

Policy Brief

Applying an Inclusive Lens to Artificial Intelligence Innovation: The COPAI Experience in Cambodia

Rafael TORQUATO CRUZ
October, 2025



POLICY BRIEF

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FRAMWORK

To achieve the vision of a complementarity economy and inclusive AI innovation and to facilitate inclusive AI innovation that fosters human development within Cambodia through Community of Practice on AI (COPAI) approach. It provides policymakers, regulatory bodies, and STI promotion agencies - with a structured way to analyse and shape AI development throughout the entire policy cycle. Main objective is national human development priorities and tailor the approach to inclusive AI innovation to Cambodia



The COPAI Experience in Cambodia



COPAI?

Co-creative and inclusive methodology conducting through `learning-by-doing` involving a diverse community - from government officials and academics to university students and businesses - in a structured series of "Hub" sessions.








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FINDINGS

Challenges in AI Innovation:

 Resource Constraints	 Human Capital Deficits	 Data Ecosystem Gaps	 Governance Challenges	 Weak Innovation Linkages
Limited funding for research and development, high-performance computing costs	Shortage of specialised AI talent, weak education systems, brain drain	Poor data availability and quality, lack of inclusive and local data	Fragmented policies, lack of AI regulations and standards	Disconnected research, industry and government efforts



ESCAP's Inclusion Framework:

POLICY RECOMMENDATION

AI relevant policies and implementations are to recommend the following:

-  Co-creation for building inclusive innovation system: using co-creative approach, and ecosystem mapping to build a vibrant innovation ecosystem.
-  Frugal and youth's driven innovation despite resource constraints: focusing on youth as a co-creator and innovator and promoting frugal innovation as innovative approach to achieving the inclusive growth in emerging economies.
-  Regional collaboration for inclusive innovation: promoting cross-border cooperation to achieve developmental goals and address societal challenges.
-  Cultural values for ethical innovation: embedding cultural values in innovation to ensure ethical and socially responsible outcomes.

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TABLE OF CONTENTS

1. Inclusive AI Innovation for Human Development.....	2
1.1 The Dual Potential of Artificial Intelligence: A Matter of Choice	4
1.2 Key Challenges for AI Innovation in Developing Countries.....	5
1.3 The Global Imperatives for Inclusive AI: The Pact for the Future, Global Digital Compact and Declaration on Futures Generations	7
2. Applying an inclusive lens to AI innovation: a conceptual framework.....	9
2.1 Overall Objectives.....	10
2.2 Direction of Innovation.....	11
2.3 Participation in Innovation.....	11
2.4 Governance of Innovation.....	13
3. Pathways for Inclusive AI Innovation in Emerging Economies: Lessons Learned from COPAI	15
3.1 Capacity Building as a Continuous, Multi-Level Process.....	16
3.2 Co-Creation as a Mechanism for Building an Inclusive AI Ecosystem	17
3.3 Ecosystem Mapping as a Strategic Policy Tool.....	18
3.4 Youth as Present-Day Co-Creators and Innovators.....	19
3.5 Resource Constraint as a Catalyst for Frugal and Context-Appropriate Innovation	20
3.6 Regional Collaboration as a Valuable Solution to Data Scarcity.....	22
3.7 Cultural Values as a Powerful Framework for Ethical Innovation	23
4. Conclusion and Way Forward	25

1. INCLUSIVE AI INNOVATION FOR HUMAN DEVELOPMENT

The global ascent of Artificial Intelligence (AI) technology in recent years presents a profound dilemma for the international community. It offers pathways to accelerated development and unprecedented innovation, yet it simultaneously risks deepening existing inequalities, particularly for the Global South. Whereas the traditional digital divide primarily refers to gaps in affordable internet connectivity, digital devices, and basic digital literacy - disproportionately affecting rural communities, women, lower-income groups, and older populations - the emerging AI divide is even more intricate. It compounds these existing disparities by layering additional barriers such as high infrastructure costs, limited linguistic and data representation, concentrated technical expertise, and exclusionary governance practices. Without a deliberate, inclusive approach, AI risks creating new, harder-to-cross frontiers between those who benefit and those who are excluded, potentially exacerbating the recent global slowdown in human development progress.¹

This challenge also frames the central promise of what the United Nations Conference on Trade and Development (UNCTAD) identifies as a potential fifth industrial revolution.² Unlike the fourth industrial revolution's focus on automation, this new paradigm is characterized by human-machine collaboration. It represents a deliberate shift from technologies that simply replace labour to those that augment human capabilities and prioritize human well-being. Harnessing AI in this human-centric manner offers a tangible pathway to mitigate the risks of the AI divide. Fortunately, a confluence of factors - including the increasing democratization of AI through free-access models, open-source technologies, the establishment of comprehensive international frameworks like the Pact for the Future, and the emergence of inclusive AI initiatives in the Global South - signals a growing opportunity for more equitable participation in the AI revolution.

This policy brief builds on ESCAP's recent work convening a Community of Practice on AI (COPAI)³ in Cambodia with a mission to map and strengthen its national AI research and innovation ecosystem (see box 1). Drawing on ESCAP's *Guidelines for Inclusive Technology and Innovation Policies for Sustainable Development*⁴ and the human-centric approach advocated by the United Nations Development Programme (UNDP)'s 2025 Human Development Report, the brief introduces a structured methodology to analyse and shape AI development through an inclusive lens. It outlines seven lessons learnt and practical policy recommendations gathered during the COPAI co-creation process, providing insights relevant for other developing economies in Asia-Pacific and beyond.

¹ United Nations Development Programme (UNDP) (2025). *Human Development Report 2025: A Matter of Choice - People and Possibilities in the Age of Artificial Intelligence*. Available at: <https://hdr.undp.org/content/human-development-report-2025>.

² United Nations Conference on Trade and Development (UNCTAD) (2025). *Technology and Innovation Report 2025: Inclusive artificial intelligence for development*. United Nations publication: Geneva. Available at <https://unctad.org/publication/technology-and-innovation-report-2025>.

³ ESCAP (2025). *Community of Practice on AI (COPAI)*, project page. Available at: <https://www.unescap.org/projects/copai>.

⁴ ESCAP (2020). *Guidelines for Inclusive Technology and Innovation Policies for Sustainable Development* (ESCAP/CICTSTI/2020/4). Available at: https://www.unescap.org/sites/default/d8files/event-documents/CICTST~2_4.PDF.

Box 1: Co-Creating the Community of Practice on AI

The Cambodian Context: Challenges and Strategic Imperatives

From a national innovation systems perspective, each country's research and innovation (R&I) ecosystem faces context-specific challenges that calls for tailored and inclusive responses. In Cambodia, the workforce is dominated by the informal economy and concentrated in routine manual tasks, making it particularly vulnerable to displacement from automation. This is compounded by significant resource and skill gaps in low-productivity sectors like agriculture, and among micro, small, and medium-sized enterprises (MSMEs), as well as limited access to digital opportunities, particularly in rural communities. This economic reality means that an approach to AI focused on high-tech, capital-intensive solutions would bypass the vast majority of the population.

However, Cambodia also possesses unique strategic assets. Its youthful demographic, with nearly two-thirds of the population under 30, and its rich cultural heritage, deeply rooted in Buddhist tradition, provide a unique foundation for a national AI vision centred on compassion, sustainability, and youth-led innovation. Furthermore, the existence of foundational digital public infrastructure, such as a national high performance computing platform (MISTI-HPC), provides a crucial building block for trusted, data-driven innovation in priority sectors like agriculture, finance, and tourism.

The Community of Practice on AI: Mission and Process

Recognizing these structural constraints and the need for an AI development pathway that is socially inclusive, economically viable, and grounded in national development priorities, the Ministry of Industry, Science, Technology & Innovation (MISTI) of Cambodia formally requested ESCAP's support in October 2024 to establish a collaborative mechanism for evidence-based policymaking for AI innovation. This request led to the creation of the Community of Practice on AI (COPAI) as a pilot initiative to bring together diverse national and regional stakeholders to map and Cambodia's national AI R&I capabilities.

The COPAI process is defined by its co-creative and inclusive methodology. It follows a "learning-by-doing" approach that involves a diverse community - from government officials and academics to university students and businesses - in a structured series of "Hub" sessions. This method was designed to build technical capacity, foster policy dialogue, and generate collective ownership simultaneously. The Hubs were structured as a logical learning journey following a design thinking approach organized in two phases, beginning with foundational sessions to incubate ideas and prototypes, followed by deep dives on specific topics to expand the understanding of AI in its different dimensions.

