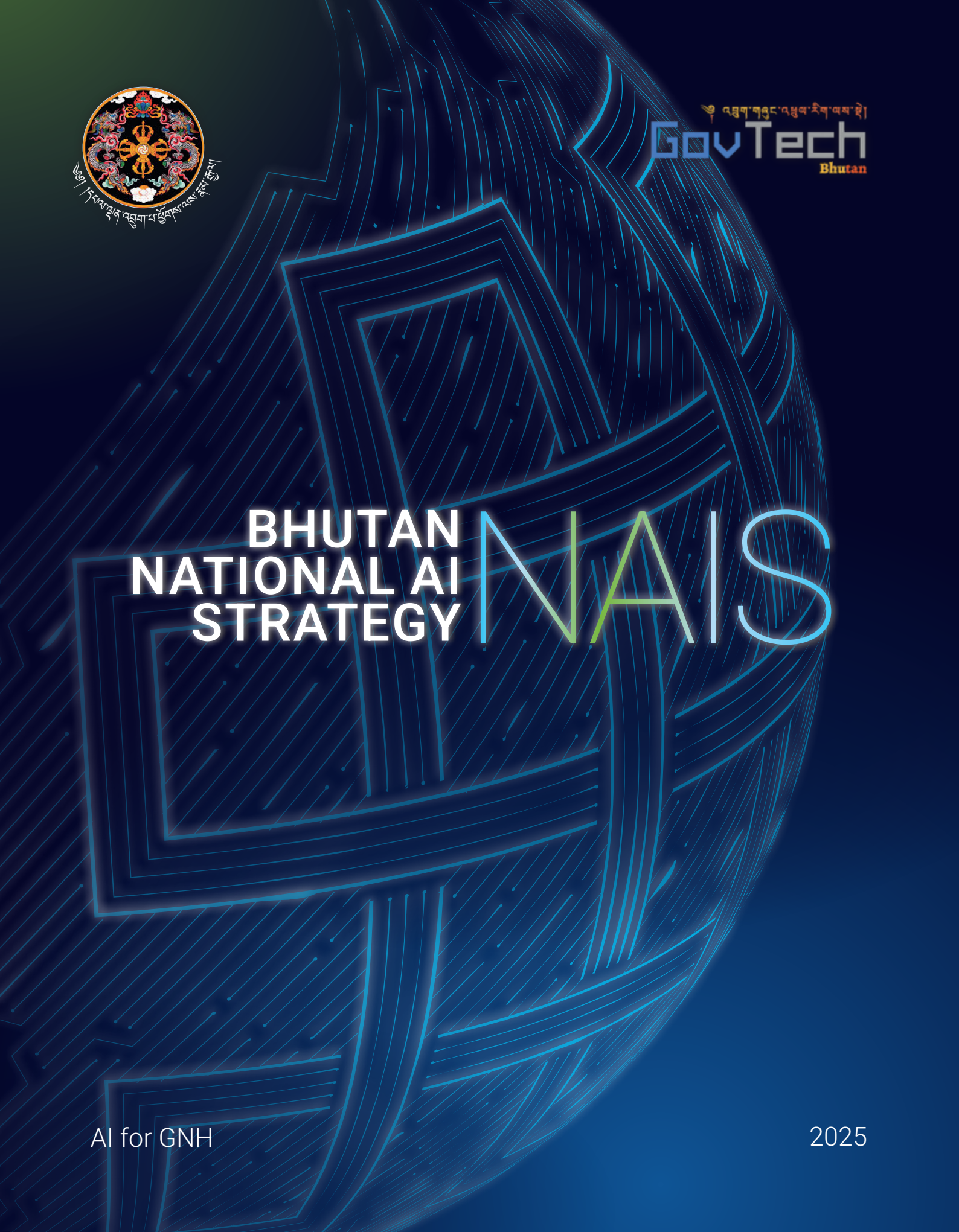
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GovTech
Bhutan
BHUTAN
NATIONAL AI
STRATEGY
NAIS
AI for GNH
2025

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GLOSSARY

AI	Artificial Intelligence
AR	Augmented Reality
ASR	Automatic Speech Recognition
CIIP	Critical Information Infrastructure Protection
e-GIF	e-Government Interoperability Framework
EWS	Early Warning System
FDI	Foreign Direct Investment
GDC	Government Data Centre
GLOF	Glacier Lake Outburst Floods
GNH	Gross National Happiness
GovTech	Government Technology
GPU	Graphics Processing Unit
HPC	High Performance Computing
IaaS	Infrastructure as a Service
ICM	Information, Communication and Media
LLM	Large Language Models
ML	Machine Learning
NAIS	National AI Strategy
NCD	Non-Communicable Disease
NCS	National Cybersecurity Strategy
OCR	Optical Character Recognition
R&D	Research and Development
RGoB	Royal Government of Bhutan
TVET	Technical and Vocational Education and Training
VA	Virtual Assistant
VPN	Virtual Private Network
VR	Virtual Reality

PRIME MINISTER

རྒྱལ་ཡོན་འབྲུག་གཞུང་།

Royal Government of Bhutan

Foreword

In the rapidly evolving 21st century, the integration of Artificial Intelligence (AI) is no longer optional but essential for national progress. I am pleased to present Bhutan's National AI Strategy (NAIS), a forward-looking plan that boldly positions AI as a core pillar of development, inherently advancing Bhutan's unique Gross National Happiness (GNH) philosophy. This strategy is not merely a technological roadmap; it is a direct response to critical national needs, addressing gaps and challenges identified in our AI Readiness Assessment (AIRA) and complementing the national digital goals outlined in our digital strategy.

Our ambition is clear: to move Bhutan's AI maturity from its current active stage to a systemic stage by the end of the 13th Five Year Plan. This comprehensive framework empowers the Royal Government to serve as both a strategic enabler and empowered user, fostering a vibrant AI industry across our economy. The GovTech Agency will be at the forefront of this transformation, leveraging digital technologies to boost economic growth, improve public service efficiency while enhancing governance. Our guiding vision, "AI for a Thriving Bhutan: Innovation rooted in GNH", ensures that all AI applications prioritize well-being across GNH's four pillars: socio-economic development, culture, environment, and good governance.

AI's transformative potential will redefine service delivery by streamlining processes, strengthening governance, and ensuring transparency. We have identified eight Key Focus Areas: Agriculture and Livestock, Tourism, Green Energy, Education, Health, Public Service Delivery, Natural Resources and Biodiversity, and Culture and Language to guide AI adoption for sustainable growth and enhanced quality of life for our citizens.

Crucially, this strategy is grounded in a human centered approach, emphasizing ethical and inclusive AI and robust regulatory frameworks to ensure fairness, accountability, and the prevention of biases. Furthermore, Bhutan will strategically leverage its abundant hydropower potential to develop green, energy efficient data centers, establishing our nation as a regional AI hub and attracting global investments in sustainable technology.

The success of this strategy hinges upon strengthening seven fundamental enablers: Infrastructure, Governance and Regulations, Cybersecurity, AI Skills and Talent Development, Research and Development, Collaboration, and Funding Support. Through concerted efforts across these critical areas, we will collectively shape a future where AI supports our cherished culture, drives environmental sustainability, and enriches the collective well-being of every Bhutanese citizen.

(Tshering Tobgay)

EXECUTIVE SUMMARY

The Bhutan's National AI Strategy (NAIS) is designed to leverage Artificial Intelligence (AI) to advance the country's unique development philosophy of Gross National Happiness (GNH), which prioritizes holistic well-being, sustainability, and cultural preservation.

While Bhutan's AI ecosystem is currently at the active stage of Gartner's Maturity Index, this strategy directly addresses the critical gaps and challenges identified in the AI Readiness Assessment (AIRA) to advance Bhutan's AI maturity to the systemic stage by the end of the 13th Five Year Plan.

