

# **Putting SDG 13 In the Spotlight:** ***Innovations for Climate Action and Resilience***

**Prof. P. ABDUL SALAM<sup>1</sup>**

**Dean - School of Environment, Resources, and Development  
Professor - Department of Energy and Climate Change  
Asian Institute of Technology (AIT), Thailand**



 [salam@ait.ac.th](mailto:salam@ait.ac.th)

 <https://ait.ac.th/school/school-of-environment-resources-development/>

# Climate Innovation & SDG 13

- ❑ Climate innovation is central to accelerating action on SDG13 across mitigation and adaptation
- ❑ IPCC identifies climate tech, nature-based solutions, data, and finance as drivers of change
- ❑ Technical solutions reduce GHGs and improve resilience.
- ❑ Progress on SDG13 remains insufficient. Innovation is the key (UN 2024 SDG report)

# Key Climate Innovation Trends Shaping SDG 13

□ The 3Ds of Climate Innovation are driving next-gen climate solutions making systems smarter, cleaner, and more resilient across energy, cities, and agriculture.

## ◆ DECARBONIZATION:

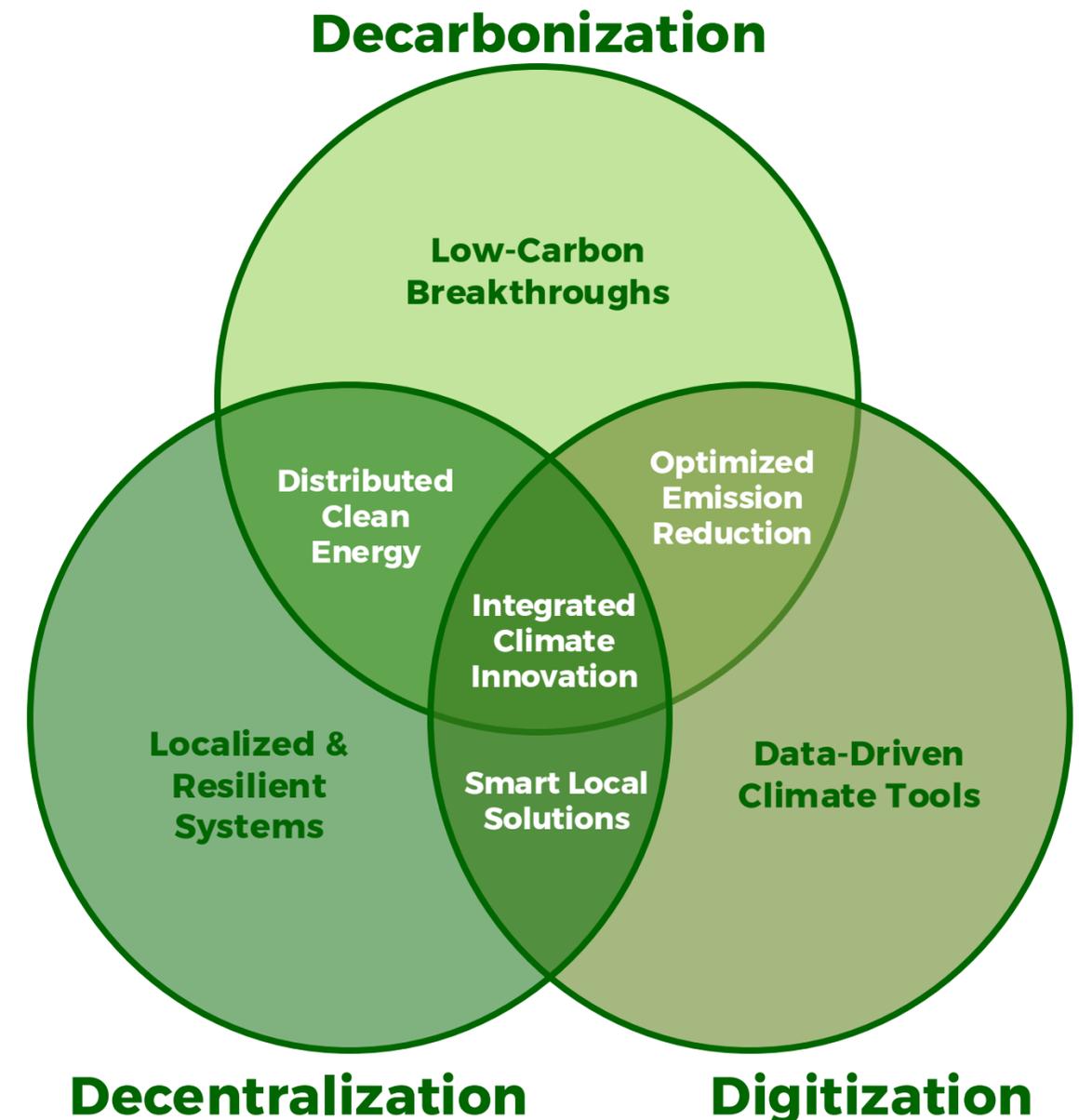
- **Electrolyzer manufacturing** for hydrogen – India and Australia.
- **Long-duration storage** using solid-state and sodium-ion batteries – South Korea and Singapore.

