MINISTRY OF ECONOMY OF THE REPUBLIC OF AZERBAIJAN

ECONOMIC SCIENTIFIC RESEARCH INSTITUTE

İGÜ SCTUAM Sürdürülebilir Çevre ve Toplum Uygulama ve Araştırma Merkezi

Scientific-Research Institute of Economic Studies UNEC

MINGACHEVIR STATE UNIVERSITY

DEDICATED TO THE "YEAR OF CONSTITUTION AND SOVEREIGNTY OF AZERBAIJAN"

INTERNATIONAL CONGRESS OF RECYCLING ECONOMY & SUSTAINABILITY POLICY-III

OCTOBER 02, 2025 / BAKU, AZERBAIJAN
OCTOBER 03, 2025 / MINGACHEVIR, AZERBAIJAN

INTERNATIONAL CONGRESS OF RECYCLING ECONOMY & SUSTAINABILITY POLICY-III

October 02-03, 2025 / Azerbaijan

CONGRESS PROCEEDINGS BOOK

EDITORS

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Prof. Dr. Durmuş Çağrı YILDIRIM
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adapted by Mariam Rasulan

CONGRESS ID

CONGRESS TITLE

INTERNATIONAL CONGRESS OF RECYCLING ECONOMY & SUSTAINABILITY POLICY-III

DATE and PLACE

OCTOBER 02-03, 2025 / BAKU/ MINGACHEVIR, AZERBAIJAN

ORGANIZATION

IKSAD-Institute of Economic Development and Social Research, Türkiye

NUMBER of ACCEPTED PAPERS-**97** *(Türkiye- 40, Other Countries- 57)*

NUMBER of REJECTED PAPERS-**11**

PARTICIPANTS COUNTRY

Türkiye, Belgrade, United States, India, KKTC, Bulgaria, Africa, Azerbaijan, Poland, Nigeria, Algeria, Romania, Bangladesh

PRESENTATION

Oral & Poster presentation

EVALUATION PROCESS

All applications have undergone a double-blind peer review process

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MINISTRY OF ECONOMY OF THE REPUBLIC OF AZERBAIJAN

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MİNGƏÇEVİR DÖVLƏT UNİVERSİTETİ

INTERNATIONAL CONGRESS OF RECYCLING ECONOMY & SUSTAINABILITY POLICY-III

Dedicated to the Year of Constitution and Sovereignty of Azerbaijan

October 02-03, 2025 / Azerbaijan

Opening Ceremony & In-Person Session-1: October 02, 2025 - Baku
In-Person Session-2: October 03, 2025 - Mingachevir

CONGRESS PROGRAM

Online & In-person

OPENING CEREMONY

02.10.2025 / Economic Scientific Research Institute
Baku city, Yasamal district, Hasan Bey Zardabi Avenue, 196, AZ1122
BAKU LOCAL TIME: 10^{00} – 11^{00}

Prof. Dr. Şahin SADIQOV
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Director of the İstanbul Gelişim University SÇTUAM (Türkiye)

IN PERSON SESSION - 1

02.10.2025 / Economic Scientific Research Institute

Moderator: Arzu Huseynova

BAKU LOCAL TIME: 11 ^{00}: 13 ^{00}

PRESENTER	AFFILIATION	TOPIC TITLE
Alovsat G. Aliyev *Sudaba E. Abasova*	*Institute of Information Technology, Baku, Azerbaijan*	*DIGITAL TRANSFORMATION ASPECTS IN THE CONTEXT OF COP29 CHALLENGES TO ADDRESS CLIMATE CHANGE PROBLEMS*
Prof. Dr. Melda Özdinç Çarpinlioğlu	*Gaziantep University, Türkiye*	*PLASTICS WASTE MANAGEMENT VIA MICROWAVE PLASMA: A MULTIPURPOSE FIT WITH SUSTAINABLE DEVELOPMENT GOALS OF THE UNITED NATIONS, UN*
Dr. Elvan CAFAROV	*Azerbaycan Devlet Pedagoji Üniversitesi*	*GRANTING THE STATUS OF THE STATE LANGUAGE TO THE AZERBAIJANI LANGUAGE, WHICH BELONGS TO THE TURKIC LINEAGE, IN THE 1995 DRAFT CONSTITUTION*
Assoc. Prof. Dr. Agnieszka Wójcik-Czerniawska *Zbigniew Grzymałą*	*SGH- Warsaw School of Economic, Poland*	*ADAPTIVE CIRCULAR GOVERNANCE: INTEGRATING RECYCLING INNOVATION INTO GLOBAL SUSTAINABILITY POLICIES*
Dr. Öğr. Üyesi Burcu Savaş Çelik *Dr. Ögr. Üyesi Tugba Kantarcı*	*İstanbul Gelişim University, Türkiye*	*THE RELATIONSHIP BETWEEN RENEWABLE ENERGY CONSUMPTION, FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH: AN EMPIRICAL ANALYSIS OF TURKEY AND AZERBAIJAN*
Roza O.Shahverdiyeva	*Institute of Information Technology, Baku, Azerbaijan*	*DEVELOPMENT OF CIRCULAR ECONOMY MECHANISMS AND TECHNOLOGIES FOR THE FORMATION OF TECHNOLOGICAL ECONOMIC DEVELOPMENT*
Ass.Prof. Huseynova Rena Shikar *Jafarova Natavan Rasim* *Ismailova Melek Fazilg*	*Azerbaijan State University of Economics, Azerbaijan*	*INTEGRATION OF CIRCULAR ECONOMY IN THE EDUCATION SYSTEM*
Assoc. Prof. Farhad Mikayilov *Emin Mustafayev* *Nigar Alasgarova* *Habiba Jabbarova*	*Economic Scientific Research Institution under the Ministry of Economy of the Republic of Azerbaijan*	*IMPACTS OF THE CIRCULAR ECONOMY TRANSITION TO THE ECONOMIC INEQUALITY: WINNERS AND LOSERS*
Turana Ahmadova	*ESRİ, Ministry of Economy of the Republic of Azerbaijan*	*SUSTAINABLE DEVELOPMENT AND BUSINESS: INTERRELATIONS AND PERSPECTIVES*
Aygün Babazada *Prof. Dr. Altan Doğan*	*Istanbul University, Institute of Social Sciences, Türkiye*	*SICK BUILDING SYNDROME AND ITS IMPACT ON EMPLOYEES*

IN PERSON SESSION - 2

02.10.2025 / Economic Scientific Research Institute

Moderator: Telman Imanov

BAKU LOCAL TIME: 11 ^{00} : 13 ^{00}

PRESENTER	AFFILIATION	TOPIC TITLE
Alovsat G. Aliyev *Khayala Abdulhuseynova*	*Institute of Information Technology, Baku, Azerbaijan*	*ASPECTS OF DIGITAL ECOLOGICAL TRANSFORMATIONS AND THEIR IMPACT ON THE GREENING PROCESSES OF ECONOMIC DEVELOPMENT*
Assist. Prof. Dr. Murat Topcu	*Istanbul Gelisim University, Faculty of Economics, Türkiye*	*TÜRKEYE BIST SUSTAINABILITY INDEX PRICE BUBBLE ANALYSIS*
Şenel Genç	*Istanbul Topkapi University, Türkiye*	*ART AND SUSTAINIBILITY: UPCYCLING PRACTISES AND ANALYSES OF TEXTILE MATERIALS*
Prof. Dr. Meltem INCE YENILMEZ	*Izmir Democracy University, Türkiye*	*RENEWABLE ENERGY TRANSFORMATION OF TURKEY: SUSTAINABILITY-ORIENTED POLICY ANALYSIS AND FUTURE PROJECTIONS*
Telman Imanov	*ESRİ, Ministry of Economy of the Republic of Azerbaijan*	*ECOLOGICAL PROBLEMS OF SUSTAINABLE ECONOMIC DEVELOPMENT*
Professor Saleh Mammadov *Musayev Vusal Suliddin*	*Azerbaijan State Economics University and Baku engineering University*	*SUSTAINABLE INVESTMENT PORTFOLIOS: THE ROLE OF AI-DRIVEN ANALYTICS IN BANKING TO OPTIMIZE RECYCLING ECONOMY PROJECTS FOCUSING ON ARTIFICIAL INTELLIGENCE TOOLS*
Murad Hajiyev	*ESRİ, Ministry of Economy of the Republic of Azerbaijan*	*MANAGEMENT CHALLENGES OF THE CENTRAL BANK OF AZERBAIJAN AND THE EFFECTIVENESS OF MONETARY POLICY*
Hasan Rahimli	*ESRİ, Ministry of Economy of the Republic of Azerbaijan*	*SUSTAINABLE ECONOMIC DEVELOPMENT PHILOSOPHY: A CRITICAL COMPARATIVE ANALYSIS OF RIGHT-CONSERVATIVE AND LEFT-GLOBALIST APPROACHES*
Ismailzade Saida Jafar	*Ganja State University, Azerbaijan*	*MONETIZATION OF SECONDARY RESOURCES: ECONOMIC POTENTIAL FOR SUSTAINABLE DEVELOPMENT OF AZERBAIJAN*
Ismail Ismailzade Mikail oglu	*Turkish-Kazakhstan University, Azerbaijan*	*INNOVATIVE WASTE PROCESSING TECHNOLOGIES: FROM THEORY TO PRACTICE*

IN PERSON SESSION - 3

03.10.2025 / Mingachevir State University

Moderator:

