Addressing the Effects of Climate Change in Environmental Assessments

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Ontario RAC Webinar Series

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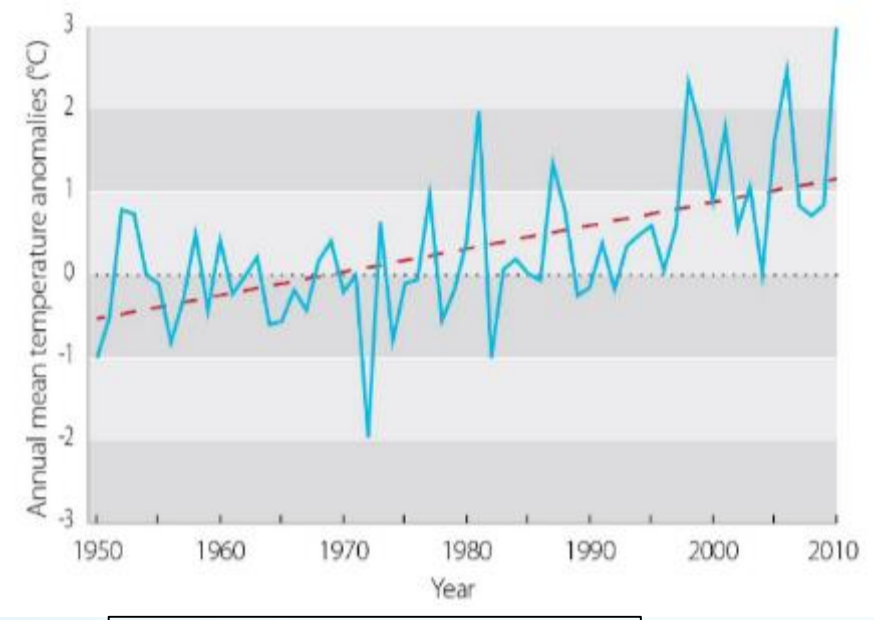
Webinar Outline

- Background
- Best Practices: Overview
- Best Practices: Details
- Overarching Issues and Challenges
- Questions?

