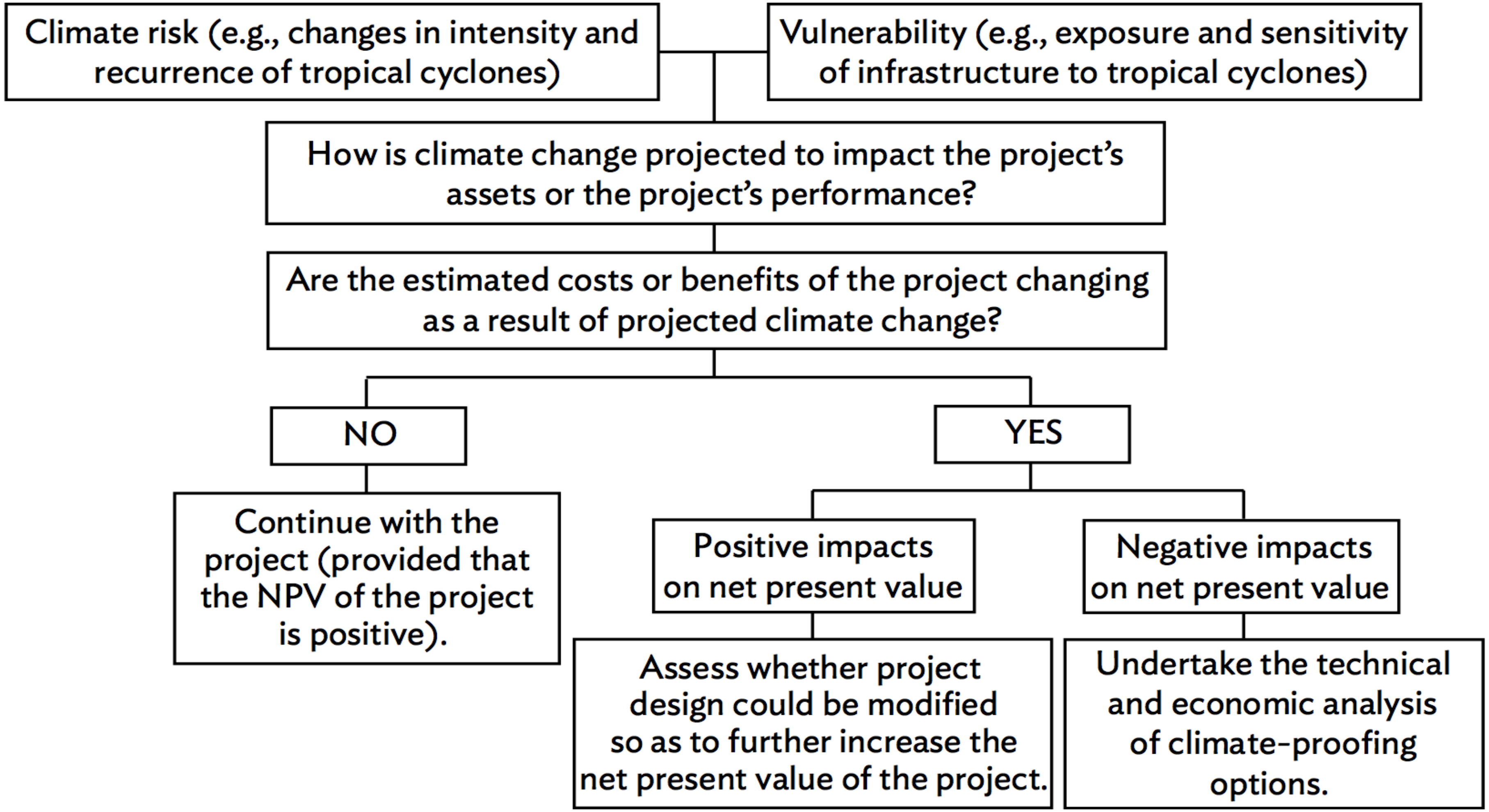
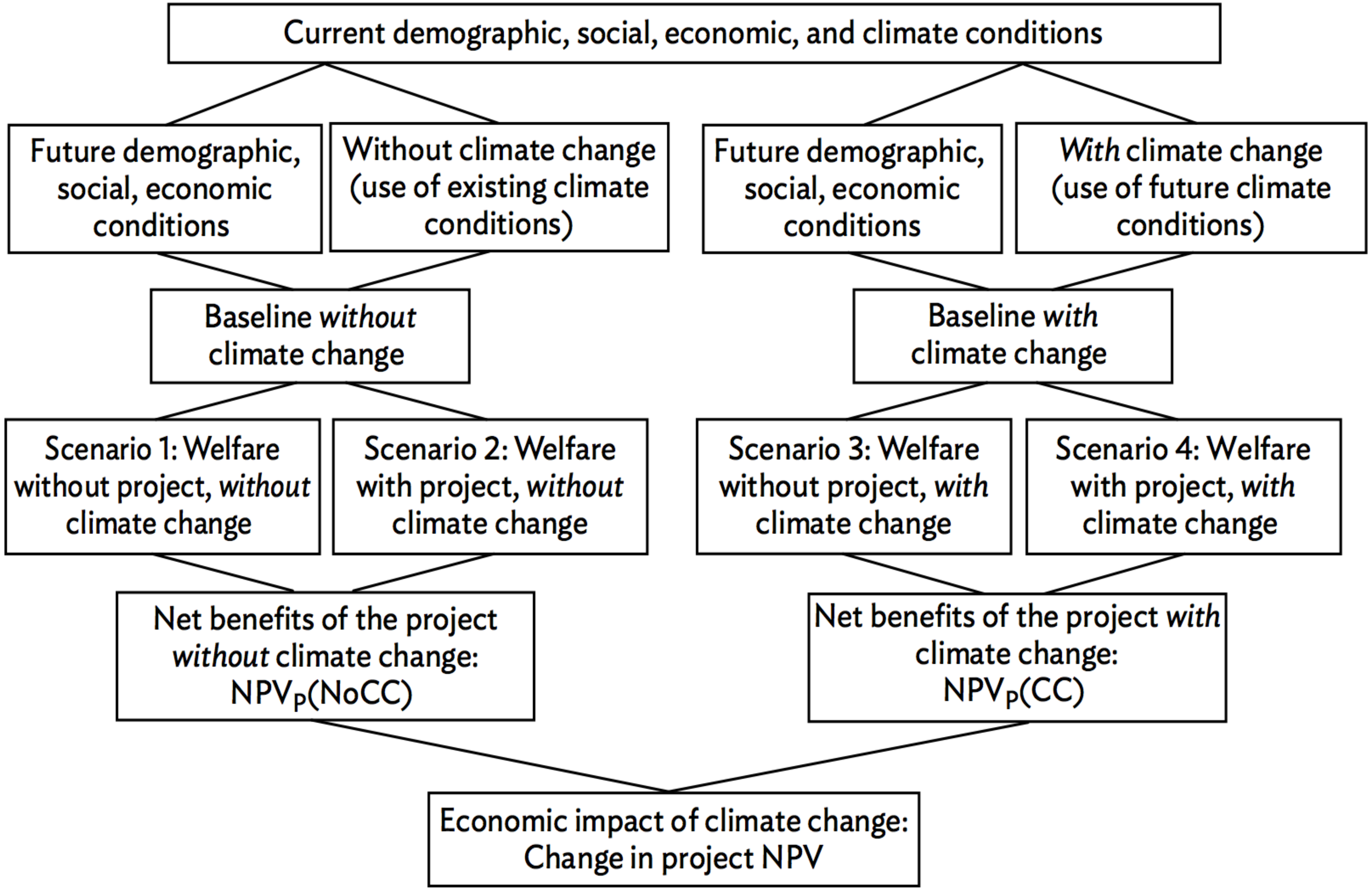
Summary of Economic Analysis of Climate-proofing Investment Projects

