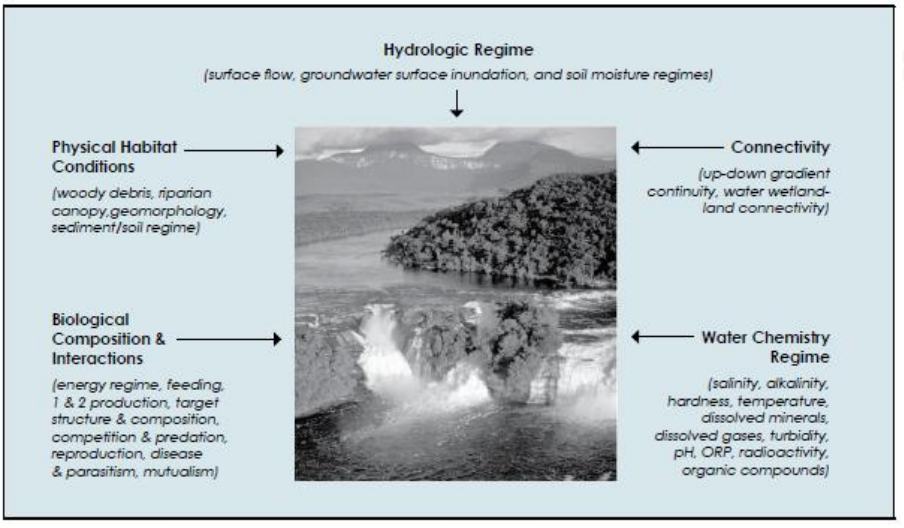
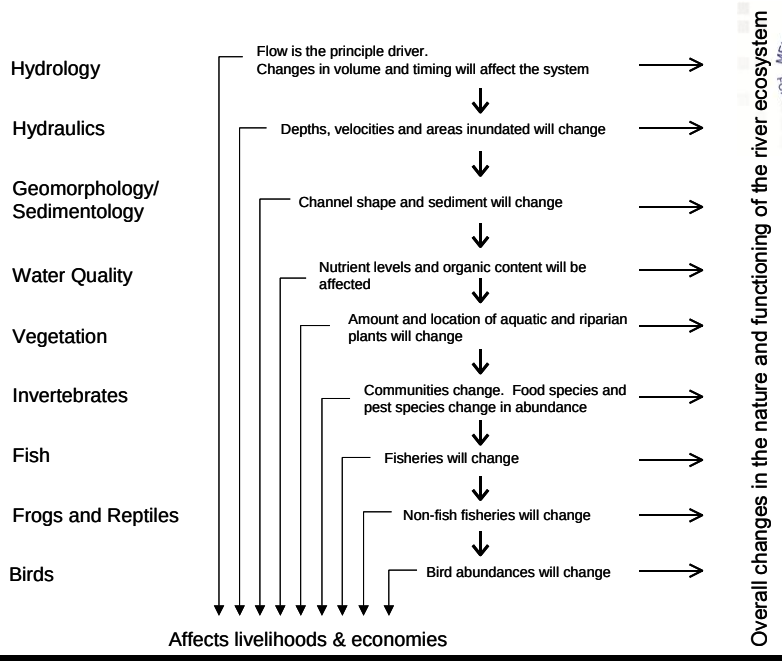
MRC Council Study: National Counterparts' Catchup