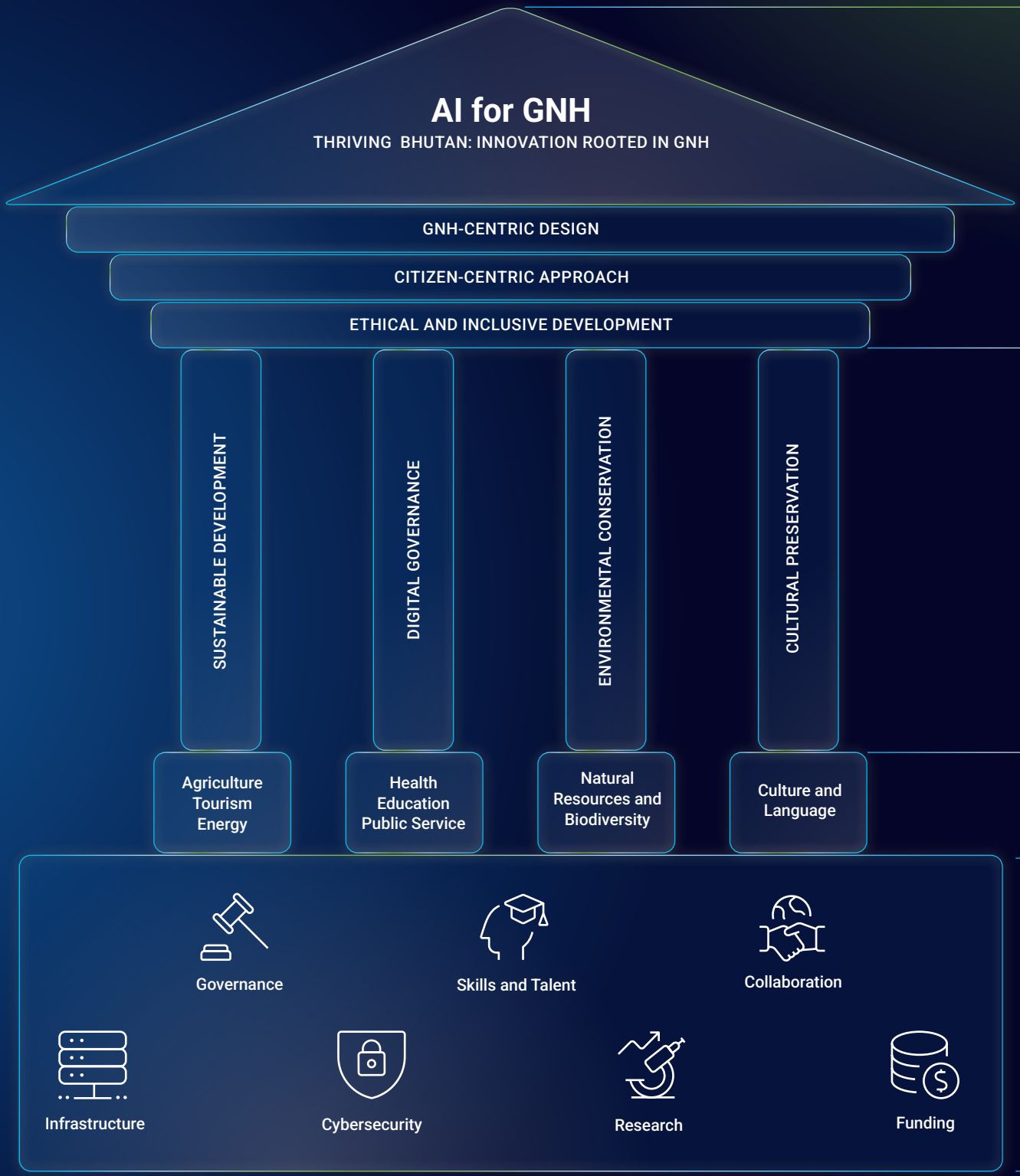
This comprehensive strategy provides a framework for the Royal Government of Bhutan to act as both a strategic enabler of the AI environment, fostering the AI industry in the wider economy, and an effective user of AI within the public sector. It outlines plans to integrate AI into eight Key Focus Areas: Agriculture and Livestock, Tourism, Green Energy, Education, Health, Public Service Delivery, Natural Resources and Biodiversity, and Culture and Language. These areas aim to enhance public services, drive sustainable economic growth, and improve the quality of life.

Crucially, the strategy adopts a human-centered approach, prioritizing ethical and inclusive AI development aligned with GNH principles. Recognizing significant gaps in Ethical AI, the strategy emphasizes establishing comprehensive regulatory and monitoring frameworks to ensure transparency, fairness, and accountability.

The strategy also aims to drive sustainable economic growth by positioning Bhutan as a regional hub for energy-efficient green data centers, given the potential to generate abundant hydropower resources. Its successful implementation hinges on strengthening seven key enablers: Infrastructure, Governance and Regulations, Cybersecurity, AI Skills and Talent Development, Research and Development, Collaboration, and Funding Support.

Recognizing the rapidly evolving nature of AI, this strategy incorporates an adaptive approach with actionable plans to be reviewed annually, and the overall strategy to be comprehensively reviewed after five years, ensuring its continued relevance and effectiveness. Through these concerted efforts, Bhutan aims to create a future where AI enhances collective well-being, supports cultural identity, and contributes to a sustainable and inclusive society, realizing the vision of "AI for a Thriving Bhutan: Innovation rooted in GNH".

FIGURE 1: OVERALL STRUCTURE NAIS, 2025



INTRODUCTION

VISION

GUIDING PRINCIPLES

OBJECTIVES

KEY FOCUS AREAS

KEY ENABLERS

Bhutan stands at a pivotal moment in its technological journey, transitioning from traditional governance to a digitally empowered nation. The country's digital transformation has been marked by strategic investments in infrastructure, education, and technological capabilities, with AI emerging as a key pillar of national development.

Bhutan's AI ecosystem is in its active maturity stage which is characterized by a growing understanding of AI's potential, initial implementation of AI projects, and a structured approach to integrating intelligent technologies across various sectors. The nation is rapidly moving beyond exploratory stages of experimenting with existing and emergent AI and related technologies, thus demonstrating a committed approach to leveraging AI for sustainable and inclusive development. By the end of the 13th Five Year Plan, Bhutan aims to reach Level 4 (Systemic) of Gartner's AI Maturity Model, driven by the implementation of actionable plans under key focus areas and enablers outlined in this strategy, indicating a sustained, enterprise-wide integration of AI solutions with measurable business value.

This National AI Strategy represents not just a technological roadmap but also a vision for intelligent and inclusive progress that aligns with Bhutan's unique developmental philosophy of GNH. Moreover, the AI strategy complements the national digital goals outlined in the National Digital Strategy 2024.

SCOPE

The NAIS provides a comprehensive framework to cultivate a thriving AI ecosystem over the next decade. This strategy encompasses strategic objectives, key focus areas, and enablers for AI adoption, and use across various sectors impacting people, businesses, government, and international partners. While outlining a national strategic vision for AI, high focus will be placed on short-term and medium-term actions to establish a strong foundation and drive early impact. Additionally, longer-term actions, requiring more than five years, have also been identified to ensure sustained growth.

To keep pace with the rapidly evolving nature of AI technology and adapt to emerging challenges and opportunities, this strategy will be reviewed after five years, and the long-term action plans may be adjusted accordingly. Actionable plans will be reviewed annually while preparing the annual work plan. This adaptive approach ensures that the strategy remains relevant and effective in guiding Bhutan's journey towards an "Intelligent Bhutan."

GUIDING PRINCIPLES

Bhutan's NAIS is guided by:

- GNH-Centric Design: Prioritizing AI applications that contribute to holistic well-being across four pillars of GNH: socio-economic development, culture, environment, and good governance.
- Citizen-Centric Approach: Focusing AI development on addressing the needs and aspirations of all citizens and enhancing public services.
- Ethical and Inclusive Development: Emphasizing fairness, transparency, accountability, and safety in AI systems while promoting equitable access to all Bhutanese.

VISION

AI FOR A THRIVING BHUTAN: INNOVATION ROOTED IN GNH

STRATEGIC OBJECTIVES

Aligned with Bhutan's GNH values, the NAIS aims to achieve the following objectives:

Objective 1

Drive innovative solutions for equitable and sustainable development.

Objective 2

Strengthen digital governance and public service delivery.

Objective 3

Enhance environmental conservation and energy sustainability.