## ◆ DECENTRALIZATION:

- **Peer-to-peer energy trading using blockchain** - Thailand.
- **Modular water-purification and decentralized wastewater treatment** - Indonesia.

## ◆ DIGITIZATION:

- **Smart irrigation** utilizing IoT Sensors and adjust watering based on weather patterns – Vietnam and Thailand
- **Satellite + blockchain-based MRV** for carbon credits - Indonesia and Lao PDR.



# Renewable Energy Breakthroughs Powering Climate Action

- **Renewable energy is the foundation of climate mitigation**, enabling countries to cut emissions, increase energy access, and foster economic development aligned with SDG 13 targets.
- **Solar Power: Soaring Efficiency and Plummeting Costs**
- **Solar Windows and Building-Integrated Photovoltaics (BIPV)**
- **Wind Energy: Taller Turbines and Floating Farms**
- **Bioenergy and Waste-to-Energy Upgrades**
- **Battery Storage: Enabling 24/7 Renewable**
- **Green Hydrogen: The Fuel of the Future**
- **AI-Driven Smart Grids and Predictive Energy Management**

# Nature-Based Solutions (Nbs) and Ecosystem Restoration

- ❑ NbS can deliver up to 30% of required mitigation by 2030 (UNEP,2024).
- ❑ Ecosystem-based approaches complement tech-based mitigation and adaptation

## Examples of Nature-based Solutions:

- **Mangrove forests** for flood mitigation
- **Natural inland wetlands, rain gardens, river floodplains** for improved water supply
- **Urban and upland forests** for erosion and landslide mitigation
- **Green corridors** for fire risk mitigation
- **Green roofs and urban canopy** for heat mitigation

# Climate Smart Agriculture Technologies

☐ Climate-smart agriculture empowers farmers with innovative, sustainable solutions that boost resilience, reduce emissions, and drive real progress

## Some of FAO's success stories:

### ✔ Livestock Waste Management (China, Thailand, Vietnam)

- Clean Development Mechanism (CDM) aligned strategies for biogas systems, manure reuse and emission monitoring in pig farms.

### ✔ Urea Deep Placement (UDP) in Rice (Bangladesh, Nigeria)

- Precision fertilizer (urea briquettes) placed at root zone.

### ✔ Community Supported agriculture (CSA) Policy Readiness (Malawi, Vietnam, Zambia)

- Evidence-based policy design using CSA investment mapping and participatory foresight.

### ✔ Sustainable Grazing Management (Qinghai, China)

- Restoration of degraded grazing lands using rotational grazing, improved feed, and biogeochemical carbon monitoring.

