Embedding Super Pollutant Mitigation Within Air Quality Management Strategies:

Leveraging shared monitoring systems, policy instruments, and financing mechanisms to deliver co-benefits for health, climate, and water security

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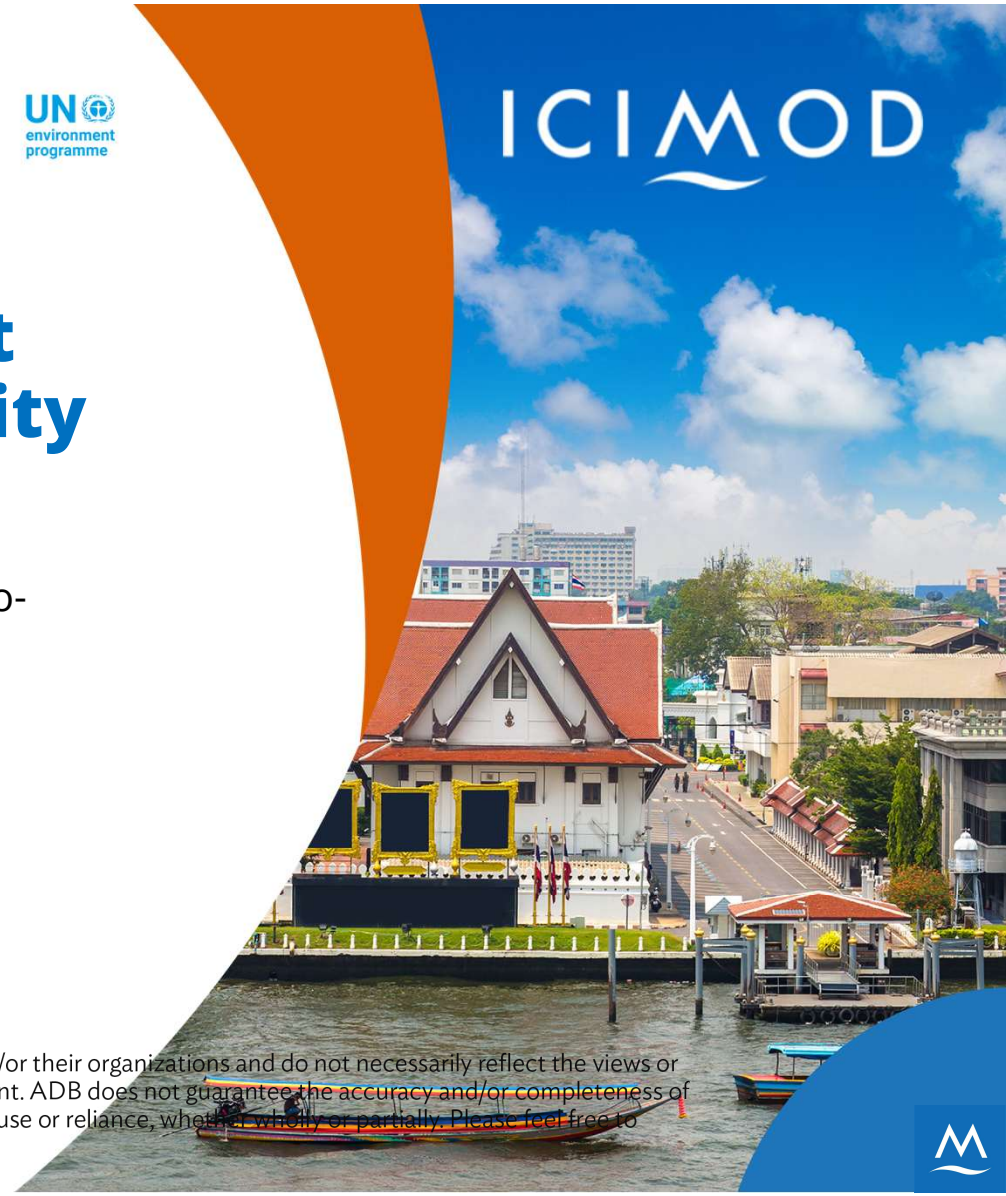


Air Pollution

- **IGP-HF is a global hotspot for air pollution -** 1.9 billion people (~23% of world population) in IGP-HF region are exposed to poor air quality
- **Health** – Air Pollution is leading environmental risk factor for poor health in Asia
- **Agriculture –** Loss in agricultural productivity

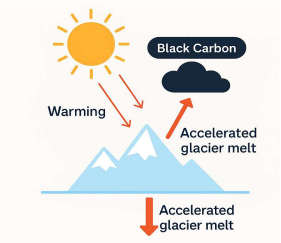
  Global crop yield losses of 3-16% (UNECE)
- **Visibility –** Reduced visibility impacting Tourism
- **Economic loss –** Loss in labor productivity, tourism, aviation and health

  Economic costs approaching 5% of global GDP (World Bank, 2025).