Objective 4

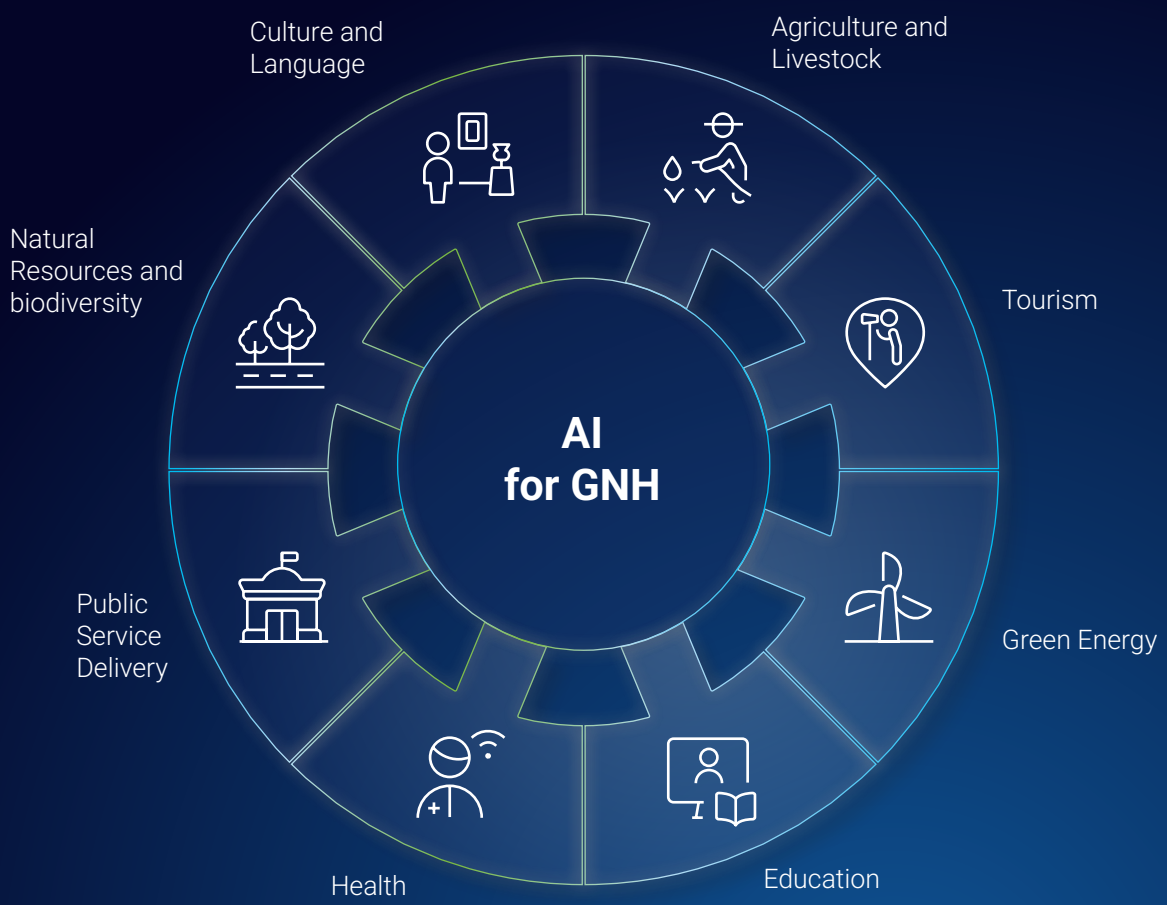
Safeguard and promote Bhutan's cultural heritage.

KEY FOCUS AREAS

Identifying focus areas for the strategy is essential to ensure effective resource allocation, strategic planning, and measurable impact. By concentrating on specific domains, the strategy can leverage opportunities aligning with our national priorities and broader development goals. The selected focus areas represent sectors with high potential for transformation, directly contributing to sustainable development, resilience, and the well-being of citizens.

The key focus areas are further supplemented by identifying the broad area of scopes. These areas are categorized into short-term (0–2 years), medium-term (2–5 years), and long-term (>5 years) based on their anticipated impact on the economy, implementation readiness, and urgency. The plans propose details of potential AI applications and serve as a comprehensive implementation roadmap to effectively guide the execution of the NAIS.

FIGURE 2: KEYFOCUS AREAS ALIGNED WITH OBJECTIVES

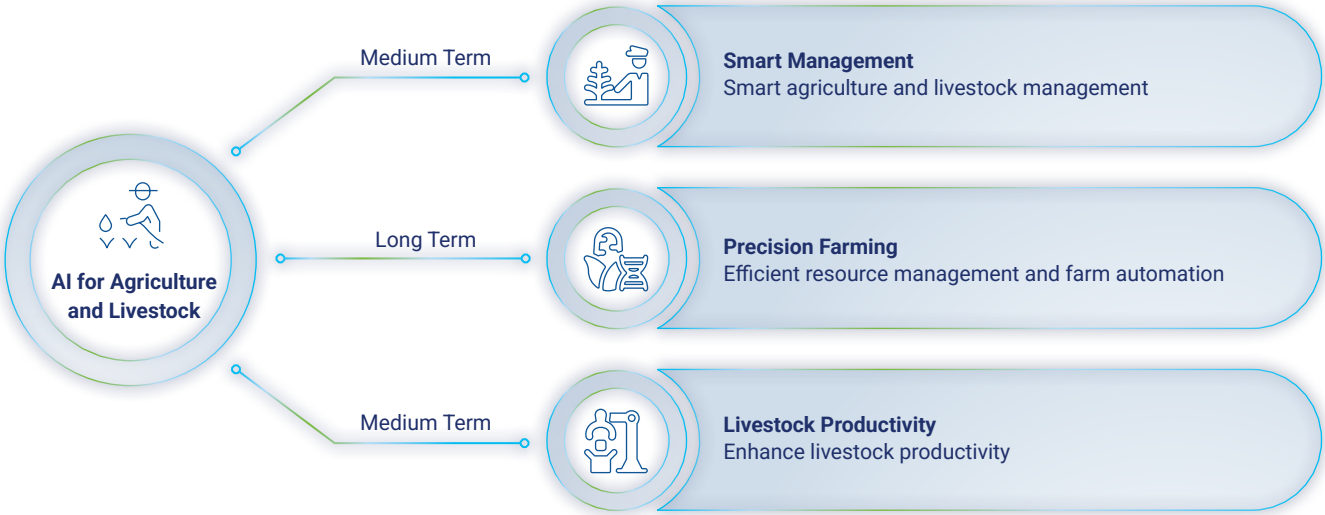


KEY FOCUS AREA 1:
Agriculture and Livestock

Agriculture and livestock farming are vital to Bhutan's economy, food security, and rural livelihoods. However, the sector faces several challenges due to Bhutan's mountainous terrain, limited arable land and dependence on traditional practices. Most farmers practice subsistence farming with minimal access to modern technology and expert guidance. Climate change further amplifies risks, affecting soil fertility, water availability, and disease outbreaks.

Leveraging AI solutions in agriculture and livestock will involve optimizing farming practices, enhancing efficiency, improving yields, and empowering farmers with innovative tools for sustainable productivity while ensuring against challenges such as resource limitations and climate change.

FIGURE 3: AI FOR AGRICULTURE AND LIVESTOCK



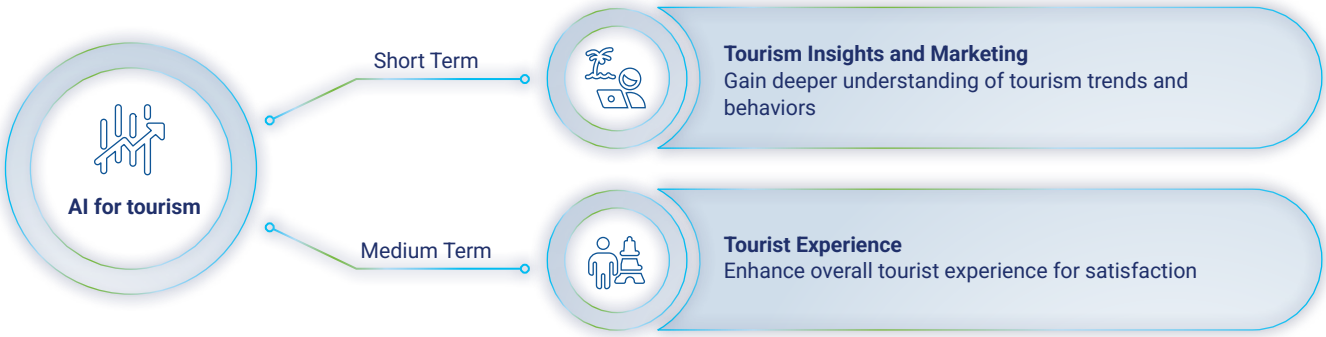
1. The integration of AI for smart agriculture and livestock management will provide near real-time advisory services, data analytics, and market intelligence to support informed decisions and boost productivity.
2. Integrating precision farming practices using AI, IoT, and drones will help optimize resource use, improve irrigation and soil health, and enhance resilience to climate change.
3. Adopting AI solutions for enhancing livestock productivity will enable data-driven genetic selection and sensor-based monitoring to improve animal health, nutrition and productivity.

KEY FOCUS AREA 2:
Tourism

Bhutan's tourism sector faces limitations such as limited international awareness, insufficient digital marketing strategies, and inadequate service infrastructure, which impact its growth potential. The absence of integrated systems for marketing, hotel management, guide coordination, and tourism inventory management leads to operational inefficiencies.

Implementing AI-driven solutions can streamline operations, elevate Bhutan's global visibility, and enhance the visitors' travel experience, making the country a more accessible and appealing destination for visitors.

