

Cambodia TNA Summary 2023

Overview

Cambodia has experienced strong economic growth, shifting from an agrarian economy to one increasingly driven by industry and services, though agriculture remains vital for rural employment. This expansion has been supported by a favorable investment climate, government reforms, and rising FDI, particularly in manufacturing, construction, and tourism. However, challenges remain, including urban-rural disparities, infrastructure deficits in energy, transport, digital connectivity, and a skills gap limiting technological adoption. To address these, the **Rectangular Strategy Phase IV** and Cambodia STI Roadmap 2030 prioritize science, technology, and innovation, focusing on R&D, digitalization, and STEM education to strengthen infrastructure, support economic diversification, and promote sustainability. These efforts align with Cambodia's ambition to graduate from LDC status by 2030 and achieve high-income status by 2050.

Agriculture

20% of GDP (key source of rural livelihoods)

Industry

34% of GDP (garment manufacturing, energy, and construction)

Services

46% of GDP (tourism, trade, transport and storage)

Priority Technology Needs

Cambodia's development strategy emphasizes technology-driven growth in key sectors, focusing on digital innovation, infrastructure, and sustainable energy to address rural-urban disparities, infrastructure gaps, and climate resilience. Key technologies include expanding internet access for education, fintech for financial inclusion, smart grids for energy reliability, and renewable energy solutions like solar and hydropower to support long-term sustainability. These initiatives align with Cambodia's Rectangular Strategy Phase IV and STI Roadmap 2030, which aim to enhance economic diversification, strengthen human capital, and drive technological adoption as the country progresses towards LDC graduation and long-term development goals.



Agriculture

Cambodia's agriculture sector, contributing over 20% of GDP, remains a vital source of rural livelihoods but faces challenges from low productivity, outdated techniques, and climate risks. Advancing precision agriculture, including smart irrigation, improved breeding for crops, livestock, and aquaculture, is crucial for boosting yields and resilience. Urban agriculture innovations, such as vertical and indoor farming, alongside bio-pesticides and bio-fertilizers, can support sustainable food production. Strengthening post-harvest and logistics technologies, including modern storage facilities and supply chain optimization, is essential to enhance efficiency and reduce post-harvest losses.



Energy

Rising energy demand and uneven access in Cambodia underscore the need for expanded distribution and efficiency improvements, particularly in rural and remote areas. Smart grids and microgrid technologies are essential for enhancing reliability and integrating renewable energy, while solar, bioenergy, and hydropower can reduce dependence on imports and increase sustainability. Digitalizing energy systems, including smart meters and automated monitoring, is key to improving efficiency and grid management. Capacity-building programs focused on renewable energy skills and technical training are also needed to develop a skilled workforce and address infrastructure challenges.



Healthcare

Healthcare in Cambodia faces challenges in service delivery, especially in rural areas, requiring technological advancements to expand access and improve efficiency. Telemedicine platforms and virtual consultations can help bridge healthcare gaps, while mobile diagnostics and portable imaging tools enhance early disease detection and response. E-pharmacy systems can improve medication access and distribution, and digital health data systems enable better patient management and decision-making. Additionally, AI-driven diagnostics support efficiency and preventive care, while capacity-building programs for healthcare workers are crucial to strengthening services and optimizing resources.



Education

Cambodia's education sector faces challenges from limited digital infrastructure and access to quality learning tools, reflected in a 14.7% tertiary enrollment rate. E-learning platforms with online/offline resources are essential for expanding accessibility, while improving internet access and digital devices in rural schools is crucial to bridging the digital divide. Technical and vocational education need to be strengthened to enhance rural outreach, expand STEM education, and improve workforce readiness. Digitalizing university management systems and modernizing curricula will also help align higher education with labor market needs and boost economic competitiveness.



Environment and Conservation

Cambodia faces severe environmental challenges, including deforestation, biodiversity loss, and climate risks, requiring advanced monitoring and sustainable management. Satellite imaging and IoT monitoring can help track forests and protect reserves. Waste recycling and wastewater systems can reduce urban pollution and enhance sustainability, while smart water management can improve conservation and efficiency. Digital climate adaptation tools and early warning systems are needed to boost resilience to extreme weather. Capacity-building initiatives for local governments and communities are also needed to ensure these innovations are effectively adopted and managed.