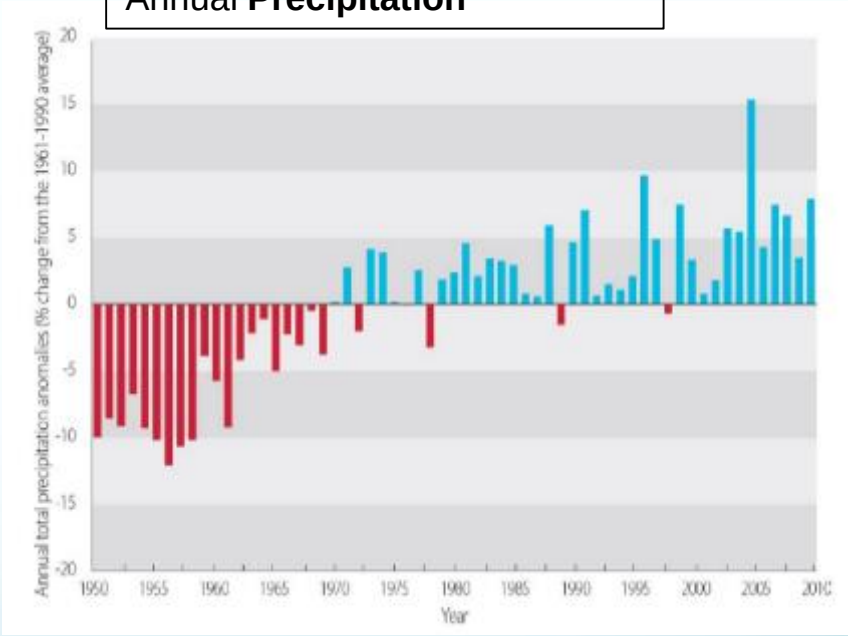
Background to Webinar

Climate Change: Happening & Impactful



ABOVE: Canadian Average Annual **Temperature**

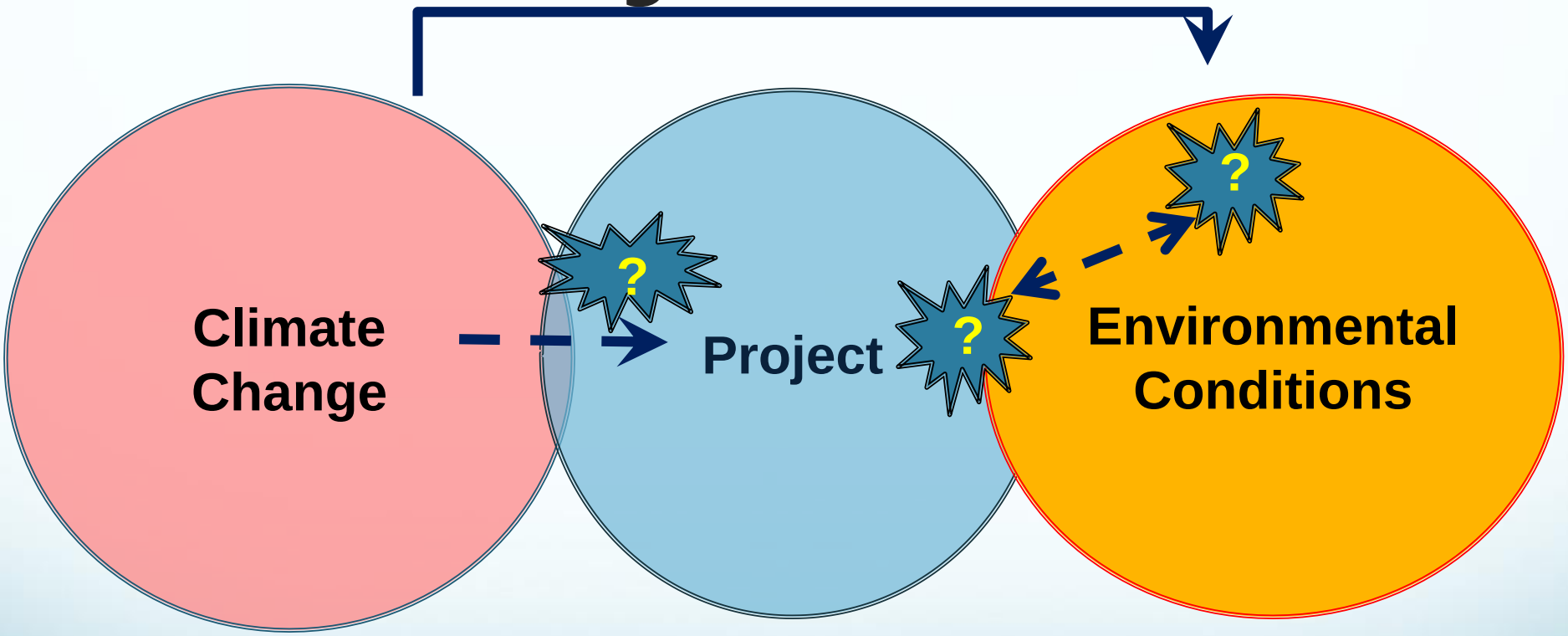
BELOW: Canadian Average Annual **Precipitation**



From Vincent et al. (2012) and Mekis & Vincent (2012),

Measured Departures from 1961-1990 baseline

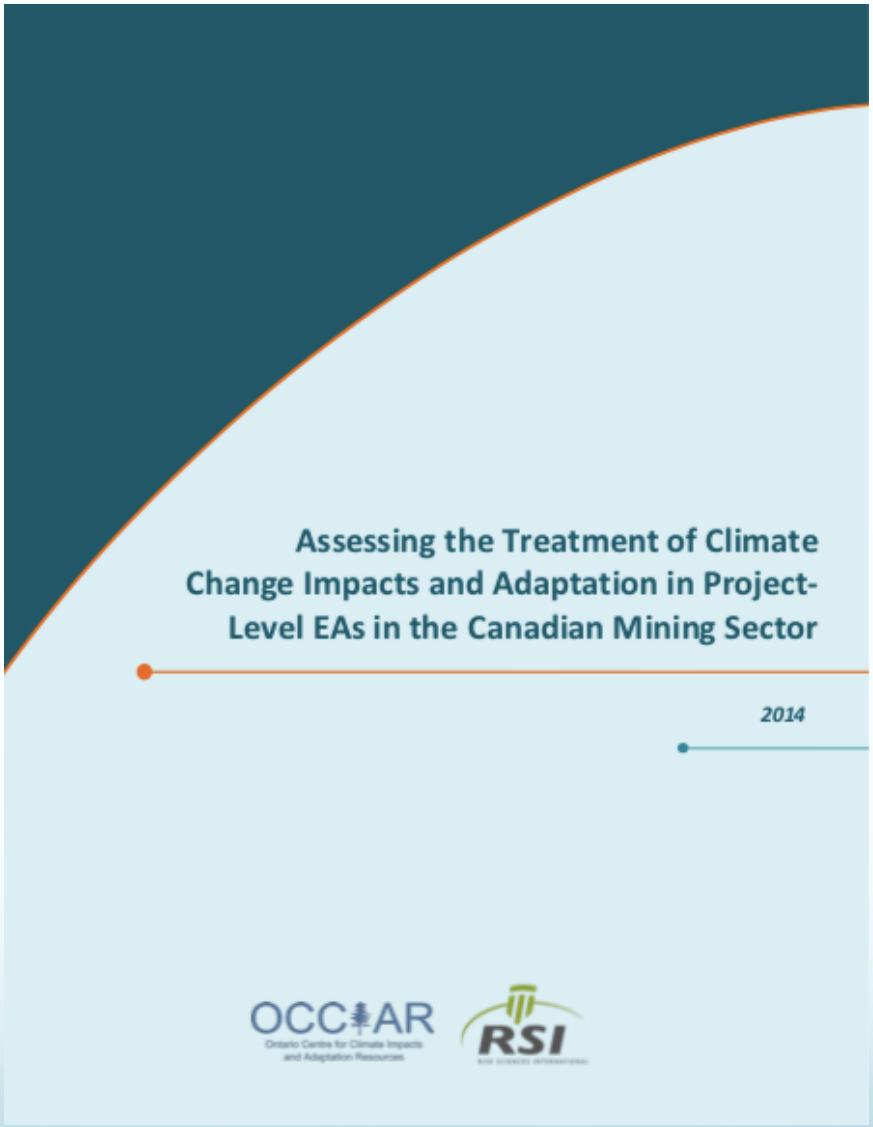
Need to Consider Effects of Climate Change…