Phase 1: Incubation and Foundation Setting

- **Hub 1 - Internal Alignment:** Align MISTI officials on the purpose and next steps for the AI strategy blueprint.
- **Hub 2 - Prototyping a Baseline Blueprint:** Develop a concise AI strategy prototype for rapid feedback and iteration.
- **Hub 3 - Developing a Baseline Vision:** Define Cambodia's AI aspirations to 2030 and align them with national priorities.
- **Hub 4 - Feedback and Refinement of the Baseline Blueprint:** Gather expert input to refine the draft AI strategy blueprint before wider review.

Phase 2: Deep Dives

- **Hub 5 - AI and Youth, Nurturing the Next Generation of Innovators:** Explore how Cambodian youth can drive ethical, skills-based AI innovation.
- **Hub 6 - Cambodia's Preparation for Artificial Intelligence Technology:** Build community understanding of Cambodia's AI goals and existing policy context.

- **Hub 7 - AI and Buddhism - Grounding Ethical and Cultural Foundations:** Apply Buddhist ethics, such as compassion and non-harm to guide responsible AI.
- **Hub 8 - AI for Economic Development - Unlocking Private Sector Growth & Startup Innovation:** Examine AI use cases, funding, and policies that promote startups and boost MSMEs productivity.
- **Hub 9 - Enabling AI Research and Innovation in Cambodia:** Identify infrastructure, networks, and capacities needed to foster AI R&I.
- **Hub 10 - Human Capital Development for AI:** Outline training and curricula to build an inclusive, skilled Cambodian AI workforce.
- **Hub 11 - Promoting AI Research and Innovation in ASEAN:** Share regional best practices and partnerships to strengthen a vibrant AI ecosystem.
- **Hub 12 - Integrating an Inclusive Lens into AI Innovation:** Consolidate community insights to ensure AI advances are ethical, accessible, and equitable.

By bringing together actors who would not normally interact, the COPAI process aimed to break down institutional silos and create the very ecosystem linkages often missing in developing contexts.

1.1 THE DUAL POTENTIAL OF ARTIFICIAL INTELLIGENCE: A MATTER OF CHOICE

AI is a frontier technology with the potential to accelerate human development and expand people's freedoms and capabilities to lead lives they value. At its core, human development rests on three foundations: living a long and healthy life, being knowledgeable, and enjoying the resources needed for a decent standard of living. Surrounding these are seven contextual enablers highlighted by UNDP that create the conditions for people and societies to flourish: environmental sustainability, gender equality, voice and participation, human security, resilience to shocks, decent work, and social cohesion.⁵

While AI's economic promise is substantial, with studies projecting a 10-18 per cent GDP uplift across Southeast Asia by 2030⁶, UNDP's 2025 Human Development Report emphasizes that AI's impact isn't predetermined by technology alone. Instead, AI serves as a "development wildcard," making its future fundamentally a matter of policy choice, shaped now by decisions in its design, development, and deployment.⁷ The key question is not what AI can do, but which choices can ensure AI works for people and the planet. This perspective shifts focus from passive adoption of technology to actively shaping its trajectory - a crucial distinction for developing economies seeking to maintain their developmental agency.

Inclusive AI innovation is a strategic imperative to counter techno-determinism, understood as the belief that technology's development path is autonomous and its societal impacts inevitable.⁸ It involves "expanding the frontiers of innovation" by ensuring technological innovation serves human values, rather than the other way around.⁹ As the 2025 Human Development Report highlights, AI currently acts as a "mirror," reflecting and amplifying existing societal inequalities. If the data used to train AI models

⁵ UNDP (2015). 'What is human development?' Human Development Report Office website. Available at: <https://hdr.undp.org/content/what-human-development>.

⁶ Chua, S.G., and N. Dobberstein (2020). *Racing toward the Future: Artificial Intelligence in Southeast Asia*. Kearney. Available at: https://www.kearney.com/documents/291362523/291369654/Racing+toward+the+future_artificial+intelligence+in+Southeast+Updated.pdf/679e501c-aae8-0483-e016-d6b780071540?t=1602047682000.

⁷ UNDP (2025). *Human Development Report 2025*, p. 3.

⁸ UNDP (2025). *Human Development Report 2025*, p. 103.

⁹ ESCAP (2021). *Frontiers of Inclusive Innovation: Formulating Technology and Innovation Policies that Leave No One Behind*, p. 7. ST/ESCAP/2978. Available at: <https://www.unescap.org/kp/2021/frontiers-inclusive-innovation-formulating-technology-and-innovation-policies-leave-no-one>.

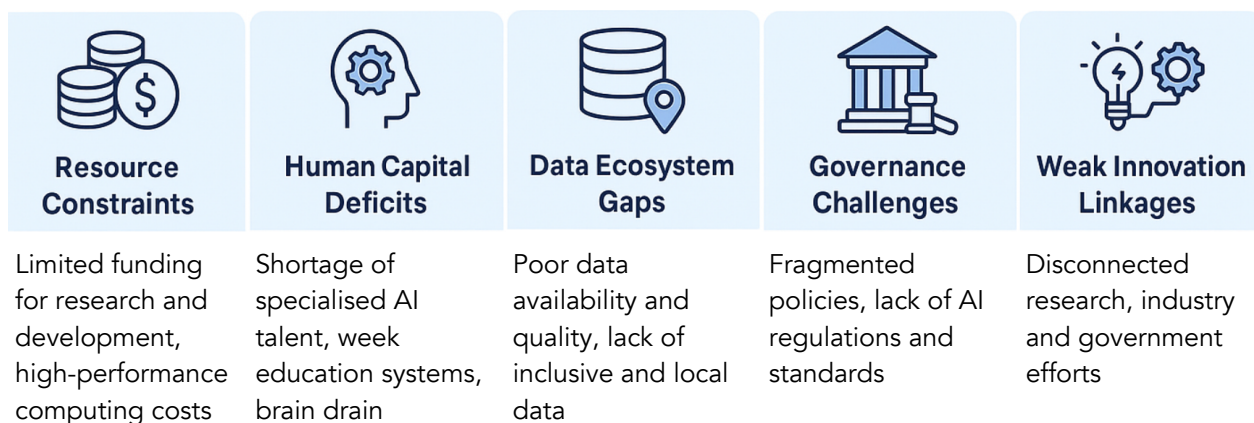
is biased, the models themselves will be biased. If the problems AI addresses primarily concern the affluent, its benefits will disproportionately serve them. Therefore, an inclusive approach is essential to consciously correct for these biases and ensure AI does not merely entrench existing divides.

The ultimate goal is to build a "complementarity economy," in which AI augments human potential rather than merely replacing it.¹⁰ This requires deliberately designing AI tools that enhance human creativity, critical thinking, and social intelligence, while strategically automating mundane or repetitive tasks when the benefits clearly outweigh the energy, resource, and societal costs. It also involves actively harnessing AI's unique capabilities to help address humanity's greatest challenges, such as the climate crisis and global health, without undermining human autonomy or capabilities. This future is one where technology serves people, not the reverse, and where success is measured not only by economic efficiency but also by the expansion of human freedom and well-being in harmony with the environment. Achieving this future is not inevitable; it must be intentionally shaped and supported by inclusive and responsible policy choices.

1.2 KEY CHALLENGES FOR AI INNOVATION IN DEVELOPING COUNTRIES

Developing economies, including Cambodia, must navigate multiple interconnected barriers to their meaningful participation in the AI revolution. These challenges are not isolated technical issues but deeply embedded in the economic, social, and institutional fabric of their economies. At the core lies a widening AI divide, rooted in a highly concentrated global supply chain and uneven access to resources, talent, and governance capacities. As illustrated in Figure 1, these barriers can be grouped into five systemic challenges: (i) severe resource constraints, (ii) human capital deficits, (iii) data ecosystem gaps, (iv) nascent and fragmented governance, and (v) weak innovation ecosystem linkages. Together, these form a mutually reinforcing set of obstacles that, if left unaddressed, risk excluding developing countries from the benefits of AI while increasing their dependence on foreign technologies and standards.

Figure 1: Systemic Barriers to Inclusive AI Innovation in Developing Countries



First, severe resource constraints represent a fundamental reality, with chronically low investment in research and development (R&D) posing a significant impediment for developing countries seeking advancement in the global value chain. Cambodia's Gross Expenditure on R&D was only 0.09 percent of GDP in 2022, nearly ten times lower than the ASEAN average.¹¹ This severely restricts the capacity to

¹⁰ UNDP (2025). *Human Development Report 2025*, Box 5.2, p. 153.

¹¹ ESCAP (2023). *The Research Ecosystem of Cambodia*. Available at: <https://repository-uat.unescap.org/items/eece734b-5384-40f0-97ab-b84a285cc031>.

fund ambitious, long-term research projects, procure necessary infrastructure, and attract top-tier talent. These limitations are compounded by the high costs and centralized nature of high-performance computing (HPC), creating additional barriers to training foundational AI models. A pragmatic approach is therefore needed, emphasizing strategic, context-appropriate investments and "frugal innovation," rather than competing in a costly global race for computational supremacy.

