BUILDING RESILIENCE

FOR CLIMATE CHANGE & NATURAL DISASTER RISKS in HYDROPOWER & DAMS

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November 13, 2017

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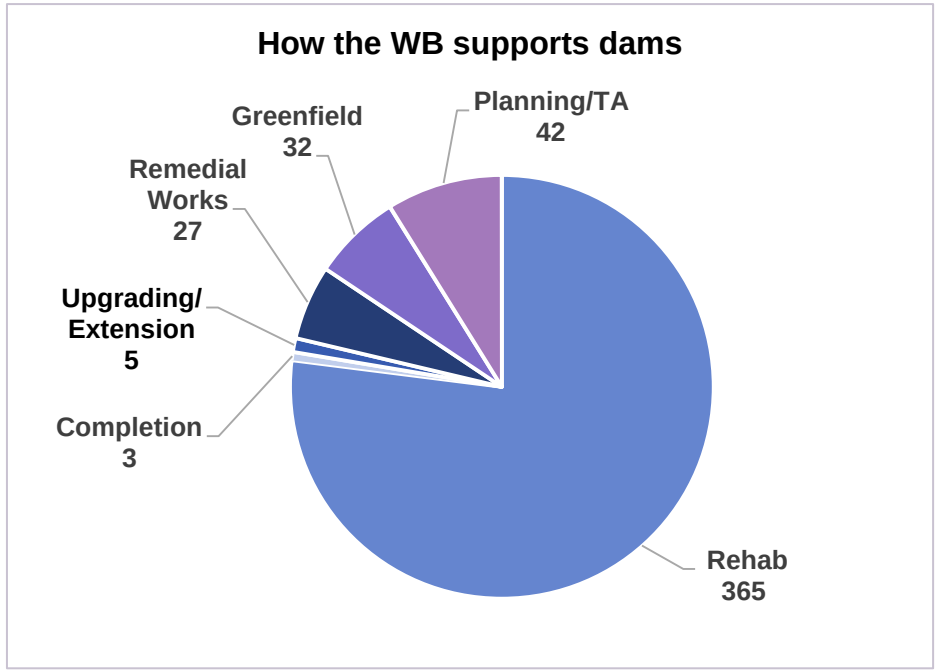
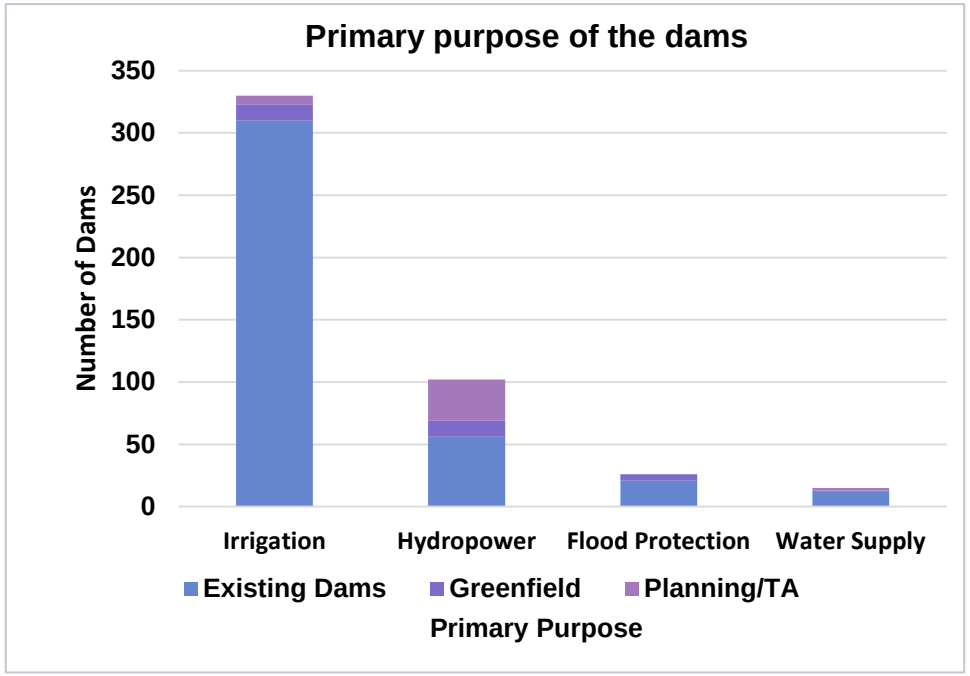
WORLD BANK SUPPORT FOR DAMS: THE LAST 5 YEARS

102 projects supporting development or rehab of more than 473 dams.





399 out of the 473 dams (84%) already exist

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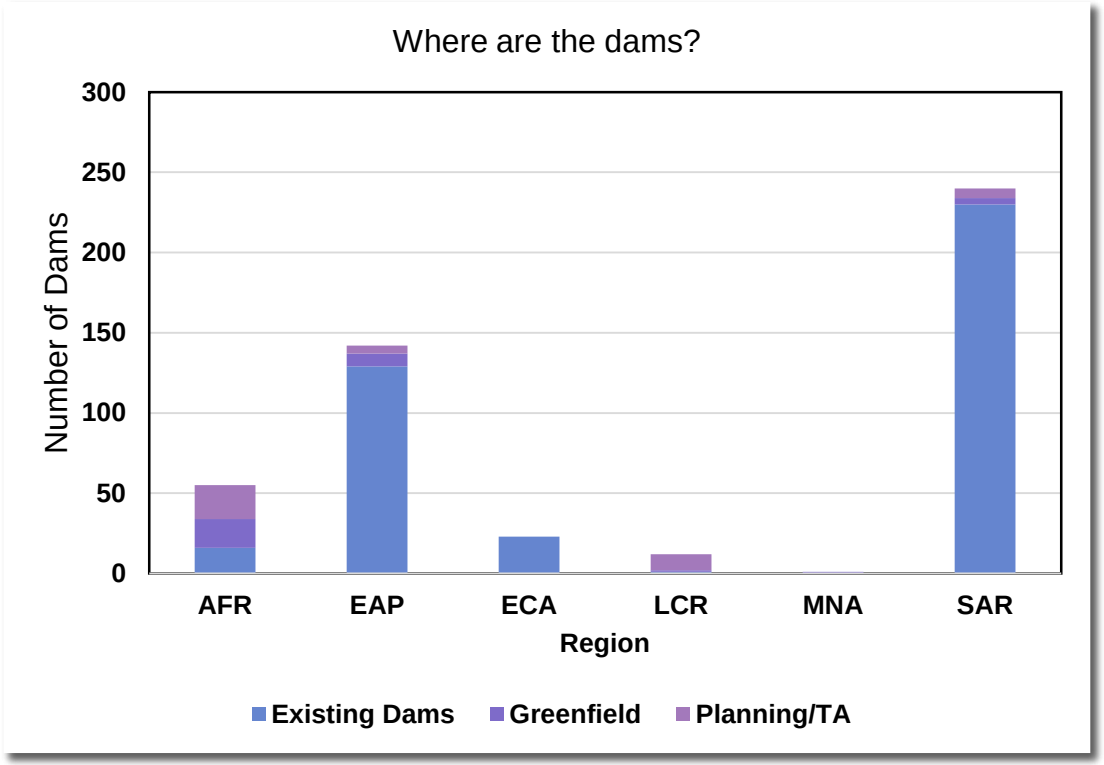

