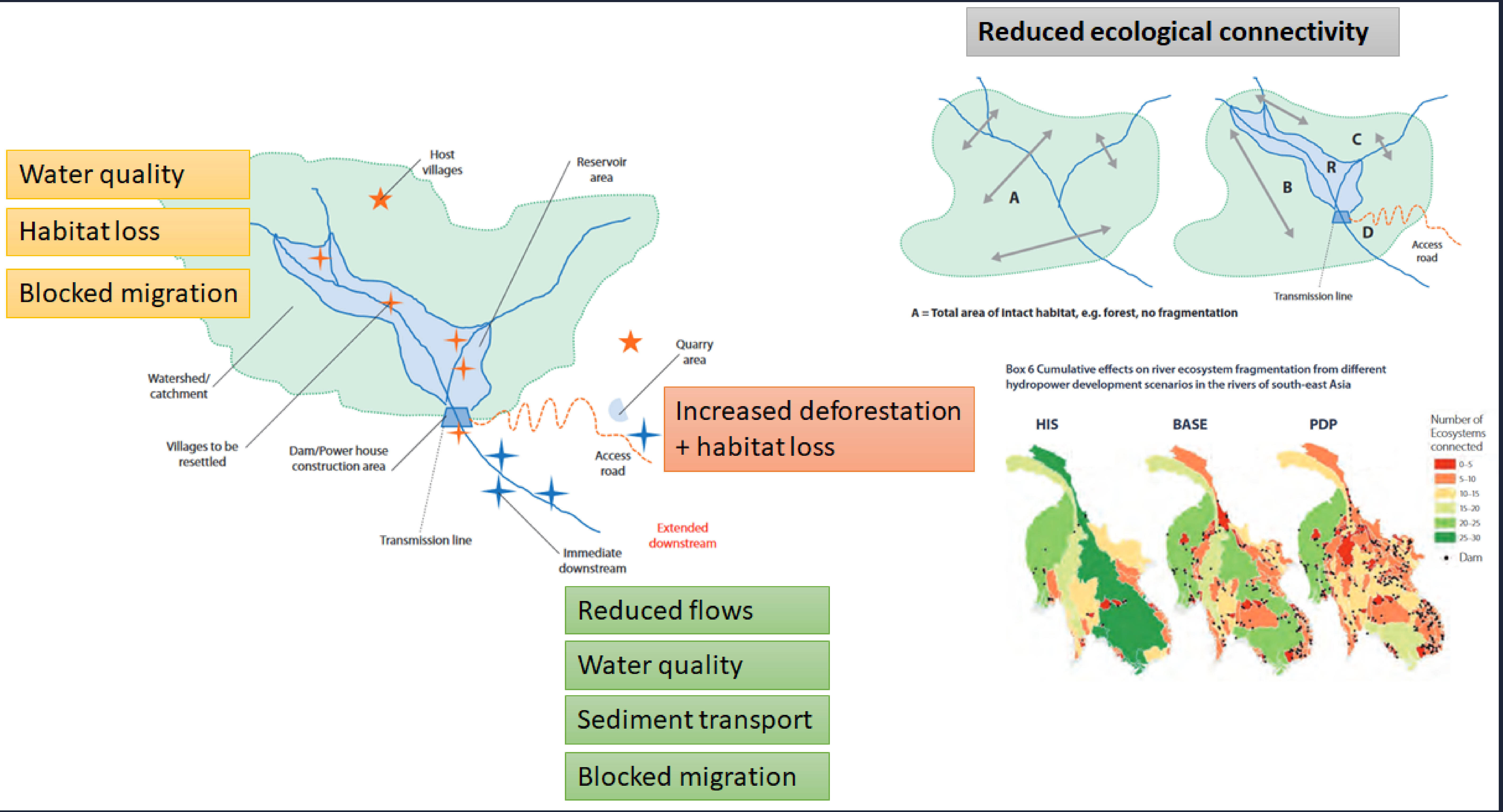
UNCERTAINTY AND COMPLEXITY

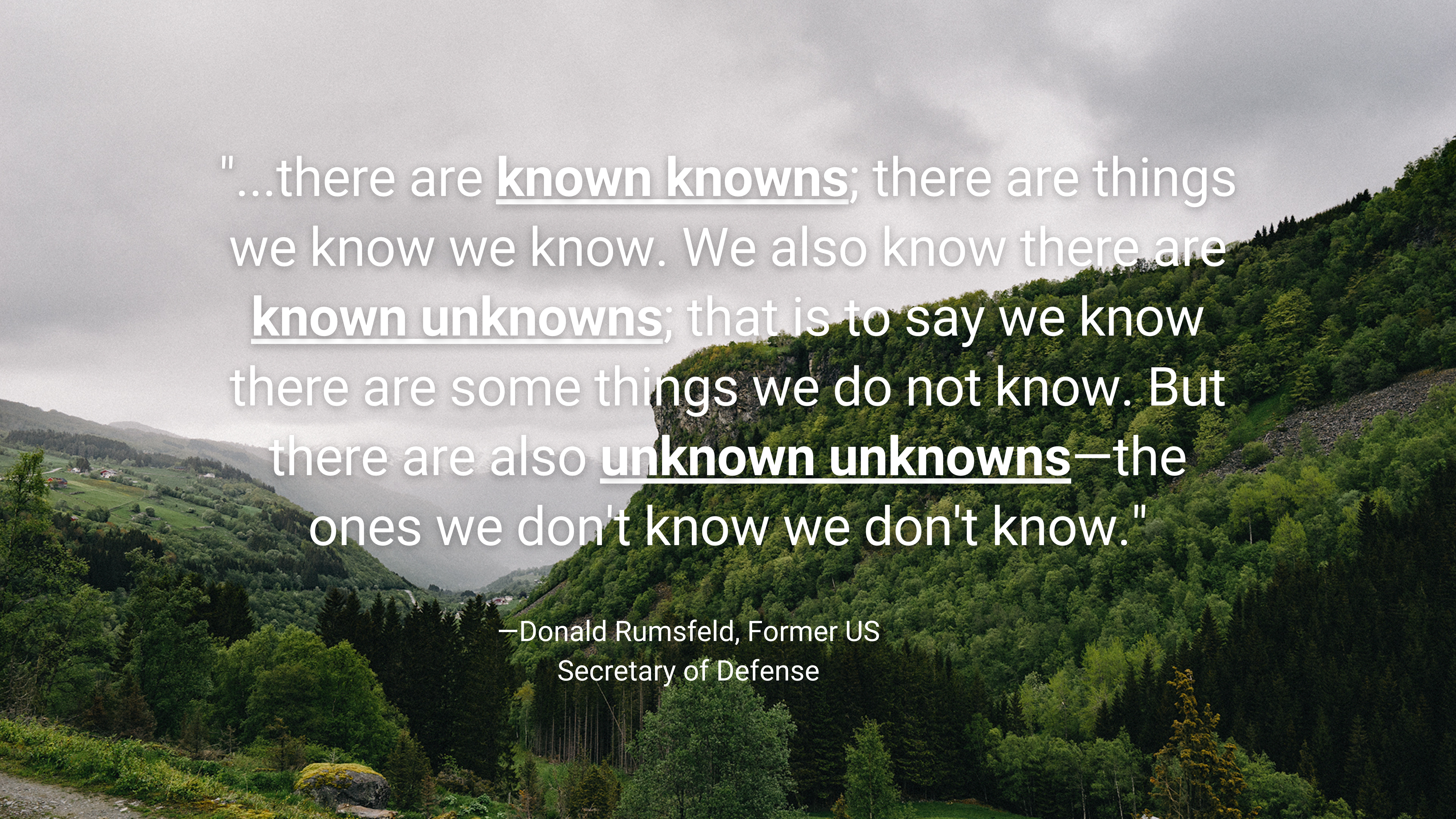
ECOLOGICAL AND SOCIAL MITIGATION OF