Climate Risk-Informed Decision Making and Demand for Data

Seventeenth Session of the Forum on Regional Climate Monitoring Assessment and Prediction for Asia (FOCRAII)

ADB

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Jatigede Dam, Cimanuk Basin, West Java, Indonesia

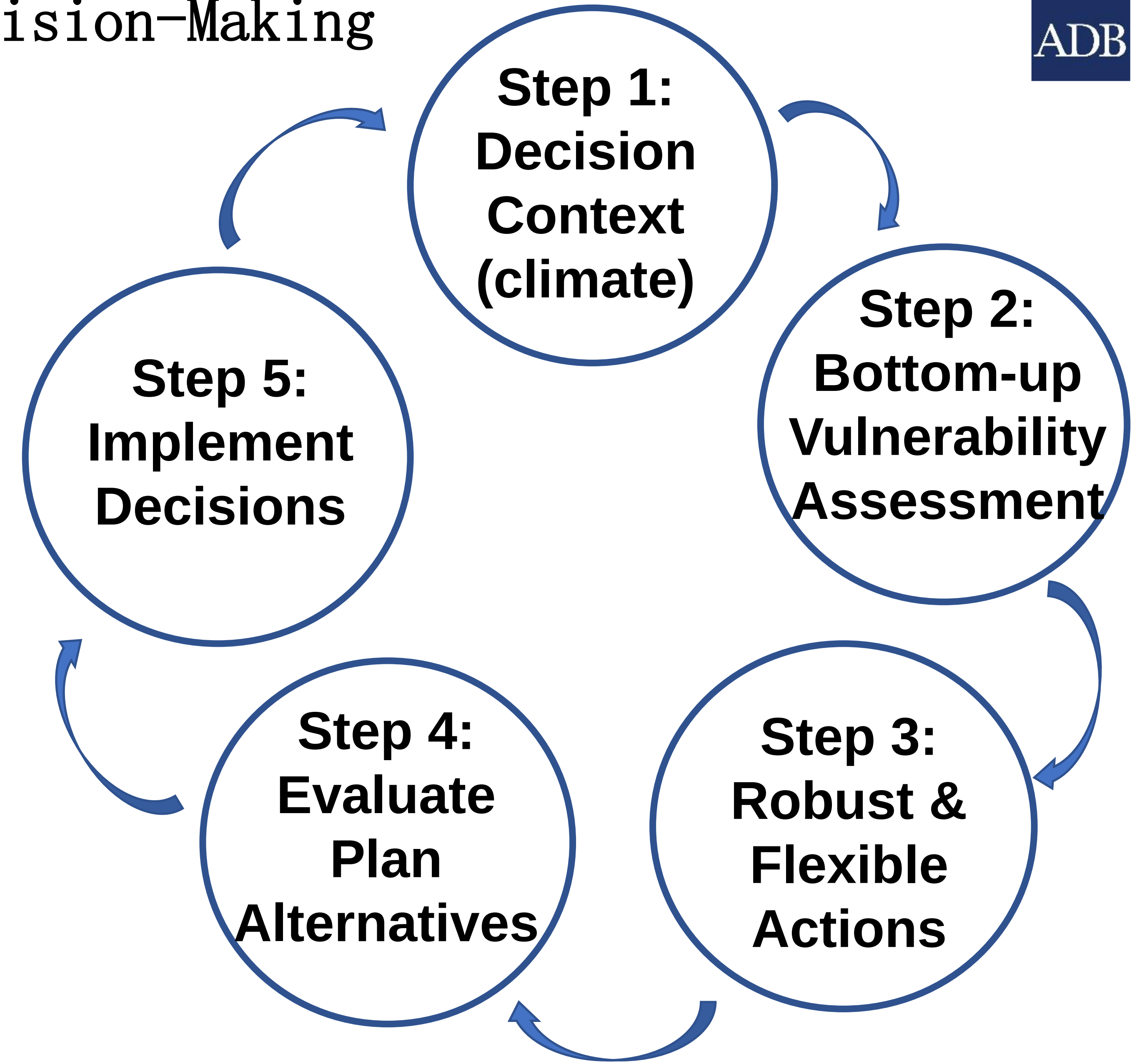
Why Climate Risk-Informed Decision-Making? Unanticipated impacts of weather events and climate change can negatively impact public infrastructure in many ways:

