# Policy Report:
# Examining AI in Low and Middle-Income Countries

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# Imprint

## Abstract

Artificial intelligence (AI) technologies have proliferated widely over the past five years and risen in adoption due to the introduction of generative AI tools like ChatGPT. However, these technologies still continue to be widely inaccessible to populations within Low and Middle-Income Countries (LMICs) due to socioeconomic development challenges that include a lack of electric power infrastructure, insufficient telecommunications connectivity, inhibited access to mobile phones, and substandard education. However, there have been a substantial number of efforts to democratize access to and creation of AI technologies throughout these countries. While a number of LMICs, including India, Kenya, and Brazil, have made significant progress to develop and govern AI, the vast majority of LMICs are underrepresented in AI research output, development, and talent concentration. To address these inequities, there must be sufficient efforts invested by national governments in LMICs to expand computing infrastructure, develop local AI research labs, improve educational upskilling opportunities, and increase regulatory capacity to govern AI. This report explores emerging use cases of AI in LMICs, examines the specific barriers faced by these countries in adopting, developing, and regulating AI, and provides actionable recommendations to promote equitable AI development and adoption in these regions.

## Introduction

Artificial intelligence (AI) encompasses a wide range of technologies that enable machines to perform tasks that mimic the capabilities of human intelligence. These include predictive systems used for decision-making and product recommendations (Zhang et al., 2021), forecasting tools applied in climate modeling (Nguyen et al., 2023), object recognition for applications like medical imaging (Jaeger et al., 2020) or autonomous vehicles (Mao et al., 2023), and content generation tools capable of producing text, images, videos, and code. In recent years, generative AI technologies, prompted by the launch of OpenAI's ChatGPT in November 2022, have revolutionized the global conversation around AI, making advanced AI systems accessible to broader audiences. While generative AI holds immense promise, its adoption has been uneven, often favoring higher-income countries due to significant disparities in technological infrastructure, research and development (R&D) capacity, and the concentration of AI talent.

This report focuses on Low and Middle-Income Countries (LMICs), a classification introduced by the World Bank, characterizing countries by gross national income (GNI) per capita thresholds of low-income countries (GNI per capita ≤ $1,145), lower-middle-income countries (GNI per capita between $1,146 and $4,515), upper-middle-income countries (GNI per capita between $4,516 and $14,005), and high-income countries (GNI per capita > $14,005) (World Bank Group, 2024). For this report, the World Bank designations of low-income countries and lower-middle-income countries are grouped within the category of LMICs. These nations face unique developmental challenges but also possess immense potential for leveraging AI to address critical societal needs. While terms like "Global South" or "developing countries" are often used interchangeably to describe this group of countries, usage of these terms often oversimplifies the complex realities of countries within these regions and fails to account for their respective cultural and socioeconomic diversity (Patrick & Huggins, 2023). For the purposes of this report, the term LMICs is employed as a more precise descriptor, avoiding stereotypical and negative geopolitical connotations associated with broader terms. Additionally, by focusing on LMICs, this report aims to highlight the specific challenges these nations face in adopting and developing AI technologies while also exploring opportunities for advancing equitable participation in the global AI ecosystem

AI is often presented as a way to address pressing development challenges in LMICs regarding domains such as agriculture, education, healthcare, infrastructure and poverty alleviation. However, the promise of AI in LMICs is tempered by stark disparities that form the AI divide, a phenomenon that can be described as inequalities in the abilities to research, develop, and adopt AI technologies that are compounded by socioeconomic deficits (Wang et al., 2024). Limited infrastructure—such as inadequate electricity supply, low internet penetration, high costs of access to telecommunications services, and a lack of access to advanced computing infrastructure like GPUs—hampers AI development and adoption (Okolo, 2023; Adan et al., 2024). Similarly, gaps in skilled talent, amplified by weak education systems, limited opportunities to pursue secondary and tertiary training in AI-focused topics, and brain drain, inhibit local innovation and capacity building (Sey & Mudongo, 2021; Okolo, 2023). Weak policy frameworks further exacerbate these challenges, preventing LMICs from effectively regulating these technologies and promoting responsible AI development (Sharma, 2022; LaForge et al., 2024). Addressing these disparities is crucial to ensuring that LMICs can equitably participate in efforts to develop, research, and regulate AI. This report explores emerging use cases of AI in LMICs, examines the specific barriers faced by these countries in adopting, developing, and regulating AI, and provides actionable recommendations for promoting equitable AI development and adoption in these regions.