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CLIMATE CHANGE & SCREENING REQUIREMENTS

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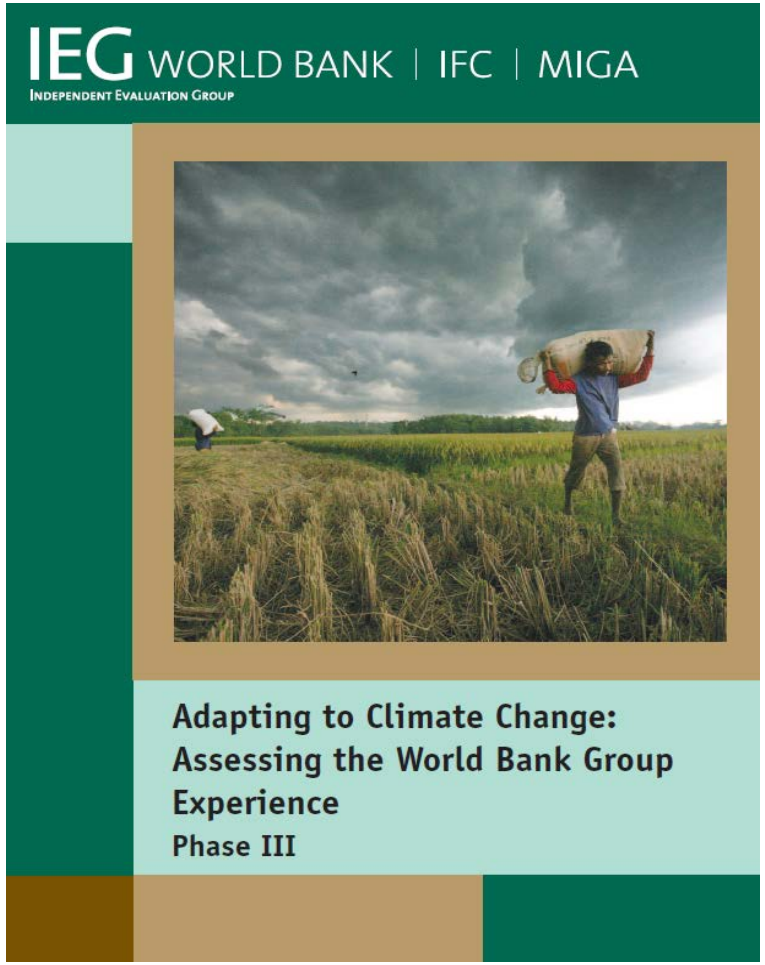
2010 IEG Report



4. Anticipatory Adaptation to Climate Change

Highlights

- Climate models have been more useful for setting context than for informing investment and policy choices. They have limited reliability for decisions involving precipitation extremes in small areas.
- Although hydropower has a long tradition of dealing with climate variability, the Bank Group lacks guidance on appropriate methods for incorporating climate change considerations into project design and appraisal.
- Land use planning is, in theory, critical to anticipatory adaptation for disaster exposure reduction, coastal zone management, and biodiversity conservation. But experience and success are limited.
- The Bank has begun to incorporate ACC into biodiversity projects, but few projects have had the goal of conserving biodiversity that could be critical for agricultural adaptation.

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IDA 17 REPLENISHMENT

SPECIAL THEME ON CLIMATE CHANGE

Screening all new operations for short- and long-term climate change and disaster risks, and where risks exist, integrate appropriate resilience measures.

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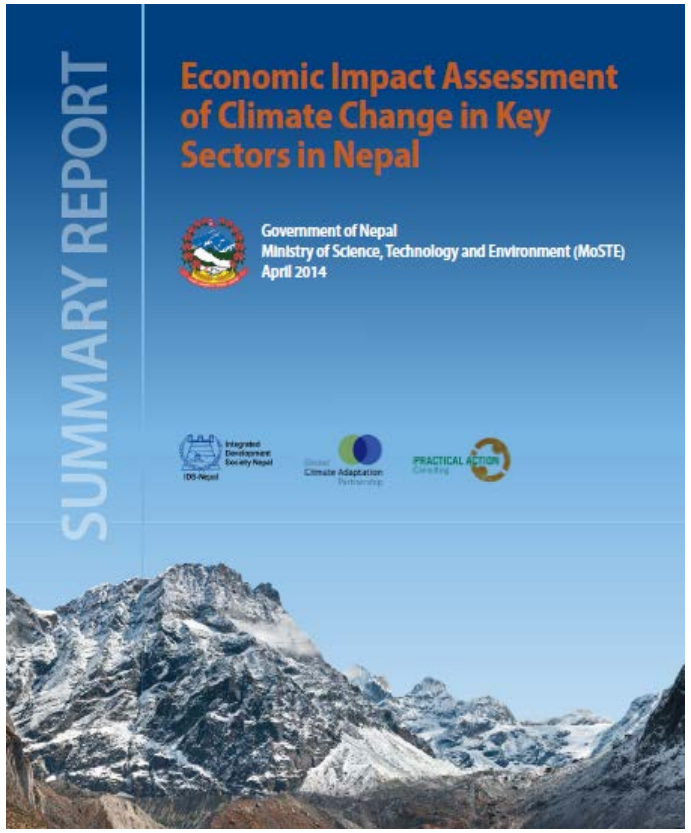
CLIENTS ASKED FOR ASSISTANCE ON MORE FLEXIBLE AND ITERATIVE PLANNING



