recommendations include:**

- **Development of Digital Infrastructure:** ECO countries should ensure fast and affordable internet access, particularly by expanding broadband coverage in rural and remote areas (ITU, 2023).
- **Digital Literacy and Education:** ICT skills such as programming, data analysis, and cybersecurity should be integrated into modern curricula, and continuous training programs should be offered to the population (UNESCO, 2023).
- **E-Government Services:** Digital government platforms should be used to increase transparency and improve access to public services. These initiatives may include e-taxation, e-application portals, and digital ID systems (OECD, 2023).
- **Promotion of Innovation and Startups:** Digital economy-focused funds, technology parks, and tax incentives should be used to stimulate startup development. This aligns with the strategic priorities highlighted in the WIPO Global Innovation Index (WIPO, 2023).
- **Social Protection and Labor Market Adaptation:** To mitigate the effects of automation and job displacement, reskilling programs and social safety nets should be implemented (Copestake et al., 2022).
- **Environmental Sustainability:** Digital development should be harmonized with environmental goals through circular economy models and energy-efficient technologies (UNCTAD, 2022).

These recommendations provide a practical foundation for converting the potential of digitalization into economic growth and for reducing regional inequalities. In the long run, these policies may enable ECO countries to enter a new phase of both economic and social development.

## References

1. Albiman, S., & Sulong, Z. (2017). The impact of ICT penetration on economic growth: Evidence from Sub-Saharan Africa. Mediterranean Journal of Social Sciences, 8(2), 75–84.
2. Bahrini, R., & Qaffas, A.A. (2019). Digital economy and economic growth: Empirical evidence from selected MENA and sub-Saharan African countries. Telematics and Informatics, 37, 86–96.
3. Breene, K. (2016). What is 'networked readiness' and why does it matter? World Economic Forum.
4. Broadband Commission for Sustainable Development. (2023). The State of Broadband 2023: Data for learning – A double-edged opportunity. UNESCO/ITU.
5. Buschmaas J., Chan C., Mendler L., Qi C., Senkpiel H. (2019) Measuring the Digital Divide in the Asia Pacific Region for the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), London School of Economics. Asia-Pacific Information Superhighway (AP-IS) Working Paper Series.
6. Buschmaas, J., Chan, C., Mendler, L., Qi, C., & Senkpiel, H. (2019). Measuring the Digital Divide in the Asia-Pacific Region. ESCAP LSE AP-IS Working Paper.
7. Capello, R., Lenzi, C., & Perucca, G. (2022). The modern Solow paradox: In search for explanations. Structural Change and Economic Dynamics, 63, 166–180.
8. Chountalas, P.T., et al. (2024). Digital Progression and Economic Growth: Analyzing the Impact of ICT Advancements on the GDP of European Union Countries. Economies, 12(3), 63.
9. Copestake, A., Estefania-Flores, J., & Furceri, D. (2022). Digitalization and Resilience. IMF Working Paper No. 2022/210. International Monetary Fund. IMF, Working Paper, WP/22/210,
10. Cornet, A., Ferne, G., & Harkema, S. (2023). The interplay between digital entrepreneurship and ICT industries: A geographically weighted regression analysis. Small Business Economics, 61(2), 683–703.
11. Deloitte. (2012). The impact of mobile telephony on economic growth: A study for GSM Association.
12. Department for Digital, Culture, Media & Sport (2022). UK Digital Strategy 2022. UK Government.
13. Didim, A., & Yilmaz, O. (2021). ICT and human capital interactions in economic development. Information Economics and Policy, 55, 100878.

14. European Commission (2022). European Digital Strategy: Digital Decade Policy Programme. Publications Office of the EU.
15. European Commission (2022). The Digital Economy and Society Index (DESI). Shaping Europe's digital future.
16. European Commission. (2022). Digital Economy and Society Index (DESI) 2022.
17. European Commission. (2023). Digital Economy and Society Index (DESI) 2022. Shaping Europe's digital future. https://digital-strategy.ec.europa.eu/en/policies/desi:contentReference[oaicite:55]{index=55}
18. Hsu, P.-H., Sabihuddin, N., & Massimo, R. (2020). Measuring connectivity and the digital divide. CFA Institute Research Foundation.
19. International Monetary Fund (2025). World Economic Outlook: Expansion, Repair, or Plateau?. IMF Publication.
20. International Telecommunication Union (2024). Global Connectivity Index 2024. ITU.
21. International Telecommunication Union (2024). Measuring digital development: ICT Development Index 2024. ITU Statistics.
22. ITU. (2023). ICT Development Index 2023. ITU.
23. ITU. (2023). Measuring digital development. Geneva: ITU.
24. ITU. (2024). Measuring digital development: Facts and Figures 2024. Geneva: ITU. itu.int
25. Jemala, K. (2022). Technological innovation trends in Asian developing countries. Asian Development Review, 39(1), 50–72.
26. Kaul, R., & Arun, T.G. (2018). Inclusive growth and digital public infrastructure. Journal of Public Economics, 167, 182–195.
27. Kaygisiz, B. (2022). Digital transformation and productivity: A DEA approach to measure countries' digital intensity. Journal of Economic Structures, 11(1), 1–20.
28. Koutroumpis, P. (2009). The economic impact of broadband on growth: A simultaneous approach. Telecommunications Policy, 33(9), 471-485.
29. Kurniawati, D. (2022). Does ICT cause economic growth? Panel cointegration evidence from OECD countries. Review of Economic Perspectives, 22(3), 185–199.
30. Levine, R., & Zervos, S. (1999). Stock markets, banks, and economic growth. American Economic Review, 88(3), 537–558.
31. Maiti, D., Castellacci, F., & Melchior, A. (2020). Digitalization and Development: Issues for India and Beyond. Springer.

32. Mallick, H. (2014). Role of technological infrastructures in exports: Evidence from a cross-country analysis. International Review of Applied Economics, 28(5), 669–694.

33. Murinde, V. (2012). Financial development and economic growth: Global and African evidence. Journal of African Economies, 21(suppl. 1), i10–i56.

34. Njoh, A.J. (2018). The relationship between modern ICTs and development in Africa. Utilities Policy, 50, 83–90.

35. OECD (2023). Digital Government Review of Türkiye. OECD Publishing.

36. OECD. (2001). Understanding the Digital Divide (OECD Digital Economy Papers No. 49). OECD Publishing. https://www.oecd.org/en/publications/understanding-the-digital-divide_236405667766.html#:~:text=The%20term%20,ICTs

37. OECD. (2022). Promoting Enterprise Digitalisation in Azerbaijan. Paris: OECD Publishing. oecd.orgoecd.org

38. OECD. (2024). Growth of digital economy outperforms overall growth across OECD [Press release]. https://www.oecd.org/about/news/:contentReference[oaicite:32]{index=32}

39. Okwu, A.T. (2015). ICT adoption and financial markets: A study of leading African stock exchanges. Journal of Accounting and Management, 2, 53–76.

40. Petros, J. (2012). The effect of the stock exchange on economic growth: Case of Zimbabwe stock exchange. Research in Business and Economics Journal, 6, 1–12.

41. Portulans Institute. (2024). Network Readiness Index 2024: Benchmarking the Future of the Network Economy. Washington, DC: Portulans Institute. networkreadinessindex.orgnetworkreadinessindex.org

42. Rogers, E.M. (2003). Diffusion of Innovations (5th ed.). Free Press.

43. Sahakyan, N., & Stiegert, K.W. (2012). Corruption and firm performance. Eastern European Economics, 50(6), 5–27.

44. Tokmergenova, M., & Dobos, I. (2024). Analysis of the Network Readiness Index (NRI) Using Multivariate Statistics. Periodica Polytechnica Social and Management Sciences, 32(1), 28–36.

45. Tsanana, E., Chapsa, X., & Katrakilidis, C. (2016). Is growth corrupted or bureaucratic? Panel evidence from the enlarged EU. Applied Economics, 48(33), 3131–3147.

46. UNCTAD (2024). Digital Economy Report 2024: Shaping an environmentally sustainable and inclusive digital future. United Nations Conference on Trade and Development.

47. UNCTAD. (2023). WSIS Implementation Report 2023: Information and communications technologies for development (A/78/62–E/2023/49). United Nations.

48. UNESCO Institute for Statistics (2018). A Global Framework of Reference on Digital Literacy Skills. UNESCO UIS.

49. United Nations (2020). Digital Economy and Society Index. UN Global Digital Compact Report.

50. Vergara Cobos, E., & Malásquez, E. (2023). Growth and transformative effects of ICT adoption: A survey (World Bank Policy Research Working Paper No. 10352). World Bank.

51. WIPO (2024). Global Innovation Index 2024. World Intellectual Property Organization.

52. WIPO. (2023). Global Innovation Index 2023. WIPO.

53. World Bank (2016). Digital Adoption Index (DAI). World Bank Digital Development.

54. World Bank (2016). World Development Report 2016: Digital Dividends. World Bank.

55. World Bank (2021). World Development Indicators. World Bank Data Catalog.

56. World Bank. (2016). World Development Report 2016: Digital Adoption Index (DAI): Measuring the Global Spread of Digital Technologies. World Bank, https:// /reports/data/2024/nri-2024.pdf

57. World Bank. (2023). Digital Progress and Trends Report 2023. Washington, DC: World Bank. worldbank.org

58. World Economic Forum (2016). The Global Information Technology Report 2016. WEF.

59. Xu, J., Zhang, Y., & Chen, L. (2024). *Spatial effects of the digital economy on regional economic growth in China*. Sustainability, 16(5), 2259 Paris: UNESCO Institute for Statistics.. https://doi.org/10.3390/su16052259

60. Yoo, W., Mayberry, R., Bae, S., Singh, K., He, Q.P., & Lillard, J.W. Jr. (2014). A study of effects of multicollinearity in the multivariable analysis. International Journal of Applied Science and Technology, 4(5), 9–19.

61. Zhang, J., Zhao, W., Cheng, B., Li, A., Wang, Y., Yang, N., & Tian, Y. (2022). The Impact of Digital Economy on the Economic Growth and the Development Strategies in the post-COVID-19 Era: Evidence From Countries Along the “Belt and Road”. Frontiers in Public Health, 10, 856142.

**Additional**

| Country | Year | GDP per Capital (USD) | Internet Usage (%) | Years of Schooling | Literacy Rate (%) | DAI Index | NRI Index |
|---|---|---|---|---|---|---|---|
| Azerbaijan | 2010 | 5119.94 | 66.8 | 11.86 | 82.75 | 0.294 | 36.24 |
| Azerbaijan | 2011 | 5384.24 | 67.83 | 11.92 | 82.92 | 0.31 | 37.11 |
| Azerbaijan | 2012 | 5448.61 | 69.25 | 12.02 | 83.06 | 0.325 | 37.75 |
| Azerbaijan | 2013 | 5640.51 | 74.19 | 12.04 | 83.67 | 0.359 | 37.84 |
| Azerbaijan | 2014 | 5998.3 | 70.5 | 12.07 | 84.67 | 0.411 | 40.5 |
| Azerbaijan | 2015 | 5799.27 | 70.52 | 12.28 | 84.13 | 0.356 | 40.47 |
| Azerbaijan | 2016 | 5490.67 | 83.44 | 12.23 | 84.94 | 0.391 | 41.42 |
| Azerbaijan | 2017 | 6617.59 | 73.53 | 12.55 | 85.62 | 0.495 | 44.12 |
| Azerbaijan | 2018 | 7001.34 | 89.23 | 12.29 | 84.18 | 0.381 | 42.06 |
| Azerbaijan | 2019 | 6647.39 | 77.4 | 12.68 | 84.93 | 0.434 | 44.16 |
| Azerbaijan | 2020 | 6062.78 | 91.85 | 12.39 | 87.7 | 0.548 | 42.63 |
| Azerbaijan | 2021 | 5729.36 | 94.72 | 12.79 | 87.06 | 0.573 | 42.31 |
| Azerbaijan | 2022 | 7125.14 | 76.27 | 12.97 | 86.94 | 0.493 | 42.77 |
| Azerbaijan | 2023 | 7107.21 | 83.86 | 12.98 | 87.36 | 0.654 | 47.04 |
| Azerbaijan | 2024 | 6392.28 | 98.76 | 13.09 | 87.29 | 0.649 | 48.08 |
| Afghanistan | 2010 | 2617.81 | 65.23 | 9.94 | 69.81 | 0.475 | 69.2 |
| Afghanistan | 2011 | 2660.75 | 66.11 | 9.99 | 70.17 | 0.489 | 69.94 |
| Afghanistan | 2012 | 2912.8 | 68.6 | 10.1 | 70.15 | 0.503 | 70.26 |
| Afghanistan | 2013 | 2765.37 | 68.82 | 10.11 | 70.22 | 0.513 | 71.67 |
| Afghanistan | 2014 | 2837.12 | 70.87 | 10.24 | 71.32 | 0.519 | 73.44 |
| Afghanistan | 2015 | 3206.38 | 68.75 | 10.41 | 72.16 | 0.532 | 72.67 |
| Afghanistan | 2016 | 3514.33 | 79.45 | 10.29 | 70.92 | 0.58 | 74.24 |
| Afghanistan | 2017 | 3466.08 | 75.18 | 10.45 | 72.61 | 0.551 | 73.94 |
| Afghanistan | 2018 | 3741.85 | 87.13 | 10.54 | 72.32 | 0.573 | 75.71 |
| Afghanistan | 2019 | 3618.72 | 75.18 | 10.51 | 72.07 | 0.569 | 75.73 |
| Afghanistan | 2020 | 3209.05 | 78.42 | 10.5 | 74.38 | 0.694 | 78.96 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Afghanistan | 2021 | 4452.01 | 84.44 | 10.53 | 73.28 | 0.715 | 80.44 |
| Afghanistan | 2022 | 3801.79 | 75.06 | 10.71 | 72.76 | 0.751 | 80.0 |
| Afghanistan | 2023 | 3739.18 | 99.0 | 10.98 | 72.35 | 0.632 | 77.09 |
| Afghanistan | 2024 | 3564.69 | 77.85 | 10.77 | 72.81 | 0.664 | 84.99 |
| Iran | 2010 | 9085.78 | 57.23 | 8.26 | 66.74 | 0.65 | 62.27 |
| Iran | 2011 | 9566.61 | 58.8 | 8.34 | 67.14 | 0.662 | 63.41 |
| Iran | 2012 | 9737.86 | 62.36 | 8.39 | 67.66 | 0.686 | 63.29 |
| Iran | 2013 | 10677.07 | 59.41 | 8.45 | 68.18 | 0.737 | 64.98 |
| Iran | 2014 | 10694.31 | 63.71 | 8.51 | 67.67 | 0.744 | 66.38 |
| Iran | 2015 | 11572.78 | 69.6 | 8.53 | 68.23 | 0.706 | 66.7 |
| Iran | 2016 | 10980.79 | 73.54 | 8.66 | 67.62 | 0.728 | 68.47 |
| Iran | 2017 | 12029.77 | 62.5 | 8.64 | 69.41 | 0.731 | 69.8 |
| Iran | 2018 | 12951.8 | 62.85 | 8.69 | 70.7 | 0.79 | 68.35 |
| Iran | 2019 | 14172.54 | 83.04 | 9.15 | 70.35 | 0.808 | 67.3 |
| Iran | 2020 | 14639.51 | 76.19 | 8.97 | 71.37 | 0.773 | 70.72 |
| Iran | 2021 | 10199.57 | 75.61 | 8.84 | 68.37 | 0.786 | 72.77 |
| Iran | 2022 | 15820.74 | 80.73 | 9.43 | 69.74 | 0.839 | 75.57 |
| Iran | 2023 | 11931.39 | 95.03 | 8.91 | 73.09 | 0.792 | 76.88 |
| Iran | 2024 | 14985.05 | 98.98 | 9.01 | 71.24 | 1.0 | 74.4 |
| Uzbekistan | 2010 | 4151.95 | 43.4 | 6.24 | 61.42 | 0.694 | 44.41 |
| Uzbekistan | 2011 | 4204.2 | 45.23 | 6.32 | 61.77 | 0.718 | 45.59 |
| Uzbekistan | 2012 | 4454.68 | 46.02 | 6.42 | 61.84 | 0.731 | 45.52 |
| Uzbekistan | 2013 | 4293.89 | 52.12 | 6.52 | 62.55 | 0.748 | 46.27 |
| Uzbekistan | 2014 | 4455.94 | 47.91 | 6.55 | 62.96 | 0.786 | 47.19 |
| Uzbekistan | 2015 | 5497.36 | 55.13 | 6.63 | 63.14 | 0.786 | 47.77 |
| Uzbekistan | 2016 | 4894.41 | 57.77 | 6.55 | 62.3 | 0.759 | 47.58 |
| Uzbekistan | 2017 | 5951.08 | 59.22 | 6.76 | 62.39 | 0.832 | 50.23 |
| Uzbekistan | 2018 | 4813.79 | 56.08 | 6.8 | 64.19 | 0.875 | 48.66 |
| Uzbekistan | 2019 | 5357.57 | 61.99 | 6.92 | 65.4 | 0.902 | 49.93 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Uzbekistan | 2020 | 4749.11 | 64.46 | 6.76 | 64.76 | 0.982 | 53.44 |
| Uzbekistan | 2021 | 5711.07 | 66.59 | 7.05 | 64.92 | 1.0 | 52.88 |
| Uzbekistan | 2022 | 8172.85 | 76.56 | 6.96 | 62.95 | 0.838 | 50.56 |
| Uzbekistan | 2023 | 5020.71 | 72.1 | 6.94 | 64.38 | 1.0 | 51.12 |
| Uzbekistan | 2024 | 8300.23 | 60.27 | 7.03 | 66.72 | 1.0 | 60.01 |
| Pakistan | 2010 | 7923.39 | 50.22 | 9.64 | 83.85 | 0.551 | 66.05 |
| Pakistan | 2011 | 8112.51 | 51.19 | 9.71 | 84.09 | 0.572 | 66.6 |
| Pakistan | 2012 | 8881.22 | 56.15 | 9.81 | 84.48 | 0.583 | 68.19 |
| Pakistan | 2013 | 9022.1 | 52.94 | 9.92 | 85.13 | 0.638 | 69.07 |
| Pakistan | 2014 | 9293.18 | 56.41 | 10.02 | 85.63 | 0.594 | 68.12 |
| Pakistan | 2015 | 9133.02 | 62.86 | 10.13 | 84.65 | 0.66 | 69.88 |
| Pakistan | 2016 | 11144.11 | 65.86 | 10.19 | 85.57 | 0.66 | 70.19 |
| Pakistan | 2017 | 8662.29 | 68.86 | 10.27 | 87.35 | 0.76 | 72.27 |
| Pakistan | 2018 | 11568.86 | 73.12 | 10.38 | 85.44 | 0.703 | 70.77 |
| Pakistan | 2019 | 13127.52 | 68.36 | 10.19 | 87.17 | 0.752 | 72.8 |
| Pakistan | 2020 | 9257.01 | 72.01 | 10.4 | 87.94 | 0.755 | 77.01 |
| Pakistan | 2021 | 11891.01 | 71.15 | 10.67 | 86.72 | 0.69 | 71.77 |
| Pakistan | 2022 | 13868.74 | 74.83 | 10.66 | 86.07 | 0.703 | 72.17 |
| Pakistan | 2023 | 11278.1 | 75.9 | 10.54 | 87.42 | 0.916 | 75.72 |
| Pakistan | 2024 | 12947.42 | 84.65 | 10.61 | 88.73 | 0.932 | 82.35 |
| Kazakhstan | 2010 | 10904.6 | 46.15 | 8.71 | 73.27 | 0.636 | 65.88 |
| Kazakhstan | 2011 | 11344.29 | 46.67 | 8.77 | 73.64 | 0.646 | 66.5 |
| Kazakhstan | 2012 | 11736.35 | 50.61 | 8.88 | 73.65 | 0.684 | 67.22 |
| Kazakhstan | 2013 | 11786.76 | 53.25 | 8.96 | 74.59 | 0.705 | 68.58 |
| Kazakhstan | 2014 | 11559.33 | 51.83 | 8.97 | 74.06 | 0.753 | 68.99 |
| Kazakhstan | 2015 | 14225.03 | 56.54 | 9.16 | 74.78 | 0.743 | 70.11 |
| Kazakhstan | 2016 | 12263.18 | 59.99 | 9.1 | 73.93 | 0.773 | 69.63 |
| Kazakhstan | 2017 | 16076.83 | 66.35 | 9.38 | 75.01 | 0.708 | 73.93 |
| Kazakhstan | 2018 | 13965.54 | 69.48 | 9.5 | 76.8 | 0.763 | 72.04 |
| Kazakhstan | 2019 | 17290.98 | 57.78 | 9.24 | 76.17 | 0.894 | 74.77 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Kazakhstan | 2020 | 15910.63 | 53.58 | 9.52 | 78.23 | 0.764 | 74.51 |
| Kazakhstan | 2021 | 19420.53 | 72.02 | 9.65 | 77.46 | 0.825 | 73.65 |
| Kazakhstan | 2022 | 19688.1 | 76.45 | 9.83 | 78.85 | 0.878 | 76.1 |
| Kazakhstan | 2023 | 20540.56 | 73.78 | 9.82 | 78.71 | 0.997 | 75.46 |
| Kazakhstan | 2024 | 16222.58 | 56.44 | 9.82 | 74.87 | 0.906 | 78.2 |
| Kyrgyzstan | 2010 | 1882.57 | 39.09 | 9.28 | 97.33 | 0.267 | 45.91 |
| Kyrgyzstan | 2011 | 1988.88 | 40.99 | 9.36 | 97.54 | 0.293 | 46.55 |
| Kyrgyzstan | 2012 | 1982.45 | 42.22 | 9.43 | 97.72 | 0.292 | 47.77 |
| Kyrgyzstan | 2013 | 2023.95 | 44.95 | 9.46 | 98.21 | 0.329 | 47.52 |
| Kyrgyzstan | 2014 | 2092.89 | 42.44 | 9.5 | 99.0 | 0.333 | 50.18 |
| Kyrgyzstan | 2015 | 2106.5 | 50.11 | 9.72 | 99.0 | 0.364 | 49.86 |
| Kyrgyzstan | 2016 | 2214.62 | 56.04 | 9.83 | 99.0 | 0.342 | 51.98 |
| Kyrgyzstan | 2017 | 2773.56 | 45.76 | 9.66 | 99.0 | 0.418 | 53.54 |
| Kyrgyzstan | 2018 | 2154.17 | 59.0 | 9.76 | 98.65 | 0.374 | 54.48 |
| Kyrgyzstan | 2019 | 2756.03 | 55.36 | 9.89 | 99.0 | 0.428 | 55.56 |
| Kyrgyzstan | 2020 | 2578.5 | 53.52 | 10.01 | 99.0 | 0.517 | 54.43 |
| Kyrgyzstan | 2021 | 2381.72 | 69.33 | 10.04 | 99.0 | 0.577 | 56.22 |
| Kyrgyzstan | 2022 | 2273.42 | 73.29 | 10.26 | 99.0 | 0.421 | 58.58 |
| Kyrgyzstan | 2023 | 3174.17 | 62.93 | 10.51 | 99.0 | 0.437 | 55.25 |
| Kyrgyzstan | 2024 | 2567.96 | 72.13 | 10.01 | 99.0 | 0.621 | 61.51 |
| Türkiye | 2010 | 6750.06 | 32.79 | 6.2 | 64.1 | 0.219 | 55.46 |
| Türkiye | 2011 | 6894.78 | 33.48 | 6.27 | 64.26 | 0.247 | 56.52 |
| Türkiye | 2012 | 7324.33 | 38.15 | 6.38 | 64.45 | 0.275 | 57.21 |
| Türkiye | 2013 | 7822.35 | 41.01 | 6.4 | 64.53 | 0.263 | 57.85 |
| Türkiye | 2014 | 8232.93 | 43.4 | 6.4 | 65.32 | 0.292 | 58.08 |
| Türkiye | 2015 | 7307.38 | 39.51 | 6.69 | 65.25 | 0.321 | 60.42 |
| Türkiye | 2016 | 7974.92 | 50.37 | 6.79 | 65.3 | 0.339 | 59.72 |
| Türkiye | 2017 | 7982.26 | 36.94 | 6.77 | 66.21 | 0.296 | 60.32 |
| Türkiye | 2018 | 10391.74 | 41.58 | 6.66 | 66.47 | 0.457 | 60.81 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Türkiye | 2019 | 9911.51 | 54.43 | 6.76 | 67.62 | 0.375 | 63.94 |
| Türkiye | 2020 | 10153.98 | 51.18 | 6.75 | 68.44 | 0.383 | 61.76 |
| Türkiye | 2021 | 7699.74 | 54.54 | 7.13 | 65.27 | 0.442 | 62.7 |
| Türkiye | 2022 | 11092.1 | 44.02 | 7.22 | 67.16 | 0.564 | 62.61 |
| Türkiye | 2023 | 9550.29 | 42.98 | 7.45 | 69.96 | 0.416 | 67.96 |
| Türkiye | 2024 | 13518.93 | 59.22 | 7.27 | 66.85 | 0.385 | 71.25 |

https://doi.org/10.71447/3005-2696-2025-1-41

# APPLICATION OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN THE LABOR MARKET: ECONOMIC AND SOCIAL PERSPECTIVES

***PhD. in Economics, Emil Gasımov***

emil.gasimov@esri.gov.az
Economic Scientific Research Institute
Head of the Infrastructure Sectors Department

***Turan Jafarov***

turan.jafarov@esri.gov.az
Economic Scientific Research Institute
Research fellow, Infrastructure Sectors Department
The Republic of Azerbaijan

**Abstract:**

The development of artificial intelligence technologies has a complex impact on the labor market. While it creates new opportunities and high-paying job fields for highly skilled workers, it also presents challenges such as the reduction of jobs and wage polarization for low-skilled workers. Robotics and automation are leading to job losses in sectors such as manufacturing, logistics, customer service, agriculture, law, healthcare, and journalism. At the same time, new professions such as data analysts and machine learning engineers are emerging.

**Keywords:** Artificial intelligence, automation, robotics, labor market, wage polarization, new jobs, workforce reskilling, digital skills, productivity, ethical concerns, regulation and standards, human-AI collaboration.

## Introduction:

In recent years, the rapid development of technology has allowed artificial intelligence (AI) to penetrate all areas of our lives, leading to significant changes in the labor market. The application of AI technologies is transforming the skills and requirements of existing jobs, driving the emergence of new professions, while simultaneously contributing to the decline of traditional jobs. This article explores the effects of AI on the labor market, the emergence of new professions, and the current challenges and opportunities in this field.

## 1. Impacts of artificial intelligence on the labor market

The development of information technologies and intellectual job markets is resulting in increased wages and broader employment opportunities for highly skilled labor. However, low-skilled workers are negatively affected by automation and AI. While robots and computers used to outperform humans only in specific physical tasks, they are now

increasingly capable of performing tasks that require cognitive skills and are rapidly improving in this area.

Although AI has not yet fully developed the mental capabilities to completely replace human labor, the current pace of progress suggests that it may achieve this in the near future. Nevertheless, it is unlikely that AI will entirely replace both physical and cognitive labor in the short term. The current stage of AI development is more focused on reducing the human workload and serving as an assistive tool.

According to a study by Frey and Osborne (2017) on the impact of automation and computerization on the workforce, they examined various occupations and their characteristics (such as manual skills or social intelligence requirements) to assess the extent to which jobs in the U.S. are susceptible to automation. Based on this analysis, they predicted the automation risk of certain jobs. The results showed that approximately 47% of existing jobs in the U.S. fall into the high-risk category, meaning they could potentially be automated within the next ten to twelve years. Based on the models cited in the study, workers in transportation and logistics, office and administrative support, and manufacturing are most at risk of automation. (Frey, 2017)

Similarly, Ajay Banga, who became the President of the World Bank in 2023, has also expressed concern about the potential for AI to reduce jobs on a global scale. According to him, AI and automation could particularly replace certain jobs that involve repetitive and routine tasks. At the same time, these technologies may create new opportunities in the job market. Banga emphasized that in order to adapt to this change, it is crucial to retrain workers and enhance their digital skills. He stated that with the right approach, the technological revolution could not only reduce the risk of job losses but also create employment opportunities in new fields and professions.