Cambodia's strategic emphasis on technology-driven development underscores its commitment to sustainability and economic modernization. **By prioritizing renewable energy, digital education, telemedicine, smart agriculture, and ICT expansion**, the country seeks to bridge urban-rural disparities, enhance resilience, and drive economic diversification. These initiatives align with Cambodia's Rectangular Strategy Phase IV and STI Roadmap 2030, positioning the nation as a regional leader in innovation and sustainable growth. With targeted investments and policy support, Cambodia is building human capital, strengthening infrastructure, and expanding digital access, laying the groundwork for long-term prosperity and resilience in a rapidly evolving global economy.

Country Context & Science, Technology, and Innovation Landscape

Cambodia's science, technology, and innovation (STI) ecosystem is evolving, emphasizing renewable energy, digital infrastructure, and digital education technologies to address limited R&D funding, weak coordination, and infrastructure gaps. The government is advancing STI policies with a focus on bridging rural-urban disparities and driving economic diversification. With a predominantly rural population reliant on agriculture, the STI Roadmap 2030 and Rectangular Strategy Phase IV aim to enhance productivity, expand job opportunities, and foster inclusive growth through technology adoption. By strengthening governance, capacity building, and infrastructure, Cambodia can bolster its innovation ecosystem and advance its goal of graduating from Least Developed Country status by 2030.

Human Development Index (HDI) Rank in 2019: 144/189 (UNDP, 2020)

16.7million
Population
(WB, 2020)

~57%
Youth <30
(UNSD, 2019)

5.2%
GDP Growth
(WB, 2022)

\$2,325
GDP per capita
(WB, 2022)

24.2%
Urbanization
(WB, 2020)

14.7%
Tertiary Enrollment
(UIS, 2019)

Frontier Technology Readiness Index (FTRI) Rank: 114/166 (UNCTAD, 2021)

56.7%
Internet Penetration
(ITU, 2022)

1.93% of GDP
R&D Expenditure
(UNESCO, 2021)

\$3.7^B
FDI Inflow
(WB, 2019)

82.5%
Access to Electricity
(WB, 2021)

35.9
PCI
(UNCTAD, 2022)

33.4%
Financial Inclusion
(WB, 2021)

Cambodia's evolving Science, Technology, and Innovation (STI) ecosystem, led by the **Ministry of Industry, Science, Technology, and Innovation (MISTI)**, is driving the country's transition to a technology-based economy. Initiatives in digital infrastructure, startup support, and STEM education are creating an enabling environment for innovation, while skills-building programs and expanded internet access support digital transformation. The growing startup ecosystem, backed by FDI in technology and infrastructure, and government programs promoting finance access for innovators, further strengthen Cambodia's capacity for homegrown solutions.

Although there has been strong commitment and marked progress, **Cambodia's STI development faces significant challenges, including weak stakeholder coordination, fragmented policies, and limited R&D funding, which constrain the country's ability to compete in high-tech sectors.** R&D expenditure remains low, restricting opportunities for domestic innovation. Additionally, brain drain among skilled professionals, particularly from rural areas, deepens urban-rural disparities, limiting inclusive growth. The education system struggles to keep pace with industry needs, with gaps in STEM-focused curricula and outdated higher education frameworks reducing Cambodia's ability to develop a competitive knowledge-based workforce.

While challenges remain, Cambodia's political stability, long-term development planning, and growing regional integration provide a strong foundation for innovation-led growth. The Rectangular Strategy Phase IV and STI Roadmap 2030 emphasize digital expansion, renewable energy, and science-driven economic diversification as key priorities. Strengthening patent enforcement, modernizing education systems, and increasing investment in R&D will be critical to unlocking Cambodia's full innovation potential. With strategic investments, stronger policy coordination, and enhanced digital connectivity, Cambodia can position itself as a regional leader in sustainable and technology-driven development, ensuring economic resilience and long-term competitiveness.

Key Recommendations

- Invest in STI governance system and policy framework, including sectoral STI strategies
- Create a national STI R&D funding agency to implement support programs.
- Create a balanced STI policy mix targeting start-ups, technology-based enterprises, and grass-roots innovators.
- Develop human capital for STEM fields, attract youth to research careers and innovation, and increase female participation in STEM.
- Enhance communication and collaboration between research performers and the private sector, integrating FDI into the innovation ecosystem.
- Strengthen research institutes to conduct and commercialize R&D in priority areas.
- Increase the number and qualifications of human resources for priority development sectors.
- Work closely with private sector and academia to improve investment and business ecosystems.
- Establish a policy framework to attract FDI, including technology transfer mechanisms.
- Invest in a solid STI foundation in education, with modern curricula, infrastructure, qualified teachers, and mentoring to promote STEM enrolment.
- Raise awareness of the patent system, industrial standards, innovation management, and PPP.
- Develop TVET programs and infrastructure to produce intermediate-level employees in key STI sectors.