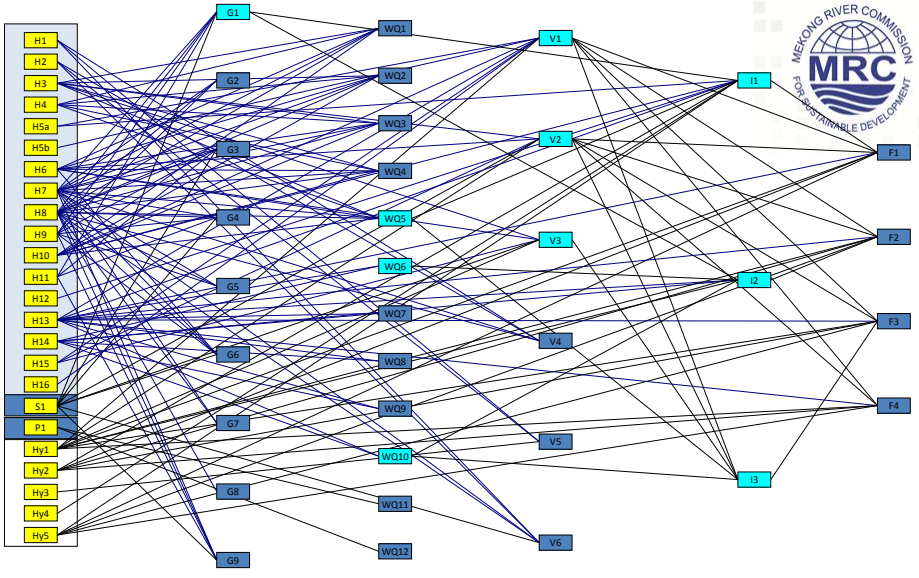


River flow and ecosystem functioning

- Lowflows:
  - basic seasonal nature of the river;
  - more or less wetted habitat;
  - different hydraulic and chemical conditions.
- Floods:
  - general geomorphological character, shape and size of river channel;
  - inundate floodplains and backwater areas
  - mobilise sediments and deposit silt, nutrients and seeds on floodplains;
  - maintain moisture levels in the banks that support the trees and shrubs;
  - trigger the emergence of adults of aquatic insects, which provide food for fish, frogs and birds;
  - stimulate and provide habitat for spawning in fish
- Flow variability, on a daily, seasonal or annual basis:
  - acts as a form of natural disturbance – maintains habitat and biological diversity;
  - dictates the width of the vegetation belt along the water line, which protects the banks against erosion.

Water-resource developments change:

- flow regimes;
- water chemistry;
- sediment and temperature regimes;
- habitats;
- fauna and flora;
- ecosystem services on which people depend.



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- Overwhelmingly complex if all viewed at once

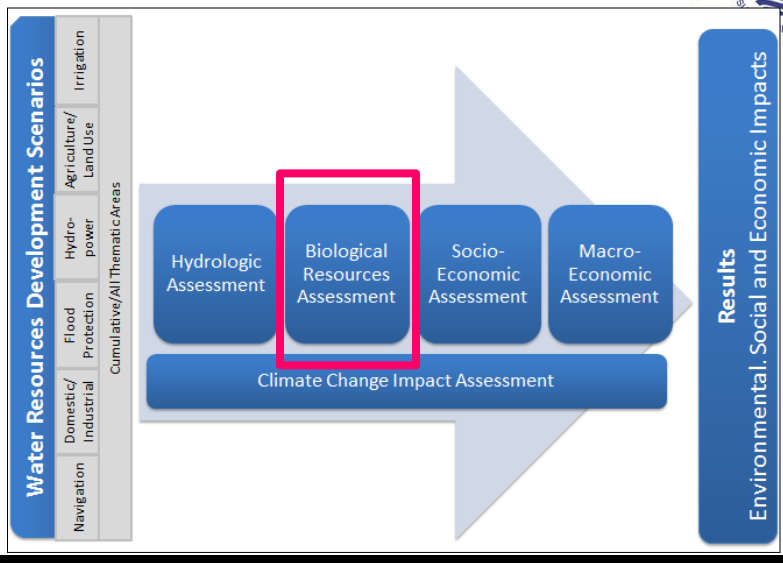
SO

- Divide ecosystem into discipline each with a small set of indicators
- Identify what are the main factors affecting change in each indicator (driving linked indicators)
- Focus on each individual relationship
- Use a model to compute permutations

DRIFT

Downstream Response to Imposed Flow Transformation

The Council Study



Biological Resources Assessment (BioRA)

Objective of BioRA

To provide clear and comparable information on the impacts of proposed thematic developments on the aquatic resources of main-stem Lower Mekong River, inclusive of the Tonle Sap Great Lake and the Mekong Delta.

