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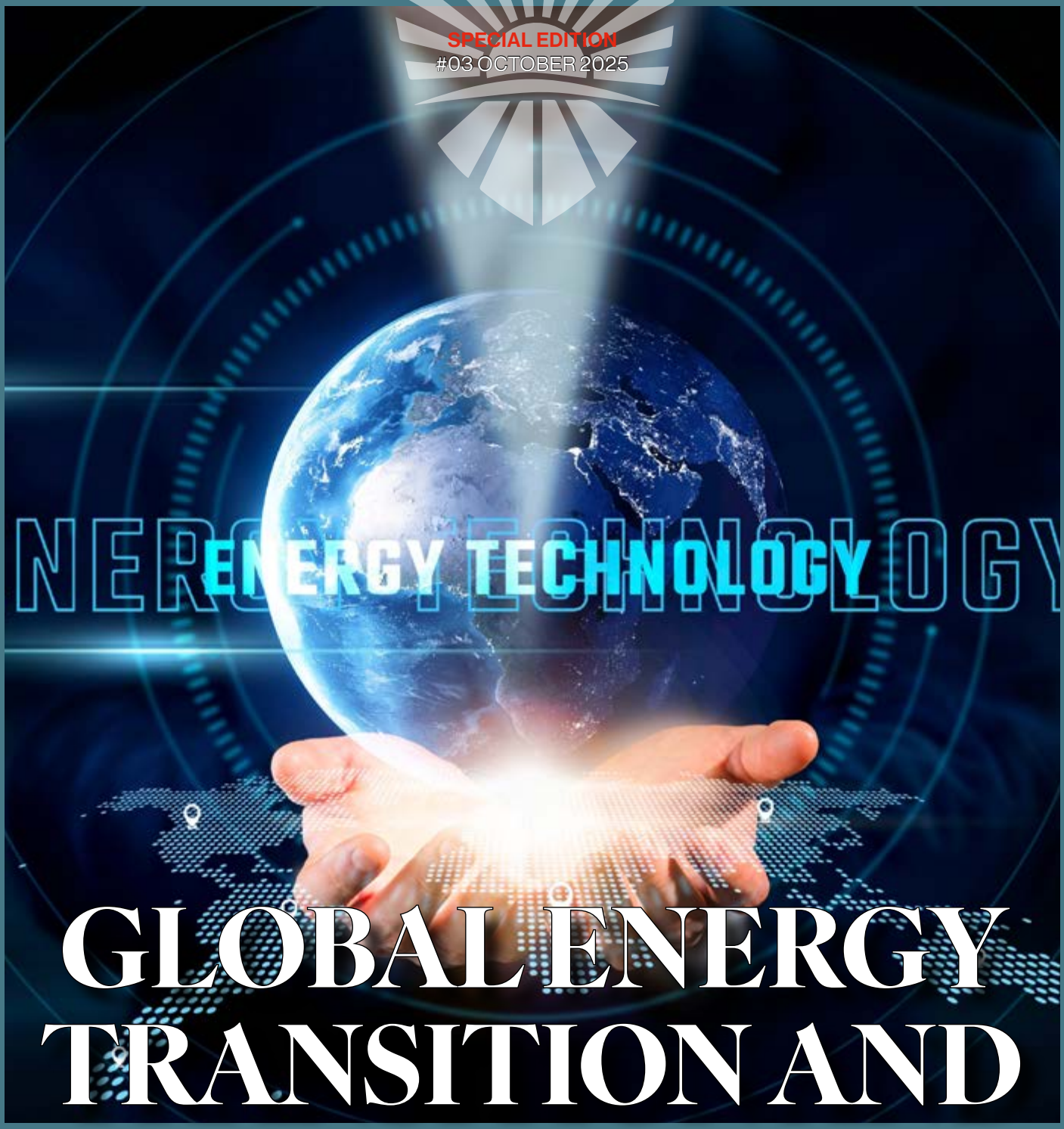

GLOBAL ENERGY TRANSITION AND SECURITY

GLOBAL ENERGY TRANSITION AND SECURITY

Only if they change, they can stay the same.
– Ulrike Gelbmann,
Head of Global Studies, University of Graz

NEW SCHOOL OF MULTILATERALISM

IDEAS WITHOUT BORDERS

We live in a multipolar, contested, and volatile international system. The level of disagreement on fundamental rights and the future organisation of society is increasing globally. The blog will address topics around four areas of interest: democracy, governance, security, and international order.

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IMPRESSUM

The Defence Horizon Journal ist eine wissenschaftliche Fachzeitschrift mit Berichten und Analysen zu Fragen der Geo-, Sicherheits- und Verteidigungspolitik, Friedens- und Konfliktforschung, der Militärwissenschaften, der Strategie bis hin zur Gefechtstechnik sowie grundsätzlichen Fragen der Wehr- und Waffentechnik.

Das Ziel des Mediums ist es, Informationen über Abläufe, Hintergründe sowie Trends in den angeführten Fachbereichen zu vermitteln. Die Themenauswahl sowie Publikation erfolgt sach- und anlassbezogen.

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The Defence Horizon Journal is a professional and academic journal that features essays, reports, and analyses covering geopolitics and law, security and defence policy, peace and conflict studies, applied military science, as well as developments in weapons technology.

The journal aims to inform about procedures, background and trends in the aforementioned topics. The selection of publications is topic- and event-driven.

The Defence Horizon Journal is an online journal. The views presented in the journal and its special edition are the authors' alone and do not necessarily represent those of the editorial office.

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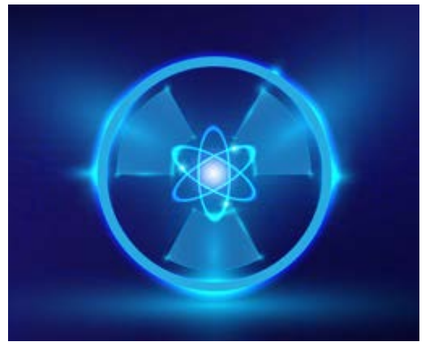
CONTENT



TOWARDS CLIMATE-COMPATIBLE SOCIETIES

This issue of The Defence Horizon Journal builds on the premise that global decarbonisation is urgent to stabilise the global climate at the lowest possible temperature rise. Failing to do so would exponentially aggravate the negative impacts of global warming that are already being felt around the globe: They range from more frequent and more severe extreme weather events, heat waves, droughts, changes in seasonal precipitation affecting agriculture and aggravation of water shortages to the melting of glaciers and polar ice as well as sea level rise threatening to flood entire islands, strips of land and cities which millions of people call home.

The best available scientific evidence tells us that to stabilise the global climate at or below plus 2°C (or indeed below 1.5°C) as agreed in the Paris Climate Change Agreement of 2015, global emissions need to reach net zero by 2050.

Evidence proves that the world is currently not on a path to achieve these goals. The atmospheric concentration of carbon dioxide reached its highest level in 2 million years last year. 2024 also marked the first single year in which the global average surface temperature rose more than 1.5°C above pre-industrial levels.

Covid-19, the energy prize hike in the wake of the Russian aggression against Ukraine in 2022, and changes to the political leadership in key countries have weakened the climate action ambition not only in the U.S. but also in countries of the EU who had hitherto been advocating for robust and speedy shifts away from fossil fuels towards a greater share of renewables in the overall energy mix and for more stringent energy (and materials) efficiency. Voices from so-called "developing countries" denounce the hypocrisy of the West, urging them not to exploit the fossil fuel resources found on their national territory, which they intend to capitalise on in order to address pressing socio-economic development needs.

The authors of this TDHJ Special Edition assume that decarbonisation is unavoidable and will continue to unfold despite these headwinds. As it proceeds, it will redraw international relations and shift geopolitical centres of gravity. As renewable energy takes up a greater share in national (and eventually overall) final energy consumption, grids will have to become more interconnected and "smarter". The sharp distinction – both at the individual and country levels – between producers (fossil fuel-exporting countries) and consumers (energy-dependent countries) will disappear as renewable energy is produced in a more distributed manner, opening up possibilities for energy democracy.

Energy transitions are, of course, much more than shifting from one (polluting) fuel to a more benign fuel. They are deep societal transformations. According to foresights by the International Renewable Energy Agency (IRENA), more new jobs will be created than lost by this energy transition. However, these new jobs will seldom be created where the old-energy jobs are lost, and a different, likely more advanced set of skills will be required to fill new energy jobs. Emphasis has therefore been increasingly placed on making sure that energy transitions are socially acceptable, inclusive, gender-responsive, participatory and leave no one behind.

For this Special Edition, experts from three world regions have taken a hard look at their region's challenges and opportunities regarding the energy transition. The question we asked them to reflect upon was what was needed to ensure, as much as humanly possible, that energy transitions would proceed peacefully, and without significant disruption to the economy, to social development and to regional cooperation.

For Africa, former IPCC Vice Chair Youba Sokona builds on the Just Transition Report, a seminal piece of analysis and advocacy that he chaired. The Report emphasises that Africans need to be in the driver's seat for their energy transitions. Given the wide variety of country profiles with regard to natural resource endowment, development needs, and political priorities, a one-size-fits-all solution cannot be advocated for. Blended energy mixes and different pathways are identified.

For Latin America, and particularly for Brazil, Natalia Weber and Raquel Guimarães advocate for energy transitions that move as quickly as possible and as slowly as necessary. As slowly as needed, meaning that the acceptance and buy-in of the affected populations are of the essence to ensure the success and effectiveness of the energy transition.

For the Indian subcontinent, Leena Srivastava and Anandajit Goswami show what is at stake for social stability in India and for climate action globally, given the magnitude of the abatement and adaptation challenges. India must also deliver on socio-economic development for its growing population.

All three articles show that energy transitions and climate action – in many ways two sides of the same coin – define a field for international cooperation where benefits are tangible for all partners. Clearly, new frameworks and flexible approaches are necessary to shepherd national and regional energy transitions, to cushion against disruptive socio-economic shocks and to pre-empt political discontent or, worse, upheaval. More work should be done to examine the reordering of international or inter-regional relations resulting from advanced stages of global decarbonization.

The fourth chapter introduces the dimension of disarmament, which is highly relevant in the current pursuit of increasingly sophisticated weaponry. Andrea Bartoli and Joshua Fisher recall the unique episode of turning "megatons into megawatts" at the end of the Cold War. They remind us that disarmament, in addition to enhancing collective human security, is also a step towards greater socio-economic and environmental sustainability.

This TDHJ Special Edition invites further inquiry into the nexus of concerns for socio-economic development, energy security as a paramount ingredient of national sovereignty, and respect for planetary boundaries, the transgression of which entails grave risks to human civilisation as we know it. While energy transitions trigger fierce competition among nations and stakeholders for technological progress and access to key markets, they also offer new opportunities to enhance international relations. Can we seize upon them and foster peaceful international cooperation and social justice while accelerating global decarbonization?

UNTERSCHRIFT FEHLT

Irene Giner-Reichl

Ambassador, (frm.) Director General at the Federal Austrian Ministry for European and International Affairs, Board Member of the Strategic Advisory Council of the European Forum Alpbach

"A JUST TRANSITION"

INTERVIEW YOUBA SOKONA

By Irene Giner-Reichl

WHAT IS SO SPECIAL ABOUT THE AFRICAN "JUST TRANSITION REPORT" ?