- Reduced project service lifetime
- Reduced reliability of service delivery
- Increased cost, extent and frequency of maintenance and upgrade operations
- Reduced financial and economic benefit to cost ratio (among others)

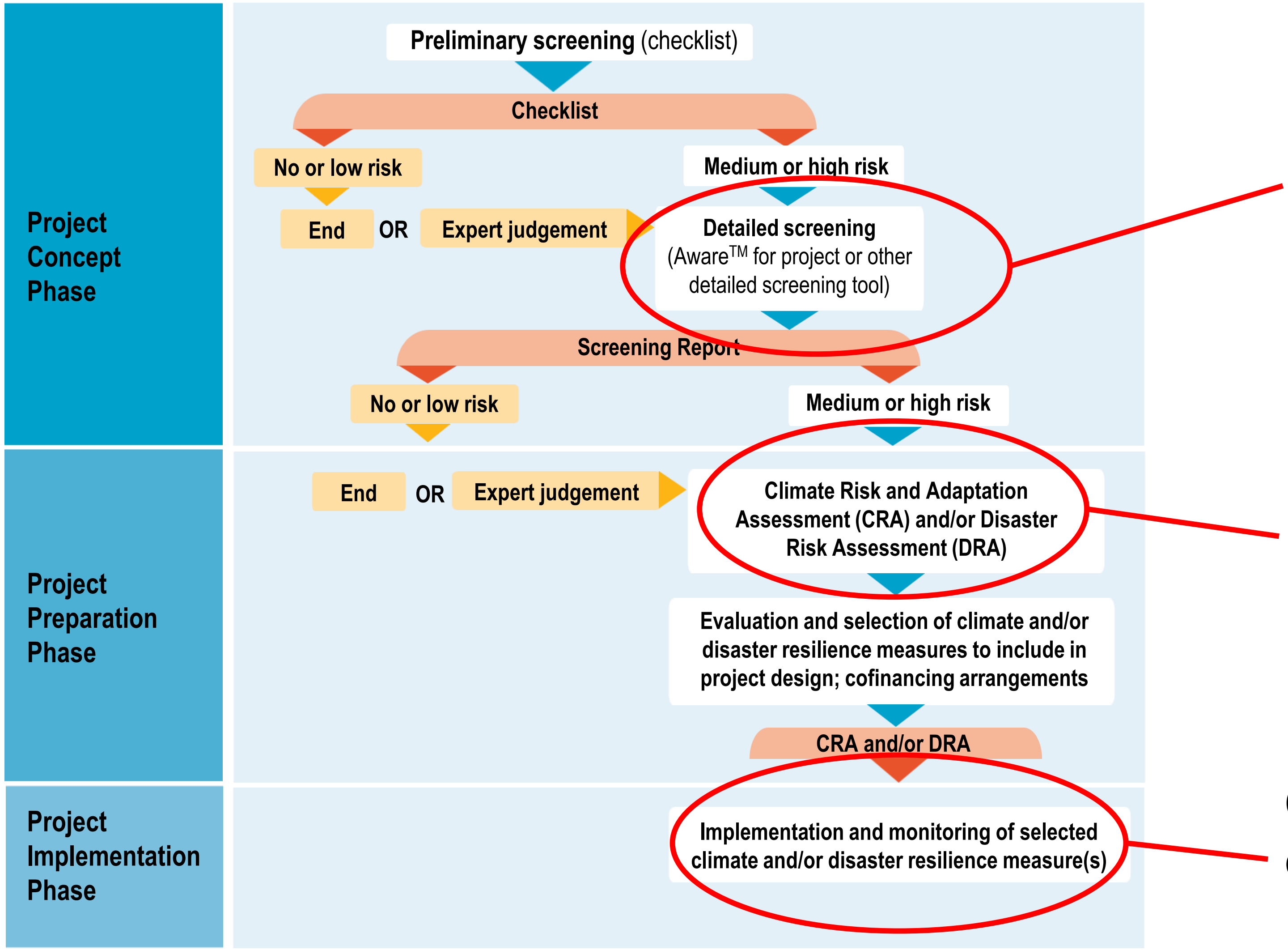
Kertajati Airport, West Java Indonesia, November 2017

Climate Risk Informed Decision-Making

Climate Risk Informed Decision-Making "is a coherent and consistent approach for dealing with anticipated but unquantified changes due to "unknown unknowns" such as climate change that impact project planning, socio-economic justification, resource management, and engineering design."



