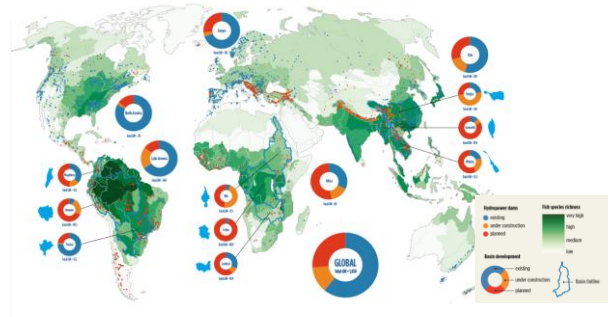
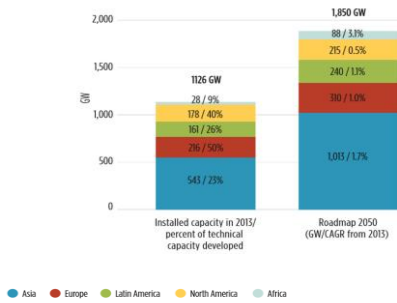


Hydropower by Design

Eloise Kendy, Ph.D.
Senior Freshwater Scientist
The Nature Conservancy

Mekong Basin Connect Workshops
System-Scale Water-Energy Planning
27-30 June 2017

TNC: 65 Years Of Leadership



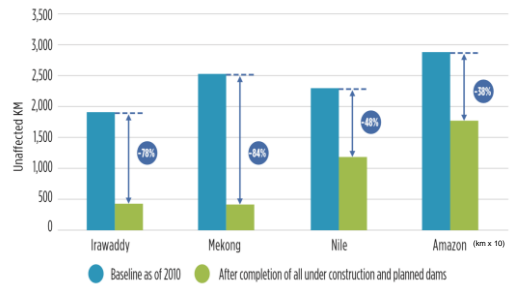
Impacts of Hydropower on Nature

Fragmentation

- Change flowing rivers into reservoirs
- Block fish migration
- Disrupt the natural cycling of nutrients
- Block sediment transport

Regulation

- Change downstream flow patterns



Social and Economic Impacts of Dams

Positive

- Generate hydropower
- Secure water supplies
- Manage flooding
- Provide recreational opportunities

Negative

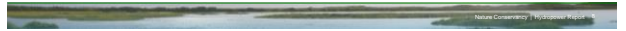
- Displace people
- Require infrastructure
- Disrupt navigation
- Inundate forests resources
- Reduce fish catches
- Eliminate flood recession agriculture



The Challenge

Locate, design, build, and operate hydropower to meet production goals while minimizing the environmental, social, and economic impacts.

- Lower the risk
- Reduce delays
- Secure more competitive financing
- Deliver the broadest range of benefits



The Current Reality – Single Project Evaluation Approach

→ unnecessary impacts, conflicts, delays and costs; missed opportunities

- Impact of upstream dams
- Benefits of dam cascades
- Mitigation solutions
- Cumulative impacts
- Multi-objective operation
- Nature conservation

IMPROVING HYDROPOWER OUTCOMES THROUGH SYSTEM-SCALE PLANNING

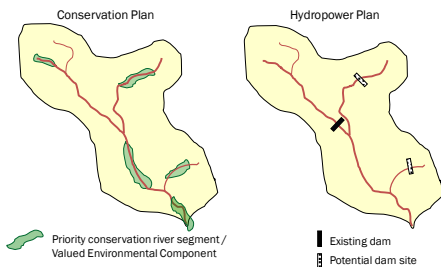
The Next Frontier – System-Scale Planning

Hydropower-by-Design (HbD) is a quantitative, integrated, multi-criteria and multi-project, system-scale planning approach.