FIGURE 4: AI FOR TOURISM



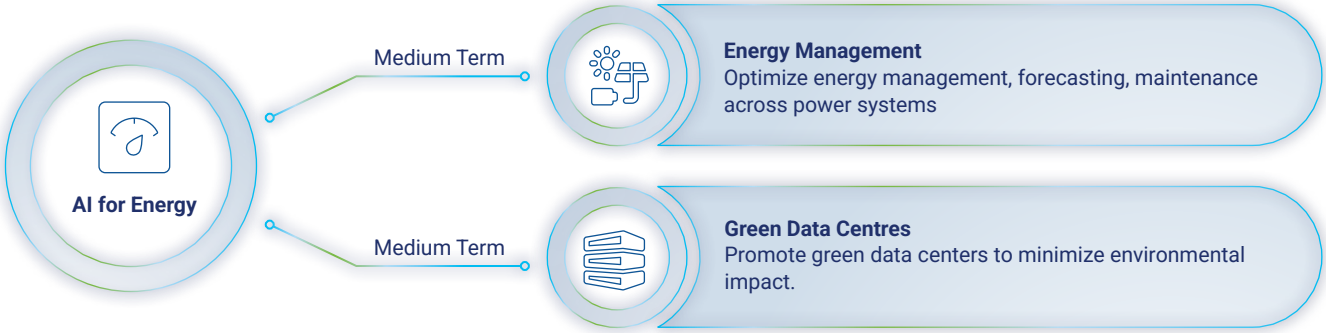
1. Leveraging AI for tourism insights and marketing, using data-driven digital campaigns, predictive analytics, and trend analysis to better target potential visitors and inform policy decisions.
2. Enhancing tourist experience through immersive technologies like AI-powered augmented reality (AR) and virtual reality (VR) and multilingual virtual assistants (VAs) will provide engaging, real-time support and cultural storytelling. Tourist experiences can also be enhanced by integrating AI into logistic management.

KEY FOCUS AREA 3:
Green Energy

Bhutan's energy sector is anchored in its abundant hydropower resources, providing clean, renewable electricity. However, the country faces challenges such as seasonal variations affecting power generation, and untapped potential in leveraging its green energy for broader socio-economic benefits. Additionally, Bhutan's energy infrastructure requires modernization to support emerging digital and AI-driven industries.

Bhutan's potential to generate abundant green energy presents a strategic opportunity to position the country as a hub for sustainable data centers. By leveraging its hydropower resources, Bhutan can support the growing global demand for energy-efficient, AI computing infrastructure. Strategic investments in AI-powered optimization can enhance operational efficiency, attract foreign investment, and promote economic diversification. By harnessing renewable energy to power intelligent data centers, Bhutan can drive innovation, optimize energy usage, and advance sustainable economic growth.

FIGURE 5: AI FOR ENERGY



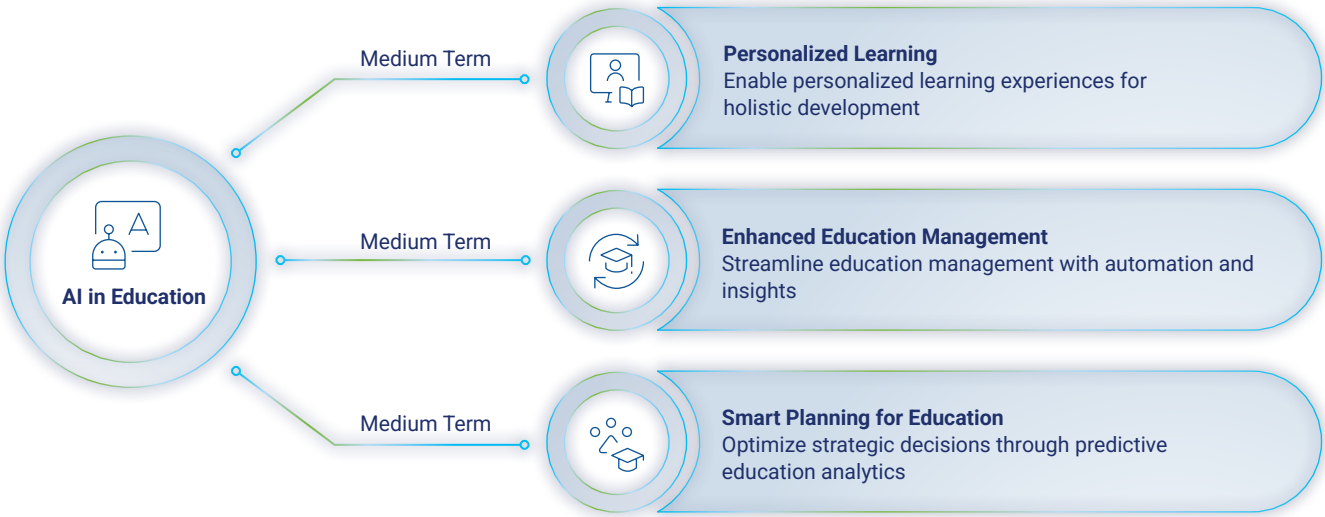
1. Developing an intelligent energy management system will leverage AI algorithms and smart grids to optimize energy use, support real-time forecasting and market analysis, enhance predictive and preventive maintenance, and improve sustainability.
2. Developing energy-efficient data centers powered by renewable energy sources to support sustainable computing, thereby positioning Bhutan as a regional hub for AI data centers.

KEY FOCUS AREA 4:
Education and Skills

The education sector in Bhutan faces significant challenges, including limited campus-wide internet access in schools, inadequate student-to-computer ratios and disparities in learning outcomes due to geographical location. A lack of an inclusive environment for students with special needs, insufficient infrastructure, unreliable digital connectivity, and a reliance on traditional curriculum and assessment methods further hinder progress. Additionally, the need for continuous professional development, particularly for teachers in technical and vocational education and training(T-VET), highlights gaps in teacher competency.

Leveraging AI can optimize educational processes, enhance engagement, and support personalized learning, making education more accessible, inclusive, and effective for all students and educators.

FIGURE 6: AI FOR EDUCATION



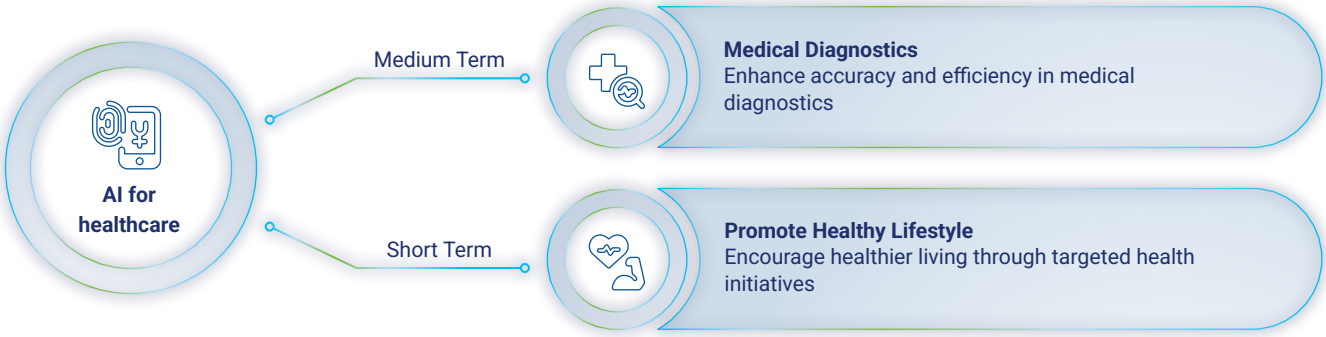
1. AI enables personalized and holistic learning through virtual tutors, chatbots, adaptive content, and career guidance enhancing academic growth, emotional well-being, and lifelong learning. In TVET, AI supports customized skilling, career alignment, and workforce readiness tailored to Bhutan's economic priorities.
2. AI-powered virtual assistants can streamline lesson planning, classroom management, assessment, and feedback. Integrated analytics improve decision-making, while personalized faculty training and business intelligence tools enhance the overall efficiency and quality of education systems.
3. AI-driven analytics enable data-informed education planning by tracking enrollment, workforce needs, and policy impact. Predictive models support school expansion, relocation, and capacity planning aligned with demographic and economic trends.

KEY FOCUS AREA 5:
Health

The rising prevalence of non-communicable diseases (NCDs), driven by lifestyle changes, poor diets, and an aging population, is compounded by increasing mental health issues. Despite efforts to address communicable diseases, the severe shortage of healthcare professionals remains a critical challenge. High attrition rates, escalating healthcare costs, and growing referrals abroad further strain the healthcare system. Additionally, the lack of AI training programs for healthcare professionals highlights the need for skills development to strengthen capacities and adopt innovative solutions for improved healthcare delivery and sustainability.

The integration of AI in healthcare will enhance diagnostic accuracy, improve efficiency, and expand access to expertise, particularly in underserved areas. It will reduce healthcare costs, enable remote assistance, and promote personalized health, physical activity, and mental well-being.