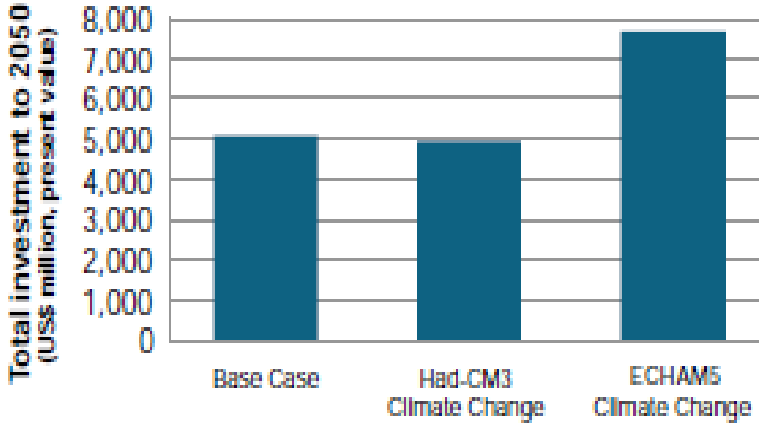


Figure 10. Total investment: current to 2050 (present value)

The results indicate that the potential importance of climate change on the sector is high, but that there is considerable uncertainty over future changes, which vary by climate model (as shown in Figure 10), river catchment and over time. It is highlighted that using historic data for the design of plants will not capture these possible future changes. This necessitates more monitoring and research, and a move to more flexible and iterative planning.

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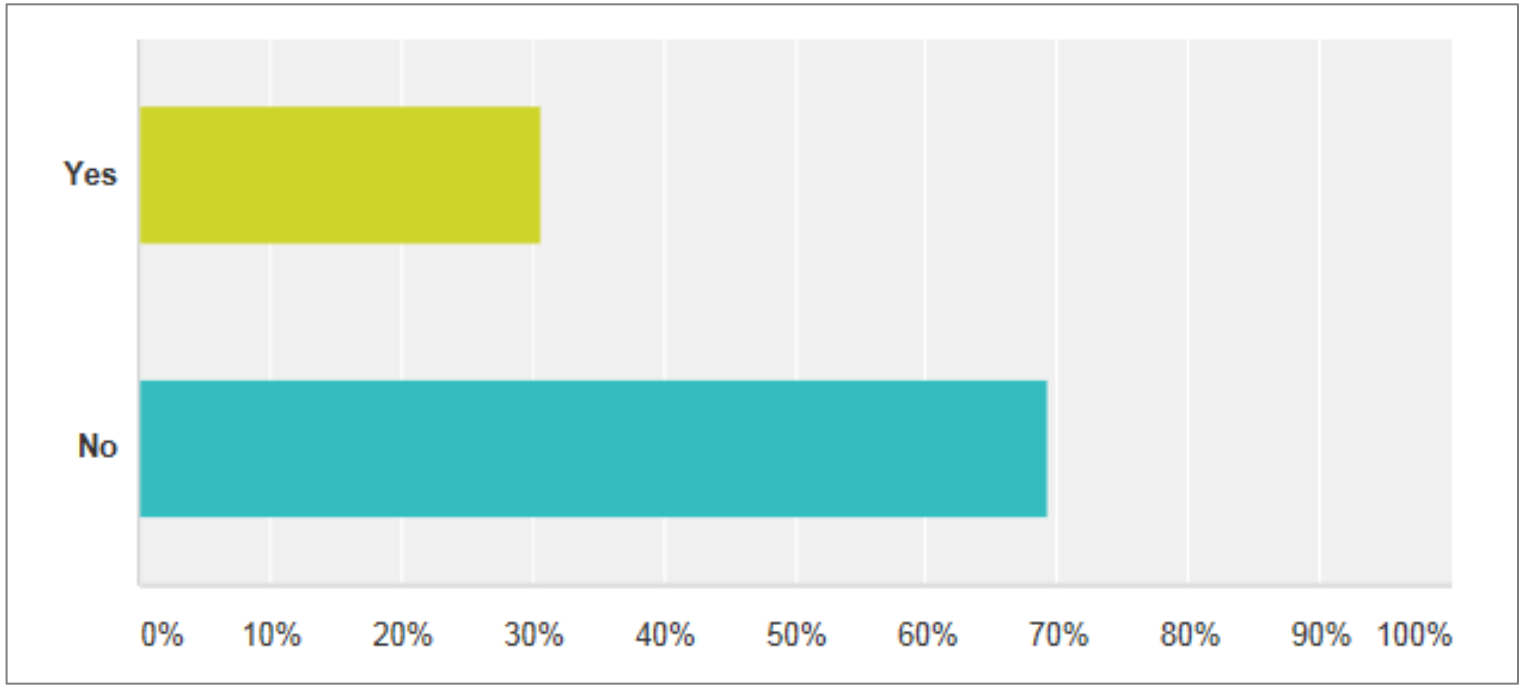
ARE YOU FAMILIAR WITH METHODOLOGIES OF STUDYING CLIMATE CHANGE IMPACTS ?



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- We started looking at approaches taken to Climate Change Analysis in selected hydropower projects in the Bank.
- Realized that there was no really guidance. Each project was doing its own thing.
- The Bank was actively working on Decision Tree in the Water GP
- Most of this was focused on screening tools BUT VERY LITTLE ON GUIDANCE ON RESILIENCE.

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INCLUDING CLIMATE UNCERTAINTY IN WATER RESOURCES PLANNING & PROJECT DESIGN - DECISION TREE INITIATIVE

- There is no accepted general methodology for assessing the significance of climate risks relative to all other risks to water resources projects, nor is there an accepted process within the World Bank.
- Need for a pragmatic process for risk assessment of Bank water resources projects that serves as the basis for a decision support tool to assist project planning under uncertainty.
- New approach of robustness-based, bottom-up alternative to previous top-down approaches to climate risk assessment, beyond ‘GCMs’.