Second, human capital deficits present multi-layered challenges, notably a critical shortage of specialized AI talent such as data scientists, machine learning engineers, and ethical AI experts. According to the Future of Jobs Report 2025, half of global executives identify a lack of relevant skills as the primary barrier to AI adoption.¹² For developing countries, this is further exacerbated by systemic weaknesses in education pipelines and the "brain drain" phenomenon, where experts migrate to high-income economies, further depleting local capacity. Additionally, women graduating with STEM degrees face a significant drop-off in workforce participation: although women comprised 38.5 percent of STEM graduates globally in 2021, only 31.6 percent remained employed in STEM fields one year later, representing a decline of 6.9 percentage points.¹³

In Cambodia, just 4.6 percent of primary school students had access to the internet for educational purposes in 2022. Moreover, a persistent structural gender gap exists in STEM tertiary education, with female students severely underrepresented (17 percent female vs. 83 percent male), despite girls outperforming boys in PISA reading and science scores.¹⁴ This represents not only a significant loss of potential talent but also risks embedding gender bias into Cambodia's future technological workforce.

Third, data ecosystem gaps form a critical bottleneck. The availability, quality, and governance of data are not merely technical challenges but social issues that determine whether AI outcomes are inclusive or exclusionary. A primary concern is the absence of disaggregated data - data categorized by gender, age, ethnicity, and geographic location. Without such granular data, it becomes impossible to design or monitor inclusive policies. AI models trained on unrepresentative data inevitably replicate and amplify existing societal biases, resulting in unfair or irrelevant outcomes for marginalized groups.

This representation challenge extends beyond demographics. The global AI landscape is dominated by data from the Global North, creating significant informational imbalance. This issue is particularly pronounced for languages like Khmer, which is systematically underrepresented in major datasets. For example, leading public web datasets contain as little as 2GB of low-quality Khmer text, compared to 67GB for Thai or 1.81TB for Russian.¹⁵ This scarcity is not limited to language but extends to a lack of locally relevant imagery, academic research, and references to Cambodian experts and culture. Consequently, AI systems naturally default to Western-centric knowledge, histories, and expertise, undermining the performance and relevance of AI tools for local populations and creating a new form of informational dependency.

Fourth, nascent and fragmented governance structures hinder coherent policy development. Cambodia's low ranking (132 out of 194) in the 2024 Global Cybersecurity Index highlights a governance

¹² World Economic Forum (2025). *The Future of Jobs Report 2025*, fig. 4.13, p. 63. Available at: <https://www.weforum.org/publications/the-future-of-jobs-report-2025/digest/>.

¹³ World Economic Forum (2023). *Global Gender Gap Report 2023*, fig. 2.12. Available at: <https://www.weforum.org/publications/global-gender-gap-report-2023/in-full/gender-gaps-in-the-workforce/>.

¹⁴ United Nations Educational, Scientific and Cultural Organization (UNESCO) (2025). *Cambodia Artificial Intelligence Readiness Assessment Report*, pp. 31 and 33. Available at: <https://cadt.edu.kh/resources/digital-skills-assessment-event-2021/cambodia-artificial-intelligence-readiness-assessment-report/>.

¹⁵ Hugging Face (2025). 'FineWeb2' dataset (HuggingFaceFW/fineweb-2), released 24 June 2025. Available at: <https://huggingface.co/datasets/HuggingFaceFW/fineweb-2>.

framework that is still in its early stages.¹⁶ The national data governance framework, including the draft Personal Data Protection Law (PDPL), remains unimplemented, and Cambodia lacks specific legislation for AI procurement or a National Quality Infrastructure for AI standards. Furthermore, fragmented responsibilities across ministries for the digital agenda result in siloed efforts, duplicated work, and strategic incoherence. Globally, weak domestic governance positions developing nations as "rule-takers" in international debates dominated by powerful actors, potentially imposing standards misaligned with their developmental priorities and values.

Fifth, weak innovation ecosystem linkages create a "valley of death" for innovation, where promising research fails to transition into commercial products due to insufficient funding and support. This challenge is exacerbated by overly strict, complex or outdated regulations, which, although well-intentioned, inadvertently exclude smaller local innovators lacking compliance resources, thereby favoring larger, often foreign entities. In Cambodia, the disconnect between academia, industry, and government is evidenced by the absence of registered AI patents and limited venture capital activity. Without robust mechanisms to translate academic research into market-ready solutions and to ensure industry needs inform research agendas, innovation remains isolated, significantly muting its economic impact. Building trust and establishing platforms connecting academia, industry, and government is therefore essential to bridging this gap and fostering a thriving innovation ecosystem.

1.3 THE GLOBAL IMPERATIVES FOR INCLUSIVE AI: THE PACT FOR THE FUTURE, GLOBAL DIGITAL COMPACT AND DECLARATION ON FUTURES GENERATIONS

The United Nations' Pact for the Future provides the overarching mandate for international cooperation to narrow digital divides and ensure science, technology, and innovation (STI) become "a catalyst for a more inclusive, equitable, sustainable, and prosperous world for all."¹⁷ Adopted by consensus at the UN General Assembly's 2024 Summit of the Future, it commits all 193 Member States to move beyond a narrow focus on economic growth and to embrace the social and environmental sustainability dimensions of technology. It explicitly calls on Member States to embed digital inclusion within national development strategies and to set concrete, multistakeholder targets for universal, affordable broadband access, digital literacy, and gender-responsive technology policies by 2030.

The Global Digital Compact, annexed to the Pact, serves as the principal vehicle for correcting power imbalances in how digital technologies, including AI, are created, distributed, and governed. It aspires to achieve "an inclusive, open, sustainable, fair, safe, and secure digital future for all" and is grounded in the crosscutting principles of inclusive participation, development orientation, full respect for international human rights law, gender equality, environmental sustainability, and multistakeholder cooperation. To accomplish this goal, the Compact sets out five mutually reinforcing objectives: (1) close all digital divides and accelerate progress across the Sustainable Development Goals; (2) expand inclusion in - and the benefits of - the digital economy for all; (3) foster an inclusive, open, safe, and secure digital space that respects, protects, and promotes human rights; (4) advance responsible,

¹⁶ International Telecommunication Union (ITU) (2024). *Global Cybersecurity Index 2024 - 5th edition*. Available at: <https://www.itu.int/epublications/publication/global-cybersecurity-index-2024>.

¹⁷ United Nations (2024). *Pact for the Future: Global Digital Compact and Declaration on Future Generations*. Available at: <https://www.un.org/en/summit-of-the-future/pact-for-the-future>.

equitable, and interoperable data governance approaches; and (5) enhance international governance of artificial intelligence for the benefit of humanity.

The Declaration on Future Generations, also annexed to the Pact, reinforces this mandate by foregrounding intergenerational equity and the agency of children and youth, calling for their meaningful engagement in decision-making and sustained investments in education, digital literacy, and anticipatory capabilities such as foresight and futures literacy so they can shape technology-enabled development pathways. It reaffirms that the full spectrum of human rights - including the right to development - must guide the responsible and ethical use of science, technology and innovation, and urges governments to bridge digital divides within and between countries through inclusive and equitable governance, capacity building and technology transfer on mutually agreed terms. Read together, these provisions open practical avenues for developing countries to build youth-led AI ecosystems and to deepen cooperation across the global South - including, where appropriate, through South-South and triangular cooperation - to co-develop context-appropriate solutions aligned with national priorities.

This global imperative is not merely aspirational. It is a political and diplomatic mandate upon which developing countries can build their national strategies and advocate for their interests. It legitimizes the pursuit of alternative, inclusive models of AI development that prioritize societal well-being over purely commercial or geopolitical competition. For a country like Cambodia, aligning its national AI aspirations with this global framework is a powerful way to attract development assistance, forge international partnerships, and ensure its voice is heard in the critical forums where the future of AI governance is being shaped.

2. APPLYING AN INCLUSIVE LENS TO AI INNOVATION: A CONCEPTUAL FRAMEWORK

To achieve the vision of a complementarity economy and inclusive AI innovation and to facilitate inclusive AI innovation that fosters human development within their countries, policymakers require a robust analytical framework. In 2020, ESCAP member-states adopted the *Guidelines for Inclusive Technology and Innovation Policies for Sustainable Development*¹⁸ which invite policymakers to look at technology and innovation policies through an inclusive lens, considering whose needs are met by innovations and how underrepresented social groups could be better served by - and participate in - innovative activities. These guidelines were further explored in ESCAP's 2021 report, *Frontiers of Inclusive Innovation: Formulating Technology and Innovation Policies that Leave No One Behind*.¹⁹ This framework, combined with the human-centric philosophy of the 2025 Human Development Report, provides a practical methodology for operationalizing the call to protect and expand human agency in the age of AI. This lens takes us beyond a simple "tech for good" narrative toward a more rigorous analysis of the structural choices that determine who benefits from innovation.

