

Scaling Sustainability: The Power of Digital Innovation in Green Initiatives

SAARC Energy Centre

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Kapil Narula, PhD
Climate Champions Team
Dubai, UAE



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- Global & regional trends
- Practical examples – Global & SAARC
- Current policy status
- Deployment gaps and limitations
- Recommendations

Green Initiative Examples



Green homes



Climate Adaptation



Hydropower



Electric mobility



Waste to compost



Run-of-River projects



Mangrove restoration

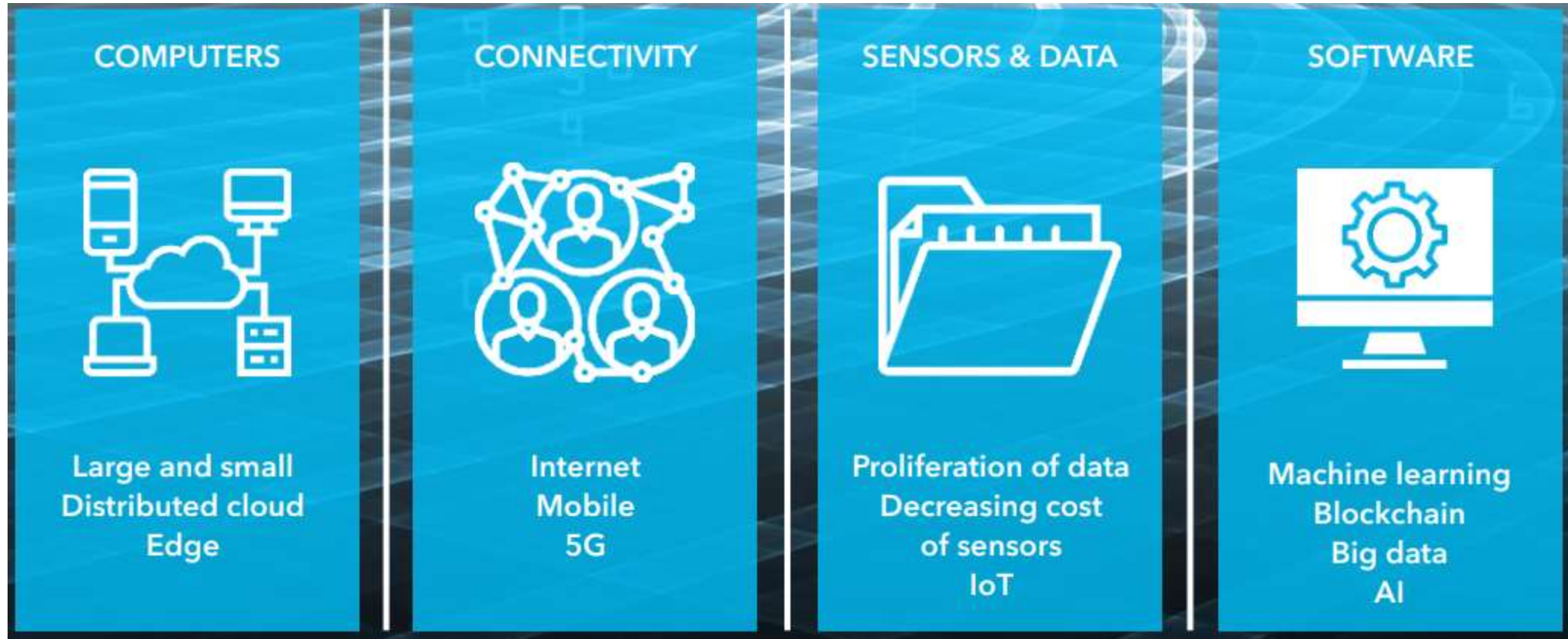


Coastal wind farms

Digitization & Digitalization

	Digitization	Digitalization
Core Meaning	Converting analog info into digital	Using digital technologies to transform processes and operations
Primary Focus	Data format	Workflow and business process improvement
Example	Scanning documents into PDFs	Automating an end-to-end document approval workflow
Scope/Impact	Narrow, operational	Broad, organisational and strategic
Changes	Minimal; mostly technical conversions	Significant; may require new systems and process redesign
Outcome	Easier storage, sharing, and retrieval	Efficiency gains, faster decisions, better customer experience
Value Creation	Limited, incremental	High, transformative, New business models
Dependency	Independent task	Relies on digitized data as the foundation