## AI Development and Governance in LMICs

LMICs are leveraging AI to drive advancements in critical sectors such as education, healthcare, agriculture, manufacturing, and logistics (Khan et al., 2024). Thousands of projects led by research labs, tech companies, and startups within these

regions aim to foster local innovation and address pressing local challenges. Within agriculture and conservation, projects have used AI to diagnose poultry diseases in Tanzania (Machuve et al., 2022), monitor crop pests in Uganda (Tusubira et al., 2020), and identify areas at high risk of poaching in Uganda and Cambodia (Xu et al., 2020). In healthcare, AI models have been developed for point-of-care ultrasounds in Kenya[1], facilitated telemedicine services to improve diagnostic access in rural areas of Brazil and Angola[2], and integrated within smartphone-enabled anthropometry solutions in rural India to detect low-birth-weight newborns[3]. Additionally, a growing number of projects from organizations and initiatives such as AI4Bharat[4], Masakhane[5], Ghana NLP[6], and Te Hiku Media[7] are advancing natural language processing (NLP) tools to increase the representation of low-resource languages across LMICs. These efforts demonstrate significant progress in local AI development and highlight the region's potential for novel innovation. However, the rapid expansion of AI also raises ethical concerns. Recent investigations have revealed the harmful conditions faced by data annotators and content moderators in countries like Kenya, Venezuela, and the Philippines, who are often exposed to graphic and traumatic content as part of their work (Hao & Hernández, 2022; Perrigo, 2023; Tan & Cabato, 2023). As Western companies increasingly outsource data annotation tasks to LMICs and rely on these regions for novel data sources, there is a growing risk of exploitation. Without stronger labor protections and ethical oversight, such practices could worsen, undermining the prospective benefits of AI development for LMICs.

To promote the responsible development and adoption of AI tools, a number of global efforts have focused on developing AI strategies and formal policies. However, tangible progress remains limited, with the EU AI Act[8] standing as the only fully enacted AI-specific policy to date. LMICs, in particular, face significant challenges in establishing robust mechanisms for effective AI oversight given low levels of AI R&D and the lack of technical expertise within their respective governments. Despite these hurdles, several LMICs have made strides in developing strategic frameworks to regulate AI. In Africa, only 25 of the 55 African Union (AU) Member States currently have an AI policy, strategy, plan, or guideline, according to the African Observatory on AI[9]. While countries like Benin, Egypt, and Kenya have developed national AI strategies, Rwanda is the only nation on the continent to propose a formal AI policy, which has yet to be fully enacted. To address continent-wide gaps in AI strategies, the African Union released the AU-AI Continental Strategy for Africa in August 2023 (African Union, 2024). In Asia, several LMICs have adopted AI strategies, including Kazakhstan[10], India[11], and Thailand[12]. Similarly, in Central and South America, countries like Chile have introduced national AI policies (UNESCO, 2024b), along with AI strategies from Colombia[13], Peru[14], and Urugay[15]. However, progress has been slower in LMICs in the Caribbean and Oceania, where no country has yet developed a national AI strategy or policy. Instead, countries within these respective regions have worked with multilateral agencies like UNESCO to form the Caribbean Artificial Intelligence Initiative (UNESCO, 2023) and conduct needs assessments to understand AI and data readiness within Small Island Developing States (UNESCO, 2024c). Participation from LMICs in major international AI governance forums, such as the inaugural AI Safety Summit, has been limited, reflecting disparities in global representation. However, these countries have been more prominently included in international agreements and declarations, such as the UNESCO Recommendation on the Ethics of AI[16] and the G20 New Delhi Declaration[17].

