Climate Resilience in Energy Sector: ADB Perspectives

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Energy Sector Investments in Developing Asia

- Annual investment of US $150 billion + up to 2030
- ADB's annual energy sector investments > $5 billion
- Energy investments usually have a life time > 30 years

Ensuring the resiliency of this large investment to risks of adverse impacts of climate change is essential.

Climate Change Impacts on Energy Investments

Increased air temperatures

- thermal generation less efficient
- increased cooling water requirements
- increased energy demand

Increased water temperatures

- reduced electric power generation
- reduced cooling efficiency

Extreme weather events

- damage generation and grid infrastructure
- interrupt fuel supply

Water scarcity

- reduced electric power generation
- reduced cooling efficiency

Changes in cloud cover, windspeed

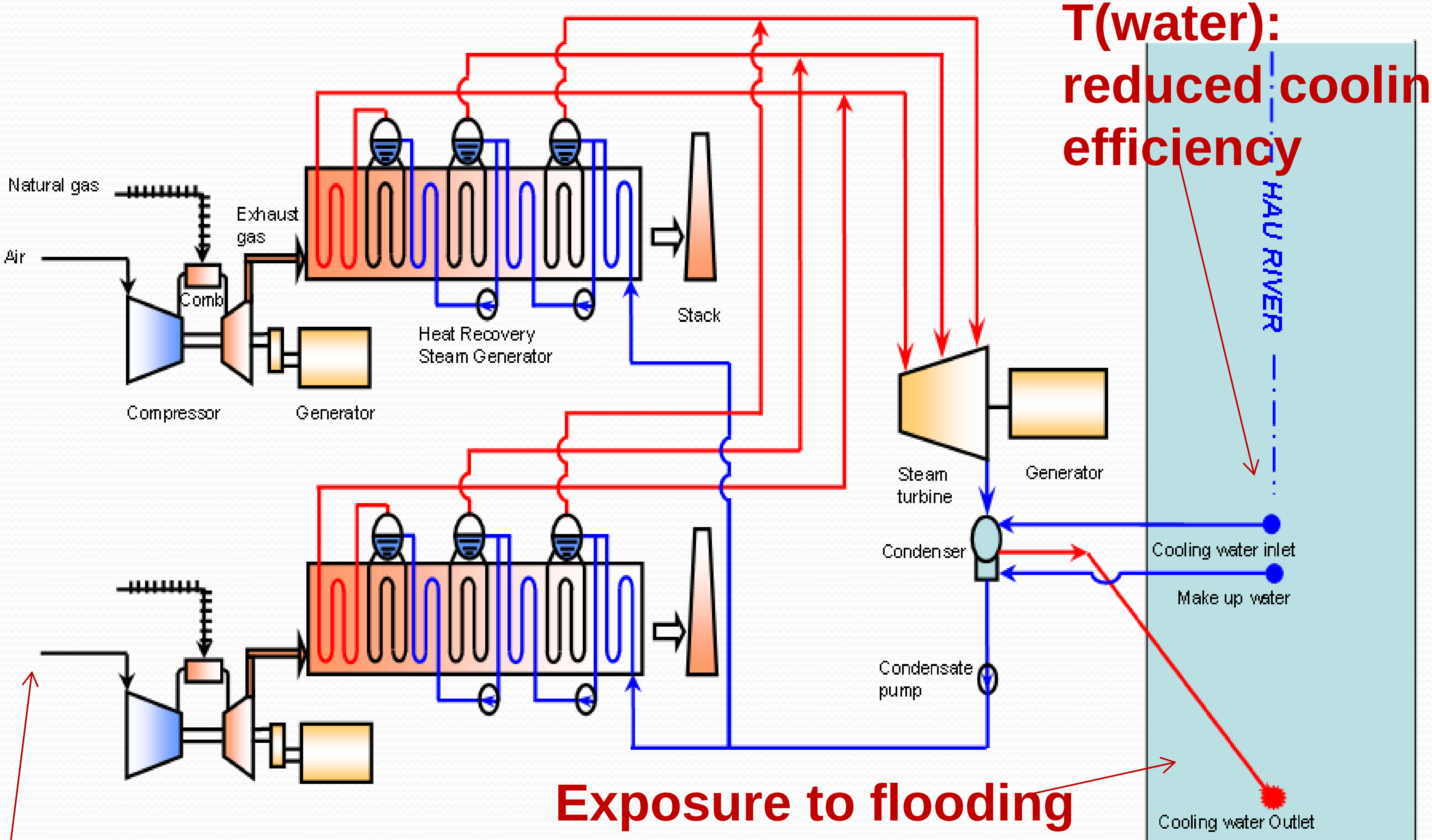
- reduced viability of renewables (solar, wind)