Reports from the World Bank also note that current threats to employment stem more seriously from macroeconomic factors such as slowing economic growth, supply shortages, and inflation. However, World Bank analysts believe that the transition to new technologies and the restructuring of global supply chains could stimulate the creation of new jobs.

Studies conducted by analysts at Goldman Sachs Bank also indicate that in the coming years, AI will directly or indirectly affect the jobs of 300 million workers worldwide.

So, what is the future of AI in the workplace? – This question is widely debated and generates much interest. To develop a clearer understanding of AI's impact on jobs, AIPRM has collected detailed data on AI adoption in various industries, jobs at risk from AI, and other workplace statistics.

According to survey results, 75% of companies reported in 2023 that they plan to fully adapt to AI within the next five years. In the marketing and advertising sector, more than 37% of employees transitioned to AI-integrated workflows in 2023.

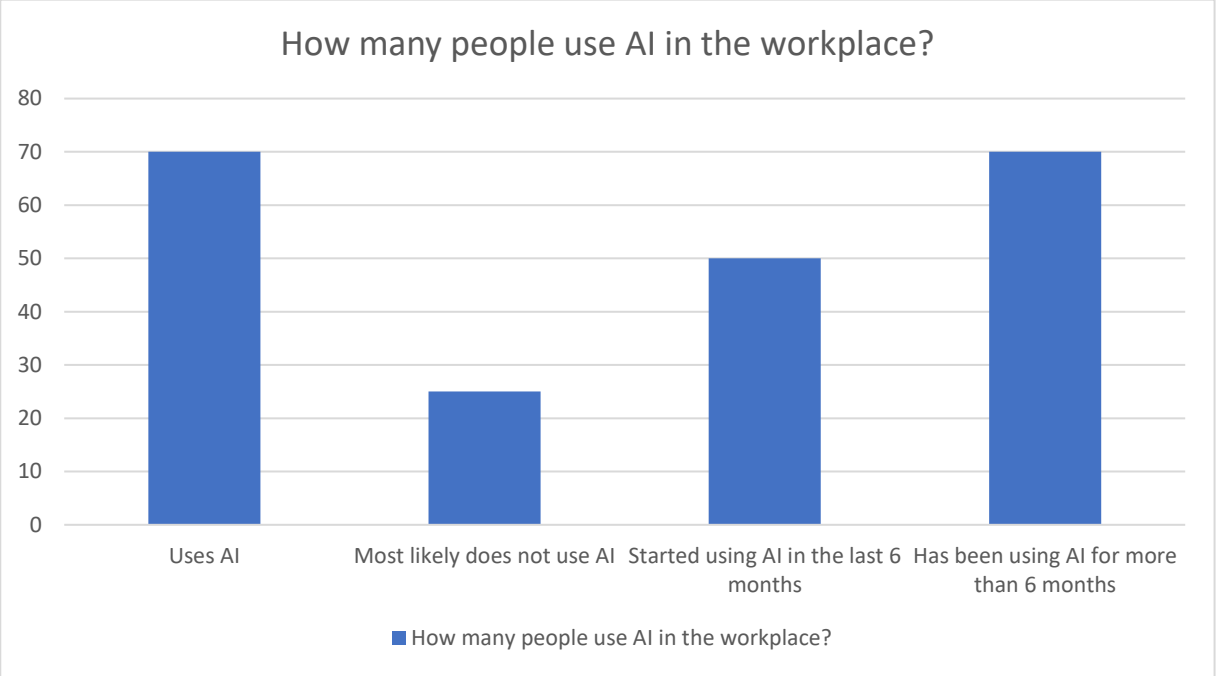
More than two-thirds (68%) of business leaders said they face difficulties in finding sufficiently talented staff to manage AI solutions. At the same time, 45% of employees in 2024 expressed concern that AI might replace them in their workplaces. Nevertheless, 9 out of 10 survey participants (90%) claimed that AI helps them save time when completing tasks.

Around 29% of business leaders reported that AI is already in use in their workplaces, while 12% stated that the implementation process is fully complete. Programmers using AI tools were able to write 126% more project code weekly compared to their peers who did not use the technology. Furthermore, 65% of surveyed employees noted that they use AI tools such as ChatGPT in their work.

Microsoft's latest AI-in-the-workplace statistics showed that in 2024, 75% of surveyed employees were using AI at work, while 25% had not yet adopted this technology.

**Figure 1.**

*Distribution of AI Usage in the Workplace*




**Source:** Invalid source specified.

Approximately half (46%) of employees using artificial intelligence in the workplace began doing so within the last six months, while the remaining 54% have been using it for a longer period.

According to a 2023 survey conducted by the World Economic Forum, around 75% of companies plan to adapt to artificial intelligence within the next five years. Digital platforms and applications were the most frequently cited technologies by business leaders, with 86% expecting these technologies to be integrated into company operations between 2023 and 2027.

The effects of automation in developing countries may be more severe than in developed nations. This is because there are more manual jobs in developing economies that could potentially be replaced by innovations.

The impact of artificial intelligence varies depending on the sector and area of application. In addition to leading to reduced employment in some sectors, it also contributes to the emergence of new job fields and the transformation of responsibilities within existing roles. Rather than focusing solely on the number of existing jobs and positions, it is more appropriate to evaluate AI's impact in terms of how it alters the nature of jobs and working conditions in the labor market.

**Table 1.**

*Positive and Negative Impacts of Artificial Intelligence on Labor Markets*

| Impact of Artificial Intelligence on Labor Markets | |
|---|---|
| **Positive Effects** | **Negative Effects** |
| Creation of new jobs | Reduction in job opportunities |
| Increase in productivity | Wage polarization |
| Empowerment of human labor | Ethical concerns |
| Growth of AI-related industries | Lack of regulation and standards |

(Prepared by the Author)

## 2. Negative Effects of Artificial Intelligence on Labor Markets

Artificial intelligence (AI) currently leads to a reduction in certain job opportunities due to the automation of physical and cognitive tasks traditionally performed by humans. The lower production costs, higher precision and flexibility compared to human labor, and increased productivity contribute to this outcome. For example:

1. Data Processing and Accounting: AI and automation systems replace human labor more quickly and accurately in data processing and accounting. Tasks such as bookkeeping and tax filing are increasingly automated, reducing the need for human employees.
2. Customer Service: AI-based chatbots and voice assistants are widely used in customer service. Companies use these technologies to reduce the need for live operators, leading to a decline in jobs in the customer service sector.
3. Manufacturing: Robots and automated production lines used in factories reduce the demand for human labor. AI has one of the most significant impacts in manufacturing, where repetitive physical tasks are automated, resulting in job losses.
4. Retail: AI technologies negatively impact employment in retail as well. For example, Amazon's cashier-less stores allow customers to shop without cashiers, reducing the demand for retail staff.
5. Logistics and Transportation: Autonomous vehicles and drones powered by AI reduce the need for human drivers in the logistics sector. These technologies pose a threat to jobs in transportation and logistics.
6. Agriculture: Automated machinery (tractors, harvesters, etc.) can perform harvesting and land preparation without human intervention, leading to a decrease in the agricultural workforce.
7. Insurance and Credit Assessment: AI can rapidly analyze large data sets to automate insurance and credit evaluations, reducing the need for analysts and assessors in these fields.

8. Translation and Language Services: AI-based translation programs can handle simple text translations, reducing the demand for human translators and leading to job losses in the translation industry.
9. Healthcare: AI is used in medical diagnostics and treatment planning. The application of AI in areas like medical imaging analysis and early disease detection puts certain healthcare roles at risk.
10. Media and Journalism: AI-powered automated writing tools can produce news articles, financial reports, and sports analyses, decreasing the need for journalists and content creators.
11. Legal Consultancy: AI is used in the preparation of legal documents, contract analysis, and legal research. As a result, the demand for legal consultants and paralegals is declining.
12. Banking and Finance: AI is widely used in analyzing financial markets and developing investment strategies, which contributes to the reduction in roles for fund managers and financial analysts. (Brynjolfsson, 2014)

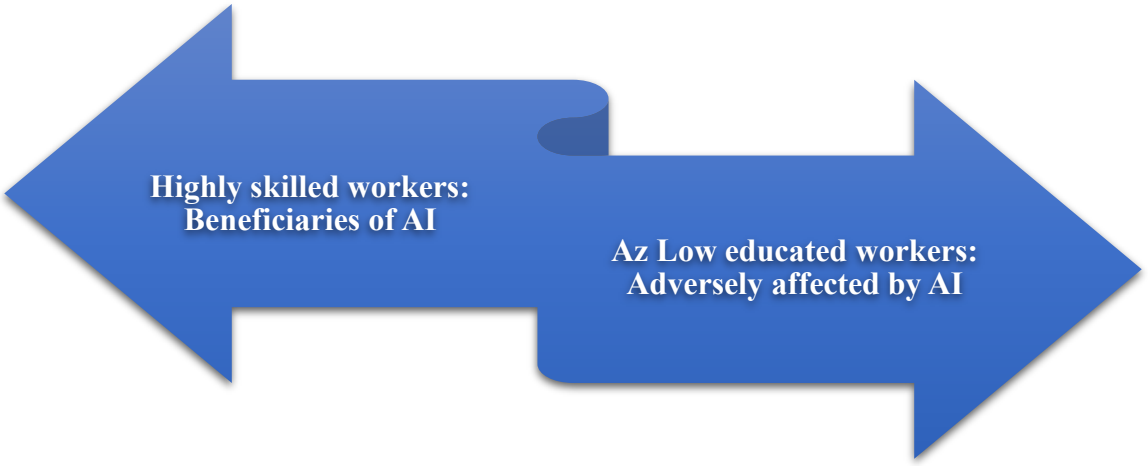
Another negative effect of AI is wage polarization in the labor market. While some individuals benefit from technological advancements and earn high incomes, others are forced to work in low-paying jobs. Such polarization has serious impacts on the socio-economic structures of society. Let's explore this issue in more detail.

How Does Wage Polarization Occur? Wage polarization refers to the widening gap between high-income and low-income occupations in the labor market. The application of AI accelerates this process. For instance, individuals with technological expertise such as programmers, engineers, and data analysts are rewarded with high salaries. Meanwhile, workers in roles that are based on simple, automatable tasks are increasingly forced to accept lower wages. (Bostrom, 2014)

To better understand how this happens, it's essential to grasp the role of AI. AI replaces human labor in many fields and performs operations more quickly and efficiently. This, in turn, leads to the disappearance of certain jobs or the transformation of these jobs into roles requiring less skill and experience. Workers with lower levels of education and limited technological skills are particularly vulnerable to this transition.

**Figure 2.**

*Diverging Impact of Artificial Intelligence on Workers by Skill Level*




(Chart prepared by the author)

**Highly Skilled Workers: Beneficiaries of AI** – The rapid development and widespread adoption of AI create significant opportunities for highly skilled workers. Professionals working in fields such as artificial intelligence engineering, programming, and data analytics are rewarded with high salaries in the labor market. They generate economic value by using technology and, in return, earn substantial incomes. However, this also deepens the income gap between different layers of the workforce.

**Low-Educated Workers: Adversely Affected** – Workers engaged in low-skilled jobs, especially those involving repetitive, simple tasks, are at risk of job loss or forced into lower-income positions due to the expansion of AI. Automation either completely eliminates such jobs or reduces the value of human labor in these fields. This has serious negative consequences on their financial and social well-being.

Wage polarization worsens socio-economic conditions and exacerbates inequality, creating tension between different segments of society. While high-income workers enjoy greater economic and social stability, lower-income groups face more financial difficulties and instability. In the long term, these disparities may give rise to broader social problems.

Solutions: To address this issue, it is essential to prioritize education and worker reskilling. Enhancing technological and digital skills helps workers remain competitive in the labor market. Additionally, public policies must be more balanced in this regard, strengthening social protections for workers and striving to reduce inequalities caused by technological advancement.

Another negative aspect of AI development is the rise of serious ethical concerns. The use of AI for social control and manipulation is alarming. AI algorithms can be used to manipulate user behavior on social media platforms. The misuse of such technologies for political and social purposes can lead to polarization within societies.

A further challenge is the lack of regulation and standardization in the field of AI, which poses potential threats to society. To ensure that AI is safe and beneficial, the creation of appropriate regulations and standards is crucial.

**Problems Caused by Regulatory Gaps:**

1. Responsibility and Accountability: In many systems where AI is applied – especially autonomous devices and machines – it is often unclear who is responsible for decisions made and who should be held accountable for their consequences. Accidents involving autonomous vehicles are a good example. Who is responsible in such cases? The manufacturer or the user? Without clear legal regulations, courts find it difficult to deliver verdicts, leading to public mistrust.
2. Ethics and Intended Use: What purposes are considered ethical for AI use? This remains a subject of debate. For example, the use of AI in mass surveillance technologies could threaten personal freedoms and privacy. Currently, there are no universally accepted global guidelines for the ethical use of AI, increasing the risk of abuse.
3. Impact on the Workforce: With the application of AI in automation, many jobs are at risk of being eliminated. If this process remains unregulated, it could lead to mass unemployment and greater economic inequality. At present, there is no comprehensive regulatory framework to address these issues.
4. Data Privacy and Security: The advancement of AI brings the protection of personal data into sharp focus. AI systems collect and process vast amounts of personal information, posing risks to data security. The lack of global standards for data protection may result in violations of personal privacy.

**The Importance of Regulation and Standards:**

To mitigate the negative impacts of AI, it is essential to establish regulations and standards. The following measures are recommended:

- Legislation and Policy: Governments and international organizations must enact new laws to regulate AI and ensure its ethical use.
- Technical Standards: Standards based on principles of safety, reliability, and transparency must be developed for tech companies to ensure the secure use of AI.
- International Coordination: Global cooperation and coordination are necessary to regulate AI and promote ethical use on an international scale. Regulatory authorities across countries should work together to create universal rules and standards.
- Public Awareness: Educational programs must be launched to raise public awareness about the safe and responsible use of AI and inform people of its potential risks and benefits.

### 3. New opportunities and emerging professions

The rapid development of AI technologies has also had positive effects on the business world and the labor market. While these technologies lead to the automation and elimination of some existing jobs, they also create new professions and job opportunities.

**New Jobs and Professions:**

1. Data Analyst: With the rise of AI, massive amounts of data are collected and transformed into valuable insights for businesses. Specialists in this field analyze large datasets to help organizations make better decisions. Data-driven jobs are vital and promising career paths.
2. Machine Learning Engineer: As machine learning technologies advance, demand for experts in this field is increasing. These engineers develop, train, and implement AI models, driving automation and optimization processes across sectors such as finance, healthcare, and manufacturing.
3. AI Ethics Specialist: The ethical use of AI systems has become an increasingly important topic. AI ethics specialists ensure that these technologies are used responsibly, fairly, and with respect for human rights. This role is gaining prominence with technological progress.
4. Digital Creator: AI creates new opportunities in content creation and management. In areas such as advertising, marketing, and social media, digital creators use AI to produce more interactive and innovative content.
5. Programmer-Marketer: These hybrid professionals combine programming and marketing expertise, contributing to both the development and promotion of technological products. With the growing application of AI, such interdisciplinary roles are becoming more relevant.

**Productivity and empowerment of human labor**

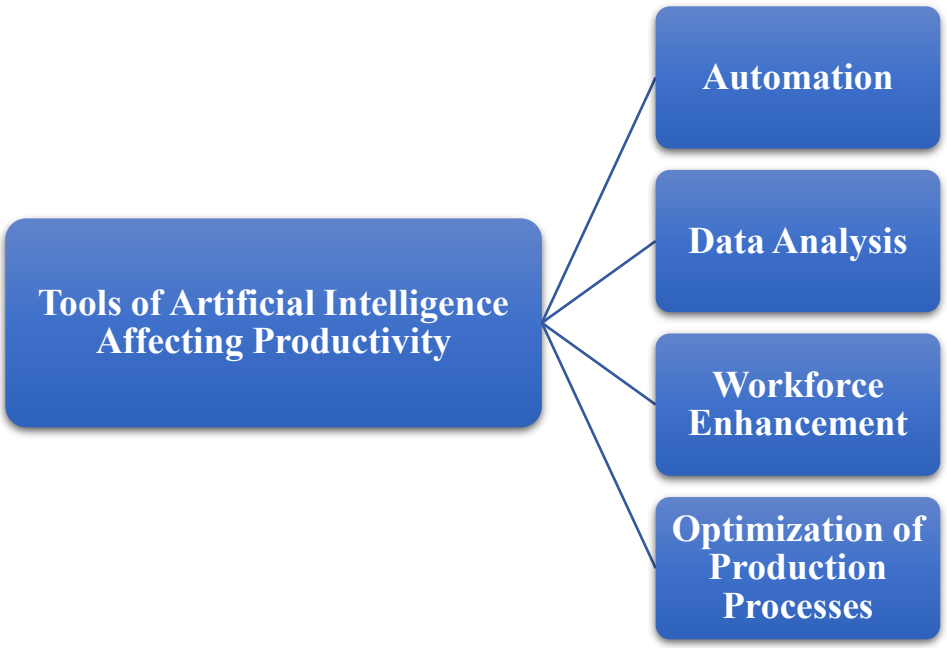
From manufacturing to workflow operations, the application of artificial intelligence (AI) across various fields enables significant improvements in productivity. To understand how AI impacts productivity, we must examine its core influencing tools.

First, AI increases productivity by automating work processes. Automation enables repetitive tasks to be completed quickly and accurately, saving both time and human resources. At the same time, the analysis of large volumes of data is carried out more precisely and efficiently with AI. The in-depth analysis of such data helps organizations make better-informed decisions. (Haenlein, 2020)

The productivity of employees increases through AI-supported tools. AI enables employees to make faster decisions, thereby enhancing work efficiency. Lastly, in manufacturing, AI optimizes processes by reducing costs and ensuring the effective use of resources.

**Figure 3.**

*Key Tools of Artificial Intelligence Enhancing Productivity*




**Source:** A future that works: Automation, employment, and productivity. McKinsey Global Institute. https://www.mckinsey.com/featured-insights/future-of-work/a-future-that-works-automation-employment-and-productivity **Invalid source specified.**.

Thus, AI significantly impacts productivity through automation, data analysis, workforce enhancement, and process optimization.

Empowerment of Human Labor through AI – The rapid development of AI is bringing about fundamental transformations in the business world. Its application goes beyond mere automation it enhances the effectiveness of human labor. One of these key changes is the "empowerment of human labor." AI helps individuals work more productively, make quicker decisions, and solve complex problems more easily.

Here's how AI strengthens human labor:

1. Faster Decision-Making Capability: AI's analytical capabilities allow workers to process large amounts of data in a short time and achieve more accurate results. Tasks that once required hours—or even weeks—of analysis can now be performed instantly using AI. For example, AI can detect patterns and trends in large datasets, enabling managers and workers to make better-informed and faster decisions.
2. Freedom from Routine Tasks: Many employees spend significant time on repetitive, routine tasks. AI automates these time-consuming processes, freeing employees to focus on more creative and strategic work. For instance, in fields such as accounting or document processing, AI can handle many tasks, liberating human resources for higher-value work.
3. Skill Enhancement: AI can also help employees improve their skills. AI-based systems can teach workers how to perform specific tasks or provide real-time guidance during workflows. For example, AI-powered training platforms help employees learn new

skills and improve their knowledge base, increasing overall workforce efficiency and leading to better outcomes.

4. Finding Innovative Solutions: AI assists workers in identifying innovative solutions. In fields such as engineering or scientific research, AI can solve complex problems more quickly and efficiently. AI-driven insights may reveal new perspectives that were previously inaccessible to humans. As a result, workers become more innovative and achieve greater success in their fields.

5. Human-AI Collaboration: To fully understand AI's impact on the labor market, the concept of "Human-AI collaboration" is essential. This collaboration allows humans and AI to work together to achieve greater outcomes. While humans retain creativity, emotional intelligence, and ethical judgment, AI supports them with data processing, speed, and precision. This synergy creates a balanced workflow and enhances performance.

In short, the impact of AI on the labor market is complex, but its role in empowering human labor is clearly positive. AI helps workers make faster decisions, offload routine tasks, enhance their skills, and find innovative solutions. Instead of weakening human potential, AI strengthens it—contributing to a more competitive and efficient work environment.

### 6. Industrial Growth and Economic Expansion

The advancement of AI technologies is ushering in a new era in the global economy and labor markets. Not only does AI transform existing industries, but it also leads to the creation and rapid expansion of entirely new sectors. The growth of AI-related industries impacts not just the tech sector but a wide range of fields, accelerating overall economic development:

1. Development of AI Technologies: As AI technologies evolve, numerous new industries are emerging. These technologies are being developed both by tech giants and startups and applied across many domains. For example, machine learning, natural language processing, robotics, and artificial neural networks are driving innovation across sectors. The advancement of these technologies creates new job opportunities and fuels the rapid growth of AI-related industries.

2. Rapid Growth of AI-Focused Startups: The expanding application areas of AI have given rise to numerous startups focused on developing and implementing AI. In areas such as data analytics, autonomous systems, healthcare, fintech, and more, AI-driven startups are introducing innovations and reshaping traditional business models. These companies are growing rapidly and creating new job opportunities. Additionally, investor interest and capital investments are accelerating the expansion of AI industries.

3. Tech Giants Integrating AI: Major technology companies are dedicating substantial resources to AI development and deployment. These tech giants invest heavily in AI research and technological solutions, resulting in rapid sectoral growth. Companies like Google, Microsoft, and Amazon are developing AI technologies and integrating

them into various services. Their efforts expand the scale of the AI industry and draw more people into the workforce.

4. Emergence of AI-Driven Industry Sectors: AI's economic impact is not limited to the tech industry. New AI-driven industry sectors are emerging. For example, in automation systems, autonomous vehicles, smart city technologies, e-commerce, and healthcare, AI-based solutions are revolutionizing operations. These fields are generating new jobs, increasing demand for AI-powered products and services, and transforming traditional industries by integrating AI technologies.

5. Skills Demand and Training Programs: The rapid development of AI technologies has led to new skill demands in the job market. High levels of technological expertise and experience are now required to work in AI-related sectors. In response, training programs and universities are expanding their AI education offerings. Programmers, data scientists, machine learning engineers, and analysts are becoming critical workforce members in the AI industry. AI-focused training programs enable workers to acquire new skills and find jobs in these fast-growing fields.

6. Development of Autonomous Systems and Market Expansion: One of the most exciting and promising areas of AI is the development of autonomous systems. Autonomous vehicles, drones, and other technologies powered by AI are reshaping traditional markets. In the near future, they will play a key role in transportation, logistics, and commerce. As a result, the AI-related market will continue to expand, creating further job opportunities. (Autor, 2015)

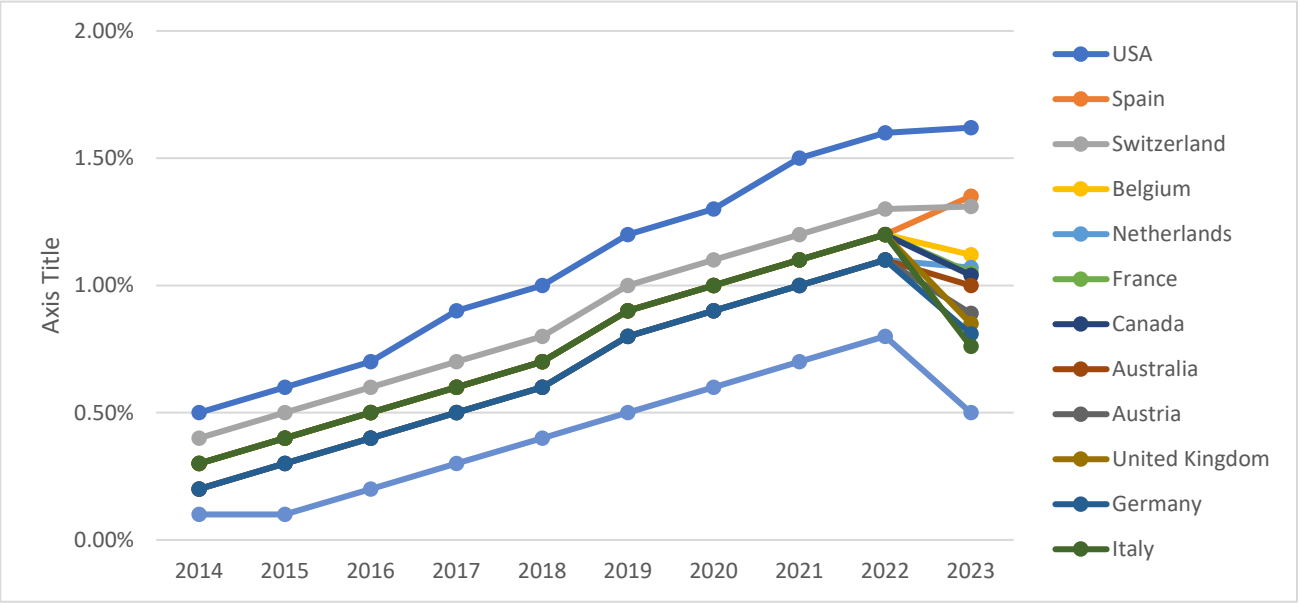
Artificial intelligence has multifaceted impacts on labor markets and industries. The development and implementation of AI technologies lead to the emergence of new industrial sectors and the rapid expansion of existing ones. Industry growth driven by the application of AI not only stimulates the economy but also creates new opportunities in the labor market. This growth requires the joint development of the technology, education, and industrial sectors, equipping workers with new skills and enabling them to adapt to the future work environment.

This chart shows the percentage of total job postings related to artificial intelligence (AI) across various geographic regions between 2014 and 2023.

Among the countries listed, the United States has the highest share of AI job postings, accounting for 1.62% of all job listings in 2023. This figure increased until 2020, after which a slight decline was observed. Growth in AI-related job postings is also seen in other countries, particularly in Spain (1.35%), Sweden (1.31%), and Belgium (1.20%). These countries also experienced a slight decline after 2020.

**Figure 4.**

*Annual Percentage of AI-Related Job Postings by Country*

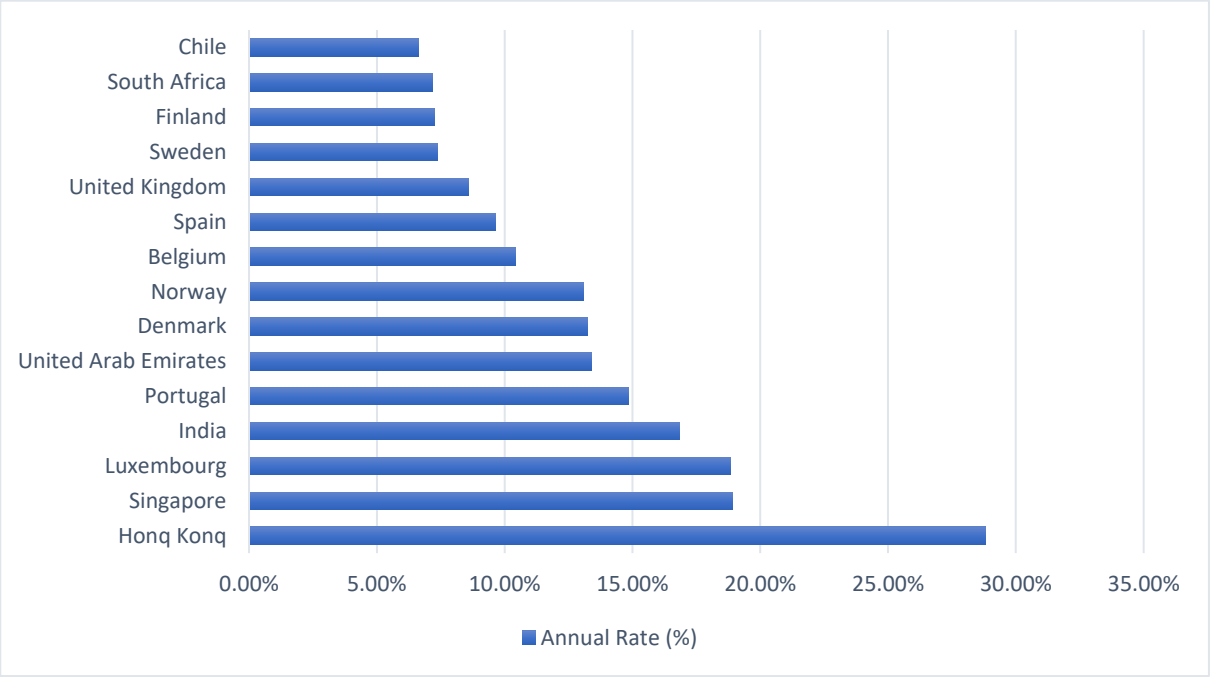



Among the countries with lower percentages is New Zealand, where AI job postings make up only 0.50%. Additionally, countries such as Australia, the United Kingdom, Germany, and Italy also show relatively low but steady growth.