  Air pollution costs Indian businesses USD 95 billion annually, equivalent to 3% of India's GDP (Clean Air Fund).

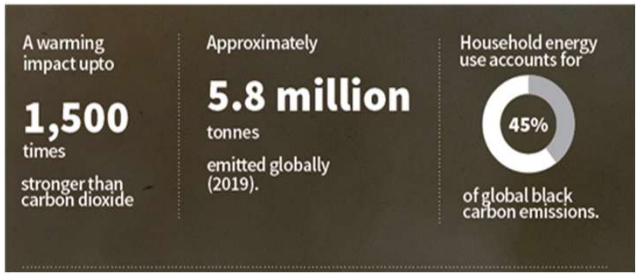
Short-lived Climate Pollutants (SLCPs)

SLCPs: Black carbon (BC), Methane (CH4), tropospheric ozone (O3), and hydrofluorocarbons (HFCs)



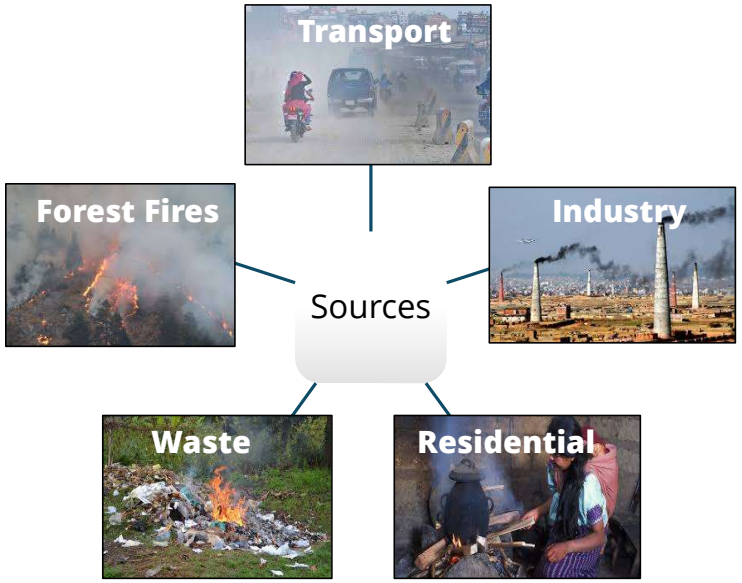
Responsible for up to 45% of current global warming

Black carbon impact in South Asia



- BC is responsible for approximately 39% of glacier melt in the Tibetan Plateau and 28% in HKH region
- SLCPs aerosols influence both the physical and dynamical processes of monsoon rainfall/snowfall
- Impact on water security, agriculture, and livelihoods
- Agriculture loss: O_3 & BC cause 36% reduction in wheat yield (2024 World economic forum: Black Carbon reduction: A Rapid Action Plan)
- BC may not be highly toxic itself, but it acts as a carrier of harmful chemicals into the lungs
- Ozone – Long-term exposure linked with chronic obstructive pulmonary disease (COPD)
- 470,000 deaths globally (State of Global Air, 2025)

Chemistry of Connection: Same Source, Dual Impact for Mitigation



Sources

Biomass burning, brick kilns, transport, cookstoves, waste, and industries.

Emissions

- $PM_{2.5}$
- Black Carbon
- Ozone precursors
- Methane

Impact

- Persistent winter $PM_{2.5}$ episodes often exceeding the WHO guidelines.
- Long-range transport from western IGP to eastern foothills.
- Black carbon transported to high-altitude cryosphere – impacts glacier melting and water security

IGP-HF Context: A Unique Challenge

Technology Mismatch

- Monitoring infrastructure unevenly distributed
- Cookstove penetration inconsistent
- Vehicle standards uneven (Euro IV, V, VI equivalents vary)
- Brick kiln technologies vary (zig-zag, FCBTK, hybrid Hoffman, traditional)

Fragmented National Responses

- No harmonized AQ and black carbon inventory framework
- SLCPs inconsistently included
- Countries operate individual National Action Plans
- Different air quality standards and monitoring metrics