# Enhancing Resilience Through Innovative Infrastructure

## Some of UNDP supported climate-proof rural and urban infrastructure:

### ❑ Thailand: RID–UNDP Yom-Nan Resilience Project

- Integration of **engineered floodgates** and **drainage improvements**

### ❑ Bangladesh: Urban Resilience & Smart Infrastructure

- support for urban poor communities- **climate-smart infrastructure**: boundary walls, raised roads, drains, toilets, street lighting, cutting flood exposure and improving sanitation

### ❑ Sri Lanka: Capacity-Building & Standards for Irrigation Sector

- Workshops and frameworks co-developed by UNDP, ADB, and Japan established **standards** and **SOPs for disaster-resilient irrigation networks**

### ❑ Tuvalu: Coastal Adaptation Project (TCP)

- **Mega geotextile berms, precast Seabee block seawalls, and land reclamation** to raise atoll islands 1.5 m+ above storm surge and future sea-level rise.

# Innovations in Climate Data Collection and Monitoring

## □ Real-time and Non-traditional Data Sources

- **Satellite and IoT sensors** deliver continuous data on air and water pollutants, weather events, and more, allowing for **hourly or daily updates** instead of delayed surveys
- **AI-enhanced satellite data** used for real-time deforestation alerts

## □ Leveraging Randomized Evaluations with Big Data

- Program evaluations **combine satellite imagery, administrative data, and randomized trials** to assess adaptation and mitigation efforts in near real-time

# Major Regional Climate Data Networks and Monitoring Initiatives in Asia

## ❑ Asia Pacific Adaptation Network (APAN)

- Collaborates with **UNEP, ADB, USAID, IGES, SEI, AIT**, etc. to support policymaking, capacity-building, and tech/financial solutions

## ❑ SERVIR Southeast Asia & Mekong

- Satellite-based tools for drought, floods, air quality, crop yields; A joint initiative by **USAID and NASA**, with **ADPC, SEI, and Deltares**

## ❑ APEC Climate Center (APCC)

- Uses multi-model ensemble forecasts to improve regional climate outlooks through training and collaboration

## ❑ SARCCIS (Southeast Asia Regional Climate Change Information System)

- Provides open-access, high-resolution downscaled climate data (via CORDEX-SEACLID), with tools and training for analysis

## ❑ ASEAN Climate Resilience Network (ASEAN-CRN)

- Launched by **ASEAN + GIZ/FAO** for climate-smart agriculture through knowledge exchange, capacity-building

## ❑ Asian Disaster Preparedness Center (Bangkok) ADPC's 4Resilience & Disaster Portals

- A geospatial portal offering Open datasets for flood monitoring, storm tracking, drought alerting and support resilience planning

# Examples and Case Studies

## Example 1: Solar Power Boom - India

### ❑ Rapid Growth

- Over **108 GW installed** (as of FY2025) and Target: **280 GW by 2030**

### ❑ Supportive Policy Environment

- **National Solar Mission**
- **Production Linked Incentive (PLI) scheme for domestic manufacturing**
- Prime Minister Surya Ghar's **free rooftop solar for 10M homes**
- Prime Minister's Farmer Energy Security and Upliftment Mission (PM-KUSUM) **solar pumps for farmers**

### ❑ Global Impact

- Co-founder of International Solar Alliance (ISA)
- Significant role in climate action & green jobs

### ❑ Incentives & Financial Support

- **Capital subsidies for rooftop solar** in residential sector.
- **Low-interest loans** from institutions like IREDA and state banks.
- **Foreign Direct Investment (FDI) permitted** under the automatic route.

### ❑ Solar Parks and Ultra Mega Projects

- Several solar parks with capacities **>500 MW**.

# Example 2: Innovative Wind Energy Projects – South East Asia

## ❑ Balaoi & Caunayan Wind Farm

- Philippines **largest wind farm**, supplying green power to Luzon area

## ❑ Floating Wind Platform Hub (Philippines) Development

- *HD Korea Shipbuilding* is converting Subic Bay facilities into a manufacturing base for floating offshore wind platforms

## ❑ Monsoon Wind Power Project (Laos → Vietnam)

- Southeast Asia's largest onshore program and first cross-border wind power plant

## ❑ PLTB Sidrap Indonesia

- **The First Wind Power Plant in Southeast Asia** with Capacity of 75 megawatts (MW)