The report „Just Transition: A Climate, Energy and Development Vision for Africa" has played a key role in shaping the discourse on sustainable development across the continent and has been instrumental in framing Africa's just transition as a rights-based, renewable-energy-first pathway. This is very important and timely: most African countries currently do not have an integrated just transition study. During the past fifteen years, Sub-Saharan African research institutions have published only six energy planning studies that consider multiple development objectives. While direct policy impacts are difficult to quantify, the Just Transition Report's influence is visible in several areas, such as the following:

1. Policy and Advocacy: The report has informed African energy transition debates and aligned with frameworks like the AUC's Agenda 2063, helping policymakers link climate action with inclusive economic growth.
2. International Engagement: Its call for Pan-African cooperation and equitable development has resonated with global donors—exemplified by the Ford Foundation's $5.7 million commitment to support just energy transitions in Africa.
3. Public Awareness: Media coverage and features on platforms like Global Citizen have amplified the report's findings, raising awareness about the need for a fair and climate-resilient energy shift in Africa.

In sum, while causal links to specific policy shifts remain limited, the report has significantly shaped the narrative and strategic thinking around Africa's just energy transition. It has empowered activists fighting fossil fuel projects and has also shaped policy debates in some African nations.

ISN'T THE DEVELOPMENT DIMENSION AT THE FOREFRONT OF AFRICAN POLITICIANS' AND SCIENTISTS' CONCERNS?

Let me mention but four of the most pressing challenges: Africa's growing population faces the biggest sustainable development gaps globally; most of the people suffering from chronic malnutrition and hunger live in Africa; most of the people lacking access to electricity are in Africa; the African labour market is very precarious.

HOW ARE AFRICAN COUNTRIES REACTING TO THE INTERNATIONAL COMMUNITY'S URGE TO MOVE AWAY FROM FOSSIL FUELS, GIVEN THAT 7,2 % OF GLOBAL OIL RESERVES, 7,5 % OF PROVEN GLOBAL NATURAL GAS RESERVES AND 84 % OF GAS RESERVES IN THE PRE-PRODUCTION STAGE ARE IN AFRICA? ISN'T THERE A NATURAL DESIRE OF GOVERNMENTS TO CAPITALISE ON THESE DEPOSITS FOR THE SAKE OF ADVANCING THEIR NATIONAL ECONOMIES?

This question strikes at the core of Africa's complex energy dilemma: how to balance global pressure to phase out fossil fuels with the continent's urgent development needs? Many African countries see oil and gas as vital economic assets—understandably so. For nations like Nigeria, Senegal, and Mozambique, fossil fuels represent major revenue opportunities. Projects like Uganda and Tanzania's East African Crude Oil Pipeline are framed as essential for national development, despite external criticism.

In response, several countries are adopting blended strategies—developing fossil resources in the short to medium term while investing in renewables for the long haul. Namibia, for example, is pursuing both oil and green hydrogen, while South Africa's Just Energy Transition Plan phases out coal with the help of international financing but still relies on some fossil energy to maintain grid stability.

There is no single African stance. Resource-rich petro-states like Nigeria and Algeria are more cautious about rapid fossil fuel phaseouts, while countries like Kenya and Morocco are leading in solar, wind, and geothermal development.

Frustration is also growing over what many African leaders see as Western double standards: wealthy nations continue investing in fossil fuels while urging Africa to „go green"—without fulfilling climate finance promises like the $100 billion/year pledged in Paris.

Ultimately, African governments are not resisting the energy transition—they are demanding a fair and realistic one. The emerging strategy is a pragmatic "both-and"-approach: using fossil fuels to fund development and energy access in the short term, while building a resilient, low-carbon future.

In an article published by the renowned journal Nature Energy, we, the 54 authors (40 from Africa), argued that Africa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INTERVIEWEE

Prof. Youba Sokona, a leading African voice on energy, environment, and sustainable development, has decades of experience driving national and continental initiatives. As a former IPCC Vice-Chair and Co-Chair, he contributed to the 2007 Nobel Peace Prize-winning work. He founded and led key institutions like the African Climate Policy Centre and the Sahara and Sahel Observatory. Currently, he is affiliated with the African Institute for Sustainable Energy and System Analysis. The views expressed are those of Youba Sokona. The questions are formulated by Irene Giner-Reichl, (Editor).

ABSTRACT

Building on the ground-breaking Just Transition Report for Africa, which advocates to jointly address food security, energy transition and development of African manufacturing capacities, Youba Sokona shows the developmental challenges of a continent (notably 600 million people without access to electricity, food insecurity and unreliable employment for a young and growing population) and the different energy transition pathways. He emphasises African agency and calls for greater honesty and equity in international cooperation.

BOTTOM-LINE-UP-FRONT

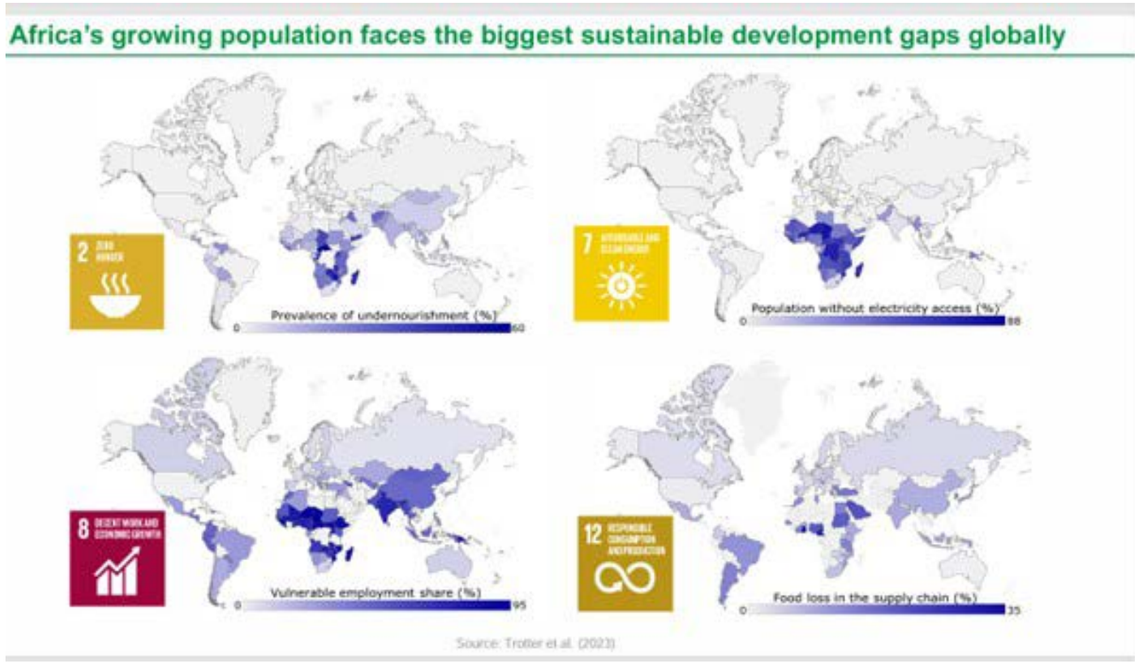
There are no one-size-fits-all solutions for African countries. Their agency in climate action ensures that Africa will reap the developmental benefits of decarbonization and strengthen the continent's voice in international affairs

PROBLEM STATEMENT

How can the African continent simultaneously address the significant development challenges confronting it while also moving decisively and considering different national and regional contexts towards energy systems that are compatible with climate stabilisation goals?

SO WHAT?

The network of scientists that will coalesce into an African Institute for Sustainable Energy and Systems Analysis (AISESA) intends to be a game changer. It deserves international support.



For an explanation of the globally agreed objectives known as "Sustainable Development Goals" (SDGs), please go to https://sdgs.un.org/goals.

needs context-relevant evidence to shape its clean energy future. Different energy pathways are outlined, considering the natural endowment with renewables and the current energy mix. The illustration below shows examples of reasonable and possible pathways for four countries, Ethiopia, South Africa, Burkina Faso and Mozambique.

WHAT ROLE FOR THE REGIONAL ECONOMIC COMMUNITIES (ECOWAS-ECREEE, SADC-SACREEE, ETC.) AND/OR THE SEVERAL POWER POOLS IN FOSTERING JUST AND INCLUSIVE ENERGY TRANSITIONS IN AFRICA?

Regional Economic Communities (RECs) and African Power Pools can play a pivotal role in driving just and inclusive energy transitions across the continent. By facilitating cross-border cooperation, harmonising regulatory frameworks, and pooling technical and financial resources, these regional structures can accelerate the deployment of clean energy infrastructure and improve energy access for underserved populations.

They can also be instrumental in fostering integrated energy markets that lower costs, reduce duplication, and enhance energy security—key components of a just transition. Moreover, RECs and Power Pools are well-positioned to mobilise large-scale investments and to coordinate climate-resilient infrastructure projects that transcend national boundaries.

However, unlocking their full potential will require three critical enablers:

1. Stronger political will to prioritise regional integration over narrow national interests.
2. Increased climate finance, both public and private, to replace declining fossil fuel investments and bridge the funding gap for clean energy projects.
3. Inclusive and pro-poor policies that ensure no community is left behind—particularly women, youth, and rural populations who often bear the brunt of energy poverty.

With the right support, RECs and Power Pools can become powerful engines for a continent-wide energy transition that is not only low-carbon, but also fair, equitable, and development-driven.

ONE OF THE MAJOR OBSTACLES TO THE JUST ENERGY TRANSITION IN EUROPE IS THE SCARCITY OF SKILLED LABOUR. IN AFRICA THE SITUATION IS QUITE DIFFERENT, ISN'T IT ?

You've touched on a critical issue: Africa's demographic boom – with the population expected to rise to 2,5 billion persons by 2050, with a median age of 20 - could be a powerful engine for a just energy transition, or a missed opportunity if skills and employment don't keep pace. While Europe faces labour shortages due to an ageing population, Africa's challenge is the opposite: a fast-growing, youthful workforce—yet many lack the skills demanded by the green economy.

According to the African Development Bank, only about 3 million formal jobs are created each year for the 10–11 million youth entering the labour market. Many young people lack technical training or hold qualifications misaligned with industry needs. Sectors like solar energy, battery production, electric mobility, and sustainable agriculture require vocational skills and STEM capabilities that are still underdeveloped in much of the continent.

This creates a paradox: high unemployment in a labour-rich region, while green sectors struggle to find skilled workers.

CAN/SHOULD THE INFORMAL SECTOR MAKE UP FOR THE LIMITATIONS OF THE FORMAL SECTOR ?

The informal sector, which employs over 80% of Africa's workforce, has shown remarkable adaptability—especially in clean energy. In Kenya, Nigeria, and Senegal, informal technicians are already key to deploying and maintaining solar home systems and mini grids. Informal recyclers also play an essential role in the circular economy through e-waste and battery reuse. Initiatives like Solar Sister and WeTu are leveraging these networks to train women and youth as clean energy entrepreneurs.

However, informal jobs often remain low-paid, unregulated, and unsafe. Unlocking their potential in the green economy requires targeted support: access to finance, business training, and formal inclusion in national strategies.

Africa has the youth and energy to lead a just energy transition. But without the right skills and support structures, the demographic dividend could turn into a missed opportunity. The informal sector must be part of the solution—but only if empowered through investment, training, and integration into broader development plans.

ENERGY TRANSITIONS ARE DEEP SOCIETAL TRANSFORMATIONS. HOW DO YOU ASSESS THE AFRICAN READINESS FOR DIVERSITY AND GENDER RESPONSIVENESS IN THIS REGARD?

The global energy transition is more than a technological shift—it is indeed a profound societal transformation. For it to be truly just and sustainable, it must be inclusive, participatory, and gender-responsive, ensuring that no one is left behind, as underscored by the UN Sustainable Development Goals. The key question is: How can Africa embed diversity and gender equity at the heart of its energy transition strategies?

Africa stands at a pivotal crossroads. The continent boasts immense renewable energy potential—solar, wind, hydro—and a young, dynamic population ready to embrace sustainable solutions. Countries like South Africa, Morocco, and Kenya have made notable progress in green energy policies and in promoting women's roles in the sector.