HYDROPOWER IN DEVELOPING COUNTRIES

EDF

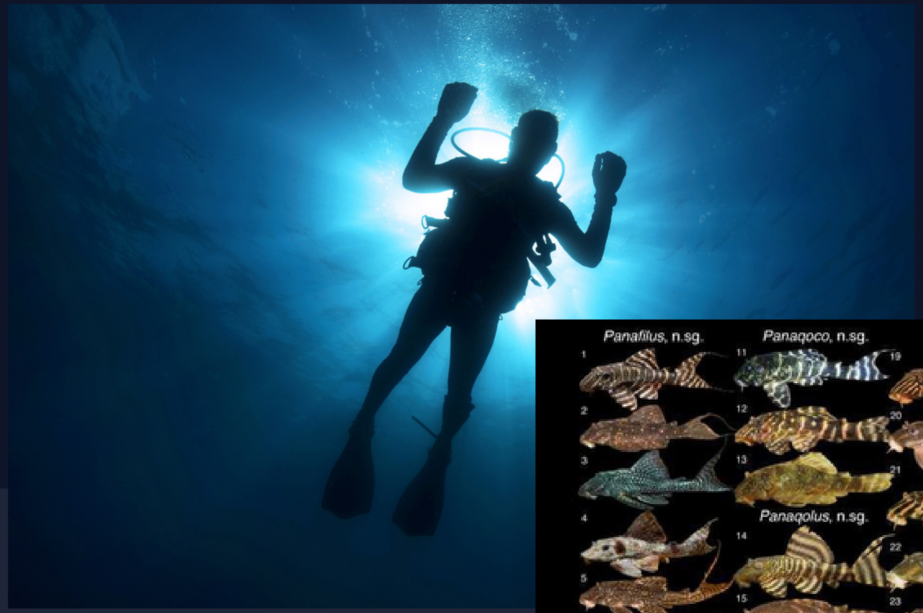
Leah BECHE, Electricity of France, Hydropower Engineering Center