ADB Climate and Disaster Risk Management Framework

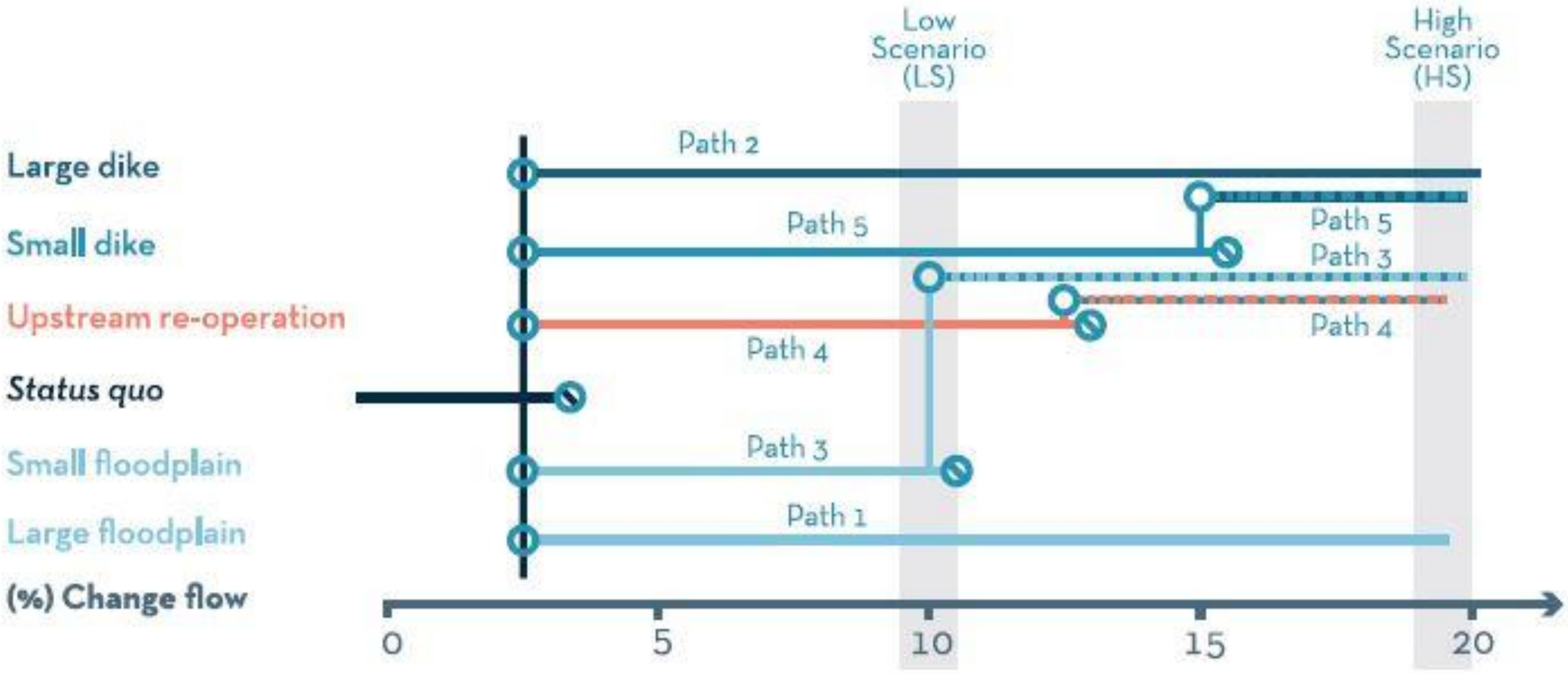


Climate information embedded in risk screening tool (AWARE)

Climate information (historical and projected) required for Climate Risk and Adaptation Assessment (CRA)