Yet, structural barriers remain. According to IRENA's "Renewable Energy: A Gender Perspective" Report, women make up only 20–25% of the energy workforce in Africa and are often limited to lower-paid, less technical positions.

Meanwhile, more than 600 million Africans still lack electricity access—with rural women disproportionately affected, spending hours daily collecting biomass for cooking and heating.

Few national energy strategies explicitly include gender-responsive planning or frameworks for inclusive community participation. This is a missed opportunity.

A truly just transition must:

» Ensure equal access for women and marginalised groups to clean energy jobs and entrepreneurship,
» Elevate women's leadership in policymaking and energy project design,
» And design energy solutions that directly address the daily realities of those most affected by energy poverty—especially women.

Africa has the potential to lead a just and inclusive energy revolution—but only if equity is treated not as an afterthought, but as a foundational pillar alongside innovation and investment.

WE SEE A SHIFT IN THE COMMITMENTS FROM DEVELOPED NATIONS VIS-À-VIS THE TRANSFORMATION OF THEIR ECONOMIES TOWARD CLIMATE-PROOF ONES. UNDER PRESIDENT TRUMP, THE U.S. ARE (AGAIN) LEAVING THE PARIS AGREEMENT. AND IN THE EU, THE NEW FOCUS IS ON RE-INDUSTRIALISATION OF EUROPE AND ON RE-GAINING A CERTAIN MEASURE OF STRATEGIC SOVEREIGNTY. WHAT IMPLICATIONS FOR THE AFRICAN CONTINENT?

The global climate agenda is at a critical juncture. With the U.S. withdrawal from the Paris Agreement as announced by the Trump administration, and the EU shifting focus toward economic sovereignty over global climate solidarity, the implications for Africa—least responsible for the crisis yet most vulnerable—are profound.

A U.S. retreat would threaten vital climate finance, undermining adaptation and mitigation efforts across Africa. Symbolically, it could legitimise fossil-fuel expansion in countries like Nigeria and Mozambique, weakening pressure to decarbonise. The EU, once a climate leader, is now prioritising re-industrialisation and trade protectionism. Instruments like the Carbon Border Adjustment Mechanism risk penalising African exports without addressing energy poverty or supporting a just transition.

The most immediate concern is the potential loss of funding. With the U.S. and EU underwriting most global climate finance, any pullback could derail critical projects—from Kenya's geothermal expansion to Senegal's coastal defenses. This vacuum may also accelerate fossil fuel investments as African nations move to monetise resources before demand declines.

Yet, this shifting landscape also presents opportunities. China, Gulf countries, and emerging powers are stepping in with infrastructure financing—but often on terms that risk debt dependency or fossil fuel lock-in.

Africa must respond with strategy and unity:

» Demand Financial Justice: Use global platforms to push historical emitters toward accountability—through litigation, debt reform, or reallocation of Special Drawing Rights for African climate priorities.
» Build South-South Alliances: Engage with BRICS and Global South partners to access finance and green technologies—on equitable terms.
» Assert Resource Sovereignty: Africa's critical minerals must fuel local industrialisation. Like Indonesia, African states could condition exports on domestic value addition.
» Leverage Western Fears: Europe's anxiety over climate-driven migration can be used to unlock investments in renewable energy and job creation in fragile regions like the Sahel.

Rather than choosing sides in a fractured global order, Africa must chart its own course—centred on energy access, industrial development, and climate resilience. The African Union has a key role to play: a unified voice is far harder to ignore than 54 fragmented ones.

The goal isn't to replicate the West's flawed path—but to lead in defining what a truly just transition means: one that prioritises African lives, economies, and futures.

The stakes are high. The next few years will determine whether Africa seizes this moment—or is forced into yet another cycle of extraction and dependency.

THE JUST TRANSITION REPORT ALSO ADVOCATES FOR A GREATER ROLE OF A SELF-ASSERTIVE AFRICAN CONTINENT IN INTERNATIONAL RELATIONS IN GENERAL. CONCERNING THE MUCH-NEEDED ENERGY TRANSITIONS, IN PARTICULAR, WE LACK AN INTERNATIONAL FRAMEWORK FOR GUIDING THEM AND FOR CUSHIONING HARDSHIPS AND MITIGATING CHALLENGES. WHAT KIND OF INTERNATIONAL SUPPORT

The global energy transition is unfolding along deeply unequal lines. Africa faces a dual challenge: ending energy poverty—where over 600 million people still lack electricity—while also decarbonising in the face of mounting climate impacts. Yet international responses remain fragmented, often prioritising Northern interests over African needs.

It's time for a new approach—designed by Africa, for Africa. A truly fair transition must rest on three foundational pillars:

1. Financial Justice: Replace climate loans with grants and targeted debt relief. Every dollar spent servicing debt is a dollar not invested in solar microgrids or climate-resilient agriculture. In parallel, an African Climate Risk Insurance Pool—funded by historical emitters—should be established to buffer against escalating climate shocks.
2. Industrial Sovereignty: At least 40% of renewable energy components should be manufactured locally, creating jobs and strengthening value chains. This requires suspending patent barriers on key green technologies, enabling African innovation tailored to local needs.
3. Fair Trade and Resource Value: Africa must not be penalised for emissions it didn't cause. Carbon border taxes should either exempt African exports or reinvest revenues into African green industrialisation. The continent should also form a Critical Minerals Alliance to ensure that lithium, cobalt, and other resources fuel local processing and economic transformation—not just global supply chains.

This framework offers a starting point for asserting African agency in the energy transition. By focusing on financial equity, technological autonomy, and fair trade, Africa can move from the margins to the centre of the global energy future.

The question is no longer whether Africa will participate in the transition—but on whose terms. The answer must be Africa's own.

HOW SHOULD EUROPE POSITION ITSELF, GIVEN THE DRAMATIC SHIFTS IN THE FOREIGN POLICY PRIORITIES OF THE U.S. WHICH WE DISCUSSED?

The United States' retreat from climate leadership is sending shockwaves across Africa's energy landscape. With Washington poised to potentially exit the Paris Agreement once again and scale back climate financing, African nations face a stark reality: the rules of the energy transition are being rewritten—and they must act decisively to safeguard their interests.

The consequences are already visible. Vital renewable energy projects face growing funding gaps just as African governments strive to reconcile energy access with climate goals. More troubling still, America's fading influence has opened space for others: China is advancing a dual-track approach—financing both renewables and fossil fuels—while Gulf states aggressively promote gas as a so-called "transition fuel" that conveniently aligns with their export agendas.

This shifting geopolitical terrain brings both risk and opportunity. On one hand, African leaders may gain greater flexibility in defining national energy strategies free from Western conditionality. On the other hand, the absence of coordinated global climate leadership increases the risk of fragmented, extractive deals that serve foreign interests more than African development.

For Europe, this is a moment of reckoning—and potential renewal. The Africa-EU energy partnership, though flawed, offers a base to build on—if European leaders are prepared to move beyond outdated paradigms.

The path forward must be defined by action, not rhetoric. The EU's Global Gateway must evolve climate financing, which should shift from debt-heavy instruments to grants and blended finance that don't strain already burdened African economies.

Equally urgent is reform of the Carbon Border Adjustment Mechanism (CBAM). In its current form, CBAM risks penalising African industries while doing little to address energy poverty. Exemptions for African exports—or reinvesting CBAM revenues into African green industrialisation—are essential.

The most promising opportunities lie in mutual strategic interests. Joint ventures in green hydrogen—particularly in North and Southern Africa—could bolster Europe's energy security while generating African industrial jobs. Likewise, critical mineral partnerships must move beyond raw extraction toward local processing and manufacturing.

Africa's stance is clear: the continent will assert its right to energy access and economic development. The question is whether Europe will rise to the occasion as a genuine partner—or remain trapped in outdated, one-sided models.

The energy transition need not be a zero-sum game. With honest dialogue and pragmatic cooperation, Africa and Europe can co-create a new partnership—one that delivers clean energy, industrial growth, and shared resilience. But this requires more than goodwill—it demands courage to challenge the status quo.

AND WHAT ABOUT COOPERATION BETWEEN AFRICAN NATIONS AND CHINA; DO THEY LEAD TO GREATER DECARBONISATION OF THE AFRICAN ENERGY SYSTEM AND/OR TO MORE JOB CREATION IN THE "NEW" ENERGY SECTOR?

China's expanding footprint in Africa's energy sector offers both promise and peril for the continent's clean energy transition. The relationship is complex: while Chinese investment has significantly boosted renewable capacity, it has also supported fossil fuel projects that risk locking African nations into carbon-intensive trajectories.

On the upside, China is a key driver of Africa's renewable energy growth. Chinese firms have delivered landmark projects like Kenya's 54MW Garissa solar farm and Ethiopia's Grand Renaissance Dam, helping millions gain access to clean electricity and reducing dependence on diesel and biomass. China also leads in battery storage and smart grid technologies—essential for scaling renewables.

Yet this green momentum coexists with continued support for fossil fuels. Projects such as Zimbabwe's 2.8GW Sengwa coal plant and Mozambique's multi-billion-dollar LNG ventures run counter to global climate goals and raise the risk of stranded assets. China's approach is largely demand-driven: it backs what African governments request, making domestic policy the decisive factor in whether cooperation accelerates or delays decarbonization.

The impact on job creation is mixed. While Chinese projects generate construction employment, most skilled roles—engineering, design, and management—are filled by Chinese workers. "Manufacturing" often means assembling imported components, limiting local value chains. Without stronger negotiation, Africa risks repeating extractive patterns seen in oil and mining—exporting raw resources while importing finished products.

Some countries are showing it can be done differently. South Africa mandates 40% local content in renewable projects. Morocco's Noor solar complex includes technology transfer and training programs. These examples highlight how good governance can align Chinese investment with national development goals.

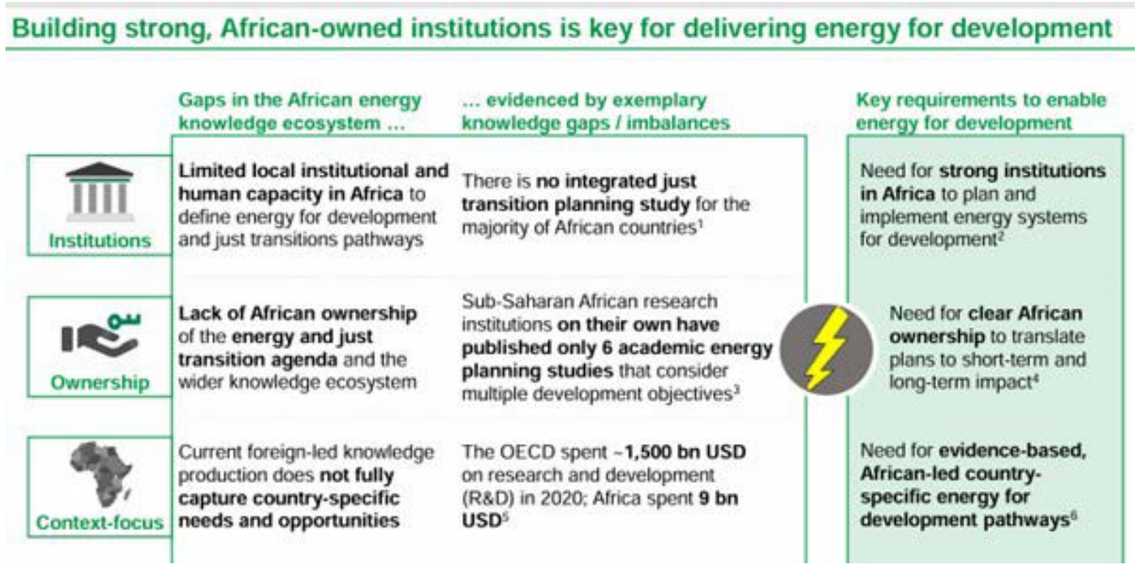
Ultimately, China responds to political and market signals. If African governments set clear conditions—local content requirements, skills development, technology sharing—Chinese firms will adapt. But absent these, the default model will remain extractive.

