# Making decisions in a changing world

Laura Bonzanigo
Research Associate
World Bank
lbonzanigo@worldbank.org

Stéphane Hallegatte
Senior Economist
World Bank
shallegatte@worldbank.org

Julie Rozenberg
Research Associate
World Bank
jrozenberg@worldbank.org

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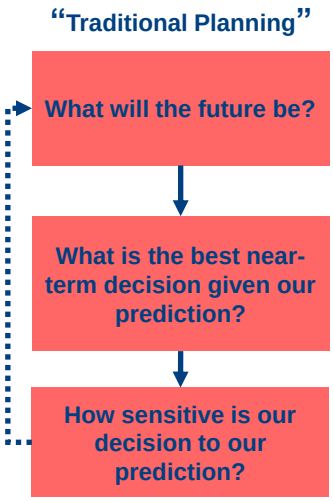
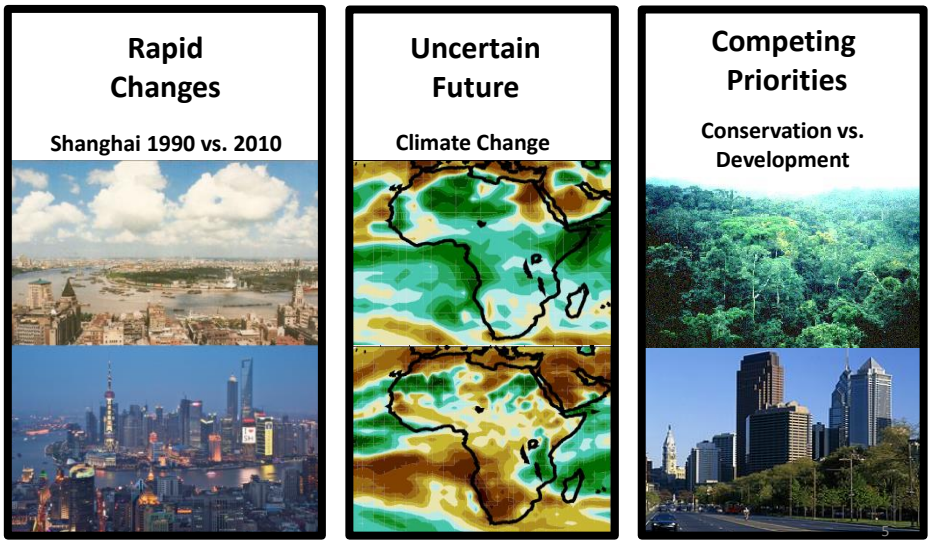
## Many Policy Decisions Have Long-Term Consequences

Designing a dam requires information on future climate, economic development, seismic activity…

## *Traditional Planning Asks "What Will The Future Bring?"*



# Yet Good Decision Making Is Challenged By Uncertainty and Disagreement




## *Should we build a bigger dam?*

Climate change may change rainfall patterns.

Future precipitations could increase during some months and decrease during others.

- Need to estimate the expected cost of different scenarios

| | Rain stays as current | Rainfall patterns change |
|---|---|---|
| Optimized dam given current conditions | $ 0 | $ -100 |
| Bigger dam | $ -10 | $ -50 |

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When is it better to build a bigger dam?

Cost(Action) → Px50+(1-P)x10=10+40P

Cost(NoAction) → Px0+(1-P)x100=100P

***If P > 16%, the investor should build a bigger dam***

# *The best "prediction" depends on the cost of various actions*

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| | Rain stays as current | Rainfall patterns change |
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| Bigger dam | $ **-20** | $ -50 |

When is it better to build a bigger dam?

Cost(Action) → Px50+(1-P)x20=20+30P

Cost(NoAction) → Px0+(1-P)x100=100P

**Warning if P > 29%**

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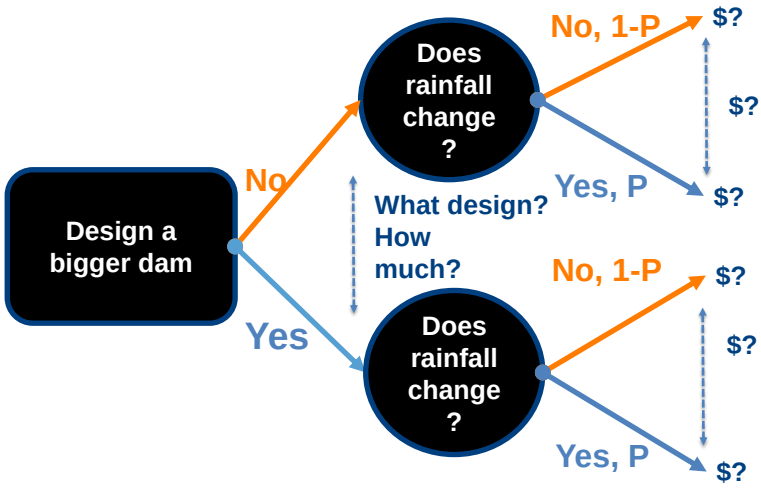
## *There Are Many Plausible Scenarios of Intervention and Cost*