Impacts *on* Project and Impacts *of* Project

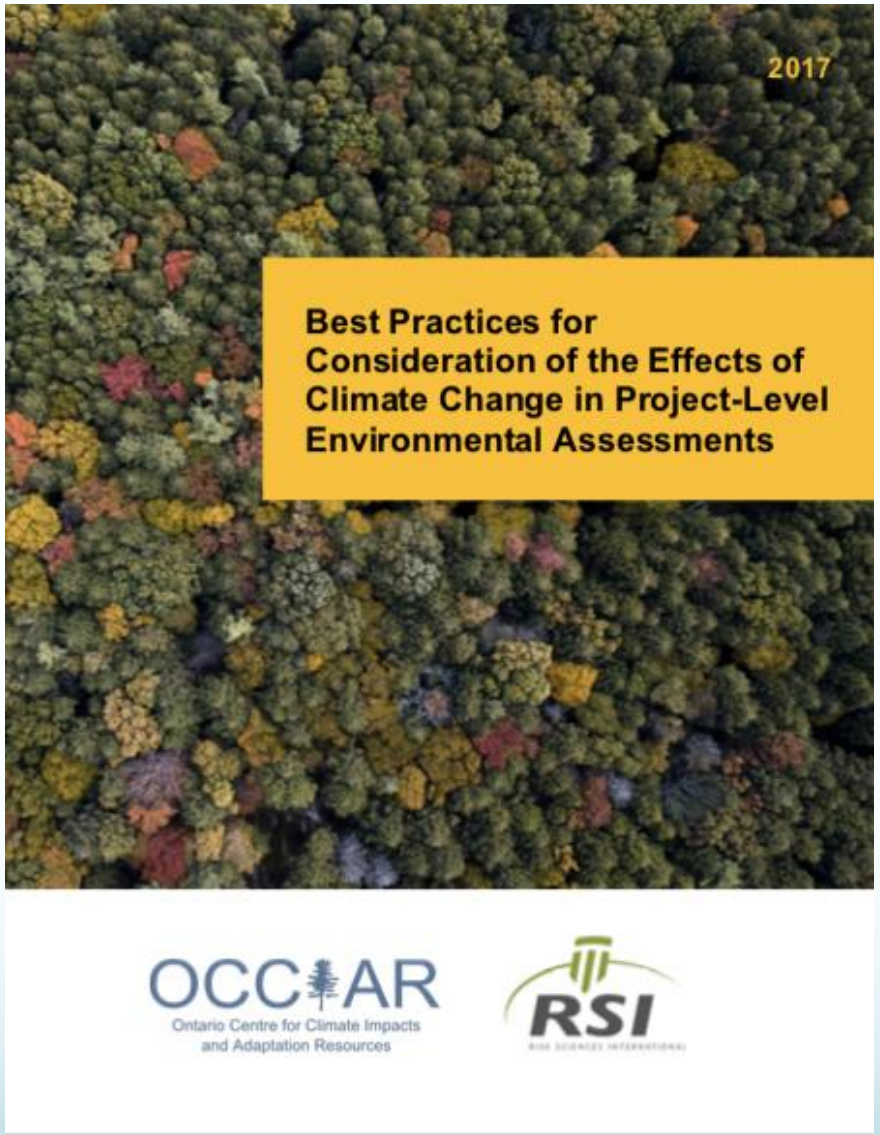
- Temperatures ---> Permafrost --> Pipeline
- Precipitation ---> Streamflows
  ---> Hydroelectric Plant ---> Energy
- Rainfall ---> Stormwater Management
  ---> Water Quality ---> Fish
  ---> Food Supply

OCCIAR and RSI 2014 Report



http://www.climateontario.ca/doc/p_ECCC/A_Review_of_Mining_Sector_Environmental_Assessments_OCCIAR_RSI.pdf

Most Recent (2017) Best Practices Report



http://www.climateontario.ca/doc/reports/BestPracticesForConsiderationOfEffectsOfClimateChangeInProjectEAs2017.pdf

Best Practices Developed from

- Current practices
- Guidelines
- Academic and expert literature

Beyond existing regulatory requirements

Requirements and stakeholder expectations evolving

Apply those practices that are appropriate and feasible under the circumstances

Best Practices Framework

Scoping	**BP1**. Identify environmental and project components affected by climate change
	BP2. Identify level of detail for assessing effects (preliminary assessment)
	BP3. Examine effects of climate change on need for or justification of project
Assessing effects	**BP4**. Adjust future baselines for climate change
	BP5. Assess effects of project
	BP6. Assess effects of climate on project
Mitigating effects (Adaptation)	**BP7**. Assess options to reduce (mitigate) project effects
	BP8. Assess options to reduce (mitigate) effects on project
Methodologies & Uncertainties	**BP9**. Explain selection of methods used
	BP10. Describe uncertainties and degree of confidence in the results
Follow-up	**BP11**. Provide monitoring and management plan

Best Practices: Details

Best Practices: Scoping

Scoping	BP1. Identify environmental and project components affected by climate change
	BP2. Identify level of detail for assessing effects (preliminary assessment)
	BP3. Examine effects of climate change on need for or justification of project

Scoping: Identifying What Might be Affected

Identify **project components** and types of potential **project impacts** that may be affected by climate change

Example: More intense rainfall

- Project components:
  - Water management system
- Potential impacts:
  - Water quality, Fish, Food supply, Economic effects

Best Practice 1

Explicitly identify environmental and project components that could be affected by future changes in climate/weather parameters for each phase of the project.