BAKU LOCAL TIME: 14 ^{00} : 16 ^{00}

PRESENTER	AFFILIATION	TOPIC TITLE
Nushaba Gadimli	*Mingachevir State University, Azerbaijan*	*OPPORTUNITIES FOR THE IMPLEMENTATION OF GREEN FINANCE MECHANISMS IN THE AZERBAIJANI ECONOMY*
Lala Ahmadova	*Mingachevir State University, Azerbaijan*	*ECOLOGICAL PRINCIPLES OF SUSTAINABLE TOURISM DEVELOPMENT*
Vefa Mustafazade	*Mingachevir State University, Azerbaijan*	*THE ECONOMIC IMPACTS AND INNOVATIVE APPROACHES OF RENEWABLE ENERGY TECHNOLOGIES*
Assoc. prof., Nushaba Gadimli *Ulvi Mammadov*	*Mingachevir State University, Azerbaijan*	*THE ROLE OF GREEN ECONOMY AND ENVIRONMENTAL INITIATIVES IN ENSURING SUSTAINABLE ECONOMIC DEVELOPMENT*
Tarana Yusibova *Gulgun Israfilova*	*Mingachevir State University, Azerbaijan*	*THE ECOLOGICAL BENEFITS OF THE ECONOMY AND ITS ROLE IN SUSTAINABILITY POLICY*
Fahmı Babayev	*Mingachevir State University, Azerbaijan*	*ENERGY TRANSITION AND RENEWABLE SOURCES: PERSPECTIVES ON REGIONAL INTEGRATION*
Aytan Nadirova	*Mingachevir state university, Azerbaijan*	*IMPLEMENTATION MECHANISMS OF INNOVATIVE FINANCIAL STRATEGIES IN COUNTRIES OF THE WORLD: DIRECTIONS AND EXPERIENCES OF INNOVATIVE FINANCIAL STRATEGIES IN AZERBAIJAN AND TURKEY*
Ulvi Seyidov	*Mingachevir State University, Azerbaijan*	*THE IMPACT OF GLOBAL ECONOMIC CHALLENGES ON SUSTAINABLE DEVELOPMENT*
Aliyeva Fatima Murshud kızı	*Mingachevir State University, Azerbaijan*	*ALGORITHMS AND METHODS OF THEIR USE IN NATURAL LANGUAGE PROCESSING*
hüseyc Taghiyev	*Mingachevir State University, Azerbaijan*	*MODERN APPROACHES TO DEVELOPMENT ECONOMICS: SUSTAINABLE DEVELOPMENT AND ECONOMIC GROWTH*
Abdullayev Alirza Agil	*Mingachevir state university, Azerbaijan*	*THE IMPACT OF INTERNATIONAL TOURIST ACTIVITY ON HOSPITALITY OPERATIONS AND EMPLOYMENT*
Orkhan Guliyev	*Mingachevir State University, Azerbaijan*	*THE U.S. MIDDLE EAST POLICY PREDICTED ON OIL AND ITS IMPLICATIONS FOR THE FORMATION OF PRICES IN THE WORLD ECONOMY*
Mammadli Vugar Ahmed oglu	*Mingachevir State University, Azerbaijan*	*CRITERIA FOR ASSESSING THE EFFICIENCY OF TAX BENEFITS*
Kenan Abbasov Polad	*Mingachevir State University, Azerbaijan*	*TRANSITION TO A CIRCULAR ECONOMY*
Jamala Tahirzadeh *İrade Khusayinova*	*Azerbaijan University of Technology, Türkiye*	*THE ROLE OF SUSTAINABLE AND REGENERATIVE TOURISM IN THE CONTEXT OF CLIMATE CHALLENGES*

IN PERSON SESSION - 4

03.10.2025 / Mingachevir State University

Moderator:

BAKU LOCAL TIME: 16 ^{00} : 18 ^{00}		
PRESENTER	**AFFILIATION**	**TOPIC TITLE**
Valiyeva Natavan Ibrahim *Islamova Shabnem Ziyeddin*	*Mingachevir State University, Azerbaijan*	*ENVIRONMENTAL PROTECTION AND NEW PERSPECTIVES OF SUSTAINABLE POLICY*
Jeyhun Mahmudov	*Mingachevir state university, Azerbaijan*	*MANAGEMENT OF PRODUCTION AND CONSUMPTION WASTE AS A NEW PARADIGM OF ECONOMIC SECURITY*
Aysel Bayramova	*Mingachevir State University, Azerbaijan*	*E-WASTE RECYCLING AND ENVIRONMENTAL RISKS*
Müallim Nərgiz Mustafayeva	*Mingachevir State University, Azerbaijan*	*IMPLEMENTATION OF GREEN CONSTRUCTION TECHNOLOGIES AND THEIR IMPACT ON THE SUSTAINABLE DEVELOPMENT PROCESS IN AZERBAIJAN*
Anar Eminov *Ramil Hasanov*	*Mingachevir State University, Azerbaijan*	*WATER RESOURCES AND AGRICULTURAL DEVELOPMENT IN AZERBAIJAN: A BOUNDS TESTING APPROACH*
P.S. Safarova	*Mingachevir State University, Azerbaijan*	*SCIENTIFIC BASES OF FORMATION OF STUDENT GROUPS AND ECOLOGICAL EDUCATION AMONG THE POPULATION*
Yeganə Məmmədli	*Mingachevir state university, Azerbaijan*	*DIRECTIONS FOR IMPROVING THE STATE SOCIAL INSURANCE SYSTEM*
Alakbarova Nurana Vugar	*Mingachevir state university, Azerbaijan*	*STRUCTURAL ANALYSIS OF ADVERTISING TERMS*
Kanan Abbasov	*Mingachevir state university, Azerbaijan*	*RANSITION TO A CIRCULAR ECONOMY*
AKBAROVA SAMIRA YUSIF qizi	*Mingachevir state university, Azerbaijan*	*ASSESSMENT OF THE USE OF ALTERNATIVE ENERGY SOURCES (NPP) IN AGROECOTOURISM AS A STEP TOWARDS THE TRANSITION OF OUR REPUBLIC TO A "GREEN ECONOMY"*
Leyla Nıyazova		*RENEWABLE AND SUSTAINABLE ENERGY POLICY*
Assoc. Prof. Vugar Sabir oghlu Mustafayev *Leyla Vugar gizi Ismayilzada*	*Mingachevir State University, Azerbaijan*	*APPLICATION OF ARTIFICIAL INTELLIGENCE IN WATER RESOURCES MANAGEMENT: REALITIES AND PROSPECTS*
Arif Taghiyev	*Mingachevir State University, Azerbaijan*	*MODERN APPROACHES TO DEVELOPMENT ECONOMICS: SUSTAINABLE DEVELOPMENT AND ECONOMIC GROWTH*
Ramida Khalilova	*Azerbaijan University of Technology, Azerbaijan*	*NAVIGATING PROGRESS: THE IMPACT OF SUSTAINABLE DEVELOPMENT INITIATIVES ON AZERBAIJAN'S TOURISM SECTOR*

ONLINE SESSION

OPENING CEREMONY

Zoom Meeting ID: 848 5448 4368 / Passcode: 123123
https://us02web.zoom.us/j/84854484368?pwd=aqC2oUjagz0NPFo49XjuPRY97DJ2oI.1

BAKU LOCAL TIME: 10 ^{00} - 11 ^{00} - ANKARA LOCAL TIME: 09 ^{00} - 12 ^{00}

PLENARY SESSION-1 / KEYNOTE SPEAKERS

MODERATOR
Prof.Dr. Ömer Esen
Tekirdag Namık Kemal University (Türkiye)

Prof. Dr. Kenan Aydın
İstanbul Gelişim University (Türkiye),
Dean of the Faculty of Economıcs, Admınıstratıve and Socıal Scıences, Busıness Admınıstratıon

Prof. Dr. Seyfettin Erdoğan
İstanbul Medeniyet University (Türkiye)

Prof. Dr. Rui Alexandre Castanho
WSB University (Poland)

Prof. Dr. Pardeep Singh
University of Delhi (India)

Prof. Dr. Cosimo Magazzino
Roma Tre University (Italia)

Assoc. Prof. Dr. Volha Rudkouskaya
Western Caspian University (Belarus)

Dr. Viana Hassan
Founder of European Tourism and Events Training Academy (Malta)

Prof. Dr. Hebatallah Adam
O.P. Jindal Global University (JGU), India

Assist. Prof. Dr. Firdous Ahmad Malik
University of People (USA),
President of Jammu and Kashmir Economic Association,