## ❑ Innovative Tech & Hybrid Solutions

- **Bladeless Wind Turbines:** Experimental CFD-optimized bladeless turbines designed for low-wind zones in Indonesia's Nusa Tenggara Timur
- **Wind–Hydro Hybrids:** Laos exploring combining wind and hydropower to stabilize electricity supply

# Example 3: Urban Climate Adaptation Initiatives - Japan

## ❑ Tokyo's Underground Flood Control System (“Cathedral”)

- 6.3 km tunnel network and huge underground storage chambers manage extreme rainfall and reduce flood risk

## ❑ Rainwater Harvesting in Sumida City (Tokyo)

- Since 1982, **rainwater tanks** installed in public buildings and homes, used for **fire-fighting and everyday use**.

## ❑ Urban Heat Island Mitigation Measures

- “Cool pavement” initiatives: installations of reflective and water-retentive surfaces reduced road temperatures

## ❑ Fukuoka: Green Space & Wind Corridor Planning

- An early adopter of municipal adaptation; incorporates wind corridors and urban greening to cool the city

## ❑ Yokohama's Integrated Adaptation Strategy

- **flood prevention, green infrastructure**, and are embedded in city planning

## ❑ National Framework & Local Support Systems

- Climate Change Adaptation Act (2018) and updated 2021 and Local Climate Change Adaptation Centers

## ❑ Advanced Risk Monitoring & International Collaboration

- Tokyo's resilience initiatives: **massive flood basins, seawall upgrades, and smart water-purification systems**

# Example 4: Coastal Resilience Technologies - Bangladesh

- ❑ **Floating Gardening**- supports marginalized farmers, and preserves livelihoods during monsoon inundation
- ❑ **Smart Water-Level Sensors (Surf-IT)**- for real-time flood alerts, empowers locals to actively monitor and respond to embankment breaches
- ❑ **Community-Led Embankment Reinforcement** -as local mobilization to repair or strengthen embankments using traditional materials, supported by modern tech like geobags
- ❑ **Climate-Resilient Housing by BRAC** - a Buoyant, elevated home models co-designed with MoEFCC, deployed in cyclone-prone coastal zones
- ❑ **Coastal Towns Climate Resilience Project (ADB–GCA)** - USD 250 million program spanning 22 towns; pilots include nature-based solutions, infrastructure upgrades, and slum adaptation plans.
- ❑ **Coastal Embankment & Cyclone Shelter Investments (World Bank)** - embankment strengthening, new shelters with solar/rainwater tech
- ❑ **Integrated Rice–Aquaculture Systems & Mangrove Restorations** - Triple F systems (Forest-Fish-Fruit) alongside mangrove afforestation and prawn-fish-rice farming.
- ❑ **Sedimentation Enhancing / Tidal River Management (TRM)** - Strategic dike breaching to allow sediment-laden tidal water to raise polder floors.
- ❑ **Climate-Smart Rice Innovations** - such as salt-tolerant, waterlogged-resistant rice breeds; integrated Community Farming Systems (CCFS); ICT-based forecasting (CS-MAP).

# Example 5: Smart Grid Deployment – South Korea

- ❑ In 2009, the government introduced the **National Smart Grid Roadmap**, targeting a **nationwide rollout by 2030**
- ❑ The **Korea Smart Grid Institute (KSGI)** and **Korea Smart Grid Association (KSGA)** drive implementation, standardization, and coordination between public and private actors

## Jeju Island Test-Bed (2009–2013)

\*world's largest smart grid test-bed with ~6,000 smart meters/homes, integrating **smart meters and microgrids**

## Metropolitan Expansion & Pilot Projects

\*Post-2014, projects scaled to **urban/metropolitan areas**. ~3,000 sites (homes, buildings, factories) connected renewables, EV charging  
\*Industrial & commercial microgrid programs

## National Rollout & Infrastructure

Smart meters **deployed nationwide**; real-time dynamic pricing with 5-minute intervals to encourage energy savings  
KEPCO plans to invest ~US\$7 billion by 2030

## Advanced Tech & Future Trends

Widespread adoption of **Synchrophasors**. Deployment of KEPCO's **BiMS** and Sungrow's **EMS3000**, featuring predictive analytics, safety safeguards, and grid support capabilities