A global perspective on AI governance is essential to ensure that the needs of countries underrepresented in AI development

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[1] https://jacarandahealth.org/

[2] https://cloud.google.com/customers/portal-telemedicina-gcp

[3] https://www.wadhwaniai.org/programs/newborn-anthropometry/newborn-anthropometry-ai-solution

[4] https://ai4bharat.iitm.ac.in/

[5] https://www.masakhane.io/

[6] https://ghananlp.org/

[7] https://tehiku.nz/

[8] https://www.europarl.europa.eu/topics/en/article/20230601STO93804/eu-ai-act-first-regulation-on-artificial-intelligence

[9] https://policy.africanobservatory.ai/

[10] https://primeminister.kz/en/news/concept-for-artificial-intelligence-development-for-2024-2029-adopted-by-government-28786

[11] https://www.niti.gov.in/national-strategy-artificial-intelligence

[12] https://ai.in.th/

[13] https://colaboracion.dnp.gov.co/CDT/Conpes/Econ%C3%B3micos/3975.pdf

[14] https://wb2server.congreso.gob.pe/spley-portal/#/expediente/2021/7033

[15] https://www.gub.uy/agencia-gobierno-electronico-sociedad-informacion-conocimiento/sites/agencia-gobierno-electronico-sociedad-informacion-conocimiento/files/documentos/publicaciones/IA%20Strategy%20-%20english%20version.pdf

[16] https://www.unesco.org/en/articles/recommendation-ethics-artificial-intelligence

[17] https://www.mea.gov.in/Images/CPV/G20-New-Delhi-Leaders-Declaration.pdf

are acknowledged and addressed (Png, 2022). Democratizing participation in governance discussions can create a ripple effect, fostering greater investment in skilled talent, digital infrastructure, and AI upskilling within these regions (Okolo, 2023; Adan et al., 2024). As AI increasingly impacts societies worldwide, the negative consequences of these technologies are likely to be most pronounced in countries with lower levels of AI development and that lack the capacity to effectively regulate these technologies. Broader inclusion in global governance frameworks can help prioritize the unique challenges faced by underrepresented countries, driving targeted initiatives to bridge gaps in AI adoption and oversight. Such efforts can promote cross-country and transcontinental collaboration, increase investments in digital infrastructure, and expand funding for research labs, startups, and innovation hubs. Over time, these measures can reduce global disparities in AI R&D, paving the way for a more equitable and inclusive digital future.

## The AI Divide

The AI divide between higher-income countries and LMICs is stark, given disparities in access to electricity, telecommunications infrastructure, cloud computing, quality education, and career opportunities in AI (Bengio et al., 2024). Infrastructure challenges disproportionately impact LMICs, and the International Energy Agency (IEA) estimates that as of 2023, 750 million people worldwide lack access to electricity (IEA, 2024). 80% of people lacking access to electricity live within Sub-Saharan Africa, and progress towards improving electricity access has been impeded by the COVID-19 pandemic. While the global electricity access rate is 90.7%, 49.3% of people in Sub-Saharan Africa have access to electricity compared to 97.1% in Central and South America, 100% in North Africa, and 97.5% in the Asia Pacific (IEA, 2024). The International Telecommunications Union (ITU) reports that 67% of the world's population has access to the Internet, but within low to middle-income countries, this statistic falls to 55% and is even lower at 27% within low-income countries (ITU, 2023). Mobile broadband is a common avenue for people living within LMICs to connect to the internet, with 84% of broadband connections occurring through mobile devices compared to 57% globally (Shanahan & Bahia, 2024). However, communities living within this region face hurdles in accessing internet services due to being unable to afford mobile devices. The World Wide Web Foundation reports that 2.5 billion people live in countries where a low-priced smartphone is 25% of their monthly household income (Alliance for Affordable Internet, 2020).