ONLINE PRESENTATIONS

02.10.2025 / SESSION-1 / HALL-1

BAKU LOCAL TIME: 13 30 : 15 30 / ANKARA LOCAL TIME: 12 30 : 14 30

HEAD OF SESSION: Prof. Dr. Bilge KÖKSEL

AUTHORS	AFFILIATION	TOPIC TITLE
Gizem Mukiyen Avci	*Zonguldak Bulent Ecevit University, Türkiye*	*CARBON-FREE FOOTPRINT IN TURKEY: ENVIRONMENTAL IMPACTS OF RENEWABLE ENERGY, ECONOMIC GROWTH, AND NATURAL RESOURCE USE*
Manaf Baghirzade *Nihala Musazade*	*Economic Scientific Research Institute, Azerbaijan*	*DIGITAL CHALLENGES OF SUSTAINABLE DEVELOPMENT: REGULATORY GAPS*
Zeka Hadizade	*Azerbaijan State University of Economics, Azerbaijan*	*BEHAVIOURAL POLICIES IN HIGH RECYCLING CULTURES: EXPERIENCES FROM GERMANY, JAPAN AND SOUTH KOREA*
Fatma TÜRÜÇ SERAJ *Süheyla ÜÇIŞIK ERBİLEN*	*Yakın Doğu Üniversitesi, Kuzey Kıbrıs Türk Cumhuriyeti* *Doğu Akdeniz Üniversitesi, Kuzey Kıbrıs Türk Cumhuriyeti*	*FOSSIL FUELS, RENEWABLE TRANSITION, AND SUSTAINABILITY: A PANEL STUDY OF THE TOP 15 CARBON-EMITTING COUNTRIES*
Lect. Murat Özdemir *Prof. Dr. Veli Sırım*	*Tekirdağ Namık Kemal University, Türkiye*	*ENERGY SOVEREIGNTY AND SUSTAINABILITY: TÜRKIYE AND AZERBAIJAN FROM AN ECONOMIC NATIONALISM PERSPECTIVE*
Sebile TECİRLİ *Prof. Dr. Bilge KÖKSEL*	*Gaziantep University, Türkiye*	*THE IMPACT OF ECONOMIC CHALLENGES ON HOUSEHOLD CONSUMPTION: INCOME INEQUALITY AND PRICE LEVEL PERSPECTIVE (1990–2024)*
Prof. Dr. İlhan Eroğlu *Duygu Yılmaz*	*Tokat Gaziosmanpasa University, Türkiye*	*REFLECTIONS OF CLIMATE CHANGE-RELATED RISKS ON MONETARY TRANSMISSION CHANNELS*
Rumella Jafarova	*Azerbaijan University of Architecture and Construction (AzUAC).*	*CONSUMER BEHAVIOR AND SUSTAINABLE LIFESTYLES*

ONLINE PRESENTATIONS

02.10.2025 / SESSION-1 / HALL-2

BAKU LOCAL TIME: 13 30 : 15 30 / ANKARA LOCAL TIME: 12 30 : 14 30

HEAD OF SESSION: Esra Dobrucali

AUTHORS	AFFILIATION	TOPIC TITLE
Baghirzade Nigar	*International Master's and Doctoral Studies Center, Azerbaijan*	*TRANSITION TO CIRCULAR ECONOMY: SUSTAINABLE MARKETING APPROACHES AND RECYCLING PRACTICES*
Firdovsi Hashim oglu Shahbazov	*MSE Institute of Economics, Azerbaijan*	*GREEN ECONOMY AS A FACTOR OF SUSTAINABLE DEVELOPMENT*
Esra Dobrucali	*Sakarya University, Türkiye*	*STRATEGIC EVALUATION OF THE CONSTRUCTION SECTOR'S TRANSITION TOWARDS A CIRCULAR ECONOMY*
Asst. Prof. Dr., Onur ŞEYRANLIOĞLU *Asst. Prof. Dr. Çağlar SÖZEN* *Assoc. Prof. Dr. Arif ÇİLEK*	*Giresun University, Türkiye*	*DO BIST SUSTAINABILITY STOCK INDEXES EXHIBIT MEAN-REVERSION BEHAVIOR?*
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Prof. Dr. Valentin Vasilev *Lect. Murat Özdemir* *Prof. Dr. Durmuş Çağrı Yıldırım*	*Higher School of Security and Economics, Bulgaria*	*GLOBALISATION, FINANCIAL DEEPENING AND SUSTAINABLE DEVELOPMENT: EVIDENCE FROM DEVELOPING COUNTRIES*
Cuma Demirtaş	*Aksaray University, Turkiye*	*REVISITING THE ROLE OF DIGITALIZATION IN TAX REVENUES: EVIDENCE FROM TURKIYE WITH A WAVELET QUANTIL APPROACH*

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ONLINE PRESENTATIONS

02.10.2025 / SESSION-1 / HALL-3

BAKU LOCAL TIME: 13 30 : 15 30 / ANKARA LOCAL TIME: 12 30 : 14 30

HEAD OF SESSION: İsgəndərova Leyla Qəhrəman qızı

AUTHORS	AFFILIATION	TOPIC TITLE
Çiğdem TUĞAÇ	*Ankara Hacı Bayram Veli Üniversitesi, Türkiye*	*INNOVATIVE APPROACHES IN SUSTAINABLE WATER MANAGEMENT*
Klemens Katterbauer *Sema Yılmaz* *Hassan Syed* *Laurent Cleenewerck* *Rahmi Deniz Özbay*	*Euclid University, Africa* *Yıldız Technical University, Türkiye.* *Euclid University, Africa* *Euclid University, Africa* *İstanbul Ticaret University, Türkiye*	*SMART TREATIES FOR A GREENER FUTURE: HOW AI CAN REVOLUTIONIZE RECYCLING LAW IN CHINA-AFRICA ENVIRONMENTAL COOPERATION*
Nail Gasimzade	*Azerbaijan University of Architecture and Construction, Azerbaijan*	*THE APPLICATION OF CONSTRUCTION LOANS IN THE FINANCING OF GREEN-CERTIFIED BUILDINGS*
Mohammed Lateefat Bunmi *Jamiu Olaide Oyetunde* *Muhammad Mujahid Muhammad*	*Ahmadu Bello University Zaria, Kaduna. Nigeria.*	*ASSESSMENT OF FLOODING ON RESIDENTIAL PROPERTIES OF NIGERIAN AIR FORCE BASE KADUNA AND ENVIRON*
E. Su TURAN	*Çukurova University, Türkiye*	*THE ROLE OF SOLAR ENERGY IN THE RENEWABLE ENERGY TRANSITION: TÜRKİYE'S CONTRIBUTION TO NET-ZERO TARGETS*
İsgəndərova Leyla Qəhrəman qızı	*Azerbaijan State University of Economics, Azerbaijan*	*COMPARATIVE ANALYSIS OF THE STATE OF HUMAN CAPITAL: AZERBAIJAN AND INTERNATIONAL EXPERIENCE*
Arafatur Rahaman *Abidur Rahman Efaz* *Mushfiq Ali Rajon* *Adiba Ashraf* *Zobia Juearia*	*Southeast University, Bangladesh* *Adroit Research Foundation (ARF), Bangladesh.*	*FIGHT AGAINST DISINFORMATION AND FACT-CHECKING IN BANGLADESH'S JULY 2024 UPRISING: THE DIGITAL BATTLEFIELD*

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ONLINE SESSION

OPENING CEREMONY

03.10.2025

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BAKU LOCAL TIME: 10 ^{00} - 13 ^{00} - ANKARA LOCAL TIME: 09 ^{00} - 12 ^{00}

PLENARY SESSION-2 / KEYNOTE SPEAKERS

MODERATOR
Prof. Dr. Seda H. Bostancı
Tekirdağ Namık Kemal University (Türkiye)

Prof. Dr. Ashulekha Gupta
Graphic Era Deemed to be University (India)

Dr. Ibrahim Kshanh
(Egypt)

Prof. Dr. Silky Vigg
New Delhi Institute of Management (India)

Recep Durul
Businessman (Türkiye)

Dr. Burak Ektiren
Director of the İstanbul Hilton Kozyatagı (Türkiye)

Assoc. Prof. Dr. Arjeta Hallunovi Shpuza
University Aleksander Moisiu Durres, (Albania)

Assoc. Prof. Dr. Samriti Mahajan
New Delhi Institute of Management (India)

Assoc. Prof Dr. Shajara Ul-Durar
University of Sunderland (England)

Asisst. Prof. Dr. Komal Rawat
St. Aloysius' College, Jabalpur, M.P., (India)

Dr. Bishnu Pada Bose
Indian Institute of Technology Kharagpur, Kharagpur, (India)

Dr. Sumanta Bhattacharya
PhD Scholar at Asian International University, (India)

ONLINE PRESENTATIONS

03.10.2025 / SESSION-1 / HALL-1

BAKU LOCAL TIME: 13 30 : 15 30 / ANKARA LOCAL TIME: 12 30 : 14 30

HEAD OF SESSION: Assoc. Prof. Dr. Abdullah Açık

AUTHORS	AFFILIATION	TOPIC TITLE
Asst. Prof. Dr. Nergis Özispa *Assoc. Prof. Dr. Abdullah Açık*	*Dokuz Eylül Universityi, Türkiye* *Mersin University, Türkiye*	*NONLINEAR MARKET BEHAVIOR IN SHIP RECYCLING: EVIDENCE FROM THRESHOLD REGRESSION ON BDI-DRIVEN SCRAP DECISIONS*
Sılanur Genç *Assoc. Prof. Dr. Ceren Çubukçu Çerasi*	*Gebze Technical University, Türkiye*	*EMPLOYEE PERCEPTIONS IN CORPORATE SUSTAINABILITY CULTURE: A CONCEPTUAL STUDY ON BLUE AND WHITE COLLAR EMPLOYEES*
Assoc. Prof. Dr. Huseynova Rena Shikar *Jafarova Natavan Rasim* *Ismailova Melek Fazil*	*Azerbaijan State University of Economics, Baku, Azerbaijan Ministry of Science and Education Republic of Azerbaijan Faculty, Azerbaijan*	*MANAGEMENT OF HUMAN CAPITAL IN THE CONTEXT OF ENVIRONMENTALLY ORIENTED DEVELOPMENT*
Ulkar Salifova Shahvaled	*Azeriqaz Production Union, Baku, Azerbaijan*	*DEVELOPMENT OF SMES AND THE UN SUSTAINABLE DEVELOPMENT GOALS: ALIGNMENT AND INTEGRATION OPPORTUNITIES*
Assoc. Prof. Sabir QULUZADA	*Azerbaijan Tourism and Management University, Vice Dean*	*THE ROLE OF TOURISM IN SUSTAINABLE ECONOMIC DEVELOPMENT IN AZERBAIJAN*
Emin Alimusayev	*Baku State University, faculty of Law, Baku, Azerbaijan*	*LEGAL MECHANISMS OF INTEGRATING SUSTAINABILITY CLAUSES AND CLIMATE REGULATION INTO DOMESTIC LEGISLATION*