Include direct and indirect effects

Best Practice 2

Set out level of detail and approach to be used for assessing each climate change-related effect:

- **detailed assessments** for environmental and project components that may be **highly** affected or vulnerable;
- **less detailed assessments** for environmental and project components that may be **moderately** affected or vulnerable; and
- **no further consideration** need be given to those environmental and project components that are considered **largely resilient** to climate change.

Scoping Based on Preliminary Assessment

- Assume a *reasonable, credible* range for future values of climate parameters
- Pair components with climate parameters and identify moderate to highly impacted pairs
- Use conservative, precautionary approach
- Justify exclusions

Example

Conditions, Components	Further Assessment?
Site water management	Yes, detailed
Water quality	Yes, detailed
Fish	Yes, less detailed
Food supply	Yes, less detailed
Economic effects	No

Implications for Need and Alternatives

Changes in climate can affect circumstances:

- Project no longer justified

Change in streamflows ---> Hydroelectric project ---> Lower energy generation ---> Project feasible?

- Project no longer needed

Sea level rise ---> Move community --->
Road access project no longer needed

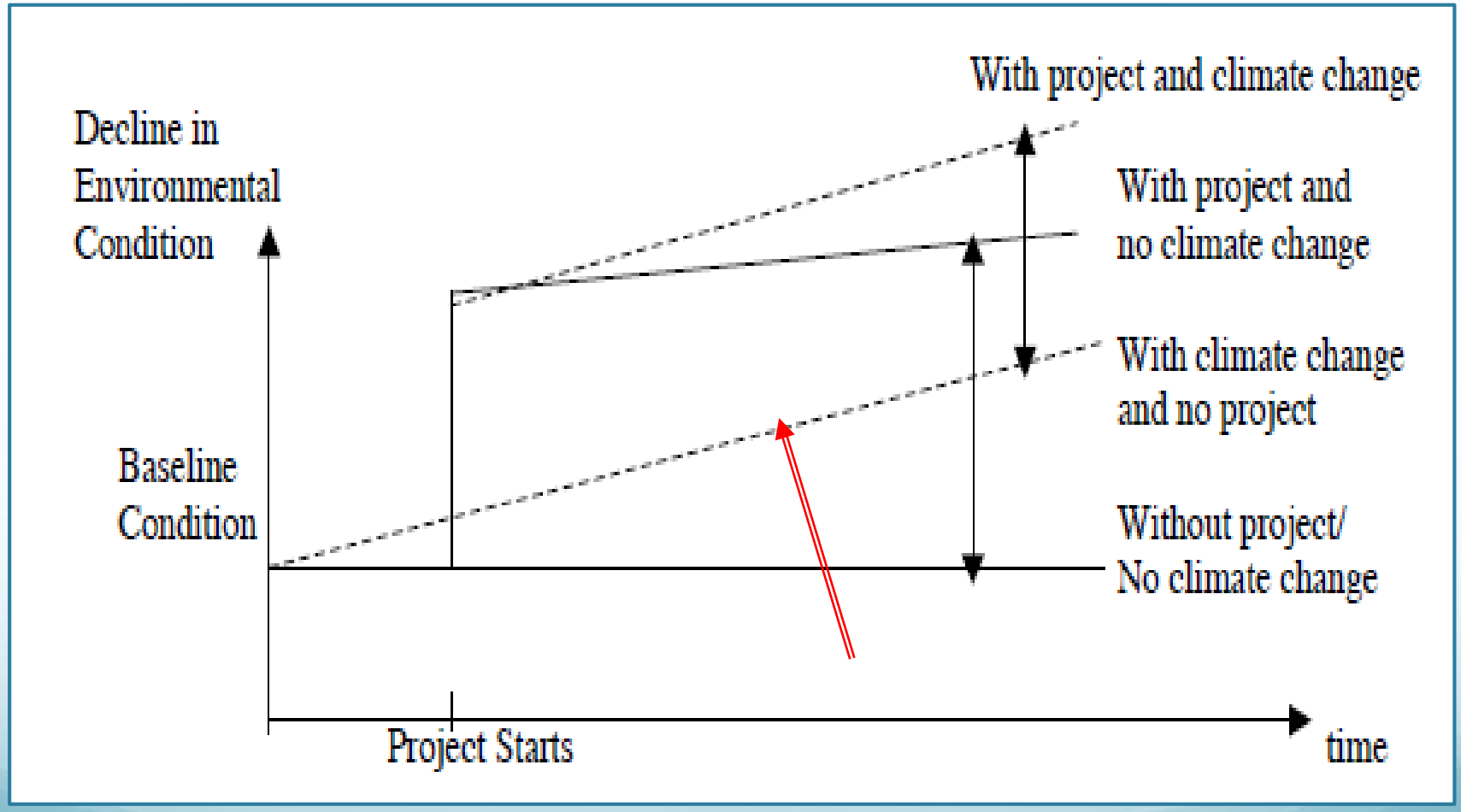
Best Practice 3

Examine whether need or justification for the project could be substantially altered as a result of effects of climate change, and any implications for project alternatives.