Topography

The Aerosols Effect

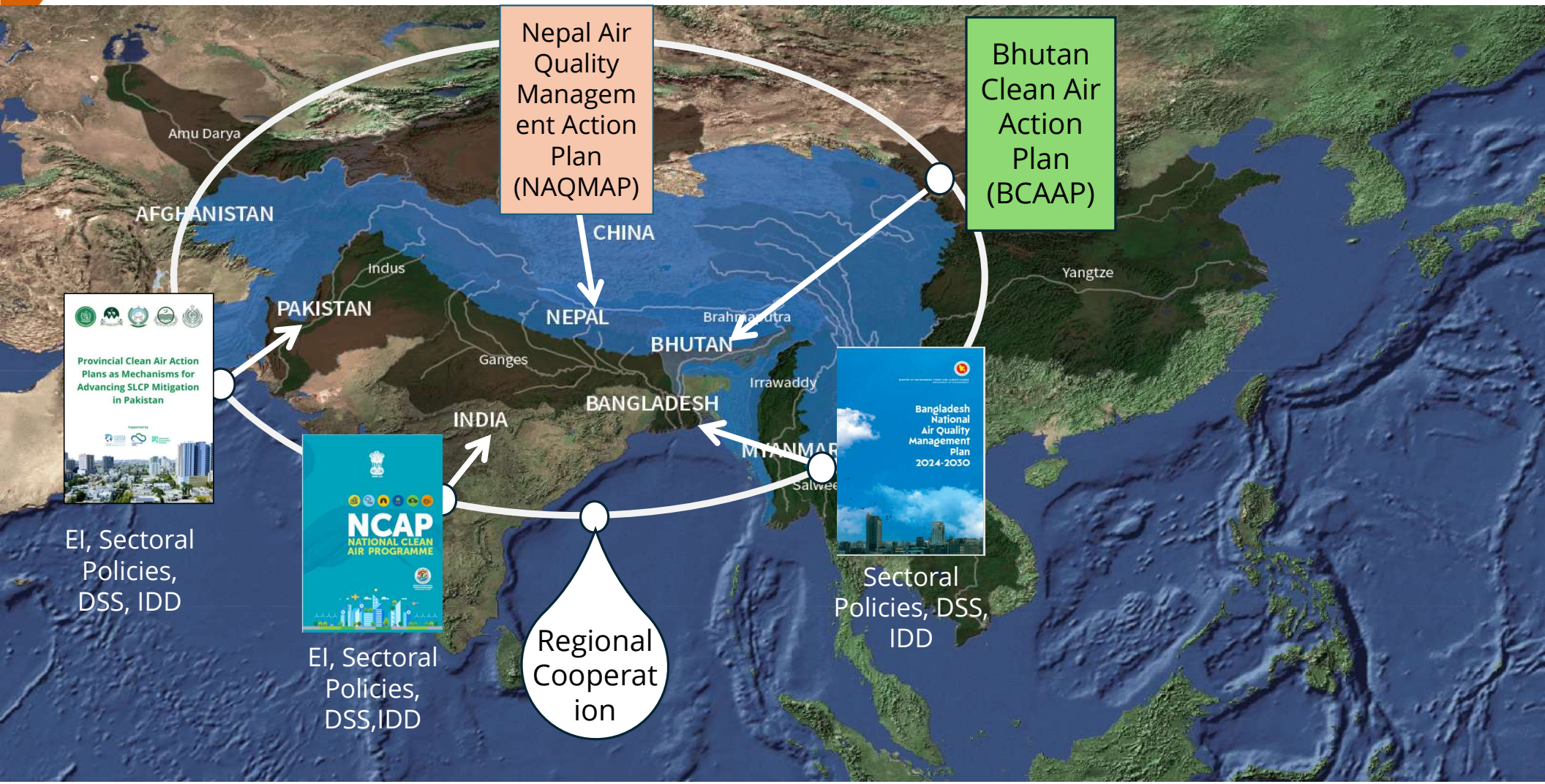
- The Indo-Gangetic Plain is bounded by the Himalayas to the north
- Winter temperature inversion suppresses vertical mixing.
- Weak wind speeds → limited dispersion.
- Pollutants accumulate and recirculate.