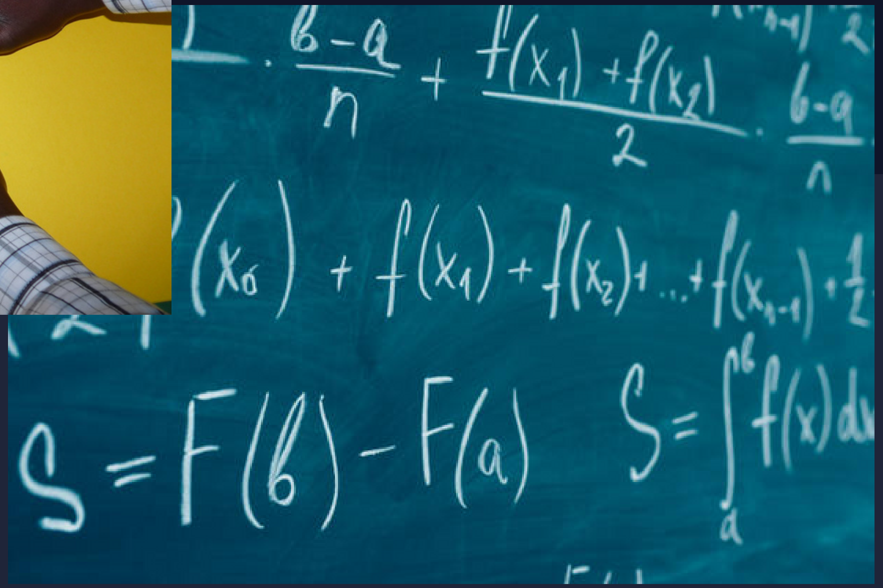
Impacts are known and universal




"...there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns—the ones we don't know we don't know."
—Donald Rumsfeld, Former US Secretary of Defense

(Somewhat) unique challenges





DIVING INTO THE UNKNOWN

New species,
un(der) studied ecology

INTEGRATING THE SOCIAL DIMENSION

The oft-forgotten element in
ecological mitigation

QUIZ

How many freshwater fish are there in the world?