This chart indicates that job opportunities in the AI sector are becoming increasingly widespread, although a slight decline has been noted in some countries in recent years.

**Figure 5.**

*AI Hiring Rates by Country in 2023: A Geographical Comparison*



This chart displays the year-over-year growth rate of hiring in the field of artificial intelligence (AI) across various geographic regions in 2023.

As shown in the chart, the highest AI hiring growth rate belongs to Hong Kong, with a significant 28.83% increase compared to the previous year. This indicates a substantial rise in demand for AI professionals in the region.

Singapore (18.93%) and Luxembourg (18.85%) rank second and third, respectively, both showing a strong upward trend in AI-related hiring.

Other notable countries include India (16.83%), Portugal (14.84%), United Arab Emirates (13.40%), and Denmark (13.23%), all reflecting high hiring growth rates and a rapidly increasing demand for AI talent.

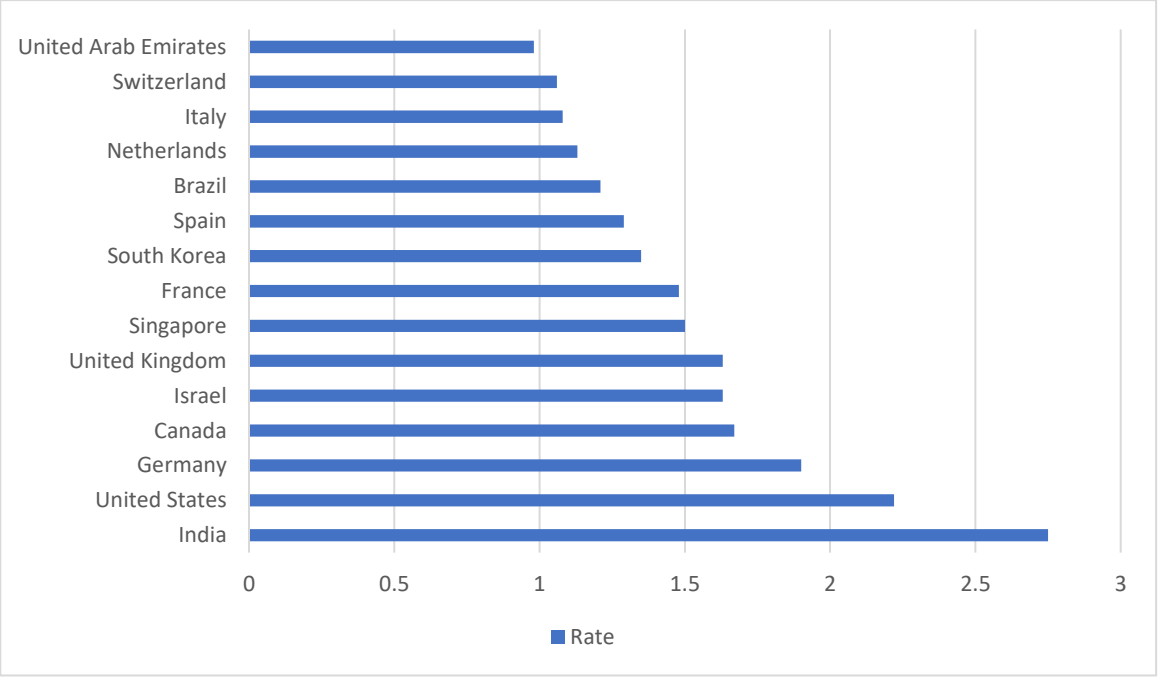
Additional countries listed in the chart—Norway (13.08%), Belgium (10.41%), Spain (9.63%), and United Kingdom (8.57%)—also demonstrate significant growth in AI hiring.

The lowest rates are seen in South Africa (7.17%) and Chile (6.65%), though these countries still show year-over-year increases.

Overall, the chart highlights the global rise in AI-related hiring and the rapidly growing demand for AI specialists across various regions.

**Figure 6.**

*Degree of AI Skill Penetration*




This chart illustrates the spread of artificial intelligence (AI) skills across various geographic regions between 2015 and 2023.

As shown in the chart, India ranks first with the highest AI skill penetration rate at 2.75, indicating the country's leading position in the adoption of AI competencies.

The United States comes in second with a rate of 2.22, followed by Germany in third place at 1.90, then Canada (1.67) and Israel (1.63). The United Kingdom also shares the same rate as Israel (1.63), demonstrating its strong presence in AI skill development.

Lower rates are observed in countries like Singapore (1.50), France (1.48), and South Korea (1.35), although these countries have also experienced notable growth in AI skills.

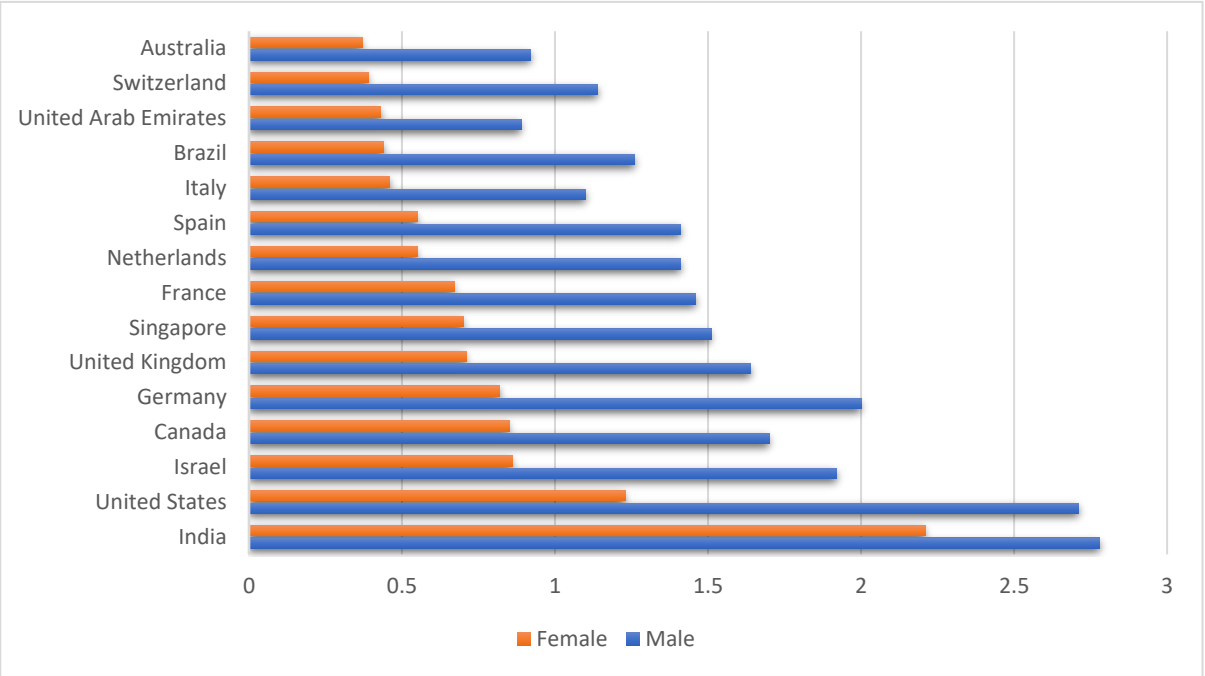
Spain (1.29) and Brazil (1.21) show relatively high AI skill levels as well.

Countries such as the Netherlands (1.13), Italy (1.08), Switzerland (1.06), and the United Arab Emirates (0.98) have slightly lower AI skill adoption rates, yet progress in the field continues in these regions.

Overall, the chart shows that while the spread of AI skills varies by country, AI competencies are rapidly expanding globally, with countries like India and the United States leading the way.

**Figure 7.**

*Distribution of AI Skills by Gender*




This chart shows the distribution of artificial intelligence (AI) skills by gender across various countries between 2015 and 2023.

The blue bars represent the spread of AI skills among male workers, while the pink bars indicate the spread among female workers.

As seen in the chart, India has the highest AI skill penetration among both male (2.78) and female (1.65) workers. However, there is a significant gap between the two, with men having notably higher AI skill levels.

In the United States, AI skills are also widely adopted among both men (2.21) and women (1.23).

In Israel, the AI skill rate among men (1.92) is more than twice that of women (0.86).

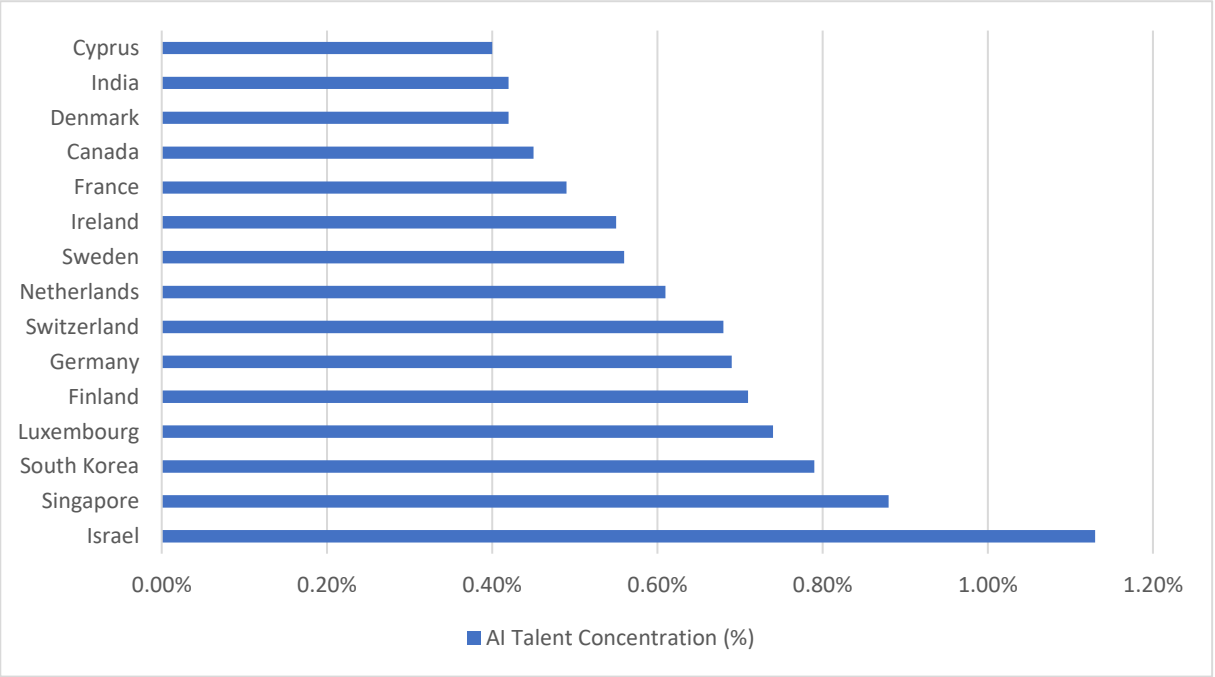
In Canada, the spread among men is 1.70 compared to 0.85 among women. Similarly, in Germany, men demonstrate a greater adoption of AI skills, with rates of 2.00 for men and 0.82 for women.

Other countries also exhibit higher AI skill adoption among male workers compared to female workers.

For example, in the United Kingdom, the rate is 1.64 for men and 0.71 for women. In France

**Figure 8.**

*AI Talent Concentration by Country in 2023*




This chart shows the concentration of artificial intelligence (AI) talent across various geographic regions in 2023.

According to the chart, Israel ranks first with an AI talent concentration of 1.13%, indicating a high percentage of workers in Israel specialized in the field of AI.

Singapore follows in second place with 0.88%, then South Korea (0.79%) and Luxembourg (0.74%). These countries also have a significant concentration of AI talent.

European countries such as Finland (0.71%), Germany (0.69%), Switzerland (0.68%), and Netherlands (0.61%) also have a notable presence of workers with AI skills, though these rates are relatively lower compared to Israel.

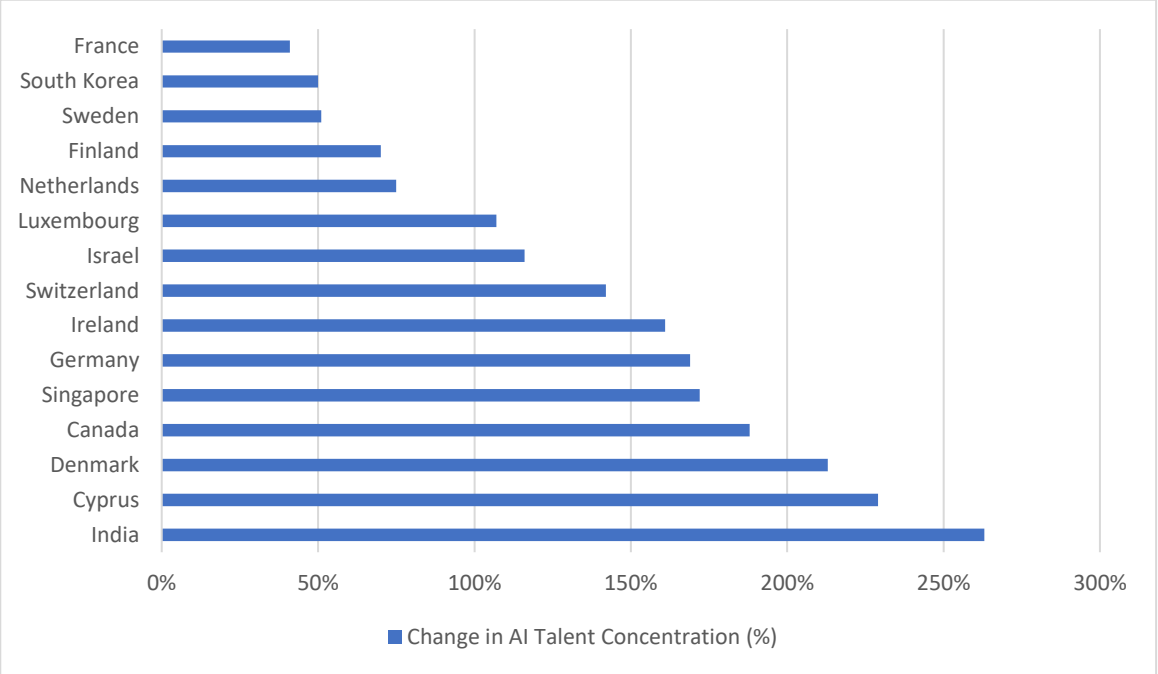
Other countries on the list include Sweden (0.56%) and Ireland (0.55%). Nations like France (0.49%) and Canada (0.45%) show comparatively lower concentrations of AI talent.

At the bottom of the list are Denmark (0.42%), India (0.42%), and Cyprus (0.40%), where the concentration of AI-skilled professionals is relatively lower.

Overall, the chart shows that specialized AI talent is more heavily concentrated in certain countries, with Israel and some Asian nations leading the way in this field.

**Figure 9.**

*Countries Showing Significant Growth in AI Skills (2016–2023) (%)*




This chart shows the percentage change in the concentration of artificial intelligence (AI) talent from 2016 to 2023.

According to the chart, India recorded the highest increase in AI talent concentration, with a 263% growth. This indicates a significant rise in the number of specialized AI professionals in India.

Cyprus ranks second with a 229% increase in AI talent concentration. Denmark (213%) and Canada (188%) are also among the countries with substantial growth in AI talent.

Other countries with high increases include Singapore (172%), Germany (169%), and Ireland (161%). Notable growth has also been observed in Switzerland (142%) and Israel (116%).

Countries such as Luxembourg (107%) and the Netherlands (75%) show growth as well, although at relatively lower rates.

Finland (70%), Sweden (51%), South Korea (50%), and France (41%) also experienced increases in AI talent concentration, but the growth in these countries is comparatively more moderate.

Overall, the chart demonstrates that the concentration of AI talent has significantly increased in recent years – particularly in countries like India, Cyprus, and Denmark. This suggests that these countries are placing greater emphasis on the field of artificial intelligence and expanding their pool of specialized professionals.

## Conclusion and Recommendations

The development and integration of artificial intelligence (AI) technologies are profoundly transforming the global labor market. While AI significantly boosts productivity, creates new professions, and empowers human labor, it also causes job losses in traditional sectors, exacerbates wage polarization, and raises serious ethical and regulatory concerns. The research demonstrates that AI's influence is multifaceted both as a disruptive and enabling force.

Key findings show that highly skilled professionals benefit the most from AI-driven transformations, while low-skilled workers face higher risks of job displacement. Additionally, AI adoption has increased notably across various industries and countries, highlighting the urgency of preparing societies and economies for the future of work.

In light of these observations, the following recommendations are proposed:

1. Invest in Education and Reskilling Programs: Governments and organizations must prioritize digital literacy, technical education, and continuous learning programs. Emphasis should be placed on developing skills in data analytics, machine learning, and other AI-related fields to enhance workforce adaptability.
2. Support Vulnerable Groups: Social safety nets and targeted support programs should be enhanced for workers in high-risk sectors. Inclusive policies must be developed to prevent deepening social and economic inequalities.
3. Foster Ethical AI Development: It is essential to promote responsible AI practices by establishing ethical guidelines and oversight mechanisms. AI systems must be transparent, explainable, and aligned with human values.
4. Implement Robust Regulatory Frameworks: National and international regulatory bodies should collaborate to create standardized legal frameworks that ensure the safe and fair deployment of AI technologies across borders.
5. Promote Human-AI Collaboration: Rather than viewing AI as a replacement, policies should encourage synergy between humans and AI. This includes designing jobs that leverage AI to augment human capabilities instead of substituting them.
6. Encourage Innovation and Entrepreneurship: Support for AI startups and research institutions should be strengthened. Innovation ecosystems can be fostered through tax incentives, grants, and strategic partnerships that accelerate AI-led industrial growth.
7. Enhance Public Awareness: Educational campaigns and public dialogues should be initiated to inform citizens about the opportunities and risks associated with AI, thereby encouraging responsible use and informed decision-making.

In conclusion, while artificial intelligence presents challenges, it also offers unprecedented opportunities to enhance economic development and human potential. A balanced, inclusive, and forward-thinking approach is critical to ensuring that the benefits of AI are equitably shared across all sectors of society.

https://doi.org/10.71447/3005-2696-2025-1-42

# THE NEW POST-2025 VISION OF ECONOMIC COOPERATION ORGANIZATION (ECO): FULFILLING ECO'S POTENTIAL IN THE NEXT DECADE

***PhD, Fırat Bayar***

firat.bayar@mfa.gov.tr

First Counsellor,
Turkish Embassy in Tehran

**Abstract**

The focus of this paper aims at presenting several contributions for the Economic Cooperation Organization (ECO), in reaching its deep, full and real potential in the coming decade ahead. The latter will find expression in its new post-2025 Vision document, currently in the formulation phase, planned to be finalized by the end of the year. This new Vision will design the future orientation of ECO in the next ten years ahead.

In that respect, this paper offers the following topics to be evaluated and incorporated into the post-2025 Vision of ECO:

- Enhancing the ownership among member states,
- Promoting the visibility of the organization,
- Strengthening result-oriented strategies,
- Focusing on the core areas of economy/trade: ECO Trade Agreement (ECOTA),
- Engagement of private sector, youth and women.

**Keywords:** Economic Cooperation Organization (ECO); post-2025 Vision of ECO; ownership; visibility; result-oriented strategies; ECOTA; private sector, youth and women

## Introduction

This paper aims to argue and contribute to the Economic Cooperation Organization (ECO) in reaching its deep, full and real potential in the coming decade ahead, finding expression in its new post-2025 Vision, currently in the formulation phase, planned to be finalized by the end of the year.

ECO, established in 1985 by Türkiye, Iran and Pakistan, and enlarged to a total of ten member countries in 1992, is one of the most important regional economic organizations at present. It transcends a strategic geographical location, consisting of 8 million square kilometers, covering about 550 million people and generating a total GDP over 2 trillion dollars.

This overall promising picture reflects a vast potential for the future of ECO, covering its core spheres of cooperation in the fields of economy and trade. It is as well interlinked to its domains of activity in transport, connectivity, energy, environment, tourism and culture.

Unfortunately, it is also a fact that ECO is currently lagging behind to fulfill this deep and promising potential, due to a variety of reasons, the latter which could be addressed and amended by formulation and implementation of rational policies.

This takes us exactly to the point of the present discussions at ECO, as the members states together with the Secretariat are working on a new Vision document which will cover the priorities of the organization in the forthcoming ten years, spanning from 2026 to 2035.

In this vein, the main focus of this paper dwells on presenting several view and contributions with regards to the formulation of this new post-2025 Vision in paving the way for ECO in reaching its deep and vast potential in the decade ahead.

Within this framework, the paper is consisted of three sections.

The first section tries to set up and display the background information about ECO, on which the paper will discuss the new Vision. This will be done by elaborating on the history and membership; objectives and functions; and organizational structure of ECO.

The second part analyzes on the current state of affairs of ECO at its 40$^{th}$ year of establishment, and tries to enumerate the reasons and rationale behind the formulation of the new post-2025 Vision of the organization for the next decade.

The third section dwells on presenting contributions for the formulation phase of this new vision which could be evaluated and incorporated into this new Vision document of ECO, the latter which will design the future orientation of the Organization in the next ten years.

The last part is consisted of brief concluding remarks.

## SECTION 1: ECONOMIC COOPERATION ORGANIZATION (ECO)

### 1.1. History and membership of ECO

ECO is established by Türkiye, Iran and Pakistan in 1985, as the successor of the Regional Cooperation for Development (RCD) that was founded in 1964.

Treaty of Izmir originally signed on 12 March 1977 by these three countries forms the basic Charter of ECO. The revised Izmir Treaty (14 September 1996) superseded the original one of 1977 and the Protocols of 1990 and 1992.

Following the collapse of the Soviet Union, seven new members joined the ECO in 1992: Azerbaijan, Kazakhstan, Uzbekistan, Turkmenistan, Kyrgyzstan, Tajikistan, and Afghanistan. This increased the total number of member states of the Organization to ten countries. The 30th Anniversary of ECO expansion was celebrated in December 2022.

**Figure 1:**

*Map of ECO member states*


**Source:** ECO

Article 13 of the Treaty of Izmir regulates the membership conditions to ECO: "Any State enjoying geographical contiguity with the ECO region and/or sharing the objectives and principles of ECO may apply to become a member of the Organization. Such State shall address its application through the Secretary General to the Council of Ministers which may decide the admission of a new member by a unanimous vote" (ECO, 1996).
It should also be noted here that ECO granted observer status to the Turkish Republic of Northern Cyprus in the name of Turkish Cypriot State (2012), Cooperation Council of Turkic Speaking States (2014), and International Energy Charter (2017).

### 1.2. Objectives and functions

Article 2 of the Treaty of Izmir, the Charter of ECO, enumerates the objectives of the Organization. To put it briefly, the main objective of the Organization is to promote conditions for sustainable economic development and thereby contribute in a positive manner the living standard and quality of life in member states of ECO. Obviously, the way to realize this objective lies on easing restrictions on trade and expanding intra and inter-regional trade; increasing economic cooperation to integrate the economies of member

states; mutual assistance in economic, social, cultural, technical and scientific fields; making progress in transport and communications infrastructures; supporting the role of the private sector; promoting human resources; utilizing energy, agricultural and industrial potential of ECO region; cooperating in environmental protection; strengthening cultural ties and tourism among members; and making partnership with other regional and international organizations (ECO, 1996).

### 1.3. Organizational structure

Summit gives direction to the Organization. It is gathered every two years at the level of the heads of members states. Last Summit was organized in Uzbekistan in 2023. The next one (17th Summit) is planned to be held in Azerbaijan on 2-3 July 2025.

Article 5 of the Treaty of İzmir states that the principal organs of ECO are Council of Ministers (COM), Council of Permanent Representatives (CPR), Regional Planning Council (RPC), the Secretariat and the Specialized Agencies (ECO, 1996).

The Council of Ministers (COM), is the highest policy and decision-making body of ECO. It is consisted of Ministers from the members states. It gathers at least once a year by rotation between them. The last COM meeting (the 28th) was held in Mashhad on 3 December 2024.

The Council of Permanent Representatives (CPR) formulates and carries out policies of ECO as well as takes appropriate steps on the implementation of the decisions of the COM. It comprises from the Permanent Representatives/Ambassadors by member states accredited to ECO in Tehran, meeting under the chairpersonship.

The Regional Planning Council (RPC) is the technical organ of the organizational structure of ECO, mainly responsible from program of action and evaluation of their results. It consists of high-level bureaucrats from the members states. RPC meets at least once a year prior to the annual meeting of COM.

The Secretariat is comprised of the Secretary General (SG) and its staff. Based in the headquarters in Tehran, the Secretariat initiates, coordinates and monitors the implementation of ECO activities and regulates the meetings of the Organization. The Secretariat shall carry out its technical work through the following Directorates: (a) Trade and Investment; (b) Transport and Communications; (c) Energy, Minerals and Environment; (d) Agriculture and Industry; (e) Tourism; (f) Human Resources and Sustainable Development (ECO, 2021).

There are also specialized agencies and regional institutions in specific fields of cooperation. The number, nature and objectives of these agencies and institutions are determined by the COM. Specialized agencies include ECO Cultural Institute in Tehran, ECO Science Foundation in Islamabad, and ECO Educational Institute in Ankara. To cite regional institutions, ECO Consultancy & Engineering Company in Lahore, ECO Research Centre in Baku, and ECO Trade and Development Bank in Istanbul. We could also name for the affiliated bodies such as ECO College of Insurance in Tehran and the Parliamentary Assembly of ECO Countries with the Secretariat in Islamabad.

## SECTION 2: THE WAY TOWARDS THE NEW POST-2025 VISION OF ECO

To set up the background in a systematic way for current discussions on the new post-2025 Vision of ECO, it would be useful to go back to the work of the Eminent Persons Group

(EPG), back in 2012. EPG had concluded some notable landmarks in the Organization's reformation process with tangible proposals with regards to fulfillment of its vast potential.

In summary, EPG in its report concluded that the majority of ECO's ideals across the entire spectrum of its areas of interest have still yet to be realized and enumerated the main impediments and shortcomings for this goal in the following points:

"Lack of efficient decision-making procedure,

Minimal participation by Member-States in the activities of the Organization,

Non-implementation of the decisions adopted by the decision-making bodies,

Lack of financial resources and insufficient budget,

Inadequate capacity of the Secretariat due to existing recruitment procedures" (EPG, 2012).

In this context, the main motto of the EPG in its report was prescribed in the following sentence: "The Organization has no choice but to succeed" (EPG, 2012: 30).

This motivating conclusion of EPG triggered the endeavor for members states together with the Secretariat in the formulation of the ECO 2025 Vision, back in 2017.

The statement in this ECO 2025 document reads as: "ECO will pave the way to a territory of integrated and sustainable economies as well as free trade area achieved by highly educated societies and improved governance through enhanced cooperation" and to materialize this goal, it enumerates strategies in the areas of (i) Trade (ii) Transport and Connectivity (iii) Energy (iv) Tourism (v) Economic Growth and Productivity and (vi) Social Welfare and Environment (ECO, 2007: 1-2).

Therefore, the ECO Vision 2025 was in essence designed to constitute the main agenda of ECO during 2015-2025, and every effort was designed to realize the goals set in this Document by various follow up and review mechanisms to ensure its implementation (ECO, 2007:10).

This ECO Vision 2025 is expiring at the end of this year. In accordance with that, the 28th COM Meeting in Mashhad at the end of 2024 mandated the Secretariat to formulate the new post-2025 Vision strategy for the next decade. In this regard, the Mashhad Communique of 2024 requested the Organization to formulate this new Vision for 2026-2035, building upon the previous ECO Vision 2025. This is aimed to align with the proposals made by the member states with a view to deepening economic and trade cooperation among member countries, and fostering development and implementation of result-oriented programs and projects (ECO, 2024 (b): 4).