BioRA Team

BioRA Management:

- Dr So Nam, Dr Peter Degan, Dr Cate Brown; Dr Alison Joubert

International and Regional Consultants:

- Geomorph/WQ: Dr Lois Koehnken
- Vegetation: Dr Andrew MacDonald
  - Macrophytes (delta): Dr Nguyen Thi Ngoc Anh
  - Algae (delta): Ms Duong Thi Hoang Oanh
- Invertebrates: Dr Ian Campbell
- Fish: Dr Ian Cowx, with Dr Kenzo Utsugi (Delta support)
- Mammals and birds: Mr Anthony Stones
- Frogs and reptiles: Dr Hoang Minh Duc
- Tonle Sap processes: Dr Dirk Lamberts

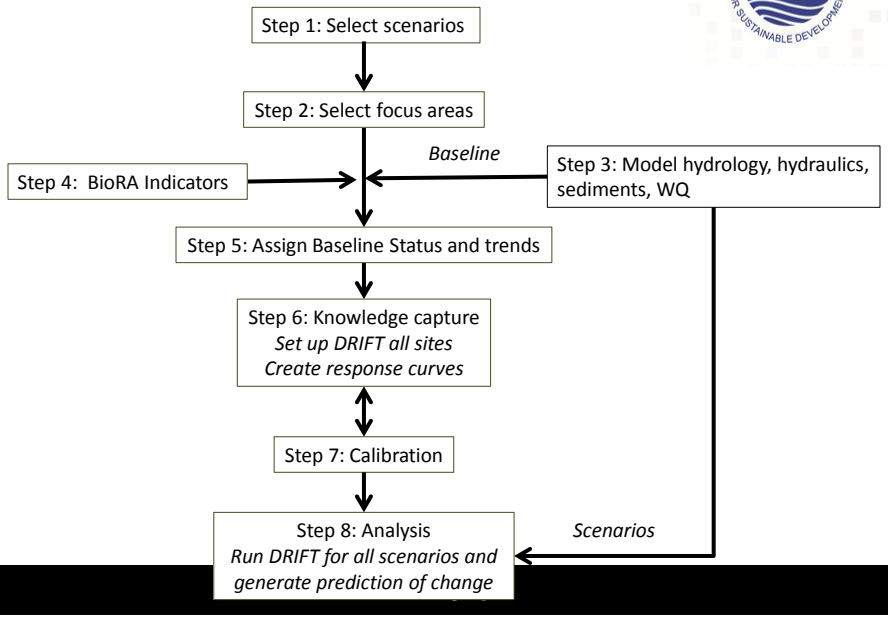
National Counterparts:

Next slide

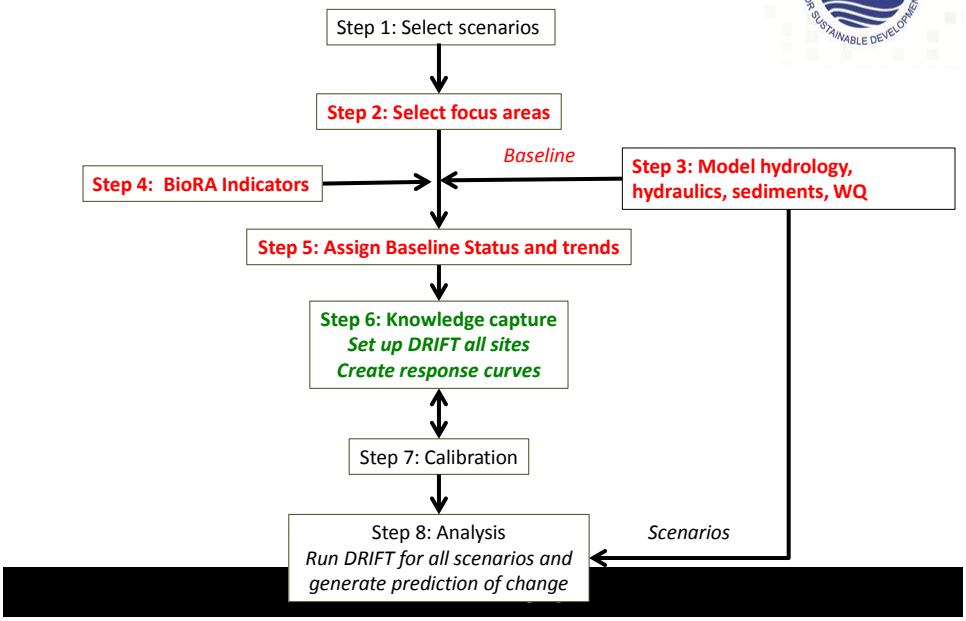
National Counterparts

Country	Name	Discipline
Cambodia	Geomorphology	Toch Sophon
	Biodiversity, excl. fish	Pich Sereywath
	Fish	Dr Chea Tharith
Laos PDR	Geomorphology	Dr Bounheng Soutichak
	Vegetation	Thananh Khotpathoom
	Fauna, excl. fish	Dr Phaivanh Phiapalath
	Fish	Dr Kaviphone Phouthavong
Thailand	Fauna, excl. fish	TBD
	Fish	Chaiwut Grudpun
Viet Nam	Geomorphology	Dr Hoang Thanh Tung
	Biodiversity, excl. fish	Dr Luu Hong Truong
	Fish	Vu Vi An