Best Practices: Assessing Effects

Scoping	
Assessing effects	**BP4**. Adjust future baselines for climate change
	BP5. Assess effects of project
	BP6. Assess effects of climate on project

New Baseline Environment



New Baselines: Examples

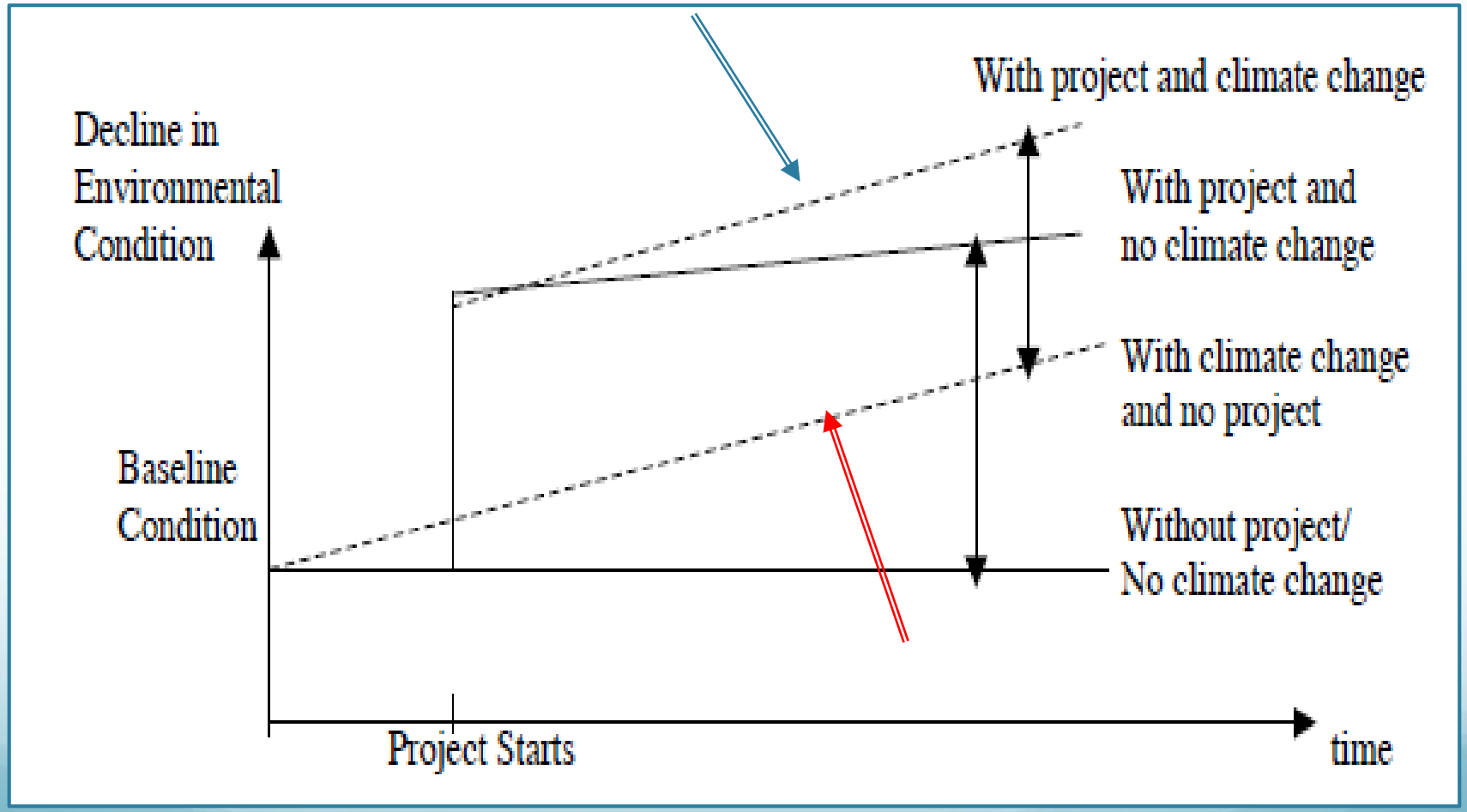
Changing temperatures and precipitation may affect

- Water flows and fisheries
- Wildlife habitats

Best Practice 4

For each environmental component being considered, predict the future baseline condition of the component as it may be affected by climate change.

Assessing Effects *of* Project on Environment



Assessing Effects of Project: Example

Power plant waste heat raises water temperature ---> Fish habitat and species

Best Practice 5

For each *project effect* requiring climate-change analysis, assess the effect relative to the climate-adjusted baseline condition.