A. *31 000*
B. *6 500*
C. *1 700*
D. *18 000*

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18 000

→ 9.5% of all species and 1/3rd of all vertebrate species live in freshwater

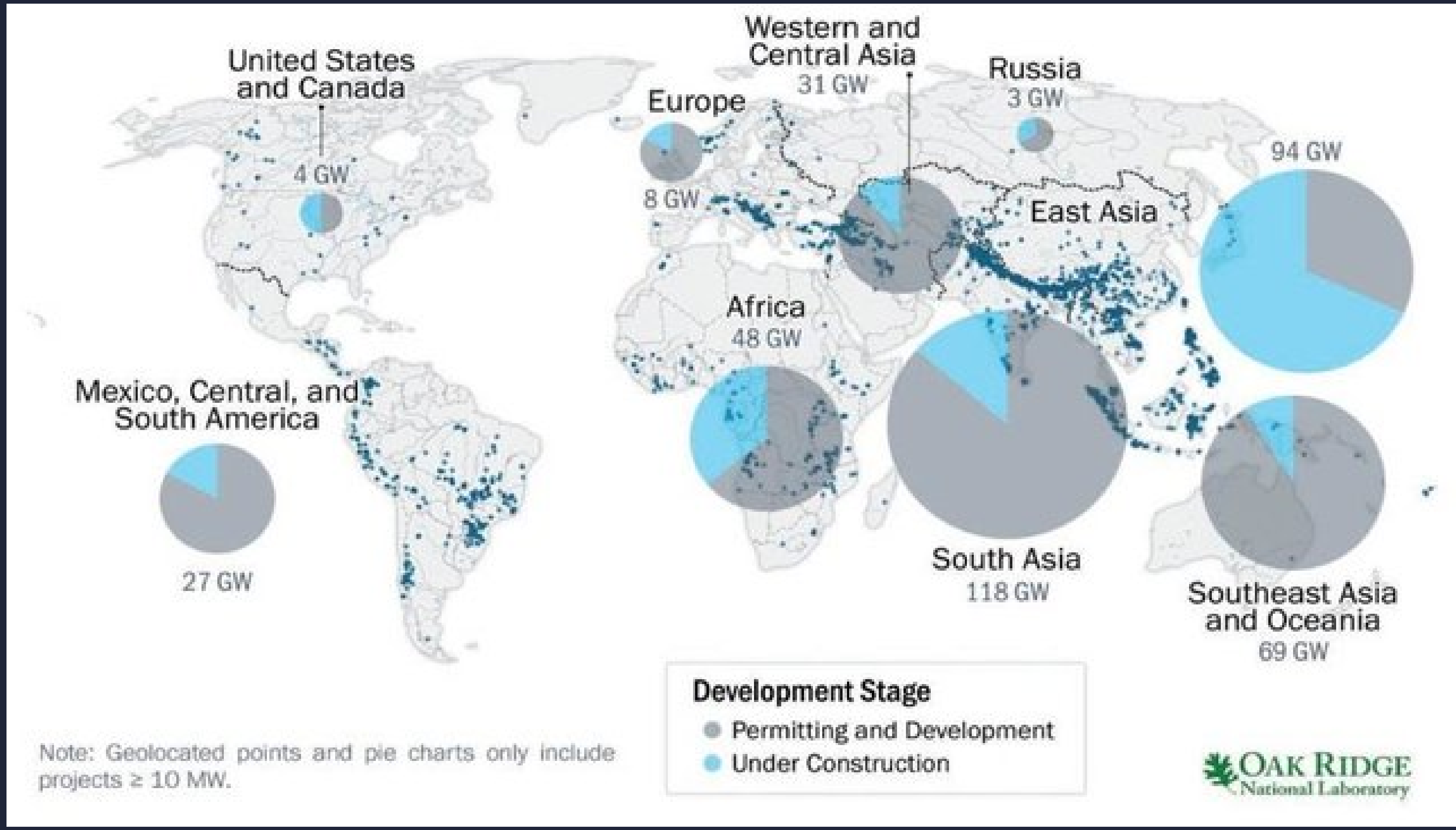
- 0.01% of surface water is freshwater
- 2.3% land surface area are rivers, lakes, reservoirs, 5.4-6.8% are wetlands

In S. America, a new fish species is described every 4 days

465 new freshwater fish species were described in 5 years between 2001 and 2006 (Eschmeyer 2006)