Building blocks



Application of AI for sustainability



Technologies and use cases (1)



IoT sensors

- Monitor energy consumption
- Record emissions in real-time
- Predictive health monitoring
- Smart appliances, meters



AI and ML

- Assess large data sets
- Forecasting models
- Predict energy demand patterns
- Optimize HVAC systems



Analytics Platforms

- Identify environmental trends
- Benchmark performance
- Data sharing
- Energy optimization for fleet
- Shared analytical models

Technologies and use cases (2)



Digital Twins

- Simulation for design
- Testing energy-saving strategies
- Lifecycle calculations
- Failure analysis
- Reliability forecasts



Edge computing

- Process data locally
- Automated energy management
- Smart buildings controls
- Autonomous vehicles
- Smart grids

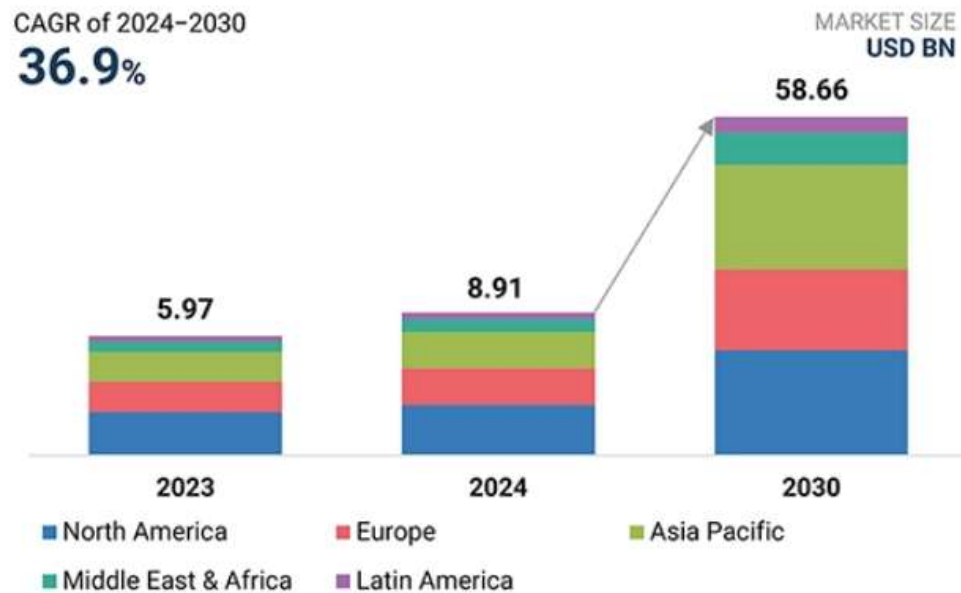


Blockchain

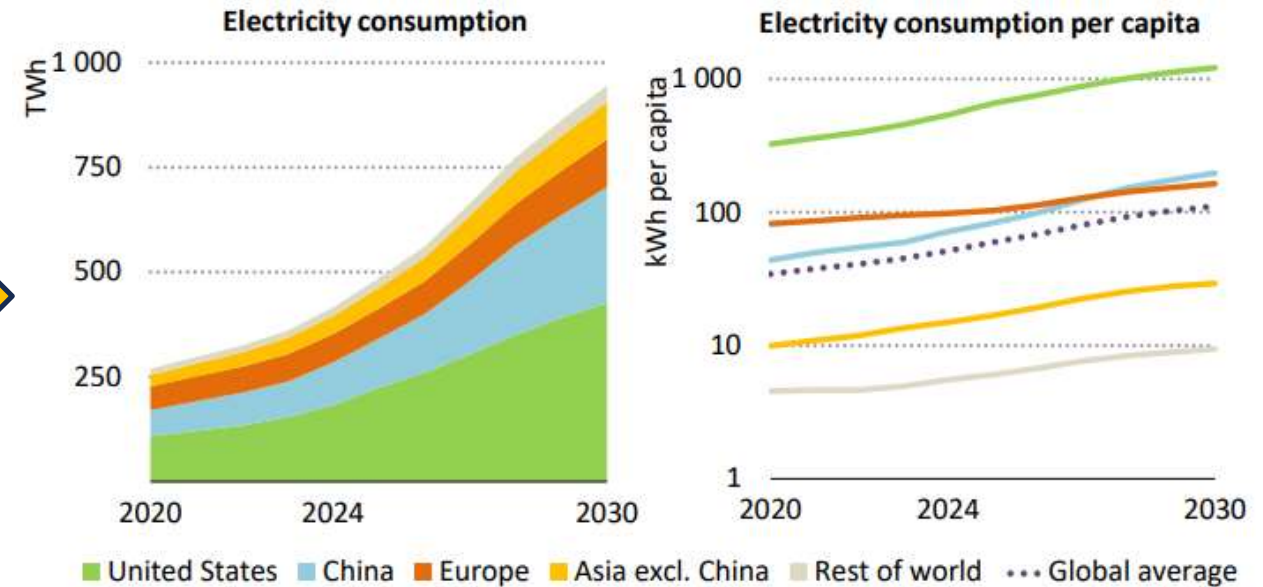
- Decentralized energy transactions
- Carbon credits
- Metering and billing
- Supply chain sustainability metrics