Asian Development Bank (2015)

How will climate change impact the project



Economic impact of climate change



Example

- A road project is currently under consideration in a mountainous area of the Mekong River Basin.
- Project construction is expected to take 3 years.
- The capital cost is estimated to be $20 million per year for each of the 3 years of the project.
- Once completed, the infrastructure has an estimated lifetime of 25 years and a residual value of zero.
- Annual (recurrent) operation and maintenance costs are projected to reach $2 million per year from Year 4 to Year 28 (25-year lifetime).
- Benefits of the project (resulting from reduced vehicle operation cost, reduced travel time, and economic benefit of an increase in the number of trips) have been estimated to reach $15 million per year from Year 4 to Year 28.

Without climate change

- Historical records show that 10 severe flood events have been experienced over the course of the last 50 years in the region where the project will take place.
- On this basis, the probability of a severe flood in any given year is estimated to be 20% (10/50).
- Based on historical records, it is estimated that the typical repair cost following each flood event of this magnitude has been on average $5 million (measured in today's dollars).
- Given this information, the *expected* annual repair cost (associated solely with the flood event, as distinct from the normal operation and maintenance cost) is estimated to be $1 million (20% * $5 million).
- A discount rate of 12% is used
- Given the above information, the NPV of the project (in millions of dollars) without climate change is:

$$NPV_p(NoCC) = \$18.95m$$

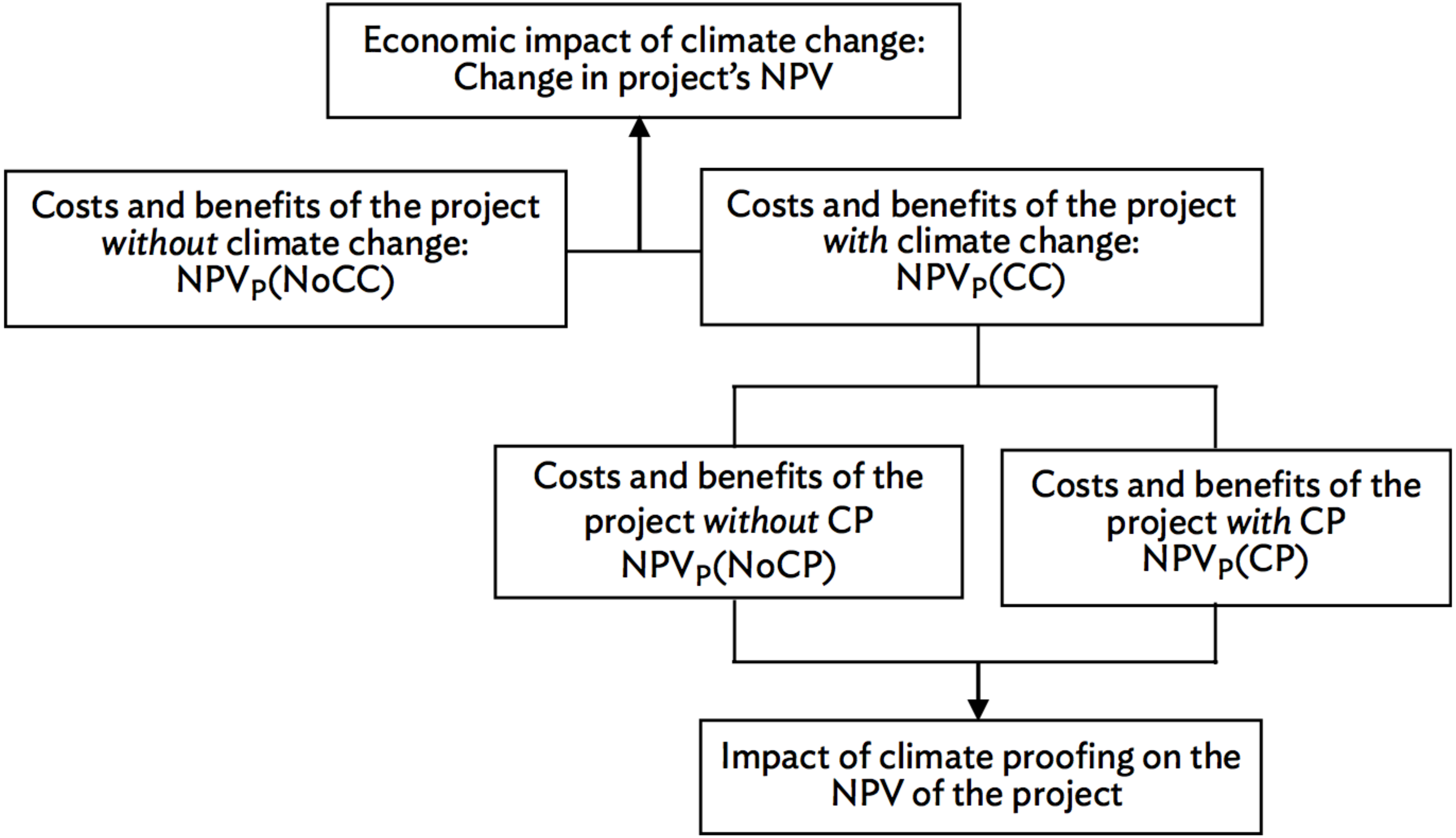
With climate change

- meteorological experts and transport engineers indicate that the *expected* annual repair cost may increase from the estimated $1 million to $2 million over the lifetime of the project infrastructure (as a result of either an increase in the frequency of severe flood events or of higher damages resulting from each event).
- include this higher expected annual repair cost from the very beginning of the project (Year 4)—a *worst case scenario*