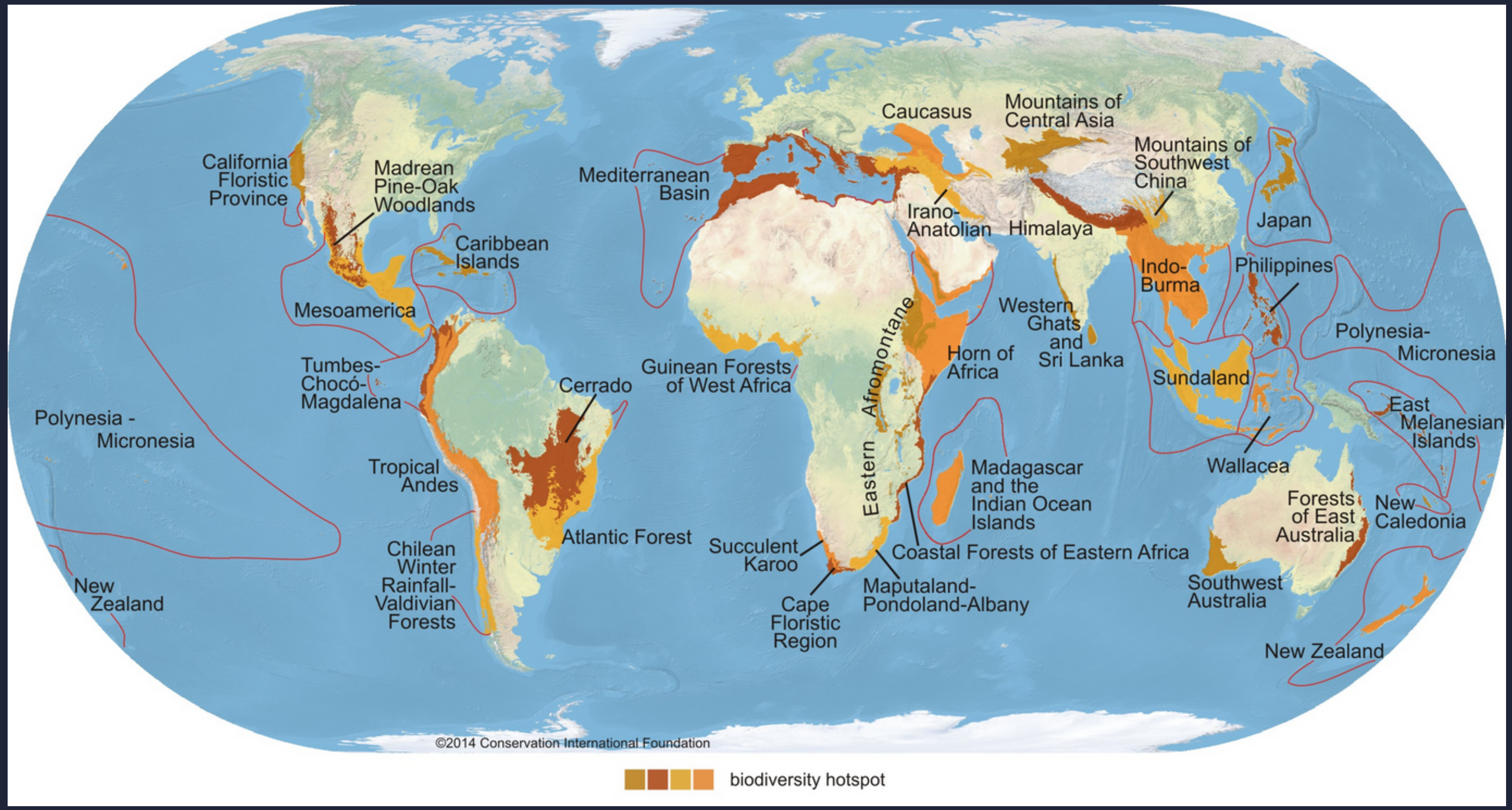
Hydropower pipeline in developing countries overlaps with biodiversity hotspots

Pipeline



Hydropower Development in 2020: Global Trends. Policy Brief.