FIGURE 7: AI FOR HEALTHCARE



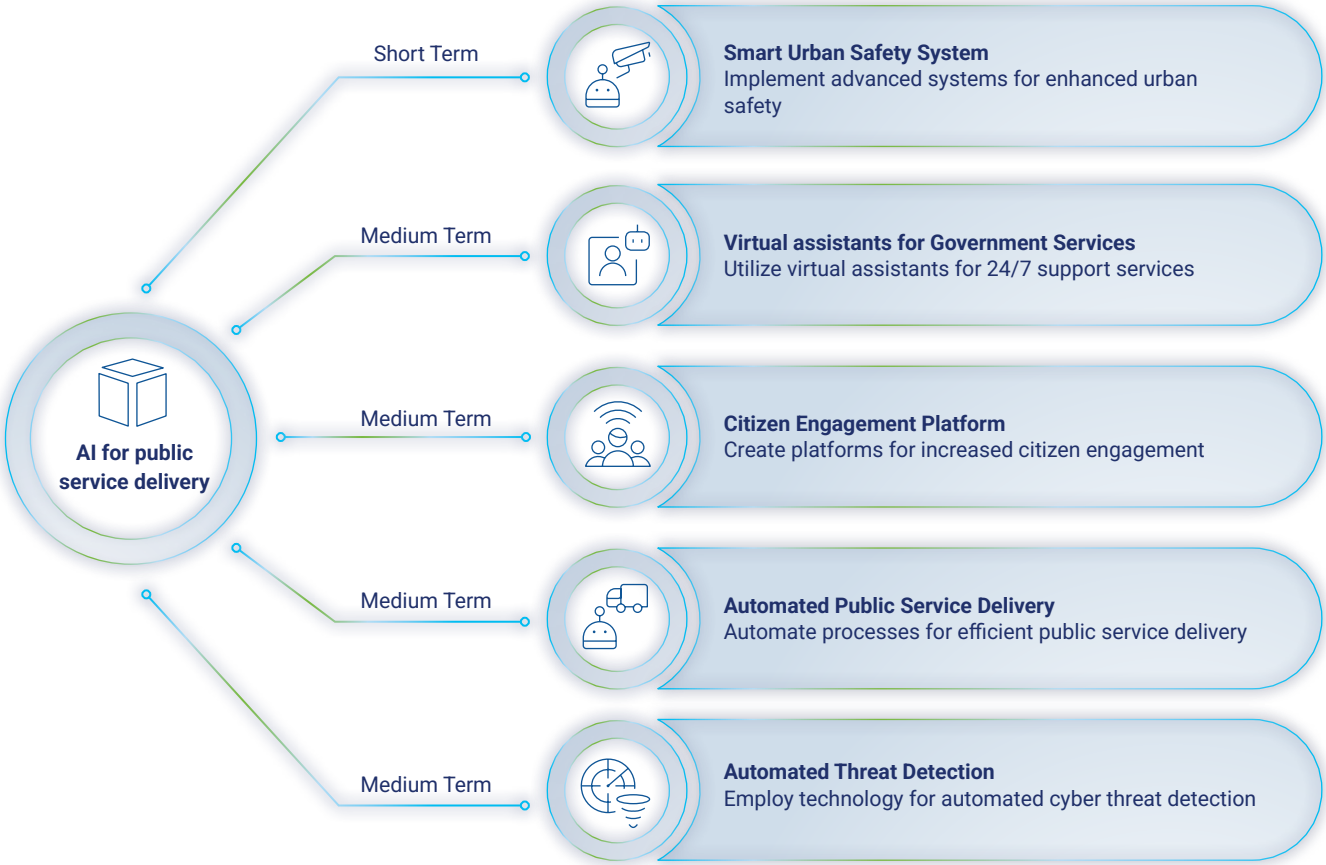
1. Improving medical diagnostics with AI to enhance the accuracy of detecting conditions such as pneumonia, tuberculosis, and cancer, while supporting lab analysis, expanding access to specialist care in underserved regions, and enabling predictive analysis for early detection of mass health risk.
2. Promoting healthy lifestyles using AI-powered personalized health advice, fitness initiatives, and mental wellness tools to help reduce the burden of NCDs and healthcare costs.

KEY FOCUS AREA 6:
Public Service Delivery

While 80% of Bhutan's public service delivery systems are digitalized, systemic inefficiencies limit their usage. Citizens often face challenges due to lack of end-to-end digitalization, requiring physical visits to multiple agencies, as not all the services are accessible through the citizen services portal. The absence of integrated government systems results in poor information exchange, data inconsistencies, and delays, compounded by bureaucratic hurdles despite digitalisation efforts. Additionally, the system lacks AI-driven automation, evidence based decision-making tools, and intelligent citizen engagement mechanisms.

To address these gaps, the way forward with AI in transforming public service delivery and elevating social welfare will need to prioritize streamlining service delivery mechanisms, ensuring accessibility, and building a citizen-centric governance model.

FIGURE 8: AI FOR PUBLIC SERVICE DELIVERY



1. The development of smart urban safety systems to enhance public security and traffic management using AI-enabled monitoring and optimization tools.
2. Virtual assistants across government services will ensure 24/7 multilingual support, streamline interactions, and improve citizen engagement.
3. The creation of a unified citizen engagement platform and service trend dashboard will enable data-driven governance and proactive communication.
4. Automating service delivery through AI will reduce bureaucratic delays and enhance user experience.
5. AI-powered cyber threat detection and incident response systems will bolster national safety and operational resilience.

KEY FOCUS AREA 7:
Natural Resources and Biodiversity

Bhutan's strong commitment to environmental sustainability is evident in its existing policies, regulations and Acts. However, the country remains highly vulnerable to climate change impacts due to its reliance on climate-sensitive sectors such as hydropower, tourism, agriculture, and forestry. Seasonal power shortages, compounded by reduced water flow during lean seasons for hydropower and rising domestic energy demand further exacerbate stress on natural resources. Additionally, disaster preparedness is limited by inadequate infrastructure, insufficient institutional capacities, and limited advanced Early Warning Systems (EWS). These underlying factors reiterated the need for advanced EWS that can forecast Glacial Lake Outburst Floods (GLOF) events with greater accuracy and precision, providing maximum lead time for evacuation.

These growing challenges underscore the need for comprehensive and innovative approaches to safeguard and optimize Bhutan's natural resources, and build environmental resilience where AI can play a critical role.

FIGURE 9: AI FOR NATURAL RESOURCES AND BIODIVERSITY

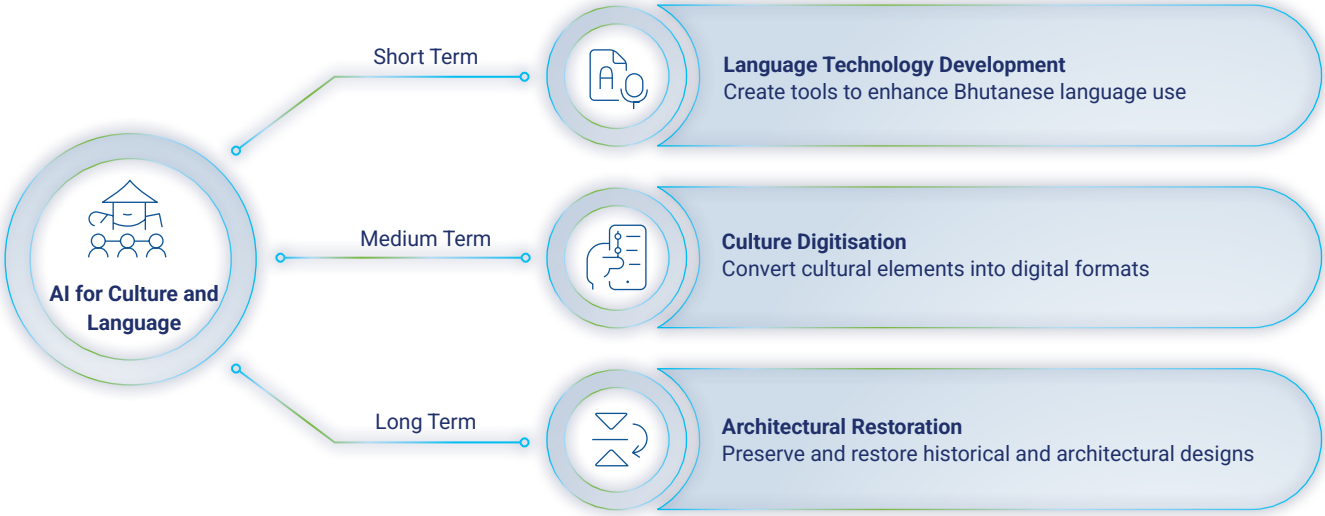
1. AI-powered drones, camera traps, and monitoring systems enable precise, low-cost tracking of biodiversity, from microbes to plants. With predictive analytics, secure data access, and genome sequencing for pharmaceutical research, cosmetics, and biotechnology, they enhance conservation, climate risk assessment, conflict reduction, and real-time protection.
2. Advanced tools using geological and remote sensing data will enhance mineral resource identification, reducing operational costs and improving exploration accuracy.
3. AI-powered analysis of satellite, drone, and sensor data detects deforestation, environmental degradation, and ecosystem stress, enabling timely interventions. For National Forest Inventory and Carbon Assessment, AI enhances measurement, reporting and varification by accurately estimating biomass and carbon stocks from satellite and field data.
4. Strengthen multi-hazard systems focused on climate change to detect and predict climate-related, natural, and man-made hazards using weather, seismic, and soil data. Real-time monitoring enables timely alerts, boosts resilience, optimizes emergency response, and supports long-term risk management. Leverage AI to help mitigate disasters driven by climate change such as GLOFs and other critical events affecting the nation's infrastructure, ecosystems, livestock, farming, and hydropower sectors.