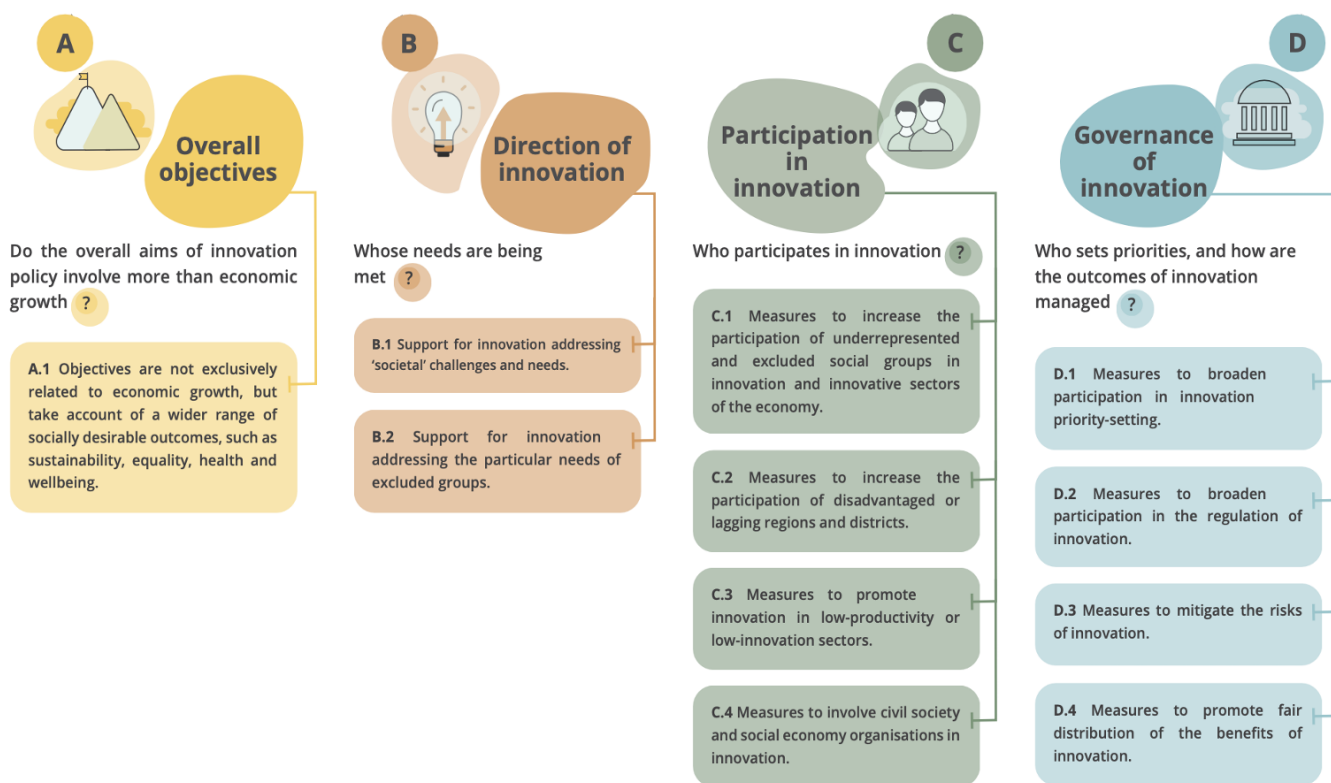
The guidelines poses four critical questions, which can be broken down into eleven indicators, to guide the formulation of inclusive science, technology and innovation (STI) policies (see figure 2). These questions provide policymakers, regulatory bodies, and STI promotion agencies - with a structured way to analyse and shape AI development throughout the entire policy cycle. Stakeholders can apply these questions at key stages: from initial scoping and agenda-setting, through stakeholder consultation and policy formulation, to implementation, evaluation, and adjustment. The insights generated should inform policy priorities, instruments, and governance mechanisms, ensuring innovation meets social objectives, reduces exclusion, and equitably distributes benefits.

The sections that follow will explore each of these points further, illustrating them through the experience of COPAI in Cambodia, complemented with other relevant cases from developing countries.

¹⁸ ESCAP (2020). *Guidelines for Inclusive Technology and Innovation Policies for Sustainable Development* (ESCAP/CICTSTI/2020/4). Available at: https://www.unescap.org/sites/default/d8files/event-documents/CICTST~2_4.PDF.

¹⁹ ESCAP (2021). *Frontiers of Inclusive Innovation*.

Figure 2: Guidelines for inclusive technology and innovation policies for sustainable development



Source: ESCAP (2021). *Frontiers of Inclusive Innovation: Formulating Technology and Innovation Policies that Leave No One Behind*; adapted from Nesta (2018), "How inclusive is innovation policy? Insights from an international comparison".

2.1 OVERALL OBJECTIVES

A.1 Objectives are not exclusively related to economic growth but take account of a wider range of socially desirable outcomes.

This first indicator challenges the narrow view that innovation's primary purpose is to increase GDP. For AI to be truly inclusive, its objectives must be explicitly linked to broader human development goals. Governments can focus on national human development priorities and tailor the approach to inclusive AI innovation to the local context. In Cambodia, through the COPAI dialogues, the concept of "Generous AI" emerged, which, grounded in Buddhist ethics, explicitly prioritizes societal well-being (*sukha*) and the reduction of suffering (*dukkha*) and inspires generosity (*dāna*).²⁰ This was complemented by discussions on "Green AI," which aims to develop energy-efficient models and apply AI to solve environmental challenges, demonstrating a multi-faceted objective that integrates economic, social, and environmental considerations from the outset.

²⁰ ESCAP (2025). 'Generous AI: Integrating Buddhism to Push the Frontiers of Inclusive Innovation in Cambodia.' ESCAP blog. Available at: <https://www.unescap.org/blog/generous-ai-integrating-buddhism-push-frontiers-inclusive-innovation-cambodia>.

2.2 DIRECTION OF INNOVATION

B.1 Support for innovation addressing 'societal' challenges and needs.

This indicator guides policymakers to prioritize innovations that solve real, pressing problems for society, rather than just creating novelties for the market. It requires identifying key national challenges - in areas like healthcare, agriculture, or education - and steering R&D resources toward them. The ChivCheat AI chatbot,²¹ designed to help Cambodian cashew farmers combat crop disease, aims to address the societal challenge of enhancing food security and improving rural livelihoods, rather than focusing on more commercially lucrative but less socially impactful applications. Another example of socially directed AI innovation is the World Bank's ZeroHungerAI initiative, which uses Natural Language Processing (NLP) to analyze news articles and other non-traditional data sources to predict food crises up to a year in advance. This early warning system improves forecasts by up to 50 percent and enables anticipatory humanitarian action, saving lives in data-scarce environments.²²

B.2 Support for innovation addressing the particular needs of excluded groups.

To be truly inclusive, innovation should be directed not only to general societal challenges, but also focus on the specific, often overlooked, needs of marginalized populations. This requires a deep, empathetic understanding of the barriers faced by groups such as the rural poor, persons with disabilities, or ethnic minorities. For example, recognizing that a significant portion of Cambodia's economy consists of micro-entrepreneurs with limited literacy, the GateMaster.AI platform was developed to reduce functional-literacy barriers by converting voice input into written Khmer or English, offering generative drafting tools and conversational coaching that open economic, social and civic opportunities well beyond the digital sphere.²³ Similarly, Cambodia Academy of Digital Technology's "Machine Translation for Khmer Braille" project instantly converts Khmer text, including complex scripts and mathematics, into Braille, cutting textbook production from days to minutes and providing more than 1000 visually impaired students with timely access to learning materials.²⁴

2.3 PARTICIPATION IN INNOVATION

C.1 Measures to increase the participation of underrepresented and excluded social groups.

This indicator asserts that the people who design and build technology profoundly influence its nature. To create inclusive AI, the teams building it must be diverse. That means proactive measures to bring under-represented groups, such as women, youth, persons with disabilities, older adults and rural populations, into the technology pipeline. The "Generative AI for Gen Z" training initiative, developed by IT Academy STEP Cambodia and Sisters of Code with support from the British Embassy in Phnom

²¹ CGIAR. 'Turning Cashew Dreams into Reality: Chivcheat's AI Chatbot on its Way to Transform Cambodian Agriculture.' Available at: <https://www.cgiar.org/news-events/news/turning-cashew-dreams-into-reality-chivcheats-ai-chatbot-on-its-way-to-transform-cambodian-agriculture/>.