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ONLINE PRESENTATIONS

03.10.2025 / SESSION-1 / HALL-2

BAKU LOCAL TIME: 13 ^{30} : 15 ^{30} / ANKARA LOCAL TIME: 12 ^{30} : 14 ^{30}

HEAD OF SESSION: Assoc. Prof. Dr. Gamze Yıldız ŞEREN

AUTHORS	AFFILIATION	TOPIC TITLE
Assoc. Prof. Dr. Gamze Yıldız ŞEREN *Prof. Dr. Ömer ESEN*	*Tekirdag Namık Kemal University, Türkiye*	*FOREIGN DIRECT INVESTMENT AND GENDER EQUALITY IN EMPLOYMENT IN TRANSITION ECONOMIES: NEW EMPIRICAL EVIDENCE FROM THE COMMONWEALTH OF INDEPENDENT STATES (CIS)*
Emine ÖRS *Prof. Dr. Dilek Sürekçi Yamaçlı*	*İzmir Demokrasi Üniversitesi, Sosyal Bilimler Enstitüsü, Türkiye*	*CARBON GOVERNANCE IN EMERGING ECONOMIES: A HYBRID THEORETICAL ANALYSIS OF TURKEY'S 2025 CLIMATE LAW AND THE EU CARBON BORDER ADJUSTMENT MECHANISM*
Prof. Dr. Durmuş Çağrı Yıldırım	*Tekirdag Namık Kemal University, Türkiye*	*RECYCLING POLICIES AMONG THE CIRCULAR ECONOMY*
Prof. Dr. Durmuş Çağrı YILDIRIM *Prof. Dr. Ömer ESEN*	*Tekirdag Namık Kemal University, Türkiye*	*The Impact of Environmental Policies and Economic Dynamics on Waste Exports in The European Union: Evidence from The Two-Step Difference Generalised Moments Method*
Prof. Dr. Ömer ESEN *Prof. Dr. Durmuş Çağrı YILDIRIM* *Metin Bayrak*	*Tekirdag Namık Kemal University, Türkiye.* *Atatürk University, Erzurum, Türkiye*	*The Dynamıc Role Of Envıronmental Taxes In Promotıng Sustaınable Development In Eu Economıes: New Evıdence From A Fractional Frequency Flexible Fourier Form Panel Coıntegratıon Test*

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ONLINE PRESENTATIONS

03.10.2025 / SESSION-1 / HALL-3

BAKU LOCAL TIME: 13 30 : 15 30 / ANKARA LOCAL TIME: 12 30 : 14 30

HEAD OF SESSION: Prof. Dr. Seda H. Bostancı

AUTHORS	AFFILIATION	TOPIC TITLE
Seda H. Bostancı *Cristina Raluca Gh. Popescu* *Gheorghe N. Popescu*	*Tekirdağ Namık Kemal University, Türkiye* *University of Bucharest, Romania*	*DISCUSSING CONTEMPORARY CIRCULARITIES: CIRCULAR ECONOMY, CIRCULAR SOCIETY, CIRCULAR LIFESTYLE, CIRCULAR CITES*
Seda H. Bostancı	*Tekirdağ Namık Kemal University, Türkiye*	*A REVIEW ON THE RELATIONSHIP BETWEEN CIRCULAR ECONOMY AND WASTE MANAGEMENT*
Seda Yıldırım *Seda H. Bostancı*	*Tekirdağ Namık Kemal University, Türkiye*	*WATER RECYCLING POLICIES FOR RESILIENT CITIES*
Sivaretinamohan R *Prof. Dr. Seda Yıldırım*	*Symbiosis Centre for Management Studies, Bengaluru, India.* *Tekirdag Namık Kemal University, Türkiye*	*CHALLENGES AND OPPORTUNITIES IN WASTE ENTREPRENEURSHIP*
Prof. Dr. Seda Yıldırım	*Tekirdag Namık Kemal University, Türkiye*	*THE ROLE OF SOCIAL MEDIA ON RECYCLING AWARENESS THROUGH GREEN INFLUENCERS*
Prof. Dr. Seda Yıldırım	*Tekirdag Namık Kemal University, Türkiye*	*PRACTICAL APPLICATION OF SUSTAINABLE TRANSFORMATION IN THE FASHION INDUSTRY: RECYCLING AND FASHION*

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ONLINE PRESENTATIONS

03.10.2025 / SESSION-1 / HALL-4

BAKU LOCAL TIME: 13 30 : 15 30 / ANKARA LOCAL TIME: 12 30 : 14 30

HEAD OF SESSION: Doctor Rahmouni Hanane

AUTHORS	AFFILIATION	TOPIC TITLE
Doctor Rahmouni Hanane	*University of Oran 2 Mohamed Ben Ahmed, Oran, Algeria*	*THE PRINCIPLES OF PUBLIC PROCUREMENT OF INVESTMENTS BETWEEN BURDEN AND OBLIGATION*
Yusuf Ahmed Tijjani *Dr. Umar Mohammed Mijinyawa* *Hamzadeen Shehu* *Sani Samau'al* *Saminu Suleiman Kanti*	*Ahmadu Bello University Zaria*	*RELATIONSHIP BETWEEN CORPORATE GOVERNANCE AND INTELLECTUAL CAPITAL EFFICIENCY OF LISTED NON-FINANCIAL FIRMS IN NIGERIA: A PANEL REGRESSION STUDY*
Lect. Andrei Borșa *Alexandra Raluca Borşa (Bogdan)* *Prof. Mircea Valentin Muntean* *Assoc. Prof Ovidiu Ghiuță*	*University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Romania*	*SUPPORT INFRASTRUCTURE AND GOVERNANCE OF ACADEMIC SPIN-OFFS: INCUBATORS AND ACCELERATOR MODELS IN ROMANIAN LIFE SCIENCE UNIVERSITIES (2014–2024)*
Feroz Ahmed *Arafatur Rahaman*	*Department of Information Systems and Analysis, Lamar University, TX, USA*	*AI-DRIVEN PREDICTIVE MODELING OF BANGLADESH ECONOMIC TRENDS: HIGHLIGHTING FINANCIAL CRIME & FRAUD*
Aleksandra Nikolova Marković	*Megatrend University, Faculty of Law, Serbia*	*LEGAL ASPECTS AND INTERNATIONAL FRAMEWORKS OF ENVIRONMENTAL AND RECYCLING POLICIES IN THE AVIATION INDUSTRY*
Grace Charles Dikki	*Georgia State University, Atlanta, United States*	*AN EMPIRICAL REVIEW OF FINANCIAL RISK MANAGEMENT AND FIRM VALUE IN AFRICAN LISTED BANKS*
Ipu Michael Ogwuma *Sesugh Ande* *John Ona Ikuba* *Idikwu Onwe Ugbem*	*University of Agriculture Makurdi Benue State Nigeria*	*HEALTH RISK ASSESSMENT OF POTENTIALLY TOXIC METALS FROM SCHOOL PLAYING GROUNDS IN MAKURDI METROPOLIS BENUE STATE NIGERIA*

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SMART TREATIES FOR A GREENER FUTURE: HOW AI CAN REVOLUTIONIZE RECYCLING LAW IN CHINA-AFRICA ENVIRONMENTAL COOPERATION

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Abstract

This study presents a comprehensive analysis of how artificial intelligence (AI) can support developing and refining recycling legal regulations within the framework of China-Africa environmental treaties. As China's Belt and Road Initiative (BRI) deepens economic engagement across the African continent, a parallel increase in industrial waste and environmental degradation necessitates robust legal instruments for recycling and waste management. However, existing treaties often lack specificity, adaptability, and enforceability, particularly in circular economy principles and cross-border waste governance. This research argues that AI—through natural language processing (NLP), predictive modeling, and legal knowledge representation—can enhance treaty design, compliance monitoring, and policy harmonization between China and African states. Using AI to analyze historical treaty texts, legal precedents, environmental data, and national legislation across jurisdictions, regulators can identify legal gaps, simulate enforcement scenarios, and forecast policy outcomes under different economic and ecological conditions. Moreover, AI-driven systems can help bridge linguistic and jurisdictional barriers in treaty negotiation by providing real-time translation, comparative legal analysis, and automated drafting tools. This capability is particularly critical in heterogeneous African legal systems and the evolving regulatory landscape shaped by digital globalization. The study highlights key case examples where AI-assisted legal tech has contributed to environmental governance, such as formulating e-waste disposal policies and regulating plastics in transnational contexts. Furthermore, the research considers ethical and sovereignty-related risks, emphasizing the need for transparent, accountable AI systems co-developed with local stakeholders to avoid technological imperialism or asymmetrical influence. Ultimately, this analysis concludes that if responsibly and collaboratively deployed, AI holds significant promise in accelerating the co-development of adaptive, enforceable, and environmentally just recycling regulations under China-Africa cooperation frameworks, while contributing to broader goals of sustainable development and ecological resilience in the Global South.

Keywords: Artificial Intelligence (AI), Recycling Law, China-Africa Environmental Cooperation, Treaty Design and Enforcement, Sustainable Development.