KEY FOCUS AREA 8:
Culture and Language

Bhutan has consistently prioritized the preservation of its unique cultural identity within its development frameworks. However, the country faces challenges, including the loss of oral literature and traditional scripts, inadequate interactive educational tools for teaching Dzongkha and Bhutanese culture, and limited linguistic resources for AI model training.

Balancing modernization with cultural preservation remains a critical concern, and continued investment in technology-driven solutions will be essential to ensure Bhutanese identity and traditions endure in the digital era.

FIGURE 10: AI FOR CULTURE AND LANGUAGE



1. The development of technology for Bhutanese language such as machine translation, large language models, and speech systems to enhance digital accessibility, preserve Dzongkha, and support inclusive public services.
2. Digitizing cultural elements through Optical Character Recognition (OCR), transcription, and automated tagging will help preserve oral literature, traditional scripts, and artIfacts, forming the basis for immersive learning platforms on Bhutanese language, Buddhism, and meditation. This will enable embedding Bhutanese culture and values including GNH in AI agents.
3. Using advanced technologies like 3D mapping, digital twins, and image recognition will enable the precise restoration of historic architecture and murals, ensuring that Bhutan's tangible cultural heritage is documented, analyzed, and revitalized for future generations.

KEY ENABLERS

To fully harness the potential of AI integration across key areas, it is imperative to prioritize the creation of enabling environments that support the development, implementation, and long-term sustainability of the AI ecosystem. The NAIS identifies seven fundamental enablers: infrastructure, governance and regulation, cybersecurity, AI skills and talent development, research and development, collaboration and funding support. These enablers along with their identified activities are critical to ensuring that AI can effectively address national challenges, foster innovation, and unlock sustainable growth opportunities.

FIGURE II: KEY ENABLERS

KEY ENABLER 1:
Infrastructure

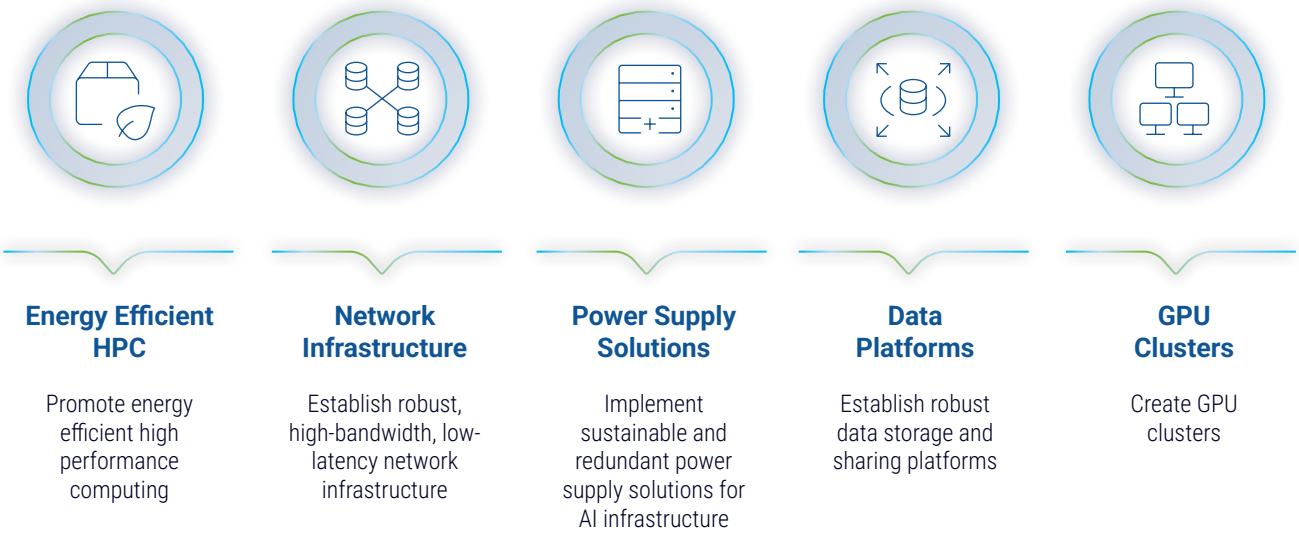
The Government Data Center (GDC) serves as a centralized Infrastructure as a Service (IaaS) facility designed to host critical applications for various government agencies. The GDC provides essential services such as virtual servers for hosting applications, secure Virtual Private Network (VPN) access, and robust resources including Graphics Processing Unit (GPU), memory, and storage.

Despite its capabilities, the GDC faces gaps and challenges that hinder its effectiveness in supporting AI initiatives. One significant challenge is the resource constraint, as AI projects typically require substantial data storage and computing power. Currently, the GDC has a few GPU-based servers, and there are similar facilities in Thimphu TechPark Private Limited (TTPL). However, the ability to handle the intensive demands of AI workloads are limited. Furthermore, issues related to connectivity and accessibility, including affordability, present additional hurdles in leveraging the full potential of the data center for AI development.

Data sharing is complicated by privacy, security, and compliance requirements, as well as interoperability issues that hinder smooth exchanges. Access to data is limited by restricted permissions, data silos, and slow retrieval, while poor data quality and inconsistent formats make the data harder to use.

Addressing these gaps is crucial for enhancing the GDC's role in enabling AI technologies and ensuring that government agencies can effectively utilize data-driven solutions.

FIGURE 12: ACTIONS FOR INFRASTRUCTURE



KEY ENABLER 2:
Governance and Regulations

Bhutan has made significant progress, starting in the early 2010s, with a whole-of-government approach to improve interoperability through shared services, data hubs, and system integration. The adoption of the e-Government Interoperability Framework (e-GIF) and national standards supports these efforts, while data management guidelines and AI ethics education are also being integrated.

However, there is limited awareness of existing data standards and inconsistent data management practices across agencies. The lack of a uniform legal provision for classifying government data based on sensitivity and shareability, combined with unclear legal guidelines, hampers data sharing. Siloed data management, including poor metadata practices, affects data integration and quality. Limited access to data and the absence of mechanisms to ensure the ethical use of AI further complicate the situation. Additionally, there is no comprehensive oversight, accountability, or transparency mechanisms, and no measures in place to prevent AI risks like bias, deepfakes, and privacy breaches.

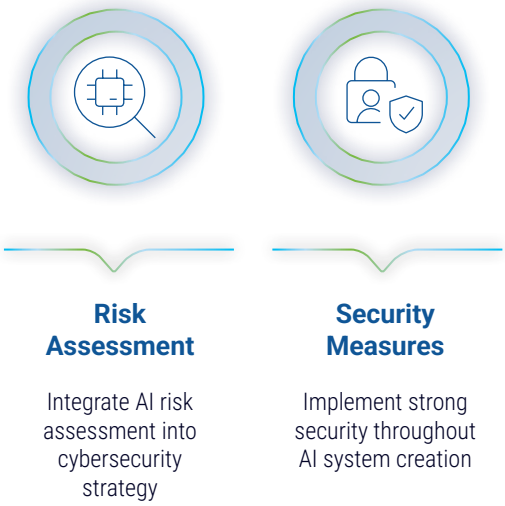
The governance and regulations enabler aims to establish ethical and inclusive policies that guide the responsible development and use of AI. This involves creating legal frameworks that prioritize human well-being, equity, and environmental sustainability while ensuring transparency, accountability, and data privacy. By aligning AI governance with GNH principles, it emphasizes social harmony, cultural preservation, and sustainable development.

FIGURE 13: ACTIONS FOR GOVERNANCE AND REGULATIONS

KEY ENABLER 3:
Cybersecurity

The first National Cybersecurity Strategy (NCS) was published in 2024, but the strategy doesn't have explicit provisions for AI risk and security, given that AI is in the early stage of adoption in the country. As AI adoption grows, securing AI systems and supporting infrastructure becomes critical. The lack of AI-specific cybersecurity expertise, evolving AI-driven cyber threats, vulnerabilities in AI systems, and the absence of clear integration plans in the National cybersecurity strategy might emerge as barriers to AI systems security. Thus, it is recommended to incorporate AI into NCS implementation plans such as the National Cyber Risk Assessment and Critical Information Infrastructure Protection (CIIP) guidelines, legislation and protection interventions. Likewise, measures shall be put in place to protect AI systems throughout its development lifecycle.