In this direction, the High-Level Committee (HLC), convened as the subsidiary organ of the COM, was tasked with preparing specific proposals and recommendations for the new Vision of ECO 2026-2035. This Committee made its first meeting at the Deputy Ministers level from the member states at the ECO headquarters in Tehran in February 2025.

In this meeting, HLC underscored the need for a future-oriented strategy, built on past achievements and current challenges. It underscored the importance of a pragmatic, results-driven vision with clear goals, strong implementation mechanisms and enhanced coordination among member states. Along with the participation of public sector, it was underlined that other stakeholders' involvement, such as the private sector, youth and women were vital for attaining a more dynamic and inclusive approach. In such a way, it is aimed at preparing a new vision document aligning with the priorities of member states which ensures clear, measurable goals, practical, realistic timelines which are action and

project driven with accountability mechanisms and achievable initiatives, concrete tools and monitoring mechanisms to track progress to foster tangible outcomes (ECO, 2025 (b): 13).

## SECTİON 3: CONTRİBUTİONS TO THE NEW VİSİON

Based on the background information of ECO, given in the first section of this paper and taking into consideration the work of EPG in the overall reform of ECO as well as the pros and cons of the previous ECO Vision 2025 which will expire at the end of this year, this part aims at presenting several contributions which could be evaluated and incorporated into the post-2025 Vision of ECO.

The latter are:

(i) Enhancing the ownership among member states,
(ii) Promoting the visibility of the organization,
(iii) Strengthening result-oriented strategies,
(iv) Focusing on the core areas of economy/trade: ECO Trade Agreement (ECOTA),
(v) Engagement of private sector, youth and women.

### 3.1. Enhancing the ownership among members states

Ownership of ECO by its member states in coordination with the Secretariat is critical and accounts for the key quality of overall success of the Organization.

Ownership under strong leadership sets coherent vision, priorities and commitment of the Organization towards accomplishing desired goals and objectives and transforms these into result-oriented plans and work programs by the member states.

The most important parameter of ownership for member states is in honoring their commitments and implementing the decisions taken by the organs of ECO, particularly the Summit, COM, CPR and RPC, the latter discussed in the first section of this paper.

As the EPG had argued at its time, member states should demonstrate serious interest and priority in ECO affairs and without their active involvement, the goals set by the Organization cannot be achieved (EPG, 2012: 4). The most visible way to prove the latter is obviously sign and ratify the basic ECO agreements.

**Table 1:**

*Signature and Ratification Status of Basic ECO Agreements*

| ECO Agreements | Afghanistan | | Azerbaijan | | Iran | | Kazakhstan | | Kyrgyzstan | | Pakistan | | Tajikistan | | Türkiye | | Turkmenistan | | Uzbekistan | | Total Signatories | Total Ratifiers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Signed | Ratified | Signed | Ratified | Signed | Ratified | Signed | Ratified | Signed | Ratified | Signed | Ratified | Signed | Ratified | Signed | Ratified | Signed | Ratified | Signed | Ratified | | |
| Treaty of Izmir | ✓ | X | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 10 | 09 |
| Agreement on Legal Status of the ECO National Representatives and International Staff | ✓ | X | ✓ | X | ✓ | ✓ | ✓ | ✓ | ✓ | X | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | X | ✓ | X | 10 | 5 |
| Agreement on Simplification of Visa Procedures for Businessmen of the ECO Member States | ✓ | ✓ | ✓ | X | ✓ | ✓ | ✓ | ✓ | X | X | ✓ | ✓ | X | X | ✓ | ✓ | ✓ | X | X | X | 7 | 5 |
| Additional Protocol on Simplification of Visa Procedures for Businessmen and Transit Drivers | ✓ | X | X | X | ✓ | X | X | X | X | X | ✓ | ✓ | X | X | X | X | X | X | X | X | 3 | 1 |
| Articles of Agreement of the ECO Trade and Development Bank | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | X | X | ✓ | ✓ | ✓ | ✓ | X | X | ✓ | ✓ | X | X | X | X | 6 | 6 |
| Charter of ECO Cultural Institute | ✓ | ✓ | ✓ | X | ✓ | ✓ | ✓ | X | X | X | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | X | X | X | 8 | 5 |
| Charter of ECO Science Foundation | ✓ | ✓ | ✓ | X | ✓ | ✓ | ✓ | X | ✓ | X | ✓ | ✓ | ✓ | ✓ | ✓ | X | ✓ | ✓ | ✓ | X | 10 | 5 |
| Charter of ECO Educational Institute | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | X | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | X | X | X | X | 8 | 7 |
| Transit Transport Framework Agreement | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | X | X | X | 9 | 8 |
| Framework Agreement on ECO Trade Cooperation | ✓ | X | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | X | ✓ | ✓ | ✓ | X | X | X | 9 | 6 |
| ECO Trade Agreement | ✓ | ✓ | X | X | ✓ | ✓ | X | X | X | X | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | X | X | X | X | 5 | 5 |
| Agreement on Promotion and Protection of Investment | ✓ | ✓ | ✓ | X | ✓ | ✓ | X | X | X | X | ✓ | ✓ | X | X | ✓ | ✓ | X | X | X | X | 5 | 4 |
| Agreement on the Establishment and Operation of ECO Smuggling and Customs Offences Data Bank | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | X | X | X | X | ✓ | ✓ | ✓ | X | ✓ | ✓ | X | X | X | X | 6 | 5 |
| Articles of Agreement on the Establishment of ECO Reinsurance Company Islamabad | X | X | X | X | ✓ | ✓ | X | X | X | X | ✓ | ✓ | X | X | ✓ | ✓ | X | X | X | X | 3 | 3 |
| ECO Regional Institute for Standardization, Conformity Assessment, Accreditation and Metrology | ✓ | ✓ | X | X | ✓ | ✓ | X | X | X | X | ✓ | ✓ | X | X | ✓ | ✓ | X | X | X | X | 4 | 4 |
| ECO Veterinary Commission | ✓ | ✓ | X | X | ✓ | ✓ | X | X | X | X | X | X | X | X | X | X | X | X | X | X | 2 | 2 |
| Statute of the ECO Regional Center of Anti-Corruption Agencies and Ombudsmen (RCCACO) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | X | X | X | X | ✓ | ✓ | ✓ | X | X | X | X | X | X | X | 5 | 4 |
| Charter of the Parliamentary Assembly of ECO | ✓ | X | ✓ | ✓ | ✓ | ✓ | X | X | X | X | ✓ | ✓ | ✓ | X | ✓ | ✓ | X | X | ✓ | X | 7 | 4 |
| Charter of ECO Research Center | X | X | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | X | X | ✓ | X | X | X | X | X | 3 | 2 |
| Charter of the ECO Clean Energy Center | X | X | ✓ | X | X | X | X | X | ✓ | X | ✓ | X | X | X | ✓ | X | X | X | ✓ | X | 5 | 0 |
| Statute of the ECO Regional Center for Risk Management of Natural Disasters | X | X | X | X | ✓ | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | 1 | 0 |

**Source:** ECO, 2025

However, as the above table clearly demonstrates, there are still major discrepancies in this regard by some member states. We could see that even the so-called Charter of ECO, the Treaty of İzmir is not ratified by all members; likewise, the flagship project of ECOTA for instance, is signed and ratified by only half of the member states.

A similar gap is evident in the signature and ratification situation of the agreements of ECO specialized agencies. As the below table illustrates, the total numbers in this respect are still not satisfactory.

**Table 2:**
*Signature and Ratification of Agreements of ECO Specialized Agencies*

| Agreements | Signed by | Ratified by |
|---|---|---|
| ECO Educational Institute | 8 | 7 |
| ECO Cultural Institute | 8 | 5 |
| ECO Science Foundation | 10 | 5 |
| ECO Bank | 6 | 6 |
| ECO Research Center | 3 | - |
| ECO Clean Energy Center | 4 | - |

**Source:** ECO, 2025

This general picture illustrates an overall deficiency concerning the comprehension and application of ownership among members states as well as for the entire organization. Therefore, it is utmost important for the new Vision document of ECO to address this serious issue and try to develop strategies to alleviate this gap.

Promoting the visibility of the organization

Strong ownership is directly linked to the visibility of ECO on both regional and global scale. Once the Organization is owned in fullest sense by member states in a strong manner, the visibility of ECO externally will definitely be promoted in a proportionate manner. As the ECO Secretary General rightly argues, "strengthening ECO's visibility and fostering a stronger sense of regional unity is crucial" (Khan, 2025).

Promotion of visibility should be done both at regional and global levels, with increasing engagement of participation of various stakeholders. To achieve that in a sustainable manner, it should be benefited more from digital platforms and media; engaged more in partnership with international organizations; coordination between the ECO Secretariat and ECO Specialized Agencies, regional institutions and affiliated bodies should be deepened; and some visibility-related tasks outsourced in a cost-effective way (ECO, 2025 (b): 10).

The visibility of the organization should be strengthened through effective publicity. As mentioned, both traditional and social media tools should be better utilized to that end. Deep and strong historical and cultural ties between member states should be used to enhance the cultural cooperation dimension within ECO and promote tourism relations among ECO countries. This will definitely help to increase the visibility of ECO internally and abroad (Cavusoglu, 2022 (c): 35).

As EPG had previously argued, ECO Specialized Agencies especially ECO Cultural Institute, ECO Science Foundation and ECO Educational Institute in coordination with the ECO Secretariat could play an active role in this regard to promote the visibility and image of ECO in line with their respective mandates (EPG, 2012: 25, 26).

In parallel with these important initiatives, one of the most important ways to increase the visibility of ECO at regional and global realm is stronger engagement with other

organizations, both at regional and global level. This should be done by deepening collaboration with the United Nations (UN) in the first place; but also establishing partnerships with other organizations.

As for the UN part, we realize that ECO has already established comprehensive relationship with the UN itself as well as its specialized agencies, funds and programs. Gaining observer status in the UN General Assembly since 1993, ECO currently engages with several other key UN agencies and conventions as well, including the UN Environment Assembly (UNEA), the UN Convention to Combat Desertification (UNCCD), the UN Convention on Biological Diversity (UNCBD), the UN Framework Convention on Climate Change (UNFCCC), the United Nations Forum on Forests (UNFF), the Intergovernmental Panel on Climate Change (IPCC), United Nations Industrial Development Organization (UNIDO), United Nations Economic and Social Commission for Asia and Pacific (UNESCAP), Food and Agriculture Organization (FAO), United Nations Economic Commission for Europe (UNECE), United Nations Conference on Trade & Development (UNCTAD), United Nations Office of High Representative for Least Developed Countries, the Landlocked Developing Countries and Small Island Developing Countries (UNOHRLLS), United Nations Office on Drugs and Crime (UNODC), United Nations Children Fund (UNICEF), United Nations Office for Coordination of Humanitarian Affairs (UNOCHA) and others which have been growing steadily in an upward trajectory (ECO, 2024: 29).

However, to promote its regional and global visibility, ECO needs to partner not only with the UN, but also find ways for creating and developing new partnerships with other organizations. We already see that ECO has taken important way in this regard. For instance, it partners with the Organization of Islamic Cooperation (OIC), since 1995 and the Islamic Development Bank (IDB). It also gained Observer Status with the International Energy Charter in 2018 and the Organization of Turkic States (OTS) in 2023. ECO is also in process to obtain observer status in the Shanghai Cooperation Organization (SCO) and International Organization for Migration (IOM). ECO intends to obtain Observership in the International Renewable Energy Agency (IRENA) (ECO, 2024: 29). It will be beneficial and advantageous for ECO to enhance its visibility once it further develops these relationship and partnership with these organizations.

Strengthening result-oriented strategies

Based on previous experience, in a general, overall manner and methodology, the new Vision of ECO for 2026-2035 should be based on result-oriented strategies.

Likewise, it should apply clear timeframes and implementation mechanisms with a program and project-oriented approach, addressing the needs of member countries (Koç, 2025).

To achieve that, ECO shall be transformed into a project-oriented organization. Real success of ECO will depend on the effective implementation of concrete common projects (Cavusoglu, 2022: 35).

Similarly, it is very important for the new Vision to give priority to concrete and result-oriented programs with set and verifiable timetables in parallel to the development goals of the region (Sekizkok, 2025).

A more result and project-oriented organization, based on member states driven priorities and common economic interests obviously require reforms aimed at increasing efficiency of the Organization and streamlining its activities (Bayramov, 2022: 12).

Devising such result-oriented and concrete projects aligned with the goals of ECO and member countries' common development challenges are essential and to provide broader support, these projects should be in accordance with the international development agenda (Duran, 2024 (d): 2).

Focusing on the core areas of economy/trade: ECO Trade Agreement (ECOTA)

The Economic Cooperation Organization (ECO) is committed to fostering long-term sustainable development in the ECO region (ECO, 2025) and in this respect, the fields of economy and trade have utmost importance.

The ECO Vision 2025, adopted in 2017 put the spheres of economy and trade as the guiding areas for cooperation and collaboration to streamline ECO activities. This Document prioritized to double intra-regional trade, simultaneously increasing ECO share in global trade, taking into account the fact that trade is one of the most effective engines of economic development and an instrument for socio-economic integration. This prioritized trade liberalization; harmonization of policies; reducing cost of doing business; financial restructuring; and institutional capacity building. In that vein, the most important expected outcomes were operationalization of and increasing the membership in the flagship project of ECO Trade Agreement (ECOTA) and to enhance the scope of the latter from preferential trade to Free Trade Agreement (FTA) (ECO, 2017: 2-3).

However, despite some progress in enhancing collaboration in various areas, concrete progress could not be achieved in these expected outcomes (Koç, 2025).

The share of the ECO in global trade increased from USD 648 billion in 2016 to USD 1 trillion 16 billion in 2023. In percentage terms, the contribution of the ECO region in world trade was recorded at 4.14 % in 2021, which increased marginally to 4.48 percent in 2022 amid the global recovery. In 2023, it has declined somewhat to 4.31 percent according to data reported so far. For a region that is strategically located on important trade routes, ECO region's contribution in world trade is clearly below its potential level (ECO, 2024: 4).

The picture with regards to intra-regional trade is also similar which has remained dismally low. According to a study conducted by ECO "Leveraging Economic Potential of ECO Region", intra-regional trade stands at around 8 percent. ECO's intra-regional trade was recorded at 81.9 billion USD in 2023 which demonstrate that we are still far below the real potential of the Organization (Duran, 2024 (d): 1). The region has actually 10-fold potential to increase trade among its member states (Zardari, 2022: 24).

As the previous ECO Secretary General had mentioned similarly, given the real potential of the ECO region, trade sector has not been statistically significant. COVID-19 pandemic further exposed the vulnerabilities and fault-lines in trade among ECO Member States (Noziri, 2022: 42).

The ECO region therefore runs under a trade deficit regime. The ECO least integrated regions in terms of connectivity and intra-regional trade merely 7.9 percent, which is below expectations (Noziri, 2022: 43).

Similarly, ECOTA, the flagship agreement of ECO in the trade domain, has not been implemented since its inception. ECOTA was signed in 2003 by Türkiye, Afghanistan, Iran,

Pakistan and Tajikistan. It entered into force in 2008. However, although ratified by these said member countries, it could still not been operationalized.

As the previous Secretary General of ECO has again rightfully stated, ECOTA offers tremendous trade benefits, and after its full implementation by member states, it could even be upgraded to a Free Trade Agreement (FTA). In this respect, ECO Trade and Development Bank can play an important role, too (Noziri, 43).

That is why, as mentioned by former Foreign Minister of Türkiye, necessary actions to fully implement ECOTA should be taken as soon as possible (Cavusoglu, 2022: 35).

A significant breakthrough in this regard has been the convening of the 9th ECOTA Cooperation Council Meeting (ECOTA CCM), in Islamabad last year on 30-31 July 2024. The ECOTA parties have agreed to create a balance in the ECOTA text in this meeting.

In this respect, the 5th ECO Ministerial Meeting on Commerce & Foreign Trade, which will be hosted by Türkiye in June this year will be very instrumental (ECO, 2024: 15). This meeting is aimed to refine the agreement; expand its membership; and boost trade liberalization to unlock the full potential (Khan, 2025). The new round of negotiations will foster this broader membership, particularly through updated trade data sharing and participation from non-ECOTA member states (Khan, 2024 (c): 1). As the ECO Secretary General has also mentioned, the year 2025 should be marked by signing and ratifying ECOTA by all members during this meeting in Istanbul (Khan, 2025).

Therefore, the field of economy and trade, and especially ECOTA should be given utmost priority in the new Vision document of ECO for 2026-2035. As mentioned by the Turkish Deputy Foreign Minister in the last COM meeting last year in Mashhad, focus should be on economic and commercial cooperation and development priorities, especially for the trade sector, focusing on trade expansion, where ECOTA and trade facilitation enjoy a special place, rather than spending our energy on secondary areas (Duran, 2024 (d): 2).

To achieve this goal requires greater emphasis on business networking and private sector engagement; and in that respect organization of trade fairs; easing visa restrictions; enhancing B2B networking or making Business Forums on the sidelines of the ECO Summits (Khan, 2025). It would be very useful to reflect and incorporte all these initiatives in the new Vision document of ECO.

The effectuation of ECO Trade Facilitation Strategy is also critical here to boost intra-regional trade. The effective implementation of the Strategy will contribute to trade facilitation among member countries (Koç, 2025).

To sum up, in the new Vision document of ECO for 2026-2035, trade facilitation and full implementation of ECOTA should be given utmost priority to enhance intra-regional trade as well as in increasing the share of ECO in global trade figures.

As Director General at Turkish Foreign Ministry Ambassador Sekizkök mentioned at the HLC meeting in Tehran this year, ECO has unfortunately lost sight of its core area of activity in economy and trade focus to a wide array of fields which stalled visible progress in core areas such as the flagship project of ECOTA. Therefore, the Organization should deepen cooperation in trade and economic development with new energy and determination on the way towards the new Vision document (Sekizkök, 2025).

Engagement of private sector, youth and women

As the Concept Note, entitled "Broadening Participation in the Formulation of ECO Vision 2026-2035", prepared by ECO Secretariat has rightly argued, to pave the way for the

creation of a more effective new vision document, the scope of dialogue should be broadened to encompass a variety of other important stakeholders. In this regard, the engagement of particularly the private sector, women and youth is essential. It is essential to actively engage these important stakeholders across critical sectors, including trade, transport and connectivity, energy, tourism, economic growth and productivity, and social welfare and environment (ECO, 2025).

Such an attitude will also increase the level of corporate and democratic governance at the member states per se, as supportive engagement of the private sector, individual entrepreneurship and innovation could be benefited in developing creative and new business models to meet the demands of the members states themselves.

In that case, the overall objective of engagement of the private sector will transcend beyond the "quantity" of growth which is measured in statistical terms, but will also pay attention to the "quality" of growth. This conception and concentration of growth in ECO program and projects will put the latter not as an end itself or an objective in its own right, but a means to alleviate poverty; reduce inequality; increase employment; and bring wealth and prosperity for the entire ECO geography. In such a framework, small and middle-sized firms in the region could be assisted to gain market access, funds, financing opportunities, technology, skills and know how. Corporate governance shall be promoted and local firms could be channeled to invest more in the provision of basic infrastructure and services or develop creative and new business models to meet the demands of the entire ECO region (Bayar, 2009).

Economic activity has a gender dimension as well in the ECO geography, like everywhere else. This phenomenon demonstrates itself as women comparably constitute the socio-economically disadvantaged proportion of the population in the region in the sense that they are mostly concentrated in insecure, unsafe and low paid works; have insufficient access to decent employment; and under-represented in politics as voters, party leaders and parliamentarians.

"Inclusiveness" of women here is the key term to encompasses equity, equality of opportunity, and protection in the market and employment transitions in the case of most member states of ECO, which are going through from upper-middle to high income economies; and from efficiency-driven to innovation-driven state structures.

Therefore, gender equality here is not only a goal in itself but also a core component of sustainable and human development in the ECO region. Discrimination on the basis of gender is above all a denial of human rights and therefore, achieving gender equality through gender mainstreaming lie at the center of achieving the SDGs in the region.

In that context, the projects of women's empowerment and enhancing women's participation in politics and decision-making as well as women's enhanced integration in the economy should be proposed as the basis for efficient projects and initiatives in the new ECO vision document for the new decade.

Last but not least, one other relatively vulnerable group in the ECO region is the youth. Child and youth poverty in the region transcend beyond the issue of income and involves other elements such as nutrition; physical and spiritual development; protection; health care; proper and quality education. Unemployment rate among young people is relatively high. They are still isolated from participation in socio-economic life and labor market as well as young people do not have access to proper education facilities.

Therefore, developing comprehensive youth policies is very important for the ECO region to face effectively the challenges ahead. The ultimate strategy and method to achieve the latter is obviously to incorporate the subject matter in the new ECO Vision for 2026-2035 in a comprehensive manner.

## CONCLUSION

This paper has tried to present several contributions for the Economic Cooperation Organization (ECO), in reaching its deep, full and real potential in the coming decade ahead.

The latter will find expression in its new post-2025 Vision document, currently in the formulation phase, planned to be finalized by the end of the year. This new Vision will design the future orientation of ECO in the next decade.

In that respect, this paper aimed to offer the following to be evaluated and incorporated into the 2026-2035 Vision of ECO: (i) Enhancing the ownership among member states; (ii) Promoting the visibility of the organization; (iii) Strengthening result-oriented strategies; (iv) Focusing on the core areas of economy/trade: ECO Trade Agreement (ECOTA); and (v) Engagement of private sector, youth and women.

Realization and implementation of these five pillars in the new post-2025 Vision of ECO are presumed to contribute to the Organization (ECO) in reaching its deep, full and real potential in the coming decade ahead.

## References

1. Bayar Fırat, "Sustainable Development: The Concept and its Pillars", Journal of International Economic Problems, No: 40, Ankara, Turkey, 2011, p.27-34.
2. Bayar Fırat, "The Role of Democratic Governance in Combating the Non-Material Dimension of Poverty", Perceptions, Vol. XIV, Autumn-Winter 2009, p. 85-108.
3. Bayramov Jeyhun, "Azerbaijan and ECO: 30 years of cooperation and way forward", ECO Chronicle, 2022 (a)
4. Bıçaklı Hüseyin Avni, "Tracing the Evolution of Economic Cooperation Organization", ECO Chronicle, 2022 (e)
5. Cavusoglu Mevlut, "30 Years of Widened Economic Cooperation Under The Economic Cooperation Organization Perspectives For Its Future", ECO Chronicle, 2022 (c)
6. COM, Mashhad Communiqué, 28th Meeting of the ECO Council of Ministers (COM), Mashhad, Iran, 3 December 2024 (b)
7. Duran Burhanettin, "Statement by Deputy Foreign Minister" at the 28th ECO Council of Ministers, Mashhad, 3 December 2024 (d)
8. ECO Vision 2025 & Implementation Framework, ECO, 2017
9. ECO, "Broadening Participation in the Formulation of ECO Vision 2026-2035", Concept Note, 2025
10. ECO, "Report of the Secretary General", 28th Council of Ministers (COM) Meeting, ECO, December 3, 2024 (a)
11. ECO, "Rules of Procedure", 2021
12. ECO, "Treaty of İzmir", 14 September 1996
13. ECO, Concept Note, 1st ECO Forum on Sustainable Development, 2025 (f)
14. ECO, First Meeting of High-Level Committee, Draft Report, ECO, 2025 (b)
15. ECO, First Meeting of High-Level Committee, presentation by the Secretariat, ECO, 2025 (a)
16. EPG, "Report of the 3rd ECO Eminent Persons Group (EPG) on Enhancing efficiency, dynamism and visibility of ECO", 2012
17. Khan Asad M., "Statement by ECO Secretary General", at the Senior Officials' Meeting (SOM), Mashhad – December 2, 2024 (c)
18. Khan Asad M., "Statement by ECO Secretary General at the Plenary Session of the 35th Meeting of the ECO Regional Planning Council (RPC)", 24 February 2025 (d)
19. Koç Selçuk, "Opening Statement by Director General in Presidency of the Strategy and Budget of the Presidency of the Republic of Türkiye, 35th Meeting of the Regional Planning Council (RPC), 24 February 2025 (e)
20. Noziri Khusrav, "ECO Past, Present and Future", ECO Chronicle, 2022 (d)
21. Sekizkok Aylin, "Statement Ambassador Aylin Sekizkök, Director-General of International Economic Affairs of the Turkish Ministry of Foreign Affairs, First Meeting of High-Level Committee, ECO, 2025 (c)
22. Zardari Bilawal Bhutto, "ECO - 30th Anniversary of the ECO Enlargement Moving Towards Integrated and Shared Future", ECO Chronicle, 2022 (b)

https://doi.org/10.71447/3005-2696-2025-1-43

# WATER SECURITY AND REGIONAL STABILITY IN CENTRAL ASIA: PATHWAYS FOR MULTILATERAL COOPERATION

***Zharkyn Kalykova with the support of Dr. A. Noorian,***
kalykovajr@gmail.com
University of Tehran, Tehran, Iran

**Abstract**

This scholarly investigation examines the critical nexus between hydrological resource management and regional security paradigms in Central Asia. Throug h a multidisciplinary analytical framework incorporating political geography, international relations theory, and environmental economics, the study elucidates how transboundary water governance mechanisms influence geopolitical stability in this strategically vital region. The research employs comparative case study methodology to evaluate both conflictual and cooperative interactions among riparian states, with particular emphasis on the hydro-political implications of large-scale infrastructure projects. The findings suggest that institutionalized water diplomacy, grounded in principles of equitable utilization and sustainable development could transform hydrological challenges into opportunities for enhanced regional integration.

**Keywords:** transboundary water governance; hydro-political security; resource diplomacy; institutional cooperation; sustainable water management

## Introduction

### 1. Conceptualizing Water Security

The Central Asian hydrological system, characterized by its transboundary nature and climatic vulnerability, presents a paradigmatic case of environmental security challenges in post-Soviet space. The region's water resources constitute:

- A critical input factor for agricultural production systems
- A strategic variable in energy security equations
- A potential flashpoint for interstate tensions
- An ecological determinant of human security

Contemporary climate models project alarming reductions (15-30%) in the runoff of the Amu Darya and Syr Darya basins by mid-century (IFAS, 2022), exacerbating existing allocation conflicts between upstream (Kyrgyzstan, Tajikistan) and downstream (Kazakhstan, Turkmenistan, Uzbekistan) states.

### 2. Theoretical Framework and Methodology

This study synthesizes three complementary theoretical perspectives:

1. “Hydro-Hegemony Theory” (Zeitoun & Warner, 2006): Examines power asymmetries in transboundary water relations

2. "Environmental Security Paradigm" (Dabelko, 2008): Analyzes water scarcity as a non-traditional security threat

3. "Institutionalist Approach" (Ostrom, 1990): Evaluates governance mechanisms for common-pool resources

Methodologically, the research combines:

- Quantitative analysis of hydrological data (1991-2023)
- Qualitative assessment of legal frameworks and policy documents
- Comparative case studies of five major transboundary disputes

## 3. Empirical Analysis: Conflict Dynamics and Cooperation Potential

**Table 1.**

*Hydro-Political Tensions in Central Asian River Basins*

| Parameter | Upstream States | Downstream States |
|---|---|---|
| Primary water use | Hydropower generation | Agricultural irrigation |
| Key concerns | Energy security | Food security |
| Infrastructure focus | Dam construction | Irrigation modernization |

The analysis reveals that contemporary disputes (e.g., Rogun and Kambarata projects) reflect deeper structural tensions rooted in:

- Divergent national development strategies
- Incomplete legal frameworks for water allocation
- Climate change-induced resource variability

## 4. Policy Recommendations: Toward Sustainable Governance

### 4.1 Institutional Innovations

-Establishment of a Central Asian Water-Energy Commission with binding arbitration authority

- Implementation of basin-wide water accounting systems

### 4.2 Technological Solutions

- Precision irrigation technologies (potential efficiency gains: 35-45%)
- Integrated water-energy modeling platforms

### 4.3 Legal Harmonization

- Ratification of the UN Watercourses Convention
- Development of sub-basin management agreements

## 5. Conclusion: A Cooperative Security Framework

The study demonstrates that sustainable water governance in Central Asia requires:

1. Transition from zero-sum approaches to benefit-sharing paradigms
2. Mainstreaming of climate adaptation strategies
3. Enhanced role for multilateral financial institutions

The proposed institutional architecture could serve as a model for other water-stressed regions facing similar governance challenges.