Assessing Effects of Climate Change *on* Project: Examples

- Increased temperatures
  ---> Loss of permafrost
  ---> Collapse of pipeline
- More intense rainfall events
  ---> Failure of waste holding facility
  ---> Lower river water quality
  ---> Fish kills

Best Practice 6

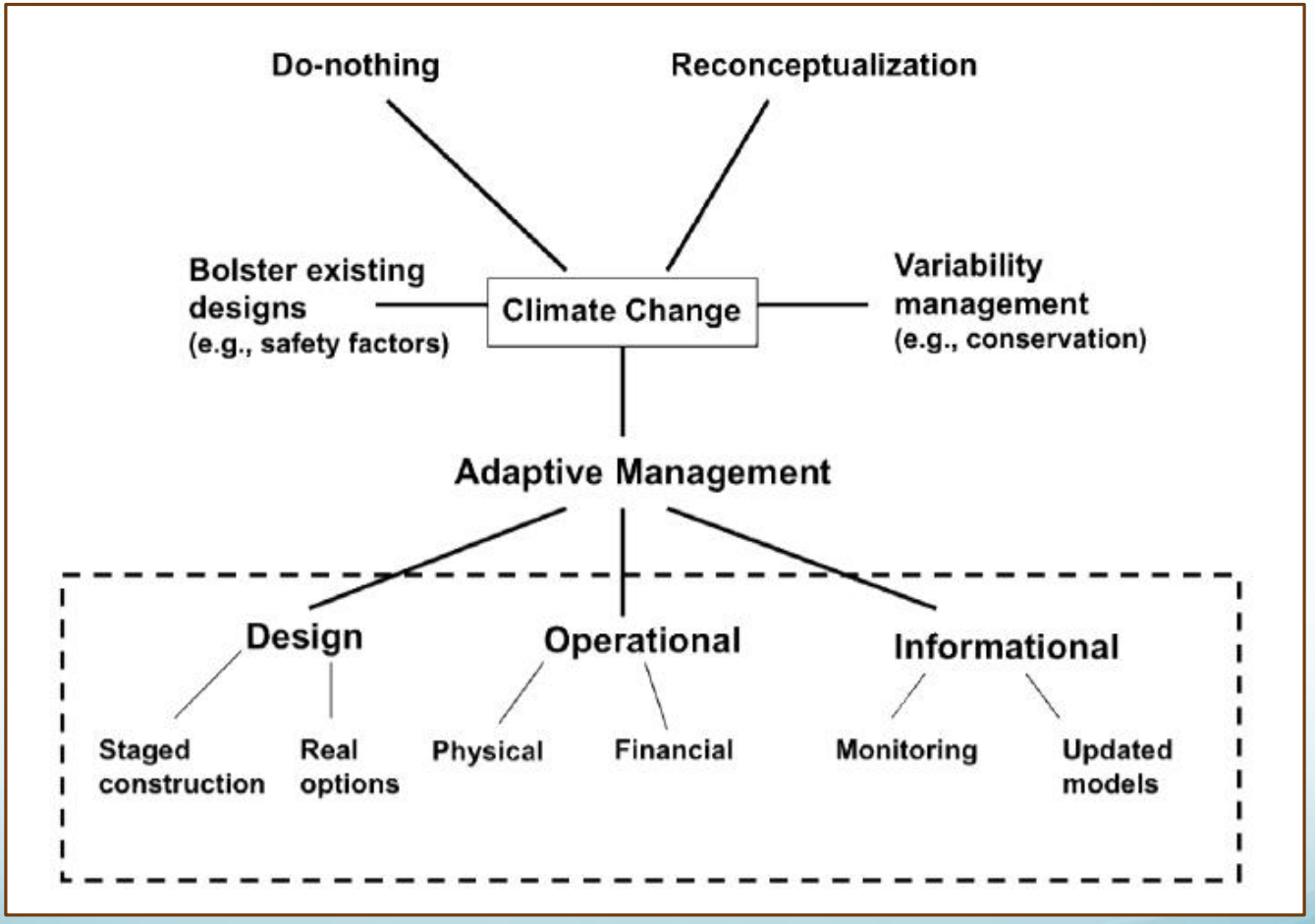
For each vulnerable *project component* requiring climate-change analysis:

- assess how climate change may affect the project component, and
- the potential consequences of these effects for related environmental components.

Best Practices: Mitigating Effects (Adaptation)

Scoping	
Assessing effects	
Mitigating effects (Adaptation)	**BP7**. Assess options to reduce (mitigate) project effects
	BP8. Assess options to reduce (mitigate) effects on project

Mitigating Effects:
Adaptation Options



Best Practice 7

For each *project effect* worsened by climate change, identify, evaluate and select feasible adaptation options to reduce the adverse effect.

Include estimate of degree to which each option would reduce the effect.

Best Practice 8

For each *project component* assessed to be vulnerable to climate change, identify, evaluate and select feasible adaptation options to reduce vulnerability.

Include estimate of degree to which each option would reduce the vulnerability and related risks to environmental components.