²² World Bank, Development Impact Evaluation (DIME). 'AI' programme page. Available at: <https://www.worldbank.org/en/about/unit/unit-dec/impactevaluation/ai>.

²³ GateMaster.ai (2025). 'The Ultimate Power of AI - 10x Faster for All-Round Business Management Tasks.' Phnom Penh. Available at: <https://gatemaster.ai>.

²⁴ Cambodia Academy of Digital Technology (2025). 'Machine Translation for Khmer Braille - Gold Medal in the Cambodia Public Innovation Award 2025.' Available at: <https://cadt.edu.kh/news/machine-translation-for-khmer-braille-win-gold-medal-in-the-cambodia-public-innovation-award2025/>.

Penh, achieved 51 per cent female student participation, indicating that when training is accessible, locally delivered and contextually relevant, women participate at rates comparable to men, thereby strengthening gender balance in emerging technology fields.²⁵ Another illustrative programme is the UN Women AI School, a regional, cohort-based learning initiative that builds AI literacy and practical skills among policymakers, civil society advocates, UN staff and young leaders, bringing women's perspectives directly into AI debates and policy processes.²⁶ By positioning women as equal contributors while mainstreaming gender analysis, such initiatives help correct the gender-blindness that characterizes most national AI strategies, as fewer than 10 per cent explicitly examine gender dimensions.²⁷

C.2 Measures to increase the participation of disadvantaged or lagging regions and districts.

While creativity and entrepreneurial spirit exist in all communities, access to R&D infrastructure, finance, talent networks and reliable connectivity is often concentrated in major cities, exacerbating regional inequalities. Inclusive participation means creating opportunities for people in rural and remote areas to contribute to and benefit from innovation. This requires decentralizing resources and using technology to bridge geographic divides. The COPAI process was deliberately conducted using online and hybrid formats. This allowed stakeholders from other provinces to participate directly in national AI dialogues, sharing their unique perspectives on challenges like the rural digital divide, which would have been missed in a capital-centric process. Another bottom-up approach is illustrated by Plantix, an AI crop-diagnosis app that serves 134 000 daily active users in 177 countries and delivers one diagnosis every 1.5 seconds (around 57 600 images per day). Backed by a crowd-sourced dataset exceeding 50 million geo-tagged images and more than 20 million downloads, Plantix turns small-holder farmers into co-creators of the diagnostic model and early beneficiaries of the technology.²⁸

C.3 Measures to promote innovation in low-productivity or low-innovation sectors.

Innovation often focuses on high-tech sectors, neglecting traditional industries like agriculture or small-scale manufacturing where most of the workforce in developing countries is employed. This indicator calls for directing innovation to uplift these foundational sectors. The work of AI Farm Robotics in Cambodia is a prime example.²⁹ By developing agricultural robots tailored for local conditions and using Khmer language AI, they are directly applying advanced technology to a traditional, low-productivity sector, with the aim of increasing efficiency and yields for farmers. Moreover, AI can support grassroots innovators in traditional sectors by bridging critical knowledge gaps. The Grassroots Innovations Augmentation Network (GIAN) is developing an AI-powered platform that allows innovators to explore a database of over one million abandoned patents, building upon a vast repository of public domain technical knowledge and lowering barriers to innovation in sectors often overlooked by high-tech development.³⁰

²⁵ IT Academy STEP Cambodia and Sisters of Code, "GenAI for Gen Z: Inspiring the Next Generation of AI Creators to Enhance Lifelong Learning for All", workshop materials, Phnom Penh, 2025. Available at: <https://cambodiaict.net/wp-content/uploads/2025/02/01-GenAI-for-GenZ.pdf>.

²⁶ UN Women Asia and the Pacific (2025). *UN Women AI School*. <https://asiapacific.unwomen.org/en/partnerships/ai-school>.

²⁷ Akzente (GIZ). 'Interview: Anna-Sophie Herken - AI & FeMALE Leaders for Africa.' Available at: <https://akzente.giz.de/en/interview-anna-sophie-herken-ai-femai-leaders-for-africa>.

²⁸ Wang, S., et al. (2020). 'Mapping Crop Types in Southeast India with Smartphone Crowdsourcing and Deep Learning,' *Remote Sensing*, 12(18): 2957. Available at: <https://www.mdpi.com/2072-4292/12/18/2957>; Plantix. 'Facts and Figures,' Press & Media page. Accessed 25 July 2025. Available at: <https://plantix.net/en/press-media/>.

²⁹ AI Farm. Official website. Available at: <https://aifarm.dev/>.

³⁰ Grassroots Innovations Augmentation Network (GIAN). 'US-Patents Search.' Available at: <https://gian.org/search/us-patents>.

C.4 Measures to involve civil society and social economy organizations in innovation.

Civil society organizations (CSOs), inclusive businesses, cooperatives and social enterprises often have deep connections to and trust within marginalized communities. Involving them in the innovation process is crucial for ensuring that solutions are relevant, ethically designed, and effectively delivered. The entire COPAI model is a testament to this principle. It is not a government-only committee but a multi-stakeholder platform that consulted CSOs, such as the AI Forum Cambodia, and even senior monastic scholars, ensuring that a diverse range of non-state actors have a voice in shaping the national AI innovation agenda. Another example is the SEACrowd initiative, an open-source research community in Southeast Asia that provides a powerful model for bottom-up participation.³¹ By empowering local researchers to become the owners and stewards of their own linguistic data, it ensures that the foundational building blocks of AI are community-governed, not just corporate-owned.

2.4 GOVERNANCE OF INNOVATION

D.1 Measures to broaden participation in innovation priority-setting.

Inclusive innovation cannot follow a top-down approach, where a small group of experts sets the national research agenda. Inclusive governance requires that the process of deciding what to innovate is itself participatory, allowing a wider range of stakeholders to shape priorities. The co-creation of Cambodia's AI innovation ecosystem mapping process is a direct application of this principle. Instead of being drafted by a closed committee, the study was shaped over many months by a diverse community of roughly 60 contributors, including youth groups, provincial students, and CSOs, who had a direct say in identifying, for example, priority sectors and ethical safeguards. Thailand provides another illustration: under the "AI for Social Good" programme, the Office of National Higher Education Science Research and Innovation Policy Council (NXPO) convened two open co-creation workshops, where officials, scientists, university researchers, and user agencies jointly set research priorities. Before any funding was released, the group jointly assessed priorities and selected two pilot projects: a "Responsible Data-Sharing Sandbox" for digital-health governance, and an AI upgrade of the Thai People Map and Analytics Platform (TPMAP) to sharpen poverty-alleviation targeting.³²

D.2 Measures to broaden participation in the regulation of innovation.

While regulation is often perceived as a barrier to innovation, inclusive regulatory approaches enable the co-creation of rules that simultaneously foster innovation and protect public interests. Regulatory sandboxes have become essential mechanisms to achieve this, allowing businesses to test innovative AI propositions with real consumers in controlled environments. For instance, Kenya operates the ICT Sandbox under the Communications Authority, where AI-driven platforms for e-learning, telemedicine, and mobile health services have been collaboratively tested with inputs from regulators, innovators, and community representatives, ensuring consumer needs and data protection issues are effectively addressed.³³ In Brazil, the National Data Protection Authority launched a pilot AI sandbox in 2024,

³¹ SEACrowd. GitHub organization page. Available at: <https://github.com/SEACrowd>.

³² Office of National Higher Education, Science, Research and Innovation Policy Council (NXPO) (2022). 'NXPO and partners organize workshop to strengthen AI policy in the Asia-Pacific region,' news article, 6 September 2022. Available at: <https://www.nxpo.or.th/th/en/13036/>.

³³ Communications Authority of Kenya. (2023). Regulatory Sandbox. Available at: <https://sandbox.ca.go.ke/>

becoming one of the first countries to do so prior to passing an AI law. The design of the sandbox benefited from input submitted by the public via Brazil's national consultation platform, involving diverse stakeholders from academia, civil society, technology companies, and citizens to inform regulatory standards and ethical practices for AI.³⁴

D.3 Measures to mitigate the social risks of innovation.