Ongoing need to monitor climate information

Climate Adaptive Design and Management – Adaptive Pathways

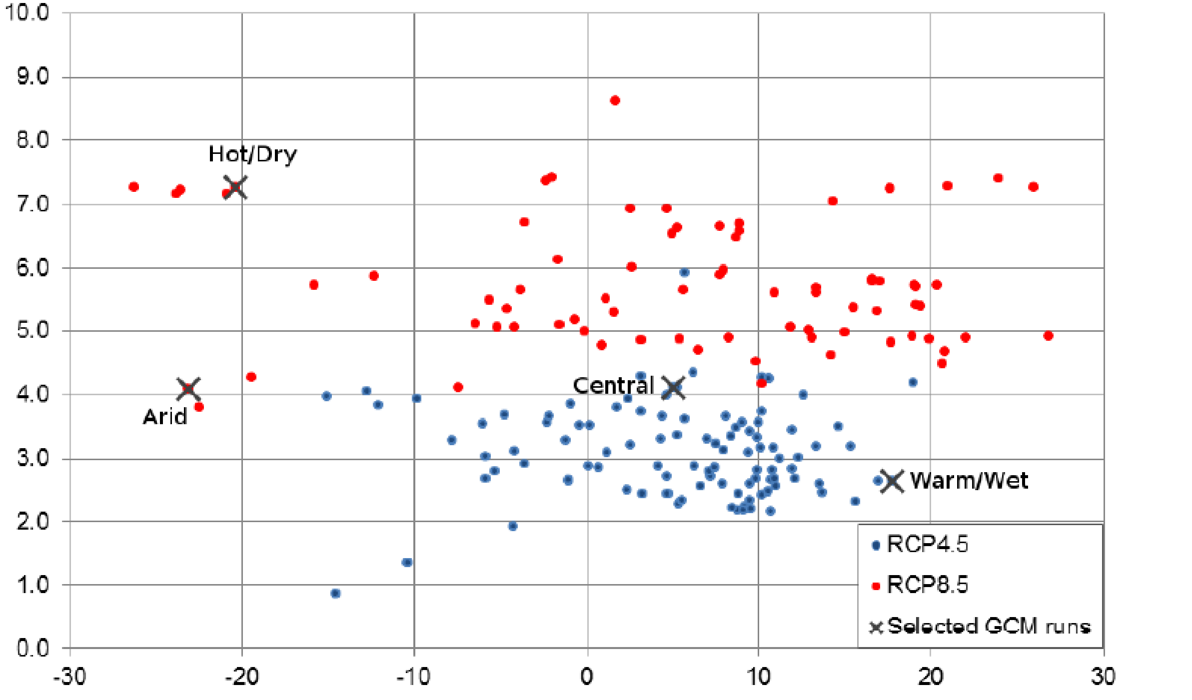


Source: UNESCO (2018)

Indicative Climate Data Report

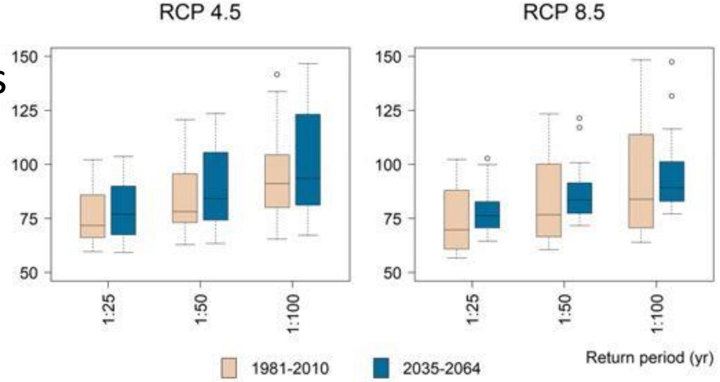
Variables selected on the basis of project type:

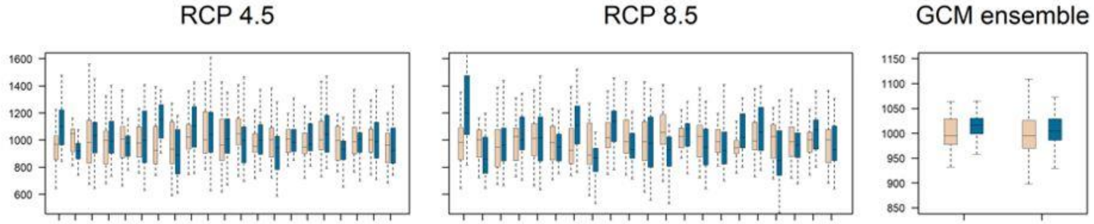
Climate Diagnostics	Energy transmission, distribution, and generation (ex. hydropower)	Hydropower	Roads and bridges	Water supply and sanitation	Urban transport	Agriculture and irrigation
Annual Variables						
Mean surface temperature	✓	✓	✓	✓	✓	✓
Minimum surface temperature			✓		✓	
Maximum surface temperature	✓		✓	✓	✓	
Total precipitation		✓				✓
Total evaporation, transpiration, sublimation						✓
Number of frost days			✓			
Growing season length						✓
Seasonal Variables						
Mean surface temperature		✓				✓
Minimum surface temperature						
Maximum surface temperature						
Total precipitation		✓				✓
Total evaporation, transpiration, sublimation						✓
Change Combinations						
Annual precipitation and temperature change		✓		✓		✓
Seasonal precipitation and temperature change		✓		✓		✓
Extreme Events						
Rx1day: annual max 1-day precipitation		✓	✓	✓	✓	✓



Range and distribution of GCM projections for scenario analysis

Projected changes in extreme events





Projected changes in annual, seasonal variables

Indicative Climate Data Report – Expanded View

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Annual Variables						
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Minimum surface temperature			✓		✓	
Maximum surface temperature	✓		✓	✓	✓	
Total precipitation		✓				✓
Total evaporation, transpiration, sublimation						✓
Number of frost days			✓			
Growing season length						✓
Seasonal Variables						
Mean surface temperature		✓				✓
Minimum surface temperature						
Maximum surface temperature						
Total precipitation		✓				✓
Total evaporation, transpiration, sublimation						✓
Change Combinations						
Annual precipitation and temperature change		✓		✓		✓
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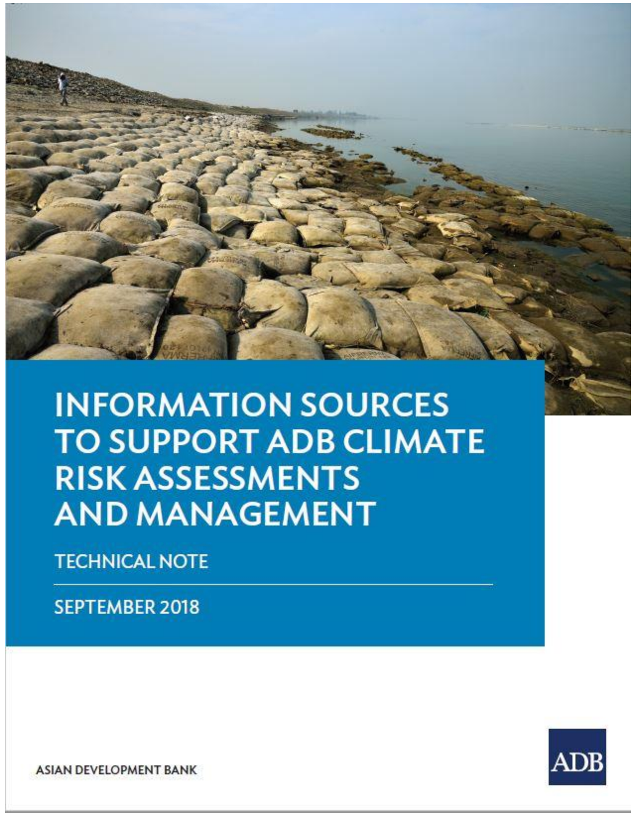