As Africa strives to expand energy access and meet climate targets, it must approach China with strategic pragmatism. The tools to shape mutually beneficial partnerships exist—but success depends on political will, technical capacity, and above all, a unified continental strategy that prevents countries from undercutting one another in a race to the bottom.

AND HOW DO YOU INTEND TO TAKE THINGS FORWARD

We continue to work on making AISESA (African Institute for Sustainable Energy and Systems Analysis) a reality. AISESA's main mission is to create African energy systems for sustainable development. It is an initiative that is open to African scholars, experts, policy makers, practitioners and non-Africans working on African energy, climate and development issues. Building strong African-owned institutions is key, in my view.

You shared an illustration which we reproduce below for our readers.



Source: Youba Sokona

AISESA aims to create and scale local African energy for development institutions.

- It wants to become the premier institution to enable evidence-based energy decisions that drive climate-compatible development in Africa.
- It will create knowledge, capacities and institutions in Africa which enable African countries to develop, set, implement and own their energy-enabled sustainable development agendas.
- In regional hubs in Africa, it will unite top African and international scholars to produce agenda-setting and policy-relevant knowledge to design energy systems for development.

In this context, key for me is African capacity development: Capacity is not the ability to implement someone else's agenda, but the ability to set and pursue your own agenda.

Setting up AISESA is pursued step-by-step by a majority of African experts affiliated with 60-plus global institutions, among them many thought-leaders on sustainable energy for Africa. From a "seed stage" we will move to a virtual institute; then we intend to establish an "Institutionalised Institute" with a physical presence in at least two African nations. In the final stage, country-specific institutions will be established in several African countries.

THANK YOU, PROF. SOKONA, AND MANY GOOD WISHES FOR THE WAY AHEAD.

INDIA'S CLIMATE (IN)ACTION IS CRUCIAL FOR GLOBAL (IN)STABILITY

by Leena Srivastava and Anandajit Goswami

INDIA'S ECONOMIC IMPORTANCE IN THE WORLD TODAY

India is a paradoxical country that holds enormous promise while simultaneously posing significant challenges to the global climate and its own sustainable development goals. India added 13 people to the list of the world's billionaires, taking the total number to 284.[1] The collective wealth of India's rich has increased by 10% since 2024, resulting in a combined wealth that exceeds the entire economy of Saudi Arabia. It ranks third globally in the number of billionaires, behind the United States and the People's Republic of China (PRC), and has become the world's fourth-largest economy.[2] Thus, despite the concerning concentration of income and wealth in the top echelons of India's population,[3] the burgeoning middle class makes India a vital market for the world.

India surpassed PRC's population towards the end of April 2023 to become the world's most populous nation. Moreover, while the overall unemployment rate in the country, as per official estimates, has declined to 5.1%, the unemployment rate in the age group of 15-29 years of age worryingly stood at 13.8% (urban – 17.2%). Also worrying is the worker population ratio (share of employed persons in the population), which stood at about 52.8% at the national average level and a mere 32.5% for women (23.5% in urban areas).[4] On the positive side, the median age of India's population at 28.44 years is 11 years younger than in PRC,[5] offering a thriving market and workforce for the future.

In addition, the Indian Government has been focusing on both the employability of its workforce and the faster integration of women in its workforce. As noted in a recent report from the UK-India Business Council in relation to its internal environment, "[...] India's young population has become increasingly employable and impressively qualified. [...] From engineering excellence to digital dynamism, India's workers are at the forefront of global innovation and brilliance." From an external perspective, "[a]ll over the world, countries face hiring challenges. India, with its huge, young, and tech-savvy population, plays a key role in redressing the imbalance of high demand and constrained supply".[6] India's young workforce is both technically highly skilled and proficient in the English language – a combination that places them at the forefront of services rather than manufacturing and as a key driver for Industry 4.0.

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The views contained in this article are the authors alone and do not represent the views of their affiliated institutions.

ABSTRACT

India's climate action trajectory holds immense implications for both national resilience and global climate stability. As the world's most populous country, with a rapidly expanding economy and a young, skilled workforce, India finds itself at a strategic crossroads. This essay evaluates India's current mitigation efforts, adaptation vulnerabilities, and the global implications of its energy and climate choices. With significant socio-economic disparities, geographical exposures, and political constraints, India presents both a risk and an opportunity for the global climate regime.

BOTTOM-LINE-UP-FRONT

India is essential to global climate outcomes. Without bold domestic action and robust international support, both global mitigation goals and regional/global socio-political stability will be under threat.

PROBLEM STATEMENT

How can India best realise its sizeable mitigation opportunities and meet its adaptation challenges?

SO WHAT?

Global actors must respect the principle of common but differentiated responsibility and, recognising India's small contribution to cumulative historical GHG emissions but large role in their own future, help India accelerate its climate ambition and action. Simultaneously, India and the world must prioritise justice-based approaches to energy and development planning, integrating local vulnerabilities into climate policies. Without this dual commitment, India's climate risks may spill over into systemic global instability.

Having noted the above, the promise of India as an emerging developed economy seems precariously predicated on an increasingly volatile and uncertain world – from unexpected and rapidly emerging changes in the world order, to the threat of runaway climate change, and a strong anti-immigration, nationalist sentiment in the developed world. Simply put, these developments not only threaten to choke some of the historical avenues for addressing India's economic and social rebalancing needs but, on top of a highly stressed natural resource base, greatly enhance the country's climate-imposed vulnerabilities.

CLIMATE CHANGE – AN EXTERNALITY OF UNBRIDLED CONSUMPTION

Formal recognition of the potential threat posed by climate change to the world was established with the creation of the Intergovernmental Panel on Climate Change (IPCC) in 1988. In these last 37 years, with increasing confidence leading to near certainty today, scientists were able to identify the causal actors and/or factors for (i) climatic changes (ii) the impacts of climate change and their cascading effects (iii) the interconnections between earth systems, as also (iv) the vulnerabilities of not just the human species but all biodiversity on planet Earth.

A detailed analysis of a global database of scenarios generated from sophisticated coupled models across the world led to the recommendation that "limiting warming to around 1.5°C (2.7°F) requires global greenhouse gas (GHG) emissions to peak before 2025 at the latest, and be reduced by 43% by 2030".[7] These reductions are to be achieved over the emissions levels of 2019.

Until the 29th Conference of the Parties to the UNFCCC (COP) held in Baku in November 2024, carbon emissions from fossil fuels continued to grow, albeit at a slowing rate. Emissions from land use change, although still high, reduced by about 20% in the decade ending 2024. Clearly, emissions have not yet peaked.[8] And, "2024 is confirmed by the European Union Copernicus Climate Change Service to be the warmest year on record globally, and the first calendar year that the average global temperature exceeded 1.5°C above its pre-industrial level." [9] Thus, 30 years after the first COP and 10 years after the Paris Agreement, despite increasingly bitter negotiations, the world is still far from reaching the goal (Article 4 of the Paris Agreement[10]) of global peaking of emissions as soon as possible and is not on track to reach net-zero emissions by 2050.

Following the Paris Agreement in 2015, a large number of state and non-state actors made pledges to achieve net-zero emissions by specific years according to their national conditions – drawing upon the principle of Common but Differentiated Responsibilities (CBDR) recognised by the United Nations Framework Convention on Climate Change (UNFCCC) in 1992. PRC pledged to achieve net-zero by 2060 and India by 2070. The European Union aims to become the first net-zero continent by 2050;[11] the USA has recently walked out of all its climate commitments.

As per the Emissions Gap Report (EGR) of 2024[12], under all scenarios of policies and the Nationally Determined Contributions (NDCs) made by Governments, the world has a 100% likelihood of breaking the 1.5°C guardrail. However, the inclusion of all net-zero pledges by non-state actors also offers a glimmer of hope, reducing this likelihood to 77% (range: 64-97%). If all conditional NDCs are met, the world still has a 79% (19-100% range) likelihood of exceeding 2°C. However, if pledges from non-state actors are accounted for, the likelihood of exceeding the 2°C guardrail falls to 20%.

India, with its burgeoning population and huge development requirements driving the need for economic growth, is still a growing contributor to global GHG emissions. However, a year-to-year cross-country comparison of performance may be unsuitable in this case, as India has committed to achieving net-zero by 2070. India's climate commitments and actions should be viewed against the fact that its per capita emissions in 2023 are at 2.9 tonnes of CO2 equivalent (tCO2e) as against 18 tCO2e for the USA and 11 tCO2e for the PRC, while its share in cumulative historical emissions from 1850 to 2022 is a mere 3% of the total.[13] By contrast, the share of the U.S. in the stock of historical GHG emissions is 20% while that of the PRC and the EU is 12% each. The Global Carbon Budget 2024 reports that India has reduced its decadal growth in fossil CO2 emissions from 6.4% between 2004 and 2013 to 3.6% between 2014 and 2023.

Having said that, India can play a significant role in climate mitigation, as it is currently the third-largest emitter of GHGs, with a share of 8% (EGR 2024). With a per capita total energy consumption of 27.3 GJ/capita (as against 120 in PRC and 277 in the U.S.) and a per capita electricity consumption of 1463 kWh (as against 8540 in PRC and 4128 in the U.S.), skewed also by the extreme income inequality, it can be reasonably expected that India's energy consumption will increase rapidly and significantly.[14]

While it is not easy to assess an individual country's contributions and alignment to a 1.5 or 2°C aligned pathway, some efforts have been made in this direction. The Climate Action Tracker estimates that, based on current policies, India would be 135-150% above 2005 levels in 2035, whereas a 1.5°C-aligned trajectory would only allow an 18% increase over 2005 by 2035. It goes on to say that "[a]chieving this level of action will not be possible without India receiving substantial finance and other support." [15] Climate Analytics calls for a phase-out of Coal use in India in the period 2035-2040 to align with a 1.5°C target.[16]

According to a recent study, India is likely to meet the goals it set for itself by 2030.[17] In its last Biennial Update Report, India confirmed that its emissions intensity reduction target is on track. Its non-fossil fuel-based power generation capacity (including nuclear) is at 46.52% as of 2024, as against a target of 50% by 2030, and it has created an additional carbon sink of 2.29 billion tonnes, as against a target of 2.5 to 3 billion tonnes. However, India has delayed its commitments for 2035, likely due to the perceived unfairness of the climate finance commitments of the developed world at COP 29 in Baku, and to give itself more time to review renewed commitments from other countries. Instead, India is actively engaged in preparations for its First National Adaptation Plan to submit for COP 30.

While meeting its 2030 commitments, it is interesting to note that India set up 220 GW of renewable energy (RE) capacity by March 2025, but also enhanced coal output to over a billion tonnes, with nearly 88% going to the power sector.[18] India also has plans to massively increase its coal-based thermal power capacity. All this is reflective of India's unmet and growing electricity demand, the lower share of renewable energy in generation (as against capacity), the significant investments that would be required in grid infrastructure and other systems to efficiently manage a larger share of RE, concerns around energy security and large losses of employment. To appreciate the opportunities provided by India's electricity sector–which currently accounts for 1 GtCO2, equalling 40% of India's emissions, and is projected to go up to 2.4 under base case scenario – a study by Bisht and Sharma estimates that (i) achieving peaking power emissions by 2030 and deploying CCS facilitates net zero goal by 2050 but (ii) pushing back net zero target to 2070 could double cumulative emissions by mid-century. [19]

In a similar vein, India's industrial capacity growth ambition is in the 6-8 % range, signifying large energy demands arising in the hard-to-abate sectors. A low car penetration rate of only 44 cars per 1,000 people signals a huge future market for vehicles, with sales growing at a CAGR (Compound Annual Growth Rate) of 3.5% to reach 5.1 million vehicles by 2030.[20] Of this, Moody's expects the share of electric vehicles to be 12 -15 % – roughly half of India's ambition – largely due to the nascent state of infrastructure and high cost of batteries. This provides a huge opportunity to accelerate the reductions in emissions in India, given well-designed incentives and access to capital. Accelerating structural adjustments in India's development pathway could possibly help India avoid a further lock-in to fossil-intensive pathways and achieve their net-zero goals before 2070.