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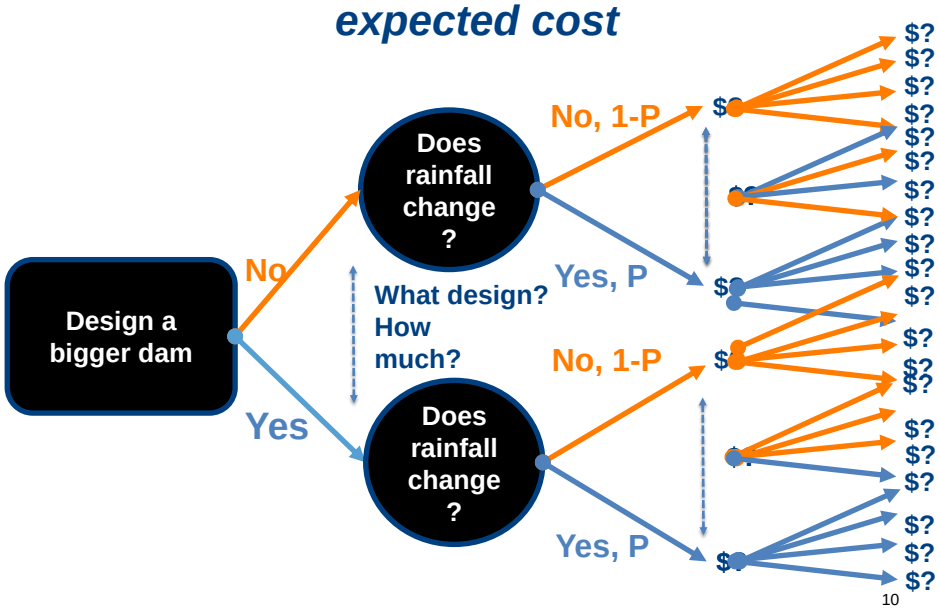
## *There are many possible scenarios of expected cost*

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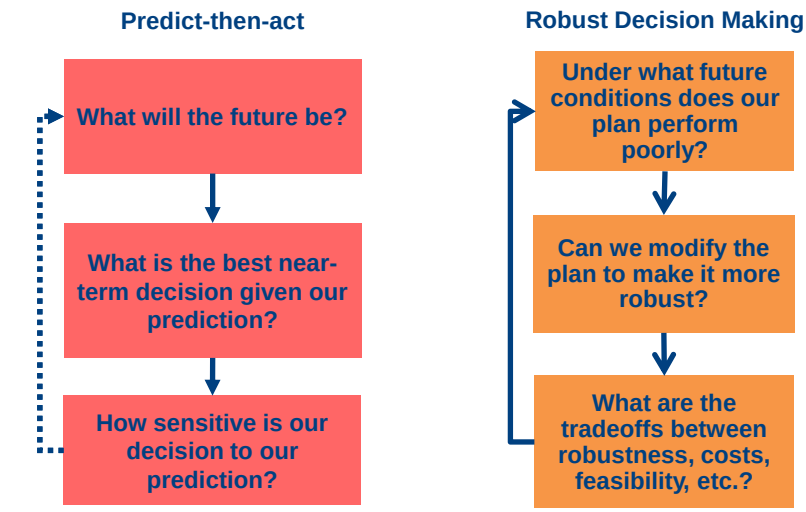
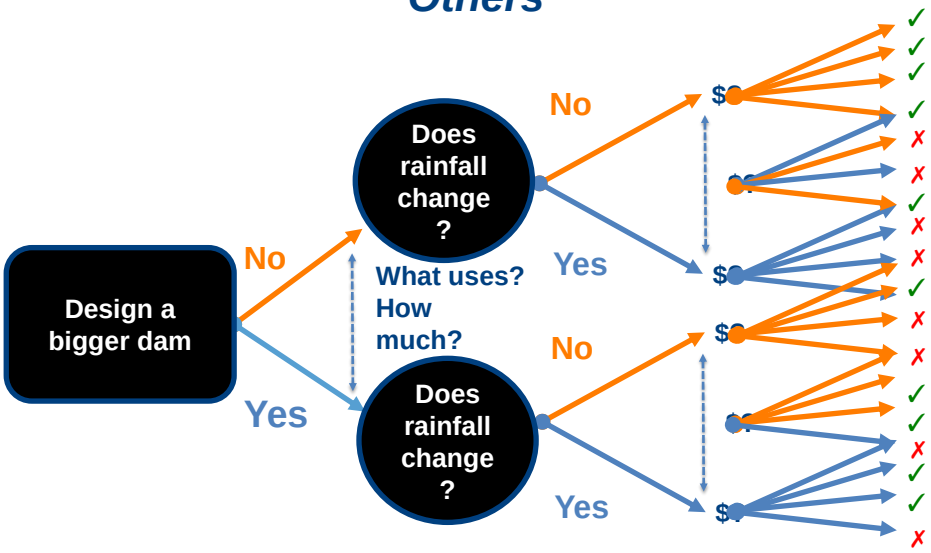
## *Robust Decision Making Asks "What Are The Limitations of Our Plan and How Can We Improve It?*