Educational barriers in LMICs significantly hinder the development of a skilled AI workforce. Many communities face challenges in accessing quality education, with 70% of children living in learning poverty—a metric indicating the inability to read and comprehend simple texts by age 10 (Saavedra et al., 2022). In Sub-Saharan Africa, the number of out-of-school children increased by 12 million between 2015 and 2021 (United Nations, 2024), and UNESCO reports that 98 million children and youth in Africa are excluded from education (UNESCO, 2022). Globally, 244 million children and youth remain out of school, including 85 million in Central and Southern Asia (UNESCO, 2022) and 9.6 million in Latin America and the Caribbean (UNESCO, 2024a). LMICs also experience disparities in science education, further amplified by a lack of assessment data on primary and secondary education within these countries (UNESCO Global Education Monitoring Team, 2022). Furthermore, disparities in access to AI-related degree programs exacerbate these challenges. Many of the top AI universities are concentrated in the United States and the United Kingdom (QS World University Rankings, 2024), with most formal AI programs in English offered in the US, UK, and Canada (Stanford HAI, 2024). As a result, students and researchers from LMICs often need to seek education abroad to access advanced AI training. While countries such as India, Malaysia, and South Africa are expanding their AI-related course offerings, much work remains to address these disparities.

The AI divide also highlights stark economic inequalities in the global concentration of AI talent and access to AI careers, with high-income countries dominating the field. Research from MacroPolo reveals that the United States has the largest share of elite AI researchers, houses the majority of top-tier research institutions, and serves as the leading destination for global AI talent (MacroPolo, 2023). Other countries such as China, the United Kingdom, Germany, France, and Canada hold significant shares of the global AI workforce due to established ecosystems that include cutting-edge research facilities, robust funding, and well-defined career pathways in AI. In contrast, many LMICs face structural challenges, such as limited access to advanced training programs, research funding, and local AI job opportunities, which hinder the growth of their AI talent pools. Despite these challenges, certain cities in LMICs such as Bangalore (India), Kuala Lumpur (Malaysia), Johannesburg (South Africa), São Paulo (Brazil), Bangkok (Thailand), Jakarta (Indonesia), and Lagos (Nigeria) have emerged as growing AI hubs (Chakravorti, 2021). These cities benefit from a mix of government support, private-sector investment, and increasing access to educational resources. However, the global demand for AI expertise has resulted in significant talent migration, with 42% of top-tier AI researchers relocating to pursue career opportunities abroad (MacroPolo, 2023). This "brain drain" disproportionately affects LMICs, which struggle to retain highly skilled individuals due to a lack of comparable local opportunities, lower wages, and underdeveloped research infrastructure. Without targeted efforts to expand AI-related jobs, provide competitive salaries, and foster local innovation ecosystems, LMICs risk perpetuating the cycle of talent outflow, further widening the global AI divide.

## Promoting Responsible AI in LMICs

Promoting responsible AI development and adoption in Low and Middle-Income Countries (LMICs) requires addressing the

unique risks and ethical challenges posed by these technologies. To ensure the responsible use of AI, governments within LMICs should invest in efforts to study AI harms, forecast potential risks, develop mitigation mechanisms, and promote strong governance (Okolo et al., 2023). AI technologies carry significant risks, particularly in LMICs, where existing social, economic, and institutional inequalities can amplify their harms. Bias in AI models remains a significant concern, as datasets often reflect socioeconomic inequalities based on ethnicity, wealth, and education. 52% of all web content on the Internet is estimated to be in English (Statista, 2024), and with this content being a common source of training data for AI systems, prominent AI models often fail to equitably represent cultures and languages within LMICs (Cohere for AI, 2024). Thus, leveraging these tools in LMIC contexts can lead to systems that disproportionately disadvantage marginalized groups. For example, governments within Africa have rapidly been acquiring AI-enabled surveillance technologies that have been deployed in ways that infringe on privacy and target vulnerable populations (Roberts et al., 2023).