Introduction

In the 21st century, environmental cooperation between China and African nations has deepened in scope and complexity. This cooperation has evolved beyond traditional aid and development paradigms into a multifaceted partnership that includes investments in green energy technologies, afforestation initiatives, biodiversity conservation programs, and waste management infrastructure development. China's Belt and Road Initiative (BRI) and other bilateral and multilateral engagements have played a pivotal role in expanding the environmental dimension of China-Africa relations (Amankwah-Amoah & and Lu, 2024). In recent years, renewable energy projects in Kenya, Ethiopia, and South Africa, as well as Chinese-funded solar infrastructure in Nigeria and Zambia, have emerged as tangible outcomes of this growing partnership. However, despite these achievements, the recycling domain remains notably underdeveloped and fraught with inconsistencies, thus representing a critical gap in the evolving environmental governance framework between China and Africa. The underperformance of recycling cooperation is attributable to a constellation of institutional, legal, and geopolitical challenges. Chief among these is the lack of harmonized regulatory frameworks across African countries, many of which operate with outdated or fragmented waste management laws. These legal inconsistencies are exacerbated by weak enforcement mechanisms, limited technological capacity, and insufficient data to track and monitor waste flows effectively (D. Eke & Ogoh, 2022). Moreover, the transboundary nature of waste—particularly electronic waste (e-waste) and plastic waste—compounds these difficulties. For example, Chinese companies operating in African nations have sometimes been linked to informal recycling sectors, which often lack environmental safeguards and operate outside formal legal oversight. Nigeria's informal e-waste sector, centered in Lagos, illustrates this phenomenon. The Agbogbloshie dump in Ghana, once cited as one of the world's most toxic sites, further underscores the' environmental and health consequences of unchecked waste flows. Despite national laws prohibiting the import of e-waste, loopholes and limited customs enforcement often allow waste to enter African ports under the guise of “second-hand electronics.” In this complex policy landscape, emerging technologies offer new avenues for innovation. Artificial intelligence (AI), with its transformative potential in legal informatics and environmental monitoring, stands at the forefront of global governance experimentation (D. O. Eke et al., 2023).

Across the world, AI is being deployed to improve compliance with environmental laws, detect pollution patterns via satellite imagery, optimize waste collection systems, and even predict ecological risks. In legal contexts, AI is also gaining traction for its capacity to support predictive justice, automate administrative procedures, and monitor regulatory compliance in real time. Within this context, the concept of "smart treaties" has emerged—a novel framework that envisions international legal agreements as digitally enabled, self-executing, and adaptively managed instruments. Smart treaties harness the power of AI to make international agreements more effective and responsive to real-world developments. Unlike traditional treaties, which are static and often dependent on periodic review conferences, smart treaties can integrate real-time data streams to trigger enforcement actions, suggest amendments, or alert signatories to non-compliance. In the context of China-Africa environmental cooperation, smart treaties could be game-changing tools for recycling governance. First, they could establish shared digital platforms that standardize data collection across borders, harmonizing legal standards and enforcement criteria. For instance, AI-driven dashboards could aggregate information on waste shipments, recycling rates, and pollution levels from across the continent, creating a unified system of accountability that transcends national bureaucracies (Nandutu et al., 2023).

Second, smart treaties could incentivize sustainable practices through dynamic reward systems. Blockchain-enabled AI algorithms, for example, could track the lifecycle of electronic goods and reward companies that engage in ethical recycling with digital credits or tax incentives. This would be particularly useful in curbing illicit trade in e-waste, where traceability is a significant challenge. A relevant example can be drawn from Rwanda's emerging role in electronic materials recovery. Rwanda has launched several pilot programs to manage end-of-life electronics, including a public-private partnership with Enviroserve Rwanda. This company operates the country's first e-waste dismantling and recycling facility. By integrating AI and smart contracts into such initiatives, recycling outcomes could be more transparently documented and aligned with broader international objectives (Otaigbe, 2022). Third, the deployment of AI in smart treaties can foster real-time accountability. Remote sensing technologies, coupled with machine learning models, can detect illegal waste dumping or the operation of unregulated recycling facilities, triggering automatic notifications to regulatory agencies or treaty secretariats. This reduces the dependence on sporadic human inspections and enhances the ability to respond swiftly to environmental violations.

China's deployment of AI for monitoring deforestation and air quality offers a template that could be extended into African contexts through joint technology transfer programs. Similarly, Kenya's National Environment Management Authority (NEMA) has expressed interest in adopting AI tools for pollution control, signaling readiness for digital environmental governance. However, implementing AI-driven smart treaties must also confront ethical, technical, and political challenges. Questions of data sovereignty, algorithmic bias, cybersecurity, and the digital divide are especially pertinent in many African countries, where access to high-quality internet infrastructure and skilled technical labor remains uneven. Moreover, the asymmetry in technological capabilities between China and many of its African partners raises concerns about dependency and the potential for techno-authoritarian practices to seep into environmental governance. Therefore, ensuring that smart treaties are co-designed with African stakeholders, grounded in principles of transparency and mutual benefit, is essential (Pagenberg, 1991). As China-Africa environmental cooperation continues evolving, addressing the recycling gap will require policy innovation and technological transformation. Smart treaties, underpinned by artificial intelligence, offer a promising model for enhancing recycling governance by enabling dynamic legal harmonization, real-time monitoring, and incentive-based compliance. While implementation will require navigating significant structural and ethical hurdles, integrating AI into treaty frameworks can bridge long-standing governance gaps in transboundary waste management. Future research and pilot programs should focus on developing regional AI governance infrastructures, fostering cross-border legal interoperability, and embedding local knowledge systems into algorithmic design, ensuring that the benefits of innovative environmental governance are equitably distributed and locally anchored.

Background: China-Africa Environmental Cooperation and the Recycling Challenge

China's engagement with African countries has undergone a remarkable evolution over the past two decades, particularly under the institutional framework of the Forum on China-Africa Cooperation (FOCAC), which has served as a central mechanism for structuring diplomatic, economic, and developmental ties. Historically, these interactions have prioritized strategic sectors such as infrastructure development, trade facilitation, and the extraction of natural resources. Investments in roads, ports, hydropower projects, and mining operations have been especially prominent, often supported by concessional loans and state-owned enterprises (Chaisse & Kirkwood, 2022a). However, as Chinese and African policymakers increasingly confront the environmental consequences of rapid development and global supply chain integration, environmental cooperation has emerged as a new and critical frontier. This shift in focus is consistent with China's broader narrative of fostering a "green Belt and Road Initiative" and Africa's simultaneous pursuit of the African Union's Agenda 2063, which envisions sustainable growth. Yet, despite this apparent convergence of goals, a coherent and enforceable legal framework governing transnational environmental cooperation—especially in sectors such as waste management and recycling—remains notably underdeveloped. The urgency of this legal vacuum is particularly pronounced in the context of solid waste management in African cities, where rapid urbanization, population growth, and increased consumption have significantly outpaced institutional and infrastructural capacities. According to the World Bank, across sub-Saharan Africa, waste generation is projected to triple by 2050, with urban centers like Lagos, Nairobi, and Accra already grappling with uncollected waste, open dumpsites, and health hazards associated with informal recycling. Of particular concern is the mounting volume of electronic waste (e-waste), which is imported legally or through illicit channels from industrialized economies, including China. E-waste contains valuable materials such as gold, copper, rare earth elements, and toxic substances like lead, mercury, and brominated flame retardants. Without regulated recycling systems, this waste is often dismantled manually in informal settings, leading to severe environmental contamination and public health risks (Wang & Lei, 2018).

China's domestic waste governance reforms, particularly the introduction of the "National Sword" policy in 2018, have indirectly yet significantly exacerbated these challenges in Africa. Before 2018, China was the world's largest importer of recyclable waste, processing more than 45% of global plastic waste. The National Sword policy, which imposed stringent contamination standards and effectively banned many categories of waste imports, aimed to curtail environmental degradation within China's borders. However, one unintended consequence was the redirection of waste flows to other parts of the world, particularly countries with weaker environmental regulations (Rusakova, 2021). As a result, several Chinese firms and subsidiaries began relocating or outsourcing recycling operations to African nations, where regulatory oversight is often limited and legal protections for environmental and labor standards are inconsistently enforced.