Global & regional trends

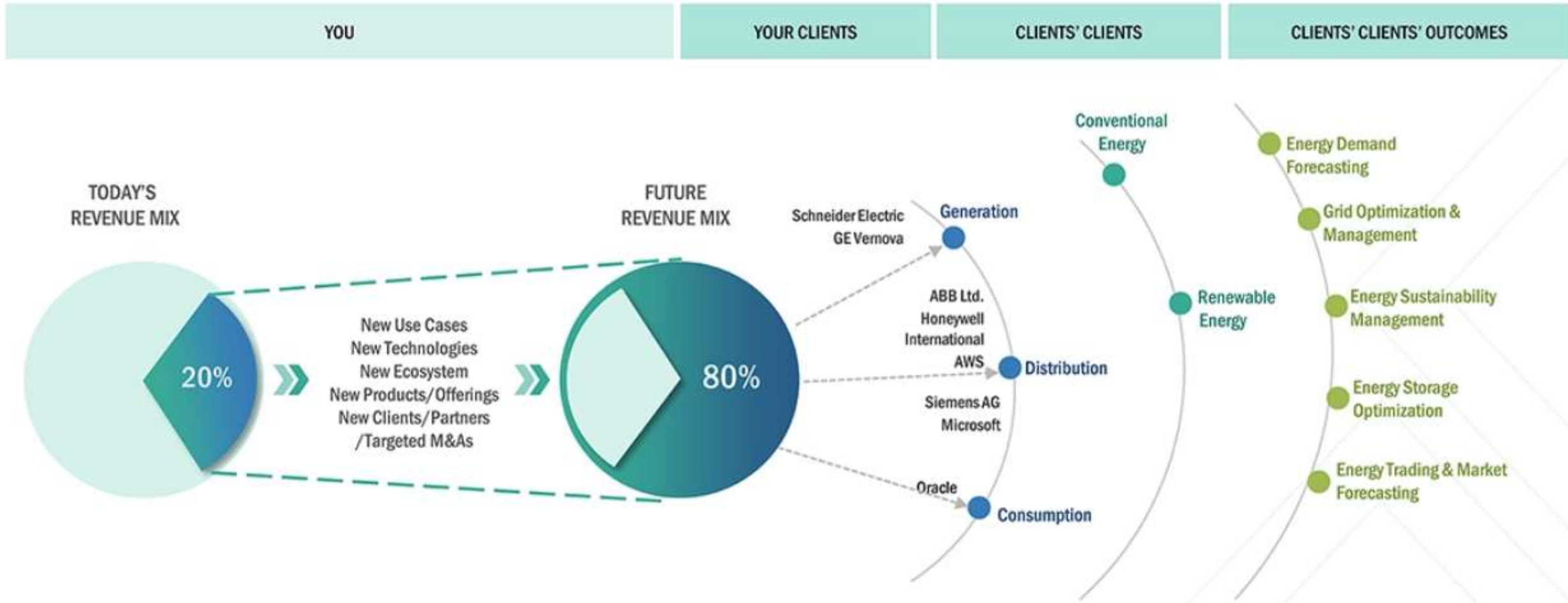
Size of AI in energy market



Electricity consumption of data centers (base case)



Future revenue mix



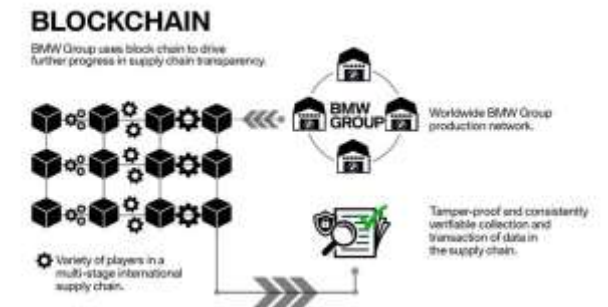
Examples – Energy Optimization

- **Google DeepMind AI for Data Center Cooling:**
 - How: Training neural networks on output from thousands of sensors monitoring temperatures, power, pump speeds, and setpoints
 - Result: Reduced cooling energy consumption by 40%, 15% reduction in overall Power Usage Effectiveness (PUE)
- **Demand Response Management for Google data centers:**
 - How: Using carbon-intelligent computing platform to shift non-urgent work (e.g. ML tasks) to off peak hours as required by utilities (e.g. Indiana Michigan Power); peak load management
 - Result: Reduced grid load, increases demand flexibility
- **Smart Grid Load Forecasting:**