Hotspots



Biodiversity Hotspots Map by CEPF, licensed under CC BY-SA 4.0

Challenge: mitigation and increased understanding advance in parallel

No projects, fewer studies

Species description
Migration studies
Distribution
Habitat use

Unknown biodiversity

18 000

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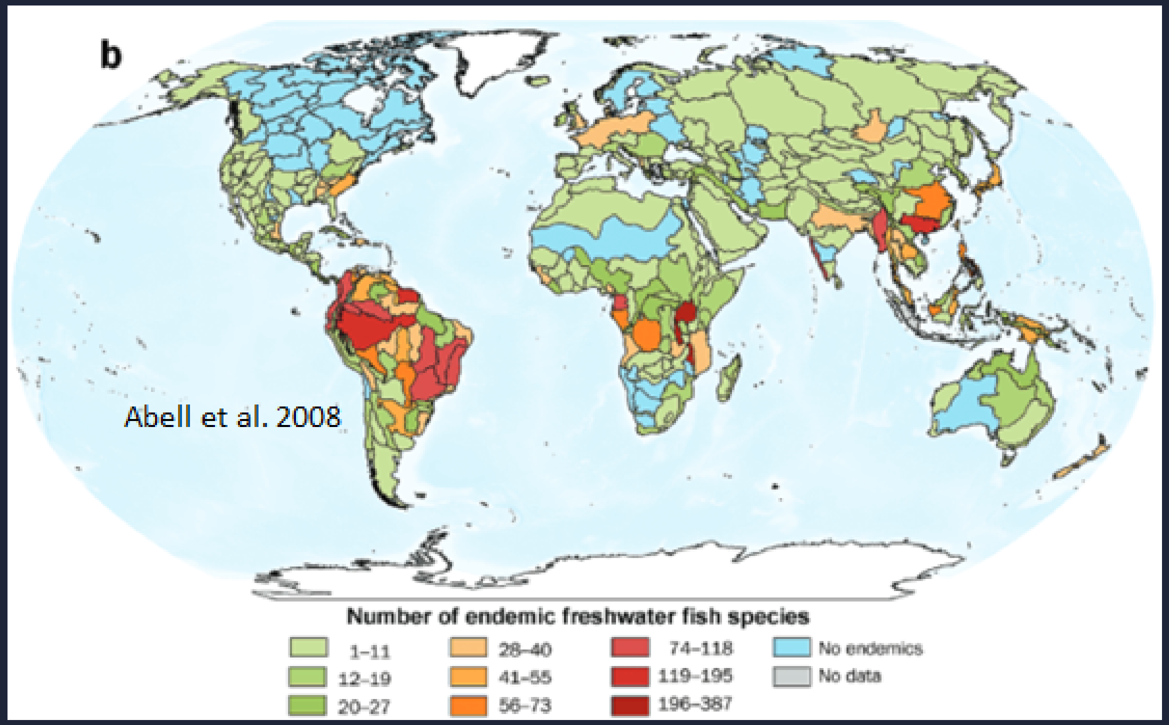
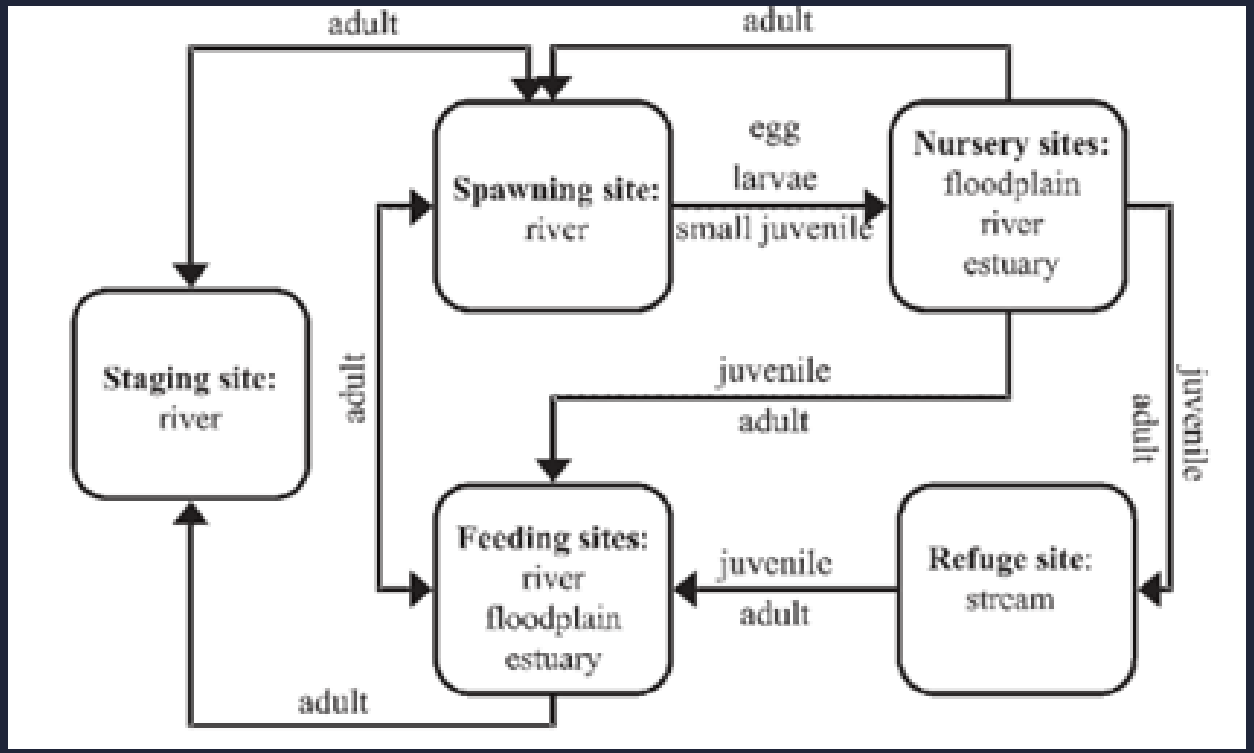
Endemism



Complexity

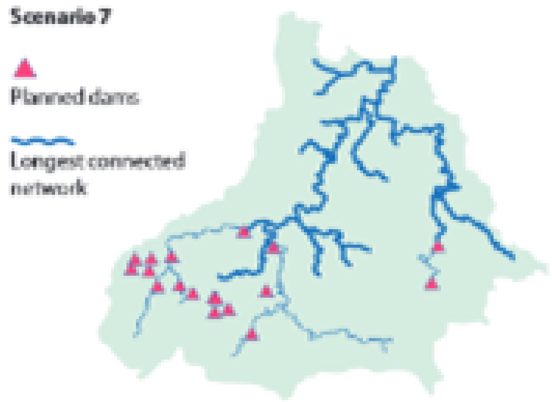


Fish migration in Brazil , cf. Godinho & Pompeu 2003

How can we mitigate?