Technological progress is not without its downsides, such as job displacement or the spread of misinformation. An inclusive governance framework must proactively anticipate and put in place measures to mitigate these risks, ensuring that the benefits of innovation are not outweighed by its social and environmental costs. For instance, a key challenge is the inherent bias found in many AI models, which can perpetuate harmful stereotypes and lead to discriminatory outcomes. This is starkly illustrated by the surge in AI-generated sexual deepfakes: It is estimated that 98 per cent of deepfake videos online are of pornographic nature and 99 per cent of those depicted are women or girls; moreover, AI-generated pornography is overwhelmingly non-consensual (>96 per cent), with more than 100,000 non-consensual images of women posted online in 2022.³⁵ In response to risks like these, initiatives such as the Parakh AI by CivicDataLab in India offer practical frameworks for citizen-led auditing of high-risk AI systems. This approach involves "red teaming," where citizens actively test AI applications to identify biases and other flaws. The findings can then be logged in a public issue registry, creating a transparent mechanism for holding developers accountable and mitigating harmful outcomes - such as gender-based discrimination - before they cause widespread harm.³⁶

D.4 Measures to promote fair distribution of the benefits of innovation.

The wealth and advantages generated by innovation can become highly concentrated. This indicator calls for mechanisms that ensure both the inputs for innovation and the resulting benefits are shared broadly. Open access to technology and data lowers entry barriers: platforms such as Hugging Face and foundational frameworks like Google's TensorFlow and Meta's PyTorch provide pre-trained models, tools and libraries that democratize AI development, enabling researchers, students and developers in the Global South to build on established work rather than starting from scratch.³⁷ Equally important, however, is guaranteeing that the outputs of innovation - for example, earlier cancer detection or simplified administrative processes for small businesses - are physically, financially and linguistically accessible to the wider population. Policy levers include public-goods licensing, tiered pricing, universal service funds, targeted subsidies and inclusive public procurement to scale proven innovations beyond pilot projects. The collaboration between Cambodia's AI Forum and AI Singapore to develop Khmer language capabilities for the SEA-LION large language model (LLM) illustrates this dual approach: by committing to make the model available as open source, the initiative ensures that its benefits reach students, researchers, start-ups and government agencies across Cambodia, rather than being captured by a single company.³⁸

³⁴ Autoridade Nacional de Proteção de Dados. (2023). Public Consultation on the AI Regulatory Sandbox. Available at: <https://www.gov.br/anpd/pt-br/assuntos/noticias/aberta-consulta-a-sociedade-sobre-sandbox-regulatorio-de-inteligencia-artificial-e-protecao-de-dados-pessoais-no-brasil>

³⁵ United Nations, Human Rights Council, *Prostitution and violence against women and girls*, Report of the Special Rapporteur on violence against women and girls, its causes and consequences (Reem Alsalem), A/HRC/56/48, 7 May 2024 (reissued 19 July 2024), paras. 15 and 24. Available at: <https://docs.un.org/en/A/HRC/56/48>.

³⁶ CivicDataLab. 'Parakh AI.' Available at: <https://civicalab.in/work/parakh-ai>.

³⁷ Built In. 'Open-Source AI' (overview page). Available at: <https://builtin.com/artificial-intelligence/open-source-ai>.

³⁸ Kiripost (2025). 'Cambodia and Singapore Partner to Develop Khmer Large Language Model,' January 2025. Available at: <https://kiripost.com/stories/cambodia-and-singapore-partner-to-develop-khmer-large-language-model>.

3. PATHWAYS FOR INCLUSIVE AI INNOVATION IN EMERGING ECONOMIES: LESSONS LEARNED FROM COPAI

Building on the inclusive innovation guidelines outlined above, the COPAI initiative in Cambodia was designed from the outset to put these principles into practice. Over the course of the 12 Hubs, AI Innovation Lab, and stakeholder dialogues, the process did more than test the framework - it revealed how its four dimensions and eleven indicators translate into concrete actions, trade-offs, and opportunities when implemented in a real-world, resource-constrained context.

From these exchanges, seven interlinked insights emerged, reflecting both the unique Cambodian context and broader lessons for other developing countries. These lessons include continuous, multi-level capacity building, co-creative policymaking processes, strategic AI ecosystem mapping, youth-led co-creation, frugal innovation driven by resource constraints, regional collaborations to overcome data scarcity, and culturally grounded ethical frameworks. Each is illustrated with practical examples from the COPAI experience and linked back to the relevant indicators, showing how inclusive AI innovation can be intentionally designed to respond to systemic barriers and align with human-centred policy goals. When taken together, these seven insights indicate a pathway for inclusive AI innovations that aligns with the Pact for the Future, Global Digital Compact and Declaration on Futures Generations (Section 1.3) and can be adapted to the reality of other developing economies, helping stakeholders to safeguard agency, reduce dependency on proprietary models and translate AI into measurable human development gains.

Moreover, these choices respond directly to the five systemic barriers identified in Section 1.2: resource constraints were addressed through frugal approaches and shared access to the MISTI high-performance computing platform; human capital deficits through a learning-by-doing approach and the engagement of university students; data scarcity through exploring open-source resources and regional collaboration (e.g., SEA-LION and SEACrowd); fragmented governance through interim ethical codes, ecosystem mapping and a sandbox-style practice environment; and weak linkages through dialogues that connect government, academia, firms and civil society. Figure 3 provides a snapshot of these insights, which are explored in detail in the sections that follow.

Figure 3: Lessons learned from COPAI



3.1 CAPACITY BUILDING AS A CONTINUOUS, MULTI-LEVEL PROCESS

Building a national AI-ready human capital base requires a continuous, multi-level approach that goes far beyond traditional university degrees. This means "investing in capabilities that count," which includes not just technical skills but also the critical thinking, ethical reasoning, and collaborative mindset needed to navigate the complexities of the AI era.

A key lesson from the COPAI process is that for an emerging and dynamic technology like AI, where no single actor holds all the answers, capacity building must be approached with humility - not as a top-down transfer of knowledge, but as a shared learning mission, understanding that in many respects, no one is a true AI expert, and everyone is learning as the technology evolves rapidly.

This philosophy was operationalized through COPAI's 'learning-by-doing' model that prioritized active, collaborative discovery. The Hubs were designed as a progressive learning journey, where the lessons from one session fed into the following discussions. By covering foundational concepts, ethical



frameworks, and economic applications together, the process actively built a shared understanding and established lasting relationships and communication channels that form the bedrock of a functional ecosystem. It is through these structured, shared learning interactions that a disconnected group of individuals is transformed into a collaborative network of peers.

This active learning was made more inclusive through innovative formats. For example, "field reports" presented by university student volunteers at the start of each Hub gave them a leadership role in introducing specific, ground-level topics relevant to their interests and concerns, ensuring the dialogue was grounded in local context. Another case was the COPAI AI Innovation Lab, which mobilized a diverse team of volunteers and government officials with the goal of prototyping an AI solution using exclusively the national high-performance computing platform (MISTI-HPC) as a sandbox-style practice environment. Arguably, the greatest value of the lab was not the final product itself, but the experiential learning that occurred during the process. It was only through hands-on experimentation that the team could discover the practical challenges and opportunities of the ecosystem - from learning how to use existing national hardware to identifying the real-world bottlenecks that stand between a prototype and a viable innovation pipeline.

Recommendations

- C1** → Foster collaborative networks through shared, 'learning-by-doing' capacity-building initiatives where the process of co-creation is valued as much as the final product.
- D1** → Leverage hackathons and innovation labs not just to produce prototypes, but as shared learning opportunities and diagnostic tools to identify and address specific bottlenecks in infrastructure, data, skills, and policy.
- D2** → Establish accessible regulatory sandboxes to allow for the safe testing of new AI applications, enabling regulators and innovators to experiment and co-develop effective, context-appropriate rules.

3.2 CO-CREATION AS A MECHANISM FOR BUILDING AN INCLUSIVE AI ECOSYSTEM



A deliberately designed co-creative process is not just a method for developing a policy; it is an essential tool for building the very ecosystem the policy aims to support. This is particularly critical for a rapidly emerging technology like AI, where the landscape of actors, challenges, and opportunities is in constant flux. A co-creative platform, therefore, serves a dual purpose: it not only includes known voices but also actively discovers new ones and surfaces the urgent, often unforeseen, conversations that are necessary for responsible innovation.

COPAI's consultative process functioned as a form of "continuous dialogue" that engaged essential intermediaries and stakeholders. The process uncovered context-specific challenges, such as regulatory hurdles or access to finance, and opportunities that were invisible from a purely administrative

perspective. Moreover, trust is a fundamental element, and its development naturally arises from shared experiences, mutual respect, and the consistent display of reliability and integrity. By adopting a more hands-on, partnership-based approach, policymakers could foster the trust and collaboration that are indispensable for a thriving innovation system.