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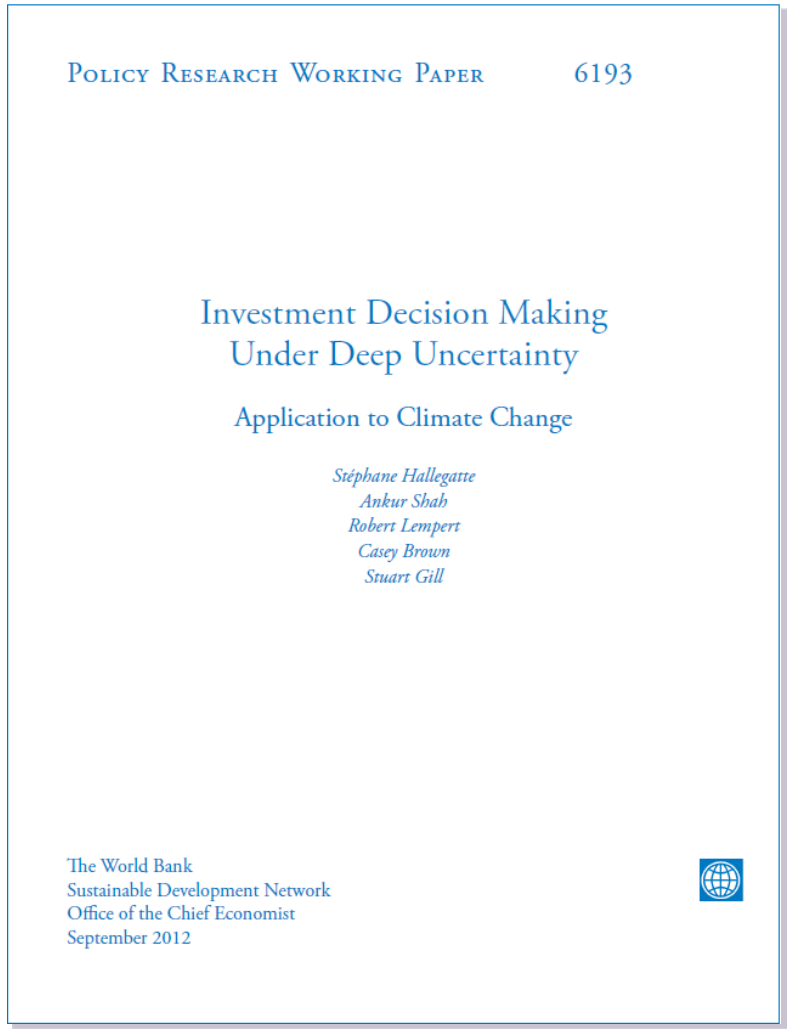

The paper concludes that it is impossible to define the “best” solution or to prescribe any particular methodology in general. Instead, a menu of methodologies is required, together with indications on which strategies are most appropriate in which contexts.

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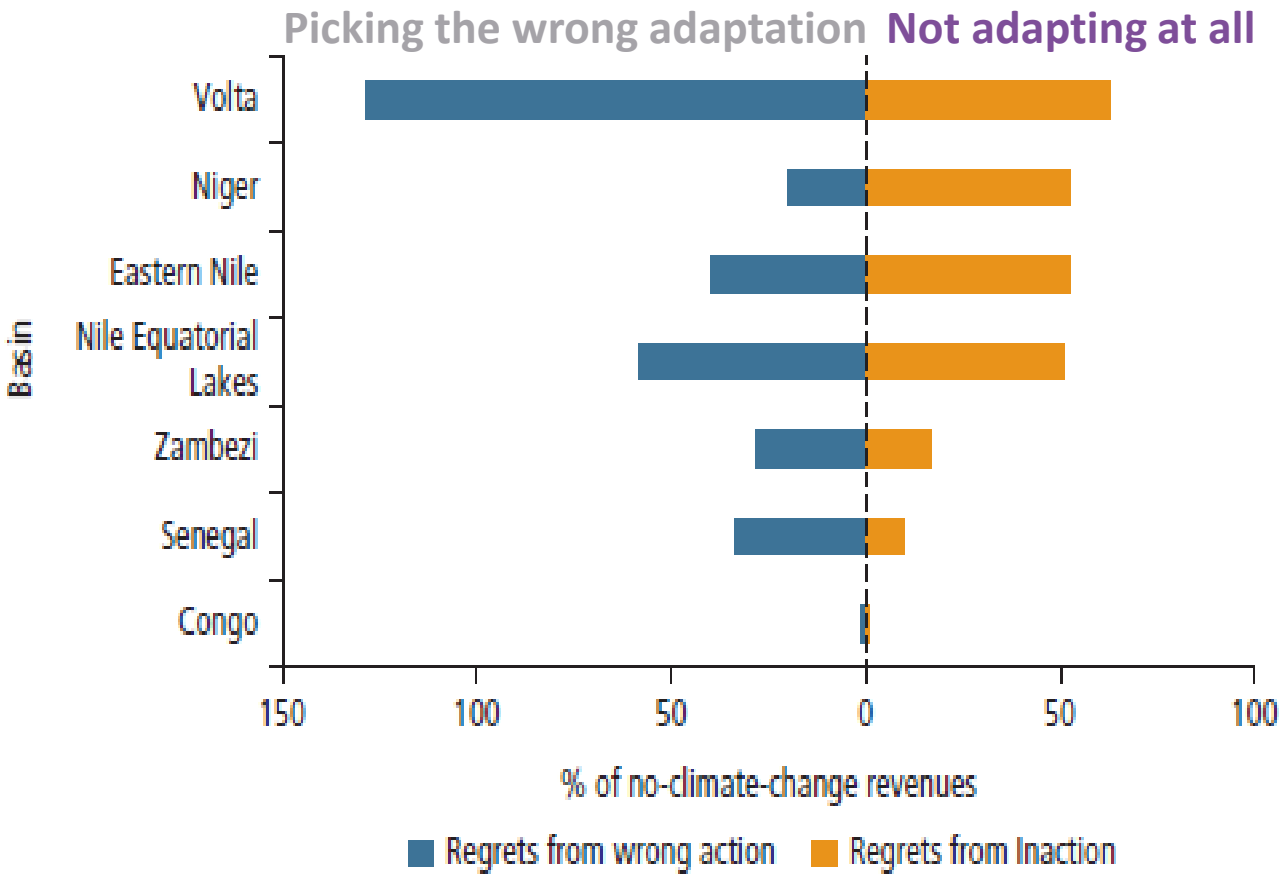
Find Large Costs for Adapting in the Wrong Way



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GUIDELINES

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Hydropower Sector Climate Resilience Guidelines

Final Report

15 September 2017

World Bank

Future climate conditions as part of a business risk analysis or climate change risks in power planning are not considered due to:

(a) No recognition that future climate trends will differ from past ones;
(b) Parties are uninformed about the potential risks to their business operations over various timescales;
(c) No clear understanding of how climate change could undermine their investments;
(d) lack of access to relevant climate and weather information to incorporate into infrastructure design, operations and maintenance, and business continuity plans; or
(e) discouraged by perceived costs of making adjustments to their business plans. This could lead to reduced power system reliability in both the short- and long-term, directly impacting local economic services, communities, as well as national energy security and economic growth.