$$NPV_p(CC) = \$13.37m$$

$$\text{Cost of CC} = NPV_p\,(NoCC) - NPV_p(CC) = \$18.95m - \$13.37m = \$5.58m$$

Benefits of climate proofing.



Example of impact of climate proofing

- Road engineers estimated that improved road drainage could be designed and implemented in order to reduce damages resulting from flood events in the region.
- The improved road drainage system would increase the project annual capital cost from $20 million to $21 million in each of the first 3 years of the project.
- the expected annual repair cost would be reduced from the estimated $2 million to $1 million (assumed that operational costs remain the same)

Example of impact of climate proofing

- $NPV_p(CC, NoCP) =$ \$13.37m
- $NPV_p(CC, CP) =$ \$16.55m

- Net benefits of climate proofing

$$NPV_p(CC, CP) - NPV_p(CC, NoCP) = \$16.55m - \$13.37m = \$3.18m$$

- Worth investing to improve drainage

Cobenefits or ancillary Benefits

- In addition to improved drainage to protect the road project, it has also been pointed out that hillside reforestation could provide a similar climate- proofing benefit to the road
- hillside reforestation could also provide nont-imber forest products to local communities.
- It has been estimated that hillside reforestation would provide the same climate-proofing benefits as improved drainage by reducing expected annual repair cost from the estimated $2 million to $1 million.
- The hillside reforestation option would increase the project capital cost from $20 million to $22 million in each of the first 3 years of the project
- Hillside reforestation option would also entail an increase in operational cost starting in Year 4 from $2 million to $2.2 million.
- Hillside reforestation project would provide additional benefits in the form of nontimber
  forest products. The economic value of these goods is estimated to be $2 million.
- Agriculture experts point out that these ancillary benefits would start being realized only in Year 10 of the project time horizon.