AI systems must be aligned with local values, ethics, and cultural contexts (Abiero, 2024). Many AI models, particularly large language models (LLMs), embed Western-centric assumptions and promote stereotypes that may prevent these models from being suitable for use in LMIC environments (Venkit et al., 2023; Ghosh et al., 2024). Promoting responsible AI development and adoption involves integrating local values by collaborating with communities to understand their social dynamics, ethical norms, and priorities. In LMICs, AI systems must be cognizant of cultural nuances, such as tribal hierarchies, caste dynamics, and religious practices. Reducing Western-centric biases in AI systems will also require curating localized datasets that better represent communities in LMICs to enable the development of more contextually relevant AI models. To make progress in this domain, researchers within LMICs have leveraged partnerships with international organizations like Mozilla[18] and Lacuna Fund[19] to produce localized datasets and machine learning models. Furthermore, inclusive development processes that involve diverse stakeholders, including civil society, academia, and marginalized groups, are essential to ensure AI tools meet the unique needs of LMICs.

Governance and oversight mechanisms are critical to promoting responsible AI adoption in LMICs (Barzelay et al., 2024). Transparent, accountable, and inclusive governance can help address the potential harms of AI technologies. Auditing frameworks, such as impact assessments, can evaluate how AI systems affect vulnerable groups and identify whether they reinforce existing inequalities (Schwartz et al., 2022). Additional transparency mechanisms, such as requiring developers and vendors to disclose their data sources, algorithms, and decision-making processes, can build trust and accountability. Local research is equally important in uncovering the unique harms of AI in LMIC contexts. Governments and international organizations should invest in academic and civil society-led research to study how AI heightens challenges specific to LMICs, such as caste-based discrimination in South Asia or religious conflicts in Sub-Saharan Africa. Efforts in forming cross-sectoral partnerships can help build local expertise to effectively assess and mitigate AI-related harms.

Finally, LMIC governments must exercise caution when adopting AI for sensitive applications, particularly for surveillance, national security, and law enforcement. Strict legal and ethical guidelines should govern the use of AI-powered surveillance systems to prevent discriminatory practices, such as targeting political dissidents, opposition leaders, activists, or minority groups. High-risk applications like automated criminal profiling, predictive policing, and algorithmic sentencing should be avoided, as biases and inaccuracies in these systems can lead to severe consequences (Browning & Arrigo, 2021). Implementing robust oversight mechanisms can also help governments evaluate the societal implications of AI technologies before they are deployed. By addressing risks, prioritizing ethical considerations, and strengthening governance frameworks, LMICs can ensure that AI adoption is responsible, equitable, and beneficial for all segments of society.

## Policy Recommendations for AI in LMICs

Many LMIC governments do not have the capacity to draft and enact comprehensive AI regulations, as national priorities such as addressing climate change, alleviating poverty, and improving infrastructure often take precedence. However, there are steps these governments can take to prepare for equitable participation in the global AI ecosystem while mitigating the harms associated with these technologies. By focusing on infrastructure, capacity building, responsible adoption, and international collaboration, LMICs can lay the groundwork for effective AI governance.

**Advancing Infrastructure Investments.** Along with addressing traditional development challenges, LMICs should also make progress in developing infrastructure to facilitate AI development and adoption. Governments must prioritize expanding electric grids, cloud computing access, and broadband infrastructure, particularly in underserved rural areas, to bridge the digital divide. Additionally, investing in efforts to distribute resources like datasets, compute power, and educational training programs, can ensure that smaller nations and vulnerable communities have access to AI tools. Public-private partnerships and development funding can play a pivotal role in scaling access to AI infrastructure, building upon efforts such as the

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[18] https://foundation.mozilla.org/en/blog/mozilla-announces-seven-africa-mradi-research-grantees/
[19] https://lacunafund.org/about/

Chinese government's Global AI Governance Initiative[20], UK government's AI for Development program[21] and the United States' Partnership for Global Inclusivity on AI[22].