Institutional Silos

Stakeholders operate separately

- Environment ministries → Air quality
- Climate divisions → GHG inventories
- Agriculture → Crop residue burning
- Energy → Clean fuels
- Water → Glacial melt

Air Quality Management Strategies In The Region



ICIMOD's AQ Management Strategies in the Region

Systems & Data

- **Monitoring & Decision Support System**
- **Data and Impact Assessment**
- **Enhanced monitoring, data, and evidence-based tools**

Planning & Policy

A robust regional strategy is in the making

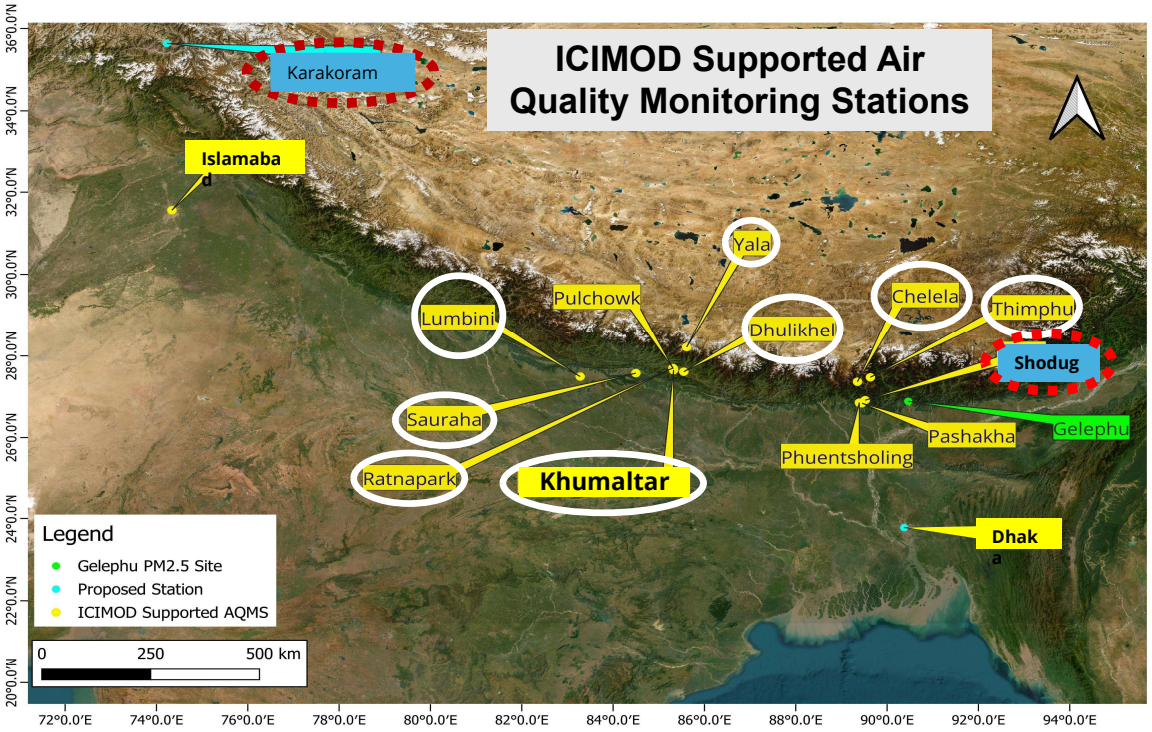
- **Action plans aligning national priorities with institutional strengthening**
  - National air quality management action Plan in all regional member countries
  - Promoting harmonizing all national action plan in the region
- **Policy advocacy regional airshed management approach**
  - SPFD, Kathmandu Roadmap, Thimphu outcomes and 35 by 35 target
  - Coordinated actions on addressing sources (transport, industry, agriculture, & waste)

Finance & Implementation

- **Financial mechanism and investment for the solution**
- **Sectoral intervention targeting major sources and super emitters**

ICIMOD activities in IGP-HF region

- Monitoring and modelling
- Knowledge and evidence generation
- Policy and action planning
- Mitigation pilots
- Capacity building