The use of online and hybrid activities for the co-creation process was also critical for overcoming participation barriers, enabling the inclusion of youth, women, and participants from outside the capital, thereby convening diverse perspectives and ensuring equitable access for individuals from underserved regions. An iterative approach of developing and refining ideas across multiple Hubs fostered a sense of collective ownership by transforming stakeholders from passive subjects of consultation into active co-authors of collective knowledge and subsequent policy outcomes. When community representatives see their specific feedback - from high-level ethical concerns to granular technical challenges - visibly integrated into successive drafts, it builds the trust and mutual respect that are foundational to genuine partnership.

This sense of ownership, in turn, is vital for effective policy implementation because it converts the ecosystem's key actors into the policy's most credible champions. Rather than a top-down mandate to be complied with, the policy becomes a shared roadmap that stakeholders are intrinsically motivated to implement, advocate for, and align their own resources with. This iterative design mechanism can guide the nation's AI journey adaptively, ensuring it remains relevant by constantly sensing and responding to the rapid, often unpredictable, evolution of the technology and the ecosystem itself.

Recommendations

- C2** → Implement targeted programmes with inclusive design (e.g., hybrid formats, local language delivery) to bring rural and remote populations into the technology design and development pipeline through locally accessible delivery and infrastructure support.
- D1** → Design AI policymaking as an iterative, co-creative process that builds the innovation ecosystem itself by fostering trust, collective ownership, and turning stakeholders into policy champions.
- D2** → Create an inclusive multi-stakeholder advisory body to provide adaptive oversight, guide policy evolution, and ensure accountability in national AI policies.

3.3 ECOSYSTEM MAPPING AS A STRATEGIC POLICY TOOL

In a nascent and fragmented innovation landscape, comprehensive ecosystem mapping is critical for establishing the foundations for AI innovation and inclusion. In small- to medium-sized economies like Cambodia, valuable initiatives are often small, dispersed, and operate in silos, unknown to policymakers, potential collaborators, or even each other. This is compounded by the fact that private firms in developing countries face additional challenges to innovate, including limited access to finance, a shortage of skilled personnel, and prohibitive costs associated with navigating complex legal and regulatory hurdles. This lack of



visibility is a critical barrier that stifles synergy, leads to duplicated efforts, and prevents the ecosystem from achieving critical mass. Therefore, ecosystem mapping is not merely a preliminary research task but a strategic intervention that builds the ecosystem by making various actors aware of one another. The COPAI process, by its multi-stakeholder nature, functioned as a dynamic, live mapping exercise. The simple act of bringing diverse actors into the same virtual room revealed hidden capacities and created spontaneous, high-value connections. This embodies a 'network as an implementation strategy', an approach where networks of diverse stakeholders can emerge as more effective mechanism for policy implementation than traditional hierarchical models.³⁹

For example, through interviews conducted to understand private-sector needs, COPAI was able to identify specific technical challenges faced by local companies and social enterprises. Subsequently, through dialogue with academic partners, it was discovered that the newly inaugurated National Incubation Center of Cambodia at the Royal University of Phnom Penh was specifically equipped to address some of these needs and foster academia-industry collaboration. This connection, which could have remained hidden due to information gaps, demonstrates the power of mapping to bridge such gaps and create immediate, practical linkages.

Recommendations

- C4** → Leverage the deep community trust and reach of CSOs, universities, inclusive businesses and social enterprises by formally involving them in the co-design and delivery of AI solutions.
- D1** → Use multi-stakeholder convenings as a form of 'live mapping' to strategically identify and connect disparate actors, bridging information gaps between industry, academia, and government.

3.4 YOUTH AS PRESENT-DAY CO-CREATORS AND INNOVATORS

The COPAI experience underscored that youth are not just future adopters but are present-day users whose insights and energy are a critical resource for AI innovation. Engaging them directly and meaningfully addresses the participation dimension and transforms a demographic asset of Cambodia's young population into a developmental force. It requires moving beyond seeing youth as simply the target of education to viewing them as partners in co-creation. This is especially urgent given that 67 per cent of young people feel they have "limited to no control" over how technology will impact their lives.⁴⁰ The goal must be to grant them not just a voice, but genuine "decision rights" in shaping the digital infrastructure they will inherit.



³⁹ ESCAP (2024). *Policies to Promote Private Sector Engagement in Science, Technology and Innovation: Workbook*. Available at: <https://www.unescap.org/kp/2024/policies-promote-private-sector-engagement-science-technology-and-innovation-workbook>.

⁴⁰ UNICEF Office of Innovation. 'DPGs: Where digital sovereignty, digital upskilling and hope for a better digital future intersect,' UNICEF Venture Fund website. Available at: <https://www.unicefventurefund.org/dpgxyouth>.

Survey data from a 2024-2025 initiative by IT Academy STEP Cambodia and Sisters of Code, revealed that 84 per cent of the surveyed students were already using generative AI tools.⁴¹ This starkly illustrated that the primary need is not for introduction but for guidance on effective and ethical application, as well as for moving from AI adopters to AI creators. Moreover, as early and heavy users, students already encounter concrete failure modes such as hallucinated “facts” and biased or over-censoring outputs on sensitive topics, which gives them a practical awareness of where safeguards often fall short. Coupled with native digital fluency, this positions youth to notice high-risk behaviours in locally relevant contexts and articulate pragmatic fixes that formal testing may miss.

The COPAI model empowered students by providing them with active roles during the Hubs and the AI Innovation Lab, where they used the national high-performance computing platform to build real-world applications. This approach directly addressed the access gap to high-cost hardware and provided an opportunity for youth to develop tangible solutions. Moreover, by giving students access to national resources and a platform to contribute, the initiative fostered a sense of ownership and agency among the youth as well, cultivating the next generation of ethical innovators and leaders.

Recommendations

- C1** → Provide direct, hands-on access to national innovation infrastructure (e.g., high-performance computing, shared datasets, and sandbox testbeds) through youth fellowships, internships, hackathons, and supervised projects in partnership with local universities.
- D1** → Empower youth as present-day innovators by granting them genuine decision-making roles in AI agenda-setting and governance (e.g., co-designing research priorities, joining procurement pilots, and serving on multi-stakeholder advisory groups).
- D3** → Pilot youth-led auditing and red teaming for high-risk use cases to surface bias and harms before scale.

3.5 RESOURCE CONSTRAINTS AS A CATALYST FOR FRUGAL AND CONTEXT-APPROPRIATE INNOVATION

Limited resources, often seen as a purely negative constraint, can be a powerful catalyst for innovation, driving a focus toward frugal, efficient, and contextually appropriate solutions. This reflects the principles of grassroots innovation⁴² and offers a strategic alternative to the high-cost, capital-intensive “AI race.” By understanding resource constraints as unavoidable design parameters, governments can create targeted innovation policies to stimulate affordable, resilient AI solutions tailored specifically to local conditions, thereby safeguarding the



⁴¹ Rodionova, N. (2025). *AI Usage by Students in Cambodia: Surveys conducted in December 2024 and January 2025*. Sisters of Code. Phnom Penh.

⁴² Frugal innovation refers to innovations that are cost-effective, resource-efficient and specifically designed to meet the basic needs of underserved populations. Grassroots innovation describes innovations generated by local communities, often addressing local challenges through bottom-up approaches, drawing on traditional knowledge and practices. Definitions adapted from: ESCAP (2021). *Frontiers of Inclusive Innovation*.

viability of SMEs, public services, and rural producers, and opening new pathways for inclusive economic growth, job creation, and broader human development gains.

This is particularly relevant for Cambodia, where a recent survey found that only 42 per cent of surveyed institutions have access to Central Processing Unit (CPU) servers, 11 per cent have on-premises Graphics Processing Unit (GPU) processors, and 22 per cent use Cloud GPU services,⁴³ making on-premise, resource-efficient models a practical necessity in order to build sovereign AI capabilities while reducing expensive recurring fees to international companies. The COPAI process addressed this through the strategic use of the national high-performance computing platform (MISTI-HPC) by student volunteers to experiment and deploy AI models locally. By using compact, open-source models on shared national hardware, the volunteers demonstrated that LLMs can run on modest equipment, providing a clear alternative to the global push for ever larger, energy-hungry LLMs. It also addresses the resource gap since models can be selfhosted at zero licensing cost, delivering premium level capabilities on specific tasks without recurring subscription fees.

This focus on frugal innovation - achieving high impact with minimal financial and computational inputs through lightweight architectures, model compression, and community-owned infrastructure - can increase the availability of highly relevant, localized AI solutions. Grassroots innovators could leverage AI to access knowledge on modern materials (e.g., composites) or more efficient tools (e.g., gasifiers) that they otherwise wouldn't have. AI could potentially also scale local heuristics, such as the farmer's wisdom that "all plants which animals don't eat are a potential source of herbal pesticide." Examples of such an approach include locally developed AI chatbots, which use existing social media platforms to provide agricultural advice to farmers, and platforms offering business advisory services to SMEs, including support for operational challenges in traceability, logistics, and impact measurement. They demonstrate that high-impact AI does not necessarily require the most powerful hardware, but rather the most insightful understanding of the local context.