 - How: AI algorithms analyze data from IoT sensors, smart meters, weather forecasts, customer behavior to dynamically integrate RE and manage loads
 - Result: Improved generation efficiency, reduces wastage



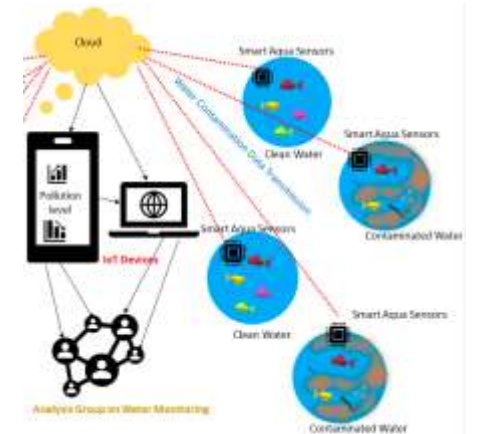
Examples - Blockchain for Transparency

- **Peer-to-Peer RE trading:** 'Power Ledger' allows P2P trading of solar energy in France, Australia, Singapore
- **Carbon Credit Tokenization:**
 - 'Plastic Bank' uses blockchain to reward people with digital tokens for collecting plastic waste;
 - 'B4ECarbon' uses blockchain and distributed ledger with digital MRV to provide emissions management solutions
- **Supply Chain Traceability:** BMW partnered with 'VeChain' on traceability of batteries across their lifecycle, recording origin, usage, recycling, and disposal to support circular economy