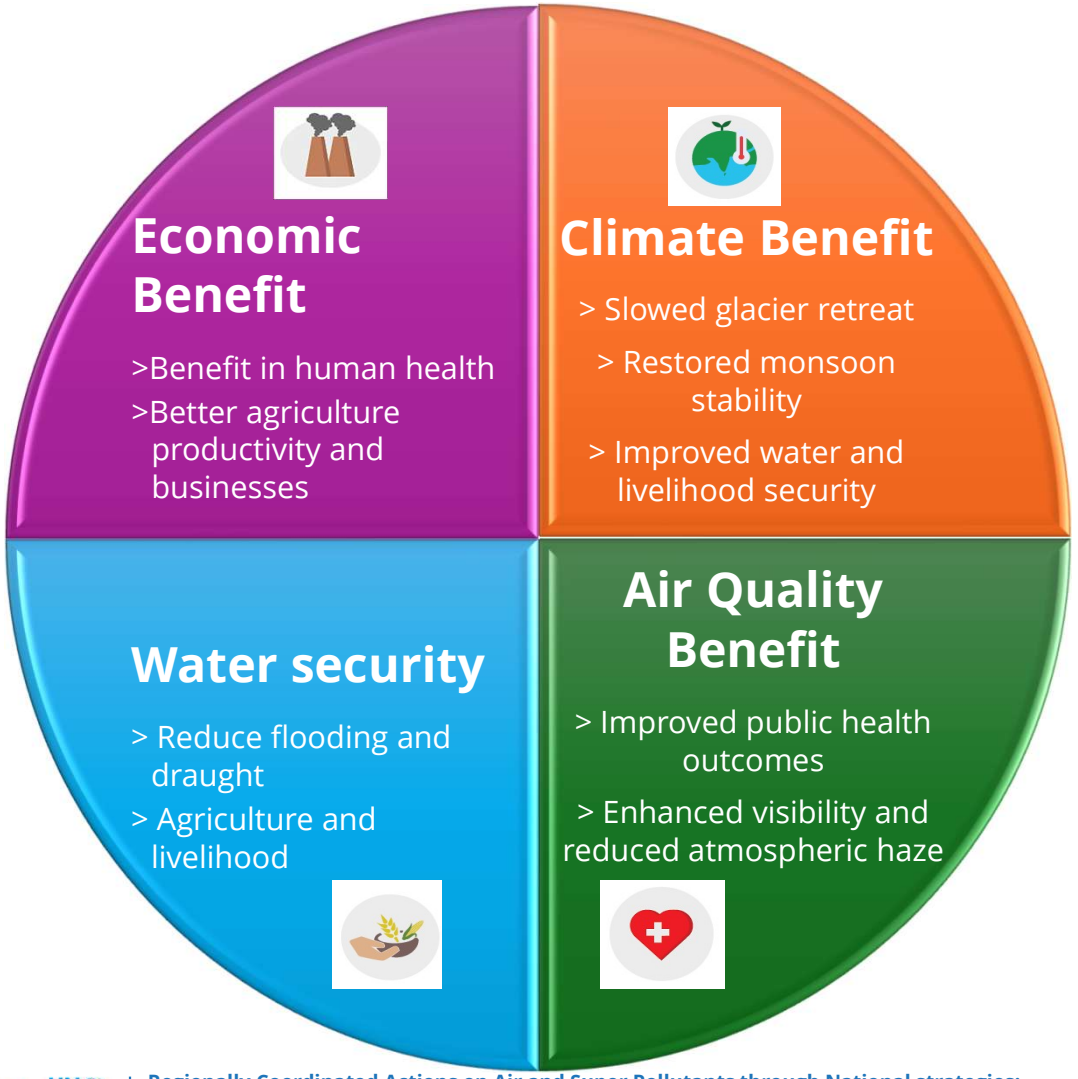


White solid Circled: Established BC monitoring stations
Red dashed Circled: Proposed BC monitoring stations

Moving from

SILOS TO SYNERGIES

For health, climate & food security



Integrating Super Pollutants and Air Quality Mitigation

Integrated Monitoring

Shared Policy

Shared Financing Mechanism

Potential Mechanism For Integrating Monitoring

- Integrating SLCP monitoring in AQ monitoring
- Air pollutant and SLCP emission inventory
- Emission monitoring at source
- Modelling and Integrated Impact Assessment
- Capacity building

Potential For Shared Policy

- SLCPs as Criteria Pollutants and standards
- Mainstream SLCP reduction target into national plan
- Formation of multilevel technical committee and working group for policy integration and harmonization
- Institutionalize green budgeting
- Development of politically binding IGP-HF framework

Potential for Shared Financing Mechanism

1. Green Budgets / Public Climate Funds

- Ministries can allocate a portion of environmental/climate budgets to integrated AQ–SLCP interventions.
- Example: India's National Clean Air Program (NCAP) could link BC reductions to climate co-benefits for budgeting.

3. Climate-Linked Development Finance

- Multilateral climate funds (e.g., GCF, GEF) increasingly support interventions with dual health + climate impact.

2. Carbon Markets & Credits

- Reductions in BC and methane can be quantified and sold as offsets in voluntary carbon markets (e.g., VCM) or counted in NDC reporting.
- Example: Replacing traditional brick kilns with cleaner tech reduces both $PM_{2.5}$ and BC, eligible for carbon credits.

4. Private Sector ESG / CSR Investments

- Companies with net-zero commitments can co-fund projects that reduce both AQ pollutants and SLCPs

Panel discussion

Interdisciplinary panel

- Science to solution
- Action plan for policy implementation
- Regional

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Thank you for listening

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