## References

1. Dabelko, G. (2008). An uncommon peace: Environment, development, and the global security agenda. Environment.

2. Ostrom, E. (1990). Governing the commons: The evolution of institutions for collective action. Cambridge University Press.

3. Zeitoun, M., & Warner, J. (2006). Hydro-hegemony: A framework for analysis of transboundary water conflicts. Water Policy.

Appendices

- Appendix A: Hydrological data series (1991-2023)
- Appendix B: Comparative legal analysis of water agreements

https://doi.org/10.71447/3005-2696-2025-1-44

# CLIMATE IMPACT AND RESILIENCE STRATEGIES FOR PAKISTAN'S FOOD SYSTEM

***Hassnain Shah , Ghulam Sadiq Afridi, Ghulam Muharnmad Ali***

## Abstract

Pakistan's food system faces formidable challcngcs in thc context of climalc change. 'Ihis paper provides a comprchensive overview of the potential impacts of climatc harards on Pakistan's food security and rcsilicnce. It also proposes practical stratcgics for adaptation and rcsilicncc-building. The intcgralcd planning and implementation stratcgics outlined herc span various sectors. They aim to cnhancc climate rcsilicnce, improvc access to nutritious diets, and foster rcsilicnt food systems. In thc short tcrm, thc focus is on timely rcsponscs during shocks. Mcanwh:ilc, long-term planning cmphasizcs structural transformation and affordability improvements. Key areas for invcstmcnt includc sustainablc agriculture, watcr management, and diversificd livclihoods. However, further research and collaborative efforts arc csscnlial to rcfinc these stratcgics and ensurc lhcir cffectivc implcmcntalion. By addressing these challcngcs head-on, Pakistan can strengthcn its food systcm and mitigatc thc impact of climatc change.

**Keywords**: climate, food system, climate impact, resilience strategies, climate hazards

## Introduction

Climate change poses significant frcats to global food syslcms (Myers et al, 2017; Oriekhoe et al., 2024; Tchonkouang et al., 2024), with Pakistan being no cxccption. Pakistan, a country with a fast-growing population is cxtrcmcly susceptible to the cffccls of global warming and is facing increasingly significant threats due 10 the incrcasing frcqucncy and intensity in temperature variations, precipitation patterns, and cxtrcmc wcalher cvcnts (Naz el al 2024). In Pakistan, whcrc agriculture is vital for livelihoods, the impact of climatc variability is particularly scvcre (Aitzaz et al 2024). I)aily climate variability hazards creatc significant challcngcs for achicving food security, poverty reduction, and rural dcvclopment (Shawad ct al., 2021; Ahmed et al., 2024). These climate hazards disrupt production, rcsulting in low yields, and quality at all levels of the food chain, leading to reduced monetary and nutritional valuc (Hussain ct al., 2020; Khurshid & Abid 2024; Mirzabaev et al., 2023). This disruption creates a vicious cyclc of food insecurity by impacting yield, quality, income, and thc overall well-being of all actors involved in food production, post-harvcst managcment, processing, and distribution (Richards 2021; Buhaug & Von 2021; Gupta et al., 2023).

Yield variability and disruptcd supply chains due to wcathcr hazards further afTccL thc sustainablc supply and price stability, impacting availability and affordability at the consumer level. In a country likc Pakistan, which is highly dcpcndcnl on agriculturc, climate-induccd hazards can havc scvcrc impacts on food production, distribution, and

consumption. 'lhc small farm cconomy, coupled with underdeveloped valuc chains, low processing capabilitics, and minirnal modem storage capacity, results in low adaptivc capacity, hindcring successftlk adaptation efforts (Guja and Bedckc, 2024; Mbuli et al., 2021). Climatc change is rccognizcd and proven Lo bc a major global challcngc, with rescarch indicating il will impact agricultural output, incomes, priccs, food access, food quality, and food safety (Tchonkouang et al., 2024).

This paper explores how diffcrcnl pillars of the food system in Pakistan would be affcctcd by climatc hazards and outlines possible coping and adaptation stratcgics across thc food system chain.

Components of the Food System in Pakistan

The food system in Pakistan can bc dividcd into four main components: production, proccssing and storagc, distribution and marketing, and consumption. Each component is intcrconncctcd and any disruption in onc can cascade through the olhcrs.

## 1. Production

Impact of Climate Hazards:

- Temperature Extremes: Both cold and heat strcss have detrimental impacts on agricultural production (Bhandari et al., 2017). Furthermore, increasing climate variability will put crop production at risk as any variation above or below threshold lirnits even for shorter time period have detrimental impact on crop yield as well as quality (Shah et al., 2021). Higher intensity resulting from overtime increase in temperature and higher frequency of climate stresses due to increasing variability are resulting in compound impacts over the same production cycle wherein there are limited coping strategies (shah et al 2021, Shah et al., 2020). The monocrop cultivation on larger scale like wheat and rice, staples in Pakistan (Ijaz el al., 2019; Nawaz ct al., 2019; Sendhi 2022), arc particularly vulnerablc and may affcct food security duc to scasonal uncertainty Icading to variation in crop production (Ahmed et al., 2023).
- Water Scarcity: Erratic rainfall patterns and reduced water availability from glacicrs impact irrigation, critical for agricultural production in Pakistan. Fluctuation in temperature, and variation in precipitation arc the main causes of climatic variability (van der Wiel and Bintanja 2021; Hussain et al., 2022). Pakistan is onc of thc rnosl. vulncrablc regions cxposcd to variations in climate, and farming sector is onc of the mostly affected sectors orthc country (Fahad and Wang 2020).
- Pests and Diseases: Climate changc will alter the prevalcncc and distribution of pests and discascs, furthcr Ihrcatcning crop yields. Since temperature is the most important environmental factor affecting insect population dynamics, it is cxpectcd that global climalc warming could trigger an expansion of their geographic rangc, increased overwintcring survival, increased number of gcncrations, incrcascd risk of invasive insect spccics and inscct-transmittcd plant diseases, as well as changes in their interaction with host plants and natural cncmics (Skcndiié ct al., 2021). Climatc changc further increases outbreak risks by allcring pathogen evolution and host—pathogen interactions and facilitating the cmcrgcncc of new pathogenic strains. Pathogen rangc can shift, increasing the spread of plant discascs in new areas (Singh ct al., 2023).

- Soil Degradation: Extrcmc wcathcr cvcnts can lead to soil crosion and loss of fertility, impacting long-term agricultural productivity (Khan ct al., 2020; Rupesh et al., 2020; Anwar-ul-Haq et al., 2023).

Coping and Adaptation Strategies:

- rought-Rcsistant Crops: l)cvckopmcnt and adoption of drought-resistant and heattolcrant crop varieties.
- Efficient Irrigation Techniques: Implcmcnting water-saving tcchnologics such as drip irrigation and rainwater harvesting.
- Integrated Pest Management (IPM): Adopting IPM practices to managc pests and discascs sustainably.
- Soil Conservation Practices: 'f'cchniqucs such as contour plowing, terracing, and agroforcstry to prevent soil erosion and maintain fertility.

## 2. Processing and Storagc

Impact of Climate Hazards:

- Infrastructurc Damage: F,xlrcmc wcalhcr cvcnts such as floods and storms can damagc agribusiness infrastructure, processing facililics, storagc and road infrastructurc casing losscs, damagc to commodities and delay in supply affecting availability and pricc hikcs affecting affordability leading to food insccurity (Ahmad and Afral 2021; Sycd ct al., 2022).
- Post-Ilarvcst Losses: Higher temperatures and humidity can increase the ratc of spoilage and pcst infestation in stored food (Misiou and Koutsoumanis, 2022). [ligh cost of refrigeration during storagc and transportation affccts return on invcstmcnl. as well as increasc in prices (Zanoni and Marchi 2021 ; Amjad 2023).

Coping and Adaptation Strategies:

- Climate-Resilient Infrastructure: Building and retrofitting processing and storagc facilities to withstand cxtrcmc weather.
- Improved Storage Techniques: Using hermetic storagc, refrigeration, and controllcd almosphcrc storagc 10 rcducc spoilage.
- Diversification of Processing Locations: Establishing multiplc processing centers to reducc the risk of localized climatc events disrupting thc cntirc supply chain.

## 3. Distribution and Marketing

Impact of Climate Ilazards:

- Transport Disruptions: 'lhc primary rolc of food systems is to supply Iöod. Ensuring stability during disruptions and volatility, along with adaptability, is crucial for both supply chain actors and socictics. (Stonc and Rahimifard 2018). National l)isastcr Management Authority (NI)MA), Pakistan reports frcqucntly highlight lhc impact of natural disaslcrs, including floods and landslides, glacial lakc outburst floods, on infrastructure and food distribution in Pakistan. 'lhc 2022 flooding highlighted several underlying iss ucs, including poor urban planning, inadcquatc watcr rcsourcc managcmcnt, lack of infrastructurc maintcnancc, complex

govcrnancc, structural incqualitics, and limitcd disaster risk reduction capacity (GOP 2022).

- Market Volatility: Climate-induced supply shocks Icad to pricc volatility, impacting both produccrs and consumers (Chaudhry et al., 2021). Climate changc threatens food security by reducing crop yields and damaging infrastructure through scvcrc wc.alhcr cvcnts, leading to dccrcascd food supply, price shocks, and rcduccd food access (Whcclcr and Braun, 2013). In Pakistan, limited economic acccss for the poorest and food chain disruptions, cxaccrbatcd by climatc change, contribute significantly to growing food i_nsecuriLy (Jalccl el al., 2023).

Coping and Adaptation Strategies:

- Robust Transport Networks: Investing in resilient transport infrastruclurc and maintaining contingency routes.
- Market Information Systems: Establishing systcms to providc real-lime information on market conditions and prices to help stakeholders makc informed dccisions. ▪ Local Markets: Promoting local markets to rcducc dcpcndcncc on long-distancc transport and incrcasc l'ood system rcsilicncc.

## 4. Consumption

Impact of Climate Hazards:

- Food Sccurity: Rcduccd agricultural productivity can lead 10 food shortagcs, affecting the availability and affordability of food (Ahmed ct al., 2023). In Pakistan, climate change is not only ncgalivcly impacting crop productivity but also scvcrcly affccl.ing animal productivity. With livestock being the primary sourcc of protcin, heal stress, ecosystem changcs, and deficiencies in Crude Protein and 'lbtal l)igcstible Nutricnts ('I'DN) for large and small ruminants arc likely to significantly impact food availability (Hashmi et Ia., 2021). Climalc changc is driving many currcnt economic issucs, including rising food sector inflation, particularly through the healflation phenomenon. 'l'his situation ncccssitatcs a national food security policy that incorporates environmental, agricultural, and monclary factors to stabilizc food prices (Erdogan et al. 2024).
- Nutritional Quality: Climate change can impact the nutritional content of crops, reducing lhc quality of food available. Climaic huards impact not only the quantity but also the quality of crop yicld‌s, often rendcring lhcm unmarkelablc (Shah cl al., 2()2 1 'l'empcraturc variability affccts photosynthesis and cnzymc activity (Portcr and Gawilh, 1999), diminishing crop quality ('IYipathi ct al., 2016) . For instance, high tcmpcralurcs during rice grain-filling rcducc quality (Shi ct al., 2017), and heat stress during maize kernel growth lowers protein and starch content (Maycr ct al., 2016). Additionally, heavy rains can cause potato tubers to rot, and humid wcathcr can Icad to mycotoxin formation in winter wheat (Schaap al., 2011).

Coping and Adaptation Strategies:

- Diversified I)iets: Encouraging dictary diversity to reduce rcliancc on a few staplc crops. ▪ Food Assistance Programs: Strengthening social safety nels and food assistance programs to support vulncrablc populations during times of food scarcity.
- Nutrition Education: Promoting awareness about the importance of a balanced dict and nutrition.

## Conclusion

Climatc hazards pose significant thrcats to the food system in Pakistan, impacting all stages from production to consumption. •ro build a resilient food system, it is csscntial 10 adopt a multifaceted approach cncompassing technological innovation, infrastructure development, policy support, and community cngagcmcnl. By implementing cfTcctive coping and adaptation stratcgics, Pakistan can mitigate the advcrsc impacts of climate changc and cnsurc food security for its population.

## References

1. Ahmad, D., & Afzal, M. (2021). Flood hazards, human displacement and food insecurity in rural riverine areas of Punjab, Pakistan: policy implications. Environmental science and pollution research, 28(8), 10125-10139.
2. Ahmed, M., Asim, M., Ahmad, S., & Aslam, M. (2023). Climate change, agricultural productivity, and töod security. In Global agricultural production: Resilience to climate change (pp. 31-72). Cham: Springer International Publishing.
3. Aitzaz, M., Aatizaz, M., & Aatzaz, G. (2024). Climate Change: Threats to Agricultural Sustainability in Pakistan. Pakistan Social Sciences Review, 8(2), 354-362.
4. Arnjad, A. l. (2023). Implications of Climate Change on Agriculture Sector of Pakistan. Journal dPublic Policy Practitioners, 2(1), 98-125.
5. Anwar-ul-Haq, M., Mehmood, M. T., Alisha, Seed, S., Haider, S., Awais, M., & Iftikhar, I. (2023). Nutrient Management Under Changing Climate. In Climate Change Impacts on Agriculrure.• Concepts, Issues and Policies for Developing Countries (pp. 281-297). Cham: Springer International Publishing.
6. Bhandari, K. , Sharma, K. D. , Hanumantha Rao, B. , Siddique, K. H. , Gaur, P. , Agrawal, S. K., ...& Nayyar, H. (2017). Temperature sensitivity of food legumes: a physiological insight. ,4CIa Physiologiae Planlarum, 39, 1-22.
7. Buhaug, H.. & Von Uexkull, N. (2021). Vicious circles: violence, vulnerability, and climate change. Annual Review QfEnvironment and Resources, 46(1), 545-568.
8. Chaudhry, 1., Suleman, R., Bhatti, A., & Ullah, I. (2021 Food price fluctuations and its influence on global food market. Annals ofSocial Sciences and Perspective, 2(1), 21-33.
9. Erdogan, S.. Kartal, M. T., & Pata, U. K. (2024). Does climate change cause an upsurge in food prices? Foods, 13(1), 154.
10. Fahad, S., & Wang, J. (2020). Climate change, vulnerability, and its impacts in rural Pakistan: a review. Environmental Science and Pollution Research, 27, 1334-1338.
11. GoP-Govcrnmcnt of Pakistan (2022). Pakistan Floods 2022; Post-Disaslcr Nccds Asscssmcnt: Ministry of Planning l)cvclopmcnt and Special Initiatives, Government of Pakistan,
12. Islamabad. A product of the Govcmmcnt of Pakistan prcparcd with thc support of thc
13. Asian I)cvclopmcnl Bank, thc Europcan Union, United Nations Agcncics Wilh technical facilitation by the Unilcd Nations l)cvclopmcnt Programmc, and the World Bank
14. Guja, M. M., & Bedeke, S. B. (2024). Smallholders' climate change adaptation strategies: exploring effectiveness and opportunities to be capitalized. Environment. Development and Suslainabilüy, 1-30.
15. Gupta, T. D., Carneiro, B. , Schapendonk, F., Pacillo, G., Suza, M., & Läderach, P. (2023). Through the lens of inequality: what can we learn from CGIAR as a case study of research on the climate—security nexus? International Development Planning RevieY'. 45(4), 351375.
16. Hashmi, H. A., Belgacem, A. 0., Behnassi, M., Javed, K., & Baig, M. B. (2021). Impacts of climate change on livestock and related food security implications—overview of the situation in Pakistan and policy recommendations. Emerging challenges to food

production and security in Asia, middle east, and Africa: climate risks and resource scarcity. 197-239.
17. Hussain, A. , Cao, J.. Ali, S., Muhammad, S. , Ullah, W., Hussain, 1., & Zhou, J. (2022). Observed trends and variability of seasonal and annual precipitation in Pakistan during 1960-2016. 1m. J. Climatol, 42(16), 8313-8332.
18. Hussain, M., Butt, A. R., Uzma, F., Ahmed, R., Irshad, S., Rehman, A., & Yousaf, B. (2020). A comprehensive review of climate change impacts, adaptation, and mitigation on environmental and natural calamities in Pakistan. Environmental monüoring and assessment, 192, 1-20.
19. fjaz, M., Nawaz. A., UI-Allah, S., Rizwan, M. S., Ullah, A., Hussain, M., ... & Ahma.d, S. (2019). Crop diversification and food security. Agronomic Crops: Volume I: Production Technologies, 607-621.
20. Jaleel, S., Noor. H.. & Abbasi, S. (2023). The challenge of climate change: Pakistan's rising food insecurity. Journal of Research in Social Development and Sustainability, 2(2), I -14.
21. Khan, N., Naushad, M., & Fahad, S. (2020). Climate Impacts on Soil Structure and its Impacts on Agriculture Production in the World. Available at SSRN 3554314.
22. Khurshid, N. , & Abid, E. (2024). Unraveling the complexity! Exploring asymmetries in climate change. political globalization, and food security in the case of Pakistan. Research in Globalizanon, 8, 100220.
23. Mayer, L. I. , Savin, R. , & Maddonni, G. A. (2016). Heat Stress during Grain Filling Modifies Kernel Protein Composition in Field-Grown Maize. Crop science, 56(4), 1890-1903.
24. Mbuli, C. S., Fonjong, L. N., & Fletcher, A. J. (2021). Climate change and small farmers' vulnerability to food insecurity in Cameroon. Sustainability, 13(3), 1523.
25. Mirzabaev, A.. Kerr, R. B., Hasegawa, T., Pradhan, P., Wreford, A., von der Pahlen, M. C. T., & Gurney-Smith, H. (2023). Severe climate change risks to food security and nutrition. Climate Risk Management, 39, 100473.
26. Misiou, O.. & Koutsoumanis, K. (2022). Climate change and its implications för tood safety and spoilage. Trends in Food Science & Technolov, 126, 142-152.
27. Myers, S, S., smith, M. R., Guth, S., Goiden, C. D., vaitla, B., Mueller, N. D.. & 'Huybers, P. (2017). Climate change and global food systems: potential impacts on food security and undernutrition. Annual review Qfpublic health, 38(1), 259-277.
28. Nawaz, A.. Farooq. M., Nadeem, F., Siddique, K. H., & Lai, R. (2019). Rice—wheat cropping systems in South Asia: issues, options and opportunities. Crop and Pasture Science, 70(5), 395-427.
29. Naz, S., Iqbal. Z., & Begum, S. (2024). Climate Change's Impact on Food Security in Pakistan: Challenges and Mitigation Strategies. Pakistan Social Sciences Revieu', 8(2), 426-438.
30. Oriekhoe. O. 1., Adisa, 0., & Ilugbusi, B. S. (2024). Climate change and food supply chain economics: a comprehensive analysis of impacts, adaptations, and sustainability. International Journal of Applied Research in Social Sciences, 6(3), 267278.
31. Porter, J. R. , & Gawith, M. (1999). Temperatures and the growth and development of wheat: a review. Europeanjournal of agronomy, 10(1), 23-36.

32. Richards. C. E., Lupton, R. C., & Allwood, J. M. (2021 ). Re-framing the threat of glcbal warming: an empirical causal loop diagram of climate change, food insecurity and societal collapse. Climatic Change, 164(3), 49.
33. Rupesh, T.. Athnere, S., Naik, B. S. S. S., Bamboriya, J. S., & Dhegavath, S. (2020). Long term soil fertility management practices for nutritional security. Journal dPharmacognosy and Phyrochemislry, 9(5S), 654-660.
34. Schaap, B. F.. Blom-Zandstra, M., Hermans, C. M., Meerburg, B. G., & Verhagen, J. (2011). Impact changes of climatic extremes on arable farming in the north of the Netherlands. Regional Environmental Change, Il, 731-741.
35. Sendhil, R.. Kumari. B., Khandoker, S., Jalali, S., Acharya, K. K., Gopalareddy, K, ... & Joshi, A. K. (2022). Wheat in Asia: trends, challenges and research priorities. [n New horizons in wheal and barley research: global trends, breeding and quality enhancement (pp. 3361 ). Singapore: Springer Singapore.
36. Shah, H.. Hellegers. P., & Siderius, C. (2021). Climate risk to agriculture: A synthesis to define ditlércnt types of critical moments. Climate Risk Management, 34. 100378.
37. Shah, H., Siderius, C., & Hellegers, P. (2020). Cost and effectiveness of in-season strategies for coping with weather variability in Pakistan's agriculture. Agricultural Systems, 178,
38. Shahzad, M. Abdulai, A., & Issahaku, G. (2021). Adaptation implications of climate-smart agriculture in rural Pakistan. Sustainability, 13(21), 1 1702.
39. Shi, W., Yin. X., Struik, P. C., Solis, C., Xie, F., Schmidt, R. C., Huang, M., zou, Y.B., Ye, C.R. & Jagadish, S. K. (2017). High day-and night-time temperatures affect grain growth dynamics in contrasting rice genotypes. Journal of Experimental Botany. 68(18), 52335245.
40. Singh, B. K., I)eIgado-Baquerizo, M., Egidi, E., Guirado, E., Leach, J. E., Liu, H., & Trivedi, P. (2023). Climate change impacts on plant pathogens, food security and paths forward. Nalure Reviews Microbiology. 21(10), 640-656.
41. SkendZié, S., Zovko, M., Zivkovié, I. P., Leäié, V., & Lemié, D. (2021). The impact of climate change on agricultural insect pests. Insects, 12(5), 44().
42. Stone, J., & Rahimithrd, S. (2018). Resilience in Agri-food supply chains: A critical analysis of the literature and synthesis of the novel framework. Supply Chain Management: Imernulional Journal, 23(3), 207-238.
43. Tchonkouang. R. D.. Onyeaka, H., & Nkoutchou, H. (2024). Assessing the vulnerability of food supply chains to climate change-induced disruptions. Science q/' the Total Environment, 171047.
44. Tchonkouang. R. D.. Onyeaka, H., & Nkoutchou, H. (2024). Assessing the vulnerability of food supply chains to climate change-induced disruptions. Science oflhe Total Environment,
Volume 920, 10 April 2024, 171047.
45. Tripathi, A., Tripathi. D. K., Chauhan, D. K., Kumar, N., & Singh, G. S. (2016). Paradigms of cliniate change impacts on some major food sources of the world: A review on current knowledge and future prospects. Agriculture, ecosystems & environment, 216, 356-373.

46. van der Wiel. K., & Bintanja, R. (2021). Contribution of climatic changes in mean and variability to monthly temperature and precipitation extremes. Communications Earth & Environmenl, 2(1), l .
47. Wheeler, T.. & Von Braun, J. (2013). Climate change impacts on global food security. Science, 341 (6145), 508 -513.
48. Zanoni, S.. & Marchi, B. (2021). Environmental impacts of foods refrigeration. In Environmental Impacl Q/Agro-Food Industry and Food Consumption (pp. 239-259). Academic Press.

https://doi.org/10.71447/3005-2696-2025-1-45

# DIGITAL CORRIDORS AND THE FUTURE OF REGIONAL TRADE: TAJIKISTAN'S DIGITALIZATION DRIVE IN THE ECO CONTEXT

***PhD, Jovid Ikromi,***

ikromi.jovid@gmail.com
Ministry of Economic Development and Trade of Tajikistan[1]

**Abstract:**

This study examines how Tajikistan, a landlocked and digitally lagging member of the Economic Cooperation Organization (ECO) can leverage regional digital integration to overcome its infrastructure and institutional deficits.

The research asks: How can landlocked ECO states like Tajikistan utilize regional digital frameworks to compensate for national-level gaps in connectivity, capacity, and policy? Using a qualitative comparative case analysis of Tajikistan alongside more advanced peers (Kazakhstan and Uzbekistan), the study draws on policy documents, digital development indicators, and institutional reports. It engages conceptual frameworks of *digital sovereignty*, *digital public goods*, and regional integration theory to assess whether regional initiatives, for example, cross-border "digital corridors," harmonized e-commerce regulations, and shared digital platforms can mitigate the disadvantages of small, remote economies. The findings indicate that regional digital cooperation can indeed act as a compensatory mechanism (for example, by pooling infrastructure and expertise), but only if accompanied by deep policy harmonization and trust among member states. Without such alignment, Tajikistan's domestic digital reforms are likely to stagnate.

The article contributes to scholarly debates by reframing digital sovereignty in a regional context and highlighting digital public infrastructure as a regional public good. It proposes a strategy based on three major three pillars (1) harmonize digital policies and standards, (2) invest in shared digital infrastructure and capacity, and (3) build regional capacity and knowledge-sharing mechanisms. These insights bridge policy and theory, offering lessons for regional connectivity and digital development.

**Keywords:** Tajikistan; digital economy; landlocked development; ECO region; regional integration; digital sovereignty; digital public goods; e-commerce

## 1. Introduction

In the wake of the COVID-19 pandemic, ECO member states have increasingly prioritized the digital economy as a driver of recovery and sustainable growth. The 14th ECO Summit in 2021 underscored the need for digital solutions to bolster economic resilience. Subsequent ECO summits, including the 15th (Ashgabat 2021) and 16th (Tashkent 2023), reiterated commitments to trade facilitation, regional connectivity, and technological

[1] Disclaimer: The views expressed in this paper are solely those of the author and do not necessarily reflect the official policies or positions of the Ministry of Economic Development and Trade of Tajikistan.

innovation as pillars of shared development (ECO, 2021; ECO, 2023). These high-level agendas have particular salience in Central Asia, where landlocked economies rely on improved connectivity to overcome geographic isolation. For Tajikistan, one of ECO's smaller and more remote economies, digitalization offers a pathway to transcend physical barriers by creating "digital corridors" that link it with regional and global markets.

Digital corridors refer to the integration of information and communication technologies (ICT) into trade and transport networks, enabling seamless cross-border data exchange, electronic trade documentation, and online services alongside traditional physical routes (Ikromi, 2025). For example, digitalizing customs procedures and logistics can significantly cut trade times and costs, complementing ongoing investments in roads and energy corridors (ECO, 2023). Improved digital connectivity also fosters inclusive growth by allowing entrepreneurs in remote areas and small businesses to participate in regional trade more easily. In short, digital integration can help compensate for Tajikistan's landlocked geography. This premise is supported by development economics research showing that physical isolation imposes heavy costs: landlocked countries often face transport costs about 50% higher than their coastal counterparts and trade volumes around 28% lower, even after controlling other factors (Limao & Venables, 2001). Digital infrastructure and online markets offer a chance to mitigate these disadvantages of being "landlocked" in the physical sense by virtually linking Tajikistan to its neighbors and to the world.

Beyond these practical motivations, Tajikistan's digital transformation can be viewed through emerging theoretical lenses. Concepts of digital statehood and digital sovereignty highlight that in the modern era, state capacity and sovereignty are increasingly exercised in cyberspace (Hulkó, Kálmán, & Lapsánszky, 2025). Digital sovereignty has been broadly defined as "the ability of a country or region to exercise control over its own digital infrastructure, data use and technological developments, independent of external influence" (Hulkó et al., 2025). Traditionally, this term is interpreted as a form of national autonomy, the state's control over data, technologies, and networks within its borders (often linked to policies like data localization or independent internet infrastructure). However, for a small state like Tajikistan, achieving full digital autonomy is extremely challenging. No single country can supply and maintain all the components of a modern digital ecosystem on its own (Collier, 2007). Even large nations rely on cross-border supply chains and knowledge networks for crucial ICT elements (for example, semiconductor production or global internet exchange), so smaller economies are even more dependent on external cooperation. Scholars argue that full digital self-sufficiency is practically impossible for small states, and that "regional cooperation is a necessity" for them to attain digital security and efficiency (Shoker, 2022). In other words, there is an inherent tension between digital sovereignty as national autonomy and digital sovereignty as a pooled regional capacity achieved through integration. This tension is central to Tajikistan's case. On one hand, pursuing digital sovereignty in the sense of absolute national control might lead to isolation and stagnation; on the other, pooling resources with neighbors requires ceding a degree of autonomy. Effective digital sovereignty for Tajikistan may paradoxically require ceding some autonomy in favor of regional frameworks, a cooperative approach whereby ECO members collectively bolster each other's digital capacity. As Shoker (2022) notes, "digital autonomy is especially impossible in the case of small states," so they must pursue sovereignty "by cooperation" through partnerships and alliances. This conceptual nuance reframes digital sovereignty not

as uncompromising self-reliance, but as the ability to jointly manage digital resources and governance in a way that enhances each nation's effective control over its digital destiny.