Other Examples

- **Precision Agriculture** by John Deere: Using IoT sensors to monitor weather, crop health, and soil moisture; Saves water, fertilizer, improves crop yield
- **Industrial Emissions Monitoring:** IoT sensors track pollution in water bodies, AI analyzes data to identify sources; blockchain record information in tamper-proof format; 'ClimateChain' project integrates tools to build global networks for climate data and action
- **Smart Building Management:** Smart meters, IoT devices provide real-time data, continuous monitoring and analysis of energy consumption; Data used for optimizing HVAC systems, lighting, and equipment use in buildings; Energy saving, improves indoor ambience





Notable projects in SAARC countries (1)

Afghanistan: Energy planning tools and renewable powered grid infrastructure buildout

\$10 billion agreement with Azizi Energy in Aug 2025 to generate, transmit, and distribute 10,000 MW electricity with IoT telemetry and remote asset monitoring

Impacts (what digital tools enable)

- Monitoring real-time plant health & availability (reduce downtime)
- Automation reduces losses and improve billing accuracy



Bangladesh: IDCOL Solar Home System (SHS) program and smart meters

- Off-grid SHS with multilayer IoT telemetry and remote performance analytics
- Smart-prepaid meter deployments by Dhaka Electric Supply Company to cut AT&C losses and improve revenue collection

Main impacts

- Reduces downtime, accurate generation accounting (supports emissions reduction claims)
- Lower technical & non-technical losses, improves revenue, detect power theft,
- Helps utility companies to manage the grid efficiently, real-time demand management





Notable projects in SAARC countries (2)

Bhutan: “Green” crypto using hydropower

Exploring hydropower-backed crypto mining and digital-asset initiatives using clean electricity; National Energy Policy (2025) explicitly calls for promoting innovative R&D and use of digital twins, smart grids, AI/IoT adoption

Main impacts

Blockchain + auditable telemetry can create verifiable “green energy certificates” for green crypto currency increasing revenues



India: Using IoT and AI platforms for Fleet Management & Logistics

Using GPS and telematics devices in vehicles to track commercial fleets, monitor driver behavior, optimize delivery routes

Main impacts

Saves fuel, improves operational efficiency, reduces operational costs, enhances safety





Notable projects in SAARC countries (3)

Maldives: Environmental Monitoring using IoT

IoT sensors used for monitoring sea level rise, coral reef health, and water quality

World Bank-financed Digital Maldives project to expand current climate-relevant data collection

Main impacts

Platform brings together many sources of climate data, facilitates easier data-sharing



Nepal: Big Data Analytics for Climate-Smart Agriculture

Big Data 2 CSA project in Nepal (Bangladesh, India) has developed digital data collection systems to crowdsource primary data from smallholder farmers

Analyzes large heterogeneous datasets (soil quality, climate, satellite imagery, yield) using data mining and ML to deliver recommendations to farmers via digital dashboards and apps

Main impacts

- Increased yield, profitability, resilience and lower GHG emission intensity
- Automated smart irrigation to conserve water and lower fertilizer application





Notable projects in SAARC countries (4)

Pakistan: K-Electric digitalisation (smart meters, apps, AI chatbots)

Lunch of AMI, customer apps and AI for customer service and grid analytics by utilities
Using AI for outage prediction, theft detection and customer engagement

Main impacts

- Reduced AT&C losses and improve revenue cycles
- Faster outage resolution and targeted maintenance



Sri Lanka: Ceylon Electricity Board procuring Advanced Metering Infrastructure (AMI)

Establishment of Smart Meter Head-End Systems (HES) at Distribution Control Centres (DCCs)

Main impacts

- Creates an operational backbone for near-real-time data and demand management
- Analytics on meter/building data unlock fast payback energy efficiency projects.