Priority Data Need: Short Term High Intensity Precipitation

Extreme Precipitation Magnitude vs Water Vapor

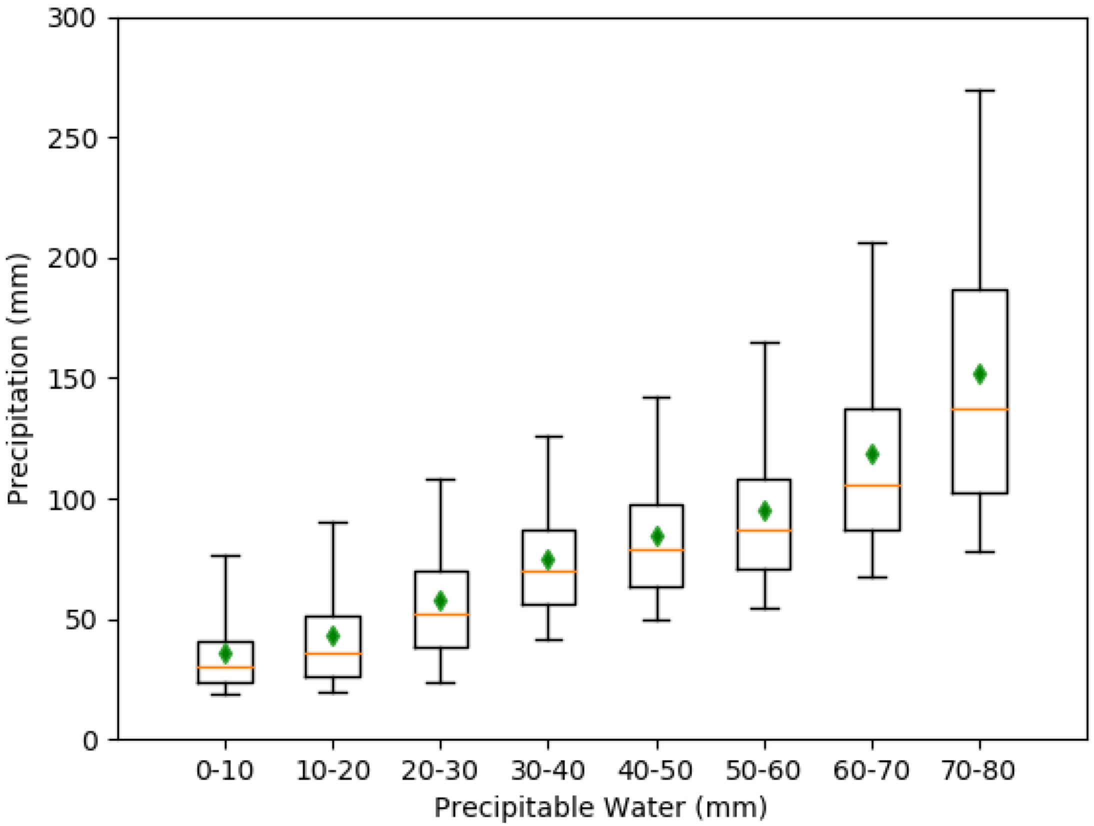

Figure source: Figure 3a in Kunkel, Stevens, et al. 2019: Observed climatological relationships of extreme daily precipitation events and precipitable water in the contiguous United States. *Geophysical Research Letters*, submitted.

R1: Specify project objectives

R2: Check for contextual climate risks at the project concept stage and adjust the site selection or design accordingly

R3: Obtain the design value(s) from historical rainfall data by
(a) collating and ensuring the quality of observed data for site;
(b) extracting the annual maximum series;
(c) fitting an extreme-value distribution to (b); and
(d) calculating the rainfall amount for the required return period with standard error of the estimate.

R4: Download climate change scenarios for the design variable(s)

R5: Calculate design values for specified baseline and future periods by repeating Steps R3a to R3d using climate-model output

R6: Derive the change factor for the specified design variable(s) and return period(s)

R7: Calculate the new design value for the future period at the specified return period and confidence level

Source: ADB (2020) Manual on Climate Change Adjustments for Detailed Engineering Design of Roads Using Examples from Viet Nam

Demand for Climate Data – Summary and Looking Forward

- Historically, climate adaptation planning involved the projection of basic climatic variables (temperature, precipitation) at seasonal resolution. By contrast, scenarios must increasingly be *decision-led*
- The realistic range of plausible future conditions is more important than any (hypothetical) "best" projection
- There is a growing need to understand and project the *behaviour of extremes* (frequency, magnitude), which involves the need to achieve consensus on credible methodologies
- There is a growing need for composite indices for application in *specific sectors*:

  Agriculture: potential evapo-transpiration, standardized precipitation-evaporation index

  Water resources: climatic water balance at basin scale

  All development projects: metabolic heat indices (e.g., wet bulb temperature)
- Climate Risk Informed Decision-making requires that we "…expand(…) the conception of climate models: not simply as prediction machines, but as scenario generators, sources of insight into complex system behavior, and aids to critical thinking …." (Weaver and co-authors 2013)

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