CLIMATE IMPACTS, VULNERABILITY AND RESILIENCE

While India is grappling with the growth pathways and mitigation choices available to it, the already visible climate impacts on the country are disproportionately large and potentially debilitating. 2024 was the first full year when temperatures remained more than 1.5°C higher than the global average pre-industrial temperatures. The Indian Meteorological Department reported that "[t]he annual mean land surface air temperature averaged over India during 2024 was +0.65°C above the long-term average (1991-2020 period). This marked the warmest year since nationwide records began in 1901[...]. The 2024 [...] monsoon season rainfall over the country as a whole was 108% of its Long Period Average (LPA). [...] [F]our cyclonic storms formed over the North Indian Ocean. [...] In addition to these cyclones, extreme weather events such as extremely heavy rainfall, floods, landslides, lightning, thunderstorms, droughts, and others were also experienced in various parts of the country."[21]

According to the Centre for Science and Environment (CSE), extreme weather affected more than 4 million hectares of agricultural land in 2024 – more than double that in 2022.[22] This is particularly worrying as the agriculture sector's share in employment is rising,[23] possibly due to the inadequacy of employment opportunities in urban areas, as highlighted at the beginning of this paper. Also worrying is the finding that the average size of landholding declined from 1.08 hectares in 2016-17 to 0.74 hectares in 2021-22, compounding the impacts of climate change on the most vulnerable.

Lancet estimates that in 2023, 181 billion potential labour hours were lost in India due to heat exposure – an increase of 50% over the 1990-1999 average.[24] This translates into a loss of 141 billion USD, with the agriculture sector suffering roughly half of these losses. It also estimates that the transmission potential for dengue fever transmitted by Aedes albopictus mosquitoes increased by 85% from 1951-1960 to 2014-2023. Also, from 2014 to 2023, the length of coastline with conditions suitable for the transmission of Vibrio pathogens at any one time during the year was 23% greater than in 1990-1999, potentially exposing 210 million people.

With increasing scientific consensus that Greenland and West Antarctica could reach tipping points at 1.5°C, the consequences for a sea level rise at the higher end, or more, of the increasingly likely projected 40-80 cm in IPCC 6 are dire. India has a coastline of 7500 km with more than 250 million people living within 50 km of the coastline and several megacities.

India is also a major beneficiary of a significant expanse of the Hindu-Kush Himalayas, which acts as a reservoir of fresh water feeding billions in the region. It also has nearly half its population dependent on the waters of the Himalayas for drinking water, irrigation and other uses. Apart from the vulnerabilities of this huge population, with the rapidly melting glaciers of the Himalayas, there is a significant rise in the threat of Glacial Lake Outburst Flood (GLOF) events and other extreme weather disasters.

With nearly 21% of its land under forest cover, India is home to four biodiversity hotspots and has a rich biodiversity outside the hotspots, too. The changing climate is already resulting in increased instances and intensity of forest fires, which are projected to increase over time. "Days with severe fire weather danger will increase by up to 60% in dry forests,[25] but will reduce by up to 40% in humid forests. The fire season will be longer by 3–61 days across the country, and the pre-monsoon fire season will become more intense over 55% of forests".[26]

With this level of vulnerabilities and extent of exposed populations, India likely should have enhanced its focus on adaptation earlier than it has. However, the scale and spread of impact that India now faces are so vast that a serious adaptation effort today, even with the currently-absent international support, would likely leave huge populations critically vulnerable. Global mitigation ambition will have to increase exponentially to limit global average temperature increases to as close to 1.5°C as possible, combined with the now unavoidable measures to capture and remove carbon dioxide from Earth's atmosphere to bring temperature increases below 1.5°C if possible.

EQUITY, JUSTICE AND SECURITY

India is clearly a victim of climate change, and the EGR 2024 acknowledges its minor role in building the stock of GHGs in Earth's atmosphere. Despite the principle of CBDR being an integral part of the UNFCCC, India is often under pressure to play more than a fair role in costly climate transitions. Undoubtedly, India's conglomerates, the top 10% of its population holding close to 75% of national wealth, and the development in its metro cities mask the real poverty that exists in the country. However, the world needs to see the challenge of raising the living standards of the majority of India–if not for equity reasons, then for selfish reasons: The world needs India to thrive for the stable democracy it is, for the human resources it provides, for the market it creates and for its innovation potential. And it needs all this without interruption and with accelerated GHG emissions reductions. The world must invest in India to reap benefits for itself, both in the short term and in the long term.

As India looks to mitigate, adapt and build resilience – with or without international support – it is imperative that social equity considerations are core to the very design of all policies and interventions. To the extent that international support is flowing – either as investments or as a responsibility – the "selfish motive" must also internalise the criticality of strengthening social equity. An article in the Wharton Magazine in 2017 stressed that "the greatest threats to India's long-term stability are rooted in social risks [...]. When grievances and needs are left unaddressed, social risk increases and seemingly insignificant events can trigger protests, strikes, litigation, looting, work stoppages, and other violence."[27]

BMI, a global country risk research firm, has cautioned against the implications of youth unemployment – a key risk factor in India's transition away from coal.[28] A recent study by ACPET also noted that, beyond the loss of jobs associated with coal mining activities – concentrated in the eastern regions of India - the closure of coal mines adversely affects the wider region and populations, shutting down livelihoods and life choices within a 5-kilometre radius of coal mines in the instance. The study highlighted the loss of traditional knowledge and skills and the loss of landholdings, which, combined with low coverage by social security schemes like ration cards, threatens to leave the region as a whole worse off and extremely vulnerable. It underscores the need for a more careful and calibrated, bottom-up approach to just energy transitions.

Similarly, many papers have addressed the key components of a just transition when phasing out ICE engines and replacing them with electric vehicles in particular.[29] However, a closer examination shows that efforts to provide skilling or re-skilling and vocational training to support the electric vehicle eco-system may not address the same workforce that would be displaced by the phase-out of ICE engines. The value chains needed to support electric vehicles are also likely not as robust, leading to significant net job losses, too. Just transition initiatives would also have to be able to address such challenges.

Around the same time, the rating agency Moody's highlighted the potential instability India faces due to rising water shortages, as it enhances volatility and reduces resilience.[30] When India banned rice exports in 2023 to stabilise domestic prices and ensure domestic demand was met, it increased the risk of political instability in Asia and Africa, highlighting the potential global fallout of climate change impacts on water supplies in India.

In short, India is a country on the brink of an environmental collapse with many social risk factors threatening its own prosperity as well as that of others. It is thus of utmost importance that when designing and implementing any mitigation and/or adaptation projects, the adoption of a just approach is both visible and recognised.

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BALANCING SPEED AND STABILITY IN THE ENERGY TRANSITION

by Natalia de Assis Brasil Weber and Raquel Guimaraes

DIE GLOBALE AUTOKRATISIERUNGSWELLE NIMMT ZU

Weltweit sind Demokratien unter Druck. Global betrachtet befindet sich die Welt in einer andauernden „dritten Welle der Autokratisierung".[1] Diese Welle dauert schon ungefähr 25 Jahren an. Der Grad an Demokratie, den der weltweite Durchschnittsbürger genießt, ist 2024 auf ein Niveau gesunken, wie es zuletzt 1985 zu beobachten war.[2] 2024 lebte die Mehrheit der Weltbevölkerung (72 Prozent) in Autokratien.[3] 2004 beispielwiese war es nur 49 Prozent.[4]

2024 befanden sich 45 Länder, in denen 38 Prozent der Weltbevölkerung lebt, in einem Prozess der Autokratisierung,[5] d. h. in einem Prozess der Regimetransformation, bei dem ein Land deutlich weniger demokratisch wird. 27 dieser Länder hatten demokratische Regierungen, als die Autokratisierung begann. In zwei Drittel von ihnen – 18 von 27 – ist die Demokratie bereits zusammengebrochen.[6] Die anderen 9 sind ebenfalls gefährdet.

Wie gravierend die heutige Situation ist, wird noch deutlicher, wenn man berücksichtigt, dass die Zahl der von der Autokratisierung betroffenen Demokratien stetig zunimmt. Von 1900 bis 2023 gab es 99 Fälle von Autokratisierung, die ihren Ausgangspunkt in Demokratien hatten.[7] Nur 35 dieser Episoden fanden zwischen 1900 und 1993 statt. Zwei Drittel aller festgestellten Fälle der Autokratisierung, die Demokratien betreffen, ereigneten sich in den letzten 30 Jahren, von 1994 bis 2023 – 64 Fälle von demokratischen Rückschritten in 54 Ländern.[8] Auch wirtschaftlich starke G-20-Nationen wie etwa Indien, Indonesien, Mexiko und die USA sind von der „dritten Welle der Autokratisierung" betroffen.

DIE „DRITTE WELLE DER AUTOKRATISIERUNG" IN AKTION

Die „dritte Welle der Autokratisierung" zeichnet sich dadurch aus, dass der Verlust an Qualität der Demokratie oft ein schleichender Prozess ist, der von innen heraus und hinter einer Fassade der Legalität stattfindet.[9] Die Hauptverantwortlichen für diesen Prozess sind demokratisch gewählte Politiker:innen und etablierte Parteien, die gezielt demokratische Normen und Institutionen abbauen. Dabei schaffen sie die demokratischen Institutionen nicht ab, höhlen diese aber aus, sodass sie ihre Funktion verlieren. Allmählich konzentriert sich die politische Macht in einer Partei oder in einer Person.[10] Indien, Polen, die Türkei und Ungarn sind markante Beispiele dafür. Medienfreiheit und zivilgesellschaftlichen Strukturen werden in der Regel zuerst und am stärksten angegriffen.[11] Oftmals treiben antidemokratische Politiker:innen auch schon bestehenden Polarisierungstendenzen voran, nicht zuletzt durch den gezielten Einsatz von Desinformation, um die Gesellschaft weiter zu spalten und dadurch demokratische Institutionen zu schwächen,[12] wie zum Beispiel in Brasilien, Ungarn und den USA. Versuche, Verfassungsänderungen vorzunehmen, die den demokratischen Prozess untergraben, sind auch üblich,[13] beispielweise in Nicaragua und Venezuela.

Die Autokratisierungsprozesse der dritten Welle haben unterschiedliche Intensitäten und Verläufe. Sie reichen von demokratischen Qualitätsverlusten in (einst) demokratischen Ländern bis hin zu einem Zusammenbruch des demokratischen Systems, sowie der Konsolidierung bereits autokratischer Systeme.[14] Wenn es in etablierten Demokratien zu Prozessen der Autokratisierung kommt, wird es als „demokratische Erosion" bezeichnet („democratic backsliding"). In der Anfangsphase eines solchen Prozesses lässt sich in der Regel noch nicht abschätzen, ob sich das betreffende Land „resilient" erweist und demokratisch bleibt. Wenn die demokratischen Institutionen des betreffenden Landes zusammenbrechen, spricht man von einem Zusammenbruch des demokratischen Systems („democratic break-

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BOTTOM-LINE-UP-FRONT

Hybrid governance models that combine centralised policy frameworks with decentralised community participation offer the most effective pathway for balancing rapid decarbonization with systemic stability in energy transitions. Success depends on adaptive governance frameworks that can navigate the complex trade-offs between speed and stability while ensuring no community is left behind.