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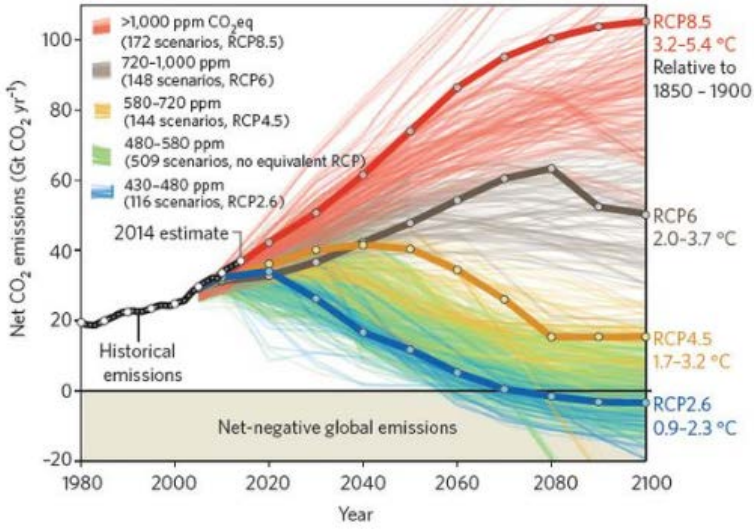
Purpose of Guidelines

- No specific guidelines already exist
- World Bank requires Climate Change Resilience to be used as part of its project filtering process.
- Need to connect upstream climate science with downstream engineering practices.
- Need to identify and evaluate robust approaches for planning, evaluating, and designing hydro-specific infrastructure investments.
- Guidance document should be applicable to all regions of the world and for various phases of project development.



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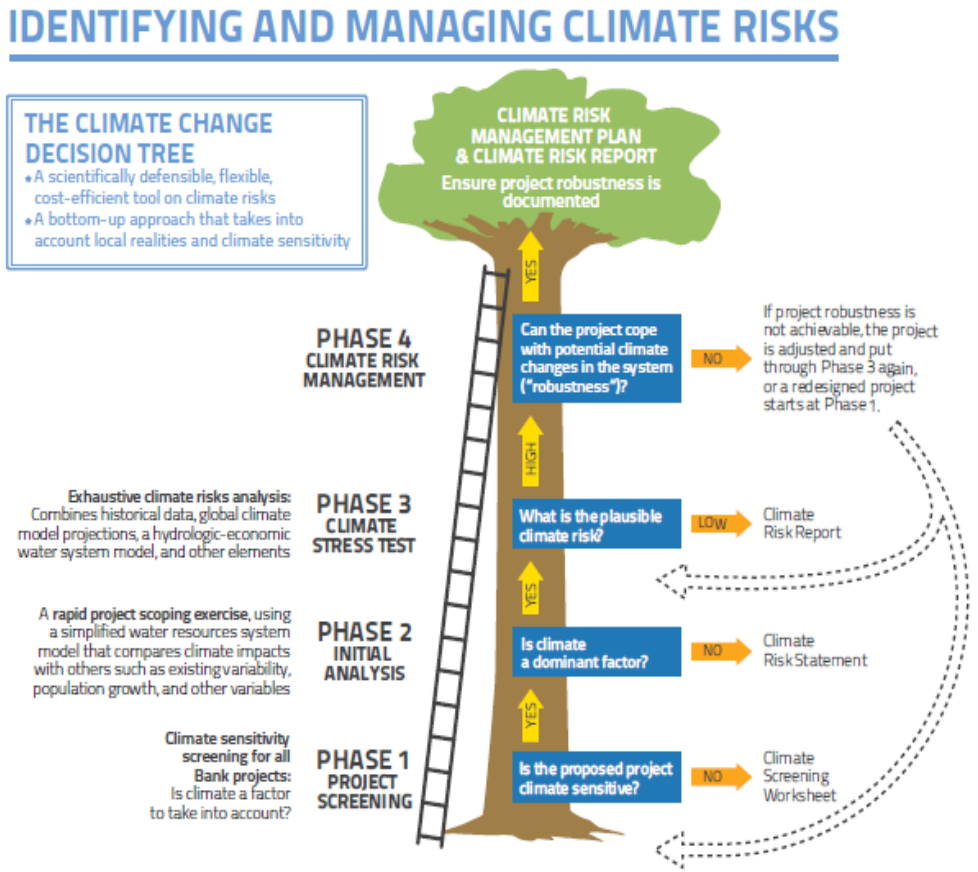
Overall Approach to the Guidelines

- **Guidelines build on the World Bank Decision Tree Framework and other studies done by IHA, ICOLD and others.**
- **Applicable for all regions of the world**
- **Applicable to all scales of development**
- **Can be applied at any stage of project development or procurement.**
- **Process to be fully integrated with existing engineering and ESIA activities.**



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Overall Report Outline

Hydropower Sector Climate Resilience Guidelines

Final Report

15 September 2017

World Bank

- **Part 1: Introduction**
- **Part 2: Defining resilience**
- **Part 3: Climate resilience guidelines for the hydropower sector**
- **Part 4: Key messages and advice for key players**
- **Part 5: Climatic stressors on hydropower projects**
- **Part 6: Project performance and associated metrics**
- **Part 7: Climate modelling and natural hazard assessment**
- **Part 8: Overview of decision making under climate uncertainty**
- **Part 9: Case Study: The Upper Trishuli-1 Hydropower Project**
- **Part 10: Case stories**
- **Part 11: Summary of stakeholder engagement**
- **References**
- **Annexes (10)**