Related to this is the concept of digital public goods and regional digital public infrastructure. Digital public goods (DPGs) are typically open-source software, data standards, and platforms that can be freely used, modified, and shared across borders (UN Secretary-General's Panel on Digital Cooperation, 2020). They form the building blocks for digital public infrastructure for example, interoperable digital ID systems, payment platforms, or data exchange standards, which can be jointly developed and adopted by multiple countries.

An integrated approach to ICT development, with shared DPGs, can foster "whole-of-government and regionally coordinated" digital solutions. In the ECO context, viewing systems like e-commerce platforms or cybersecurity frameworks as *regional public goods* could help members like Tajikistan leapfrog by using common digital tools and standards developed with stronger partners. The idea of regional digital integration aligns with broader theories of regional integration in development economics, where collective action can provide regional goods that no single country could supply cost-effectively on its own. Just as neighbors might share electric grids or transportation links, they can share digital infrastructure (for instance, internet exchange points or cloud data centers) and even policy frameworks. This not only yields economies of scale but also ensures interoperability and security across countries. In summary, the theoretical framework guiding this study posits that landlocked, smaller economies can achieve digital progress by pooling resources, standardizing rules, and co-developing digital public goods at the regional level, thereby turning shared challenges into collective opportunities.

Within this context, our research question is as follows:

Can regional digital cooperation under ECO serve as a mechanism for Tajikistan (and similar landlocked states) to overcome national deficits in digital infrastructure, skills, and governance? We approach this question by examining Tajikistan's digital development status and comparing it with two peer ECO countries (Kazakhstan and Uzbekistan) that have made more rapid progress. The comparative analysis illuminates how regional collaboration and knowledge transfer might help bridge Tajikistan's digital divide. We then propose strategic recommendations grounded in the concept of pooled digital sovereignty for Tajikistan and its ECO partners to jointly foster an inclusive regional digital ecosystem. The findings shed light on why regional digital integration is essential for Tajikistan to overcome domestic capacity constraints and fully realize its digital transformation.

## 2. Tajikistan's Digital Transformation: Progress and Challenges

### 2.1 Policy Reforms and Initiatives

Over the past few years, the Tajik government has launched multiple policies aimed at jump-starting its digital economy. Notably, the "Concept for the Digital Economy" (adopted 2019) and a follow-up Program for 2021–2025 established a national vision for ICT development. These strategies set targets for expanding broadband access, developing e-government services, and promoting ICT skills. In addition, new laws and regulations have been introduced to create an enabling environment for digital commerce and innovation, for instance, a Law on Electronic Commerce (2022) to legitimize online transactions, and

cybersecurity guidelines aligned with international standards. Tajikistan also joined the World Bank's regional Digital CASA project in 2018, aiming to improve internet connectivity through regional fiber-optic links and to strengthen digital government platforms. Furthermore, the government created the Agency for Information and Communication Technologies (CIT) under the President to coordinate digital transformation initiatives across sectors. These steps signal a growing political will to integrate into the global digital economy and catch up with regional peers.

International partners have supported Tajikistan's efforts. The Asian Development Bank and USAID funded projects to expand rural telecommunication infrastructure and e-government capacity (USAID, 2023), while the International Telecommunication Union (ITU) provided policy advice and training (ITU, 2022). As a result, some early gains are evident. The introduction of online business registration and electronic tax filing has begun to streamline bureaucratic processes (World Bank, 2024b). A small tech startup scene is slowly emerging in Dushanbe, and awareness of digital opportunities has increased among the urban youth (USAID, 2023). The government has also piloted several e-government services, such as electronic notarization and digital licensing portals (UNESCAP, 2022). These policy initiatives indicate that Tajikistan is actively laying the groundwork for a digital economy.

However, it is important to note that these reforms are nascent and have yet to yield major outcomes. Many laws remain on paper with uneven implementation on the ground. Funding for large-scale ICT projects is limited, and coordination between ministries can be slow. Moreover, frequent turnover in government personnel and shifting priorities have at times stalled the continuity of digital initiatives. Thus, while the strategic intent is in place, Tajikistan still faces an uphill battle in translating policies into widespread digital transformation.

This paper contributes to the growing literature on regional digital governance by offering a reframing of digital sovereignty for small, landlocked states. Traditionally defined as national control over data and digital infrastructure, digital sovereignty has often implied a pursuit of autonomy. Yet for capacity-constrained economies like Tajikistan, this notion is both impractical and potentially counterproductive. Instead, sovereignty may be better conceived as a shared capacity—achieved not by isolation, but through collective infrastructure, interoperability standards, and mutual institutional support. This paper examines that proposition through the lens of 'digital corridors' in the ECO region.

### 2.2 Current Digital Landscape and Gaps

Tajikistan's digitalization drive has yielded some initial gains, but the country's overall digital landscape remains underdeveloped compared to regional neighbors. Internet access has expanded in recent years by early 2024, Tajikistan had an estimated 4.25 million internet users, representing about 41–42% of the population (DataReportal, 2024a). This is a substantial increase from just a few years prior, for example, internet penetration was around 17% in 2015 (World Bank, 2021), reflecting the spread of mobile networks and cheaper smartphones.

However, it still lags far behind Kazakhstan and Uzbekistan, where over 80–90% of the population is online (DataReportal, 2023; TheGlobalEconomy, 2024). In rural and remote areas of Tajikistan, connectivity remains very sparse. Mobile broadband coverage

reaches only around 60% of the population (mostly in cities), and 4G networks are largely absent outside the capital and major towns.

By contrast, both Kazakhstan and Uzbekistan report over 95% population coverage for 4G, and have even begun rolling out 5G in urban centers (DataReportal, 2023; World Bank, 2024). The quality of internet service in Tajikistan is also relatively poor international bandwidth per capita is extremely low (on the order of 5–10 kbps per person in 2021), since the country relies on a few costly transit links through neighboring states (World Bank, 2021).

These connectivity issues are compounded by weak legal and institutional capacity. As Ikromi (2022) highlights, Tajikistan has yet to transition from outdated regulatory models, with limited reform in digital governance and persistent state dominance in the ICT sector. High wholesale bandwidth costs translate into expensive and slow internet for end users, contributing to a persistent digital divide between Tajikistan and better-connected countries. These challenges are summarized in Table 1, which outlines the key structural and institutional gaps currently limiting Tajikistan's digital progress. These patterns are consistent with previous research (Ikromi, 2022), which underscores the persistent institutional inertia and geographic disadvantages shaping Tajikistan's digital landscape.

**Table 1:**

Digital Development Gaps in Tajikistan

| Category | Gap Description | Additional Issues |
|---|---|---|
| Internet Access | Low internet penetration (~42%) | |
| Broadband Infrastructure | Limited fiber-optic coverage and expensive transit links | |
| Digital Services | Few digital government services, weak e-commerce uptake | Weak e-payment ecosystem; limited user trust |
| Institutional Capacity | Recent establishment of coordination bodies, still limited in capacity | New institutions (e.g., digital agency) still developing technical expertise |
| Human Capital | Digital literacy low, especially in rural areas | |
| International Bandwidth | High cost per Mbps due to reliance on external providers | Limited international bandwidth; poor rural 4G coverage |
| Legal and Policy Framework | Early-stage implementation of e-commerce and digital laws | Limited regulatory support for cross-border digital trade |
| Telecom Infrastructure | No national IXP | Limited international bandwidth; poor rural 4G coverage |
| Regional Integration | Minimal engagement in joint digital projects | No mutual recognition of digital certificates |

**Sources:** World Bank (2024), ITU (2023), Ikromi (2022), DataReportal (2024)

Another gap is in e-government and digital public services. Tajikistan has only a few hundred government services online, roughly 30% (Ikromi, 2022; World Bank, 2024a) of public services have some digital presence, and the country is still developing a unified e-government web portal. In practice, most administrative tasks in Tajikistan must still be done in person with paper forms. In contrast, Kazakhstan offers over 90% (World Bank, 2023; ITU, 2023) of public services online through a well-established e-government portal (eGov.kz), and Uzbekistan offers around 60% (with over 560 services available on its my.gov.uz platform) (ITU, 2023; International Trade Centre, 2023). Citizen uptake of e-services is accordingly much higher in those countries, whereas in Tajikistan digital government usage is minimal. The ICT sector of Tajikistan is also in an early stage, there are only a few small IT companies and startups, and the country imports most of its software and hardware (Ikromi, 2022). Limited human capital is a major issue: only about 10% of Tajikistan's labor force has advanced digital skills, and there are few domestic training programs producing IT specialists at scale (UNESCAP, 2022; World Bank, 2024b). By comparison, Kazakhstan and Uzbekistan have nurtured sizeable tech workforces and IT industries (e.g., Uzbekistan's IT Park hub has hundreds of resident companies and startups) (International Trade Centre, 2023).

Crucially, Tajikistan's international connectivity is constrained by its geography and infrastructure. As a landlocked nation, it depends on neighboring countries for access to global internet backbones. Currently, internet traffic from Tajikistan must transit through Uzbekistan, Kazakhstan, or Russia to reach major global exchange points (World Bank, 2023; ADB, 2023). This dependency not only raises costs but also creates vulnerability: outages or policy shifts in transit countries can directly impact Tajikistan's connectivity. The country has joined regional infrastructure projects (like Digital CASA) in hopes of diversifying routes for instance, linking through Kyrgyzstan to connect with China or through Afghanistan to connect southward, but these links are not yet fully operational or secure. Meanwhile, domestic fiber-optic infrastructure is thin; many districts are still connected by older microwave links or even satellite in remote mountain areas, which limits bandwidth. Power supply instability further hampers telecom networks in rural areas (World Bank, 2024a).

Despite some important first steps, Tajikistan's digital transformation remains fragile and uneven. Policy frameworks have been launched, and internet access has grown but the foundations are still thin. Infrastructure gaps, limited talent, and high connectivity costs continue to weigh down progress. More importantly, reforms often remain on paper, slowed by institutional fragmentation and dependence on costly external networks. For a landlocked country with modest resources, this kind of isolation becomes more than a logistical hurdle. It turns into a structural disadvantage. What Tajikistan lacks in scale, it might find through smart alignment with its neighbors. The next section examines how Kazakhstan and Uzbekistan, not without their own constraints, managed to leap ahead by combining domestic reform with regional openness. Their trajectories offer Tajikistan both a mirror and a map.

## 3. Comparative Analysis: Lessons from Kazakhstan and Uzbekistan

While Tajikistan is still in the early stages of its digital transition, other ECO member states provide useful reference points for what rapid digital progress can look like, as well as what pitfalls to avoid. In particular, Kazakhstan and Uzbekistan (Central Asia's largest economies) have undertaken robust digital transformation programs over the past decade. Both have leveraged digital technology to boost government efficiency, diversify their

economies, and improve regional connectivity, in line with ECO's broader goals of an integrated and innovative region. At the same time, Kazakhstan and Uzbekistan started from circumstances not entirely dissimilar to Tajikistan's for example, post-Soviet infrastructure legacies, landlocked locations, and significant rural populations and faced some of the same obstacles (such as rural connectivity gaps, outdated regulations, and shortages of IT skills). Examining how these two countries addressed those challenges can shed light on strategies that Tajikistan might emulate, as well as cautionary tales of issues to watch out for.

As a backdrop, Table 2 compares key digital indicators for Tajikistan versus Kazakhstan and Uzbekistan. The disparities are striking and underscore Tajikistan's lagging position in the region. For instance, about 93% of Kazakhstan's population and 83–89% of Uzbekistan's used the internet by 2023, compared to roughly 40% in Tajikistan (DataReportal, 2023; TheGlobalEconomy, 2024). Both Kazakhstan and Uzbekistan enjoy near-universal mobile broadband coverage over 98% of their population covered by 4G networks, whereas Tajikistan's coverage is patchy outside cities (World Bank, 2024). Kazakhstan has over 15 million mobile broadband subscriptions (almost one per adult), and Uzbekistan over 20 million, while Tajikistan has only around 4–5 million (ITU, 2023). In international benchmarks like the UN E-Government Development Index, Kazakhstan ranks among the top 30 globally, and Uzbekistan in the top 50, whereas Tajikistan is near the bottom quartile (UN DESA, 2022). These quantitative gaps illustrate the regional digital divide within ECO: Tajikistan is significantly behind on access, usage, and digital services, a sobering reminder of how much it must catch up.

**Table 2:**
Comparative Digital Development Indicators (Tajikistan, Kazakhstan, Uzbekistan)

| Indicator | Tajikistan | Kazakhstan | Uzbekistan |
|---|---|---|---|
| Internet Users (% of population) | 41–42% (2024) | 93% (2023) | 83–89% (2023) |
| 4G Coverage (% of population) | ~60% (mostly cities) | >98% | >98% |
| 5G Rollout (urban areas) | Not yet launched | Underway in major cities | Operational in all regions |
| Mobile Broadband Subscriptions (millions) | 4–5 million | 15+ million | 20+ million |
| UN E-Government Development Index Ranking | Bottom quartile | Top 30 | Top 50 |
| Adoption of National Digital Strategy | Yes (2019, updated 2024) | Yes (2018–2022) | Yes (Digital Uzbekistan 2030) |

**Source:** Data compiled from World Bank (2024), ITU (2023), and national digital strategy documents. See full citations in References

Kazakhstan has emerged as a digital frontrunner in the ECO region, propelled by its Kazakhstan has clearly pulled ahead as the ECO region's digital frontrunner. With the backing of strong state capacity and energy revenues, it started investing heavily in ICT as early as the mid-2010s. The "Digital Kazakhstan 2018–2022" strategy wasn't just branding, it came with real infrastructure commitments and institutional reforms (Government of

Kazakhstan, 2017). By 2023, more than 90% (ITU, 2023; DataReportal, 2023) of public services were accessible online, and Kazakhstan had among the highest internet penetration and broadband speeds in Asia. It also anchored regional connectivity: Almaty became home to a key Internet Exchange Point, and Kazakhstan helped initiate the Trans-Caspian "Digital Silk Road" cable linking to Azerbaijan (World Bank, 2023a).

But Kazakhstan didn't just upgrade its own systems, it exported them. Its e-government architecture and digital ID systems were shared with neighbors through initiatives like KazAID (KazAID, 2022), along with technical assistance and regulatory templates In trade policy, it pushed for e-commerce and cybersecurity harmonization across borders (ADB, 2022). What Kazakhstan's experience shows is this: when digital infrastructure is treated as a strategic and regional asset, not just a domestic fix, it opens new lanes for influence and resilience.

Uzbekistan came to digital reform a bit later but moved fast. Since 2017, it's gone through a wave of liberalization. The government's "Digital Uzbekistan 2030" program, launched in 2020, was paired with the creation of a new Ministry of Digital Technologies (Government of Uzbekistan, 2020). Telecom sector reform, most notably the 2023 Telecom Law (U.S. Department of Commerce, 2024) broke monopolies and triggered real competition, driving down prices and boosting access.

More importantly, Uzbekistan invested in people. IT Parks were set up across the country to nurture startups, and targeted policies encouraged private sector growth (IT Park Uzbekistan, 2023). By 2023, more than 60% of public services were digitalized. The country also leaned into regional engagement joining the World Bank's Digital CASA initiative and hosting training programs for Afghan and Kyrgyz ICT officials (World Bank, 2022; ITC, 2023). Uzbekistan's case shows that when policy, market liberalization, and tech training move in sync, visible results follow—fast.

So what does this mean for Tajikistan? First, ad hoc reforms won't cut it. Both Kazakhstan and Uzbekistan succeeded because they had coherent strategies backed by real investment and institutional reform. Tajikistan will need to match that level of ambition especially in broadband infrastructure, digital skills, and regulatory modernization.

Second, both countries show the value of outward-facing strategies. Kazakhstan and Uzbekistan benefited from regional platforms and donor partnerships; they didn't build in isolation. Tajikistan can similarly leverage regional programs and proven solutions to sidestep some of the high fixed costs of experimentation.

Finally, and perhaps most importantly, both countries reframed digital sovereignty not as full independence, but as shared capacity through cooperation. Neither tried to "go it alone." Instead, they strengthened national control by investing in regional public goods: from fiber cables to cloud services to training programs. For Tajikistan, the implication is clear: regional integration isn't a threat to digital sovereignty, it may be the only viable path to achieving it (Shoker, 2022; Chander & Sun, 2021).

The next section draws on these insights to outline specific ways ECO countries, including Tajikistan, can co-invest, coordinate, and advance together in their digital transformation journeys.

## 4. Policy Recommendations: Toward a Regional Digital Ecosystem

The comparative analysis above reveals a clear digital divide within the ECO region. To capitalize on the promise of "digital corridors" and ensure no member state is left behind, a shift toward a more integrated regional digital ecosystem is needed. We outline here a multi-pillar strategy through which Tajikistan, in concert with its ECO partners could

overcome its domestic constraints. The focus is on practical steps to pool resources and harmonize policies, thereby operationalizing the idea of shared digital sovereignty. The recommendations center on three main pillars: (1) harmonize digital policies and standards, (2) invest in shared digital infrastructure and capacity, and (3) build regional knowledge-sharing mechanisms. Each is discussed below in terms of rationale and proposed actions, with an emphasis on how they address Tajikistan's challenges while benefiting the region.

### 4.1 Harmonize Digital Policies and Standards

One foundational pillar for regional digital integration is the alignment and harmonization of regulatory frameworks across ECO member states. At present, divergent national rules create friction in cross-border digital interactions, ranging from incompatible electronic signature standards to inconsistent data protection regimes and varying licensing requirements for digital services. Regulatory harmonization would help transform the ECO space into a more coherent and functional digital market, thereby improving trust, reducing transaction costs, and fostering deeper economic interdependence. For a country like Tajikistan, aligning with the more advanced frameworks of its neighbors offers an opportunity to "import" good regulatory practices and leapfrog certain domestic constraints.

A first area of focus is the mutual recognition of electronic documents and signatures. If a digital signature or business license issued in one ECO country were to be legally recognized in another, it would greatly facilitate paperless trade and cross-border e-commerce. Encouragingly, steps in this direction are already underway under the UN's Framework Agreement on Facilitation of Cross-Border Paperless Trade in Asia and the Pacific, to which several ECO countries are party or have expressed interest (UNESCAP, 2022).

Second, regional compatibility in data privacy and cybersecurity standards is essential. A shared understanding of how personal data is handled and how cybersecurity threats are managed would improve trust among businesses and consumers operating across ECO borders. For example, if Tajikistan enacts data protection legislation aligned with international norms and if neighboring states do likewise companies operating in multiple jurisdictions would face fewer legal uncertainties. Similarly, a regional protocol on cybersecurity information-sharing and coordinated incident response would significantly enhance resilience against cross-border digital threats.

Third, the harmonization of digital trade regulations, including electronic payments, consumer protection in e-commerce, and simplified customs procedures for digital goods, can reduce regulatory friction. These are particularly critical for landlocked states like Tajikistan, which depend heavily on regional trade corridors. The easier it becomes for Tajik entrepreneurs and small firms to engage in digital commerce with partners across the ECO region, the more inclusive and competitive Tajikistan's digital economy will become.

By pursuing such harmonization, ECO members could establish a unified regional digital market. For Tajikistan, entering this larger market mitigates the disadvantage of its small domestic economy, giving its digital entrepreneurs access to millions more customers. At the same time, harmonization does not require heavy investment. It is largely a matter of political coordination and legal updates, making it a cost-effective strategy. Importantly, aligning policies is also a confidence-building measure. It signals trust and common purpose, which can spill over into deeper cooperation. In sum, regulatory harmonization is a low-cost but high-impact strategy to create a more level playing field and integrate

Tajikistan into the regional digital economy. It sets the institutional foundation upon which physical infrastructure and platforms (the next pillar) can then interconnect.

### 4.2 Invest in Shared Digital Infrastructure

The second pillar is to develop and interconnect digital infrastructure across the region, treating it as a shared foundation for the ECO's digital economy. Just as ECO countries have historically collaborated on physical connectivity projects (roads, railways, power grids), they can now collaborate on the less tangible but equally critical domain of digital connectivity. A prime example would be the establishment of regional Internet Exchange Points (IXPs) and data centers that serve multiple countries. At present, much of Central Asia's internet traffic is routed through servers outside the region (in Europe or Russia), causing inefficiencies and high transit costs due to long distances and intermediary fees (World Bank, 2024a).

If ECO members co-invest in regional internet hubs, for instance, a major IXP in Almaty or Tashkent where all member countries' networks interconnect, local traffic could be exchanged within the region, greatly improving speeds and reducing dependency on external networks. Tajikistan, for example, could exchange internet traffic with Uzbekistan or Kazakhstan at a nearby regional hub instead of routing everything via Moscow or Frankfurt. This would lower latency (improving user experience for online services) and cut costs for local ISPs and users.

Another priority is to build a regional fiber-optic backbone. Plans are already underway in Kazakhstan and Azerbaijan to enhance fiber routes (e.g., the Trans-Caspian cable), and extending these to Kyrgyzstan, Tajikistan, and further to Afghanistan, Pakistan, and Iran would create a robust mesh of fiber-optic links in the ECO space (U.S. Department of Commerce, 2024a). One viable option would involve ECO Regional Fiber Ring , connecting all member states' capital cities with high-capacity fiber infrastructure and multiple cross-border nodes for redundancy. Such a network would ensure that even if one country faces an outage or disruption, traffic could be rerouted through regional partners. For Tajikistan, being part of a regional fiber ring would provide alternative pathways to global internet networks (bypassing its over-reliance on any single transit country) and improve its bargaining position for bandwidth pricing.

Investing in shared data centers and cloud infrastructure is another avenue. Rather than each country building its own expensive Tier-III data center, ECO states could collaborate to establish a few regional data hubs where computing resources are pooled. A data center in one country could host disaster recovery backups or regional digital services that all members use. For example, a jointly managed ECO cloud platform might support applications like a regional digital payment system or an e-learning library accessible to all member states. Smaller countries like Tajikistan and Kyrgyzstan, which on their own cannot justify large data center projects, would benefit immensely from access to such shared infrastructure (ADB, 2023; World Bank, 2024b). This approach treats critical digital infrastructure as a regional public good. Of course, shared infrastructure raises questions about governance and trust, countries need assurances that their data and services in a foreign-based center are secure. Co-ownership models and legal safeguards can mitigate these risks. With proper safeguards, the economies of scale from pooling infrastructure far outweigh the downsides: all members get more reliable and robust services at lower unit cost, and the region becomes more self-sufficient.

In addition, alternative and emerging technologies should complement terrestrial fiber. Many ECO countries have remote mountainous or desert areas (Tajikistan's Pamir

region, Pakistan's Karakoram, etc.) where laying fiber is difficult and not economical. Here, members could collaborate on satellite broadband solutions. The rise of low-earth orbit satellite constellations (like SpaceX's Starlink) offers new opportunities for high-speed internet in hard-to-reach locales. An ECO-wide initiative to jointly procure satellite capacity or establish regional ground stations could ensure that every member, even those with challenging geography, can connect their rural communities. For example, if Tajikistan, Kyrgyzstan, and Afghanistan together negotiate with a satellite provider, they might secure a better deal or coverage plan than each acting alone. Pooling demand in this way fosters collective digital sovereignty, the region becomes less dependent on external terrestrial routes and can guarantee minimum connectivity for all its people. A recent commentary on Gulf states' connectivity noted that "*by pooling resources, countries can create an interconnected and resilient network, fostering digital sovereignty while supporting economic integration across the region*" (ORF, 2024). This insight equally applies to Central Asia.

To move these ideas forward, ECO as an organization can play a coordinating role. It could help mobilize joint funding (approaching development partners like the World Bank or Asian Development Bank on behalf of multiple countries) and ensure technical standards compatibility.

The World Bank's support for the West Africa Regional Communications Infrastructure Program, for instance, shows that multilateral lenders are keen to fund regional digital integration. In fact, the World Bank and ADB are already financing pieces of Central Asian connectivity (e.g., Digital CASA) (World Bank, 2024a), so building on and linking these efforts under an ECO umbrella would be timely. In sum, by planning and investing collaboratively, ECO members can create a meshed regional digital network where data flows freely and reliably across borders, turning the region's geography from a liability (fragmented, landlocked networks) into a strength (integrated "digital silk roads") (World Bank, 2024b).

### 4.3 Build Capacity and Share Knowledge

The third pillar is about building people, not just platforms. Human and institutional capacity must rise together across the region—or no digital reform will stick. Technology and law alone are not enough, there is a need to elevate the digital know-how in all member states so that initiatives are implemented effectively. Currently, there is a wide variance in digital capacity among ECO states: some have advanced e-government agencies and thriving tech sectors, while others face acute skill shortages. A regional approach to knowledge transfer can help level this playing field.

Start with something practical. ECO should set up a *Digital Economy Working Group* under its Secretariat that meets regularly, whether online or in-person. Not another talk shop, but a place where IT officials, telecom regulators, and digital entrepreneurs across ECO share blueprints, not just bullet points. This platform would bring together officials, IT experts, and industry representatives from each country to exchange experiences and coordinate joint initiatives. It could institutionalize the currently ad-hoc exchanges, for example, instances where Kazakh experts who built e-government systems informally advise their Tajik counterparts, or Uzbek telecom regulators share lessons with Afghan officials. By making such exchanges systematic (through workshops, study tours, or short-term staff secondments), countries can learn from each other's successes and failures much faster than if each works in isolation. The knowledge gap on specific issues, say, how to implement a one-stop government e-service portal or how to draft effective data protection regulations,

can be closed through direct mentoring by a neighbor that has done it before. This sort of South-South learning is often more relatable and practical than generic international advice.

Encouragingly, some cooperation is already happening. For instance, Uzbekistan's IT Park has hosted delegations from Kyrgyzstan and Tajikistan to showcase its startup incubation model (ITC, 2023), while Kazakhstan's Government Digital Academy opened training slots for regional officials (ITC, 2023). These examples show the appetite for peer learning in the region. ECO can add value by scaling up and formalizing such efforts, potentially by creating regional training programs or centers of excellence. Regional hackathons and tech forums, like an annual 'ECO Digital Challenge', could catalyze youth innovation and build stronger cross-border networks in the ICT sector.

For Tajikistan, tapping into the expertise of Kazakhstan, Uzbekistan, and others is a quick win to build its human capital. Rather than struggling to train all needed specialists domestically, Tajikistan can send trainees to courses in neighbors' institutions, use curricula developed elsewhere, or even outsource certain digital services initially while its own capacity ramps up. Over time, as Tajikistan's practitioners gain experience, they can contribute back to regional knowledge networks, creating a virtuous cycle. International players are already on board. UN-ESCAP's APCICT ran digital governance training for Central Asia, and ITU regularly supports knowledge exchanges (UNESCAP, 2022; ITU, 2023). Tajikistan can tap these networks now, not wait for perfect domestic rollout. By coordinating with these actors, ECO could ensure that capacity-building programs are tailored to the region's needs and inclusive of the least developed members.

In implementing all these recommendations, neutral phrasing and mutual respect are key. The goal is not for one country to dominate or impose its model, but for ECO members to recognize their interdependence and jointly elevate their digital profiles. Tajikistan may position itself as a regional facilitator by proposing some of these measures at the next ECO ministerial meeting, framing them not as demands, but as collaborative opportunities that align with ECO's stated vision. For example, it could volunteer to co-chair a working group on digital integration or host a pilot regional data center (with international support) as a test case for shared infrastructure governance. Tajikistan could position itself as a credible convener of ECO digital coordination, garner goodwill, and attract the technical assistance needed to execute these plans.

Digital deficits aren't just national, when Tajikistan stays offline, it drags the region with it. And when it connects, it expands the whole market. Sovereignty in this space isn't about fencing off servers. It's about showing up, shaping the rules, and sharing the gains. Tajikistan's lack of broadband or cybersecurity expertise isn't just its problem. It affects the whole region's connectivity and trust. Conversely, a more digitally enabled Tajikistan opens new markets and routes that benefit neighbors. By embracing this perspective, Tajikistan and its ECO partners can turn collective weaknesses into shared strengths. Ultimately, regional integration does not dilute digital sovereignty for small states like Tajikistan, it redefines it. Sovereignty, in this context, is not isolation, but the capacity to participate in and shape shared regional systems.