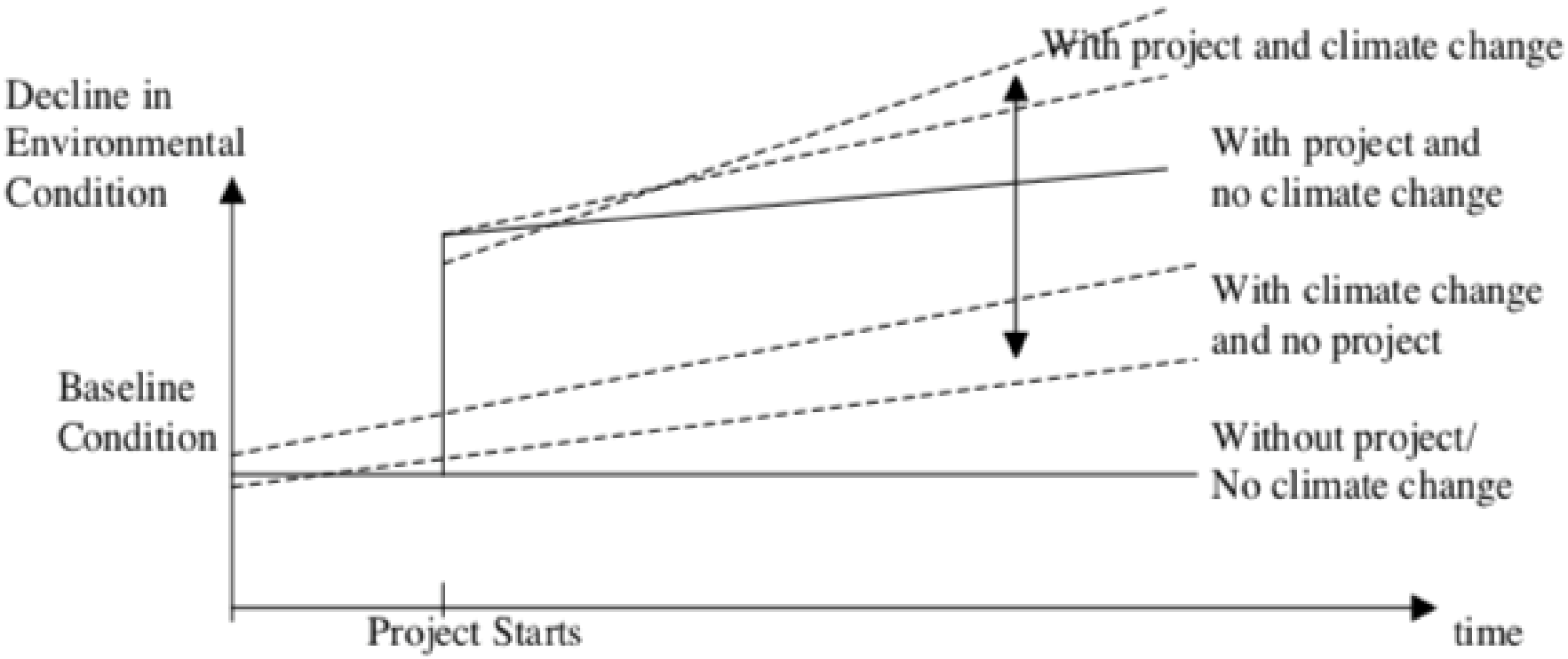
Best Practices: Methodologies & Uncertainties

Scoping	
Assessing effects	
Mitigating effects (Adaptation)	
Methodologies & Uncertainties	**BP9**. Explain selection of methods used
	BP10. Describe uncertainties and degree of confidence in the results