## *Some Costs Are More Acceptable Than Others*

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## *RAND Helped Inland Empire Utilities Agency (IEUA) Include Climate Change in 2010 Long-Range Plans*

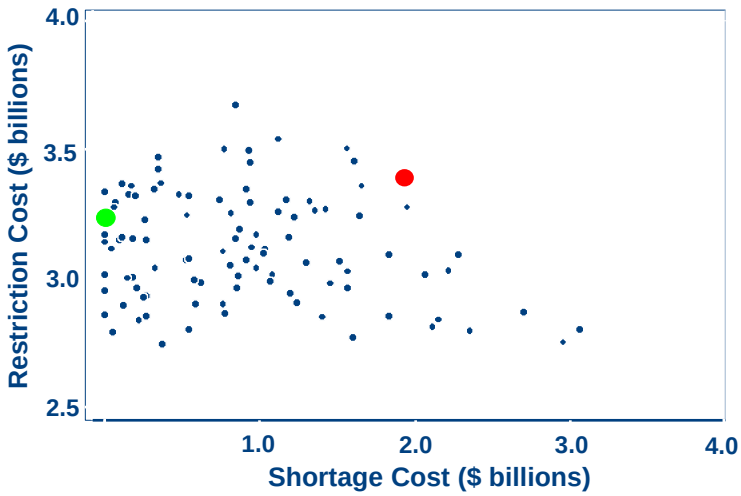
- **Currently serves 800,000 people**
- **+ 300,000 by 2025**
- **Few "traditional" sources of water**


**Current water sources include:**

| | |
|---|---|
| Groundwater | 56% |
| Imports | 32% |
| Recycled | 1% |
| Surface | 8% |
| Desalter | 2% |

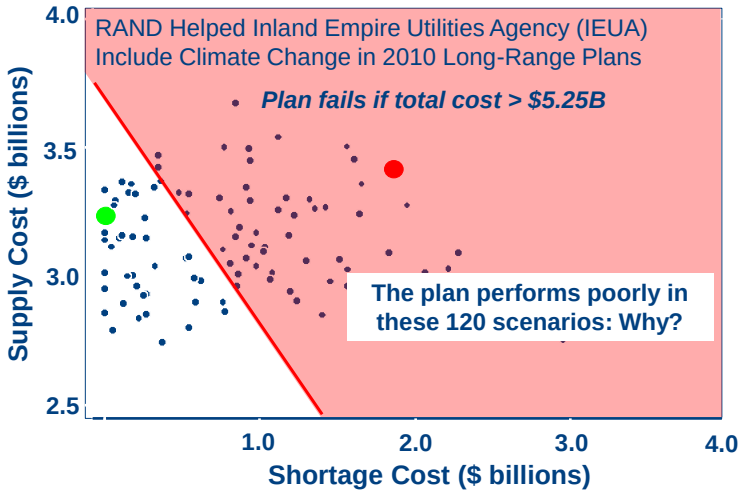
RAND

## *We Identify Hundreds of Combinations of Cost and Drought Magnitude*




RAND

## *We Identify Scenarios Where Water Restrictions Lead To Unacceptably High Costs*

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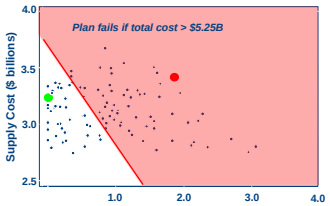
## *Why Does the Plan Perform Poorly in These 120 Scenarios?*




→ **Statistical Analysis of 120 Bad Scenarios**

RAND

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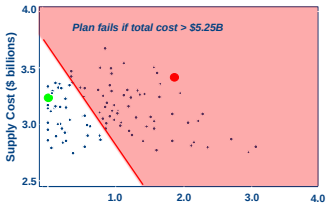