Of course, pursuing regional integration is not without risks. Differences in national digital strategies, political mistrust, and varying levels of institutional maturity across ECO members could complicate implementation. Additionally, concerns about data sovereignty and control over shared infrastructure may deter some countries from fully participating. These risks can be mitigated through clear legal agreements, transparency, and the establishment of neutral governance structures for regional digital assets.

## 5. Conclusion

Tajikistan's digital transformation will not succeed in isolation. The experiences of its ECO neighbors make one thing clear: regional alignment is no longer optional; it is the only viable path for countries constrained by geography and scale. They can continue with fragmented, country-by-country digitalization, which will likely see the smaller and poorer states lagging or they can embrace a more unified regional approach, leveraging their collective strengths. A coordinated approach could accelerate digital growth and reduce gaps between ECO's advanced and lagging members. Tajikistan's recent policy momentum is a welcome sign of political commitment. By channeling that momentum into regional cooperation, Tajikistan and the ECO can create a "digital Silk Road" that ensures even the most remote and landlocked communities are connected to the global digital economy. Such an outcome would illustrate how true digital sovereignty for a small state can be achieved collectively rather than individually: by pooling resources and aligning with neighbors, Tajikistan can exercise greater effective control over its digital destiny than it ever could in isolation (Shoker, 2022; Hulkó, Kálmán, & Lapsánszky, 2025). This case thus provides a nuanced contribution to the literature on small states in an era of digital globalization, highlighting that sovereignty and interdependence are not mutually exclusive, but in fact, for developing countries, often two sides of the same coin.

In closing, the Tajikistan example underscores a broader insight: in the digital era, regional integration is not just a political ideal but a practical necessity for countries facing capacity constraints. A cooperative regional strategy offers scale, efficiency, and shared knowledge that no single small economy could muster alone. As ECO moves forward, concrete steps towards a regional digital ecosystem will be crucial. If implemented, the recommendations outlined here from policy harmonization to shared infrastructure and capacity-building could collectively lift the region's digital performance. Success will require political will, trust, and sustained effort, but the payoff would be significant: a Central Asia (and broader ECO space) that is digitally connected, economically vibrant, and more resilient in the face of global technological shifts. Tajikistan, by actively embracing this regional vision, stands not only to overcome its own digital challenges but to become a key node in a stronger, smarter network of nations. This reaffirms the core proposition of this paper: that regional integration, particularly through shared digital infrastructure and harmonized governance, redefines sovereignty as collective capacity, not isolation.

## 6. Contributions and Limitations

This study contributes to literature by applying the concept of digital sovereignty to small states in a regional context. Its limitation lies in its primarily qualitative nature; future research could explore quantifying the impacts of regional digital investments or modeling trade effects of digital corridors.

## Author Note

*Jovid Ikromi is the Director for International Economic Cooperation at the Ministry of Economic Development and Trade of Tajikistan. He leads intergovernmental work on digital economy policy, trade negotiations, and regional economic integration within ECO and Central Asia. He previously served as Head of the Economics Department at the Parliament of Tajikistan and as a member of expert councils under the IPA CIS. Dr. Ikromi holds a Ph.D. in International Economics and a Master of Public Policy from the London School of Economics (LSE).*

**References:**

1. ADB. (2023a). *Digital Strategy 2030: Strengthening Digital Infrastructure in Asia and the Pacific*. Asian Development Bank. https://www.adb.org
2. ADB. (2023b). *Regional ICT infrastructure review: Central and South Asia*. Asian Development Bank.
3. Chander, A., & Sun, H. (2021). *Sovereignty 2.0*. UC Davis Law Review, 54(3), 101–152.
4. Collier, P. (2007). *The Bottom Billion: Why the Poorest Countries are Failing and What Can Be Done About It*. Oxford University Press.
5. DataReportal. (2023). *Digital 2023: Kazakhstan – Global Digital Insights*. https://datareportal.com/reports/digital-2023-kazakhstan
6. DataReportal. (2024a). *Digital 2024: Tajikistan – Global Digital Insights*. Retrieved from: https://datareportal.com/reports/digital-2024-tajikistan
7. ECO. (2021). *Fourteenth ECO Summit Declaration*. Economic Cooperation Organization. Retrieved from: https://eco.int
8. ECO. (2023). *Sixteenth ECO Summit – Tashkent Declaration*. Economic Cooperation Organization. Retrieved from: https://eco.int
9. Economic Cooperation Organization (ECO). (2021). *Fourteenth ECO Summit Declaration: Regional Economic Cooperation in the Aftermath of COVID-19*. ECO Secretariat.
10. Economic Cooperation Organization (ECO). (2023). *Sixteenth ECO Summit – Tashkent Declaration: Strengthening Regional Economic Integration through Digital Connectivity*. ECO Secretariat.
11. eGov.kz. (2023). *Kazakhstan's electronic government portal*. Retrieved from: https://egov.kz
12. Floridi, L. (2020). The fight for digital sovereignty: What it is, and why it matters. *Philosophy & Technology, 33*(3), 369–378. https://doi.org/10.1007/s13347-020-00423-6
13. Hulkó, G., Kálmán, J., & Lapsánszky, A. (2025). The politics of digital sovereignty and the EU's legislation: Navigating crises. *Frontiers in Political Science*, 7, Article 1548562. https://doi.org/10.3389/fpos.2025.1548562
14. Ikromi, J. Z. (2022). *Current Issues of Digitalization in Tajikistan*. Outlines of Global Transformations: Politics, Economics, Law, 15(6), 214–237. https://doi.org/10.31249/kgt/2022.06.11
15. International Telecommunication Union (ITU). (2023). *Facts and figures: Asia-Pacific broadband statistics*. Retrieved from: https://www.itu.int/en/ITU-D/Statistics/Pages/facts/default.aspx
16. International Trade Centre. (2023). *Central Asia ICT skills exchange initiative*. Retrieved from:https://intracen.org/news-and-events/news/central-asia-ict-skills-exchange-initiative
17. ITU. (2022). *ICT Development Index Country Report: Tajikistan*. Geneva: International Telecommunication Union.
18. Limão, N., & Venables, A. J. (2001). Infrastructure, geographical disadvantage, transport costs, and trade. *World Bank Economic Review*, 15(3), 451–479. https://doi.org/10.1093/wber/15.3.451
19. Observer Research Foundation (ORF). (2025). *Harnessing satellite internet for resilient digital connectivity in the Gulf*. ORF Middle East Commentary.
20. Shoker, A. (2022). Digital sovereignty strategies for every nation. *Applied Cybersecurity & Internet Governance Journal, 1*(1), 1–17.

21. TheGlobalEconomy. (2024). *Uzbekistan Internet Users – Data and Chart*. Retrieved from: https://www.theglobaleconomy.com
22. U.S. Department of Commerce. (2024). *Tajikistan – Information and Communication Technologies (ICT)*. International Trade Administration. Retrieved from: https://www.trade.gov/country-commercial-guides/tajikistan-information-and-communication-technologies
23. UN DESA. (2022). *E-Government Survey 2022: The Future of Digital Government*. United Nations Department of Economic and Social Affairs. Retrieved from: https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2022
24. UN Secretary-General's Panel on Digital Cooperation. (2020). *The Age of Digital Interdependence*. Retrieved from: https://www.un.org/en/pdfs/DigitalCooperation-report-for%20web.pdf
25. UNESCAP. (2022). *Asia-Pacific Digital Transformation Report*. Retrieved from: https://www.unescap.org/kp/2022/asia-pacific-digital-transformation-report
26. United Nations Conference on Trade and Development (UNCTAD). (2022). *Framework Agreement on Facilitation of Cross-Border Paperless Trade in Asia and the Pacific*. United Nations.
27. USAID. (2023). *Digital ecosystem country assessment: Tajikistan*. United States Agency for International Development. Retrieved from: https://www.usaid.gov/digital-development/DECA
28. World Bank. (2021). *The Global Findex Database 2021: Financial Inclusion, Digital Payments, and Resilience*. Retrieved from: https://globalfindex.worldbank.org
29. World Bank. (2023). *Improving regional digital connectivity in Central and South Asia*. Retrieved from: https://www.worldbank.org/en/news/feature/2023/09/27/improving-regional-digital-connectivity-central-south-asia
30. World Bank. (2024a). *Improving Regional Digital Connectivity in Central and South Asia*. Retrieved from: https://www.worldbank.org
31. World Bank. (2024b). *Strengthening Digital Public Infrastructure and Digital Skills in Tajikistan*. Retrieved from: https://www.worldbank.org/en/news/press-release/2024/12/17

https://doi.org/10.71447/3005-2696-2025-1-46

# REGIONAL INTEGRATION AND THE EMERGENCE OF AZERBAIJAN AS THE NEW LOGISTICS CENTER

***Dr. Volkan Özdemir***

ozdemirvolkan@gmail.com

Atasam Center for Strategic Research, Ankara - Türkiye

**Abstract**

The Caspian Basin has historically served as a critical nexus for economic, political, and cultural exchanges among diverse civilizations. Recent developments, notably the global pandemic and the war in Ukraine, have profoundly reshaped the dynamics of trade and economic corridors, giving rise to a new geoeconomic reality in the region. Intensified economic activity has accelerated regional integration, with Azerbaijan, strategically positioned at the heart of this geography, emerging as a pivotal logistics hub due to recent advancements. This paper first evaluates Azerbaijan's growing transport potential by analyzing major economic corridor projects along the East-West and North-South axes in Eurasia and then examines the process of regional integration. Member states of the Economic Cooperation Organization (ECO) are actively engaged in these international economic corridors, highlighting Azerbaijan's central role within the ECO framework. The primary finding of this study is that Azerbaijan has significantly strengthened its position as a regional transport and economic hub, establishing itself as a strategic intersection for the continent's major logistical corridors in recent years.

**Keywords:** The Caspian Basin; Regional Integration; International Economic Corridors; The Economic Cooperation Organization; Azerbaijan

## 1. Introduction

Well-functioning infrastructure, particularly robust transport network systems, is a prerequisite for the development of international trade, which can foster the integration of economic and political entities at the regional level. This enhanced economic integration fosters the emergence of regional structures that warrant detailed analysis. The literature on new regionalism adopts a broad, multidimensional, and multiregional perspective, in contrast to the post-World War II focus on European regionalization and integration processes (Söderbaum, 2003). Multidisciplinary studies exploring various facets of new regionalism have intensified, driven by successive crises in the new millennium. Amid the failure of free-market mechanisms to serve as a universal solution for crisis recognition and prevention, a global paradigm shift appears to be underway, though not yet fully acknowledged by dominant economic powers. The 2008 global recession highlighted the risks of unregulated financialization, while disruptions in global supply chains during the COVID-19 pandemic exposed severe vulnerabilities in economies reliant on international sources for essential goods and traditional transport routes. Consequently, recent years have witnessed a notable increase in intra-regional trade, as opposed to inter-regional trade, amid ongoing global supply chain disruptions.

International economic corridors are the indispensable part of the regional economic integration since the search for access to markets, combined with transit security concerns, creates the need to establish interconnectivity lines. According to a study by the Asian Development Bank, (Brunner, 2013) the economic corridors are integrated networks of infrastructure within an area designed to stimulate economic development and connect different economic agents in a particular geographical space. The Eurasian geography has specifically witnessed large changes in terms of logistics and trade especially after the sanctions adopted by Western countries against Russian Federation due to its war with Ukraine. Bilateral trade volumes are increasing among the Caspian countries unprecedently thanks to the newly established or revitalized economic corridors. Situated at the nexus of two principal Eurasian transport corridors (East-West & North-South), the Caspian Basin has assumed heightened significance within the framework of multidimensional international logistics projects recently advanced. Specifically, the case of Azerbaijan, centrally positioned within these major regional infrastructure initiatives, exemplifies the successful implementation of economic corridors.

International transport projects have played also an important role in determining the balance of power, along with other dynamics in the world system, in every period of history. Trade routes designed by different economic agents and power centers have also constituted the essence of geoeconomic competition. Therefore, it is not a coincidence that mega economic corridors are discussed, especially in periods of systemic change and transitions. Since there are intense commercial activities between the Asian and European continents, there are many infrastructure projects developed to increase and ease economic interaction between the continents. Especially in the last two years, increasing investment, trade and transportation as well as the recent geopolitical issues drew attention to the region. Being located at the meeting point of 'East-West' and 'North-South' axis transportation and the economic corridors between Asia and Europe, Azerbaijan is turning into a playing field in Eurasian geography with the potential to generate impact beyond the region.

This paper first analyzes major international logistics projects in Eurasia, with a focus on their role in reshaping regional trade dynamics. Subsequently, it examines Azerbaijan's emerging potential as a logistics hub and its pivotal contributions to the development of the Economic Cooperation Organization (ECO).

## 2. International Economic Corridors & the Caspian Basin

A shift in paradigm regarding the trade and economic corridors leads to the modification of existing or construction of new infrastructural projects that interconnects different parts of the Eurasian supercontinent. Since the Caspian basin is located at the very center of Eurasia (between India, Russia, China and Europe) the trade links crossing Azerbaijan have also been energized. The East-West international economic corridors play significant role in accelerating trade between Asia and Europe. Among the East-West axis projects in the region, the most important is undoubtedly the Belt and Road Initiative (BRI).

The BRI encompasses two primary components. The Maritime 'Road' facilitates extensive trade and maritime connectivity from the Pacific Ocean to the Mediterranean. 'The Belt' on the other hand, operating primarily through highways and railways, establishes continental connectivity via multiple sub-routes. The most significant among those routes is New Eurasian Land Bridge or northern route that originates in mainland China, traverses north of Caspian region, and spreads to European Union via the countries in Eurasian Economic Union. Another route that forms 'Belt' is China-Pakistan and China-West Asia

Economic Corridor or southern route. Through these routes, goods are sent to Europe after passing through Central Asia, Caspian, Iran and Türkiye thanks to railway links between the countries.

Apart from the routes along the northern and southern shores of the Caspian Sea, maritime logistics also connects Turkmenistan, Kazakhstan, and Azerbaijan. While transportation through the Caspian Sea remained limited until recently, transport activity has surged in recent years. The growing significance of the Caspian Basin and its transport routes stems primarily from disruptions to the New Eurasian Land Bridge. This disruption resulted from Western sanctions imposed on Russia following the outbreak of armed conflict in Ukraine. These sanctions significantly reduced transit flows between Russia and Europe, disrupted established trade routes, and necessitated a comprehensive restructuring of the transport system. The sanctions tortuously impacted trade between European Union and other Asian states because of Russia's role as a transit hub. As sanctions and physical constraints disrupted cargo transit from China to the EU, the need for route diversification became principal. Consequently, China and Europe have increasingly turned to substitute directions. Since south of Caspian Sea remains less viable due to ongoing sanctions against Iran, the most prominent alternatives are inter-oceanic sea routes and the Trans Caspian International Transport Route which is in a broader sense defined as Middle Corridor.

The Middle Corridor, involving multi-modal transport vehicles, constitutes a significant alternative route and the straight distance in trade between Europe and Asia. Goods originating in European countries, by transiting through Black Sea, reach to Georgia and Azerbaijan and from Alat Port of the latter are posted to the east of the Caspian Sea. In addition, goods originating in Asia, by transiting through Central Asia, reach to Azerbaijan via Caspian Sea before travelling to Europe whether through Georgia or Türkiye. Compared to traditional Northern Corridor, the Middle Corridor is approximately 3,000 kilometers shorter, reducing transit times between China and Europe from 19 days to 12 days, thereby enhancing efficiency and cost-effectiveness (The Astana Times, 2024). While transport traffic through the Northern Eurasia declined by 31.9% annually in 2022, goods transported from Kazakhstan through the Middle Corridor increased by 2.5 times during the same period (EBRD Report, 2023). Moreover, the Global Gateway Initiative of the EU and the 'Build Back Better World' (B3W) of the US are important hints of the new trend for global powers. These initiatives can be viewed as responses to the needs and priorities of developing and underdeveloped countries in relation to developed nations. Of these Western initiatives, the Global Gateway merits particular attention. Amid sanctions on Russia, the European Union seeks to strengthen connectivity with China, positioning Caspian countries as increasingly significant partners. The Global Gateway serves as a key instrument to bolster both soft and hard infrastructure in the region. The cargo transit between the Caspian Basin and Central Asia and the Black Sea and Europe is already noteworthy and plays an important role in the functioning of the regional economy but the transport potential of the region could be further exploited (Tsereteli, 2023)

On the other hand, the international economic corridors on the North-South Axis in Eurasia have also gained importance recently. The 'International North-South Transport Corridor' (INSTC) serves as a prominent example. Although efforts to establish the corridor, which extends from Russia to India through Caspian Sea and Iran, had started in early 2000s, the INSTC has gained significant progress only recently. This 7,000-kilometer corridor spans from Russia's Northen territory to South Asia, facilitating enhanced connectivity and trade. Aim to develop the INSTC is clearly stated in the strategic

partnership agreement that was signed between Iran and Russia on January 17, 2025. In this agreement, it is underlined that such interaction includes the promotion of goods originating from these countries to the markets of third countries, as well as the creation of conditions for the development of continuous transportation along transport corridors both in bilateral traffic and in transit through their territories. (Tass, 2025).

Both Russia and Iran have been accelerating infrastructure work in the Caspian Sea. The INSTC and the BRI rely on Iranian port infrastructure in the Caspian and overland trade routes to expand exports into the Persian Gulf and South Asian markets (Grajewski, 2022). Presently, Iran's only Caspian Sea port connected to its railway network is Amirabad. Transportation traffic and bilateral trade between Russian and Iranian ports have increased significantly. Russia has established an exclusive economic zone in Astrakhan region to support this growth. Additionally, Iran and Russia plan to create a joint fund to enhance Caspian naval transportation and finance the construction of new ships. Given the rising demand in the region, the current number of ships, particularly Ro-Ro vessels, remains insufficient. In order for the INSTC to become operational, Moscow is even thinking to grant an navigation privilege in her internal waters (Volga River and Don Canal) to a third country for the first time (Kaleji, 2023). Under today's circumstances, a ship traveling from northern ports of Russia to Indian seaports via Atlantic shore takes 30–45 days, whereas the route through Iran requires only 14–25 days. Despite its potential, the INSTC faces infrastructural challenges which limit its full functionality and to address these bottlenecks, $38.2 billion in new investments is required for 102 projects, with the majority allocated to infrastructure development in Russia, Iran, and Kazakhstan (Eurasian Development Bank Report, 2022).

The International North-South Transport Corridor (INSTC) extends beyond the maritime passageway of the Caspian Sea. To the west of the Caspian, a terrestrial network connects Russia with Iran via Azerbaijan. On the eastern side, connectivity is established among Kazakhstan, Russia, Iran, and Turkmenistan. Although the eastern route is well-equipped with road and rail infrastructure, its utilization for international transportation remains limited. In contrast, the western route requires significant infrastructure investments to achieve full operational capacity. Beyond modernizing roads and railways in Russia and Azerbaijan, a critical component is the construction of the Rasht-Astara railway in Iran (Silk Road Briefing, 2023). Upon completion, this railway will enable seamless delivery of goods from Russia to Iran via Azerbaijan, facilitating onward transport to India.

## 3. Emerging Role of Azerbaijan as a Logistics Center and the Economic Cooperation Organization

Irrespective of their orientation along the East-West or North-South axes, all international corridor projects traversing the Caspian Basin converge in Azerbaijan, positioning the country as a pivotal logistics hub. Consequently, Azerbaijan, previously recognized primarily for its energy commodity exports, has increasingly gained prominence for facilitating the transport of a diverse range of goods, as the significance of Caspian routes has grown. Moreover, energy pipeline projects, long under consideration, have reemerged in discussions over the past two years. Notably, the proposal to transport Turkmen gas to Azerbaijan and onward to Europe via the Southern Gas Corridor has gained traction. However, the feasibility of laying a pipeline beneath the Caspian Sea appears limited without the consensus of all littoral states.

Nevertheless, the revitalization of trade and associated logistics across a broad geography has a positive impact on regional development and institutional structures.

Notably, most countries through which these economic corridors pass are members of the Economic Cooperation Organization (ECO). Through these corridors, ECO member states have successfully attracted substantial international infrastructure investment from major creditors, such as China. The diverse political systems among ECO members, ranging from post-Soviet states to regional powers like Iran, Pakistan, and Türkiye, render China's investments particularly significant. Regional trade among countries with comparable development levels is likely to yield net benefits, provided it aligns with the national priorities of participating nations. Under favorable conditions, the expansion of regional trade can enhance access to larger markets, thereby supporting developmental efforts and improving overall welfare. With the majority of the Caspian or Central Asian countries are being economies in transition, joining such an integrated network can potentially have a great impact on the course of their economic development (Twillert & Vega, 2023).

A key indicator of regional development and evolving integration is Azerbaijan's expanding trade with member states of the Economic Cooperation Organization. Between January and May 2025, Azerbaijan's trade turnover with ECO countries reached $3.547 billion, reflecting a more than 10 % increase compared to the same period in the previous year (Heybetov, 2025). As a vital member of the ECO, Azerbaijan has significantly strengthened its position as a regional transport and energy hub. Key infrastructure projects involving ECO partners include the Baku–Tbilisi–Kars railway, the Southern Gas Corridor, the Baku–Tbilisi–Ceyhan oil pipeline, the development of the Alat International Sea Trade Port, the Iranian railway connection, and a modern highway network that facilitates efficient cargo transportation. Furthermore, by hosting the 17th ECO Summit in Khankendi in July 2025, Azerbaijan has opened new horizons for regional cooperation, positioning the summit as a catalyst for enhanced regional development.

In light of this, the expansion of regional trade and transport, which underpins new forms of economic integration, has the potential to stimulate diverse growth strategies for ECO countries. In alignment with global economic trends, member states of the ECO are adopting a collective strategy to promote sustainable industrial growth, emphasizing advanced technologies and green energy. Within this context, prioritizing the development of clean energy technologies serves as a catalyst for regional development and sustainable growth among ECO countries. It is no coincidence that Baku was selected as the headquarter for the newly established ECO Clean Energy Center. Through this center, ECO member states can address the dynamics of the global energy transition and develop a region-wide strategy to localize the production of critical clean energy technologies, such as wind turbines and solar panels. This transformative strategy has the potential to further accelerate regional economic integration, with Azerbaijan emerging as one of the key actors in this domain.

## 4. Conclusion

As a result of recent developments, Azerbaijan has emerged as an international logistics center, driven by the expansion of economic corridors along both the East-West and North-South axes of the Caspian Basin. These dual-axis projects should be regarded as complementary rather than competitive, as they hold significant potential to generate positive regional synergies.

Within the broader Eurasian geography, member states of the Economic Cooperation Organization (ECO) stand to benefit substantially from increased infrastructure investments along both axes. Beyond their transit potential, these transport infrastructure developments

are critical for the emergence of a regional market, fostering greater intra-regional trade, particularly when neighboring countries are included. Finally, the growing transport infrastructure in the Caspian Basin, encompassing ECO member states and regional initiatives such as ECO Clean Energy Center is likely to strengthen the ECO's position as an influential international organization. Azerbaijan's dual role as an emerging logistics hub and an active participant in ECO initiatives will be pivotal in the coming years.

## Reference

1. Brunner, H.P. (2013) "What is Economic Corridor Development and What Can It Achieve in Asia's Subregions?", *Asian Development Bank Economics Working Paper Series*, No. 117
2. EBRD Report (2023) "Sustainable Transport Connections between Europe and Central Asia". Accessed 29 September 2023. (https://www.ebrd.com/news/publications/special-reports/sustainable-transport-connections-between-europe-and-central-asia.html)
3. Eurasian Development Bank Report (2022) "International North-South Transport Corridor: Investment & Soft Infrastructure". Accessed 30 September 2023. (https://eabr.org/upload/iblock/a2b/EDB_2022_Report-2_INSTC_rus.pdf)
4. Grajewski, N. (2022) "An Illusory Entente: The Myth of a Russia-China-Iran "Axis", *Asian Affairs*, 53:1, 164-183
5. Heybetov, T. (2025) 17th ECO summit in Khankendi highlights Azerbaijan's growing regional influence. https://news.az/news/-17th-eco-summit-in-khankendi-highlights-azerbaijans-growing-regional-influence
6. Kaleji, V. (2023) "Expanding Maritime Trade Between Iran and Russia in the Caspian: Capacities and Challanges", https://valdaiclub.com/a/highlights/expanding-maritime-trade-between-iran-and-russia/
7. Silk Road Briefing. (2023) Moscow, Tehran, Finally sign Off On US$1.6 Billion Rasht-Astara INSTC Rail Link. https://www.silkroadbriefing.com/news/2023/05/18/moscow-tehran-finally-sign-off-on-us1-6-billion-rasht-astara-instc-rail-link/
8. Söderbaum, F, (2003) "Introduction: Theories of new regionalism" in *Theories of New Regionalism* (Söderbaum, F., & Shaw, T. M Ed.) New York: Palgrave Macmillan. 1-21
9. Tass (2025) RF i Iran dogovorilis' aktivno razvivat' transportniy korrdior Sever-Yug [Russia and Iran agree to actively develop the North-South transport corridor]. https://tass.ru/ekonomika/22909847
10. The Astana Times (2024) Kazakhstan and Middle Corridor: Impact on Global Trade.
11. https://astanatimes.com/2024/06/kazakhstan-and-middle-corridor-impact-on - global-trade/
12. Tsereteli, M. (2023) "The Strategic Value of Connectivity in Central Asia and the Caucasus", https://www.cacianalyst.org/publications/feature-articles/item/13765-the-strategic-value-of-connectivity-in-central-asia-and-the-caucasus.html
13. Twillert, N. & Vega, S.H. (2023) "Risk or opportunity? The Belt and Road Initiative and the role of debt in the China-Central Asia-West Asia Economic Corridor" *Eurasian Geography and Economics*, 64:3, 365-377

https://doi.org/10.71447/3005-2696-2025-1-48

# GREEN CUSTOMS: ALIGNMENT WITH ENVIRONMENTAL OBJECTIVES IN THE ECO REGION

**Shahin Baghirov**

international@customs.gov.az

Chairman of the State Customs Committee of

the Republic of Azerbaijan

**Abstract**

The article involves a detailed examination of the concept of “green customs” and their applicability to the Economic Cooperation Organization (ECO) region. Green customs involves the integration ot environmental values within the policies of customs to promote the legitimate trade of environmentally sensitive commodities and suppress the movement of illegal and dangerous products. The article outlines the achievements of the Republic of Azerbaijan on green customs, the signing of the Baku Declaration during COP29, and digital technology adoption. It also involves practical recommendations for cooperation based on lessons from other countries. The article uncovers green customs as an unavoidable mechanism for maintaining the balance between trade and environmental protection and can form a leading mechanism for promoting sustainable development across ECO member nations.

**Keywords**: green customs, sustainable aevelopment, environment, customs reforms, ECO region, trade policy

## 1. Introduction

Environmental damage and climate change are no longer remote risks; they are global challenges, and we must attend to them now and on an ongoing basis. With expanding trade as globalization and economic growth continue, the environmental price of expanding trade rises. As levels of trade increase on a global basis, levels of environmental footprint corresponding to the movement of goods likewise rise—the range from greenhouse gas emissions from the transportation network to illegal movements of hazardous wastes and endangered species. As a consequence, sustainability of the custom authorities becomes a front-line issue. “Green customs” became an unavoidable mechanism, particularly for Economic Cooperation Organization (ECO) member countries, to integrate environmental protection and trade facilitation.

The concept of “green customs" is hence gaining ever-increasing significance. As a whole, green customs involves integrating environment-related aspects within the practices of the customs with a view to enabling the rightful trade of environment concerned commodities while not enabling illegal environmental trade and facilitating efficiency in the execution of international environmental treaties. This action heralds a shift from the

traditional “control” mandate of the customs to assuming an environmental sentinel mandate.

For ECO member nations, the transition to green customs is both a strategic necessity and a policy requirement. The region is rich with natural resources and privileged with environmental spaces key to the livelihoods of local populations. While member states share common issues to combat, and these are illegal wildlife trade, transboundary pollution, and limited environmental enforcement technical capacity, the adoption of green customs promotes not only environmental governance but also trade facilitation, economic competitiveness, and international standards compliance such as the Paris Agreement and the Basel Convention.