Recommendations

- B1** → Direct the national AI research agenda towards solving tangible, high-priority local problems (e.g., in agriculture, health, literacy) to demonstrate societal value and secure broad-based support.
- B2** → Reframe operating under resource constraints as a strategic opportunity to build technological capabilities on frugal AI innovation - developing efficient, low-cost AI solutions tailored to local contexts and responding the needs of marginalized groups, such as informal workers.
- B2** → Leverage AI to connect grassroots innovators with public domain knowledge, such as databases of abandoned patents, to accelerate frugal product development.
- C3** → Prioritize and channel R&D support to low-productivity but high-employment sectors (e.g., MSMEs) to ensure innovation benefits the majority of the workforce.

⁴³ UNESCO (2025). *Cambodia Artificial Intelligence Readiness Assessment Report*, p. 40.

3.6 REGIONAL COLLABORATION AS A VALUABLE SOLUTION TO DATA SCARCITY



Given that globally, AI talent and investment flow disproportionately to high-income countries and English-language models and applications, countries like Cambodia - where the local language Khmer is underrepresented in global datasets and commercially available AI tools - must identify alternative approaches to develop AI models relevant to local contexts. This is compounded by the risk of "digital colonization," where local data is extracted to improve proprietary models owned by foreign companies, with little value returning to the community that generated the data.

As mentioned earlier, AI Singapore's SEA-LION initiative, a flagship regional project as part of Singapore's approach to technological diplomacy, is developing a foundational LLM for Southeast Asian languages, including Khmer. By working closely with local partners to build capabilities, guide data collection, and contribute hardware for model training, the project demonstrates how top-down regional collaboration can unlock shared infrastructure, promote technology transfer, and protect smaller markets from dependence on Global North-centric models. Providing a high-quality, open-source foundational model allows countries like Cambodia to focus their limited resources on crucial tasks such as fine-tuning and data curation specific to their context. It is crucial, however, to ensure these models are genuinely open source rather than merely "open weight" with restrictive commercial licenses that limit their use.

At the same time, SEACrowd shows how bottom up, community driven collaboration can build truly inclusive and sovereign AI. SEACrowd is an opensource research community dedicated to advancing AI for the underrepresented languages of Southeast Asia. Its mission is not just to collect data, but to empower the next generation of local researchers to become the owners and stewards of their own linguistic digital future.

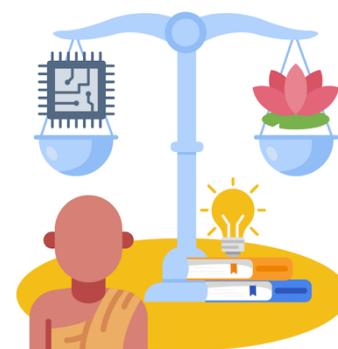
Together, these complementary approaches - SEA-LION's shared regional model infrastructure and SEACrowd's grassroots data commons - create a practical pathway for Cambodia to develop locally made, Khmer-relevant AI tools as digital public goods to encourage wide, low-cost reuse. Such collaboration lowers barriers to entry by pooling expensive compute resources, providing opensource model checkpoints, and offering community curated datasets and best practice guidelines, enabling universities, startups, and independent developers to innovate without starting from scratch.

Recommendations

- C4** → Pursue a dual strategy for data scarcity: engage in top-down regional collaborations for foundational models while simultaneously fostering bottom-up, community-driven initiatives to build sovereign data commons.
- D4** → Champion the creation of local language datasets and AI tools as digital public goods to lower barriers to entry, spur local innovation, and ensure equitable benefit sharing.

- D4** → Build upon existing digital public infrastructure, such as secure data exchange platforms, as a trusted foundation for data-driven innovation in both the public and private sectors.
- D4** → Foster a reciprocity practice in public AI/data platforms by encouraging every user who accesses or downloads information to also upload their own knowledge, such as an assignment or local observation, thereby improving the upload-to-download ratio and enriching the public knowledge commons.

3.7 CULTURAL VALUES AS A POWERFUL FRAMEWORK FOR ETHICAL INNOVATION



A key lesson is that integrating local cultural values provides a powerful, agile, and socially resonant framework for responsible AI governance. In a context where formal legal frameworks may be nascent, a culturally grounded ethical code can guide innovation effectively and build public trust. This form of "context-appropriate innovation" directly counters the risk of cultural homogenization from globally dominant AI models and ensures that technological development is aligned with societal values.

The COPAI experience demonstrated this through the development of the "Generous AI" concept,⁴⁴ an ethical framework explicitly grounded in Buddhist principles of compassion (*karuṇā*), non-harm (*ahimsā*) and generosity (*dāna*). Reflections on *kamma*⁴⁵ were directly applied to AI, leading to the conclusion that since AI lacks consciousness, the full moral responsibility for its outcomes - positive or negative - lies with the humans who finance, program, and deploy it. This provides a simple but profound accountability framework. Furthermore, the discussions also explored the idea of "digital merit-making," reframing investment in beneficial AI not just as a social good but as a culturally understood act of generating positive *kamma*, creating a powerful local incentive for ethical development.

This ethical understanding was not merely a theoretical exercise; it was operationalized through a Code of Conduct for community volunteers and informed by direct collaboration with senior monastic scholars during a dedicated Hub session. This approach enabled the rapid development of a shared ethical understanding that was both deeply Cambodian and universally comprehensible.

The cultural framing also opens new avenues for AI application. For instance, AI could be used to promote social morality and peace by analysing diverse religious texts (such as the Buddhist Tripitaka, the Vedas, and the Quran) to identify shared principles of tolerance and compassion, thereby fostering mutual respect in a way that would be challenging for any single human to achieve. Furthermore, AI can serve as a vital tool for cultural preservation, helping to digitize and safeguard the oral histories and traditional knowledge of indigenous communities, whose wisdom is often at risk of being lost. However, the dialogues also highlighted a crucial nuance: AI, lacking consciousness and "lived experience,"

⁴⁴ ESCAP (2025). 'Generous AI' (blog). Available at: <https://www.unescap.org/blog/generous-ai-integrating-buddhism-push-frontiers-inclusive-innovation-cambodia>.

⁴⁵ *Kamma* (Pāli; Sanskrit: Karma) refers to intentional actions - of thought, speech, or deed - that create moral consequences shaping future experiences.

cannot substitute for human wisdom. The advice from an AI, however well-trained on religious texts, is fundamentally different from the counsel of a monk whose wisdom is based on interpretation and experience.

The primary challenge of this approach lies in its implementation and enforcement. Translating the high-level "Generous AI" vision into funded, concrete policy instruments and verifiable standards is the critical next step. This could position Cambodia not as a mere adopter of external ethical norms, but as a potential contributor to the global discourse on responsible AI.

Recommendations

- A1** → Move beyond GDP-centric goals by explicitly aligning national AI policies with broader human development outcomes, such as equity, education, environmental sustainability and spiritual fulfilment.
- B1** → Promote the use of AI for cultural preservation, such as digitizing the oral histories of indigenous communities, and for fostering inter-faith tolerance by identifying shared values across religious texts.
- D2** → Co-develop national AI ethics frameworks with local cultural and spiritual leaders to create socially resonant and trusted principles to guide the development of AI solutions.
- D3** → Translate high-level ethical visions into funded, concrete policy instruments, verifiable standards and monitoring and evaluation systems to ensure practical implementation. These may include ethical requirements in procurement criteria, grant guidelines, and review checklists (e.g., require "non-harm/benefit" rationales in project proposals).

4. CONCLUSION AND WAY FORWARD

The COPAI experience in Cambodia highlights how co-creative approaches can effectively address the needs of one country for inclusive innovation and bridging the gap between global ambitions and local realities. It demonstrates that meaningful progress does not solely depend on technological advancement alone, but also on the participation, trust, and values from all walks of life in the society, that place people at the centre of innovation.

Several pathways emerge from this experience:

- **Co-creation for building inclusive innovation system:** using co-creative approach, and ecosystem mapping to build a vibrant innovation ecosystem.
- **Frugal and youth's driven innovation despite resource constraints:** focusing on youth as a co-creator and innovator and promoting frugal innovation as innovative approach to achieving the inclusive growth in emerging economies.
- **Regional collaboration for inclusive innovation:** promoting cross-border cooperation to achieve developmental goals and address societal challenges.
- **Cultural values for ethical innovation:** embedding cultural values in innovation to ensure ethical and socially responsible outcomes.



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