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Part 3: Climate resilience guidelines for the hydropower sector - overview

- **Climate resilience assessment is not a standalone exercise – it must be fully integrated in the existing feasibility and design work already being undertaken on hydropower projects.**
- **Much of the recommendations enhance existing good practices but with additional resilience assessments.**
- **Process is for new projects, decommissioning, refurbishment and upgrading, or operation and maintenance of an existing project.**
- **Checklist to be completed at each Phase with a summary of the findings.**
- **'Exit' possible after Phase 2 or 3 if not applicable (i.e. not all projects must complete all Phases)**

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Part 3: Climate resilience guidelines for the hydropower sector

Summary

- When, who and the objective are highlighted.
- Six phases with concise steps within each phase.
- The methodology to perform each step is documented.
- Examples of flow charts, risk assessment and registers, and economic/financial analyses are shown.
- Examples of structural and non-structural or functional adaptation measures are given.
- A list of additional readings is provided.
- A checklist and criteria for progressing is presented at the end to check that all key items were analysed, to document findings, and to track progress.

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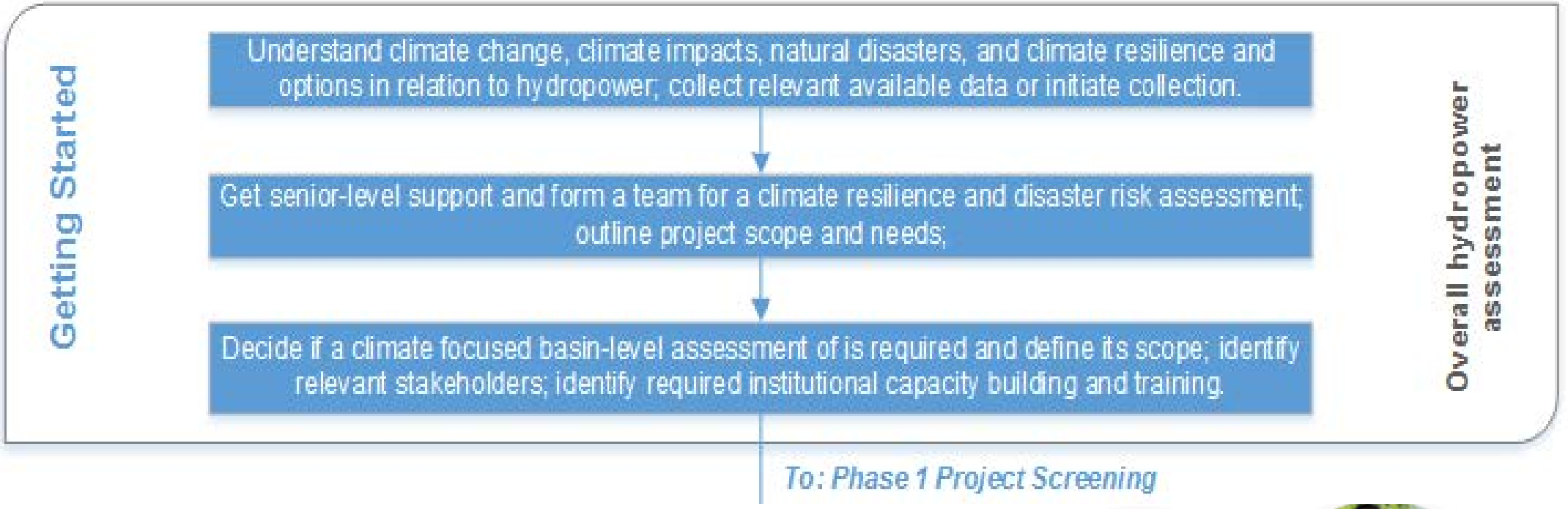
Getting Started

What are the key climate change issues to be addressed in hydropower operation and development?



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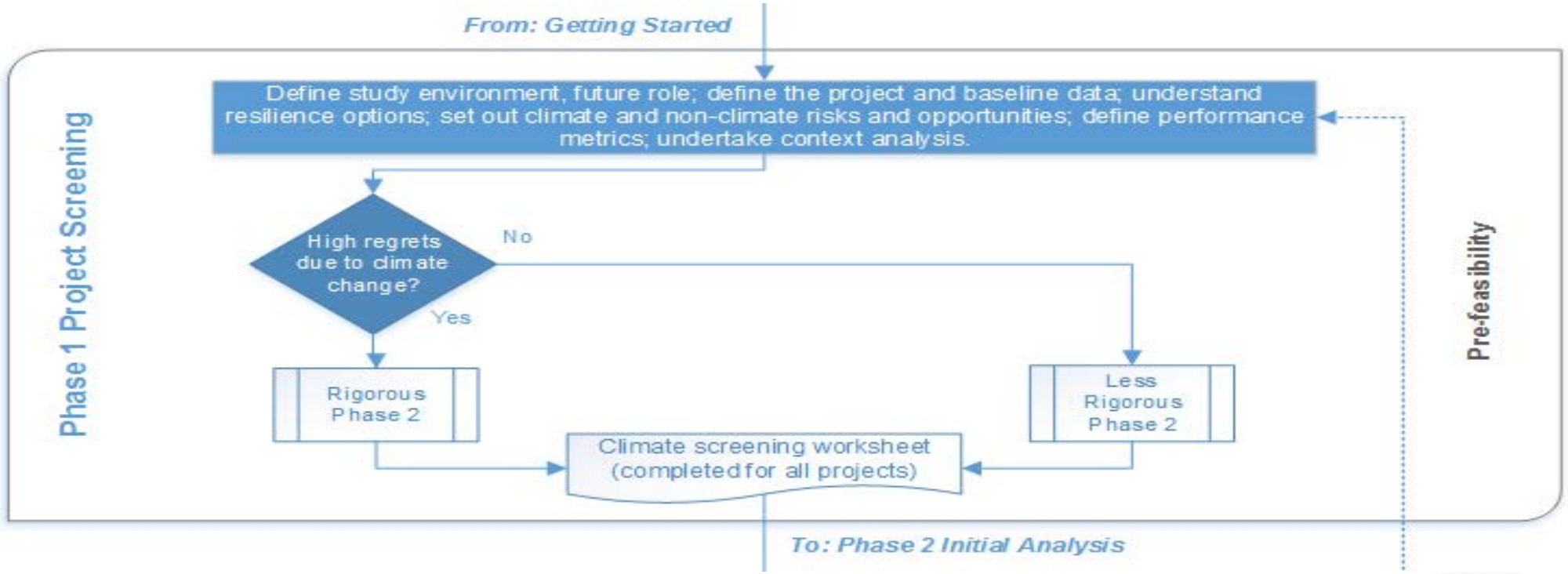
Phase 1: Project Screening

Are there high potential regrets due to climate change?