FIGURE 14: ACTIONS FOR CYBERSECURITY



KEY ENABLER 4:

Skills and Talent Development

Python programming is now part of the school curriculum from grades 9 to 12, while institutions like Sherubtse College, Gyalpozhing College of Information Technology, and College of Science and Technology offer data science and AI specialization courses, supported by long and short-term government training programmes. Additionally, TTPL has established Information Access Centers to support AI startups.

Despite these advancements, several challenges persist. The country faces a shortage of skilled AI experts (data scientists, ML/AI engineers, AI policy specialists) and researchers to support AI adoption. There are also no clear AI talent retention strategies and private sector participation in AI job creation remains minimal, hindering broader industry adoption within the country. Moreover, limited digital and AI literacy also pose a significant challenge in overall AI implementation.

FIGURE 15: ACTIONS FOR SKILLS AND TALENT DEVELOPMENT

Talent Cultivation

Develop local AI talent through programs

Education Integration

Integrate AI education into school and university curricula

Talent Retention

Implement strategies to retain local AI talents and attract global experts

Literacy Programs

Launch AI literacy and awareness programs for everyone

Deep Tech Development

Develop deep tech talents for future innovations

KEY ENABLER 5:

Research and Development

Research and Development (R&D) in Bhutan is still nascent but holds immense potential to transform key sectors like education, healthcare, and agriculture through AI. However, AI R&D growth faces hurdles such as limited funding, inadequate data availability, a lack of dedicated AI research labs, and a shortage of skilled professionals. Additionally, there is a disparity between research and market deployment.

Despite these challenges, Bhutan has taken initial steps toward fostering AI innovation, including the rise of startups and the publication of AI research in the Bhutan Journal of Research and Development. While these efforts are modest, they mark the beginning of AI R&D in the country, setting the stage for future advancements.

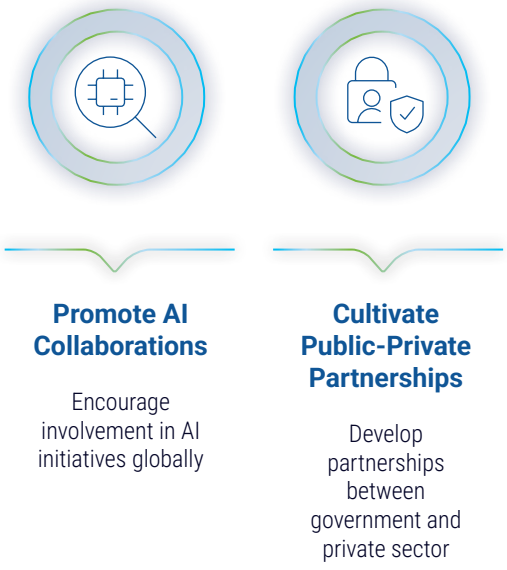
FIGURE 16: ACTIONS FOR RESEARCH AND DEVELOPMENT

KEY ENABLER 6:
Collaboration

Bhutan has made progress in AI and digital transformation through international partnerships, leading to AI labs and capacity-building initiatives. However, full technology integration remains hindered by infrastructural and policy constraints.

The current gaps and challenges include siloed operations with limited coordination among the government entities, private sector, and academic institutions, which slows progress. Communication barriers, such as slow knowledge transfer and bureaucratic delays also hinder efficiency. Many organizations face technological limitations, lacking the digital tools needed for seamless collaboration.

FIGURE 17: ACTIONS FOR COLLABORATION



KEY ENABLER 7:
Funding Support

While Bhutan currently lacks a dedicated budget for AI projects, the government is making substantial investments in broader digital transformation initiatives under its 13th Five-Year Plan (13FYP). A significant budget is allocated to digital transformation across key sectors: governance, economy, social, and security. This includes process automation and the adoption of emerging technologies to enhance citizen services. This strategic emphasis on digital transformation, automation, and data implicitly fosters the development of AI technologies within these broader digital efforts. GovTech Agency also operates a five-year AI lab program designed to cultivate an ecosystem for AI innovators and startups, building tech and non-tech talent through capacity-building and supporting the development of scalable minimum viable products.

Despite these initiatives, several funding-related challenges persist. A major obstacle is the absence of dedicated AI funding, which could hinder the development and deployment of advanced AI solutions. There's also a recognized low awareness among stakeholders regarding AI's full transformative potential, resulting in slower adoption. The private sector shows reluctance to invest in high-risk AI projects, a common issue in emerging markets. Additionally, a lack of coordination among funding efforts from governmental bodies, private sectors, and international organizations can lead to inefficiencies.

FIGURE 18: ACTIONS FOR FUNDING SUPPORT

Allocate AI Funding

Dedicate resources to AI and start pilot projects

Integrate AI Initiatives

Incorporate AI into ongoing digital transformation efforts

Provide Incentives

Offer financial rewards to encourage AI investment

Promote Collaboration

Encourage participation in global AI funding partnerships

Secure Funding

Ensure long-term financial support for AI research

MONITORING AND EVALUATION

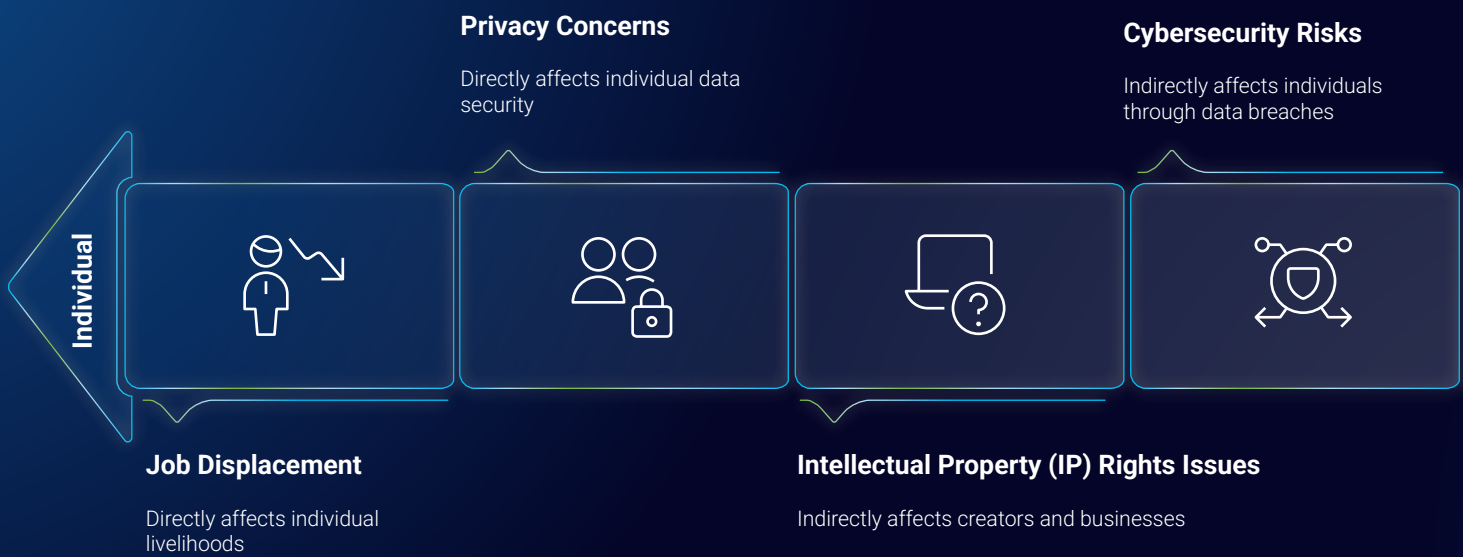
To ensure the successful implementation of the strategy, establishing a robust monitoring and evaluation (M&E) mechanism is important for systematically tracking progress and assessing outcomes. The strategy will be reviewed after five years, during which the effectiveness of the action plans and overall strategic objectives will be evaluated.

The implementation will be reviewed annually and the GovTech Agency along with relevant agencies will incorporate the action plans in the Annual Work Plans(AWPs) through which M&E framework will be effectively embedded within the AWPs of the relevant implementing agencies. This strategic integration ensures that the activities, performance indicators and timelines of the strategy are fully incorporated into the agencies' yearly planning processes.

RISK IDENTIFICATION AND MITIGATION STRATEGIES

NAIS acknowledges that while it offers significant potential for innovation and transformation, various risks may emerge during its implementation. To address these, agencies involved are encouraged to undertake thorough risk analyzes and develop well-defined mitigation strategies. This proactive approach aims to ensure that the NAIS is carried out responsibly and inclusively, aligning with national priorities and safeguarding long-term societal and economic interests.