Sea level rise

- flooding of power plants, oil refineries and fuel storage facilities located in coastal areas

Example: Combined Cycle Power Plant

T(water): reduced cooling efficiency



Exposure to flooding

T(air): reduced turbine efficiency

T(water): violate environmental standards

Adaptation Options for Climate Resilience

Thermal Power Facilities:

- convert once-through to recirculation cooling
- convert to dry cooling towers
- increase volume of water treatment works
- use waste water and brackish water for cooling
- waterproof facilities where increased flooding is expected
- decentralize generation

Hydropower Facilities:

- divert upstream tributaries,
- build new storage reservoirs
- increase existing storage
- improve catchment cover
- modify spillways
- install turbines better suited to expected conditions

Adaptation Options for Climate Resilience

Wind Energy Facilities:

- taller towers
- new turbines better able to capture energy of increased wind speeds

Solar Energy Facilities:

- solar modules with a higher temperature coefficient
- string or micro inverters (cool down easily)
- more robust structures, tracking motors and mountings

Biomass and Biofuels:

- more robust feedstock
- expanded or more efficient irrigation systems

All Coastal Facilities:

- assure robust protection from sea level rise, floods, tsunamis, or other extreme events

Planning Options for a Climate Resilient Energy Sector

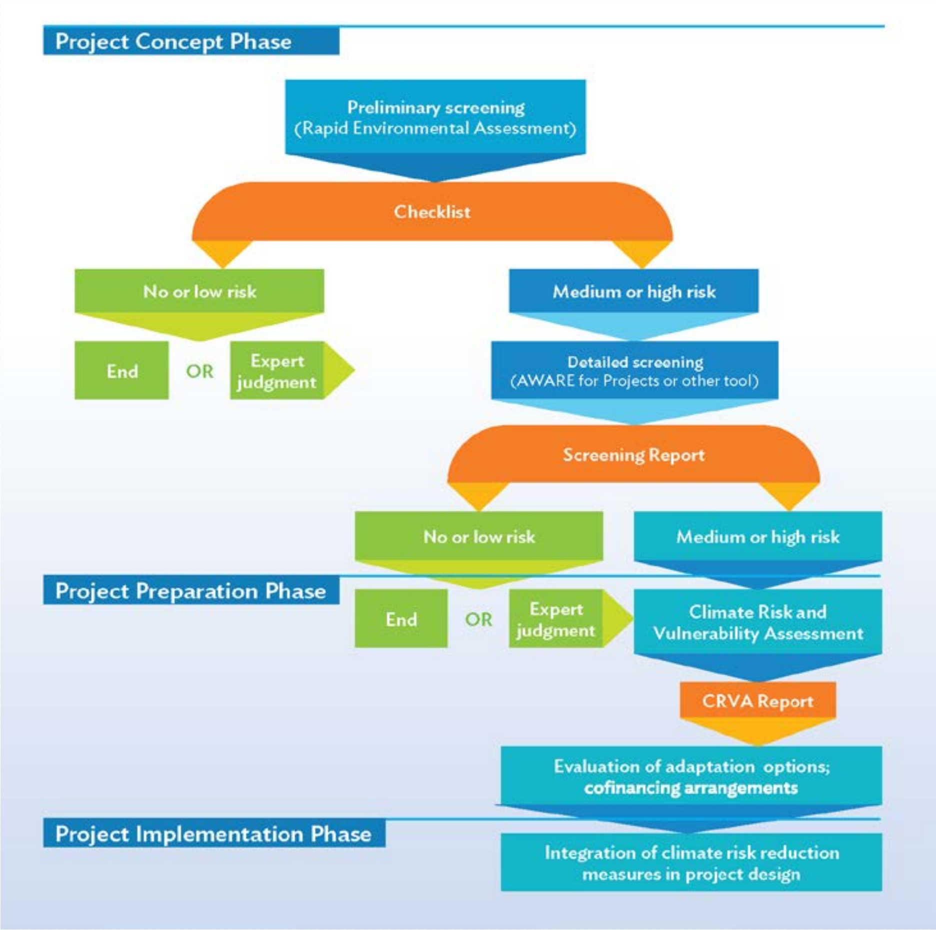
- Improved modelling of vulnerability of energy sector to low probability – high impact climate events
- Greater redundancy to ensure reliability of energy supply
- Sector wide assessment to identify climate vulnerability and improve cost-benefit assessment of resilience measures
- Diversify energy supply mix and greater use of decentralized supply options
- Integrated resource planning that takes into account cross sector issues such as water – energy- food nexus in the context of climate change
- More robust assessment of climate vulnerability of new investments in energy infrastructure

What ADB is doing ?