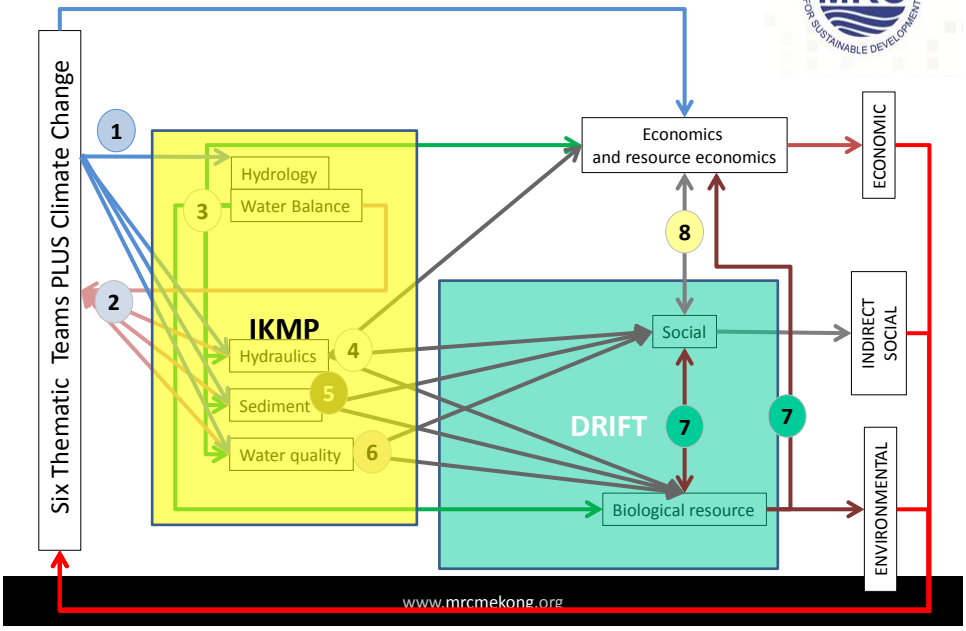
Main steps in BioRA



Main steps in BioRA



Summary of main data flow

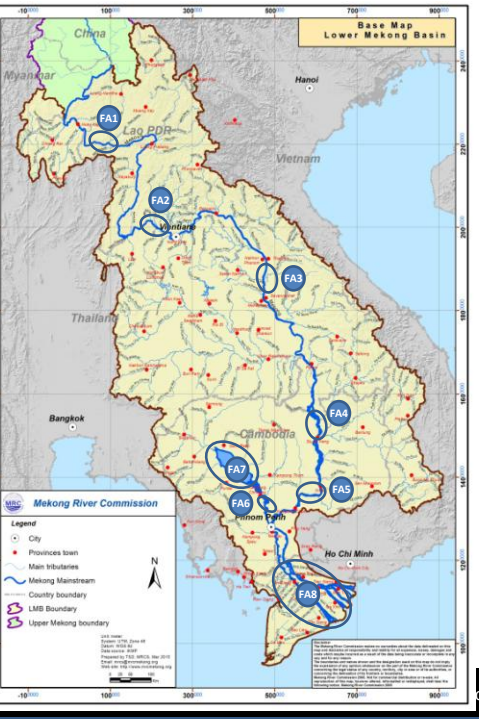


BioRA Focus Areas

Establish nodes

Tier	Criteria	Description
1	International borders	Add node at each international border
2	Hydrological zones	Add node at downstream end of each Hydrological Zone
3	Geomorphological zones	Add node at downstream end of each Geomorphological Zone
4	Tributaries	Add node upstream of each major tributary
5	Conservation hotspots	Add node upstream and downstream of conservation hotspots
6	Mainstem fish migration pathways	Add node in mid-point of fish migratory pathways.
7	Inundation bands	Add node to represent the lowest extent of each inundation band in Tonle Sap Great Lake
8	Salinity	Add nodes at extent of flood and drought salinity intrusion
9	Existing water-resource developments	Add node upstream and downstream of locations of major existing water resource developments, plus navigation and sand mining
10	Planned water-resource developments	Add a node at the upstream limit of major dam infrastructure, mines, towns, agricultural areas, etc.
11	Socio-economic zones	Add node at downstream end of each Socio-economic Zone
12	Rationalisation	1. Remove nodes that <10 km (river length) apart. 2. Remove nodes at tributaries unimportant for sediment and fish.

BioRA Zones



BioRA Focus areas (FAs)

BioRA Indicators

Geomorphology indicators

Code	Indicator
Erosion	Erosion (bank / bed incision)
FineCoarse	Dry and wet season bed sediment size
Sandbars	Availability of sandy bars, islands and insets
Rockreefs	Exposure of rocky reefs
PDepth	Bedrock pool depth
Clarity	Water clarity

Vegetation indicators

Code	Indicator	
CUCover	Channel	Extent of upper bank vegetation cover
CLCover		Extent of lower bank vegetation cover