PROBLEM STATEMENT

How to understand how the principle of „as fast as possible, as slow as necessary" can guide the transition process by examining governance approaches, social acceptance, and insights from successful case studies from Latin America and Europe?

ABSTRACT

The global energy transition faces a fundamental challenge: how to accelerate renewable energy deployment while maintaining systemic stability and social equity. This research examines the principle of „as fast as possible, as slow as necessary" through a qualitative analysis of governance approaches, social acceptance mechanisms, and case studies from Latin America and Denmark. Using literature review and comparative case study methodology, we analyse how different governance models influence transition pacing and outcomes. Our findings reveal that hybrid governance models, combining centralised policy frameworks with decentralised community participation, offer the most viable pathway for balancing rapid decarbonization with systemic stability. The study demonstrates that social acceptance is a critical determinant of feasible transition pace, with energy communities serving as effective mechanisms for redistributing power and enhancing participation. Denmark's experience illustrates the successful integration of high renewable energy shares through consistent policy frameworks and community engagement. At the same time, Latin American cases highlight the importance of addressing distributional justice and cultural considerations. The research concludes that optimal energy transition pacing requires differentiated approaches across sectors, sequenced implementation strategies, and continuous adaptation to local contexts. These insights provide a framework for policymakers seeking to navigate the complex trade-offs between speed and stability in energy transitions.

SO WHAT?

Policymakers in Latin America should adopt hybrid governance frameworks that integrate national energy planning with community participation, moving beyond centralised models that exclude marginalised groups. Governments must invest in institutional capacity and regulations that empower energy communities as instruments of inclusion and fair power distribution. Meanwhile, international development banks should condition their financing on demonstrable social acceptance and equity mechanisms. The transition requires shifting from "fast versus slow" to "as fast as possible, as slow as necessary," with continuous reassessment based on local contexts and community needs.

down“). In dem Fall ist das Regime nicht mehr in der Lage, demokratische Eigenschaften aufrechtzuerhalten und wird zu einer Autokratie. Auch in Autokratien versuchen Politiker:innen häufig, ihre Macht zu konsolidieren und zu konzentrieren. Wenn die Autokratisierungsprozesse in Autokratien fortsetzen, spricht man von der Konsolidierung bereits autokratischer Systeme („autocratic regression“). Dadurch werden bereits bestehende autokratische Institutionen ausgebaut und gefestigt.

Demokratien überleben selten eine Autokratisierung. Wenn die Autokratisierung in einer Demokratie einsetzt, ist die Sterblichkeitsrate für die Demokratie alarmierend hoch. In etwa 80% aller Fälle von Autokratisierung in (einst) demokratischen Ländern seit 1900 kam es zum Zusammenbruch des demokratischen Systems.[15] Die Sterblichkeitsrate für die Demokratie ist auch seit 1994 weiterhin sehr hoch: in 41 von 49 Fällen von Autokratisierung, für die das Ergebnis bereits bekannt ist, ist die Demokratie zusammengebrochen.[16] Das entspricht fast 84%.

Dennoch gibt es Gründe, optimistisch zu bleiben. Es hat sich vor kurzem empirisch gezeigt, dass eine demokratische Resilienz gegenüber Autokratisierung deutlich häufiger ist als bisher angenommen, denn ein Zusammenbruch verhindert nicht die Rückkehr der Demokratie. Etwa 73% aller Autokratisierungsepisoden der „dritten Welle“, für die das Ergebnis bereits bekannt ist, wurden schließlich rückgängig gemacht, oft kurz nach einem demokratischen Zusammenbruch.[17] Diese neue Information stellt die internationale Demokratieförderung vor neue Herausforderungen. Um Autokratisierung erfolgreich entgegenzuwirken, muss die Demokratieförderung neu ausgerichtet werden. Unter anderem ist es wichtig zu berücksichtigen, welche Art von demokratischer Resilienz erforderlich ist und wie sie gefördert werden kann.

DREI ARTEN VON DEMOKRATISCHER RESILIENZ

Die Widerstandsfähigkeit der Demokratie gegenüber Autokratisierung („demokratische Resilienz“) ist heutzutage ein zentrales Thema geworden. Wer aber verstehen möchte, wie resilient heutige Demokratien sind, muss zunächst definieren, was „Resilienz“ bedeutet. Demokratische Resilienz beschreibt die Fähigkeit einer Demokratie, externen und internen Stressfaktoren standzuhalten oder sich nach einer Bedrohung von innen zu erholen.[18]

Demokratien können auf unterschiedliche Weise gegen Autokratisierung resilient sein. Erstens können Demokratien einer beginnenden Autokratisierung standhalten, d. h. sie können eine Autokratisierung gänzlich verhindern. Mehr als die Hälfte aller Demokratien (54%) sind seit 1994 ohne jeglichen Verlust demokratischer Qualität demokratisch geblieben.[19] Costa Rica, Japan und die Schweiz sind aktuelle Beispiele. Viele von diesen Ländern waren allerdings auch von keiner Krise betroffen, sodass wir nicht mit Sicherheit sagen können, ob sie gegen Autokratisierung resilient sind oder nicht.

Zweitens können Demokratien, wenn eine Autokratisierung bereits im Gange ist, immer noch widerstandsfähig gegenüber einem Zusammenbruch sein. In diesen Fällen wird die Autokratisierung gestoppt, solange das Regime noch demokratisch ist, und ein Regimewechsel vermieden. Solche Fälle der Resilienz sind relativ selten. Nur 8 von 64 Ländern, die sich von 1900 bis 2023 autokratisch orientiert hatten, haben Autokratisierung durchlebt, ohne in die Autokratie abzurutschen.[20] Brasilien und Polen sind die jüngsten Beispiele dafür.

Die dritte Art der demokratischen Resilienz – die „Bounce-Back“-Resilienz – zeigt sich in der Fähigkeit einer Demokratie, sich nach einer kurzen Phase der Autokratie in einer Periode der Re-Demokratisierung zu erholen.[21] Demokratien „erholen“ sich nach einem „U-Turn“ und erreichen in den meisten Fällen ein mehr oder weniger ähnliches Niveau der demokratischen Qualität ihrer politischen Institutionen.[22] Die Malediven und Sambia sind aktuelle Beispiele.

„U-Turns“ sind mit Abstand die häufigste Art der demokratischen Resilienz. Von 1900 bis 2023 wurden 46% aller Prozesse der Autokratisierung, die ihren Ausgangspunkt in Demokratien hatten, nach einem demokratischen Zusammenbruch in Form von „U-Turns“ rückgängig gemacht.[23] In den meisten dieser Fälle wurde die Autokratisierung relativ schnell gestoppt und rückgängig gemacht, im Durchschnitt innerhalb von 5 Jahren nach ihrem Beginn.[24]

Die „Bounce-Back“-Resilienz (in Form eines „U-Turn“) wird auch immer häufiger. In den letzten 30 Jahren wurden die Demokratie in 54% aller Zusammenbrüche (oder 42% aller Fälle von Autokratisierung in Demokratien) in einem „U-Turn“ wiederhergestellt.[25]

DEMOKRATIEFÖRDERUNG MUSS NEU GEDACHT WERDEN

Um Autokratisierung erfolgreich entgegenzuwirken, ist es wichtig zu wissen, welche Art von demokratischer Resilienz dafür erforderlich ist. Die drei Arten von Resilienz sollten also die Handlungslogik der Demokratieförderung grundlegend definieren.

In Demokratien, die nicht von Autokratisierung betroffen sind, sollte der Schwerpunkt auf dem Schutz der Demokratie (vor Autokratisierung) und auf Aktivitäten, die darauf abzielen, die Fähigkeit von Akteur:innen und Institutionen zu stärken, den Beginn oder die weitere Verschlechterung demokratischer Institutionen zu verhindern, liegen.[26] Der Demokratieschutz muss darauf abzielen, Autokratisierung zu verhindern, also Resilienz von Anfang an zu fördern. Allerdings existieren zurzeit wenige verallgemeinerbare Erkenntnisse über geeignete Instrumente und Wirkmechanismen für Handeln.

In Demokratien, die bereits von Autokratisierung betroffen sind und unter einem Verlust demokratischer Qualität leiden, ist es notwendig, zumindest das Tempo negativer Veränderungen zu verlangsamen und den Erhalt institutioneller Schutzmechanismen zu fördern, wie beispielweise verfassungsrechtliche Regeln, die eine Ausweitung der Exekutivgewalt verhindern.

Die Forschung zeigt, dass in den seltenen Fällen, in denen ein Zusammenbruch der Demokratie abgewendet werden kann, antidemokratische Politiker:innen durch demokratische Wahlen abgewählt werden, wie beispielweise in Brasilien 2022 oder in Polen 2023. Der Aufbau eines breiten Wahlbündnisses der pro-demokratischen Opposition in der Vorwahlzeit scheint der Schlüssel zum Erfolg zu sein.[27] Die brasilianische Wahl 2022 unterstreicht auch die Bedeutung der Bekämpfung von Desinformation.[28] Die unabhängige Wahlbehörde („Electoral Management Body“) und die aktive Zivilgesellschaft sind in dieser Hinsicht wichtige Akteure. Sie entwickeln Mechanismen zur Aufdeckung von Desinformation, zum Faktencheck in Echtzeit und zur Bereitstellung zuverlässiger Daten. Solche Initiativen sind wichtig, weil aufstrebende Autokrat:innen bekanntermaßen den Staatsapparat zur Verbreitung von Desinformation nutzen, um an der Macht zu bleiben.

Auch gerichtliche Verfahren können dazu beitragen, demokratische Rückschritte zu verhindern, wie etwa in Südkorea sowohl im Jahr 2019 als auch aktuell im Jahr 2025. Im Allgemeinen machen eine starke Justiz und Erfahrung mit Demokratie einen Zusammenbruch der Demokratie weniger wahrscheinlich.[29] Die Legislative hingegen kann vergleichsweise wenig tun, um eine einmal begonnene Autokratisierung zu stoppen,[30] und Versuche, autokratische Amtsinhaber:innen durch irreguläre Mittel abzusetzen, führen sehr wahrscheinlich zu einem Zusammenbruch der Demokratie.[31]

Schließlich, da die „U-Turns“ die häufigste Art der demokratischen Resilienz sind, ist es entscheidend, mehr über die Möglichkeiten zur Unterstützung dieser Entwicklungen zu erfahren. Zurzeit ist unser Wissen über die Ursachen der „U-Turns“ sehr spärlich. Es muss noch viel geforscht werden, um die Frage zu beantworten, warum einige Demokratien nach Autokratisierung und Zusammenbruch erfolgreich re-demokratisieren (z. B. Sambia), während viele andere im Autoritarismus gefangen sind (z. B. die Türkei).