**Building Capacity for AI Development and Governance.** To handle concerns with AI technologies, LMICs should equip their respective governments to navigate the complexities of AI governance. Policymakers and regulators must be upskilled to understand the technical and ethical implications of AI technologies and to develop effective oversight frameworks. Educational programs, including AI-focused curricula in schools and universities, can cultivate the next generation of AI talent. Governments should also foster partnerships with the private sector to create training opportunities and research collaborations that encourage innovation. Local stakeholders, including civil society organizations and community leaders, must be empowered to participate in AI decision-making, ensuring that governance approaches are inclusive and contextually relevant.

**Advocating for Responsible AI Adoption and Use**. LMIC governments should adopt ethical procurement guidelines that prioritize transparency, fairness, and accountability in AI systems (Sloane et al., 2021). Vendors supplying AI tools and applications to governments must be required to disclose key details about their technologies, including their data sources, algorithms, and potential biases. Governments must also adopt policies that limit the use of AI in sensitive domains, such as surveillance and criminal justice, unless robust safeguards are in place to prevent misuse and mitigate harms that may occur in their respective usage. LMIC governments must also leverage their respective data privacy protection policies to equip citizens with the right to object to their data being used in automated decision-making and to be informed of necessary avenues for recourse.

**Fostering International Collaboration.** LMICs can leverage collaborative partnerships to significantly enhance their capacity to govern AI effectively. Multilateral and bilateral initiatives that increase funding for research projects, academic centers, and graduate training can help LMICs strengthen their respective AI ecosystems. These collaborations can also promote inclusive innovation by facilitating exchanges between LMICs and high-income countries, enabling the co-creation of AI technologies and governance frameworks that address shared global challenges. Regional and international initiatives, such as the Global Partnership on Artificial Intelligence[23], the AI Global South Summit[24], and the Commonwealth AI Consortium[25], can further amplify the voices of LMICs in international AI governance forums, ensuring that their priorities and concerns are adequately represented.

By investing in infrastructure, building local capacities, promoting ethical AI adoption, and fostering international collaboration, LMICs can position themselves to leverage AI responsibly and equitably while addressing its potential risks. These measures will not only enhance national resilience but also contribute to a more inclusive global AI landscape.

## Conclusion

AI holds immense potential to drive positive change in countries across the world, particularly in Low-to-Middle Income Countries (LMICs). While these governments face significant development challenges, it is critical that the adoption and integration of AI technologies are approached with caution and strategic foresight. The promise of AI lies in its ability to address pressing developmental issues, such as improving access to education, healthcare, and sustainable agriculture. However, LMICs must avoid being engulfed in the global AI hype and instead adopt context-specific approaches that align with their unique socioeconomic realities.

Balancing opportunities and risks is essential to ensure that AI delivers equitable benefits without exacerbating existing inequalities. Deploying AI tools without adequate oversight risks amplifying bias, enabling harmful applications like mass surveillance, and worsening societal divides. Governments in LMICs must prioritize the development of strong governance frameworks that foster responsible innovation while safeguarding human rights and ethical standards. This includes integrating local values and cultural nuances into AI systems, building robust mechanisms for oversight, and promoting transparency and accountability in AI deployment.

Looking ahead, inclusive partnerships will play a vital role in advancing AI equity and enabling LMICs to participate meaningfully in the global AI ecosystem. Collaboration across regions and between public and private sectors can help

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[20] http://vienna.china-mission.gov.cn/eng/mtjj/202404/t20240417_11283440.htm
[21] https://www.gov.uk/government/news/uk-unites-with-global-partners-to-accelerate-development-using-ai
[22] https://www.state.gov/united-states-and-eight-companies-launch-the-partnership-for-global-inclusivity-on-ai/
[23] https://gpai.ai/
[24] https://www.aiglobalsouthsummit.com/
[25] https://caic.thecommonwealth.org/

expand access to financial resources, enhance technical capacities, and foster innovation. LMICs must commit to investing in inclusive, ethical, and sustainable AI ecosystems, while simultaneously addressing broader development challenges like poverty, infrastructure gaps, healthcare deficits, and education inequalities. By taking cautious and deliberate approaches, LMICs can harness the capabilities of AI to drive equitable and inclusive development, paving the way for a more just and sustainable future.

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