This transnational reconfiguration of waste processing has created a complex and ambiguous legal landscape. On one hand, it represents an opportunity for African countries to develop domestic recycling industries and attract foreign investment. On the other hand, it introduces significant risks of environmental injustice, wherein vulnerable communities bear the brunt of pollution and ecological degradation resulting from inadequately regulated industrial activities. Case studies from Ghana's Agbogbloshie site and Nigeria's Alaba International Market illustrate the scale and intensity of informal e-waste recycling. At Agbogbloshie, one of the world's most infamous e-waste dump sites, children and young men routinely burn wires to extract copper, exposing themselves to hazardous fumes (Bickers & Jackson, 2016). Despite international frameworks like the Basel Convention, enforcement remains weak due to limited institutional capacity, corruption, and the informal nature of much of the trade. Efforts to harmonize international recycling laws have consistently encountered formidable obstacles. The diversity of legal traditions across African nations—from common law to civil law and customary legal systems—complicates the adoption of standardized regulations. Furthermore, enforcement capabilities are often constrained by inadequate funding, lack of technical expertise, and competing policy priorities such as poverty alleviation and economic growth. Political asymmetries also play a role; Chinese investments are often welcomed due to their scale and speed of deployment, sometimes leading to regulatory concessions or the circumvention of environmental impact assessments (Parts, 2019). As a result, the principle of "polluter pays" is frequently diluted, and environmental externalities are offloaded onto local communities. In this context, emerging technologies such as artificial intelligence (AI) may offer promising, though not unproblematic, avenues for strengthening environmental governance. AI-driven systems can enhance waste tracking, facilitate real-time monitoring of illegal dumping, and optimize recycling logistics. For instance, computer vision algorithms can detect and categorize e-waste at collection centers. At the same time, blockchain technology could be integrated to ensure the traceability of hazardous shipments across borders (Xia, 2019). In Rwanda, drone-based surveillance pilot projects have shown potential for monitoring landfills and illegal dumping activities. However, deploying such technologies raises ethical and practical questions, including data sovereignty, digital infrastructure readiness, and the displacement of informal labor. Addressing these challenges requires a multi-scalar and interdisciplinary approach. Legal harmonization should be pursued through both top-down and bottom-up mechanisms. At the intergovernmental level, China and African states could expand the environmental chapter of FOCAC to include binding commitments on waste trade transparency, technology transfer, and capacity building. At the national and subnational levels, governments must be empowered to craft localized legislation reflecting global standards and community-specific realities. Civil society organizations and environmental justice advocates are critical in ensuring accountability, promoting inclusive policy-making, and resisting exploitative practices masked as development. In conclusion, the intersection of China-Africa relations, transnational recycling flows, and environmental governance presents a paradigmatic case of global ecological interdependence marked by asymmetry and fragmentation. As waste increasingly becomes a transboundary commodity, the absence of robust legal frameworks threatens ecological sustainability and the socio-economic resilience of communities in the Global South. The challenge ahead is not merely technical coordination or diplomatic consensus, but ethical commitment to equitable and sustainable development. Bridging this domain's legal and regulatory gaps will require bold innovation, transcontinental solidarity, and a reconceptualization of environmental stewardship in an era of globalized waste (Li et al., 2013).

What are Smart Treaties? Conceptual Foundation

The emergence of smart treaties marks a transformative shift in international law and governance theory and practice. Rooted in integrating legal norms with emergent digital technologies, smart treaties represent a convergence of law, computer science, and systems engineering. At their core, smart treaties are legal instruments that incorporate the functionalities of smart contracts—computer protocols that automatically execute predefined actions when specific conditions are met. These contracts are typically deployed on decentralized digital infrastructures such as blockchain, ensuring immutability, transparency, and self-execution. Integrating such technological infrastructures into treaty frameworks introduces a fundamentally new modality of norm compliance and enforcement, potentially addressing long-standing challenges of implementation and accountability in international agreements (Wellhausen, 2025). Smart treaties are not merely digital versions of traditional agreements. They embody a paradigmatic shift toward procedural automation, real-time responsiveness, and systemic interconnectivity.

Unlike conventional treaties, which depend heavily on state-centric interpretation, diplomatic negotiation, and institutional enforcement, smart treaties embed enforceability and adaptability within the legal architecture. This approach has theoretical foundations in cybernetics and systems theory, particularly in feedback loops: systems that adjust their behavior based on environmental inputs. The most salient features of smart treaties include the data integration and monitoring mechanisms, automated compliance and enforcement, and the adaptive legal frameworks. In addition, transparency, traceability, and trust are other key pillars (Lebbie et al., 2021).

Smart treaties rely extensively on data streams derived from various digital monitoring systems. These include remote sensing technologies, such as satellite imagery; the Internet of Things (IoT), including RFID sensors embedded in containers and waste management infrastructure; and machine learning algorithms capable of detecting anomalies or violations in compliance behavior. For example, in environmental governance, smart treaties can utilize satellite data to verify deforestation rates or pollution levels, thereby reducing dependence on state self-reporting—a mechanism long criticized for lacking reliability. One of the most promising aspects of smart treaties is their capacity for automated compliance enforcement. Leveraging artificial intelligence (AI) and machine-readable treaty clauses, smart treaties can continuously assess whether parties are meeting their obligations. In instances of non-compliance, the treaty can trigger automated alerts, levy financial penalties, or freeze access to digital resources without intermediary institutions or protracted diplomatic processes. This automation not only enhances efficiency but also deters opportunistic behavior by states. Smart treaties are inherently dynamic rather than static instruments. Through predictive analytics and machine learning, these treaties can be programmed to evolve in response to new scientific findings, emerging environmental threats, or shifts in geopolitical conditions. For instance, if climate models predict an intensification of drought conditions in a given region, a smart treaty governing water sharing could automatically adjust quotas among the signatories. Such adaptability introduces a level of legal responsiveness previously unattainable in traditional treaties, which often require years to renegotiate or amend. Blockchain technology is the digital backbone of many smart contracts, offering immutability, decentralized verification, and enhanced transparency. Each transaction or data input is recorded on a distributed ledger accessible to all stakeholders. In the context of recycling and waste management, this can mean complete traceability of hazardous materials from their origin to final disposal. This traceability mitigates risks of illegal dumping or misreporting and fosters mutual trust between treaty partners.

Smart treaties' theoretical and technical attributes become particularly salient when examined through international environmental cooperation, such as the partnership between China and African nations on recycling and waste management. A complex mix of geopolitical interests, economic development goals, and environmental imperatives has shaped this partnership. However, traditional cooperation frameworks have often faltered due to enforcement deficits, asymmetrical information, and limited regulatory capacity. Smart treaties offer a viable pathway to overcome these barriers. By embedding compliance mechanisms directly into the treaty structure and tying obligations to real-time data, such instruments can reduce the implementation gap—a persistent issue in North-South environmental agreements. For instance, a smart treaty between China and Kenya on e-waste recycling could mandate using RFID tags on all exported electronics. Sensors at African ports would verify compliance, while blockchain records would document the entire lifecycle of the waste products. In non-compliance—such as illegal dumping or mishandling—the treaty could trigger automated sanctions or financial penalties, with minimal reliance on diplomatic or legal adjudication. A pertinent case study from Nigeria's Basel Convention 2019 e-waste tracking pilot project can be drawn. While not a smart treaty per se, the initiative used blockchain to track electronic waste shipments from Europe to Africa.

The project revealed how digital tools could prevent illegal transboundary movements of hazardous materials. Building on such experiments, smart treaties can institutionalize these capabilities within a binding legal framework, operationalizing environmental justice and regulatory parity in an otherwise asymmetrical international system. While smart treaties promise efficiency and precision, they also raise significant normative questions. Automating legal processes may challenge established notions of state sovereignty and legal interpretation. There is a risk of over-reliance on opaque algorithms that may encode biases or be susceptible to manipulation. Moreover, digital inequality may render some states ill-equipped to participate fully in smart treaty regimes. African nations, for instance, may require substantial technical and infrastructural investments to engage in these frameworks effectively. Thus, the equitable design of smart treaties must include capacity-building measures and inclusive governance structures.

Smart treaties represent a confluence of technological innovation and legal reform, offering a potentially transformative tool for international cooperation, particularly in domains characterized by complex, data-intensive challenges like environmental governance. Their capacity to integrate real-time data, automate enforcement, and adapt dynamically to changing circumstances addresses many of the shortcomings of traditional treaty mechanisms. However, the operationalization of smart treaties in the context of China-Africa cooperation on recycling will require careful attention to issues of trust, sovereignty, digital access, and institutional readiness. As global environmental governance enters a more digitally mediated era, developing and implementing smart treaties could serve as a critical test case for the future of international law (Katterbauer & Cleenewerck, 2023).

AI Applications in Recycling Law

Artificial intelligence (AI) has emerged as a transformative force in environmental governance, offering innovative tools to address waste management and recycling challenges, particularly in global trade and transnational cooperation. Recycling governance, especially across jurisdictions such as China and Africa, requires sophisticated mechanisms to ensure compliance, transparency, and efficiency. Traditional governance structures often fall short in tackling the dynamic and often opaque flows of recyclables, especially with the added complication of illegal or misclassified waste shipments. With its suite of advanced computational capabilities, AI offers significant promise in enhancing regulatory oversight, ensuring legal harmonization, and creating automated incentive structures that reinforce sustainable behavior. This section explores four key domains where AI can reinforce recycling governance, emphasizing practical applications, technological mechanisms, and real-world case studies (McInerney, 2022).

One of the most critical challenges in recycling governance is accurately identifying, classifying, and tracking waste materials. Conventional manual methods are often insufficient due to the volume and complexity of mixed waste streams, human error, and intentional fraud. AI can automate and significantly improve waste classification processes, particularly through machine learning and computer vision. Algorithms trained on thousands of images can accurately distinguish between recyclable and non-recyclable materials, detect contamination levels, and assess the quality of sorted waste in real time. For instance, smart recycling bins equipped with image recognition systems have been deployed in cities such as Seoul and Tokyo, which automatically sort and report the types and weights of discarded materials. More advanced AI systems can also be integrated into the broader logistics chain to improve transboundary waste governance. In international trade, AI can be employed to scrutinize digital waste manifests—documents that outline the contents and destination of waste shipments. Using natural language processing and anomaly detection algorithms, these systems can flag discrepancies between declared and actual cargo, potentially identifying illegal hazardous waste exports (Chaisse & Kirkwood, 2022b). A case in point is the European Union's "Waste Shipment Regulation" enforcement, where AI has been piloted to cross-reference customs declarations, port surveillance footage, and satellite images to detect unauthorized shipments to West Africa. These tools enhance compliance with international agreements such as the Basel Convention and protect recipient countries from environmental degradation and public health risks associated with unmanaged waste imports. AI’s predictive analytics capabilities present a powerful method for regulatory agencies to preemptively address non-compliance and environmental crime in the recycling sector. Predictive enforcement involves training machine learning models on historical datasets—including customs records, inspection outcomes, environmental impact assessments, and even satellite imagery—to forecast where and when treaty violations are likely to occur. This shift from reactive to proactive enforcement can greatly enhance the efficiency and effectiveness of environmental governance. An illustrative example is the work done by the United Nations Environment Programme (UNEP) in collaboration with AI researchers to detect illegal mining and waste dumping sites across sub-Saharan Africa. By analyzing spatial-temporal patterns in satellite imagery, AI models could predict areas with a high probability of environmental violations, allowing for the targeted deployment of inspection teams. Similarly, the Chinese government has begun experimenting with AI-driven enforcement systems that correlate industrial outputs with registered recycling activities to uncover cases of false reporting or evasion of environmental regulations. These systems act as early warning mechanisms, enabling authorities to focus limited enforcement resources on high-risk areas and actors. Transnational recycling governance is often hindered by legal fragmentation and inconsistency across jurisdictions.