Erste Forschungsergebnisse deuten darauf hin, dass in seltenen Fällen eine Re-Demokratisierung daraus resultieren kann, dass Autokrat:innen einige kritische Fehler begehen, wie beispielweise die Forderung nach einem Referendum, während sie ihre Unterstützung in der Bevölkerung überschätzen; alternativ kann die Wiederbelebung der Demokratie auf internationale Interventionen zurückzuführen sein, typischerweise nach einem (Bürger-)Krieg oder einem Militärputsch.[32]

Die überwiegende Mehrheit der gegenwärtigen „U-Turns“ scheint jedoch durch unterschiedliche Kombinationen von ***institutionellen Schutzmechanismen*** (Gerichte, Wahlen) und ***kollektivem gesellschaftlichen Handeln*** (Parteien, Zivilgesellschaft, Medien und Bevölkerung) gekennzeichnet zu sein, die sich der Stabilisierung der Autokratie widersetzen und zu einer Re-Demokratisierung führen.[33]

Zu den ***institutionellen Schutzmechanismen***, die dazu beitragen, den Boden für einen „U-Turn“ zu ebnen, gehört vor allem eine unabhängige Justiz, die den Bemühungen um eine Aushöhlung der Demokratie standhält. Angehende Diktator:innen versuchen oft, die Kontrollmechanismen für die Exekutive während des Prozesses der „Vergrößerung der Exekutive“ („executive aggrandizement“) zu schwächen, und eine unabhängige Justiz kann wichtige Vetopunkte bieten.[34] Die Verhinderung von Reformen der Justizinstitutionen während der Autokratisierung sowie die Unterstützung von Akteur:innen, die sich solchen Reformen widersetzen, können daher entscheidend sein.

Ein weiterer wichtiger Aspekt ist der Schutz der Integrität der Wahlen, insbesondere der Autonomie der Wahlbehörde sowie der Freiheit und Fairness der Wahlen. Dieser spielte bei fast der Hälfte aller „U-Turns“ zwischen 2000 und 2023 eine Rolle bei der Abkehr von Autokratisierung.[35]

Zu den ***gesellschaftlichen Strategien kollektiven Handelns*** gehören breite Oppositionskoalitionen, die sich oft mit der Zivilgesellschaft zusammenschließen und in vielen Fällen eine einheitliche Herausforderung der aufstrebenden Autokrat:innen bei den Wahlen ermöglichen.[36] Eine gespaltene und zersplitterte Opposition hingegen spielt den Autokrat:innen in die Hände. Es gibt auch einige Hinweise darauf, dass Oppositionskoalitionen am besten funktionieren, wenn sie in den frühen Phasen der Autokratisierung gebildet werden.[37]

Eine weitere gesellschaftliche Kollektivmaßnahme, die oft wirksam ist, ist eine groß angelegte, einheitliche und anhaltende Massenmobilisierung gegen eine(n) aufstrebende(n) Autokrat:in. Sie hat in vielen Fällen eines „U-Turns“ eine wichtige Rolle bei der Überwindung von demokratischen Rückschritten gespielt.[38] Massenproteste können jedoch auch nach hinten losgehen und zu einer verstärkten Unterdrückung der Zivilgesellschaft und oppositioneller Parteien führen.[39]

In vielen Fällen trug das internationale Mitwirken an Unterstützung und Schutz der Demokratie und diplomatischer Druck zum erfolgreichen „U-Turn“ bei.[40] Externe Akteur:innen und Anreize sind jedoch nur dann förderlich, wenn es starke pro-demokratische Kräfte vor Ort gibt.[41] Die Unterstützung der oben beschriebenen einheimischen pro-demokratischen Kräfte ist daher der Schlüssel zur Entwicklung einer „Bounce-Back“-Resilienz.

Schließlich scheint es von entscheidender Bedeutung zu sein, in den frühen Phasen der Autokratisierung zu handeln. In den erfolgreichen Fällen demokratischer Wiederbelebungen wurde die Autokratisierung im Durchschnitt innerhalb von 4 bzw. 6 Jahren nach Beginn gestoppt bzw. rückgängig gemacht.[42] Das entspricht einem Wahlzyklus.

Mit der möglichen Ausnahme von Bolivien, wo der Prozess des „U-Turns“ noch andauert und das Ergebnis noch offen ist, ist es keiner Demokratie gelungen, den demokratischen Zusammenbruch rückgängig zu machen und zu ihrem früheren Niveau zurückzukehren, wenn die Autokratisierung länger als ein Jahrzehnt andauerte. Nach 10 Jahren tendiert der Autokratisierungsprozess dazu, die autokratische Herrschaft zu konsolidieren, sodass eine Umkehrung des Prozesses nahezu unmöglich wird.[43]

Daher ist es besonders wichtig, dass die internationalen Akteur:innen, die die Demokratie unterstützen und schützen sowie die einheimischen pro-demokratischen Akteur:innen für den schleichenden Charakter der gegenwärtigen Autokratisierung und die Bedeutung eines schnellen Handelns sensibilisieren.

OPTIMISTISCHE ANMERKUNGEN

Auch wenn demokratische Institutionen derzeit unter sehr starkem Druck stehen, ist eine demokratische Resilienz gegenüber Autokratisierung deutlich häufiger als vielleicht bisher angenommen. Während der „dritten Welle der Autokratisierung" werden 73% aller Autokratisierungsprozesse zu U-Turns; die überwiegende Mehrheit dieser (90%) führt zu einer Wiederherstellung oder sogar Verbesserung des Demokratieniveaus.[44] Außerdem nehmen die „U-Turns" auch historisch zu.[45] Dies deutet darauf hin, dass die Konsolidierung autoritärer Herrschaft sehr viel schwieriger wird als in der Vergangenheit. Die Widerstandsfähigkeit der Demokratie ist historisch gesehen beispiellos, und der Widerstand gegen antidemokratische Amtsinhaber könnte in Zukunft weiter zunehmen.

Internationale Demokratieförderung muss also darauf abzielen, alle drei Arten demokratischer Resilienz zu unterstützen. Transnationale Kooperationsformate sowie das Lernen von internationaler Demokratieförderung sind deswegen notwendig.

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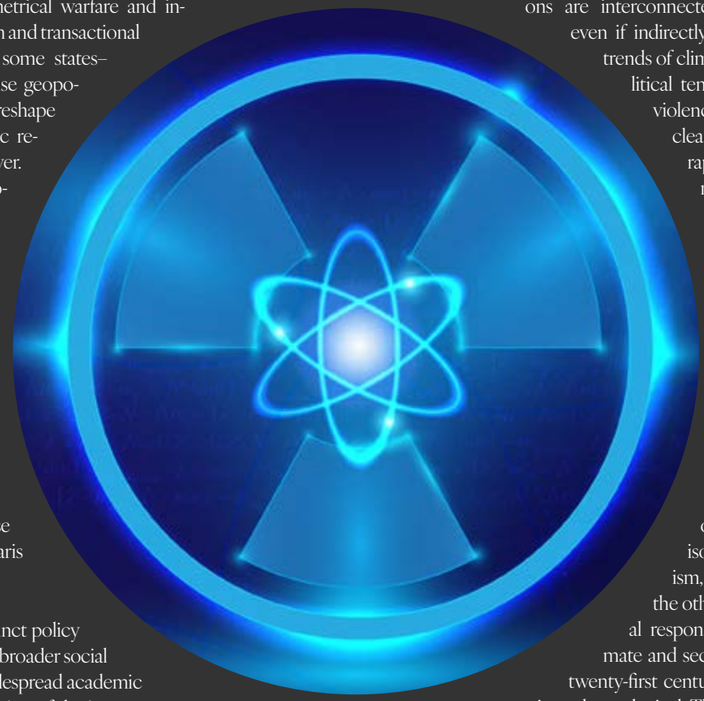
NUCLEAR DISARMAMENT AND JUST TRANSITIONS TO CLIMATE-COMPATIBLE SOCIETIES

by Andrea Bartoli and Joshua Fisher

CONCURRENT CRISES AND HISTORIC COOPERATION

The world today is facing concurrent crises, many of which pose real and urgent existential threats to human security and the ecological integrity of the planet. Among these, a rapidly changing climate and intensification of interstate conflict–both symmetrical warfare and increased militarisation and transactional foreign policies by some states–threaten to destabilise geopolitical alliances and reshape social and economic realities the world over. This erosion of cooperation likewise challenges the possibility of just transitions to climate-compatible societies by diverting resources, political and economic capital, and trust away from agreed-upon frameworks for climate action like those ratified in the Paris Agreement.



While these are distinct policy areas and sources of broader social concern, there is widespread academic and political recognition of the interconnections and interdependencies between conflict and environmental crises. Highlighting this, a large body of empirical work has been generated that shows the impact of climate change on national and human security.[1] The impact of military operations alone, while difficult to accurately measure, has been estimated to account for significant levels of greenhouse gas (GHG) emissions, accounting for up to 5.5% globally. It is also well known that since the beginning of the nuclear age in 1945, long residence-time radiological pollutants have been released into the world's atmospheric, terrestrial, aquatic, and subterranean systems through the production, testing, storage, and disposal of nuclear arms and their byproducts. In certain situations, this has lowered the resilience of the environmental systems that provide climate-regulating ecosystem services. In this sense, climate and the spectre of nuclear weapons are interconnected and inexorably, even if indirectly, linked. While the trends of climate change, geopolitical tensions, and outright violence, often among nuclear-armed states, have rapidly increased in recent years, the international responses to these trends have lacked consistency, coordination, and effectiveness. The world has oscillated between moves toward cooperation and collective action on one end, and isolationism, nationalism, and antagonism on the other. The international response to both the climate and security threats of the twenty-first century has been uncertain and paradoxical. The reduction of the USA-USSR confrontation of the late 1980s and the period of increased international cooperation during detente, not only significant geopolitical restructuring but also very relevant nuclear disarmament. Downward trends conflict across the decades since the end of the Cold War began to reverse in the mid-2010s.[2] While the total number of nuclear armaments has declined substantially since their height in the late 20th century, and testing is no longer an issue as in the past, many nuclear actors are upgrading and modernising their nuclear arsenals.[3]

It can be argued that the early achievements in climate action, like the ratification of the Paris Agreement,[4] were built on the foundation of international cooperation throughout the 1980s- 2010s, and yet their arrival coincided with recent reversals in trends of international cooperation. The structures and the institutional frameworks through which the world can mobilise coordinated action were built just as the general geopolitical trend began to move in the direction of disharmony.

It is unsurprising, therefore, that sticking points such as so-called loss and damage in climate negotiations have exerted inertia on much of the early good faith engagement and led to an uncertain path forward5. Current institutions and processes lack the infrastructure of effective cooperation and reify asymmetries among states, thus highlighting the need for truly just transitions in the energy system and perceived justice in adaptation and mitigation action to advance policy and action again. In both the climate and the conflict contexts, the world has experienced rapid shifts in engagement, isolationism, rapprochement, and antagonism. In the current international and geopolitical context, learning from past successes in cooperation may seem improbable. However, there are important cases of successful cooperation across deep divides, like the case of nuclear disarmament between the U.S. and USSR/Russia, that should inform policy-making and process design.

Where trends in climate or conflict are themselves general patterns in the direction of changes in aggregated data, there is inherent uncertainty in what an observed trend means for the future, and yet, many events highlight the precarious and delicate state of our planet. The world is only a simple error, oversight, or strategic miscalculation away from catastrophe. On the environment side, for instance, failure to reduce global emissions contributed to 2024 being the first year during which mean global temperatures likely exceeded the Paris Agreement's 1.5 °C warming threshold.[6] Whether mean temperatures remain in excess of that threshold, for how long, and by how much remains to be determined. On the nuclear side, access to newly declassified documents demonstrates that between 1945 and today, there were hundreds of instances described as "close calls", situations in which a nuclear conflict was avoided by chance and limited human decision jeopardised the integrity and security of one of the world's largest stockpiles of nuclear warheads.[7] Simultaneously, escalation in armed conflict between Russia and Ukraine, between India and Pakistan, and between Israel and proxies of Iran in Yemen, Syria, and Lebanon, all raised the possibility of strategic miscalculation by nuclear-armed adversaries. While contemporary events have largely (and fortunately) omitted threats of nuclear deployment, escalation of violence among nuclear-armed adversaries carries inherent risks.