Cobenefits or ancillary Benefits

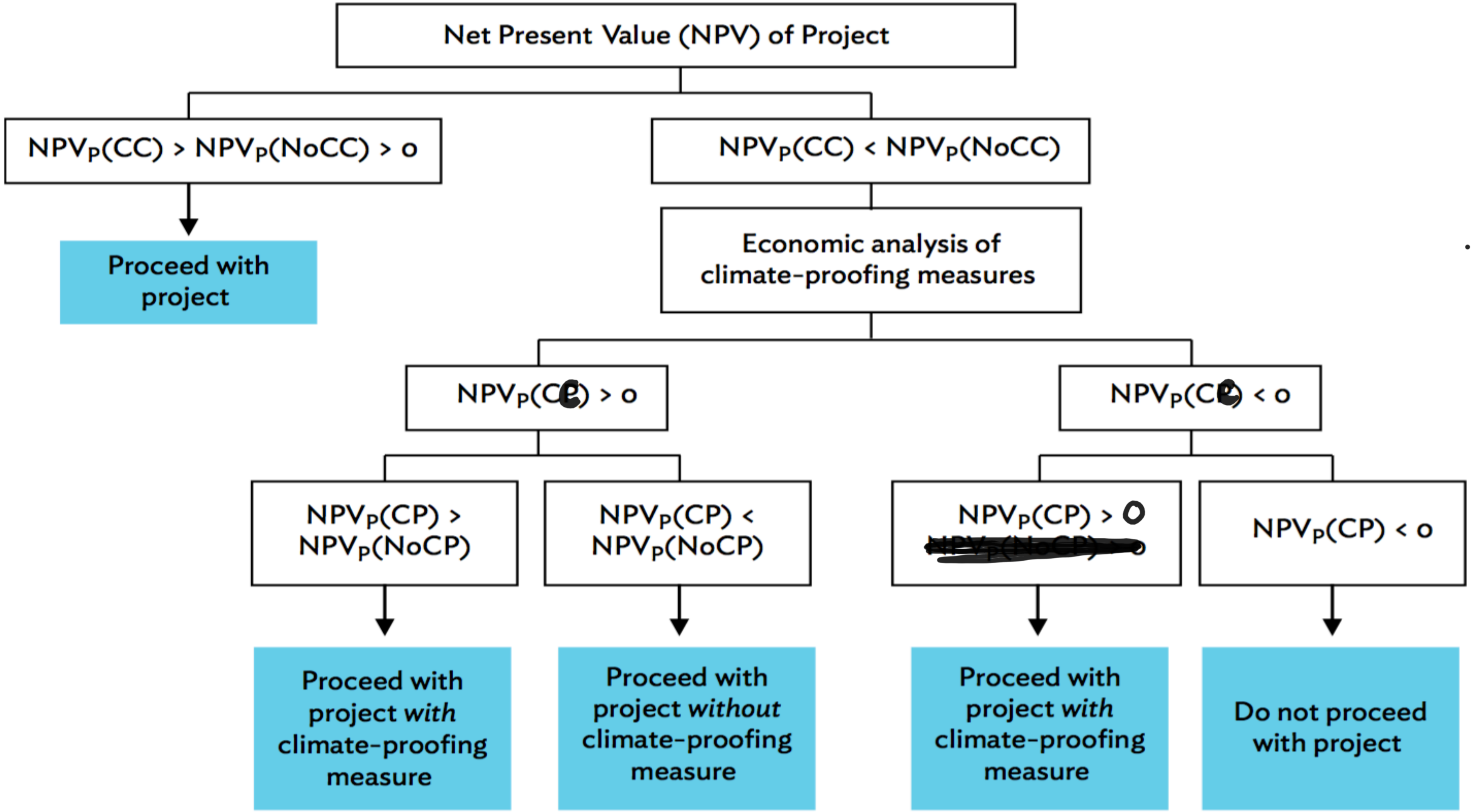
- NPV_p(CC, NoCP) = $13.37m
- NPV_p(CC, drainage) = $16.55m
- NPV_p(CC, reforestation) = $18.35m
- Economic benefit of improved drainage = $3.18m
- Economic benefit of hillside reforestation = $4.97m

Discount rate

The World Bank has not calculated a discount rate but has used 10%–12% as a notional figure for evaluating Bank-financed projects. This notional figure is not necessarily the opportunity cost of capital in borrower countries, but is more properly viewed as a rationing device for World Bank funds. Task managers may use a different discount rate, as long as departures from the 10%–12% rate have been justified in the Country Assistance Strategy (Belli et al. 1998).

The economic justification of the project is based on comparing the benefits and costs as they occur over time and appropriately discounted. A project investment is economically justified if the estimated economic internal rate of return (IRR) exceeds the economic opportunity cost of capital (EOCC) for the country. Given the difficulty of estimating country-specific EOCCs, the EOCC for all ADB DMCs is 12%. An economic IRR between 10% and 12% is acceptable if there are significant unquantified net benefits (ADB 2013c).

Decision rule



Decision rule: Invest now

- The costs of climate proofing now are estimated to be relatively small while the benefits (the avoided expected costs from not climate proofing) are estimated to be very large.
- The costs of climate proofing at a later point in time are expected to be prohibitive or climate proofing at a later point in time is technically not possible.
- The climate-proofing measures deliver net positive economic benefits regardless of the nature and extent of climate change.
- The climate-proofing measures not only reduces climate risks to the project, but also has other social, environmental, or economic benefits.

Decision rule: Invest minimally

- Take steps to ensure that the project can be climate proofed in the future.
- Aim to ensure that the project is “ready” for climate proofing if and when required.
- For example, while current sea level rise and storm surge scenarios may not warrant the construction today of sea dikes suitable to projected higher sea level and stronger storm surges in a distant future, the base of the sea dike may nonetheless be built large enough today to accommodate a heightening of the sea dike at a later point in time.

Decision rule: No investment

- The costs of climate proofing now are estimated to be large relative to the expected benefits.
- The costs (in present value terms) of climate proofing (e.g., retrofitting) at a later time are expected to be no larger than climate proofing now.
- The expected benefits of climate proofing are estimated to be relatively small.