FIGURE 19: RISK OF AI



1. JOB DISPLACEMENT

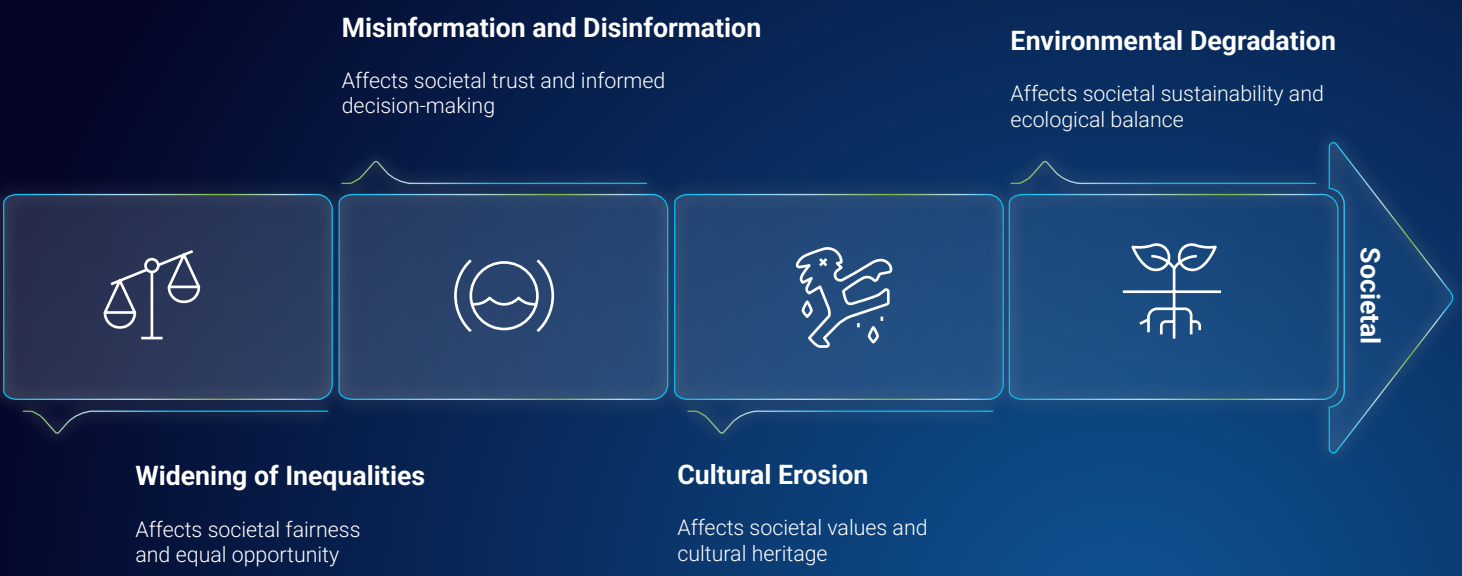
The adoption of AI may lead to the displacement of certain jobs, especially those involving repetitive tasks. To address this, the AI Skills and Talent Development enabler emphasizes integrating AI education into school and university curricula, offering hands-on training and workshops, and implementing talent retention strategies to reskill the workforce. In parallel, the Collaboration enabler fosters partnerships between the government, academia, and private sectors to promote inclusive job creation through the development of new AI-driven industries, ensuring that the workforce transitions smoothly into an AI-powered economy.

2. INTELLECTUAL PROPERTY (IP) RIGHTS ISSUES

With AI-generated content becoming more prevalent, current legal frameworks may not adequately address ownership and rights issues. The Governance and Regulations enabler supports the need to review and update key legal instruments such as the ICM Act, IP Rights legislation, and ICT regulations. These revisions will ensure clear legal guidance around authorship, ownership, and liability in the context of AI-generated innovations, thereby fostering trust and innovation in the AI ecosystem.

3. WIDENING OF INEQUALITIES

AI could widen the digital divide if access is unequal across different regions and communities. The Infrastructure enabler addresses this risk by advocating for improved broadband connectivity and access to national AI platforms. Simultaneously, the AI Skills and Talent Development enabler promotes digital literacy programs and AI education specifically tailored to underserved communities. Furthermore, the Governance and Regulations enabler ensures that inclusive policies are implemented to promote fairness, equity, and accessibility in AI deployment.



4. PRIVACY CONCERNS

As AI systems rely heavily on large volumes of data, there is a significant risk to personal privacy. The Governance and Regulations enabler supports the establishment of a comprehensive Data Governance Framework that mandates legal compliance, high data quality, and responsible data management practices. Additionally, the Cybersecurity enabler advocates for the implementation of privacy-by-design principles and secure data access protocols in the development and deployment of AI systems to protect individuals' information.

5. CYBERSECURITY RISKS

AI systems can be exploited through new forms of cyber threats such as data poisoning or adversarial attacks. The Cybersecurity enabler mitigates this risk by calling for the integration of AI-specific risk assessments into the NCS, establishing CIIP for AI assets, and securing the full AI development lifecycle from data collection to model deployment. These measures ensure the integrity, availability, and confidentiality of AI systems.

6. CULTURAL EROSION

AI models developed outside Bhutan may not reflect or support Bhutanese values, language, and traditions. The key focus area Culture and Language will support preservation and promotion of culture through AI-assisted language technology tools for digitization of cultural elements. Bhutan's unique and rich cultural values can be used for generating content.

7. MISINFORMATION AND DISINFORMATION

AI can be used maliciously to spread misinformation and create realistic but false content. To counter this, the Governance and Regulation key enabler recommends the development of responsible and ethical AI guidelines and development of regulations and policies to provide the necessary framework for preventing harmful content. Additionally, the development of robust detection schemes using AI and machine learning to create counter-technolgy is crucial. Concurrently, verification of sources for establishing the authenticity of content's origin will help to protect the AI users from misinformation and disinformation.

8. ENVIRONMENTAL DEGRADATION

The development and deployment of AI often require significant computing power, which can lead to increased energy consumption and environmental degradation. The Infrastructure enabler mitigates this by promoting investment in energy-efficient High-Performance Computing (HPC) systems to reduce environmental impact. The Governance and Regulations enabler supports the introduction of green AI policies that advocate for energy-efficient and environmentally responsible practices.

CONCLUSION

NAIS, grounded in the GNH principles, envisions a sustainable, inclusive, and ethical AI ecosystem that enhances societal well-being while preserving cultural and environmental values. Indeed, Bhutan can foster innovation without compromising its unique identity by leveraging AI for smart governance, urban development, environmental sustainability, and economic growth.

With a human-centric approach, AI will be a tool to empower citizens, improve public services, and drive equitable progress. Moreover, ethical AI governance, digital literacy, and responsible AI adoption will ensure that technology serves happiness, harmony, and holistic development. Bhutan's AI journey is not only about technological advancement but about creating a future where innovation and well-being coexist for a happier and more prosperous nation.

STAKEHOLDERS CONSULTED

Anti-Corruption Commission of Bhutan
Bhutan AI Society
Bhutan Construction and Transport Authority
Bhutan Data Scientists
Bhutan Food and Drug Authority
Bhutan InfoComm and Media Authority
Bhutan Telecom Limited
Office of Cabinet Affairs and Strategic Coordination, Office of Prime Minister and Cabinet
College of Science and Technology
Department of Geology and Mines, Ministry of Energy and Natural Resources
Department of Creative Industry and Intellectual Property, Ministry of Industry, Commerce and Employment
Department of Culture and Dzongkha Development, Ministry of Home Affairs
Department of Economic and Tech Diplomacy, Ministry of Foreign Affairs and External Trade
Department of Environment and Climate Change, Ministry of Energy and Natural Resources
Department of Forests and Park Services, Ministry of Energy and Natural Resources
Department of Law and Order, Ministry of Home Affairs
Department of Livestock, Ministry of Agriculture and Livestock
Department of local governance and Disaster Management, Ministry of Home Affairs
Department of Media, Creative Industry & Intellectual Property, Ministry of Industry, Commerce and Employment
Department of Procurement and Properties, Ministry of Finance
Department of Public Health, Ministry of Health
Department of Tourism, Ministry of Industry, Commerce and Employment
Department of Trade, Ministry of Industry, Commerce and Employment
Department of Workforce Planning and Skills Development, Ministry of Education and Skills Development
Disabled People's Organization of Bhutan
Dragon Coders Private Limited
Dratshang Lhentshog
Druk Holding and Investments
Election Commission of Bhutan
Faculty of Traditional Medicine
Green E-Integrated Pvt. Ltd.
Gyalpozhing College of Information Technology
iBest Institute
iMerit Bhutan Pvt. Ltd
iTechnologies
Jaggle.AI
Khesar Gyalpo University of Medical Sciences of Bhutan
National Commission for Women and Children
National Statistics Bureau
NewEdge Technologies Pvt Ltd
NGN Technologies Pvt. Ltd.
NoMindBhutan
Office of the Attorney General
Royal Bhutan Police
Royal Monetary Authority
Royal University of Bhutan
Scancafe Pvt. Ltd.
Secretariat, Ministry of Infrastructure and Transport
Sherubtse College
T3 Cloud
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