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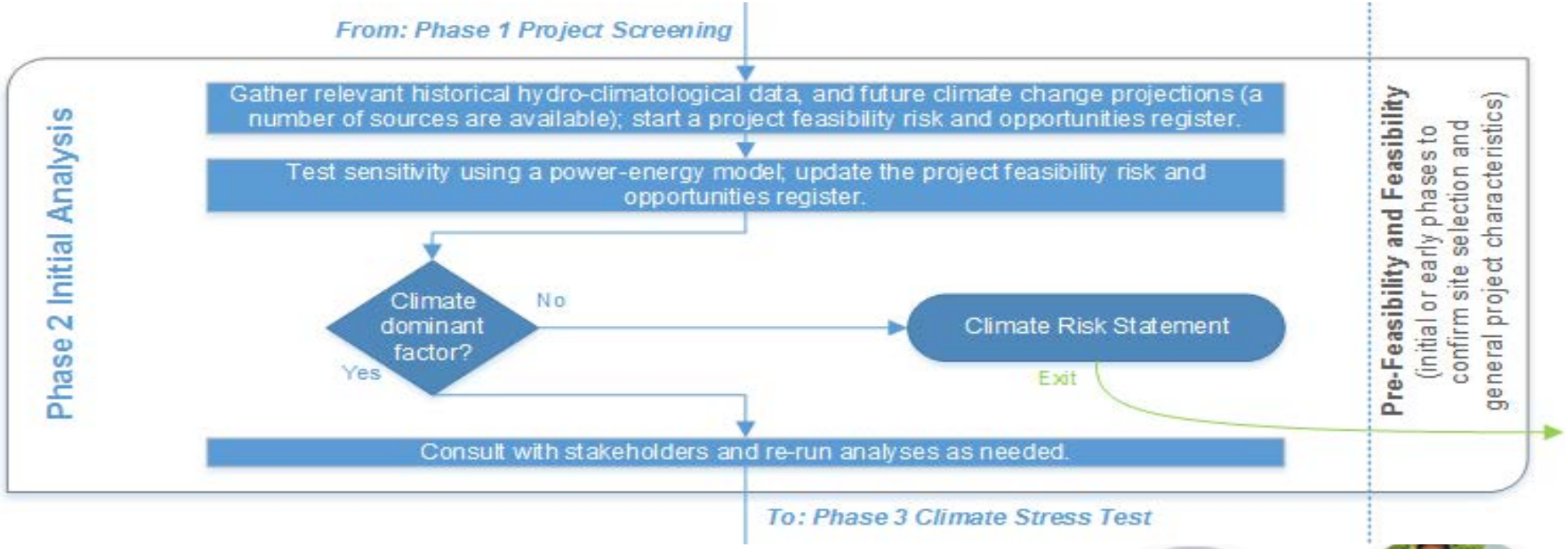
Phase 2: Initial Analysis

Is climate a dominant factor?



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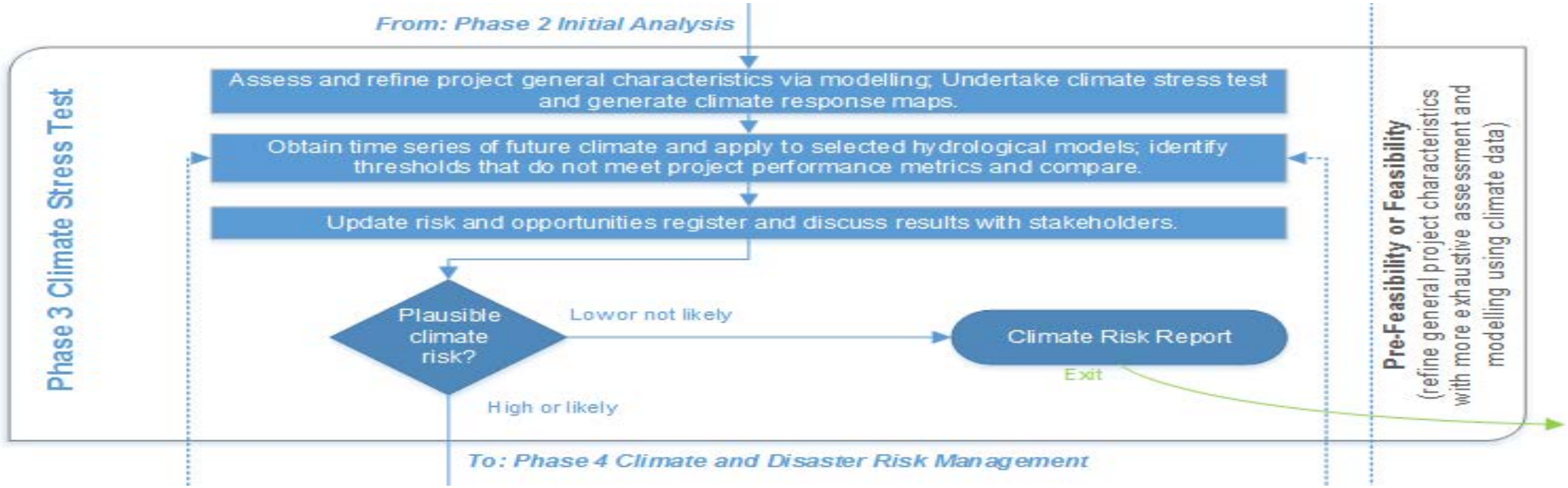
Phase 3: Climate Stress Test

What is the plausible climate risk?