Avoid

Project siting



Reduce

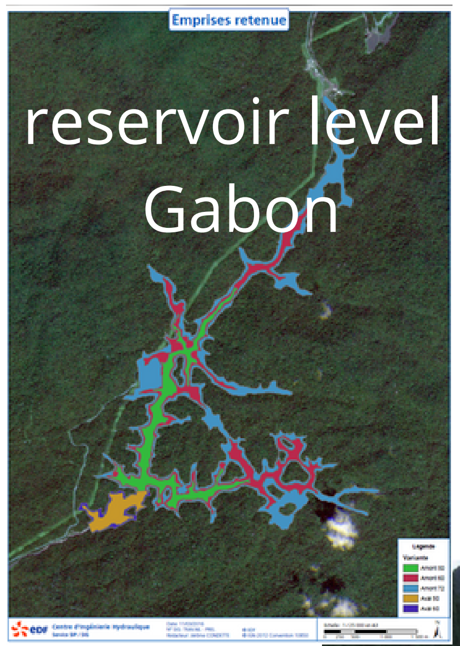
- Fish passage (up/down)
- Fish-friendly turbines
- Reservoir level
- Water intake level
- Aeration weirs
- Animal rescue
- E-flows
- Sediment management (*design and operation*)
- Wastewater management
- Minimize footprint
- …

Restore

Site rehabilitation

Offset

- Catchment reforestation
- Creation /reinforcement of protected areas
- Livelihood restoration to reduce pressures (overexploitation, pollution,…)



Boats ready to rescue animals during impoundment (SINOP, Brazil)

(Nam Theun 2 Laos)

Nursery for site rehabilitation (SINOP)

Fish passages in Brazil (Makrakis et al. 2019)

Knowledge

STANDARD MITIGATION

Principles that are independent of place

Siting*
Reservoir level*
Water intake level*
Footprint reduction*
E-flows
Modified habitats
Construction mitigation
Sediment management

SPECIFIC MITIGATION

requires ecological knowledge

E-flows
Fish passage (up/down)*
Reservoir fisheries
Site Rehabilitation

***Elements of design**

Knowledge

STANDARD MITIGATION

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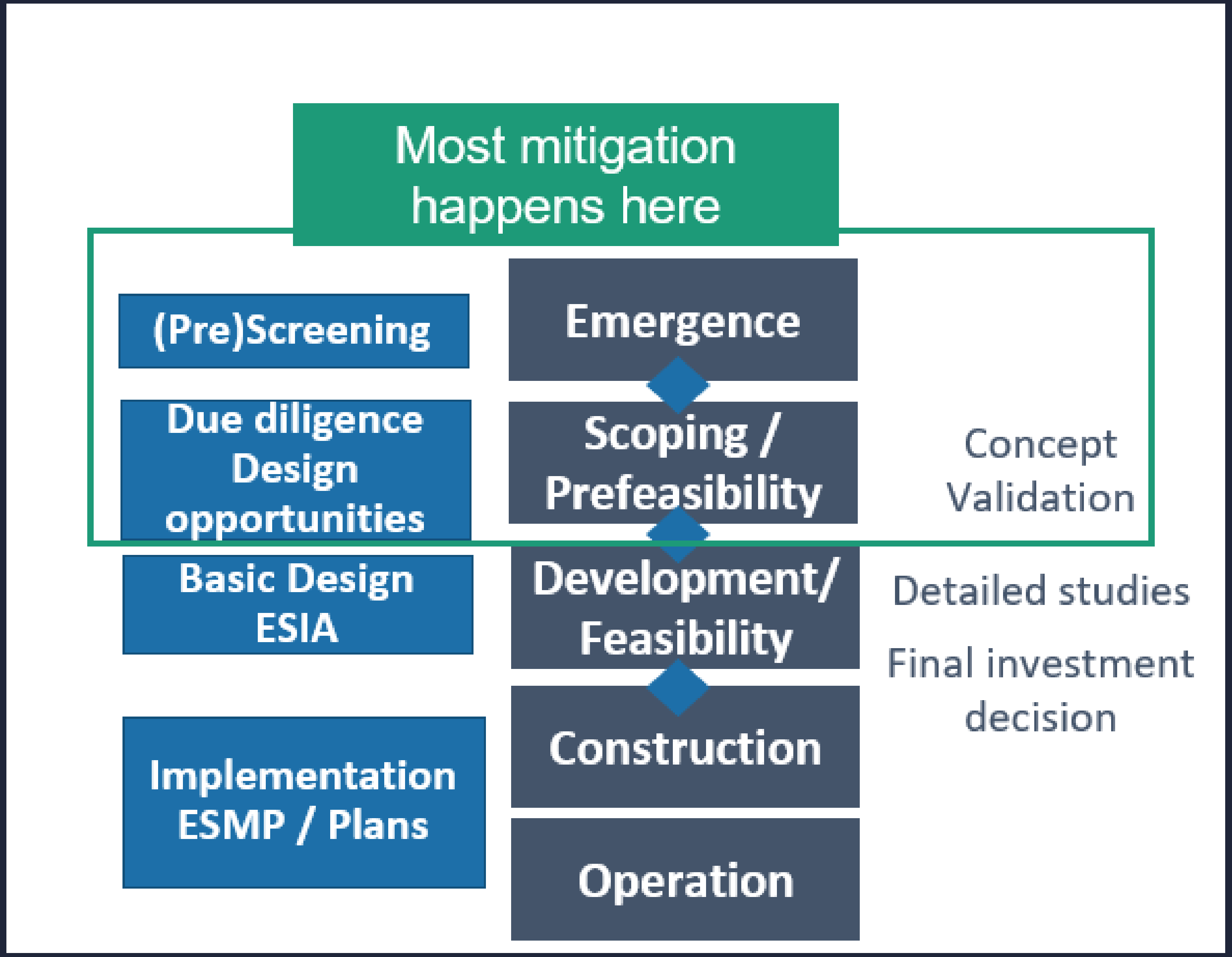
***Elements of design**