CHerb		Extent of herbaceous marsh vegetation
CBioRip		Biomass of riparian vegetation
CBioAlg		Biomass of algae (planktonic and benthic)
CComm		Community structure and species composition
FForest	Floodplain	Extent of flooded forest cover
FHerb		Extent of herbaceous marsh vegetation
FBio		Biomass of riparian/aquatic cover
FBioBG		Biomass of cyanobacteria
FBioAlg		Biomass of algae (planktonic and benthic)
RipInv		Extent of Invasive riparian plant cover
FloatInv		Extent of floating and submerged invasive plant cover

Macroinvertebrate indicators

Code	Indicator
Hept	Heptageniid mayflies
Beat	Baetid mayflies
Emerge	Dry season emergence
Palin	Palingeniid mayflies
SnailA	Snail abundance
SnailD	Diversity of snails
N. aperta	Neotricula aperta
Bivalve	Bivalves abundance
Poly	Polychaet worms
Crust	Shrimps and crabs
LitDiv	Littoral diversity
LitASPT	Littoral ATSP
BenDiv	Benthic diversity
BenASPT	Benthic ATSP
Zoo	Zooplankton abundance

Fish indicators

Code	Indicator
Rithron	Rithron resident species
CRes	Main channel resident (long distant white) species
CSpawn	Main channel spawner (short distance white) species
FSpawn	Floodplain spawner (grey) species
Gen	Eurytopic (generalist) species
FRes	Floodplain resident (black fish)
ERes	Estuarine resident species
Anad	Anadromous species
Catad	Catadromous species
Marine	Marine visitor species
NonN	Non-native species

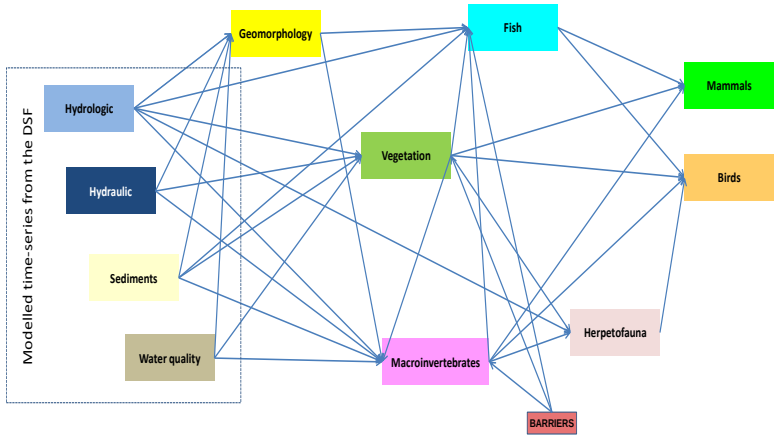
Herpetofauna indicators

No.	Indicator
AquSerp	Aquatic serpents
SAquSerp	Semi-aquatic serpents
AquTur	Aquatic turtles
SAquTur	Semi-aquatic turtles
Amphib	Amphibians
SAquRep	Aquatic/semi-aquatic reptiles
SpAmphib	Species richness of riparian amphibians
SpRep	Species richness of riparian reptiles
DivAmphib	Diversity riparian amphibians
DivRep	Diversity riparian reptiles