Still, trends describe patterns in aggregate data observed over a finite period of time. Expand the time horizon, and the trend line changes. Underlying the peaks and valleys in the data are nuanced events that can be extrapolated to inform policy changes and alter the trajectory of the trend moving forward. A short period of observation on either climate or conflict shows real and intensifying deterioration in the resilience of our world's systems. However, expanding the observation period reveals important instances of past cooperation and collaboration among enemies, such as the U.S. and USSR/Russia, that were based on verified and verifiable scientific knowledge and produced mutual benefit and advanced common good. The establishment and successful implementation of the Montreal Protocol on Substances that Deplete the Ozone Layer[8] was a landmark example of this, where the international community addressed a scientifically complex, economically complicated, and technically difficult problem together to reduce emissions of certain deleterious chemical compounds, which in turn addressed a global issue and returned global benefits.

EFFECTIVE COOPERATION ACROSS ADVERSARIAL LINES

Following the collapse of the Soviet Union in 1991, the United States and Russia were able to decommission large portions of their nuclear arsenals successfully. That process was politically relevant but also economically successful and yielded positive environmental impacts in terms of decreased need for long-term waste storage, decreased demand for uranium, and increased supply of non-carbon-derived energy for U.S. consumption, reducing overall GHG emissions throughout the period of cooperation. The case presented in this contribution–titled in different ways as the HEU Deal, the Grand Uranium Bargain, or Megatons to Megawatts M2M–was the product of the historic Reagan and Gorbachev negotiations. One of the results of that season of cooperation between the United States of America and the Soviet Union (later the Russian Federation) was the sharp reduction in nuclear weapons. It was also the recognition that cooperation was not only possible but advantageous for the parties themselves.

It has been calculated that after 1945, "more than 130,000 nuclear weapons were built."[9] At its peak, it was estimated that global stockpiles and deployments of nuclear arms totalled an estimated 70,000 atomic bombs in the 1980s. Today, the estimate is nearly 12,500.[10] A significant part of the observed reduction is attributed not only to the political-diplomatic agreement but also to the technical choices that led to the repurposing of enriched uranium, originally proposed for nuclear weapons, to produce electricity through civilian nuclear power plants. This was possible only through the adjustments that were made by adversaries to cooperation and coordination, which needed to be harmonised not only with security and political concerns but also with economic ones.

A proposal for the conversion through the dilution of the highly enriched uranium (90-98% for the weapons; 4-8% for electricity production) is attributed to Edoardo Amaldi and his team.[11] A group of Italian scientists and technologists (Politecnico di Milano; Pisa, LUISS, Lincei, Ansaldo, Enel, ENEA) prepared the feasibility study that was then presented jointly by Italy and the USSR as „Edoardo Amaldi Project" at the Fourth NPT Review Conference on 31 August 1990 and at the International Atomic Energy Agency 35th General Conference of 19 September 1991. The study was relevant because the conversion process would have achieved several significant results:

- Nuclear bombs would be completely deactivated and made unusable for tactical deployment;
- Radioactive material would be used through the standard lifecycle for civil application and thus no longer dangerous; and
- A large volume of electricity would be produced for civilian use, with significant and positive economic and ecological impacts.

Meanwhile, decades of scientific exchanges between American and Soviet experts created the conditions for new explorations, making possible experiments and cooperative agreements that were previously unthinkable. In an OpEd in The New York Times, Thomas Neff suggested conversion as the technical component of the "Grand Uranium Bargain" by which "valuable material ... can be processed for use in commercial nuclear power plants."[12] This program was subsequently branded as Megatons to Megawatts.[13] World producers of electricity through nuclear reactors showed interest (especially Japan with TEPCO and the U.S. with URENCO). The project was presented in Paris in January 1992. In June 1992, at a conference in Rome, a meeting was held with Pope John Paul II, three ministers and several Soviet senior generals.[14] On June 16, 1992, President George H. W. Bush and Boris Yeltsin signed the agreement[15] that made the project operational, leading to the dismantling of thousands of nuclear weapons and the production of significant amounts of electricity for civilian purposes. The project was positively evaluated by IAEA Directors General Hans Blix[16] and Dr. Mohamed ElBaradei[17] and closely followed and managed by American experts such as James Timbie, Tom Neff, Daniel B. Poneman, Jeffrey Hughes, and others.

In a surprising and unexpected way, cooperative nuclear disarmament had a profoundly positive environmental impact. Electricity was produced that reduced demand for coal and reduced GHG emissions through the use of non-carbon-based energy. Unfortunately, despite this outcome, neither the economic nor the environmental impacts of nuclear disarmament and conversion to electricity have been studied systematically. Doing so could motivate nuclear countries to understand and consider new cycles of these programs and new avenues for both reducing risks from nuclear armaments and contributing to climate change mitigation. At a minimum, knowing more about the political, social, technical, and international architecture of such cases would contribute to shared scientific knowledge available to all, including independent actors such as international organisations, academic institutions and civil society. Just transitions to climate-com-

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The views contained in this article are the author's alone and do not represent the views of Columbia University and the Sant'Egidio Foundation for Peace and Dialogue

ABSTRACT

With a renewed focus on nuclear stockpiling among certain state actors, there is an urgent need to identify successful pathways for nuclear disarmament. History has demonstrated that this is an achievable goal, with important lessons for contemporary security discourse and policy. The potential lessons extend beyond purely security dividends, with potential contributions to economic and environmental discourses as well. The case presented in this contribution - titled at different times the HEU Deal, the Grand Uranium Bargain, or Megatons to Megawatts M2M - was the product of sustained cooperation between enemies (USA - USSR/Russia) and multiple stakeholders. It was an early, still little-known, yet useful component of just transitions to climate-compatible societies. The positive results of this actual cooperative disarmament case significantly contribute to the moral argument for nuclear disarmament with a practical, almost utilitarian rationale. The larger framework of transitions to climate-compatible societies creates a broader motivational framework that must be employed to properly evaluate the results of actual nuclear disarmament cases and the need for sustained cooperation.

BOTTOM-LINE-UP-FRONT

Nuclear disarmament has been advocated for years on moral grounds, stressing the unacceptable risk of omnicide and the destruction of life on the planet. In addition to being dangerous, nuclear weapons are extremely costly and environmentally burdensome. The environmental crisis, to which the production and use of nuclear weapons have contributed significantly, adds a new catastrophic threat to the habitability of the planet. Nuclear disarmament, especially when used to produce electricity from converted fissile fuel, has historically shifted the balance of certain environmental risks, while also demonstrating a path for cooperation among adversaries toward reducing their shared existential risk. Importantly, there can be no successful nuclear disarmament without sustained and verified cooperation among interdependent states and international actors.

PROBLEDARSTELLUNG

What diplomatic, economic, and environmental lessons can states and international institutions learn and replicate from successful cases of cooperative nuclear disarmament?

SO WHAT?

The United States and USSR/Russia -the two actors that successfully cooperated in past nuclear disarmament processes - as well as the international community of scholars and policy makers, should revisit those experiences and carefully assess their positive strategic, economic, and environmental impact. There is a growing demand for a decarbonised energy system, environmental protection, and a significant need to reduce the risks associated with nuclear arms production, deployment, and use. The strong moral rationale for nuclear disarmament should be complemented by the utilitarian motive for addressing climate and security issues through cooperative strategies, coupled with strict verification and accountability mechanisms.

patible societies will not occur without the active participation of different actors open to "trust and verify."

What is already known is that by converting 500 metric tons of highly enriched uranium to produce 7 billion megawatts of electricity, the M2M program accounted for 10% of U.S. electricity production or half of the energy generated by nuclear power in the U.S over a 20-year period (1993 to 2013). This amounted to roughly 8 trillion kilowatt hours of energy. Both elements of the process (1 - the reduction of radioactive material and 2 - the production of non-carbon energy) had significant environmental impact.18 They were expressions of a cooperative framework that positioned nuclear disarmament and just transitions to climate-compatible societies in very favourable terms.

To answer the question "Is there a contribution that cooperative nuclear disarmament has offered and could offer to just transitions to climate-compatible societies?", it must be observed that the very presence of thousands of nuclear weapons and the management of the arsenals that are necessary for their maintenance and functionality have a tremendous negative impact both on the environment and on societies. Costs alone are in the order of "a cumulative $387 billion ...spent ... to build and maintain ... nuclear arsenals over the past five years."19

The M2M program's success depended on cooperation across various domains, including government, the private sector, civil society, academia, and the international community. A proper assessment is still needed to integrate perspectives and evidence from each domain. Additionally, further analysis of M2M could help calculate the environmental impacts that may result from new weapons-to-energy conversion programs.

UNDERSTANDING THE MECHANISMS THAT ENABLE COOPERATION AND COLLABORATION

While much of the history of the Megatons to Megawatts case remains obscure, it is clear that while the program was operational, there were real, positive gains from the cooperation between adversaries, and that the benefits were realised in terms of both nuclear disarmament and a decarbonised portion of the U.S. energy system.

As the contemporary world grapples with questions of how to again reduce international confrontation, restore regional security, reduce global emissions to reverse current warming trends, and boost energy production, there are important lessons to be learned from this case. Whether or not denuclearisation and nuclear energy will be effective strategies to achieve those goals, the mechanisms that enabled past success–namely, the institutions, structures, relationships, and policies that enabled adversaries to achieve mutual gains–may be the key to developing new strategies to address our current global challenges.

In collaboration with the Community of Sant'Egidio, well known for its peacemaking work,20 Columbia University's Advanced Consortium and Cooperation, Conflict and Complexity (AC4), established a Cooperative Nuclear Disarmament and Sustainability Initiative - CNDSI that focuses on actual cases of cooperative nuclear disarmament and their impact on sustainability through four lenses:

- Political diplomatic dynamics
- Scientific and technical solutions
- Economic impact
- Environmental significance

While aware that the current trend is towards rearmament, the constructive engagement approach of the evaluation emphasises that motivations towards nuclear disarmament can be strengthened by a deeper understanding of positive, previous experiences. The CNDSI work is based on open, non-classified sources that are becoming increasingly available, as well as interdisciplinary literature.21

By allowing the dismantling of thousands of Russian nuclear weapons, the M2M program has been a significant moment in the disarmament trajectory and demonstrated that disarmament is possible and can produce beneficial results. It invites the exploration of the reasonableness of nuclear disarmament, the relevance of mutually attractive strategies for actors involved (security, technical, economic, and environmental), and the contribution of technological advances and civilian use of nuclear energy.

The worrying trend in rearmament comes at a moment in human history where our planet's life-sustaining climate system is increasingly compromised by rising global temperatures. There is an urgent need to rapidly decarbonise the global economy to limit global warming by reducing greenhouse gas emissions (GHGs). However, unless designed with justice and social vulnerability in mind, efforts in an energy transition may present disproportionate risks for already marginalised populations worldwide.

After a decline in nuclear power as an energy source, the scientific community is once again examining its potential as a tool for decarbonisation.22 In this context, the CNDSI's work explores whether there are environmental peacebuilding and decarbonisation dividends that the Megatons to Megawatts program could impart. The interconnectivity and interdependence between the climate and security spheres necessitate a thorough examination of cooperative and collaborative actions that can facilitate constructive engagement. There is an inherent tension between the two, where cooperation enables independent action toward an overarching objective and requires coordination across independent parties, while collaboration acknowledges interdependencies and requires deep engagement and shared action toward a collective goal or set of goals.

While recent trends in international relations are worrying, they are not necessarily path-dependent. The issues of disarmament, de-escalation, peacebuilding through non-proliferation, and climate action span local to global scales and must be pursued collaboratively. The lessons of historical cooperation are crucial and salient for the current geopolitical moment, as there is a good precedent for developing mutually beneficial approaches to enable nuclear disarmament.

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