- Embed climate risk assessment in projects’ planning and climate proofing of projects at risk
- Capacity building in energy sector planning
- Regional integration of energy networks to enhance redundancy and reliability

Climate Resilience in ADB Projects

- Climate risk management embedded in project cycle:
  - **Climate risk screening** at the concept development stage
  - **Climate risk and vulnerability assessment** in the preparation of projects at risk
  - **Technical and economic evaluation** of adaptation options
  - **Monitoring and reporting** of climate risk ranking and adaptation spending



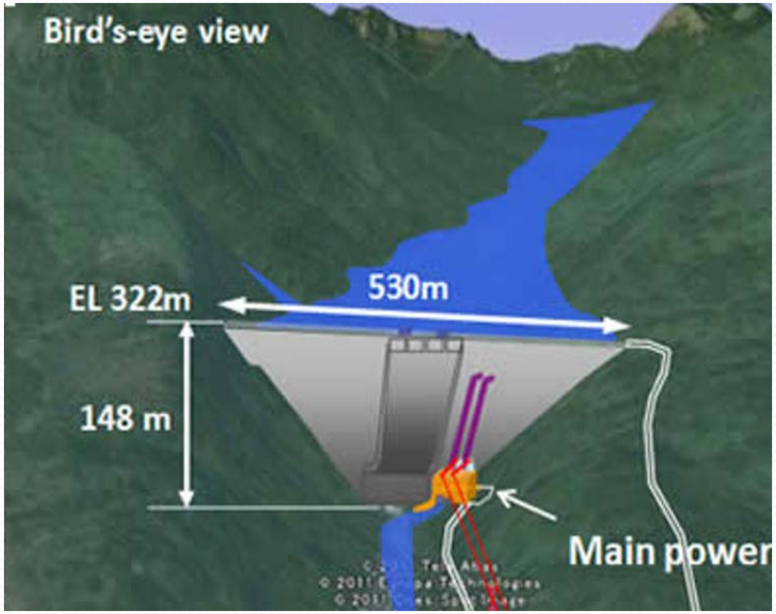
PNG Town Electrification Investment

- $71.6 m investment; 2 run-of-river hydros
- Anticipated impacts : more severe rainfalls and floods, prolonged and intense droughts

- Adaptation measures integrated in the project design
  - A new stream gauge and rain gauge installed to provide long term monitoring of catchment.
  - Design flood level calculated to allow setting of the power station floor at an appropriate elevation;

Hydropower Project on Mekong Tributary

- $982 million project; $144 million: ADB
- 290 MW hydropower plant
- Anticipated scenarios :Increase in air and water temperatures, precipitation, and more frequent floods
- Climate change impacts: degraded water quality, increased catchment erosion; sedimentation of reservoir; increase in spillway discharge; damage to spillway



- Potential benefits in increased inflow and hydropower generation
- Adaptation recommendations: (i) monitor cc risk parameters (temperature, DO, …), (ii) catchment management to reduce erosion; (iii) adaptive capacity for increased wet season electricity production; (iv) flood early warning

Samoa Renewable Energy Development and Power Sector Rehabilitation Project

- $23.9 million project budget
- Rehabilitation to increase resilience of the power sector damaged by a major cyclone
- Three small hydropower plants (SHPs) on Upolu and construct three new SHPs on Upolu and Savai'i
- Training on operation and maintenance of the SHPs
- Climate risk and vulnerability assessment showed potential negative impacts of extreme weather events (e.g., cyclones) throughout the life cycle of the project
- Adaptation integrated in project design
  - erosion protection to prevent scour around the intakes
  - level of the powerhouse discharge outlet increased to prevent flood induced backflow

Insights from ADB

- Risks need to be identified at the early stage of project development
- **Context of vulnerability** (what is the project vulnerable to and what are we trying to adapt to) is key
- Climate risk and vulnerability assessment can be undertaken within a reasonable timeframe and limited resources
- Adaptation is not cost neutral but may not always expensive
- Adaptation is context specific – no ‘standard cost’
- A large menu of engineering and non-engineering adaptation options are available
- Continued *learning* process

Source: ADB. Forthcoming. *Building Climate Resilience in Asia and the Pacific: Insights from ADB Experience*. Manila

ADB Resources

http://www.adb.org/pu
blications/climate-risk
management-adb-
projects