Bird and mammal indicators

No.	Indicator	
CGround	Birds	Medium / large ground-nesting channel species
SeaFV		Small non-flocking land bird of seasonally flooded vegetation
TreeWB		Tree-nesting large waterbird
CHole		Bank-/hole-nesting species
Grambeds		Flocking non-aerial passerine of tall graminoid beds
FGround		Large ground-nesting species of floodplain wetlands
CForest		Channel-using large species which require bank side forest
CRock		Natural rocky crevice nester in channels
WoodWater		Dense woody vegetation / water interface
Dolphin	Mammals	Irrawaddy dolphin
Otter		Otters
Ung		Wetland ungulates

Indicators and Linked Indicators



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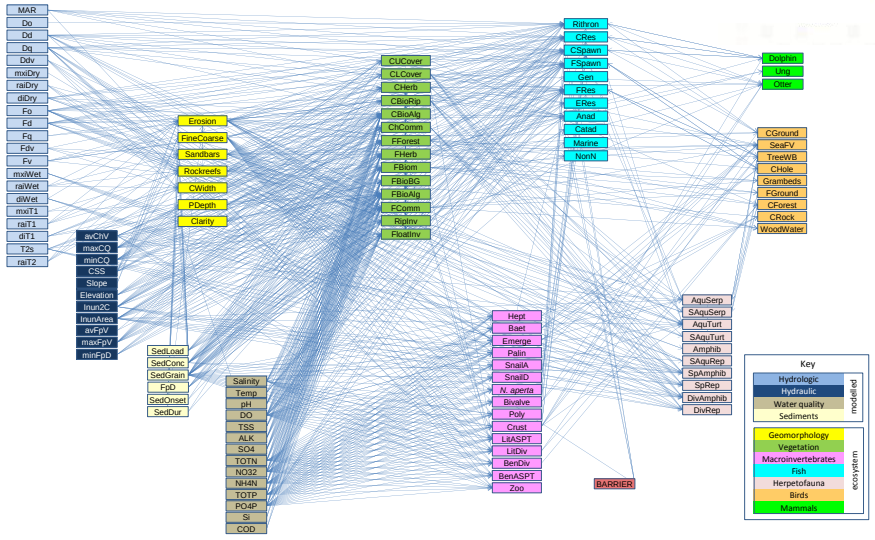

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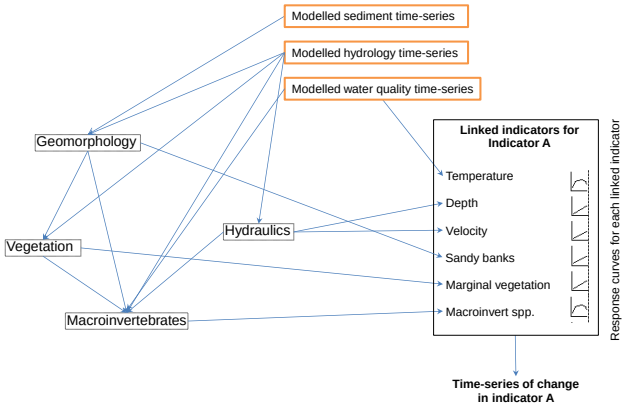


BioRA Status and Trends

Status and trends

- 1. impoundments, which reduce sediment delivery and alter the flow regime;
- 2. sediment mining, which alters channel morphology and induces bank erosion through steepening;
- 3. land cover changes, which alter the quantity of sediment delivered to the river;
- 4. irrigation and other extractions, which alter the flow regime.