Timing



Entering the social dimension

Strong direct dependence on local environment

Mitigation and offsets must integrate people

Engagement
Inclusion
Acceptance
Governance
Stewardship

Ecological mitigation is "easy"

Example with offseting

IFC PS6 principles

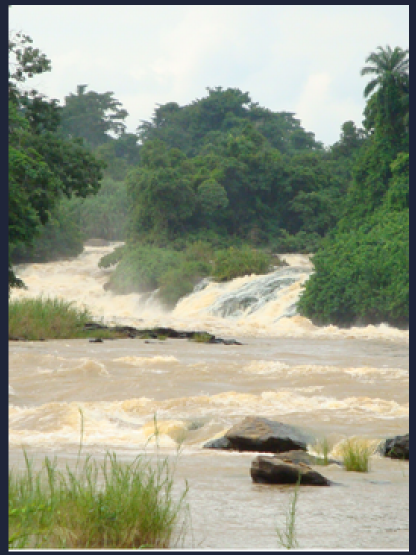
Ecology

Principles known

Social and societal

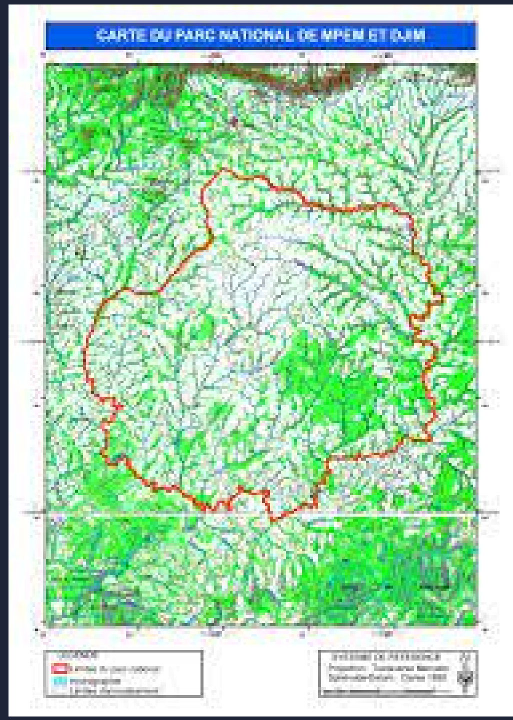
Need people to restore and protect biodiversity

Long-term viability depends on creating viable alternatives for people



Mpem-Djim NP

Offset for Nachtigal HPP in Cameroon



Averted loss, protection and restoration

Reduce poaching / destructive fishing
Reduce deforestation
Riparian buffer zones

↓

Livelihood improvement for adjacent communities

More integration needed!

E&S embarked in design team

Most mitigation happens at the (early) design phase

Ecology needs more sociology

Humans are part of their environment

Mitigation (esp offseting) cannot be done in silo

Demonstrating long-term viability

Researchers and developers

Projects need research to develop and monitor mitigation

Projects provide opportunities to improve biodiversity knowledge and future mitigation


Thank you!