Different countries may have divergent definitions of recyclable materials, contamination thresholds, and procedural trade documentation requirements. Such inconsistencies create loopholes for waste smugglers and undermine the effectiveness of multilateral agreements. AI, particularly through natural language processing (NLP), offers tools to address these challenges by facilitating the comparison, translation, and harmonization of legal texts across different legal systems and languages (Chaisse & Kirkwood, 2022b). NLP algorithms can automatically extract legal provisions from environmental laws and treaties, compare them across countries, and identify areas of divergence or overlap. For instance, the World Bank developed an NLP-based tool to align climate-related legislation across East African Community (EAC) member states. Applied to the recycling domain, such a tool could help standardize regulations between China and African nations involved in bilateral recycling agreements. Furthermore, AI can provide real-time translation and contextual analysis of legal documents, enabling policymakers and legal experts to draft more coherent and enforceable recycling protocols collaboratively. This fosters mutual legal understanding and reduces the administrative burden of harmonizing laws through traditional diplomatic channels. Beyond monitoring and enforcement, AI can also be central in designing and managing incentive-based governance systems that reward positive environmental behavior. In the context of international recycling treaties, incentive mechanisms such as carbon credits, green bonds, or trade benefits can be employed to encourage compliance and investment in sustainable recycling infrastructure. AI can provide the data verification backbone to ensure these incentives are distributed fairly and accurately. By aggregating and analyzing data from various sources—such as IoT-enabled recycling facilities, satellite monitoring, and third-party audits—AI systems can generate reliable performance metrics on recycling outputs, contamination rates, and environmental impacts. These metrics can then be linked to automated incentive mechanisms. For example, blockchain-based smart contracts could be triggered by AI-verified data to release carbon credits or grant access to green financing. One notable case study is SAP's "GreenToken" initiative, which uses AI and blockchain to track sustainable materials across supply chains. Participating companies receive digital tokens based on verified sustainable practices, which can be traded or redeemed for regulatory advantages. In Africa-China, such systems could be embedded in bilateral environmental treaties. Chinese enterprises operating in Africa are rewarded for adhering to local recycling standards and investing in circular economy infrastructure. AI ensures the integrity and transparency of such systems, reducing opportunities for fraud and increasing stakeholder trust. Integrating artificial intelligence into recycling governance represents a significant step forward in overcoming traditional limitations associated with cross-border environmental management. By enhancing waste identification and tracking, enabling predictive enforcement, supporting legal harmonization, and powering data-driven incentive systems, AI is both a technical enabler and a strategic ally in the quest for sustainable recycling practices. For China and African nations seeking to deepen environmental cooperation, AI-driven governance frameworks offer a scalable, transparent, and effective pathway to achieving mutual sustainability goals while fostering trust and accountability in international waste trade.

Case Studies and Hypothetical Scenarios

To better understand the operational potential of smart treaties in transnational governance, particularly within environmental and technological cooperation, it is instructive to explore hypothetical scenarios and real-world analogues that illustrate how such systems could function in practice. Smart treaties—digital, self-executing agreements embedded with monitoring and enforcement mechanisms—represent a substantial innovation over traditional treaty models. They promise enhanced transparency and accountability and the automation of compliance, enabling real-time responsiveness to violations and the proactive management of risks. The following hypothetical scenario, situated within the context of Sino-African environmental diplomacy, demonstrates how such a treaty might function in the complex, often opaque domain of e-waste recycling. Imagine a bilateral smart treaty between China, one of the world's largest producers and exporters of electronic goods, and Ghana, a key African recipient of second-hand electronics and e-waste. This treaty governs the transboundary movement and environmentally sound management of electronic waste. Under the treaty, all e-waste shipments—including lithium batteries, circuit boards, and obsolete devices—are tagged with RFID chips and continuously monitored via satellite-based GPS systems. Each data point related to the shipment, such as origin, transit route, storage conditions, and final destination, is stored immutably on a distributed blockchain ledger, ensuring both visibility and verification by Chinese and Ghanaian authorities. Critically, the treaty incorporates an AI-driven compliance platform that analyzes the movement of goods in real time.

For instance, the system automatically flags the anomaly if a shipment deviates from its authorized route or is offloaded at an unregistered site—perhaps near an informal settlement lacking environmental safeguards. The smart treaty, encoded with conditional logic (akin to a smart contract), responds by triggering a series of actions: it alerts both Chinese and Ghanaian environmental agencies, initiates a temporary suspension of the offending exporter's license, and imposes a financial penalty according to the treaty's enforcement schedule. Moreover, a predictive analytics module scans broader shipment patterns and demographic data to recommend a new processing facility location in a less congested region of Ghana, where infrastructure could be augmented through targeted Chinese investment under a "green diplomacy" framework (Polanco, 2023).

The implications of such a system are profound. Not only does it promise significant reductions in illicit dumping and environmental degradation, but it also enhances bilateral trust by removing discretionary enforcement and potential corruption. The smart treaty fosters environmental justice by proactively addressing the concerns of communities historically marginalized by the informal e-waste economy. Importantly, it aligns with the objectives of both the Basel Convention and the Bamako Convention, surpassing them in implementation capacity through digital enforcement mechanisms. This hypothetical scenario finds partial inspiration in existing frameworks, such as the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal. While the Basel Convention establishes international rules to curb hazardous waste dumping in developing countries, its enforcement mechanisms are limited. Most compliance relies on national implementation and periodic reporting, which often suffers from institutional weaknesses, corruption, and data opacity. For instance, Ghana's Agbogbloshie region—frequently cited as one of the world's most toxic e-waste dump sites—is a testament to traditional treaty enforcement's failure, where shipments are misdeclared as second-hand goods and evade detection. A smart treaty with automated data streams and real-time sanctioning could potentially eliminate such loopholes. The European Union's Digital Product Passport (DPP) initiative under the Circular Economy Action Plan is a relevant empirical development. This emerging system aims to embed digital identifiers in products, including electronics, that carry information about origin, components, repair history, and environmental impact. While not a treaty per se, the DPP provides a technological framework for tracking and managing product lifecycles across borders. If adapted and scaled through bilateral or multilateral agreements, it could form the technical foundation of smart treaties in global trade. For example, an EU-Ghana DPP-enabled agreement on used electronics could ensure traceability, enforce environmental standards, and incentivize responsible producers through digital certification schemes (Moy, 1992).

Smart treaties, particularly in the context of environmental governance, offer a compelling model for overcoming long-standing issues in treaty enforcement: delayed responses, lack of reliable data, and inadequate accountability structures. Their promise is especially salient for North-South and South-South relations, where asymmetries in regulatory capacity and economic leverage often result in environmental externalities borne disproportionately by less developed nations. By shifting some elements of treaty enforcement from subjective political processes to objective technological systems, smart treaties reduce opportunities for manipulation and increase policy fidelity. Moreover, such treaties could be extended to other pressing transnational issues, such as illegal fishing, carbon trading fraud, and biodiversity conservation. For example, a trilateral smart treaty on rainforest protection between Indonesia, Norway, and the United States could use satellite imagery and AI-driven deforestation detection to trigger payment disbursements or penalties under a results-based REDD+ framework. Similarly, a treaty on Arctic resource extraction might employ smart sensors and blockchain-based records to enforce ecological safeguards in a geopolitically contested region. In conclusion, while challenges remain regarding data privacy, technological sovereignty, and the risk of algorithmic bias, integrating digital technologies into treaty frameworks opens new avenues for governance innovation. The hypothetical scenario of a Sino-Ghanaian e-waste smart treaty exemplifies how such systems might function to enforce compliance and foster equity, resilience, and sustainable development in a rapidly digitizing global order.

Challenges and Ethical Considerations

Implementing smart treaties—digitally enabled, AI-assisted agreements governed through blockchain or other secure digital platforms—offers substantial promise for enhancing transparency, accountability, and efficiency in international agreements. However, deploying such technologies, particularly in Africa, introduces many complex challenges and ethical dilemmas.

These issues span the domains of data sovereignty, digital infrastructure, algorithmic fairness, and legal legitimacy, each of which requires critical examination (Katterbauer, 2023).