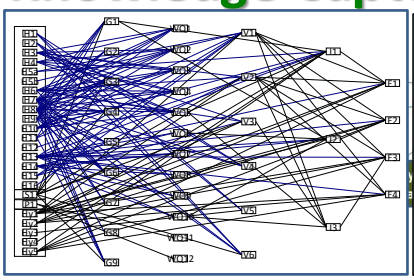
Area: EROSION	Status	Abundance as % of 2015			
	2015	1900	1950	1970	2000
Mekong River in Laos PDR	D	50	50	50	60
Mekong River in Laos PDR/Thailand	D	50	50	60	70
Mekong River in Cambodia	D	50	50	60	70
Tonle Sap River	C	50	50	60	70
Tonle Sap Great Lake	C	50	50	60	70
Mekong Delta	D	50	50	60	70

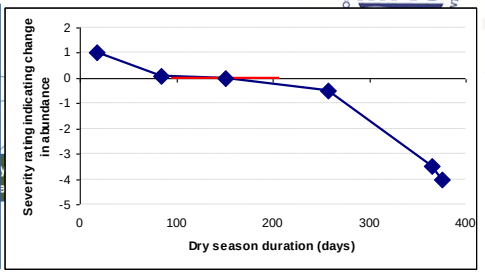
BioRA Schedule

BioRA Schedule

Preparation Meetings:	March 2015
Field Visits:	March 2015
Status and trends:	**June 2015**
~~Field Visit 2:~~	~~July 2015~~
DSS Set-up – river/TLS:	**June-July 2015**
KCW &Calibration –river/TLS:	**Sept 2015**
KCW – Delta:	**Sept 2015**
Calibration – Delta:	**November 2015**
Specialist Reports:	**November 2015**
Scenario Assessment & Reporting:	March/June 2016

Knowledge Capture





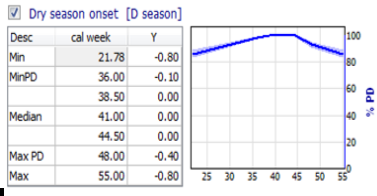
- Sequential/staggered drafting of Response Curves
  1. Geomorphology
  2. Biota
- Iterative
  - Indicators and linked indicators may change
  - Motivations for RC must be provided

Calibration

- Run 'calibration' scenarios to assist with calibrating RCs:
  - Naturalised scenario
  - Extreme scenarios
  - Stepped scenarios
  - Development and exogenous scenarios
- Workshop(s) in Vientiane
- One-on-one sessions facilitated by Skype/email

Specialist Reports

1. Discipline-specific description of study area
2. Indicators:
   1. Reasons for selection
   2. Description
3. Status and trends
4. **Response curve evidence-based motivations**



The fish need sufficient time prior to the onset of the dry season to accumulate food reserves and energy required for maturing of eggs and spawning (Bell 2006; Bagenal 1969). Breeding is triggered by a drop in water temperature, associated with a drop in flow, and should coincide with the maturation of eggs in the fish (Wootton 1998; Pender and Kwak 2002).

Onset of the dry season before September (week 35) could mean that the triggers for breeding occur before the eggs have sufficiently matured. Breeding success would be compromised if spawning takes place at this time (Baltz et al. 1987).

A delayed in the onset of the dry season could result in the fish having mature eggs but missing the temperature cue for breeding (Pender and Kwak 2002). Eggs could perish within the fish and be reabsorbed. Flows in the breeding areas would probably be high and may not be appropriate for construction of redds (eggs would wash away).

Scenario Evaluation and Reporting

- Run scenarios through the DRIFT DSS
- Specialists to review outcomes
- Make adjustments to Response Curves if and where deemed necessary
- Draft the reports:
  - Thematic
  - Cumulative
- Specialists to review and discipline-specific inputs to reports

Role of National Consultants

- Support Lead Consultants:
  - Data
  - Input on Response Curves
  - Motivations
- Ensure understand the process
- Feedback to MCs

DELIVERABLES	Date
Deliverable 1: Progress Report - Preliminary Indicators and Focus Area	Done
Deliverable 2: Progress Report - DSS Set-up	31 July 2015
Deliverable 3: Specialist Reports	November 2015
Deliverable 4: Populated and calibrated DRIFT DSS	November 2015
Deliverable 5: Thematic Scenario Reports	2016
Deliverable 6: Cumulative Scenario Report	2016

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Outputs of OSV July Meetings

- Report: DSS Set-up. This will contain, *inter alia*:
  - Revised BioRA indicator list
  - Links to MRC indicators
  - Anticipated direction of change in BioRA indicators response to changes in linked indicators
  - Trends and Status assessments
  - Layout of DRIFT DSS for BioRA
  - Reference data sets
- Schedule of follow-up activities
- Summary of main issues arising from meetings
- Copies of presentations made at meetings

Thank you