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**The IAEA Plan performs poorly if two conditions occur simultaneously:**

- **Precipitation ↓ 10%**
- **Groundwater percolation: ↓ 3%**

RAND

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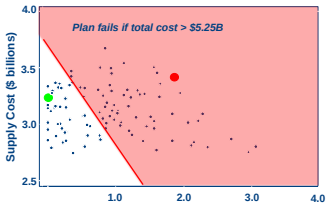


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↓

**Policy decision: monitoring groundwater and additional measures if lower than needed**

RAND

# *For the design of dams, RDM can…*

**Assess threats without first needing to predict the future (weather, costs)**

**Examine the performance of possible (series of) actions in a very wide range of cases**

**Understand the risks concisely – as a set of undesirable outcomes**

**Consider tradeoffs between robustness, timeliness, costs, etc.**

**Build trust around the Plan and smoothening conflict via scenario exploration**

***Choose a Plan that you are confident it will serve your needs despite deep uncertainties and disagreements***

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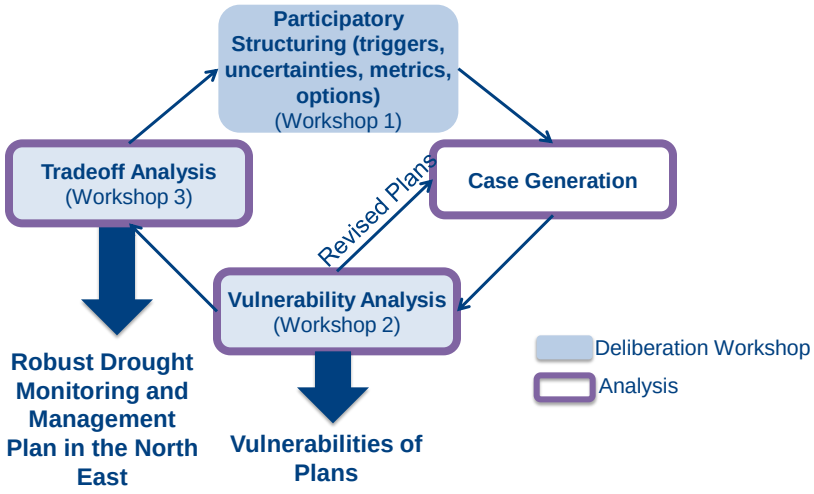
# *RDM in Practice*

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# *Potential XLRM For Initial Analysis. Example of the Kunar Basin Dams (Afghanistan)*

| Exogenous Uncertainties and risks | Policy Levers for the construction of Shal dam |
|---|---|
| Future electricity demand,<br>Future irrigation demand,<br>Glaciers melting and changes in precipitations (climate change),<br>Unilateral vs bilateral agreement,<br>Seismic risk<br>Delays due to security issues<br>Construction of transmission lines between AF and PK<br>Technical uncertainties (length of construction time, capital cost,…) | Taking into account potential construction of chitral in PK<br>NOT taking into account potential construction of chitral in PK<br>Focus on individual dams<br>Focus on phased cascade development with several run-of-river downstream **(sequential decision-making)** |
| **Data and models available** | **Metrics of interest** |
| Hydrological analysis (90% completed)<br>Geo-technical investigations for seismic risk quantification<br>Socio-economic data (e.g. landscan)<br>Current electricity demand | System costs (includes resettlement and compensation of affected people)<br>Avoided flood losses<br>Economic benefits linked to electricity generation (domestic supply+export revenues)<br>Economic benefits linked to increased irrigation potential<br>Reduced GHG emissions |

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# *RDM Helps Decision Makers Make Good Decisions Without Good Predictions*

- **RDM is not a new model – uses models differently**
- **RDM is not "new"**
  - **Framework and tools to implement best practices**
  - **Increasingly used in developed countries in many sectors**
- **RDM lets decision makers drive by revealing assumptions and tradeoffs**

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# *For More Information….*

**Laura Bonzanigo**
lbonzanigo@worldbank.org

**Stéphane Hallegatte**
shallegatte@worldbank.org

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jrozenberg@worldbank.org

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# *Current and Prospective Pilot Studies*

**Flood Risk in Ho Chi Minh City**

**Water Resources Management in Lima**

**Wetland Protection in Colombo**

**Drought Management in Brazil**

**Water and Sanitation (Global)**

**Energy Investments in Turkey**

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# *At The World Bank's SDNCE* We Are…*

**Tailoring tools and methodologies**

**Undertaking several pilot applications**

**Developing creative learning experiences**

*** Office of the Chief Economist of the Sustainable Development Network**

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