Current policy status (1)



Afghanistan

- Approved a 5-year long-term development strategy (Aug 25)
- Digital Foundation: Strategy For Afghanistan (2019-21)



Bangladesh

- Draft 3.0 National Strategy for AI (2024)
- National AI policy 2024 (not adopted) - AI Ethics Board, national data-sharing platform



Bhutan

- Digital Drukyl flagship programmes
-
- National Digital Strategy – Intelligent Bhutan (2024)



India

- Digital identity (Aadhaar)
- Digital payments (UPI)
- National Smart Grid Mission
- AgriStack, integrated information system

Current policy status (2)



Maldives

- Maldives 2.0 - National vision for digital transformation (8 pillars)
- Digital Maldives for Adaptation, Decentralization and Diversification Project - National flagship initiative



Nepal

- Digital Nepal Framework (DNF) 2.0 (2025)
- 8 priority sectors and ~80 initiatives covering connectivity, e-gov, digital services and skills



Pakistan

- Digital Nation Pakistan Act 2025- provides institutional & legal framework
- Pakistan Digital Authority, Aug 25 - Develop and implement the National Digital Masterplan, Foster DPI, project monitoring framework



Sri Lanka

- National Digital Governance Policy (draft)
- National Digital Economy Strategy 2030 (2024) - Roadmap
- National Cyber Protection Strategy 2025 - 2029 (Sep 2025)

Deployment gaps and limitations (1)



Infrastructure

- Lack of modernized grid infrastructure
- Lack of automation
- Limited digital infrastructure
- Smart metering deployment delays
- Vendor fragmentation



Technology adoption

- Slow progress
- Implementation challenges
- Poor integration between existing systems and new IoT infrastructure
- AI & Analytics underutilized
- System incompatibility



Regulatory framework

- Fragmented regulatory environment
- State monopoly
- Inadequate legal & data governance frameworks
- Policy implementation delays
- Limited incentives



Financial constraints

- High upfront costs
- Limited access to concessional financing
- Market uncertainty
- Unclear RoI
- Currency risks
- Political instability risks

Deployment gaps and limitations (2)



Regional Cooperation

- Geopolitical tensions
- Lack of regional agreements on technical standards
- Information sharing limitations



Data management

- Data quality & availability
- No standardized data
- Interoperability challenges in platform integration
- Data security & privacy
- Lack of consumer trust



Social barriers

- Lack of public awareness
- Resistance to change
- Institutional inertia
- Digital divide
- Socioeconomic barriers



Misc.

- Skills shortage
- Cybersecurity vulnerabilities
- MRV System Deficiencies
- Scalability challenges

Recommendations for SAARC countries (1)

Policy & Regulatory Framework

- **Develop national smart grid roadmaps, phased implementation**
- **Establish data governance standards for interoperability**
- **Mandate blockchain-verified carbon emissions reporting**

Infrastructure Development

- **Deploy smart metering, Advanced Metering Infrastructure (AMI)**
- **Establish regional data centers, cloud-based management platforms**
- **Digital twins for infrastructure planning, shared infrastructure**

Technology Adoption & Innovation

- **AI-powered demand forecasting for power utilities**
- **Blockchain for sustainability tracking and supply chain management**
- **IoT sensor networks for real-time automated regulatory reporting**

Recommendations for SAARC countries (2)

Cybersecurity & Resilience

- Regional cybersecurity standards, develop unified protocols
- Regular penetration testing, cybersecurity drills
- Disaster recovery systems, cloud-based backup systems

Capacity Building & Skills Development

- Regional centers of excellence, specialized training hubs
- Academic-Industry collaboration, joint research programs
- Workforce reskilling programs- data analytics, digital platforms

Regional Cooperation Mechanisms

- SAARC digital energy platform, real-time trading, balancing, data exchange
- Shared R&D initiatives, co-fund research
- Technology transfer agreements, technical assistance and pilot projects

Conclusion

- **Digitalization** powered by sensors, connectivity, data, computing and platforms provide the **backbone** for digital services
- **AI technologies** can be used in **multiple ways for enhancing sustainability**
- Regional trends are **encouraging , large untapped potential**
- Current **policy status is fragmented**
- Deployment **gaps must be bridged** quickly
- **Timebound action** on recommendations

Discussions

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