## 2. Global Green Customs

Environmental procedures are procedures of customs designed not only to prevent illegal practices potentially harmful to ecosystems but to promote respectable trade of environmentally sensitive products as part of environmental conservation. Prioritized for the first time by the World Customs Organization (WCO), environmental procedures have been intimately linked with international environmental treaties such as the Basel Convention, Montreal Protocol, CITES, and the Paris Agreement.

Green Customs, according to the United Nations Environment Programme (UNEP), combat illicit trade in hazardous wastes, ozone-depletting substances, toxic chemicals, and endangered wildlife. Detection and prevention of environmental crime are an indispensable mandate of customs agencies, and therefore green customs constitute the cornerstone of global environmental governance.

In their book Trade and the Environment: Theory and Evidence, (2003) Brian R. Copeland and M. Scott Taylor emphasize the issue of international trade regimes needing to converge with environmental regulations to prevent ecological externalities, which hamper sustainable development.

The ECO region, consisting of Azerbaijan. Iran. Pakistan, Turkey, and the Central Asian nations, poses special environmental and development challenges. Rapid urbanization, industrialization, and increase in trade volumes put enormous pressure on natural resources. Water scarcity, environmental pollution, deforestation, and land degradation are common features of the region.

The United Nations Economic Commission for Europe (UNECE) Environmental Performance Reviews refer to ECO countries' systemic weaknesses such as inefficient use of resources and ineffective enforcement of environmental protection measures. These realities emphasize further the urgency to pursue a green customs approach in the region.

In support of environmental protection, the World Customs Organization (WCO) is enhancing the Harmonized System (HS) codes to enable the appropriate classification of environmentally sensitive products. "Greening" the HS system, as the key purpose, is to enable better tracking and control of such products by customs authorities. One of the enhancements here includes the 2022 edition of the HS, whereby finer classifications have been included on environmental products and streams of wastes. Among the products included with new subheadings are electric car batteries, solar panels, wind power equipment, biodegradable plastics, and electronic wastes (e-waste).

These amendments allow for enhanced data accuracy and trade restraint enforcement among multilateral environmental agreements. They also allow for the harmonization of the

greening of the HS system to support national and regional efforts to promote green technology, monitor hazardous chemicals, and ensure material trade for sustainable development.

### 3. Azerbaijan, Regional Cooperation, and the Baku Declaration

Azerbaijan has established itself as a leading force in advancing green customs efforts within the region. A major step in promoting regional cooperation on this front was the high -level event, "Green Customs: Dialogue of Senior Customs Officials," hosted in Baku in November 2024 as part of the COP29 framework.

In line with the ' Year of Solidarity for a Green World" initiative declared by President Ilham Aliyev, Azerbaijan has introduced a range of forward-looking environmental policies, including:

- Customs and VAT exemptions for electric vehicles and renewable energy technologies to encourage clean energy adoption;
- Deployment of artificial intelligence and automated systems such as ARAS;
- Active participation in international operations like DEMETER aimed at combating the illegal trade in hazardous substances and strengthening cross-border environmental enforcement.

As noted by Barry L. Johnson in Environmental Policy and Public Health (2011), such programs play an indispensable role in reducing the unwanted impacts of the public policy on environmental quality and the health of the public, demonstrating how targeted practices and regulatory actions have broad-based societally beneficial returns.

Azerbaijan's green customs initiative is being promoted within the Customs Development Strategy for 2025-2030, with a focus on digitalization, environmental protection, and enhanced regional cooperation. Its main objective is to switch from old-style paperwork to digital, efficient, and environment-friendly procedures.

In fulfilling this objective, Azerbaijan's State Customs Committee works with environmental authorities and other international organizations. This collaboration not only assures protection of international standards but also reinforces the capacity of custom services to efficiently contribute to environmental protection and sustainable trade practices.

At the same time, technology is a key component of green customs implementation. Azerbaijan has invested in artificial intelligence-based customs infrastructure, enabling real-time monitoring and risk analysis to enhance the efficiency and responsiveness of customs operations.

The Economic Cooperation Organization has aiso intensified its efforts to strengthen regional cooperation in the field of green customs and sustainable trade practices. A major milestone in these efforts was the launch of the Regional Initiative on Resource Efficiency, Sustainability, and Circular Economy in the ECO Region (RESCUE), presented during COP29 in Baku in 2024. This initiative serves as a joint platform to promote a fair transition toward resource efficiency, circularity, and regenerative economic models across the ECO region.

Baku Declaration represented a major step forward in embedding environmental responsibility within customs administrations across the ECO region. Signed by the heads of customs authorities from several ECO member countries, the Declaration calls on its signatories to commit to environmentally responsible trade practices, adopt green technologies, and strengthen regulatory compliance in alignment with international

environmental agreements. The Declaration reflects a unified regional vision to integrate sustainability into trade and customs operations, laying the groundwork for long-term cooperation and coordinated environmental governance among ECO member states.

The countries that signed the Declaration committed to the following objectives:

• Supporting environmentally responsible trade to minimize the ecological impact of cross

border commerce;

• Harmonizing customs standards across the region to facilitate consistent and sustainable practices;

• Enhancing the knowledge and skills of customs officers through training and capacity building in environmental regulations;

• Promoting tne adoption of green technologies and reducing carbon emissions at borders to modernize infrastructure in line with climate goals.

These projects are part of a comprehensive initiative to align customs procedures with environmental issues within the ECO region. Witn the Baku Declaration and the RESCUE program, ECO member nations are taking concrete measures to increase regional cooperation and integrate environmental responsibility into trade flows. Collectively, these projects mark important milestones towards both trade liberalization and environmental protection and meeting the international sustainable development agenda.

## 4. The Socio-Economic Benefits of Green Customs

The benefits of green customs extend far beyond environmental protection. With more transparency, fewer trade restrictions, and sustainable development, green customs strive to build a strong and sustainable economy. Efficient and sustainable customs procedures lower transactional costs, reduce border clearing times, and increase the reliability of supply chains.

In line with an OECD study carried out in 2021, countries whose customs management is enhanced with green values have elevated trade volumes and rapid clearances. Such outcomes have a direct positive bearing on the business environment and regulatory certainty, hence why green customs remains an enabler of economic and environmental gains.

The historical contribution of paperless trade infrastructure to international trade, particularly to developing nations, has been reaffirmed with the recent developments. Digital documentation would reduce trade an estimated 75% of the cost and create an additional USD 1.2 trillion of trade potential among Commonwealth countries until 2026, according to a recent Commonwealth Secretariat report on 2024. Paperless trade infrastructure benefits developing and poor nations in a peculiar way, as past trade costs tend to far outweigh export receipts, and hence trade becomes commercially unfeasible.

Substantial strides have been noted with projects such as the “Climate-Resilient Trade Facilitation” project jointly undertaken between UNCTAD and ESCAP within the Asian-Pacific and African regions. For instance, utilization of the cargo clearance within the use of the ASYCUDA system eliminated physical documents completely and reduced utilization of papers within sanitary and phytosanitary certifications to a level above 95%. Similarly, the government ot Kenya embarked on utilization of the TradeNet System, engaging a total of 35 government agencies on a single digital platform, an endeavor which had gravely streamlined processes and reduced wastage of papers to a considerable level.

These innovations enhance not only operational effectiveness but also environmental sustainability. As one UNCTAD study revealed, digitalization of trade processes reduces greenhouse emissions per document by as much as 63%—mostly because of enhanced efficiency.

But to tap the complete strength of paperless trade, there is a need for wide-ranging legal and institutional reform. For this, national laws need to be harmonized with international instruments of law like the UNCITRAL Model Law on Electronic Transferable Records (MLETR). This reform helps to give legal validity to electronic documents and instill an environment for digital trade practices not only to be efficient but also legally enforceable.

Generally, the integration of paperless trade infrastructure presents bright opportunities for countries to increase their trade efficiency, reduce environmental impacts, and timulate economic growth. For complete utilization of these opportunities, there should be continued investments in digital infrastructure, harmonization of legislations, and human capital development.

In doing so, green traditions advocate for inclusive economic growth because they aid conservation of natural areas, which are the source of livelihood for millions. For the ECO region, where agriculture, forest, and fishing form the foundation of local livelihoods, prevention of environmental crime such as illegal logging and dumping harmful wastes helps to sustain biodiversity and increase community governance of natural resources. Illegal environmenial trade, according to the United Nations Environment Programme (UNEP) and climate change repository, 2022, annual remittance to developing nations surpasses USD 200 billion, which could have been expended on healthcare, infrastructure development, and education.

Besides, green practices are a catalyst to sustainable industry expansion. Through enabling proper trade of renewable energy products, biodegradable materials, and green products, the customs are part and parcel of enabling the green transition. This unleashes a cascade to other rising industries like solar and wind power, electric vehicle parts, and sustainable bio-based petrochemicals. Not only do the industries generate high value employment, but foreign investments on an Environmental, Social, and Governance (ESG) footing as well. As as the World Bank reports, green industries generate seven times as much employment as the fossil- fueled industry. Green traditions are therefore an instrument of policy to achieve both environmental sustainability and economic strength within and beyond the ECO region.

The formalization of green practices of customs has been already reshaping international trade flows and inducing measurable changes in sectoral performances both among high- and low- carbon industries. Much higher growth is registered for environmentally linked industries. For example, the international green logistics market, facilitated by government stimuli, environmental certification requirements, and carbon-aware procurement standards, increased from approximately USD 1.3 trillion in 2023 to USD 1.43 trillion in 2024, and is projected to reach more than USD 2.8 trillion by 2033.

Similarly, electric vehicle (EV) commerce increased by 25% year-on-year in the opening part of 2024. This growth has been aided by exemptions on custom duties, simplified custom clearances on low-emissions products, and rising domestic demand for green modes of transport. The green logistics segment also recorded an expansion of 8%, which was spurred by increased funding for projects on low-emissions infrastructure and the use of environmentally sustainable supply chain practices. Meanwhile, the segment on ecopackaging recorded a 12% increase, which came as a result of increased demands for

compliant packaging spearheaded by import incentives on products that are biodegradable and other environmental labeling regulations. These are advancements which not only demonstrate how green traditions are driving clean trade practices but also how they are restructuring market forces within global value chains, aiding long-term structural changes towards sustainability and innovation.

In contrast, energy-intensive industries such as steel, cement, and aluminum are becoming less trade competitive on trade routes where environmental border measures are being implemented. For instance, cement and steel trade values have decreased by 10% and 7%, respectively. This reduction is to a very large extent caused by new regulatory policies such as the European Union's Carbon Border Adjustment Mechanism (CBAM), which imposes additional taxes on emissions-intensive imports. This regulatory pressure intensifies compliance costs among producers who emit a lot and are doing production in countries with weak environmental governance, thus narrowing their export possibilities. Export of aluminum lowered by 6% as well, due to rising international scrutiny of imbedded carbon emissions and energy consumption while producing. More broadly, old-line sectors that have retarded upgrading their production patterns have seen combined average trade flows decline by an average of 4%. This decline comes mainly from additional non-tariff measures related to sustainability certification and customs clearances because of insufficient environmental paperwork. Besides, old energy-consuming and environmentally harmful production-based sectors are facing expanding trade barriers. Environmental green Customs procedures are increasingly requesting sustainability paperwork such as life-cycle assessment and compliance with the green product categories adopted to the HS 2022 revision (HS 2022). Such expanding requests are part of an escalated environmental accountability trena and are redesigning terms of market access within international value chains.

This sectoral transformation is part of a general restructuring of cross-border trade, whereby value addition is increasingly tied to environmental results. Green customs do not only regulate trade: they are redesigning the very definition of comparative advantage itself. For ECO countries, the strategic challenge runs two-fold: to proactively promote the restructuring of frail industries while promoting green industrialization with special-purpose policy instruments, reform of trade facilitation, and capacity-building.

Green practices also grant access to preferential trade arrangements. All of today's next- generation FTAs now have environmental components, and adherence to such measures can grant ECO nations duty exemption, simplified procedures, and access to green financing. For instance, the impending EU Carbon Border Adjustment Mechanism (CBAM) to take effect in 2026 will encourage products with low-emissions production and clear environmental tracking—making green customs both an interior reform, but a competitive one.

Besides, green customs ensure equitable sharing of environmental benefits. By banning illegal extraction of resources within ecologically sensitive areas, green customs protect environmentally vulnerable populations against environmental destruction and socio-economic marginalization. This is especially true for frontier areas where local communities are prone to bearing the biggest burden of environmental destruction. Equitable enforcement of green customs can then serve as an environmental justice mechanism, aligning trade control measures with human rights and sustainable livelihoods.

Green practices are also observed to find a strategic location among international institutions to advance international cooperation. International Trade Centre (ITC)

highlights the reality that environmentally efficient trade practices provide a nation with a better image and attract investors who care about sustainability. Green standards are usually embraced by nations who are more integrated into international green value chains, have improved climate funds access, and perform better on the sustainability indexes.

In the long term, green customs support national policy goals for climate change mitigation, sustainable development, and environmental health. By monitoring import and export of ozone- depleting substances, toxic chemicals, and electronic wastes, green customs address international agreement commitments such as the Montreal Protocol and the Basel Convention. Besides easing the enforcement burden among agencies, this harmonization signals a country's international protection credentials for the environment, an ever-determining force behind diplomatic and trade negotiations. In short, for the ECO region, a green customs investment is not only a technical reform, but an investment in the very welfare of humanity and the Earth.

## 5. Global Experience

A comparison of best practices of leader nations for green customs practices determines some of the most important lessons on aligning trade policy with environment and socio-economic objectives. Not only do these best practices modernize customs procedures, but they are practical templates for ECO member nations looking to promote sustainable economic development. One of the most frequently quoted international cases is Sweden. National climate policy in Sweden is closely associated with customs reform. Environmental risk assessment is included within cargo inspection practice and there are strong ties with environmental agencies to ensure transboundary pollution is closely monitored. This cross-agency initiative has strengthened detection of illegal chemicals shipments effectively and yielded better public health results.

As evaluated by the Swedish Environmental Protection Agency (2022), this institutional connection has reduced government annual environmental remediation costs by over 15%. The Sweden case demonstrates the practical economic benefits of linking customs operations with environmental governance and shows how environmental protection can become part of routine trade controls without adversely impacting efficiency. These lessons suggest ECO countries may reap environmental and budgetary dividends from assuming similar inter-agency coordination, linking environmental risk criteria to their customs procedures, and drawing on national climate plans. Sweden's experience is one very strong argument for why green customs can become a tool of integrated policy and long-term resilience.

Yet another global leader, Singapore, shows the vital role digital infrastructure plays to the effectiveness of green customs. Singapore's National Trade Platform checks the rovenance, transit, and sustainability credentials of products with the aid of blockchain and Al. Blockchain technology makes an enormous contribution to transparency and track-and-trace throughout the value chain.

According to the World Bank, digital customs terminals can reduce import-export clearing times by up to 50%, reduce corruption possibilities, and increase revenue collections. They do not only simplify paperwork but also support verification of environmental certifications and verification of international standards. Singapore's experience depicts digitalization as much more than an issue of effectiveness—the digitalization of Singapore Customs is a key facilitator of environmental accountability and trade transparency.

As a result, Singapore saw increased foreign investments into green businesses and rising exports of accredited products to OECD nations and the European Union. This model reveals how digital advanced tools can assist countries to be credible partners of sustainable trade worldwide.

In Costa Rica, trade policy has been closely linked with national biodiversity goals. The nation keeps strict controls to prevent smuggling of endangered species and illegal forest products. Its effort is supplemented with mobile verification units and special border authority training. These types of measures have helped to maintain ecotourism and forest-dependent livelihoods— activities intertwined comprising over 13% of Costa Rica's GDP (World Bank, 2021). The harmonization of environmental crime prevention and customs work within Costa Rica proves environmental protection isn't against economic power, but supports it. Its framework preserves the link between environmental conservation and sustainable economic development, especially for countries with high biodiversity.

The Netherlands is an interesting example of the success of strong public-private cooperation towards green customs. Dutch authorities collaborate with trade associations to establish "green corridors" for low-emitting and waste-management industries. They incentivize those industries with fast-tracking clearances and lower rates of tariffs. The model invites firms to invest in sustainability and aligns commercial interests with environmental ends. The Dutch experience illustrates how tradition can act as a bridge between regimes of regulation and regimes of market incentive and promote a transition where sustainability is an asset on the competitive stage and not a cost of regulation.

In the case of South Korea with its "Green New Deal," extensive investments have been made in green custom training. With the collaboration of research centers and universities, the Korea Customs Service developed specialized training materials on electronic wastes, hazardous chemicals, and circular economy actions for the custom agents. Such investments in human capital have enhanced institutional capacity and increased harmonization of custom procedures with international tools such as the Basel and Rotterdam Conventions.

Indeed, human capital ranks among the most vital elements of the successful implementation of green customs. Training and capacity building are among the most important features of the initiative, which allow employees to have the skills and expertise to identify environmentally sensitive products, enforce corresponding legislations, and utilize advanced technologies.

In Azerbaijan, the customs authorities are systematically trained on environmental protection legislations, detection of smuggled commodities, and the use of advanced technologies. Such programs are delivered collaboratively with educational institutions and international agencies to keep Azerbaijan's customs authorities up to date with global best practices.

Along with formal training, the State Customs Committee of the Republic of Azerbaijan has also undertaken awareness programs for traders and forwarding agencies specifically to familiarize them with green obligations of the customs. These efforts increase legal compliance as well as instill environmental responsibility among members of the trade fraternity. Investing both in awareness and technical knowledge of the private and the public sectors, Azerbaijan cements the fact that green customs is not only a tool of regulation—but a group responsibility requiring collaboration, learning, and constant interaction.

The importance of environmental protection and the contribution of education is also noted by James Salzman and Barton H. Thompson Jr. in Environmental Law and Policy (2018). They note the importance of knowledge and legal literacy among government

officials to achieve successful environmental protection. These practices complement the institutional capacity of constant learning and international cooperation to enhance the professional competencies of the customs agents. In member states of ECO, capacity building and human capital investments could efficiently increase the utilization of regulatory tools against environmental degradation. This ultimately contributes to sustainable trade and environmental security in the region.

These are but a few examples to demonstrate that green practices are beyond mere regulatory compliance—sources of creativity, of competitiveness, and of social equity. For the ECO region, context-specific versions of these strategies can create an opening to building an inclusive, environmentally-friendly, and climate-resilient economy, an economy better equipped to weather market volatility and environmental unpredictability.

In short, green customs mean not only a technical change but a transformational method—one linking trade governance to sustainability, responsibility, and long-term prosperity.

**Table 1.**

*Global Best Practices in Green Customs*

| Country | Practice | Socio-Economic Impact |
|---|---|---|
| Sweden | Environmental risk-based inspections | 15% reduction in environmental restoration costs |
| Singapore | Blockchain technology | Increase in green exports and foreign direct investment |
| Costa Rica | Anti-smuggling controls for biodiversity protection | Preservation of 13% of GDP from ecotourism |
| Netherlands | Green lanes for low-emission trade | Stimulation of sustainable industrial practices |
| South Korea | Customs training under the Green New Deal | Strengthened compliance with international environmental agreements |

## Conclusions

The green evolution of customs within the ECO region ana beyond is today more than a symbol of inspirational special interest; it is a strategic necessity and one of the pillars of economic governance. Against the backdrop of climate change and shrinking resources, the customs authorities are turning out to be global leaders of sustainable development, responsible trade, and environmental integrity.

As this article shows, green practices are not just technical adjustments; they are an institutional renovation, one that necessarily changes countries' trade, legislations, and their resources management. From Azerbaijan's progressive measures during the "Year of Solidarity for a Green World," to the reciprocal responsibilities cemented within the Baku

Declaration, ECO countries are laying the foundation for simplified, clear, and environmentally-conscious customs regimes.

With the global economy needing to become more carbon neutral and trade regulations strengthened, there is a strategic need for the ECO region to set an example with innovation, cooperation, and an ironclad commitment to green customs. Doing this will ensure regional

economic growth is not accomplished on the backs of environmental devastation but works towards creating a long-term and sustainable future. ECO members can put customs as a key instrument of long-term prosperity—ensuring cross-country trade of goods isn't accomplished on the backs of the planet or future generations. In the long term, green traditions' prospects will depend on political will, institutional innovation, and long-term international cooperation. Where there are these guiding principles, the ECO region can not only demonstrate excellent leadership but also ensure trade arrangements are good for the environment, economy, and society at the same time.

## Bibliography

1. Commonwealth Secretariat. (2024). *Quantitative analysis of the move to paperless trade*. https://thecommonwealth.org/quantitative-analysis-move-paperless-trade
2. Copeland, B. R., & Taylor, M. S. (2003). *Trade and the environment: Theory and evidence*. Princeton University Press.
3. European Commission. (2023). *Green deal and customs union reform*. https://ec.europa.eu
4. International Institute for Sustainable Development (IISD). (2023). *The role of trade policy in green economic recovery*. https://www.iisd.org
5. Johnson, B. L. (2011). *Environmental policy and public health*. CRC Press.
6. Organisation for Economic Co-operation and Development (OECD). (2021). *Trade facilitation and the environment*. OECD Publishing. https://www.oecd.org
7. Salzman, J., & Thompson, B. H., Jr. (2018). *Environmental law and policy* (5th ed.). Foundation Press.
8. State Customs Committee of Azerbaijan. (2023). *Strategic development plan 2025–2030*. https://customs.gov.az
9. United Nations Conference on Trade and Development (UNCTAD). (2021). *Quantifying the environmental benefits from paperless trade facilitation*. https://unctad.org/news/quantifying-environmental-benefits-paperless-trade-facilitation
10. United Nations Conference on Trade and Development (UNCTAD). (2024). *ASYCUDA report 2024: Innovation for a changing world*. https://asycuda.org/wp-content/uploads/ASYCUDA_Report_2024.pdf
11. United Nations Conference on Trade and Development (UNCTAD). (2025). *Climate-smart trade facilitation: From efficiency to climate solutions*. https://unctad.org/news/climate-smart-trade-facilitation-efficiency-climate-solutions
12. United Nations Economic Commission for Europe (UNECE). (2019). *Environmental performance reviews*. United Nations. https://unece.org
13. United Nations Environment Programme (UNEP). (2022). *Green Customs Initiative*. https://www.greencustoms.org
14. World Bank. (2020). *Customs modernization handbook*. World Bank Publications.
15. World Bank. (2022). *Digital trade and customs: Reforming for a resilient future*. https://www.worldbank.org
16. World Customs Organization (WCO). (2021). *Role of customs in environmental protection*. https://www.wcoomd.org
17. World Economic Forum. (2022). *Building sustainable supply chains through customs innovation*. https://www.weforum.org

# SUBMISSION TERMS

Authors presenting articles agree to comply with the following terms:

1. The journal should be published in an electronic format.
2. Articles should be submitted through the electronic platform and follow the instructions.
3. By submitting an article, the author confirms that the article has not been published in any other journal.
4. Only original and completed research papers are accepted.
5. Articles must be written in the format given in the “Author Guidelines”.
6. All articles should be submitted in English.
7. Before the review, the editor examines whether the article complies with the requirements. Non-complying articles will be immediately rejected and the authors will be informed about the reasons for rejection. The final deadline for the submission of the new version will be communicated to them.
8. Each article submitted to the journal will be checked by 2 reviewers.
9. The authors should take into account all the comments of the reviewers and make corrections. The third reviewer gives a reference to the objections of the author. The final decision on the publication of the article will be made by the editor-in-chief.
10. The published articles are copyrighted by the Editorial Board.
11. Modified or revised versions are not accepted after the deadline determined by the editor-in-chief. Any adjustments made after that date are not taken into account.
12. Articles, accepted for publication, will be checked by special anti-plagiarism software.
13. By submitting an article, the author confirms that he/she has obtained permission from the co-authors mentioned in the article.
14. All the used sources should be cited and the authors should guarantee that each and every reference is complete and accurate.
15. By uploading the article, the author gives the publishers the right to publish and retain the article.
16. Requests to withdraw an article are considered by the editor-in-chief. He/she may accept or reject the request.
17. Articles will be published under a Creative Commons Attribution License 4.0. This means that the journal is open to the public in electronic form, anyone can download and read the article for free. Besides, the article may be reprinted and quoted, provided that there is a reference to the originally published version.

# AUTHOR GUIDELINES

**Layout:** Articles must be written following the guidelines in the 7th edition of the Publication Manual of the American Psychological Association. Articles must be in Microsoft Word format (21 cm x 29.7 cm), using 12-point Georgia font, with 2.5 cm margins, paragraphs left-aligned, pages numbered in the upper right, and double-spaced (except for tables and figures which may use single spacing).

**First Page:** It contains the title of the paper, the author's name, email address, organization and country, the abstract, keywords, and the introduction part of your article.

## 1. Title

The title should be in 14pt Georgia font (capital letters), bold and centered. After leaving one clear line space, the names, surnames and emails of the authors should be indicated in 12pt. After further omitting a line, the name, address (city) and country of the author's organization must be written in italics font size 12pt.

## 2. Abstract

The abstract must be no longer than 200 words, written in simple font size 12pt, and must cover the essential elements of the article such as the research topic, the methods used, and the main results and conclusions. It must be accurate, concise, and encompass the key points of the study.

## 3. Keywords

After the abstract, the author should provide a list of up to 6 keywords, separated by semicolon, that indicate the most important topics, methods and/or frameworks used in the article. Keywords must be written in a simple font size of 12pt.

**Content:** The main body of the article should be written in font size of 12pt following APA style.

## 1. Headings

Headings should be numbered with Arabic numerals, bold, left-aligned, and set in 12pt font size. There should be one complete line space between the sections and between the title and the main text. Paragraphs within the section should be indented 5-character spaces.

## 2. Subheadings

The subheadings (if any) should be bold, left-aligned, set in 12pt font size, and numbered with Arabic numerals (first indicating the section to which it belongs, then the sequence number) (for example: 2.1 or 2.1.1).

### 3. Equations

All equations must be clearly set and numbered consecutively from the beginning of the paper. They should be numbered simply (1), (2), (3), etc. Equations are centered on the page and labeled with Arabic numerals, right-aligned, in parentheses, and referred to only by those numbers in the text.

### 4. Tables and Figures

Tables and figures should be numbered with Arabic numerals consecutively from the beginning of the paper. Numbers are assigned based on the order in which tables/figures appear in the text and are bolded and left-aligned. All tables/figures must have a title, which should be written in 12-point Georgia font, left-aligned (over the table/figure), in italicized title case below the table/figure number, with a blank line between the number and the title.

All the tables and figures must be referred to in the text. The tables and figures should be inserted in the first appropriate place after being referred to. PNG and JPEG formats are considered suitable for figures.

We kindly request you to provide the original figures and tables that were extracted from the program/software used for its creation.

**References:** The APA style should be used for in-text citations and the reference list.

### 1. In-text Citations

In-text citations must be given in parentheses, indicating the author and the year of the publication.

Examples:

- A work by one author – (Nielsen, 2017)
- A work by two authors – (Sadigzade & Nasibov, 2022)
- A work by three or more authors – (Huseynova et al., 2019)
- Two or more works by the same author in the same year – (Berndt 1981a; Berndt 1981b)
- Organization as an author – (Food and Drug Administration [FDA], 2019)
- For quotations – (Yanmaz, 2018, p. 12)

### 2. Reference List

Each source cited in the article must appear in the reference list. All lines after the first line of each entry in your reference list should be indented 1.27 cm from the left margin. The references should be arranged in alphabetical order and comply with the APA 7th edition style.

## Note

Articles in the journal are first arranged in alphabetical order by the primary author's country of origin. If there are several articles from the same country, they are then listed alphabetically by the primary authors' surnames.

## Disclaimer

The opinions and views expressed in this publication belong solely to the authors of the articles and do not necessarily reflect the opinions, views or the official position of the ESRI, the ECO or the ECO Trade and Development Bank (ECO TDB). As the ECO Economic Journal strives to promote knowledge sharing and scholarly dialogue, we acknowledge the value and importance of open discussions on economic and institutional matters. In doing so, we recognize that disagreements may arise, and contentious topics may be explored. The ESRI, the ECO and the ECO TDB do not hold any responsibility for the political statements or contentious issues reflected in the articles of this publication.