- Multi-Project Scenarios, or Portfolios, account for each project's
- Location
 - Design
 - Operation
 - Interaction with other projects in the basin

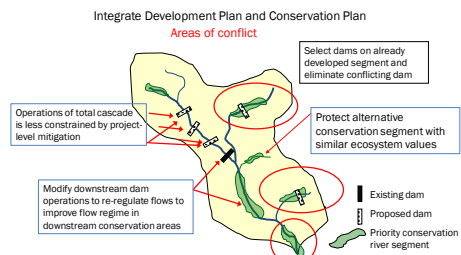
IMPROVING HYDROPOWER OUTCOMES THROUGH SYSTEM-SCALE PLANNING

System-Scale Mitigation Hierarchy: Avoid, Mitigate, Offset



IMPROVING HYDROPOWER OUTCOMES THROUGH SYSTEM-SCALE PLANNING

System-Scale Mitigation Hierarchy: Avoid, Mitigate, Offset



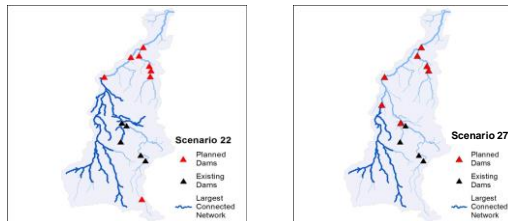
IMPROVING HYDROPOWER OUTCOMES THROUGH SYSTEM-SCALE PLANNING

Tapajos River, Brasil



- 1800 km long
 - 500,000 km²
 - Globally important rare species
 - 1.4 million people
 - 10 indigenous tribes
 - 1/3 of global soy production
- 44 large dams and 80 small dams planned
 - 29 GW of new energy (25% domestic increase)

IMPROVING HYDROPOWER OUTCOMES THROUGH SYSTEM-SCALE PLANNING

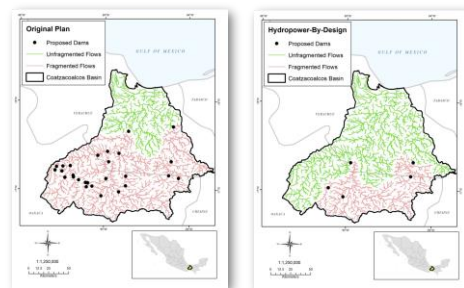
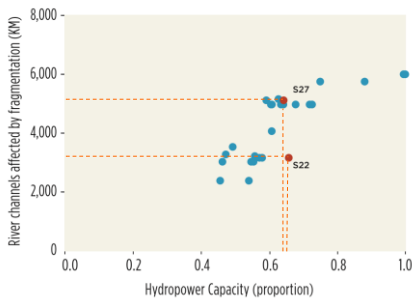


Tapajos River, Brasil
 These two scenarios provide same level of energy development (65% of basin inventory), but Scenario 22 (left) maintains nearly twice as much connected channel network with 5% greater overall cost.

Hydropower by Design

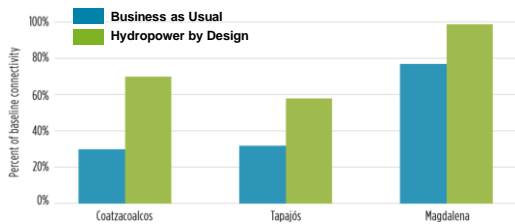
This example:
 2 criteria,
 multiple scenarios

Full HbD:
 Multiple criteria,
 multiple scenarios

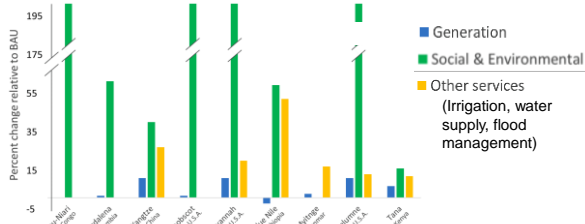


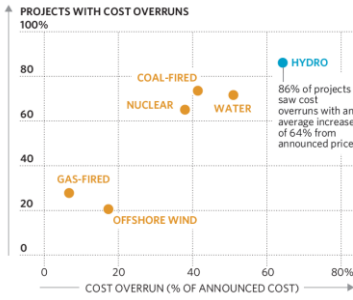
Coatzacoalcos River, México
 Collaboration with CFE, México's Federal Electricity Commission

Hydropower by Design scenarios provide greater connectivity



Hydropower by Design provides more services with less social and environmental impacts.





Source: EY Research 2016

Hydropower projects have greater cost overruns than other large infrastructure projects



Photo from Friends of the Earth

Hydropower by Design offers:

- Financial value to developers and investors due to improved risk management and system efficiencies
- Increased economic value to countries due to more strategic investments in infrastructure
- Improved environmental and social outcomes

The Nature Conservancy
Protecting nature. Promoting life™

www.nature.org