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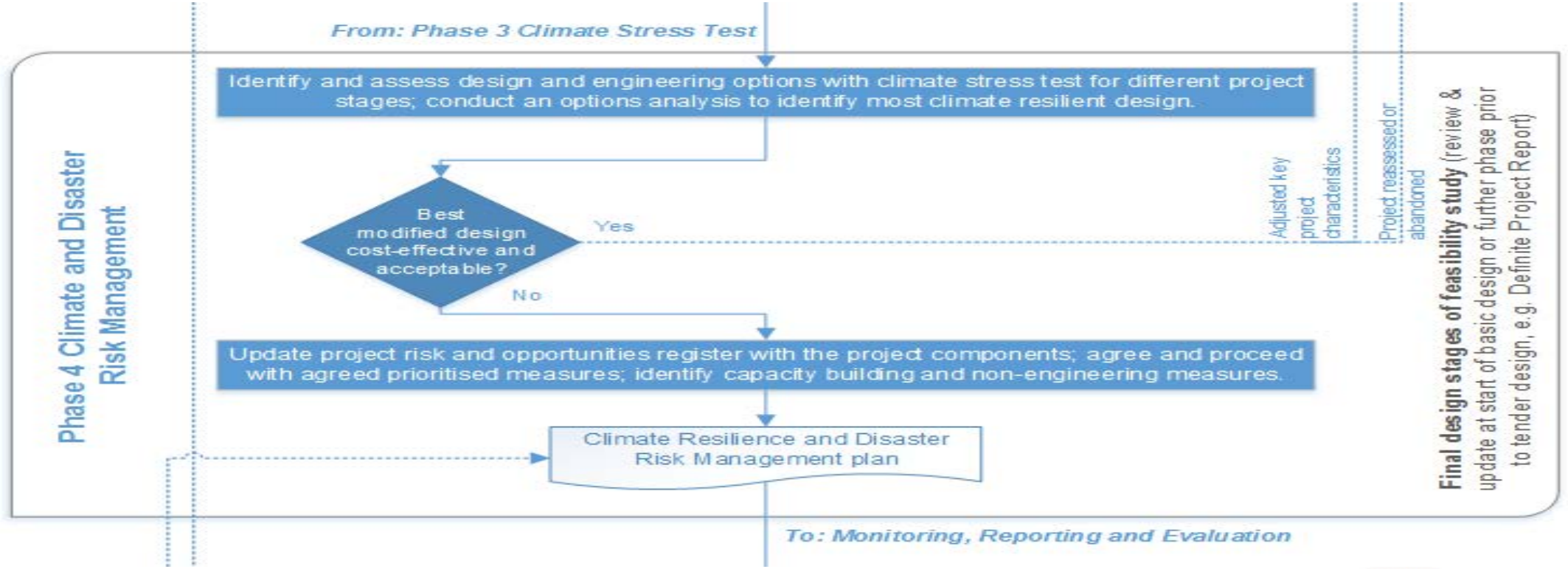
Phase 4: Climate Risk Management

Is the modified design that best improves resilience cost-effective and acceptable?



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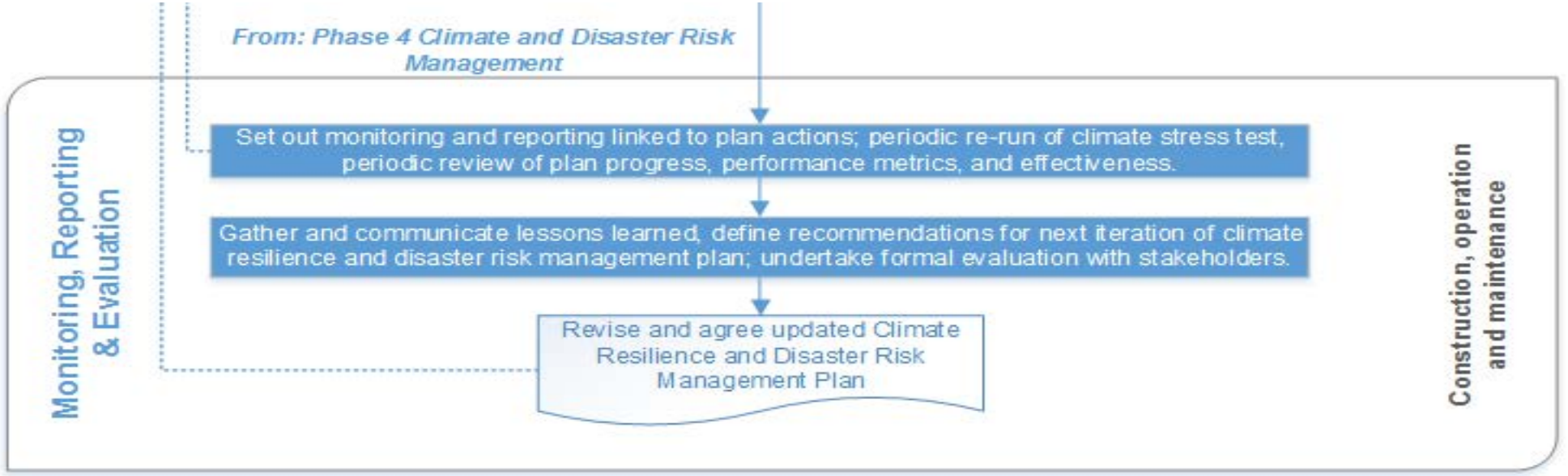
Monitoring, Reporting & Evaluation

How can resilience be tracked, monitored, evaluated and updated?



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Part 3: Climate resilience guidelines for the hydropower sector

Expected Results

- **Stakeholder engagement is critical to process and runs through all six Phases.**
- **Examples of integrated Risk Registers and structural and functional adaptation measures are presented.**
- **Economic or financial performance must be considered throughout the process to ensure resilience measures are viable.**
- **Climate stress test to be undertaken, e.g. through a climate stress test with a defined threshold.**
- **Feedback loop from Phase 4 back to Phase 1/3 if project cannot cope with the climate risks, i.e. is not robust.**

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Way forward

- **Draft Guidelines submitted to the World Bank on September 15, 2017**
- **World Bank internal review process to take place in November 2017**
- **Draft to be Disseminated to wider hydropower community**
- **Pilot projects to be selected and started**
- **Feedback on pilot projects to be collated by World Bank and guidelines finalised and issued**

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Stakeholder Engagement

iha
international hydropower association

https://www.hydropower.org/sediment-management

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