## Smart Grid Services & EV Integration

**Demand Response** for residential, commercial, and industrial sectors via smart appliances.  
**Smart Transportation:** Nationwide EV charging infrastructure with V2G pilots

# Example 6: Agritech Solutions - Vietnam

❑ Vietnam has **12 areas certified for hi-tech agriculture.**

## ❑ Supportive Policy & Funding

- **National Digital Transformation (2020) , Modern Agriculture Restructuring (2021), Financing Boost** ≈ US \$4.4 billion credit package from the State Bank and allied banks targets high-tech agribusiness

## ❑ Public-private collaborations

- Remote Sensing-based Information and Insurance for Crop in Emerging Economies (**RIICE**) project, a collaboration among IRRI, SwissRe, Sarmap, GIZ, and the SIDA which **uses remote sensing technology**

## ❑ Technology Adoption & Ecosystem Growth

- **Big Data and IoT tools** are being tested and scaled, enabling a shift from traditional to modern farming
- **High connectivity and smartphone penetration** support digital agricultural services across regions
- **Emerging Agritech Startups** - companies like Koina, Kamereo, MimosaTEK, Enfarm, and others are addressing challenges across the supply chain, from production to distribution

# Example 7: Digital Technologies for Climate Risk Management – Thailand

## ❑ Integrated Urban Climate, Weather and Environment Systems for Climate-Smart and Resilient Cities (IUC4CRC)

- Equip urban planners with timely meteorological, climate, air-quality, and early-warning data

## ❑ Smart City Operations Centre dashboard

- for real-time data on issues like drought, floods, traffic, and resource use, enabling local officials to respond quickly

## ❑ Digital Twin & Geospatial Tools -Under Thailand’s “GI for All” plan

- publicly available geospatial data supports dashboards, and urban risk modeling

## ❑ Flood Management Decision Support (Bangkok)

- BMA piloted a Decision-Support System (DSS) integrating data from multiple departments to improve integrated flood risk planning

## ❑ Civic Engagement via ‘Traffy Fondue’

- A LINE/web-based civic reporting tool letting citizens report urban issues—including floods, drainage or pollution—send directly to relevant agencies.

# Example 8: Forest Conservation and Reforestation Innovation - Indonesia

## ❑ Integrated Workflow

### Map & Analyze:

UAV LiDAR + satellite imaging to assess terrain and canopy



### Plan & Prioritize

AI models identify species suited for each ecosystem niche



### Deploy & Plant

Seed-sowing drones scale up planting efficiently



### Monitor & Adapt

Sensor networks, digital twins, and field apps track survival, fire risks, and ecosystem health continuously.

## ❑ Drone & Unmanned Aerial Vehicle Tech

- **LiDAR mapping** for precision terrain analysis and **seed-sowing drones** for large-scale replanting

## ❑ Digital Tools

- **MonMang app** for AI-based mangrove monitoring
- **Digital twins track tree species** and growth
- **Predictive AI** for Planting

## ❑ Satellite & AI Monitoring

- **Satellite + Spaceborne LiDAR analysis high-resolution canopy and carbon-stock mapping**
- **Real-time fire risk alerts via IoT sensors** in peatlands

# Lessons Learned and Future Opportunities

## What Has Worked

- ❑ Government leadership is crucial
- ❑ Public–private collaboration drives impact
- ❑ Localized innovation matters<sup>18</sup>
- ❑ Data platforms enable regional coordination
- ❑ Climate-tech startups are emerging fast

# Lessons Learned and Future Opportunities

## What's Next

- ❑ Strengthen city-level climate innovation
- ❑ Empower local innovators with tools and finance
- ❑ Mainstream digital agriculture and climate-smart food systems
- ❑ Bridge silos across energy, food, water, and urban systems.
- ❑ Invest in human capital and cross-sector training
- ❑ Regional integration and open innovation
- ❑ Scale blended finance and carbon markets
- ❑ Embed resilience and equity into every new climate solution

**THANK YOU  
FOR YOUR ATTENTION**