One of the most pressing concerns relates to data sovereignty—the right of a nation to control the data generated within its borders. As smart treaties often rely on real-time data streams and cloud-based analytics managed by foreign tech firms, African countries may be justifiably wary of external data stewardship. This skepticism stems from historical experiences of extractive relationships with global powers, often called "digital neocolonialism," wherein control over data becomes a new frontier for asymmetrical power dynamics. For instance, deploying Huawei's digital infrastructure in several African countries has raised surveillance and data privacy alarms. Similarly, the dependency on Western AI platforms could lead to African states ceding significant control over treaty monitoring and enforcement processes to non-African entities. In this context, Ethiopia's recent moves to develop its domestic digital infrastructure—such as establishing its National Data Center—reflect a broader continental trend toward asserting digital sovereignty. Equally significant is the issue of digital infrastructure gaps. While major urban centers in Africa have made considerable strides in internet connectivity and mobile penetration, vast disparities remain, particularly in rural and remote regions. Many of the technologies underpinning smart treaties—blockchain verification, automated compliance monitoring, and sensor networks—require high levels of connectivity, consistent power supply, and a digital literacy base that is far from universal. This infrastructural asymmetry may lead to uneven implementation of treaties, privileging regions with more robust digital access and sidelining marginalized communities. The case of the Lake Chad Basin Commission (LCBC), which oversees water-sharing agreements among Cameroon, Chad, Niger, and Nigeria, illustrates the difficulty of monitoring cross-border water usage without adequate remote sensing infrastructure. Attempts to digitize treaty enforcement in this region have repeatedly encountered technical and logistical limitations. A third concern is the problem of algorithmic bias, which arises when AI systems—trained predominantly on datasets from the Global North—fail to capture the nuanced social, economic, and environmental conditions of African states. This bias can manifest in various ways: predictive algorithms might wrongly classify treaty-compliant behavior as a breach due to contextual misunderstandings, or worse, they might fail to flag actual violations due to a lack of relevant training data. In one instance, an early warning system designed to monitor drought conditions in the Horn of Africa produced inaccurate forecasts because it was calibrated using meteorological patterns from temperate climates, leading to misguided policy responses. The implications for treaty enforcement are profound; faulty data analytics can undermine trust in the treaty system, perpetuate inequalities, and even fuel inter-state tensions. Another critical dimension is the legal validity and institutional acceptance of smart treaties. For these instruments to function effectively, they must be recognized by international legal bodies and embedded within the participating nations' domestic legal frameworks. Given the often slow and contested nature of legal reform in many jurisdictions, this poses a formidable challenge. National constitutions, legislative acts, and judicial procedures must be updated to account for digital evidence, automated decision-making, and cross-border data flows—none of which are easily accommodated within traditional legal paradigms. Furthermore, international legal forums such as the International Court of Justice or the African Court on Human and Peoples' Rights have yet to develop clear guidelines for admissibility and enforcement of AI-generated treaty data. The 2020 African Union Digital Transformation Strategy calls for harmonizing digital policies across member states, yet progress has been uneven and largely aspirational (Katterbauer & Cleenewerck, 2023).

These multifaceted challenges underscore the need for an inclusive treaty design that actively involves stakeholders from across the socio-economic and geopolitical spectrum. Grassroots actors, indigenous communities, and local technologists must be engaged alongside policymakers and international legal experts to ensure that treaty frameworks are equitable, transparent, and locally resonant. In addition, sustained investment in digital infrastructure is imperative—not just in terms of hardware and connectivity, but also in building human capital capable of managing and scrutinizing innovative treaty technologies. Multilateral cooperation will be essential in this regard. Initiatives such as the African Continental Free Trade Area (AfCFTA) digital protocols or the Smart Africa Alliance exemplify the collaborative effort required to harmonize standards, share best practices, and pool technological resources. Ultimately, while smart treaties present an exciting frontier for international governance, particularly within the African context where development imperatives are urgent and complex, they must be approached with caution and a strong ethical compass. The goal should not merely be technological sophistication but equitable and accountable governance mechanisms that respect national sovereignty, promote infrastructural inclusivity, and guard against the unintended consequences of algorithmic decision-making.

As such, the success of smart treaties in Africa will hinge on technological innovation and the political will to engage deeply with their ethical, legal, and social implications (McInerney, 2022).

Policy Recommendations

The potential of smart treaties—digitally encoded legal agreements that utilize artificial intelligence (AI), blockchain, and data-driven enforcement mechanisms—offers a transformative opportunity to reshape China-Africa cooperation in the recycling sector. As both regions face pressing environmental and developmental challenges, integrating innovative technologies into environmental governance may allow for more efficient treaty compliance, enhanced transparency, and adaptive regulation. However, this potential can only be realized through a deliberate policy framework that addresses the unique socio-political, infrastructural, and legal dynamics between China and African states. To this end, five strategic policy actions are proposed. A foundational step is creating a dedicated task force focused on the intersection of AI, environmental law, and international cooperation between China and African nations. This body should be jointly constituted by legal scholars, technologists, environmental policy experts, and diplomats from both regions. Its primary mandate would be to develop pilot smart treaties in the recycling sector, facilitate knowledge transfer on digital legal tools, and ensure that both Chinese and African legal practitioners possess a mutual understanding of AI-integrated treaty mechanisms. The Task Force could take inspiration from the OECD AI Policy Observatory, which serves as a collaborative space for analyzing the impact of AI on public policy, and the EU-African Union Digital Economy Task Force, which has worked to align digital regulatory frameworks across borders. A key output of the China-Africa task force could be the development of a model smart treaty that governs transboundary e-waste management, complete with embedded compliance algorithms and real-time data integration mechanisms. The persistent digital divide is one of the most significant barriers to AI-driven treaty implementation in Africa. While China has emerged as a global leader in digital infrastructure, with companies like Huawei and Alibaba playing pivotal roles in AI and cloud computing, many African nations struggle with unreliable internet access, limited data centers, and a shortage of trained digital professionals. Bridging this gap is imperative. China's Belt and Road Initiative (BRI) Digital Silk Road provides a strategic platform through which digital infrastructure investments—such as 5G networks, cloud storage facilities, and satellite monitoring systems—can be expanded into African regions critical to the recycling chain. These investments should be paired with targeted capacity-building programs to train African legal professionals, environmental regulators, and technologists in AI systems, innovative contract development, and environmental data analytics. Case studies from Rwanda's partnership with Carnegie Mellon University Africa and China's investment in Ethiopia's Ethio Telecom network highlight the potential for effective digital collaboration when infrastructure is coupled with human capital development.

By their very nature, smart treaties rely on AI algorithms to monitor compliance, interpret legal clauses, and recommend enforcement actions. Without rigorous ethical guidelines, these systems risk entrenching algorithmic bias, reducing transparency, and undermining the legitimacy of treaty enforcement. The China-Africa partnership must adopt and adapt ethical AI principles that ensure fairness, accountability, and transparency. The Task Force should reference global standards such as the UNESCO Recommendation on the Ethics of Artificial Intelligence and the Beijing AI Principles to co-develop a set of norms and guidelines tailored to the unique context of environmental governance. These should address data sovereignty, the right to explanation for automated decisions, and safeguards against surveillance misuse. A relevant precedent is the Kenyan government's adaptation of the OECD principles in its National AI Strategy (2021), which emphasizes local control and inclusive AI development. Transparency and legal literacy are cornerstones of practical international cooperation. To support the deployment and scaling of smart treaties, China and African nations should jointly develop open-access legal platforms that house legal texts, compliance data, best practices, and model clauses. These platforms should be multilingual, user-friendly, and interoperable with existing African legal information systems such as the African Legal Information Institute (AfricanLII).

Blockchain technology could play a critical role in ensuring the immutability and accessibility of treaty documents. At the same time, AI-driven legal analytics could help identify patterns of non-compliance and suggest regulatory improvements. The European Union's EUR-Lex platform, which provides free access to legal texts and procedures across member states, offers a model for how such systems can promote legal harmonization and empower stakeholders. Effective environmental regulation of recycling and waste management requires cross-border cooperation and legal alignment.

Given the diversity of legal systems across the African continent—from civil law in francophone countries to common law in anglophone jurisdictions—there is a pressing need for harmonization efforts. These should be led by the African Union, the African Continental Free Trade Area (AfCFTA), and relevant regional economic communities (RECs), with support from Chinese legal and environmental institutions. Smart treaties must be compatible with regional regulatory frameworks to avoid legal fragmentation and ensure coherent enforcement. The China-Africa task force should work closely with bodies such as the African Union Commission on International Law (AUCIL) to integrate smart treaty clauses into regional environmental agreements. A successful precedent is the Bamako Convention on Hazardous Wastes, which, despite limited enforcement capacity, has laid the groundwork for regional regulatory coherence. Innovative treaty mechanisms could revitalize such frameworks by automating reporting and facilitating real-time compliance verification.

Integrating smart treaties into China-Africa environmental cooperation holds transformative promise for the future of recycling governance. However, realizing this potential requires more than technological innovation; it demands robust legal institutions, ethical foresight, infrastructural investment, and cross-cultural dialogue. By jointly establishing a task force, investing in capacity, embracing ethical AI, promoting transparency through open-access legal platforms, and harmonizing regional legal standards, China and Africa can lay the groundwork for a new era of equitable and sustainable digital environmental governance. These policy actions, taken together, can ensure that smart treaties evolve from a technological concept to a pragmatic tool of international cooperation.

Conclusions

AI can reimagine how international environmental agreements are drafted, implemented, and enforced. In the case of China-Africa environmental cooperation, smart treaties could provide the legal and technological backbone for a more equitable and effective recycling framework. While infrastructure, trust, and legality remain, a proactive and collaborative approach can turn these obstacles into opportunities. As climate change and environmental degradation accelerate, smart treaties represent a critical innovation for building a greener, more just, and technologically empowered future.

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