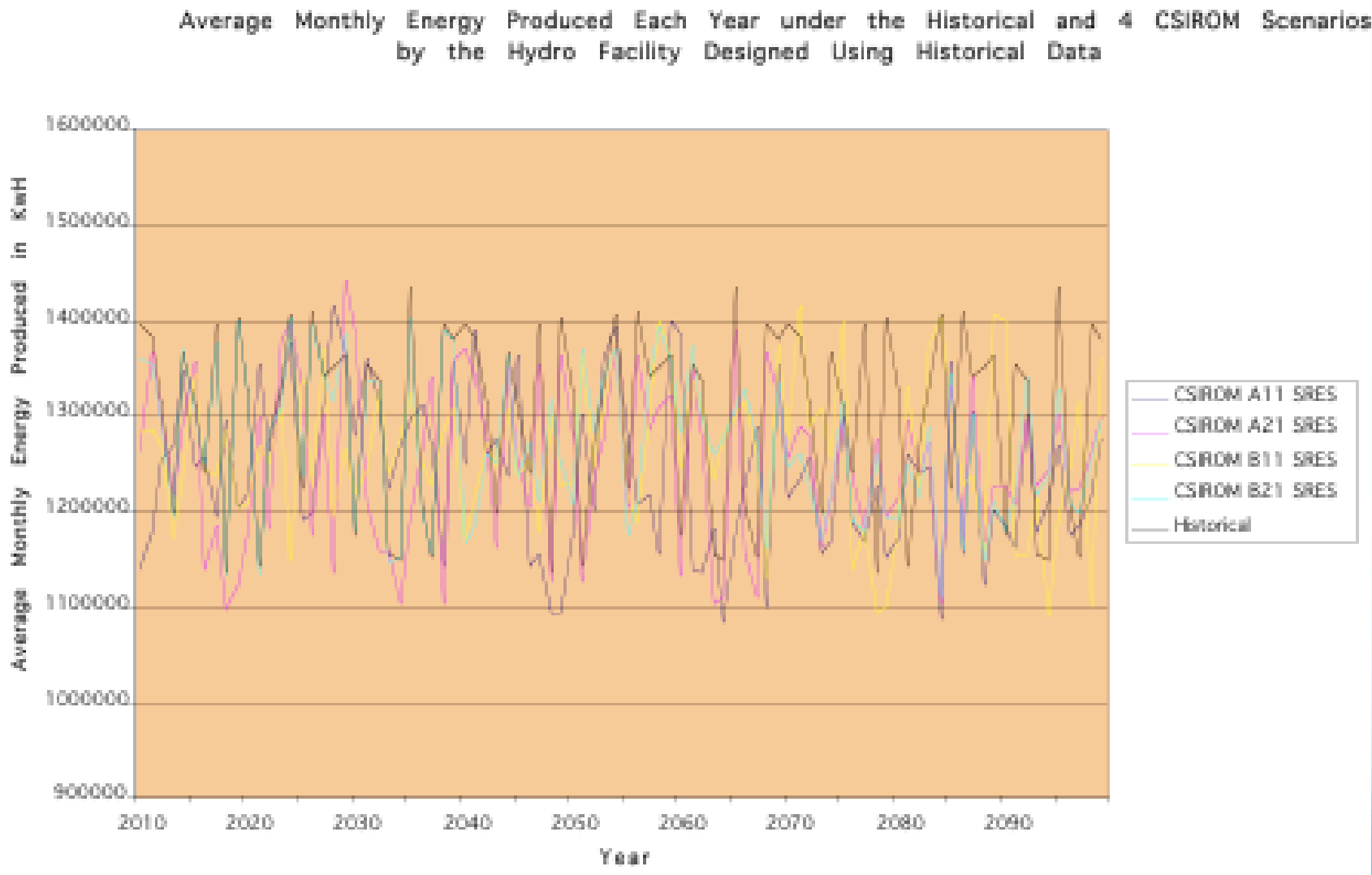
Methodologies Use

- Models and methods, e.g.
  - climate models, hydrologic models
- Data, e.g.
  - climate data, streamflow data
- Assumptions, e.g.
  - model coefficients

Uncertainties in Predictions



Uncertainties: Hydroelectric Example



Best Practice 9

For each estimate and decision based on climate change, provide an explanation and justification for the methodology that was used, including the choice of:

- models,
- datasets, and
- key assumptions.

Credible expertise and latest, most credible scientific information and climate projections should be used.

Best Practice 10

For each estimate based on climate change, describe the uncertainties and degree of confidence in the estimate.

Explain how the uncertainties affected conclusions and decisions.

Greater attention to more significant effects.

Need to Communicate Clearly

To decision makers and stakeholder

- Predictions and their uncertainties
- Information about the degree of belief in the predictions

Communicating Uncertain Quantitative & Qualitative Predictions

- Range, e.g. 0.02 to 0.068 annual probability; or low to moderate likelihood.
- Central tendency (mean) and variation, e.g. 0.04 with a possible maximum of 0.068 (90% confidence); or low likelihood of significant losses.

"While the effluent of the project is not expected to increase the stream temperature above the level to support cold water fish, including climate change considerations, there is some likelihood, conservatively estimated to be 1 to 5%, that future temperatures and stream flows would result in the complete loss of these fish species."

Belief (Confidence) in Predictions

		Scenarios	Streamflows	Energy
Model:	Source	IPCC/CICS	Consultant	Consultant
	Rep. of reality	Unknown	Medium	High
	Theory/Sch.of thought	School	Est. Theory	Est. Theory
	Peer review	Yes	No	No
	Acceptance	Variable	-	-
Data:	Source	Various	MNR	-
	Primary/Sec.	Primary	Primary	-
	Theory/Sch.of thought	-	-	-
Key Assumptions:				
	Rep. of reality	Medium	High	High
	Acceptance	Variable	High	High
Resulting Estimates:				
	Indep. review	Yes	No	No
	Acceptance by review	Medium	-	-
	Overall confidence	**Medium**	**Low-Medium**	**Low-Medium**

Best Practices: Follow-up

Scoping	
Assessing effects	
Mitigating effects (Adaptation)	
Methodologies & Uncertainties	
Follow-up	**BP11**. Provide monitoring and management plan

Follow-up:
After Project Implementation

- Identifying thresholds for adaptive actions
- Monitor: Collect and evaluate data
- Review and update vulnerability assessments
- Design contingency plans

Best Practice 11

Include a plan to monitor, evaluate, manage (including adaptive management strategies) and communicate:

- How climate change is affecting baseline conditions
- Project effects on the environment
- Effects of climate change on the project
- Effectiveness of adaptation measures and potential for additional contingency measures.

Final Comments: Overarching Considerations and Key Challenges

Overarching Considerations

- Use best science, methods, data and knowledge sources
- More attention to more important issues
- Uncertainties inherent with climate change
- Clear communication with stakeholders and decision makers
- Coordination between studies

Key Reasons and Challenges in Reaching Best Practice

- Availability of appropriate data, models and methods
- Availability of expertise
- Time and resource intensiveness
- Decision-making with the uncertainties
- Ensuring follow-up and detecting triggers for adaptation
- Communicating complex matters
- Lack of standard practices
- Evolving policies

Thank You!

Questions?

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